# THE ASSOCIATION BETWEEN ACCOUNTING INFORMATION AND STOCK PRICES

## Model development and empirical tests based on Swedish data

Mikael Runsten

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## Preface

This report is a result of a research project carried out at the department of Accounting and Managerial Finance at the Economic Research Institute (EFI) at the Stockholm School of Economics.

This volume is submitted as a doctor's thesis at the Stockholm School of Economics.

The Institute is grateful for the financial support provided by Rune Höglunds minnesfond, Jan Wallenders stiftelse, Svenska Handelsbanken, Institutet för företagsledning—IFL, and Price Waterhouse,.

As usual at the Economic Research Institute, the author has been entirely free to conduct and present his research in his own ways as an expression of his own ideas.

Stockholm in July 1998

| | |
|---|---|
| Rune Castenäs | Lars Östman |
| Director | Professor |
| The Economic Research Institute | Head of Department for |
| | Accounting and |
| | Managerial Finance |

## ACKNOWLEDGMENTS

My career as a doctoral student started many years ago. I spent a number of years thinking that my thesis would deal with incentive schemes, but was eventually only happy with the title—"Performance beyond Survival". Then my attention switched to the topic of this manuscript in the late 1980s. No one, certainly not myself, could foresee how long this research project would take. I am greatly indebted to many people for sharing their insights with me and for making the process such a happy journey.

First of all, I would like to thank Professor Kenth Skogsvik, my thesis committee chairman and Professor Lars Östman, my former chairman. Both Lars and Kenth have contributed enormously in different ways over the years. Besides offering plenty of research advice, they have gently applied a mixture of carrots, sticks and other stimuli. But most importantly they have provided an exceptional amount of trust and patience. Thank you.

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Professor emeritus Sven-Erik Johansson has, over the years, offered numerous stimulating ideas regarding everything from details of accounting to the art of the proper use of a golf tee. Sven-Erik has also generously offered a number of invaluable suggestions concerning the final draft of this thesis.

In the early phase of my research, a 'traveling research group' consisting of my colleagues Kenth Skogsvik (who later became my thesis committee chairman), Peter Kähäri, Magnus Bild and myself, spent numerous hours discussing our research projects aboard various trains destined for metropolises such as Åndalsnäs and Berlin. Peter and Magnus also deserve mentioning. Peter has been close friend and a trusty gillie. I particularly admire Peter's talent for raising basic but difficult research questions. Peter has also been an important source of inspiration in the art of teaching.

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The empirical part of this research is based on data compiled by Findata. Findata has generously allowed me to access their database, without which this research could not have been conducted. Furthermore, I would like to thank Erik Eklund, one of the co-founders of Findata, who has always been willing to discuss detailed data matters.

Maria De Liseo proofread this manuscript and I am very grateful for her many suggestions which no doubt have made my English more readable.

Dr. Rune Castenäs at the Economic Research Institute (EFI) of the Stockholm School of Economics has been very helpful in finding financial support for this project. In this context, I am especially grateful to Rune Höglunds stiftelse, Svenska Handelsbanken, Jan Wallanders stiftelse, the Swedish Institute of Management (IFL), and Price Waterhouse.

I was very fortunate to spend a year at the University of California, Berkeley, and at Stanford University. Both campuses offered a very stimulating academic environment which contributed immensely to my development. My year in California is in many respects very special to me. I was very lucky to get to know my dear friend Udo Zander—the source of many witty discussions and good entertainment. Many thanks to all the artists of Circus Alvarado, and particularly Udo, Greg, Dechen and Rick. I am most grateful to the Fulbright Commision, C. Silvéns stiftelse and the Chiles Foundation for making my stay in the US possible. The personal support offered by Earle Chiles and his generous hospitality towards my wife and myself during our visit to Portland is gratefully remembered.

In my childhood, while working on different construction projects with my father, I learned that any creative endeavor require two essential ingredients: i) an element of luck which is essential and must be allowed for, ii) time to sit back and enjoy any small achievement. In other words, improvise, see the opportunities and enjoy the process. Thank you for these lessons which I have applied liberally over the years.

Finally, to my wife Eola—thank you for being who you are, and thank you for letting me be who I am.

Despite the contributions made by all these people, deficiencies in this thesis still remain. They are entirely my own.

Mikael Runsten

Stockholm
July 1998

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# Part I

# THEORETICAL FRAMEWORK AND RESEARCH DESIGN

# 1 INTRODUCTION AND BACKGROUND

## 1.1 Economic, market and accounting value

According to economic theory, the value of an asset for its owner is the discounted value of all future cash flows which the owner expects to receive as a consequence of the possession and decisions regarding the asset's use. The value of a firm is assumed to ultimately depend on the monetary success of the business. Some firms have many owners and a share that is traded on a stock exchange. Observed stock prices are the result of an interaction between many individual investors with different transaction motives, expectations of the future, time horizons and analytical methods.[1] The result of these individual investors' aggregated actions generate market prices. Observed stock prices can be viewed as an aggregated measure of the market's valuation of the claim on the firm's future value creation. Thus the stock price is an implicit indicator of the market's expectations of the future success of the firm.

Accounting can be viewed as a language through which an attempt is made to measure and describe the financial consequences of the actions that are taken within a financial entity. The accounting procedure generates a number of descriptions of the firm. In the balance sheet the firm's assets and liabilities are identified and valued at a particular point in time. The difference between assets and liabilities is labeled owners' equity. Equity is a measure of the value that the shareholders have a claim on. In the income statement an attempt is made to describe the revenues that the activities have generated during a period and the expenses that the generation of these revenues has caused.[2] The residual, labeled earnings or net income, is a

1 Some actors represent their own economy directly, whereas an increasing proportion of the actors are employed individuals that invest on behalf of the institutions' ultimate owners.

2 Revenues and expenses can, of course, further be specified at different levels of aggregation.

measure of the period's value creation, measured after all the firm's stakeholders, except for the shareholders, have received compensation.[3]

According to the pricing procedure, value is the result of an almost daily anonymous trading process where, according to financial theory, the expected performance of a firm is balanced into a price via the investors' return requirements. Information is often assumed to constitute the base for the creation of expectations of firm prospects, and preferences are manifested into required rates of return. Value from the accounting procedure is, on the other hand, the result of a measurement procedure that follows specific conventions and rules.

Three value and value creation concepts have been identified. Firstly, the value concept derived from discounted future cash flows will be called economic value (V).[4] This theoretical value concept will be used as a general point of reference. Secondly, market value (M) and accounting value were identified. The term book value of equity (B) will often be used rather than the term accounting value. Figure 1.1 illustrates the relationship between these three value concepts. The economic value concept is forward looking (expected future cash flows), while the starting point of traditional cost-based accounting is actual cash outlays. The market price observed on the stock market is based on trade between investors.

3 Most common accounting regimes postulated today rely extensively on valuation according to historical cost. This simplified description of accounting, however, does not refer to a particular accounting regime.

4 Classical valuation theory was developed by, among others, Fisher (1906) and Lindahl (1939). See discussion in Johansson and Östman (1995).

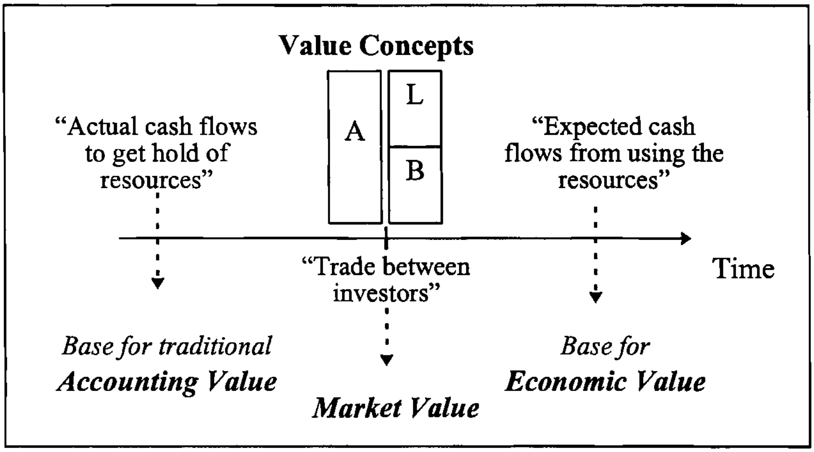


*Figure 1.1* ***An illustration of three major value concepts relating to the shareholders' claim on a company. Assets minus liabilities equals book value of equity (A–L=B). The economic value concept is basically forward looking (expected future cash flows), while the starting point of traditional cost-based accounting is actual cash outlays. The market price observed on the stock market is based on trade between investors.***

For each value concept, one can also identify a value change or a return measure. Return can relate to expectations (*ex ante*) or actual outcomes (*ex post*). In a world of certainty, these measures do, of course, coincide.

Value according to economic theory is intimately connected to a discount factor ($r$), which is a measure of a fair expected and required return. The change in economic value between two points in time plus the period's net transactions between the owners and the firm ($NT$ = dividends – new issues) equals 'economic income'. The change in value referring to observed market prices plus the period's net transactions is an *ex post* return concept. In a similar way, return can be calculated from accounting descriptions. The change in accounting equity plus net transactions with the owners equals accounting earnings. Earnings divided by opening equity generates the commonly used ratio return on equity (*ROE*).

If the accounting procedure generates 'good' descriptions of the firm's value and value creation, a close correspondence between accounting equity (the change in equity) and the stock market value of the firm (the change in the stock market's valuation of the firm) can be expected. All three value concepts may even be made to coincide, provided a set of strong assumptions. Sufficient conditions include perfect markets, individuals with the same preferences, the same level of wealth, and access to the same information which is treated in an identical way. In order to ensure that *ex post* return is equal to *ex ante* return, an assumption of certainty is also required.[5]

These conditions, however, are not particularly realistic. Rather than separate systems generating identical descriptions, one type of description may in practice facilitate the functioning of the other. The output of the accounting procedure may, for example, be used as input in the pricing procedure. Different actors can use accounting information for different purposes; stock investors may, for example, use the information to i) form ideas of the firm's financial status, ii) form expectations of future firm performance, and iii) compare realized performance with expected performance and thus when necessary revise expectations.

The following observations can be made:

i) Two of the value expressions (M and B) can easily be observed.
ii) Value according to economic theory is not possible to observe, but is a possible ideal for anyone who produces, establishes laws about, or uses values from the accounting procedure.
iii) The valuation approaches of individual actors (P/E ratios, discounted expected cash flows, etc.) may to varying degrees be inspired by or be consistent with economic theory. The result of the individual investor's aggregated behavior corresponds to M.

Consider the following simple illustration. In figure 1.2 the market and accounting value of Ericsson, the Swedish telecommunications equipment manufacturer, is illustrated over time (from 1966 to 1996). The stockmarket's value of the firm (number of shares outstanding times the latest quoted buying price) has been measured at the end of each month and the accounting value relates to the end of each year. Given that the stock price of Ericsson at any time is assumed to be a function of how investors expect the firm to perform, it is easy to realize that these expectations may change at any time due to, for example, the market entry of a new competitor, a press

5 See discussion in chapter 3 and 4 in Beaver (1989).

release regarding an important breakthrough in research, or news of a large order. The value of Ericsson measured according to the current accounting regime is, on the other hand, a function of, for example which revenues may be recognized and how assets should be valued. Events that change expectations of future performance may take time to work their way into registered accounting performance, given a specific accounting regime, or the performance may never actually materialize (assuming incorrect expectations).

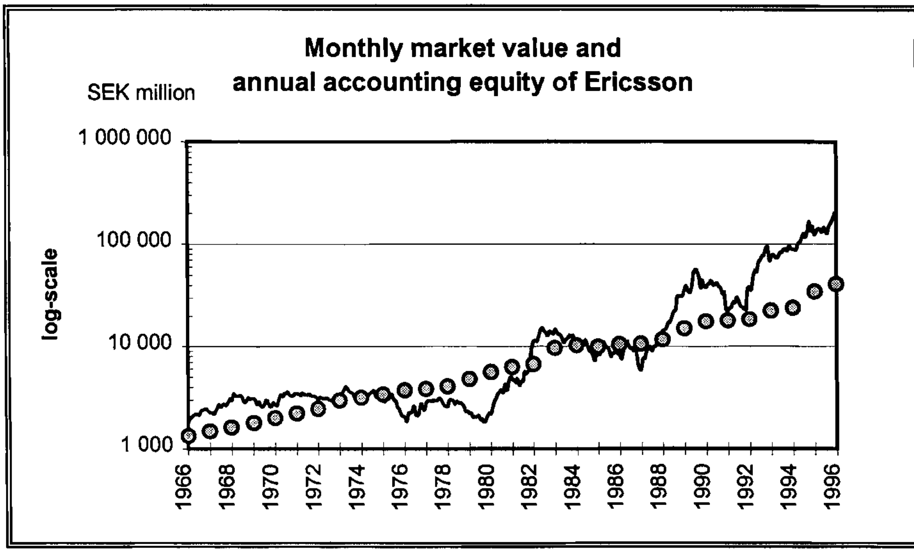


**Figure 1.2** ***The market value (the unbroken line) and accounting equity (dots) of Ericsson during the period 1966 to 1996. Market value has been measured at the end of each month and accounting equity at the end of each year. Accounting equity includes 50% of untaxed reserves up until 1988 and 70% from then on. (Note that a logged value scale simplifies the comparison of the relative distance between the two value measures over the relatively long period.)***
***(Data has been compiled from Dextel-Findata.)***

It can be concluded from the figure that the two descriptions seldom agree. At some points in time, the market's valuation exceeded accounting value and vice versa. Value change, according to the two descriptions, has often been contradictory for shorter periods. Both descriptions seem, however, to have followed the same general trend.

One reason for this not surprisingly imperfect relationship can be found in the principles of conventional accounting. The prevailing accounting regime is guided by a number of fundamental principles and compromises. An accounting convention relies on specific principles regarding valuation (for example; historical costs, current costs or exit prices), matching of costs to revenues within a specific period, recognition of income, and so on. The guiding principles can, for example, put an emphasis on keeping track of actual historical transactions or their potential consequences for future transactions. Kam (1990) argues that the accounting procedure's way of calculating an entity's periodic income is a compromise between what would have been possible under two extreme circumstances—the terminal case and the certainty of future case.

> *"In our world of uncertainty, determining income is somewhere between the strict accrual accounting of the ideal case and the cash receipts and cash payments basis of the terminal case."*
>
> *"Income determination for a business firm is not a simple task. The cash flows are not known with certainty, and the time horizon is not ascertainable. Yet, because of legal requirements, necessity and convention, periodic income must be calculated."*

Kam (1990, pp. 192 - 193)

Patell (1989) points out that the existence of many potential users of accounting information may have led to a choice of principles that is not optimal given a specific user's perspective.

> *"To the extent that we must focus on a single, bottom-line measure of earnings to meet the demands of all of these constituencies,[6] compromises may have been reached in determining the measurement rules, so that some of the potential usefulness in any one arena (say equity capital markets) has been knowingly sacrificed when that is necessary to enhance utility in other arenas."*

6 Patell discusses different interest groups in terms of different markets. He refers to the market for equity capital, debt capital, labor, material and products. He further refers to the political market when discussing the role measurement plays in taxes, tariffs and duties etc.

The Swedish accounting convention has been forced to compromise in particular between the information interest of creditors and shareholders. Furthermore, a strong impact on chosen accounting principles is due to the fact that the measurement of tax charges in Sweden has been closely linked to accounting descriptions. Having to cope with the real difficulties of a combination of genuine uncertainty of the future and long-term projects, the Swedish accounting convention has come to emphasize characteristics such as objectivity and reliability. This has led to measurement rules characterized by prudence and valuation based on documented transactions.[7] Thus the accounting regime has a deliberate tendency to recognize losses early and recognize gains late and to valuing assets low and liabilities high. The value of accounting equity for an arbitrary firm calculated according to the Swedish accounting convention cannot therefore be described as attempting to be the best possible estimate of 'true value'. Neither can accounting earnings be described as the best possible estimate of the period's financial value creation:

> *"The realization convention and the convention of prudence can often imply a poor matching of revenues and expenses and of income and capital in measuring rate of return"*
>
> Johansson and Östman (1995, p. 121)

The role and usefulness of accounting information naturally differs depending on the user and for what purposes the information is used. Hendriksen discusses this matter from the point of view of different users:

> *"Managers seek information that will help them to predict the effect of current decisions on future cash flows. Stockholders who have an effective control of management need information to be able to judge the relative efficiency of management. Stockholders, prospective investors, and creditors need information that will help them predict the future course of the firm and the probability of future financial success that will permit repayments and cash distributions. While these objectives may lead to a single set of accounting principles, different sets of principles*

7 Note that most of these observations are not typically Swedish, but are probably as valid for most industrialized economies.

> *may be required to meet the several possible goals of accounting."*
>
> Hendriksen (1982, p.11)

The Financial Accountings Standards Board (FASB) characterizes useful information as follows:

> *"... useful information possesses two primary characteristics: relevance and reliability. Information is relevant if it makes a difference in the decision of the user, and it is reliable if it represents what it purports to represent."*
>
> FASB concept statement No. 2

With reference to the reliability and relevance concepts, one can argue that from the investor's position, the bottom-line measure of earnings disclosed in an income statement can be analyzed from two perspectives:

i) as a measure of the firm's value creation during the period (earnings in a measurement function);
ii) as an indication (or signal) of the firm's ability to create value (earnings in a signaling function).

## 1.2 Previous research

Most of the classical accounting research has been related to measurement questions often from a normative perspective without direct reference to stock prices. However, since the late 1960s, US accounting research has largely been oriented towards price reactions on accounting signals often without reference to measurement.

With economic value as the point of reference, a classical measurement issue focuses around how well accounting equity and accounting earnings approximate firm value and income according to economic theory. Examples of research questions include: Which depreciation pattern best describes the 'true' value change of an asset? What biases or errors are introduced in the measurement procedure when a certain accounting convention is used and, for example, inflation is non-zero? Does current cost accounting better approximate theoretical ideals? [Significant contributions include: Fisher (1906), Bonbright (1937), Lindahl (1939), Paton and Littleton (1940), Johansson (1961), Edwards and Bell (1961), Mattessich (1964), and Ijiri (1967). See also recent discussion in Johansson and Östman (1995).]

In the book "*Financial Reporting—An Accounting Revolution*" Beaver (1989) notes that the research perspective shifted from economic income measurement to an 'informational' approach in the late 1960s. Beaver argues that the reasons for this shift were related to the 'ideal' that financial statement data attempt to represent (economic value and income), not being conceptually clear in an economy where so many of a firm's assets and claims are represented by imperfect or incomplete markets. Within an 'informational perspective' of earnings, earnings are assumed to affect individuals' beliefs about relevant attributes of a firm (such as dividends). Beaver describes the roles of accounting information as follows:

> *"Financial reporting data play two distinct, but related roles. The first role is to facilitate decision makers, such as investors, in selecting the best action among the available alternatives, such as alternative investment portfolios. The second role is to facilitate contracting between parties, such as management and investors, by having the payment under the contract defined in part in terms of financial reporting data. The first role is often called the* ***pre-contracting role*** *while the second is often called the* ***post-contract role.****"*
>
> Beaver (1989, p. 6)

Much of contemporary (empirical) research attention is focused on informational questions (viewing accounting information as signals). These so-called 'Information Content studies' were initiated by the seminal papers by Ball and Brown (1968) and Beaver (1968). If information arrives (a signal) which triggers a revision of the expectations of future firm performance, then a simultaneous revision of the market price, (or increased trading volume, as Beaver (1968) tested) is expected. In the traditional information content design, studies focused on the residual price change (price changes not associated with the general price change in the market) around an event date when new information was released. Firms were divided into different groups depending on the sign or the magnitude of the news. The magnitude of the news has usually been calculated as the relative difference between a reported news item and the level that the market is assumed to have had reason to expect. The news item most often studied is reported earnings per share. Referring to the martingale process, as the statistical process best describing the earnings' generation process, the last period's reported earnings have most often been used as the proxy for market expectations (often with an added positive drift term). This branch of research has found a significant association between the sign of the unexpected price change and the sign of the unexpected accounting earnings change. Forsgårdh and Hertzen (1975) identified a similar association in the Swedish market.[8] Beaver, Clarke and Wright (1979) found a significant positive association between the level of abnormal return and the degree of surprise in disclosed accounting earnings. With time and effort, research has identified a number of plausible fundamental relationships. Several lengthy reviews of these research efforts have been published, including Beaver (1981), Lev and Ohlson (1982), Foster (1986) and Watts and Zimmerman (1986). However, some disturbing problems have also been identified. Lev's (1989) study, whose purpose was to evaluate the collective results of the research efforts following Ball and Brown (1968), concluded that the studies in general show very low explanation (in the $R^2$-sense). In other words, the correlation between earnings and returns has been very low. Lev further noted the following:

> *"The wide intertemporal fluctuations of the parameters of the returns/earnings regression reflect negatively on the usefulness of earnings in facilitating the prediction of future stock returns—perhaps even more so than the low level of the returns/earnings association. ... Not much is currently known about the underlying reasons for this instability. Theory suggests that one of the reasons might be changes in the discount rate."*
>
> Lev (1989, p. 168)

The potential reasons for these rather disappointing results are many. Given the well-known 'weaknesses' in the accrual accounting procedure and continuous change in accounting principles, a stable and unambiguous relationship over time between an actual reported accounting variable (such as

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8 Rather than relying on naive earnings change models, Forsgårdh and Hertzen's study constitutes an early effort to use expectations from analysts.

earnings) and the stock price can hardly be expected, even if accounting information is used and is important in the valuation process. Many empirical studies use firms from different industries as if they were homogeneous. Accounting compromises may well cause very different types of problems for different types of business activities. Using achieved earnings during time periods with, for example, different levels of inflation and/or different accounting regimes, could certainly blur the strength of a modeled theoretical association.

In a rather provocative article Penman (1991) analyzed and criticized the signal research paradigm and advocated the revival of fundamental analysis. Penman argued that the academic burial of fundamental analysis came about in the late 1960s and early 1970s due to the strong belief in the efficient market hypothesis (EMH) which prevailed during this period:

> *"Indeed "faith in the EMH" bred a disinterest in both fundamental security valuation and the accounting that might lead to measures of value. Consider some of the well-circulated statements associated with EMH. Fundamental analysis doesn't matter because prices give as value. Accounting is not important because the market is efficient with respect to accounting information. And, of course, the classic: the market "sees through" the accounting."*
>
> Penman (1991, p. 10 )

In such an academic environment, accounting measurement issues became less interesting. The skepticism against accounting numbers was strong, as is evident, for example, in a statement by Treynor:[9]

> *"But, it is becoming more and more difficult for accountants to convince practical decision makers that earnings figures based on such arbitrary procedures have any relevance...they are bringing steadily closer the day when it will be obvious to everyone in and outside their profession that the earnings concept is not suited to the needs of investors."*
>
> Treynor (1972, p. 43)

9 Such skepticism is still widespread today. See, for example, Stewart (1991) and Copeland et al (1991).

Penman concluded that the research results within the information content paradigm often have a minor practical value. In most practical situations, it would be more interesting to generate an expected value of a firm rather than focusing on the relative stock price response on an accounting news item. Penman further argued that the associations that have been studied are statistical associations and that they are generally not well founded in a valuation theory. Therefore, to determine whether an accounting number has value relevance within this paradigm, it is necessary to assume market efficiency.

An old branch of accounting research literature, which during the last decade has received renewed attention, concerns theoretical modeling of the economic value of an entity using concepts from the accounting framework without reference to the actual stock price. These efforts are the basis for (or, possibly just as much, inspired by), so-called, 'fundamental analysis'. Significant contributions include: Preinreich (1938), Williams (1938), Edwards and Bell (1961), several papers by Ohlson (1989a, 1989b and 1995) and Brief and Lawson (1992). The discounted residual income (EVA) oriented approach found in Stewart (1991) and the discounted free cash flow approach advocated in Copeland et al (1991) are examples of two popular 'handbooks' on value management and company valuation today.[10]

Over the years, a number of empirical tests of fundamental valuation models have been performed. Studies include Meader (1935), Gordon (1962), Miller and Modigliani (1966) and Brown (1968) who have attempted to explain a firm's market price using different variables. Litzenberger and Rao (1971) and Bowen (1981) attempted to explain the ratio of the market value to accounting value of equity. The aim of these studies has primarily been to either test a valuation model or to analyze the investors' required rate of return and time horizon. These studies have, however, generally not focused on accounting measurement issues as such. A general conclusion seems to have been that expected profitability (or earnings) is the single most important explanatory variable. Foster (1986, p. 445) contains a summary of the result of this branch of research. Foster notes that even if an

10 Damodaran (1994) provides an *exposé* of different valuation approaches and discusses their pros and cons in different situations.

earnings measure is important, the studies tend to give very different estimates of key coefficients of the valuation models. He quotes Granger:

> *"There is no stability in the estimates of coefficients of the model derived from a sequence of cross-sectional data sets through time. This is an extremely damaging observation, throwing considerable doubt both on the reality of the model and also on its usefulness as a predictive tool... What causes this coefficient instability? A whole variety of technical statistical reasons can be proposed but the most important reason is likely to prove to be model misspecification."*
>
> Granger (1972, pp. 503-504)

As a response to the signal-oriented stream of papers a more measurement-oriented branch of studies began to emerge in the early 1990s. With market value as the point of reference, Easton and Harris (1991) concluded that annual accounting earnings explain a statistically significant proportion of annual stock market return. However, the explanatory power in their sample was below 10%. In Easton, Harris and Ohlson (1992), the time interval studied was increased to a maximum of ten years. Easton, Harris and Ohlson concluded that the longer the time interval over which earnings are aggregated, the higher the cross-sectional correlation between earnings and stock returns. For a ten-year interval they show an $R^2$ of more than 60%. They suggested that this result can be explained by the fact that many accounting measurement errors diminish when longer periods are studied. They also noted, somewhat puzzled, that:

> *"A dollar of earnings evidently is associated with more than a dollar of change in value for long return periods."*
>
> Easton, Harris and Ohlson (1992, p. 139)

In a review article discussing capital markets research in accounting during the 1980s, Bernard (1989) offered the following concluding remarks regarding "Research on the Role of Accounting in Valuation":

> *"The bad news is that this line of research has suffered from scanty use of our knowledge of the accounting system, too little attention to economic (as opposed to statistical) interpretation, and, in some cases, weak or unstated motivation."*
>
> Bernard (1989, p. 99)

Later in the same paragraph, Bernard summarized his suggestions for future research:

> *"1) Progress will require that we end reliance on simple models of valuation (for example, assuming that returns can be explained by an additive combination of accounting variables, without regard to precisely what those variables communicate about the economic status of the firm). An injection of knowledge about the accounting system and fundamental analysis is necessary; research designs must explicitly consider that the signal conveyed by a given accounting number is clear, only once it is conditioned on other information, possibly including accounting information.*
> *2) It would frequently be useful to sacrifice large sample sizes and sophisticated statistics for the sake of achieving a deeper understanding of the relations among accounting variables, and between those variables and equity values. This may involve studies of small samples-within an industry or group of related industries.*
> *3) Further reliance on formal modeling would be fruitful. The framework adopted by Ohlson [1989a and 1989b] may be a good starting point."*
>
> Bernard (1989, p. 99)

Incidentally, Bernard's suggestions coincide with my own research intentions which I had largely formulated before coming across his advice. The association between stock market prices (and the change in prices) and accounting data will be studied using, what I hope, is a sufficiently rich valuation model specification. The association will be studied with particular attention to: i) differences in firm (or industry) characteristics, ii) changes in the economic climate, and iii) changes in the accounting regime.

## 1.3 Purpose

***The purpose of this study is to investigate the relationship between a selection of traditional accounting numbers and stock market prices in Sweden. Particular attention will be paid to the valuation model specification, and to i) differences in firm characteristics, ii) changes in the economic climate, and iii) some major changes in accounting practice.***

## 1.4 Discussion of the purpose, limitations and assumptions

This study will attempt to generate further understanding concerning the relationship between observed stock prices (and changes in stock prices) and the observable outcome of the formal accounting procedure. The study will focus on key accounting numbers, such as earnings and equity, and key financial ratios, such as return on owners' equity, based on official financial statements of individual firms.

The specification of a valuation model that formally ties accounting measures to expected stock prices is expected to serve as a useful guide towards designing statistical tests and increasing the possibility of making economic inferences from different estimated coefficients. The valuation model should be outlined so that, for example, known measurement biases in traditional accounting can be used to improve the explanatory power of a regression rather than obscuring it.

Acknowledging and understanding the nature of the biases in the prevailing accounting measurement system should help us to interpret the association (or lack of association) between the accounting descriptions and the market descriptions of value and value change. The fact that the type and size of the measurement biases are different for different types of firms under different environmental conditions will be of particular interest. From an accounting measurement perspective, particular characteristics of firms are related to attributes such as the firm's degree of trading versus holding activity, the economic lives of the firm's assets, the relative importance of investments in intangibles such as research and development as well as brandnames.

Potentially important changes over time in the economic climate and financial conditions include the level and pattern of the inflation rate, the general fluctuations in the business cycle, changes in the tax system and the currency exchange rate. Finally, consequences of the association between accounting numbers and stock prices, from changes in accounting conventions, such as group consolidation practice, and the transition from tax-based towards economically-based disclosure of value and depreciation of tangible assets, will be analyzed.

The aim of this study is to investigate the relationship between accounting measures and stock market measures given the prevailing accounting regime(s), it is not to develop an ideal accounting system. Observed stock prices will be viewed as an aggregated measure of the market's valuation of its claim on invested capital (and/or retained value created) and future value creation. Whether the price at all times for all firms perfectly mirrors the implications of public information is the focus of tests of (semi-strong) market efficiency. This study, however, is not intended as a test of market efficiency. The associations will be studied without an explicit focus on or assumption of market efficiency. The type and strength of the conclusions that can be drawn from observed statistical associations will, however, to some extent, depend on whether or not the market is considered efficient. The main advantage of assuming market efficiency is that the stock price can be used as a 'true benchmark'.

The empirical part of the study will be performed using Swedish data. A prerequisite for the study of accounting practice changes and the impact of changes in the economic climate is a period of time spanning many years. Due to availability of a database including both accounting and stock price information for Swedish firms from 1966, the study will be restricted to the period thereafter. As the compilation of data began in 1994, the last year to be included is 1993.

## 1.5 Distinctive features and expected contributions

This is an empirical study of both value and value change, utilizing a valuation model based on accounting concepts, but derived from classical valuation theory. The number of potential confounding variables in such an empirical test situation is enormous. Using both a value and a value change specification will provide ways to shed light on the association between market and accounting values from different angles. Different types of business activities are expected to be affected differently by the measurement rules of accounting. The valuation model will therefore specifically allow for and incorporate such differences. The specified valuation specification should also preferably allow economic interpretations of estimated regression coefficients. A period of more than 25 years will be studied, a period during which many fundamental changes took place, both regarding the economic and business environment and regarding accounting measurement and disclosure practice. A number of these changes will explicitly be examined.

This study will thus hopefully contribute to our knowledge regarding the relationship between stock prices and accounting information, that is, knowledge of the usefulness of accounting information in a valuation context. The approach used to control for differences in firm characteristics, changes in the economic climate and accounting conventions, will hopefully provide some insights into, for example, the noted unstable regression coefficients of many previous level studies (and many information content studies). Further, the study will attempt to shed light, for example, on the noted 'strange' result that a unit of earnings tend to be associated with more than a unit of change in value for long return windows.

Almost all Swedish companies listed on the Stockholm Stock Exchange during the specified 25-year period will be included in this study. This may thus be viewed as a descriptive study of the whole population implying that statistical inferences to a larger population are not possible. On the other hand, the data may both be viewed as a particular realization in the indefinite space of time (a sample in the space of time), or as a non-random collection of observations from a large universe of stock markets and accounting regions. The results could thus be viewed as a description of a particular era in Swedish history, but inferences towards future periods and comparisons to similar studies in other countries should also be of interest. The results could further be used as a starting point for the generation of hypotheses regarding similar relationships in other countries with similar accounting conventions.

## 1.6 Structure of this document

Part I of this document, consisting of Chapters 1, 2 and 3, describes a theoretical framework and the research design. Chapter 2 presents an accounting based valuation model. From this valuation specification, several testable regression specifications for both value and value change are derived. Chapter 3 conceptually develops and discusses: i) differences in firm characteristics, ii) changes in economic climate, and iii) changes in the accounting regime.

In part II, consisting of Chapters 4, 5 and 6, the empirical sample is selected, whereupon practical measurement issues and estimation procedures of all necessary model variables are performed and discussed.

Part III, consisting of Chapters 7, 8 and 9, presents the results of the empirical tests. The results of the level regression specifications are presented and discussed in Chapter 7. Subsequently, Chapter 8 presents and discusses the results of different value change regression specifications, with different time intervals. The final chapter includes a summary and offers some concluding remarks.

# 2 A VALUATION FRAMEWORK

In order to empirically study the relationship between accounting and market value measures, and conceptually advance beyond mere statistical associations, a valuation model that formally ties accounting measures to calculated economic value is needed. This essentially involves three steps: i) expressing value as a function of expected future dividends, ii) expressing future dividends as a function of future performance described in accounting terms, and iii) predict the future accounting performance of a company. This chapter will deal with the first two steps.

Outlining this valuation model, return on equity (*ROE*) will be included as the central accounting performance variable rather than absolute earnings. This choice is driven by two reasons: First, among Swedish listed companies, return on equity is a prominent performance indicator; generating a sufficient *ROE* is perceived by many Swedish firms as a necessary condition for long-term survival.[1] Second, the future accounting performance of individual companies must in later sections be predicted. To perform such predictions, the empirical observation of a mean reversion pattern in return on equity[2] is considered a more fruitful starting point than the empirical observation of a random walk behavior of earnings.[3] As the valuation model will eventually be the base for an empirical study of the relationship between actual accounting data and market value, and since the prevailing accounting regime in Sweden is expected to be deliberately prudent in several areas, a variable capturing the concept of biased accounting will also explicitly be included in the valuation model.

1 See discussion in Johansson (1995) and Johansson and Östman (1995).
2 See, for example, Freeman, Ohlson and Penman (1982) and Ou and Penman (1994).
3 See, for example, Ball and Watts (1972).

## 2.1 A valuation approach

The structure of the valuation approach outlined below was originally presented by Preinreich (1938) and Edwards and Bell (1961). The valuation approach has more recently been refined and further developed in several papers by Ohlson (1989a, 1989b and 1995), Brief and Lawson (1992) and Skogsvik (1993).[4] The presentation in Section 2.1 draws on all these references.

The first step is rather uncontroversial. A general valuation model where the economic value is the discounted value of expected future dividends can be expressed in the following way:

$$[2:1] \qquad V_{j,t} = \sum_{s=1}^{\infty} E_t\left(\tilde{D}_{j,t+s} - \tilde{N}_{j,t+s}\right) \cdot \prod_{\tau=1}^{s} \left( \frac{1}{\left(1 + r_{j,t+\tau}\right)} \right)$$

where $V_{j,t}$ is the economic value of the equity of firm $j$ at the end of period $t$, $D_{j,t+s} - N_{j,t+s}$ is the firm's net transactions with its shareholders (dividends minus new issues) at the end of period $t+s$, $E_t(..)$ is the notation for expectations at the end of period $t$,[5] ~ denotes a stochastic variable and $r_{j,t+\tau}$ is the market's required rate of return on equity capital for firm $j$.[6]

In order to simplify the mathematical treatment, assume a flat term structure of future required return (i.e. $r_{j,t+\tau}$ is a constant for all future periods). Assume further that investors are risk-neutral which implies that the cost of equity equals the risk-free interest rate. It will further prove helpful to divide the valuation function into two parts. The first part consists of the discounted value of expected future dividends minus new issues until a future date, $T$ periods away, and the second part consists of the discounted value of the remaining economic value at time $t+T$ ($V_{t+T}$). Firm index ($j$) is understood but for convenience, will temporarily be suppressed.

4 This is by no means a comprehensive list of the contributions in this area.

5 The time index for the expectations operator $E(..)$ will from now on (for notational convenience) be suppressed.

6 The subscript $t$ for time when related to a flow variable, such as return on equity, describes a time period ($t$–1, $t$). When related to a stock variable, such as price or book value of equity, $t$ refers to the end of the time period. The cash transactions $D_t$ and $N_t$ are assumed to take place at the end of period $t$.

[2:2] $$V_t = \sum_{s=1}^{T} \frac{E\left(\tilde{D}_{t+s} - \tilde{N}_{t+s}\right)}{(1+r)^s} + \frac{E\left(\tilde{V}_{t+T}\right)}{(1+r)^T}$$

In order to perform the second step, one essential assumption regarding the accounting measurement principles must be established. Ohlson (1989a) calls it the 'clean surplus relation of accounting' and Skogsvik (1993) formulates this requirement as follows:

> *"The measurement of assets and liabilities in the balance sheet is consistent with the measurement of revenues and expenses in the income statement."*
>
> Assumption A.1 on page 5 in Skogsvik (1993)

With accounting notation the requirement can be expressed in the following way, assuming that accounting equity is measured including the 'latest' new issue and excluding the 'latest' dividend payment:

[2:3] $$B_{t+1} = B_t + Earnings_{t+1} - D_{t+1} + N_{t+1} \qquad \text{for all periods}$$

According to this relationship, the book value of equity at the end of a period ($B_{t+1}$) equals the book value of equity at the beginning of the period plus the accounting earnings for the period in question, minus net dividends paid to the shareholders during the period.[7] Dividends reduce equity and stock issues increase equity. The difference between dividends and stock issues will be viewed as a net transaction with the shareholders, denoted (*NT*). The equation can thus be written as:

[2:4] $$NT_{t+1} = Earnings_{t+1} + B_t - B_{t+1}$$

Define return on equity (*ROE*) as follows:

[2:5] $$ROE_{t+1} \equiv \frac{Earnings_{t+1}}{B_t}$$

7 Comprehensive accounting is another common term for this accounting relation.

If this *ROE* expression is incorporated into the clean surplus relation of accounting, the following expression is obtained:[8]

$$[2:6] \qquad NT_{t+1} = B_t \cdot \left(1 + ROE_{t+1}\right) - B_{t+1}$$

Valuation model [2:2] can be rewritten by replacing net cash transactions with the accounting variables:

$$[2:7] \qquad V_t = \sum_{s=1}^{T} \frac{E\left(\widetilde{B}_{t+s-1} \cdot \left(1 + R\widetilde{O}E_{t+s}\right) - \widetilde{B}_{t+s}\right)}{\left(1+r\right)^s} + \frac{E\left(\widetilde{V}_{t+T}\right)}{\left(1+r\right)^T}$$

By factoring in *r* in the clean surplus relation of accounting, the following expression is obtained. Note that the difference between *ROE* and *r* is a measure of abnormal return on equity.

$$[2:8] \qquad B_{t+s-1} \cdot \left(1 + ROE_{t+s}\right) = B_{t+s-1} \cdot \left(1 + r\right) + B_{t+s-1} \cdot \left(ROE_{t+s} - r\right)$$

Expression [2:7] can now be rearranged:[9]

---

8 In the following sections, *ROE* will be used with some slightly different notations. $R\breve{O}E_{t+1}$ implies that return on equity for period *t*+1 is uncertain. $E\left[R\breve{O}E_{t+1}\right]$ denotes the expected outcome of the uncertain return on equity for period *t*+1. $ROE_{t+1}$ denotes the actual realization of return on equity for period *t*+1.

9 $$V_t = \sum_{s=1}^{T} \frac{E\left(\widetilde{B}_{t+s-1} \cdot \left(1+r\right) + \widetilde{B}_{t+s-1} \cdot \left(R\widetilde{O}E_{t+s} - r\right) - \widetilde{B}_{t+s}\right)}{\left(1+r\right)^s} + \frac{E\left(\widetilde{V}_{t+T}\right)}{\left(1+r\right)^T} =$$

$$= \frac{E\left(B_t \cdot \left(1+r\right) + B_t \cdot \left(R\widetilde{O}E_{t+1} - r\right) - E\left(\widetilde{B}_{t+1}\right)\right)}{\left(1+r\right)^1} +$$

$$+ \frac{E\left(\widetilde{B}_{t+1} \cdot \left(1+r\right) + \widetilde{B}_{t+1} \cdot \left(R\widetilde{O}E_{t+2} - r\right) - E\left(\widetilde{B}_{t+2}\right)\right)}{\left(1+r\right)^2} +$$

$$+ \cdots + \frac{E\left(\widetilde{B}_{t+T-1} \cdot \left(1+r\right) + \widetilde{B}_{t+T-1} \cdot \left(R\widetilde{O}E_{t+T} - r\right) - E\left(\widetilde{B}_{t+T}\right)\right)}{\left(1+r\right)^T} + \frac{E\left(\widetilde{V}_{t+T}\right)}{\left(1+r\right)^T} =$$

$$= B_t + \sum_{s=1}^{T} \frac{E\left(\widetilde{B}_{t+s-1} \cdot \left(R\widetilde{O}E_{t+s} - r\right)\right)}{\left(1+r\right)^s} + \frac{E\left(\widetilde{V}_{t+T} - \widetilde{B}_{t+T}\right)}{\left(1+r\right)^T}$$

[2:9] $$V_t = B_t + \sum_{s=1}^{T} \frac{E\left(\tilde{B}_{t+s-1} \cdot \left(R\tilde{O}E_{t+s} - r\right)\right)}{(1+r)^s} + \frac{E\left(\tilde{V}_{t+T} - \tilde{B}_{t+T}\right)}{(1+r)^T}$$

According to [2:9] the economic value of the shares of a firm can be divided into three parts: i) the current level of accounting equity, ii) the discounted sum of all abnormal profits that the firm is expected to generate from time $t$ to a date $T$ periods ahead, and iii) the present value of the expected difference between the economic value and accounting value of owner's equity $T$ periods ahead.

At this stage, the only assumptions that are necessary for the validity of valuation model in [2:9] are a constant required rate of return, end of period cash flows and the assumption of the clean surplus relation of accounting. The first two assumptions ensure a fairly simple mathematical expression and the last one generates an axiomatic link between dividends and accounting. The valuation model is thus not sensitive to whether the accounting regime is, for example, prudent or not.

## 2.2 The valuation model with disappearing abnormal profit

It is obvious that the valuation model reduces to $V_t = B_t$ in the absence of any expected abnormal profits and if $V_{t+T} = B_{t+T}$. Abnormal profits may, however, be expected to be persistent for a number of periods for a certain company as a result of imperfect competition due to, for example, patents or other barriers to entry. In a competitive environment, however, it seems reasonable to expect that such abnormal performance cannot last indefinitely for most companies.[10] The second assumption ($V_{t+T} = B_{t+T}$) is consistent with such zero expected abnormal profits after time $t+T$, and an accounting regime that is 'unbiased'. An unbiased accounting regime is defined to imply that in the absence of expected abnormal performance, ac-

10 This kind of assumption can be traced back to the discussions of goodwill valuation in the early German accounting literature (e.g. Preinreich 1937 and 1939). See discussion in Chapter 6.5 in Johansson (1959).

counting equity will equal economic value and that expected accounting return will simultaneously equal the required rate of return for all future periods. Performance is deemed to be normal when existing and new projects are expected to generate a return that just covers the cost of capital. To be more explicit, unbiased accounting denoted by superscript (*u*), is defined to imply that in absence of expected abnormal performance:

$$E\left[R\tilde{O}E^{(u)}_{t+T+m}\right] = r \text{ for all } m \geq 1$$

and

$$E\left[\tilde{B}^{(u)}_{t+T}\right] = E\left[\tilde{V}_{t+T}\right]$$

A.2 Assume that such an unbiased accounting language can be established.

According to A.2, unbiased accounting earnings ($x^{(u)}$) for every future period are expected to equal opening period unbiased accounting equity times the cost of capital:

[2:10] $$E\left[\tilde{x}^{(u)}_{t+T+m}\right] = E\left(\tilde{B}^{(u)}_{t+T+m-1}\right) \cdot r$$ for all m ≥ 1 if no abnormal performance is expected

or unbiased abnormal earnings ($\tilde{x}^{a(u)}$), using the notation in Ohlson (1995), are expected to equal zero for all future periods

[2:11] $$E\left[\tilde{x}^{a(u)}_{t+T+m}\right] = 0$$ for all $m \geq 1$ given unbiased accounting and no expected abnormal performance

In order to simplify the valuation equation, the following assumptions regarding the firm's expected growth and dividend policy are expected to hold.[11]

11 A number of assumptions will be stated in the following sections. To emphasize the different nature of these assumptions, they will be labeled either A, B or C.
Category A = Assumptions related to the accounting regime.
Category B = Assumptions regarding the firm.
Category C = Assumptions regarding investors or the capital market.

B.1 The firm will experience a constant growth in assets and will strive to keep a constant ratio of the book value of equity to assets from time $t$ to time $t+T$. Thus equity will grow at a constant rate, denoted $g$, assumed to be known at time $t$.

B.2 To ensure that equity grows at a constant rate the firm will adjust its payment of dividends (or new issues).

Empirical evidence offered by Bertmar and Molin (1977) implies that the dividend policy of Swedish industrial firms (1963 to 1972), could better be described as payments amounting to a constant fraction of accounting equity. This constant fraction has further been shown to be fairly constant as measured in the cross-section. Such dividend behavior means that the growth of equity has tended to be more closely related to the generated *ROE* than to the investment opportunities of the firms. Another consequence of such dividend policies is a tendency for profitable companies to increase their equity-to-assets-ratio, and for unprofitable companies to do the opposite.

Assuming constant growth, and allowing the dividend policy to be a residual, obviously violates the above empirical observations. However, with reference to Miller and Modigliani (1961), one can argue that a valuation model should preferably be immune to the distribution pattern of dividends. Assuming a rate of growth which is not determined by a fixed retention ratio means that the firm's expected capacity to pay dividends will drive value (via the firm's ability to generate profits and the assumption of a constant equity-to-assets-ratio). Value is thus driven by the expected capacity of the firm to generate profits on current investments, and on the firm's capacity to generate abnormal profits on new investments.

Given that $\widetilde{B}_t$ is known at present and given the constant growth assumption, $\widetilde{B}_{t+s}$ is no longer a stochastic variable, thus ~ may be eliminated. Assume further that $T$ is large enough to ensure that all expected abnormal performance beyond $T$ is eliminated.

B.3 Beyond time $t+T$ all expected abnormal performance is eliminated.

$$E\left[R\widetilde{O}E^{(u)}_{t+T+m}\right] = r \qquad \text{for all } m \geq 1$$

Assuming that a constant annual growth rate ($g$) in equity is expected for all future $T$ periods and that all abnormal performance has disappeared after $T$ periods, the valuation equation can be written as:[12]

$$[2{:}12] \quad V_t = B_t + \sum_{s=1}^{T} \frac{B_t \cdot (1+g)^{s-1} \cdot \left( E\left( R\breve{O}E_{t+s} \right) - r \right)}{(1+r)^s}$$

A specification that describes the expected development pattern of future return on equity is needed for a final simplification of the valuation equation. A simple process that is consistent with empirical observations is the mean reversion process.[13] The relation between return on equity in different periods can thus be described as follows, assuming that abnormal return is reduced over time at a rate dependent on a fading factor denoted by λ:

$$[2{:}13] \quad R\breve{O}E_{t+s} = r + \left( E\left[ R\breve{O}E_{t+1} \right] - r \right) \cdot \lambda^{s-1} + \tilde{\varepsilon}_{t+s}$$

where $1 \leq s \leq T$

$0 \leq \lambda \leq 1$

$\tilde{\varepsilon}_{t+s}$ is an unpredictable disturbance term with an expected mean of zero

A value of λ close to zero means that the abnormal return is very transitory and, conversely, with λ close to one, abnormal return is disappearing very slowly. As the disturbance term is unpredictable with an expected zero mean, the process may be rewritten as follows:

$$[2{:}14] \quad E\left[ R\breve{O}E_{t+s} \right] = r + \left( E\left[ R\breve{O}E_{t+1} \right] - r \right) \cdot \lambda^{s-1}$$

According to B.3 this process is assumed to be disrupted after $T$ periods, whereupon normal return is always expected. Allowing for different levels of $\lambda$ and $T$, this process permits quite a wide range of development patterns

12 Note that no particular assumptions regarding the accounting system, besides the clean surplus relation, have been imposed until beyond time $t+T$.

13 See Freeman, Ohlson and Penman (1982) and Ou and Penman (1994).

of *ROE*. Most restrictively, the process does not allow, for example, for a number of years of negative expected abnormal return followed by some years of positive abnormal return (and vice versa).[14]

Substituting $E[R\tilde{O}E_{t+s}] - r$ in the valuation equation [2:12] with expression [2:14], the equation can be rewritten as:

[2:15] $$V_t = B_t + \sum_{s=1}^{T} \frac{B_t \cdot (1+g)^{s-1} \cdot \left(E\left(R\tilde{O}E_{t+1}\right) - r\right) \cdot \lambda^{s-1}}{(1+r)^s}$$

The second term of [2:15] is the sum of a finite geometric series, if $T < \infty$. Therefore, the sum and the whole expression can be rewritten.[15] The definition $G \equiv 1+g$ is used.

[2:16] $$V_t = B_t + B_t \frac{\left(E\left(R\tilde{O}E_{t+1}\right) - r\right)}{1+r} \cdot \left( \frac{1 - \left(\frac{G \cdot \lambda}{1+r}\right)^T}{1 - \left(\frac{G \cdot \lambda}{1+r}\right)} \right)$$

14 Skogsvik (1993) p.18, utilized a similar process, where:
$E\left[R\tilde{O}E_{j,t+s}\right] = ROE_{j,t} \cdot \lambda_j^{s-1}$ and $ROE_{j,t} \cdot \lambda_j^{T_j - 1} = r_j$
Given this process, the knowledge of the firm-specific *T*, *r* and $ROE_t$ makes it possible to calculate λ. An advantage of this process is that it ensures a smooth development of *ROE* all the way toward the cost of capital, during the *T* periods, over which abnormal return is expected. A drawback of the process, however, is that it does not work for situations when $ROE_t \leq 0$. Another slight difference in specification relates to the starting point of the process. In Skogsvik (1993) the starting point is $ROE_t$. According to [2:14] the starting point is $E\left[R\tilde{O}E_{t+1}\right]$. Letting $E\left[R\tilde{O}E_{t+1}\right] = ROE_t$ is a common assumption; [2:14] is, however, not restricted to such a relation. In the later empirical chapters of this study this matter will be discussed further.

15 The sum of the elements in a finite geometric series with constant growth can be expressed the following way (see Fredriksson et al (1983) p. 247-48).

$$A \cdot \sum_{s=1}^{n} q^{s-1} = \frac{A\left(1 - q^n\right)}{1 - q} \qquad \text{where } q = \frac{G \cdot \lambda}{1+r}$$

Note that value is not defined using this mathematical simplification in the special case when: $\left(\frac{G \cdot \lambda}{1+r}\right) = 1$

Value is now described as the sum of two elements: i) the level of current accounting equity, ii) the present value of all abnormal profits that the firm is expected to generate from time $t$ to a date $T$ periods ahead. The latter element has in turn been reduced to a multiple of three factors: i) the level of current accounting equity, ii) next period's expected abnormal return (discounted one period), and iii) a combined factor that depends on a combination of the expected growth, the development pattern and persistence of abnormal performance, and the discount rate.

The validity of this specification hinges particularly on two critical assumptions. Is it reasonable to assume that abnormal return has disappeared after $T$ periods, and is it reasonable to assume that the calculation of the owner's equity according to the employed accounting convention actually generates an expected value of $\tilde{B}_{t+T}$ that equals the expected value of $\tilde{V}_{t+T}$? Given a large value of $T$, the first assumption is probably reasonable for most types of firms. The second assumption, however, seems more questionable for several types of business activities when described by a traditional cost-based prudent accounting regime.

## 2.3 The valuation model given a prudent accounting regime

The stage when $E\left[\tilde{B}_{t+T}\right]$ equals $E\left[\tilde{V}_{t+T}\right]$ may never occur, even if a firm is only expected to generate a return that just covers the cost of capital. For example, for a firm that continuously 'invests' in R&D and where these investments are immediately treated as expenses, this state is unlikely ever to occur. Johansson and Östman (1995) have shown that given rather strict assumptions regarding the investment pattern and a constant inflation rate, a constant relative measurement bias due to different kinds of matching errors can be expected. An analysis of the size and development of different measurement biases assuming more realistic conditions quickly becomes extremely complex.[16] Simplifications must therefore be made. In this study the valuation equation will only be expanded to allow for a constant relative measurement bias. Assume that the following holds for a prudent (biased) accounting convention. Superscript (*b*) is introduced to indicate biased accounting:

A.3 The accounting relative measurement bias is expected to be constant over time, in the sense that the fraction of the unbiased equity to the biased equity is constant over time.

$$[2:17] \quad E\left[\frac{\tilde{B}_t^{(u)}}{\tilde{B}_t^{(b)}}\right] = E\left[\frac{\tilde{B}_{t+s}^{(u)}}{\tilde{B}_{t+s}^{(b)}}\right] \qquad \text{for all } s \geq 1$$

This assumption is equivalent to stating that the third counter balancing error theorem in Johansson and Östman (1995) holds.[17] An implication of A.3 is that the growth rate of unbiased and biased equity is the same. Assume further that it is possible to assess the expected level of the permanent measurement bias (denoted *PMB*) given knowledge of the (biased) accounting regime and the type of assets and liabilities that a particular firm is

16 See Johansson and Östman (1995) Chapters 8 and 9.

17 Note that this is a rather strong assumption. For example, to assume that

$$E\left[\frac{\tilde{B}_{t+T}^{(u)}}{\tilde{B}_{t+T}^{(b)}}\right] = E\left[\frac{\tilde{B}_{t+T+m}^{(u)}}{\tilde{B}_{t+T+m}^{(b)}}\right] \qquad \text{for all } m \geq 1$$

would be a less restrictive and possibly a more realistic assumption. However, in order to achieve a simple model suitable for large-scale empirical testing, the stronger assumption will be utilized in this study.

expected to hold.[18] Firm index ($j$) is temporarily reintroduced to emphasize that the permanent measurement bias is expected to be firm-specific.

$$\text{A.4} \qquad E\left[\frac{\tilde{B}_j^{(u)}}{\hat{B}_j^{(b)}} - 1\right] = PMB_j$$

According to B.1, constant growth ($g$) is assumed. This means that

$$[2:18] \qquad \frac{E\left[\tilde{NT}_{t+s}\right]}{B_{t+s-1}^{(u)}} = E\left[\tilde{ROE}_{t+s}^{(u)}\right] - g \qquad \text{for all } s \geq 1$$

According to A.3 a similar relationship should hold for a prudent accounting regime.

$$[2:19] \qquad \frac{E\left[\tilde{NT}_{t+s}\right]}{B_{t+s-1}^{(b)}} = E\left[\tilde{ROE}_{t+s}^{(b)}\right] - g \qquad \text{for all } s \geq 1$$

Unbiased abnormal earnings (*true abnormal performance*) of a firm can be specified as follows:

$$[2:20] \qquad E\left[\tilde{x}_{t+s}^{a(u)}\right] = E\left[\tilde{x}_{t+s}^{(u)}\right] - r \cdot B_{t+s-1}^{(u)} = \left(E\left[\tilde{ROE}_{t+s}^{(u)}\right] - r\right) \cdot B_{t+s-1}^{(u)}$$

Similarly, biased abnormal earnings (*distorted abnormal performance*) can be specified as follows:

$$[2:21] \qquad E\left[\tilde{x}_{t+s}^{a(b)}\right] = E\left[\tilde{x}_{t+s}^{(b)}\right] - r \cdot B_{t+s-1}^{(b)} = \left(E\left[\tilde{ROE}_{t+s}^{(b)}\right] - r\right) \cdot B_{t+s-1}^{(b)}$$

In a competitive environment, true abnormal performance can be expected to disappear over time, whereas performance according to a biased accounting convention may seem to remain abnormal. Thus when valuing a

18 A discussion of how this bias estimation can be performed will be presented in Chapter 3.

company described by a biased accounting convention, it is important to succeed in disentangling the part of performance that is pressured by competitive forces. The difference between true and distorted abnormal performance will be a function of the size of the book value of equity, the size of the permanent measurement bias (*PMB*), the rate of growth in the absolute measurement bias ($g^{MB}$), and the discount rate. Using equations [2:18-21] this difference can be formulated as follows:

$$[2:22] \qquad E\left[x_{t+s}^{a(b)}\right] - E\left[x_{t+s}^{a(u)}\right] = \left(r - g^{MB}\right) \cdot B_{t+s-1}^{(b)} \cdot PMB_{t+s-1}$$

According to B.1 and A.3, both $g$ and the *PMB* are constant from time $t+1$.[19] This means that under these conditions, the difference between true and distorted abnormal performance will only be a function of the size of the book value of equity and a constant, call the constant $\gamma$.

$$[2:23] \qquad E\left[x_{t+s}^{a(b)}\right] - E\left[x_{t+s}^{a(u)}\right] = B_{t+s-1}^{(b)} \cdot \gamma$$

where

$$[2:24] \qquad \gamma = (r - g) \cdot PMB$$

Provided that the 'true' abnormal performance that a firm is expected to generate is unrelated to how performance actually is described, unbiased abnormal earnings can be extracted from a biased description as follows:

$$[2:25] \qquad \begin{aligned} &\left(E\left[ROE_{t+s}^{(b)}\right] - r\right) \cdot B_{t+s-1}^{(b)} - \gamma \cdot B_{t+s-1}^{(b)} = \\ &\qquad \left(E\left[ROE_{t+s}^{(u)}\right] - r\right) \cdot B_{t+s-1}^{(u)} = E\left[x_{t+s}^{a(u)}\right] \end{aligned} \qquad \text{for all } s \geq 1$$

19 The common tendency to over-value the liability deferred taxes is an example of a particular accounting issue that can create a measurement bias. As the size of a company's deferred tax might to some extent be a function of the company's level of abnormal performance, the simultaneous assumption of complete permanence in the size of the relative measurement bias and presence of diminishing abnormal performance can related to this particular case be viewed as being somewhat inconsistent.

The relationship between unbiased and biased *ROE* can further be specified as follows:

$$[2{:}26] \quad E\left[R\breve{O}E_{t+s}^{(b)}\right] = r + \gamma + \left(E\left[R\breve{O}E_{t+s}^{(u)}\right] - r\right) \cdot \frac{B_{t+s-1}^{(u)}}{B_{t+s-1}^{(b)}} \qquad \text{for all s} \geq 1$$

or

$$[2{:}27] \quad E\left[R\breve{O}E_{t+s}^{(u)}\right] = r + \left(E\left[R\breve{O}E_{t+s}^{(b)}\right] - r - \gamma\right) \cdot \frac{B_{t+s-1}^{(b)}}{B_{t+s-1}^{(u)}} \qquad \text{for all s} \geq 1$$

These expressions can be rewritten to:

$$[2{:}28] \quad B_{t+s-1}^{(b)} \cdot \left(E\left[R\breve{O}E_{t+s}^{(b)}\right] - r - \gamma\right) = B_{t+s-1}^{(u)} \cdot \left(\left[R\breve{O}E_{t+s}^{(u)}\right] - r\right)$$

$\gamma$ plus the cost of equity capital can thus be viewed as the increased hurdle rate which biased *ROE* must exceed (scaled against biased equity) in order for the firm to perform beyond the 'norm', (the norm being unbiased abnormal earnings of zero).

When all expected abnormal performance is expected to have disappeared (after time $t+T$), [2:26] is obviously reduced to:

$$[2{:}29] \quad E\left(R\breve{O}E_{t+T+m}^{(b)}\right) = r + \gamma \qquad \text{for all m} \geq 1$$

This means that when no abnormal performance is expected (beyond time $t+T$ according to B.3) the relationship is simply:

$$[2{:}30] \quad \begin{aligned} \gamma &= E\left[R\breve{O}E_{t+T+m}^{(b)}\right] - E\left[R\breve{O}E_{t+T+m}^{(u)}\right] = \\ &= \frac{E\left[N\breve{I}_{t+T+m}\right]}{B_{t+T+m-1}^{(b)}} - \frac{E\left[N\breve{I}_{t+T+m}\right]}{B_{t+T+m-1}^{(u)}} \end{aligned} \qquad \text{for all m} \geq 1$$

The size and determinants of the constant annual return measurement bias ($\gamma$), under the conditions of constant growth, a constant relative measurement bias, and no abnormal performance have previously been derived in Skogsvik (1993, pp. 28).[20]

A *ROE* development process similar to [2:14] and consistent with this kind of biased accounting can be described as follows:

[2:31] $$E\left[R\tilde{O}E_{t+s}^{(b)}\right]=r+\gamma+\left(E\left[R\tilde{O}E_{t+1}^{(b)}\right]-(r+\gamma)\right)\cdot\lambda^{s-1}$$

where $1\leq s\leq T$

$0\leq\lambda\leq1$

$\gamma=PMB\cdot(r-g)$

Given this *ROE* development process, a known and constant *PMB*, a known and constant growth ($g$), and assuming that all abnormal performance has disappeared after $T$ periods, the valuation equation [2:16] can be extended to:

[2:32] $$V_t=B_t^{(b)}\cdot(1+PMB)+B_t^{(b)}\cdot\frac{\left(E\left(R\tilde{O}E_{t+1}^{(b)}\right)-r-\gamma\right)}{1+r}\cdot\left(\frac{1-\left(\frac{G\cdot\lambda}{1+r}\right)^T}{1-\left(\frac{G\cdot\lambda}{1+r}\right)}\right)$$

---

20 $$E\left[R\tilde{O}E_{t+T+m}^{(u)}\right]-\frac{E\left[NT_{t+T+m}\right]}{B_{t+T+m-1}^{(u)}}=E\left[R\tilde{O}E_{t+T+m}^{(b)}\right]-\frac{E\left[NT_{t+T+m}\right]}{B_{t+T+m-1}^{(b)}}=g$$

$$E\left[R\tilde{O}E_{t+T+m}^{(b)}\right]-E\left[R\tilde{O}E_{t+T+m}^{(u)}\right]=\frac{E\left[NT_{t+T+m}\right]}{B_{t+T+m-1}^{(b)}}-\frac{E\left[NT_{t+T+m}\right]}{B_{t+T+m-1}^{(u)}}$$ . As

$$\frac{E\left[NT_{t+T+m}\right]}{B_{t+T+m-1}^{(u)}}\cdot\frac{B_{t+T+m-1}^{(u)}}{B_{t+T+m-1}^{(b)}}=\frac{E\left[NT_{t+T+m}\right]}{B_{t+T+m-1}^{(b)}}$$ , we have

$$E\left[R\tilde{O}E_{t+T+m}^{(b)}\right]-E\left[R\tilde{O}E_{t+T+m}^{(u)}\right]=\frac{E\left[NT_{t+T+m}\right]}{B_{t+T+m-1}^{(u)}}\cdot\frac{B_{t+T+m-1}^{(u)}}{B_{t+T+m-1}^{(b)}}-\frac{E\left[NT_{t+T+m}\right]}{B_{t+T+m-1}^{(u)}}=$$
$$=PMB\cdot\frac{E\left[NT_{t+T+m}\right]}{B_{t+T+m-1}^{(u)}}\ .$$

Since $\frac{E\left[NT_{t+T+m}\right]}{B_{t+T+m-1}^{(u)}}=E\left[R\tilde{O}E_{t+T+m}^{(u)}\right]-g$ and $E\left[R\tilde{O}E_{t+T+m}^{(u)}\right]=r$, it follows that

$$E\left[R\tilde{O}E_{t+T+m}^{(b)}\right]-E\left[R\tilde{O}E_{t+T+m}^{(u)}\right]=PMB\cdot(r-g)=\gamma\ .$$

Value is again described as the sum of two terms: i) the level of current accounting equity adjusted for any measurement bias of the accounting regime, and ii) the present value of all abnormal profits that the firm is expected to generate from time $t$ to a date $T$ periods ahead. The hurdle rate to calculate abnormal profits has now been adjusted to incorporate the annual measurement bias, $\gamma$.

Dividing both sides of the equation by owners' equity and deducting 1 from each side, the following equation is generated:

$$[2:33] \quad \frac{V_t}{B_t^{(b)}} - 1 = PMB + \frac{\left(E\left(R\tilde{O}E_{t+1}^{(b)}\right) - r - \gamma\right)}{1+r} \cdot \left( \frac{1 - \left(\frac{G \cdot \lambda}{1+r}\right)^T}{1 - \left(\frac{G \cdot \lambda}{1+r}\right)} \right)$$

Within this valuation framework, the following main forces influencing the economic-to-accounting value relation are thus expected:

1. $\frac{V_t}{B_t^{(b)}} - 1 = PMB$ when no abnormal performance is expected
2. $\frac{V_t}{B_t^{(b)}} - 1$ increases when the *PMB* increases
3. $\frac{V_t}{B_t^{(b)}} - 1$ increases when $E\left(R\tilde{O}E_{t+1}^{(b)}\right)$ increases
4. $\frac{V_t}{B_t^{(b)}} - 1$ increases when $g$, $T$, or $\lambda$ increases if $E\left(R\tilde{O}E_{t+1}^{(b)}\right) > (r+\gamma)$
5. $\frac{V_t}{B_t^{(b)}} - 1$ decreases when $g$, $T$, or $\lambda$ increases if $E\left(R\tilde{O}E_{t+1}^{(b)}\right) < (r+\gamma)$

Although a number of rather restrictive assumptions regarding the prudent accounting regime and the expected development of future performance have been established, this valuation specification still includes a number of appealing elements which will constitute a starting point for empirical testing. The main advantage of this specification is that the economic-to-book value relation is explained by two key factors only, the *PMB* and expected next period *ROE*. The specification has been derived in order to achieve a condensed model suitable for empirical evaluation on a large sample of firms. However, in a valuation situation for a particular firm, such a simplified model may, be unnecessarily restrictive. The assumption of a constant measurement bias already in place, is probably the most unrealistic assumption. The idea of a permanent measurement bias, but only in place at a future date, can easily be incorporated into the more general formulation found in [2:12]; thus generating the following specification:

[2:34] $$V_t = B_t^{(b)} + \sum_{s=1}^{T} \frac{B_t^{(b)} \cdot (1+g)^{s-1} \cdot \left( E\left( R\tilde{O}E_{t+s}^{(b)} \right) - r \right)}{(1+r)^s} + \frac{B_t^{(b)} \cdot (1+g)^T}{(1+r)^T} \cdot PMB_{t+T}$$

## 2.4 A numerical example

In the initial valuation framework, economic value was assumed to be a function of expected future dividends, as in [2:1]. A number of assumptions regarding the accounting regime have henceforth been introduced, as well as an assumption of a constant expected growth and a specification of the development of future *ROE*. To illustrate that the later valuation models in the previous sections are equivalent to discounted dividend models, a simple numerical example is presented below.

Basic facts and expectations for a prudent accounting regime:

| | | | | | |
|---|---|---|---|---|---|
| $B_0^{(b)}$ | = | 100 | $g$ | = | 6% |
| $E_0\left(ROE_1^{(b)}\right)$ | = | 30% | $\lambda$ | = | 0.5 |
| $r$ | = | 10% | $T$ | = | 2 |
| $\gamma$ | = | 5% | *PMB* | = | 1.25 |

The expected development of equity, *ROE*, earnings and dividends given these expectations are as follows:

| | s = 1 | s = 2 | s = 3 | s = 4 | s = 5 → s = ∞ |
|---|---|---|---|---|---|
| $B_{s-1}^{(b)}$ | 100 | 106 | 112.4 | 119.1 | Constant growth = 6% |
| $E_0\left(ROE_s^{(b)}\right)$ | 30.0% | 22.5% | 15.0% | 15.0% | Constant level = 15% |
| $Earnings_S$ | 30 | 23.9 | 16.9 | 17.9 | Constant growth = 6% |
| $B_s^{(b)}$ | 106 | 112.4 | 119.1 | 126.4 | Constant growth = 6% |
| $Dividends_S$ | 24 | 17.5 | 10.1 | 10.7 | Constant growth = 6% |

## Discounted dividends according to [2:1]:

$$V_0 = \frac{24}{1.10^1} + \frac{17.5}{1.10^2} + \frac{\frac{10.1}{0.10 - 0.06}}{1.10^2} = 245.2$$

The third element in the dividend discount formula is the mathematical simplification that calculates the sum of a perpetual geometric series with constant growth.[21]

## Calculated value according to [2:32]:

$$V_0 = 100 \cdot (1 + 1.25) + 100 \cdot \left( \frac{0.30 - 0.10 - 0.05}{1.10} \right) \cdot \left( \frac{1 - \left( \frac{1.06 \cdot 0.5}{1.10} \right)^2}{1 - \left( \frac{1.06 \cdot 0.5}{1.10} \right)} \right) =$$

$$= 225 + 20.2 = 245.2$$

21 This part is identical to the valuation model derived by Williams (1938) and later popularized by Gordon (1959, 1962):

$$V_t = \frac{E\left(\tilde{D}_{t+1}\right)}{r - g} \quad \text{if}$$

i) The expected growth in dividends ($g$) is constant and eternal ($T \rightarrow \infty$).
ii) The required rate of interest ($r$) is constant over time.
iii) $g < r$

## Calculated value according to [2:16]:

The unbiased accounting description consistent with the basic facts would have been as follows:

| | s = 1 | s = 2 | s = 3 | s = 4 | s = 5 → s = ∞ |
|---|---|---|---|---|---|
| $B_{s-1}^{(u)}$ | 225 | 238.5 | 252.8 | 268.0 | Constant growth = 6% |
| $E_0\left(R\breve{O}E_s^{(u)}\right)$ | 16.7% | 13.3% | 10.0% | 10.0% | Constant level = 10% |
| $Earnings_s^{(u)}$ | 37.5 | 31.8 | 25.3 | 26.8 | Constant growth = 6% |
| $B_s^{(u)}$ | 238.5 | 252.8 | 268.0 | 284.1 | Constant growth = 6% |
| $Dividends_s$ | 24 | 17.5 | 10.1 | 10.7 | Constant growth = 6% |

$$V_0 = 225 + 225 \cdot \left(\frac{0.167 - 0.10}{1.10}\right) \cdot \left(\frac{1 - \left(\frac{1.06 \cdot 0.5}{1.10}\right)^2}{1 - \left(\frac{1.06 \cdot 0.5}{1.10}\right)}\right) =$$

$$= 225 + 20.2 = 245.2$$

Note that the calculated value at time *zero* is 245.2 regardless of the valuation approach used. Note further that the discounted value of the two years of abnormal performance is 20.2 in both return on equity specifications, while the effect of the persistent measurement bias is 'eliminated' in an unbiased regime, the use of the estimated *PMB* and $\gamma$ 'scales up the equity' and 'provides the hurdle rate' with which to identify the abnormal performance.

## 2.5 The valuation model in empirical tests

Assuming that the valuation models derived in the previous section constitute a reasonable description of the valuation process, it is possible to exchange $M_t$ for $V_t$ in the valuation model.

C.1 $M_t \approx V_t$

It is common practice in capital market research to add a risk premium to an estimated risk-free rate of interest in order to allow for uncertainty and risk-averse investors. Ohlson (1995), however, states that it is by no means obvious that risk can be properly captured by simply increasing the discount factor in a 'present-value-of-expected-dividend' model, such as [2:1] in this study. As a theoretically more appealing alternative, Ohlson (ibid.) refers to the work of Rubinstein (1976), where adjustments for risk are performed on the flows (creating certainty-equivalents) rather than on the discount rate. Empirical use of this approach seems, however, to be limited. Ohlson (ibid. p. 31) notes that the risk premium adjusted discount rate concept should be adequate in many empirical applications (or evaluations) of the valuation model.

For the empirical tests that will be performed in this study, the idea of an estimated cost of equity capital as the sum of the risk-free interest rate and a risk premium will thus be relied upon, and $r$ will simply be replaced by $\rho$ in the valuation equations.

C.2 $\rho = r + \text{risk premium}$

Exchanging $M_t$ for $V_t$ in the valuation model [2:33], an equation is obtained in which the market-to-book-value premium is explained by the expected measurement bias and the expected future accounting performance.[22]

22 The market-to-book value in excess of one will henceforth be called a market-to-book value premium. A 'negative premium' may, of course, also occur. Such a 'premium' should, however, more correctly be referred to as a market-to-book value discount.

[2:35] $$\frac{M_t}{B_t^{(b)}} - 1 = PMB + \frac{\left(E\left(R\breve{O}E_{t+1}^{(b)}\right) - r - \gamma\right)}{1+r} \cdot \left( \frac{1 - \left(\frac{G \cdot \lambda}{1+r}\right)^T}{1 - \left(\frac{G \cdot \lambda}{1+r}\right)} \right)$$

The first element of this formula is an expression for the expected future accounting measurement bias. It has already been given the name **P**ermanent **M**easurement **B**ias (*PMB*).The second element of this formula consists of two parts: i) next period's expected abnormal return discounted back one period, ii) a factor that depends on a combination of expected growth, the development pattern and the persistence of future accounting performance. Let the first part be called Expected **R**esidual **R**eturn, or ***E*[*RR*]**, and the second part Equity **G**rowth Earnings **P**ersistence **F**actor, or ***GPF***. Thus:

[2:36] $$E(R\tilde{R}_{t+1}) = \frac{\left(E\left(R\tilde{O}E_{t+1}^{(b)}\right) - \rho - \gamma\right)}{1+\rho}$$

[2:37] $$GPF = \left( \frac{1 - \left(\frac{G \cdot \lambda}{1+\rho}\right)^T}{1 - \left(\frac{G \cdot \lambda}{1+\rho}\right)} \right)$$

Rewriting [2:35] using these expressions and still suppressing the firm index (*j*), the following model is obviously obtained:

[2:38] $$\frac{M_t}{B_t^{(u)}} - 1 = PMB + GPF \cdot E\left(R\breve{R}_{t+1}\right)$$

The relationship according to equation [2:38] can be illustrated graphically as in figure 2.1 below. In the absence of an expected persistent accounting measurement bias, market-to-book value can be drawn as a positive function of expected future residual return that goes through the origin and where the slope of the line depends on the level of the *GPF*. The dotted line has been shifted upwards due to an arbitrary expected existence of a positive accounting measurement bias.

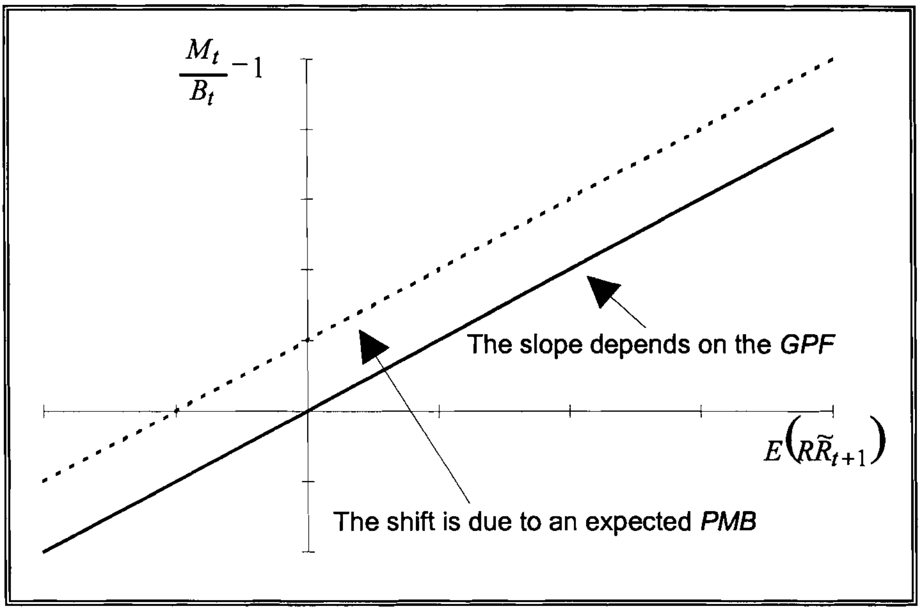


***Figure 2.1** A graphical illustration of the relationship between market-to-book values and expected residual return according to equation [2:38].*

### 2.5.1 Regression specifications for value level studies

The explanatory power of the value level specification [2:38] can be assessed for a sample of firms using a linear regression model. For a sample of firms for which unbiased accounting is possible to obtain, or for which only a very small permanent measurement bias is expected, a univariate model can be used.

M.1 $$\frac{M_{j,t}}{B_{j,t}} - 1 = \alpha + \beta_1 \cdot E_t\left[\tilde{RR}_{j,t+1}\right] + \tilde{\varepsilon}_{j,t}$$

The inclusion of an estimated expected accounting measurement bias generates the following multiple regression model:[23]

M.2 $$\frac{M_{j,t}}{B_{j,t}} - 1 = \alpha + \beta_1 \cdot E_t\left[\tilde{RR}_{j,t+1}\right] + \beta_2 \cdot PMB_j + \tilde{\varepsilon}_{j,t}$$

Given a good estimate of the firm's specific expected residual return and the permanent accounting measurement bias, and given that the valuation model is valid, the following regression coefficients are expected:

$$\hat{\alpha} = 0$$
$$\hat{\beta}_1 \geq 1$$
$$\hat{\beta}_2 = 1$$

$\hat{\alpha}$ is expected to be zero as the regression line is expected to run through the origin. $\hat{\beta}_1$ is an estimate of the growth persistence factor. The smallest value the *GPF* can amount to, with either $\lambda$ or $T$ amounting to zero, is one. This is in the case of completely transitory abnormal return. Other combinations of the *GPF* components generate values exceeding one. This means that the *GPF* is expected to be positive and equal or exceed one. $\hat{\beta}_2$ is expected to equal one acknowledging the measurement bias. In order to receive a high explanatory power, it is important that the sample of firms is reasonably similar with regard to the level of the growth persistence factor.

23 Viewing M.1 as a 'simpler' version of M.2, the added explanatory variable (the *PMB*) is written last in the expression, in contrast to how it was written in [2:38].

Consider the following example. Assume access to observations from three different industries, industry A, B and C. Industry A is mature and competitive. Industry B is comparable to industry A, but due to prudence, the specific type of assets that B's firms tend to hold will permanently be undervalued. Industry C is growing quickly and has high barriers to entry. In figure 2.2 a few idealized firm observations from each industry have been plotted. If these observations were run together in a linear regression analysis as outlined in M.1 above (without controlling for differences in the accounting measurement bias), $\hat{\alpha}$ would exceed zero and $\hat{\beta}_1$ would be positive. If it were possible to estimate and include the measurement bias parameter in the regression, and/or separate the firms into different regressions, it is obvious that the total explanatory power ($R^2$) would increase and the resulting level of the separate regression coefficients would be different. These observations point to some of the statistical problems associated with the use of very heterogeneous samples of firms and a rather simple statistical model.

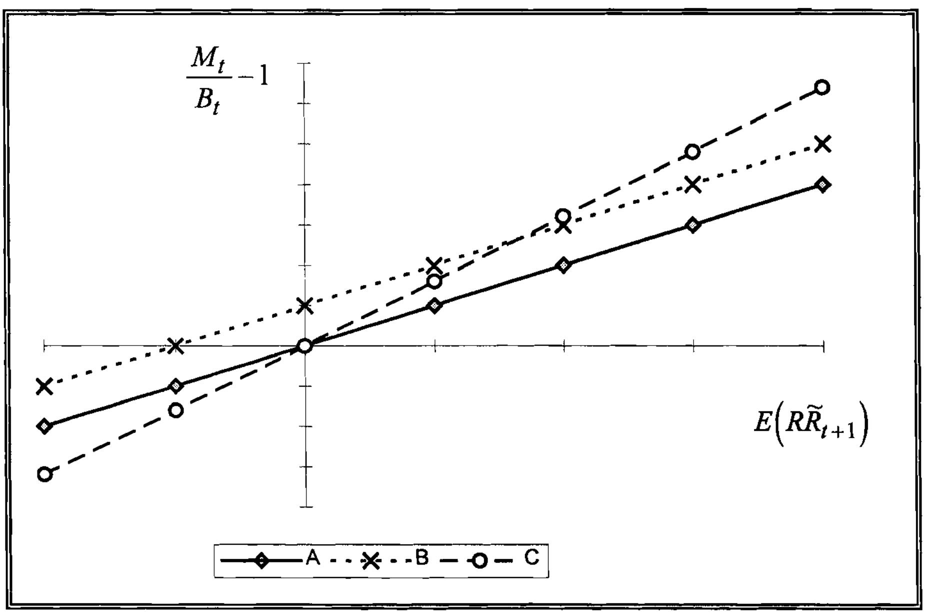


***Figure 2.2*** ***A graphical illustration of idealized firms' observations from three different industries: A, B and C.***

### 2.5.2 Model and regression specifications for value change studies

Using valuation equation [2:32], the abbreviations introduced in Section 2.3, and assuming a constant expected *GPF* and *PMB*, the valuation formula can be written as follows:

[2:39] $$M_t = B_t + B_t \cdot E_t\left(\overline{RR}_{t+1}\right) \cdot GPF + B_t \cdot PMB$$

A 'value change model' can either attempt to explain capital gain alone or capital gain plus dividends (total return). Relative capital gain and rate of return for one period can be specified as follows:

[2:40] $$\text{Capital gain}_{t+1} = \frac{M_{t+1} - M_t}{M_t}$$

[2:41] $$\text{Return}_{t+1} = \frac{M_{t+1} - M_t + D_{t+1} - N_{t+1}}{M_t}$$

Moving $s$ periods ahead, [2:39] can be expressed as:[24]

[2:39′] $$M_{t+s} = B_{t+s} + B_{t+s} \cdot E_{t+s}\left(\overline{RR}_{t+s+1}\right) \cdot GPF + B_{t+s} \cdot PMB$$

A value change version of [2:39] can thus be written as follows:

[2:42] $$\begin{aligned} M_{t+s} - M_t &= B_{t+s} - B_t + \\ &+ \left[B_{t+s} \cdot E_{t+s}\left(\overline{RR}_{t+s+1}\right) - B_t \cdot E_t\left(\overline{RR}_{t+1}\right)\right] \cdot GPF + \\ &+ \left[B_{t+s} - B_t\right] \cdot PMB \end{aligned}$$

According to this specification, the change in market value can be explained by three components: i) the change in accounting equity, which according to the clean surplus relation is equal to earnings adjusted for net transactions

24 The assumption of a constant *GPF* implies that the components of the *GPF* ($\lambda$, $g$ and $\rho$) are constant and that either $T$ is so large that the effect of moving closer to the horizon is marginal or that the horizon keeps moving forward. This is obviously a set of rather restrictive assumptions.

with the owners, ii) the change in expectations concerning the firm's ability to generate abnormal earnings[25] times the *GPF*, and iii) the change in accounting equity times the expected persistent accounting measurement bias. In the absence of any accounting measurement biases and any expected abnormal performance, the change model simply collapses to an equality between change in equity and change in market value. Dividing both sides of such an equality with opening period market value, a benchmark regression model consistent with zero expected abnormal performance and no measurement bias is obtained:

M.3 $$\frac{M_{j,t+s} - M_{j,t}}{M_{j,t}} = a + c_1 \cdot \frac{B_{j,t+s} - B_{j,t}}{M_{j,t}} + \tilde{\varepsilon}_{j,t+s}$$

This specification is identical to the one evaluated in Ohlson and Penman (1992), provided that the clean surplus relation of accounting holds.[26] The specification tested in Easton, Harris and Ohlson (1992) was also similar, except that they included the accumulated value of paid dividends in both variables (in their main value change specification).[27]

Dividing both sides of [2:42] by $M_t$ and rearranging the terms somewhat generates a more complete value change model:

25 A discussion of how this measure can be interpreted will follow later.

26 They used (accumulated) net earnings per share minus (accumulated) dividends per share instead of change in equity.

27 M.3 could in principle be run either on full market value or on a per share basis. In the absence of any new issues of shares and given appropriate adjustment for stock splits and stock dividends, both specifications will generate identical results. A new issue will, however, result in a simultaneous boost in both aggregate market value and equity. On a per share basis, the new issue (adjusted for any element of a stock dividend) should, however, result in no change in the share price. Given the focus on the relation between (retained) value creation as it is described by the accounting language and how it is perceived by the investors (manifested in a share price), an analysis on a per share basis will provide a stronger test. With frequent occurrences of large new issues, the market value specification would be positively biased. Both Easton, Harris and Ohlson (1992) and Ohlson and Penman (1992) ran their similar regressions on a per share basis.

[2:43]
$$\frac{M_{t+s}-M_t}{M_t}=\left(1+PMB\right)\cdot\frac{B_{t+s}-B_t}{M_t}+ + GPF\cdot\frac{\left[E_{t+s}\left(RI_{t+s+1}\right)-E_t\left(RI_{t+1}\right)\right]}{M_t}$$

where $E_{t+s}\left(RI_{t+s+1}\right)=B_{t+s}\cdot E_{t+s}\left(RR_{t+s+1}\right)$ and *RI* is short for residual income.

[2:43] is obviously a capital gain specification. The validity of this model can be tested empirically through regression analysis in the following way:

M.4
$$\frac{M_{j,t+s}-M_{j,t}}{M_{j,t}}=a+c_1\cdot\frac{B_{j,t+s}-B_{j,t}}{M_{j,t}}+ + c_2\cdot\frac{\left[E_{t+s}\left(RI_{j,t+s+1}\right)-E_t\left(RI_{j,t+1}\right)\right]}{M_{j,t}}+\varepsilon_{j,t+s}$$

This specification is quite similar to one of the specifications tested in Easton and Harris (1991). They attempted to explain one year's market return, with net income and change in net income normalized with opening market price. The estimated regression coefficient of the variable 'change in net income' has been analyzed in several market-based accounting studies, for example in Lev (1989). The regression coefficient has often been called the Earnings Response Coefficient (ERC) in the literature. In Easton and Harris (1991), the main motive for running the multivariate regression appears to have been to evaluate which of the two variables best explains returns, viewing the two variables more or less as competitors.[28] In this study, the two variables are viewed as complimentary variables, rather than competitors. The change in equity variable is viewed as an attempt to measure the value created (and retained), while the change in the expected residual income variable is interpreted as an indicator (or signal) of changes in the expected ability of the firm to perform. Given good estimates of the firm specific residual income and given that the assumptions of constant *GPF*s

28 The origin of such a competitive view can presumably be traced back to the empirical research that followed Ball and Brown (1968).

and *PMB*s are reasonably valid, the following regression coefficients can be expected: $\hat{a}$ is expected to be zero, and $\hat{c}_1$ is expected to equal one in the absence of an accounting measurement bias. In a certain sample, for example research and development intensive firms described by a conservative accounting regime, $\hat{c}_1$, however, is expected to exceed one. $\hat{c}_2$ is an estimate of the growth persistence factor. Thus the coefficient can be interpreted, for example, as an estimate of how long a firm can be expected to defend a new performance level. The $\hat{c}_2$ coefficient is expected to be positive and to be equal to or exceed one. The level, significance and stability of $\hat{c}_1$ can indicate how well the accounting convention's description of the firm's value creation is translated into changes in the valuation on the stock market. Using published accounting data to estimate expected values of *RI*, the level, significance and stability of $\hat{c}_2$ can indicate the strength and relevance of this accounting signal of the firm's ability to generate value.

This signal perspective is quite similar to the classical setting of 'good news' versus 'bad news' in the Ball and Brown type of analysis. In that line of studies, unexpected return has generally been explained by unexpected earnings. The standard operationalization of unexpected earnings as change in published earnings per share (minus a drift term) is similar to the change in expected *RI* variable of this study in a one-year change setting, provided that actual *ROE* is used as a base for expectations, the cost of capital is constant over time, and the growth in equity capital (due to retained earnings) is viewed as the reason for a drift term.

Finally, with explicit firm-specific estimates of the *PMB*, one may also specify the following multivariate regression:

M.5

$$\frac{M_{j,t+s}-M_{j,t}}{M_{j,t}} = a + c_1 \cdot \frac{B_{j,t+s}-B_{j,t}}{M_{j,t}} + c_2 \cdot \frac{\left[E_{t+s}\left(RT_{j,t+s+1}\right)-E_t\left(RT_{j,t+1}\right)\right]}{M_{j,t}} + c_3 \cdot \frac{\left(B_{j,t+s}-B_{j,t}\right)\cdot PMB}{M_{j,t}} + \tilde{\varepsilon}_{j,t+s}$$

$\hat{c}_1$ is now expected to equal one and $\hat{c}_3$ is expected to 'pick up' differences in the permanent accounting measurement bias.

Questions to address within this proposed framework relate to the association of the accounting language's descriptions of value creation with value creation as perceived by the market (manifested in changes in share prices). As noted earlier, regression specifications similar to M.3 have previously been tested on US data for both long and short intervals (three months up to 20 years).[29] These studies all noted a stronger association, in an $R^2$ sense, as the time interval was prolonged. A common conclusion has been that the more backward looking value creation descriptions of traditional accounting align better with the forward looking (expectation-based) value creation descriptions, calculated from the changes in market prices, when longer intervals are studied. This result has been attributed to the fact that the likelihood of accounting descriptions describing the same value created as the value created perceived by the market, increases as the time horizon increases, that is, there is more value creation overlap. Warfield and Wild (1992) further noted a difference in association for firms from different industries. They argue that the accounting regime's earnings recognition lag is higher for industries such as mining, construction and manufacturing compared to industries such as wholesale trade, retail trade and service.

Adding control for changes in earnings expectations, such as in M.4, has previously and quite similarly been tested for a one-year change period in Easton and Harris (1991). However, to my knowledge, a variable similar to change in $E[RI]$ and an extension of the time period have not previously been used.[30] Further, controlling for differences in expected firm-specific accounting measurement biases (*PMB*s) does not appear to have been previously evaluated in a value change setting.

Beyond the three regression specifications and the different time intervals that will be tested, this study will also explore the differences in association related to different firm characteristics, changes in the economic climate and some major changes in the accounting regime.

29 Warfield and Wild (1992), Easton, Harris and Ohlson (1992), Ohlson and Penman (1992) and O'Hanlon and Pope (1997). The latter used data from the UK.

30 Easton, Harris and Ohlson (1992) did, however, test the variable change in accumulated earnings.

### 2.5.3 Analysis of the different elements of the regression models

Before the regression specifications M.1 to M.5 are empirically tested, each explanatory variable in the valuation equations can be further discussed. Important issues regarding each explanatory variable include whether they can be observed, or estimated, and how they can be expected to vary between different firms at different times.

- $M_{j,t}$

can be observed daily and is thus known at time $t$.

- $B_{j,t}$

is published with a two - four month lag annually, most often describing accounting value at the end of December each year. The increased frequency of interim reports means that more frequent observations are available.

- $E_t\left[R\widetilde{R}_{t+1}\right]$

is the next period's expected return on equity minus the market's required return (adjusted for the accounting measurement bias) discounted back one period (recall formula [2:36] for the full definition). It is crucial to generate an estimate of the next period's expected *ROE*. Required return ($\rho$) at time $t$ can be estimated as the long-term risk-free interest rate plus a market risk premium. If a persistent measurement bias is expected for the firm, this must also be estimated. Knowledge of different firm characteristics and the accounting regime is essential for this estimate.

- $GPF_j$

depends on a combination of $\lambda$, $T$, $G$ and $\rho$ (recall formula [2:37] for the full definition). The size of these parameters can largely be expected to be functions of the type of business the firm is involved in and the environment the firm is operating in. The degree of competitive pressures and barriers to entry is expected to influence the level of $\lambda$ and $T$. Whether the market in which the firm is active is mature or has a high growth potential is expected to influence the level of $G$. $\rho$ is essentially a function of the interest rate (which in turn is related to expected inflation) and risk. The level of the *GPF* is thus expected to vary between different industries, depending on the industry's current degree of competitiveness and growth potential. To illustrate the combined effect on the value of the *GPF* of different combinations of growth and persistence, five tables are presented below. Tables 2.1a-e show the level of the *GPF* for different combinations of the growth parameter $G$ and the persistence parameter $\lambda$, given that $T$ equals 2, 5, 10, 15 and 20 years and $\rho$ is equal to 15%..

**Table 2.1a The growth persistence factor (*GPF*) for $T$ = 2, 5, 10, 15 and 20 years and $\rho$ equal to 15% for different combinations of $\lambda$ and $G$.**

| $T = 2$ | $\lambda$ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $G$ | 0.00 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 1.00 |
| 0.90 | 1.0 | 1.1 | 1.2 | 1.2 | 1.3 | 1.4 | 1.5 | 1.5 | 1.6 | 1.7 | 1.8 |
| 0.95 | 1.0 | 1.1 | 1.2 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.7 | 1.8 |
| 1.00 | 1.0 | 1.1 | 1.2 | 1.3 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 |
| 1.05 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 |
| 1.10 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 |
| 1.15 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 |
| 1.20 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 |
| 1.25 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 |
| 1.30 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 |

**Table 2.1b**

| $T = 5$ | $\lambda$ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $G$ | 0.00 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 1.00 |
| 0.90 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.8 | 2.1 | 2.4 | 2.8 | 3.2 |
| 0.95 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.7 | 1.9 | 2.2 | 2.6 | 3.0 | 3.5 |
| 1.00 | 1.0 | 1.1 | 1.2 | 1.4 | 1.5 | 1.7 | 2.0 | 2.3 | 2.8 | 3.2 | 3.9 |
| 1.05 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.8 | 2.1 | 2.5 | 2.9 | 3.5 | 4.2 |
| 1.10 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.9 | 2.2 | 2.6 | 3.1 | 3.8 | 4.6 |
| 1.15 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.9 | 2.3 | 2.8 | 3.4 | 4.1 | 5.0 |
| 1.20 | 1.0 | 1.1 | 1.3 | 1.5 | 1.7 | 2.0 | 2.4 | 2.9 | 3.6 | 4.4 | 5.5 |
| 1.25 | 1.0 | 1.1 | 1.3 | 1.5 | 1.7 | 2.1 | 2.5 | 3.1 | 3.9 | 4.8 | 5.9 |
| 1.30 | 1.0 | 1.1 | 1.3 | 1.5 | 1.8 | 2.2 | 2.7 | 3.3 | 4.1 | 5.2 | 6.5 |

**Table 2.1c**

| $T=10$ | $\lambda$ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $G$ | 0.00 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 1.00 |
| 0.90 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.9 | 2.2 | 2.6 | 3.3 | 4.2 |
| 0.95 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.7 | 2.0 | 2.4 | 2.9 | 3.7 | 4.9 |
| 1.00 | 1.0 | 1.1 | 1.2 | 1.4 | 1.5 | 1.8 | 2.1 | 2.5 | 3.2 | 4.2 | 5.8 |
| 1.05 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.8 | 2.2 | 2.7 | 3.5 | 4.8 | 6.9 |
| 1.10 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.9 | 2.3 | 3.0 | 4.0 | 5.6 | 8.3 |
| 1.15 | 1.0 | 1.1 | 1.2 | 1.4 | 1.7 | 2.0 | 2.5 | 3.2 | 4.5 | 6.5 | 10.0 |
| 1.20 | 1.0 | 1.1 | 1.3 | 1.5 | 1.7 | 2.1 | 2.6 | 3.5 | 5.1 | 7.7 | 12.2 |
| 1.25 | 1.0 | 1.1 | 1.3 | 1.5 | 1.8 | 2.2 | 2.8 | 3.9 | 5.8 | 9.1 | 15.0 |
| 1.30 | 1.0 | 1.1 | 1.3 | 1.5 | 1.8 | 2.3 | 3.0 | 4.3 | 6.6 | 10.8 | 18.5 |

**Table 2.1d**

| $T=15$ | $\lambda$ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $G$ | 0.00 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 1.00 |
| 0.90 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.9 | 2.2 | 2.7 | 3.4 | 4.5 |
| 0.95 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.7 | 2.0 | 2.4 | 2.9 | 3.9 | 5.4 |
| 1.00 | 1.0 | 1.1 | 1.2 | 1.4 | 1.5 | 1.8 | 2.1 | 2.6 | 3.3 | 4.5 | 6.7 |
| 1.05 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.8 | 2.2 | 2.8 | 3.7 | 5.3 | 8.6 |
| 1.10 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.9 | 2.3 | 3.0 | 4.2 | 6.4 | 11.2 |
| 1.15 | 1.0 | 1.1 | 1.2 | 1.4 | 1.7 | 2.0 | 2.5 | 3.3 | 4.8 | 7.9 | 15.0 |
| 1.20 | 1.0 | 1.1 | 1.3 | 1.5 | 1.7 | 2.1 | 2.7 | 3.7 | 5.6 | 10.0 | 20.5 |
| 1.25 | 1.0 | 1.1 | 1.3 | 1.5 | 1.8 | 2.2 | 2.9 | 4.1 | 6.7 | 12.9 | 28.7 |
| 1.30 | 1.0 | 1.1 | 1.3 | 1.5 | 1.8 | 2.3 | 3.1 | 4.6 | 8.1 | 17.0 | 40.6 |

**Table 2.1e**

| $T=20$ | $\lambda$ | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $G$ | 0.00 | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 1.00 |
| 0.90 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.9 | 2.2 | 2.7 | 3.4 | 4.6 |
| 0.95 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.7 | 2.0 | 2.4 | 2.9 | 3.9 | 5.6 |
| 1.00 | 1.0 | 1.1 | 1.2 | 1.4 | 1.5 | 1.8 | 2.1 | 2.6 | 3.3 | 4.6 | 7.2 |
| 1.05 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.8 | 2.2 | 2.8 | 3.7 | 5.5 | 9.6 |
| 1.10 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.9 | 2.3 | 3.0 | 4.2 | 6.8 | 13.5 |
| 1.15 | 1.0 | 1.1 | 1.2 | 1.4 | 1.7 | 2.0 | 2.5 | 3.3 | 4.9 | 8.8 | 20.0 |
| 1.20 | 1.0 | 1.1 | 1.3 | 1.5 | 1.7 | 2.1 | 2.7 | 3.7 | 5.9 | 11.7 | 30.9 |
| 1.25 | 1.0 | 1.1 | 1.3 | 1.5 | 1.8 | 2.2 | 2.9 | 4.2 | 7.2 | 16.4 | 49.4 |
| 1.30 | 1.0 | 1.1 | 1.3 | 1.5 | 1.8 | 2.3 | 3.1 | 4.7 | 9.1 | 23.7 | 81.4 |

The *GPF* varies in the tables from a value of one to values in the region of eighty when going from a completely transitory abnormal performance (i.e. abnormal performance that immediately fades off after $t$+1) to a combination of twenty years of constant abnormal performance (i.e. $\lambda$=1 means that the residual return is constant) on a permanently fast growing equity base. It is obvious that the latter combination is unlikely for most firms. One can identify areas in the tables where the *GPF* does not change very much. If it were possible to identify firms, or industries, for which a fairly equivalent level of the *GPF* could be expected, this would be a useful base for the selection of firms to be included in different empirical tests.

The competitive forces within an industry have been studied and described by, for example, Porter (1980). In his terminology, pressure towards normal profitability can be expected from: current competitors within the industry, potential new entrants, suppliers of goods and labor, the firm's customers, and from potential substituting products. For firms whose competitive edge is hard to copy, protected via patents or is due to, for example, cost advantages resulting from economies of scale, the reversion process may be expected to be rather slow. For firms currently in a loss situation, the reversion process should necessarily be expected to be rather quick if the firm is expected to survive at all. The pressure, especially from investors, may be expected to be strong.[31] Consider thus the following potential clusters of firms:

31 There are, however, several examples of firms that for extended time periods have failed to reach what would be considered a normal level of profitability.

**Table 2.2 A table indicating the relation between different firm and industry characteristics and the expected size of the growth persistence factor.**

| Subgroup | Firm/industry characteristics | Growth persistence factor |
|---|---|---|
| • Quick reversion | Loss situation<br>Competitive industry<br>Low barriers to entry | $1 \leq GPF < 3$ |
| • Slow reversion/ Normal growth | Barriers to entry<br>Mature to normal growth | $3 \leq GPF \leq 8$ |
| • Slow reversion/ High growth | High barriers to entry<br>Rapid expansion | $GPF > 8$ |

- *PMB*

is expected to be zero when the accounting regime is unbiased. The level of the expected measurement bias of a firm's equity is a question of how value is actually measured and how it should ideally be measured (according to a theoretical ideal such as economic value).[32] The prevailing accounting regime in Sweden (as well as in most other Western countries) relies on the notion of conservatism, with historical cost as a valuation cornerstone and the realization principle guiding when income may be recognized. Following the recommendations of this kind of an accounting regime, 'investments' in different types of assets will be treated differently. For example, large expenditures in R&D or in a brandname (through marketing) are generally treated as expenses rather than investments. An accounting description that relies on historical cost as the basis for valuation further generates a measurement bias when a firm holds old and potentially very valuable assets. A conservative accounting regime does, furthermore, not normally allow firms to recognize the potential value of 'investments' in specialized human resources. Older Swedish accounting practice (relying heavily on valuation according to what was allowed from the tax authorities point of view) allowed substantial hidden reserves related to, for example,

32 Assuming that such an ideal can actually be defined.

the valuation of inventory and depreciable assets. A direct measurement bias is, of course, created by such a non-open accounting procedure, an indirect measurement bias is, furthermore, created by the later common accounting procedure to value the interest-free deferred tax liability at a face value.

It is thus not difficult to identify characteristics of firms that are prone to generate a large persistent measurement bias. Such characteristics include:

- Permanent and large R&D expenditures (e.g. pharmaceuticals and 'high-tech' firms).
- Permanent and large marketing expenditures (e.g. brandname-intensive firms).
- Significant investments in specialized human competence through training, etc. (e.g. consulting firms).
- Permanent and large investments in assets with long economic lives (e.g. real estate companies).
- A significant inventory of ongoing projects with a long production cycle and a large accumulated income that is reported according to the 'completed contract method' (e.g. construction companies).

Unfortunately, estimating the firm-specific bias is a difficult task. The bias depends on the firm's combined mix of these types of characteristics, which in turn depends on factors such as the actual outflow to inflow lag related to the firm's expenditures (investments). The average economic lives, the age structure and value change of the assets affects the average unrealized holding gain. Furthermore, the inflation rate, changes in the inflation rate and the real growth of the firms will affect the size of the bias.

For firms that do not invest heavily in R&D or marketing, that do not rely on specialized human resources, and whose assets do not have long economic lives, the *PMB* may be expected to be close to zero.

# 3 RESEARCH DESIGN CONSIDERATIONS

In investigating the association between the accounting measures of value and value creation with stock market prices and price changes, it has been considered important to control for differences in i) firm characteristics, ii) changes in the economic climate, and iii) accounting changes. Some of these issues will be of particular interest in themselves; others are deemed important to control for in order to avoid the effects of confounding variables. Extreme heterogeneity in a sample of firms, in one or several of these dimensions, is expected to significantly affect the result of estimating regression specifications, such as M.1 to M.5. Low explanatory power and unstable regression coefficients are thus deemed as likely consequences.

## 3.1 Firm characteristics

Consistent with the outlined valuation model and well-known characteristics of the traditional cost-based accounting regime, the most important firm characteristic is considered to be related to the difference in expected size of the accounting measurement bias for different types of business activities. Identification and quantification issues related to this kind of measurement bias will be elaborated on at some length in the next few sections. It is also considered important to identify characteristics of firms that are expected to have non-normal growth and experience strong persistence in abnormal performance, this will be briefly discussed in Section 3.1.2. Finally, if expected future *ROE* is based on the current level of *ROE* (as in many previous earnings-return studies), the identification of firm types for which such a simple estimation procedure may be considered particularly invalid, is deemed important. These matters will briefly be discussed in Section 3.1.3.

### 3.1.1 Expected accounting measurement bias (in capital terms)

The level of the expected measurement bias of a firm's book value is in principle a question of how value is actually measured according to the prevailing accounting regime in comparison with economic ideal measurement principles—compare to the previously used notion of unbiased accounting. The established 'solution' to the problem of describing value and value creation in a world of uncertainty and non-specified time horizons, has been to rely on measurement rules based on prudence. Historical cost is the general valuation base and the realization principle generally governs when income may be recognized. Thus the accounting regime has a deliberate tendency to realize losses early and gains late, and to valuing assets low and liabilities high. The valuation model used in this study is based on discounted (net) dividends to the owner of the firm. Conceptually, the ideal measurement principles against which the bias should be scaled can thus be found in the classical theory of capital value (see, for example, Fisher, 1906 and Lindahl, 1939). According to the notion of unbiased accounting utilized in Chapter 2, accounting value is only expected to equal economic value when no abnormal performance is expected. Such a valuation concept is most consistent with a current cost-based accounting system that allows for capitalization of investments in different intangibles. Johansson and Östman (1995 p. 116) point out (referring to Beaver, 1989) that it is difficult or even impossible to, in practice, define and measure economic value precisely in a world of uncertainty.[1]

The prevailing accounting procedures do, nevertheless, in some instances, deviate so much from the ideal reference point that it should be worthwhile to attempt to at least crudely assess the size of the measurement biases. Fruhan (1979) studied the creation, transfer and destruction of shareholder value. In order to control for accounting measurement problems, he attempted to make systematic adjustments for the measurement biases he identified as the most significant ones. Fruhan made calculations of book value of equity adjusted for capitalized investments in advertising and R&D.

1 Johansson and Östman (1995) further point out that actual measurement principles may have a non-trivial influence on actual cash flows, via what they refer to as the post-contracting role of accounting (for example, via tax regulations and debt covenants), and related to the role of motivating and influencing the behavior of users.

He further revalued assets according to estimated replacement costs. Fruhan's estimates of the accounting measurement bias will be discussed later.

The size of the measurement bias can be expected to vary immensely for different balance sheet items. As different firms are expected to hold different mixes of balance sheet items, some firms are prone to have large expected permanent measurement biases, whereas others are not.

### *3.1.1.1 Sources of the measurement bias for different balance sheet items*

This section discusses the valuation principles that have generally been used in Sweden for different ***balance sheet items,*** and how these valuation principles are expected to generate deviations from the value norm. The presentation follows the traditional order in which the items have appeared in the balance sheet. Consider the following simplified balance sheet.

| | |
|---|---|
| • Cash<br>• Accounts receivable<br>• Inventory<br>• Other accruals | • Operating liabilities<br>• Financial liabilities<br>• Pension obligations |
| | • Untaxed reserves |
| • Depreciable assets<br>• Land<br>• Investment in financial assets<br>• Other long-term assets | • Equity |
| Intangibles:<br>• Know-How<br>• Brandname | Off-balance sheet liabilities:<br>• Guarantee commitment |

## Cash

Cash is generally valued at face value and does not normally cause any valuation problems. If the cash is in a foreign currency, a conservative bias is potentially created via the use of the 'lower of cost or market' valuation rule.

### Accounts receivable

Accounts receivable generally causes no large valuation problems. The fact that this asset does not normally generate interest income means that, in a strict sense, it will tend to be overvalued when stated at face value. The longer the average collection period and the higher the cost of capital, the larger this effect is.

### Inventory and work in progress

The valuation of inventory in Sweden generally follows the rule of 'lower of cost or market' and the 'first in first out' principle (FIFO). The FIFO principle ensures that the conservative bias is rather small given a reasonably high inventory turnover with low value added.[2] Long-term project-intensive companies with significant value added (for example, building and construction firms) with revenue recognition at completion may, of course, hold 'inventory' that is significantly undervalued.

Until 1990, it was for tax purposes possible to value inventory very low. The consequences of this low valuation has, however, been openly disclosed (via full valuation of the asset and a deduction classified as an untaxed reserve between liabilities and equity), at least for the listed Swedish companies, since the mid 1960s.[3]

### Other accruals

Other accruals are not generally expected to cause severe valuation problems.

### Depreciable assets

Depreciable assets (machinery and equipment, buildings, ships, acquired goodwill, etc.) are generally valued at historical cost, reduced by accumulated linear depreciation over the expected economic life. The existence of large unrealized holding gains may constitute a permanent situation for a firm that holds a portfolio of long lived assets for many years, and either the depreciation plan is too aggressive and/or there is inflation in the economy (generating nominal value changes in the assets held by the firm). The size

2 The unrealized holding gains for a firm trading in commodities with very large price fluctuations (such as oil or coffee), may however still at times be non-trivial.

3 Open disclosure has been enforced by law since 1977 (ABL 75) and earlier by a recommendations from NBK and FAR. For further details, see Hanner (1980).

of the permanent measurement bias is expected to be a function of the average age of the assets held and the level of the inflation rate.[4]

Given constant inflation (equaling the value change of the specific asset), a valid depreciation scheme and knowledge of the economic life of an asset type, the bias of traditional accounting measurement (relative to current cost) for a portfolio of the asset type can be calculated:

[3:1] $$\text{Asset bias} = \sum_{n=o}^{N}\left(\left(1+i\right)^{n}-1\right)\cdot\frac{A_{n,k}^{(r)}}{acc\left[A_{k}^{(r)}\right]}\cdot\left(1-\tau\right)$$

where

| | |
|---|---|
| $i =$ | the annual rate of change in value for the asset type—in the simplest case corresponding to the rate of inflation |
| $n =$ | the age of the asset (0 years to $N$ years) |
| $A_{n,k}^{(r)} =$ | the reported book value of the $n$ year old asset of type $k$ (after accumulated depreciation) |
| $acc\left[A_{k}^{(r)}\right] =$ | the accumulated book value of all assets of type $k$ (after accumulated depreciation) |
| $\tau =$ | the tax rate |

The bias for assets of type $k$ (with the same economic life and the same depreciation schedule) is the sum of unrealized holding gains (after tax) for all assets of type $k$ (at a certain date of valuation) divided by the book value of these assets (at the same date).

The depreciation rules applicable for taxation purposes have been rather generous (for machinery and equipment, a company has a choice between 30% depreciation on opening book value or a five-year straight line depreciation of acquisition value). Further, the taxation rules connected to the so-called 'investment funds' could generate a complete write-off of any de-

4 Note that even if a conservative bias is to be expected on average, one may observe the opposite, due to, for example, large declines in property values on the market, combined with the regulations demanding write-downs on fixed assets which have been subject to value decline.

preciable asset, even a building, during the investment year.[5] Given separate disclosure of depreciation according to plan and depreciation for taxation purposes, this causes no additional problems. However, such open disclosure has not been the general norm until the early 1980s. A gradual adaptation to open disclosure began to occur in the late 1960s. The effect of this accounting disclosure issue will be considered separately later in this study.

### Land and equivalent property

Land and equivalent property is generally valued at historical cost. The size of the permanent measurement bias is thus expected to be a function of the age of the assets held and the level of annual nominal value change since the acquisition dates.[6] To calculate a permanent measurement bias, an estimate of the holding periods and the annual value changes is needed.[7]

### Investments in financial assets

Investments in shares and other financial assets are generally valued at historical cost. The expected benefits of owning shares are dividends and capital gains. Capital gains remain unrecorded until the shares are sold. The size of this measurement bias is thus expected to be a function of the age of the shares and the level of annual nominal capital gains since the acquisition dates.[8]

5 The investment fund system first came into being in 1938, but it did not become important until 1955, when the rules changed. After several revisions, the system was abandoned in 1990. See, for example, Lodin et at (1990) and Angelin and Jennergren (1994). Note, however, that the effect (the existence of a deferred tax given open disclosure) of a complete write-off of a long lived asset will remain for many years after 1990.

6 Note that Swedish valuation rules allow for write-ups of an asset with a 'substantial and permanent' market value in excess of acquisition cost. These unrealized holding gains are, however, not allowed to pass through the income statement and thus violate the clean surplus relation of accounting.

7 The fact that the investment pattern in this type of asset can be expected to be particularly non-continuous may make the assumption of a permanent measurement bias in this case somewhat dubious.

8 Note that since the mid 1980s in an increasing number of firms the shares held in associated companies have been valued according to the so-called 'equity-method'. According to this valuation method, the share value will increase in proportion to the realized profits in the associated firm (net of distributed dividends). The expected measurement bias for these firms is thus obviously less important.

## Intangible assets

Investments in intangible assets can create a large permanent measurement bias. In a number of companies, large resources are spent annually in order to generate successful future business. Typical examples of such activities are research and development, future-oriented training of personnel, and marketing campaigns. The resources associated with these activities are commonly recorded as an immediate expense, rather than being treated as an investment and capitalized. Assuming that an expenditure is expected to generate a 'fair but late return', the size of the measurement bias is a function of how late this return is expected to be realized (and the discount rate).

Consider an investment of a 100 in a zero-coupon bond that repays 161.1 five years later. This investment generates 10% annual return and should (given a 10% discount rate) be recorded at 110 at the end of the first year in a balance sheet, according to economic value theory, and then successively increase towards 161.1 over the next four years. Consider an R&D investment with a similar expected cash flow structure. According to common accounting practice, R&D expenditures would be valued in the balance sheet at zero for the five years and the benefit of the investment (161.1) would finally show up as revenue at the end of year 5.[9] If such an investment is made every year, the accumulated unrecorded value can obviously be substantial. For a stable firm that continuously invests in this kind of an equivalent to a zero-coupon bond, the measurement bias may be expected to be large and permanent. The component that shows up annually in the income statement can formally be expressed as:

[3:2] $$\textit{Income component} = \left[ I \cdot (1 + r^*)^h \right] - I$$

where

$I =$ the annual constant investment in real terms (expenditure)
$r^* =$ a discount rate (expected real return)
$h =$ the number of years until the investment pays off

9 It is, of course, somewhat unrealistic to assume that the benefit of an R&D investment comes in a one-time lump sum (unless the 'research results' are sold off to a third party). The key point to illustrate, however, is the general effect of a timelag between investment and harvest.

The unrecorded value of a constant stock (in real terms) of annual investments in such zero-coupon bond equivalents can then be expressed as:

[3:3] $$Value = I \cdot \frac{\left[(1+r^*)^h - 1\right]}{r^*}$$

The annual expenditures (investments) have for tax purposes been fully treated as expenses. The tax rate times the unrecorded value can thus be viewed as a deferred tax, implying that the after-tax unrecorded value can be expressed as follows:[10]

[3:4] $$Value = I \cdot \frac{\left[(1+r^*)^h - 1\right]}{r^*} \cdot (1-\tau)$$

where
$\tau =$ the tax rate

If the annual expenditure in an intangible asset is assumed to have grown annually at a constant rate ($\delta$), the bias expression can simply be extended to:[11]

[3:4′] $$Value = I \cdot \frac{\left[1-\left(\frac{1+r^*}{1+\delta}\right)^h\right]}{1-\left(\frac{1+r^*}{1+\delta}\right)} \cdot (1-\tau)$$

where
$\delta =$ annual real growth in the expenditure $I$

The expected investment-to-harvest timelag can be expected to vary immensely between different enterprises. Typical extreme examples include the basic research activities in a pharmaceutical company and the marketing

10 The complications introduced by non-zero inflation and a particular set of taxation rules are not elaborated on here.

11 Note that the measurement bias given this specification will always be smaller given positive historical growth ($\delta > 0$).

campaign for a new shampoo of a consumer goods firm. The zero-coupon bond metaphor may be non-representative of a typical project; a company may invest in a particular project for a number of years and then later also harvest for several years. However, for a company that is expected to have a balanced portfolio of ongoing projects, an estimate an average investment-to-harvest timelag and the use of the proposed metaphor may constitute a useful tool to estimate a firm's expected permanent measurement bias.[12]

The calculation of the measurement bias related to intangibles presented above is in spirit similar to, for example, Fruhan (1979). However, Fruhan assumed a regular depreciation scheme for the investments (linear for R&D expenditures and the double declining balance method for advertising expenditures). The measurement bias calculated with the zero-coupon bond method will be larger than the corresponding bias for a linear depreciation plan. This is not surprising as the assets are assumed to increase annually in value according to the former model and decrease in value according the latter. Which valuation method that is the most representative is eventually an empirical matter.

## Operating liabilities

Operating liabilities are generally valued at face value and do not generally carry an explicit (and separable) interest cost. This generates a conservative bias (over-valuation of the liability) opposite to the one discussed regarding accounts receivable.[13] For most firms, however, the relative size of this bias is not expected to be severe. For a firm that permanently tends to generate large advance payments from customers, this may, on the other hand, still generate a significant bias.

12 Green, Stark and Thomas (1996) used similar reasoning when interpreting the regression coefficient of R&D expenditures. They ran a regression using R&D expenditures (deflated by the firm's book value of equity) as an explanatory variable for the market-to-book value premium on UK data.

13 If the liability is assumed to carry an implicit cost of interest (included in the contracted transaction price), the face value of the liability includes the expected interest cost and thus still over-states the value of the liability in economical value terms until the day the debt is repaid. This situation also implies that an interest expense is wrongly labeled acquisition expense and it might also be allocated to the wrong period.

### Financial liabilities

Financial liabilities are generally valued according to the face value of the contractual obligation. As long as these commitments also include payment of interest rates close to the market rate, a valuation method of this kind causes no measurement bias. However, fluctuating market interest rates and a firm choosing long-term financing with fixed interest rates can generate a measurement bias compared to the economic value ideal. A conservative bias related to liabilities in a foreign currency, similar to the previously discussed bias regarding liquid assets, may also occur.

### Pension obligations

In Swedish financial statements, the liability to pay future pensions to present and former employees is commonly valued according an actuarial model. Pension obligations are generally long-term, and contingent on uncertain factors such as the life spans of the employees. The valuation of such obligations is thus necessarily very complex. Skogsvik (1993b), performed a deductive analysis of the measurement bias of a commonly used (in Sweden) actuarial model compared to a valuation based on economic theory. His conclusions indicate that (given stated assumptions), the size of the bias is related to the personnel characteristics of the company, the tax rate and the inflation rate of the economy. The relative over-statement of the pension liability is shown to be most substantial if the company's employees are young, the tax rate is high, and the future inflation rates are expected to be high.[14] Further, the measurement bias is shown to be much smaller for a company with a predominance of old employees, or with an evenly dispersed age distribution of employees.[15] As companies with predominantly young employees may be expected to have a rather small total pension obligation, the overall measurement bias in relation to the book value of shareholder equity may not be so severe for most companies.

### Untaxed reserves

According to the Swedish accounting tradition, firms have generally disclosed 'untaxed reserves' as an item between liabilities and equity. For many firms, this item has amounted to a significant portion of the liability side of the balance sheet. The individual user of the information has then

14 See Skogsvik, 1993b p. 39.
15 Ibid. p. 39.

often chosen to reclassify a part of the untaxed reserves as deferred taxes and the other as owners' equity. The standard method has been to use the prevailing marginal tax rate (or a similar approximation) to accomplish this separation. As these tax liabilities do not carry an explicit interest cost and are commonly expected to be paid out several years ahead, the value of the liability tends to be over-stated. If deferred taxes related to unrealized holding gains are calculated in a similar fashion, a corresponding type of overstatement will be present. A valuation approach in the spirit of economic valuation theory would calculate the liability as the discounted value of expected future tax payments related to the reversal of the untaxed reserves and the unrealized holding gains.[16] The expected size of this bias is thus a function of the tax rate, the expected lives of the individual untaxed reserves, the time until unrealized holding gains are realized, and the discount rate. Formally, the expected bias may be calculated as follows:

[3:5] $$\text{Deferred tax bias}_0 = -\left[ \frac{\sum_{t=1}^{\infty} \frac{\Delta UR_t \cdot \tau}{\left(1 + r_{d,at}\right)^t} + \sum_{t=1}^{\infty} \frac{\Delta UHG_t \cdot \tau}{\left(1 + r_{d,at}\right)^t}}{\left(UR_0 + UHG_0\right) \cdot \tau} - 1 \right]$$

where

| | |
|---|---|
| $\Delta UR_t =$ | the change in untaxed reserves at time $t$ |
| $\Delta UHG_t =$ | the change in unrealized holding gain at time $t$ |
| $\tau =$ | the tax rate |
| $r_{d,at} =$ | the cost of debt after tax |

## Book value of equity

Book value of equity is calculated as a residual: total assets minus total liabilities. Given that all potential measurement errors related to assets and liabilities could be estimated, these errors can in principle be aggregated into a total measurement error in equity.

16 See discussion in Skogsvik (1987, pp. 127)

### Off-balance sheet liabilities

Provided that the accounting regime is guided by conservatism, one does not expect any unrecorded off-balance sheet liabilities. However, as such cases may nevertheless occur, the issue should be mentioned.

### Other accounting issues

This list of measurement issues related to different balance sheet items could be supplemented with other accounting issues that may have an effect on the size of the measurement bias. An obvious example of such an issue is the method used for group consolidation after an acquisition. The ***pooling method***[17] 'preserves' any measurement biases whereas the ***purchase method*** means that acquired tangible assets are given new current values and intangible assets, related to, for example, brandnames and know-how, are capitalized (often under the heading goodwill). The previous discussion of measurement errors has essentially been from the perspective of firms holding 'balanced portfolios' of assets in terms of age structure and value change. Such a balance is obviously, at least temporarily, disturbed after a large acquisition which is consolidated according to the purchase method.[18]

### *3.1.1.2 Principal estimation procedure of the measurement bias*

A number of potential sources for a measurement bias were identified above. The size of the measurement problems can be expected to vary between different balance sheet items. The total relative measurement bias of a firm in a particular industry is thus expected to be a function of the types of assets, intangibles and liabilities that the firm is holding. To estimate a firm's measurement bias in relation to the book value of equity, a three-step approach can be used: i) estimate the relative measurement bias of different items, ii) identify the relative importance of each item for the firm, and iii) scale and aggregate these errors against the book value of equity.

The following formula is a comprehensive way to illustrate a procedure of this kind.

---

[17] A method similar to the pooling method (called 'Parivärdemetoden' in Swedish), was commonly used by Swedish firms until the mid 1970s.

[18] A large acquisition of a particularly large asset (such as a power-plant or a new paper mill) will have the same kind of effect on an individual firm's *current* measurement bias.

[3:6]

$$PMB = \frac{B^{(u)}}{B^{(r)}} - 1 = \frac{\sum_{k=1}^{K} w_i \cdot \left( \frac{acc\left[A_k^{(u)}\right]}{acc\left[A_k^{(r)}\right]} - 1 \right) + \sum_{\phi=1}^{\Phi} \frac{I_\phi^{(u)}}{TA^{(r)}} - \sum_{\theta=1}^{\Theta} \frac{L_\theta^{(r)}}{TA^{(r)}} \cdot \left( \frac{L_\theta^{(u)}}{L_\theta^{(r)}} - 1 \right) - \sum_{\varphi=1}^{\Gamma} \frac{DT_\varphi^{(r)}}{TA^{(r)}} \cdot \left( \frac{DT_\varphi^{(u)}}{DT_\varphi^{(r)}} - 1 \right) - \sum_{\eta=1}^{H} \frac{Off_\eta^{(u)}}{TA^{(r)}}}{B^{(r)} / TA^{(r)}}$$

where

$B^{(r)}$ = reported ($r$) book value of owner's equity

$B^{(u)}$ = the estimate of unbiased ($u$) value of owner's equity

$acc\left[A_k^{(r)}\right]$ = reported book value of asset type ($k$)

$TA^{(r)} = \sum_{k=1}^{K} acc\left[A_k^{(r)}\right]$ = the sum of total reported assets

$w_k = \frac{acc\left[A_k^{(r)}\right]}{TA^{(r)}}$ = the relative weight of each asset type

$acc\left[A_k^{(u)}\right]$ = the estimated unbiased value of a particular asset type

$I_\phi^{(u)}$ = the estimated value of the intangible ($I$) asset type ($\phi$)

$L_\theta^{(r)}$ = reported book value of liability ($L$) type ($\theta$)

$L_\theta^{(u)}$ = the estimated unbiased value of liability type ($\theta$)

$DT_\varphi^{(r)}$ = reported book value of deferred tax liability ($DT$) type ($\varphi$)

$DT_\varphi^{(u)}$ = the estimated unbiased value of deferred tax liability

$Off_\eta^{(u)}$ = the estimated unbiased value of the off-balance liability type ($\eta$)

According to this procedure, all estimated measurement biases (related to assets, intangibles and liabilities) are first quantified and scaled against total reported assets,[19] and then eventually re-scaled against reported book value of equity.[20] The marginal effect of one kind of measurement bias, when finally scaled against book value of equity, for a particular firm, conse-

19 This gives the measurement bias in terms of a 100% equity financed firm.
20 The total measurement bias increases as a function of the firm's leverage.

quently depends on the relative bias of the particular item, the relative importance of this item for the firm, and the relative size of the firm's reported equity base.

To illustrate, consider the balance sheets of the following firm (for example, a research-oriented manufacturing company), first described using conservative accounting and then using unbiased accounting:[21]

Reported balance sheet

| | |
|---|---|
| $A_1^{(r)} = 40$ | $L_1^{(r)} = 60$ |
| $A_2^{(r)} = 60$ | $B^{(r)} = 40$ |

Estimated balance sheet

| | |
|---|---|
| $A_1^{(u)} = 40$ | $L_1^{(u)} = 40$ |
| $A_2^{(u)} = 80$ | $B^{(u)} = 100$ |
| $I_1^{(u)} = 20$ | |

The accounting regime measurement bias can easily be calculated directly from the two equity measures:

$$PMB = \frac{B^{(u)}}{B^{(r)}} - 1 = \frac{100}{40} - 1 = 1.50$$

The measurement bias can also be calculated—in accordance with the formula presented above—as the sum of the three measurement errors: i) the under-value of the second asset type, ii) the unrecorded value of an intangible asset, and iii) the over-value of the liability.

21 These values do not explicitly consider any bias related to the deferred tax on unrealized holding gains.

$$PMB = \frac{\left(0.60\cdot\left(\frac{80}{60}-1\right)\right)+\frac{20}{100}-\left(0.60\cdot\left(\frac{40}{60}-1\right)\right)}{40/100} = 0.50 + 0.50 + 0.50 = 1.50$$

The marginal *PMB* is in this case apparently 0.50 for each issue. A calculation technique of this kind will subsequently be used in order to estimate firm or specific industry sector measurement biases. The effort will necessarily be somewhat crude since a number of assumptions, for example, regarding the growth rate and the inflation rate have to be made. Also, the average economic lives and annual value change of different firms' assets must be estimated. Annual expenditures regarding R&D and future-oriented advertising must be identified. The average investment-to-harvest timelag must be estimated. The relative importance of different items for different firms must also be identified. Some of this information can be extracted from annual reports, but other details have to be approximated. In this study, only the factors that are expected to create the most significant biases will be considered.

### *3.1.1.3 Calculation of the most significant measurement biases*

As in Fruhan's US study from 1979, the main sources of large permanent biases associated with the Swedish accounting regime can most likely be traced to the historical cost valuation of long lived assets and the expensing procedure of investments in intangibles. The over-valuation of deferred tax liabilities can possibly also create non-trivial measurement biases for several firms. To illustrate the potential size of these biases, different tables are calculated using the formulas presented above.

#### Tangible assets

Johansson and Östman (1995) illustrated with an example that the conservative measurement bias[22] will be permanent (in the relative sense of assumption A.3) if three (strict) conditions are fulfilled:[23]

22 The current cost method developed by Edwards and Bell (1961) was used as a proxy for 'ideal' measurement.

23 Additionally, an assumption of no technical development of the asset type is implicitly assumed.

> *"i) The units have uniform economic lives, uniform rates of depreciation, the same cost of acquisition in real terms and the same number of units are replaced each year.*
> *ii) The historical rate of inflation has been constant since the first of the existing units was acquired.*
> *iii) The same rate of inflation will continue."*
>
> Johansson and Östman (1995, p. 137)

These rather restrictive conditions may not be expected to hold for firms in general at a present date, but can still serve as a useful starting point for an estimation procedure of a permanent measurement bias. It can further be shown that their observation of a constant measurement bias also holds when allowing for constant annual growth in the number of units of the asset. The measurement bias, will *ceteris paribus*, always be smaller when growth is positive, given a positive inflation rate. The constant measurement bias, given these particular conditions, can be described as follows in terms of equation [3:1]:

$$\text{[3:7]} \qquad \text{Asset bias} = \sum_{n=0}^{N} \underbrace{\left((1+i)^n - 1\right)}_{\substack{\text{Inflation} \\ \text{Component}}} \cdot \underbrace{\frac{\dfrac{AP}{(1+q)^n} \cdot \left(1 - \dfrac{n}{N}\right)}{\displaystyle\sum_{n=0}^{N} \frac{AP}{(1+q)^n} \cdot \left(1 - \frac{n}{N}\right)}}_{\text{Asset Weight}} \cdot \underbrace{(1-\tau)}_{\substack{\text{Tax} \\ \text{Component}}}$$

where

| | |
|---|---|
| $AP =$ | the acquisition price of one unit of the asset in nominal terms |
| $n =$ | the age of the asset (in years) |
| $N =$ | the economic life of the asset type |
| $q =$ | the annual percentage growth in number of acquired units |
| $i =$ | the annual unrecorded value change |
| $\tau =$ | the tax rate |

To understand the relative importance of the components that generate a measurement bias on a depreciable asset, consider figure 3.1a (*10% inflation and no growth*) and 3.1b (*10% inflation and 10% growth*). The calculations have been based on [3:7], and on the following specific assumptions:[24]

- One item of the asset is bought at the beginning of every year.
- One similar old asset is simultaneously scrapped (salvage value = 0).
- If growth occurs, more units (a fixed percentage) of the asset are bought every year.
- The units have uniform economic lives (10 years), uniform rates of depreciation (straight line), and the same cost of acquisition in real terms.
- The historical rate of inflation has been constant (10%) since the first of the existing units was acquired. The same rate of inflation will continue.
- The measurement bias is calculated at the end of the year.[25]
- The deferred tax on holding gains is not considered.

24 These conditions are largely borrowed from an example in Johansson and Östman, 1995 pp. 136. Their example was provided to illustrate that growth in equity will be similar irrespective of traditional measurement principals or current cost measurement under the specified conditions, i.e. the case of a permanent measurement bias.

25 This means, in combination with beginning-of-the-year acquisitions, that if there is no growth, the company holds one unit of the asset that is one year old, one that is two years old, etc., and that the oldest unit held is 10 years old and fully depreciated. This means that the mean age of the units the company holds is 5.5 years.

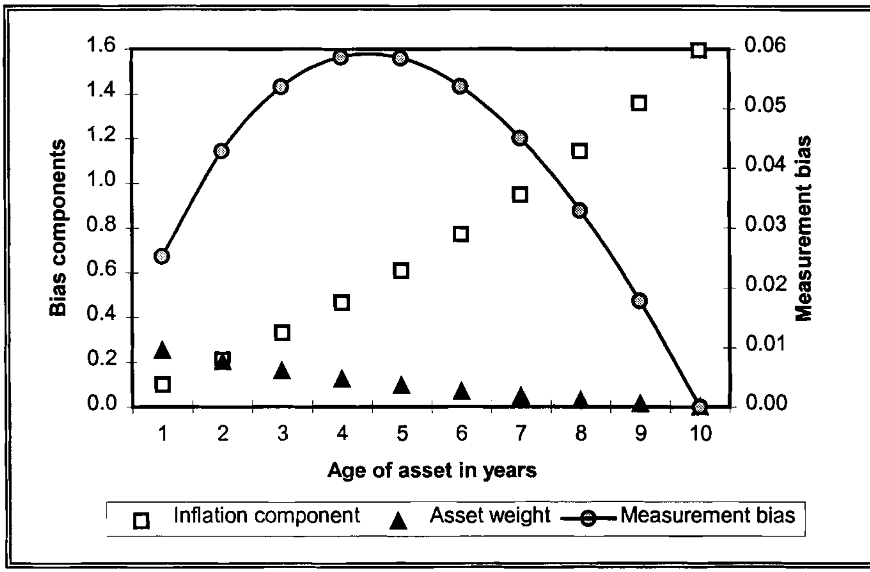


***Figure 3.1a An illustration of the components that generate a measurement bias (before tax) on depreciable assets with a 10-year economic life given 10% inflation and no growth.***

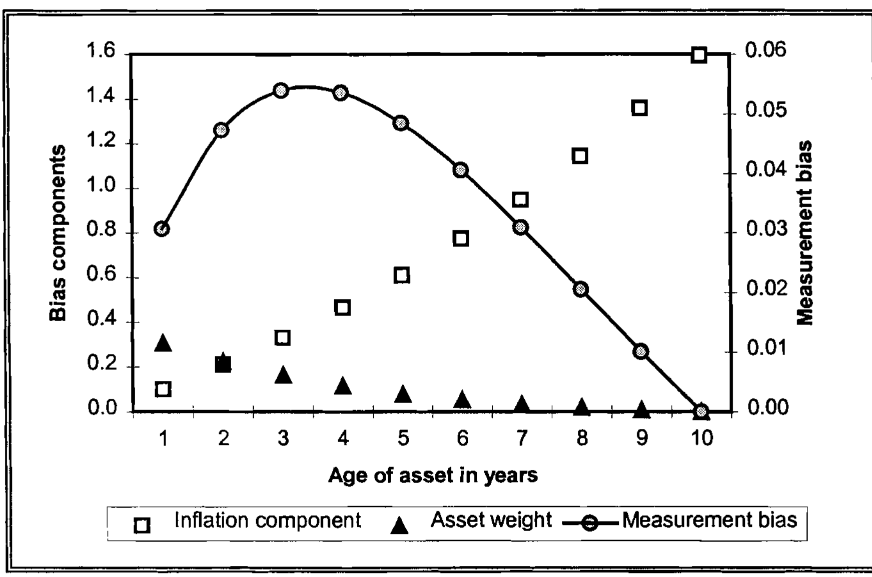


***Figure 3.1b An illustration of the components that generate a measurement bias (before tax) on depreciable assets with a 10-year economic life given 10% inflation and 10% annual growth.***

The inflation component is identical in the two figures. It is obviously a positive function of the holding period of the asset (its age). The asset weight, on the other hand, is a decreasing function of the age of the asset, mainly due to the depreciation scheme, but also due to the lower earlier acquisition price of each unit of the asset in nominal terms (due to inflation). These two off-setting factors are combined into a measurement bias from each year's investment. The measurement bias for each year is illustrated in the figures as a dot (joined by a line). Each dot illustrates the contribution to the total measurement bias (the right hand y-scale is used) of the asset of a particular age. The total measurement bias (before tax) constitutes the sum of the measurement biases of each year's investment. The total measurement bias, add up the values represented by the dots in the figures, equals 0.39 and 0.34. Given positive growth, the weights are relatively larger for the newer assets, and therefore the bias is reduced.

An important insight gained from these figures is that the relative contribution to the total measurement bias of a depreciable asset first increases with age, reaches a maximum, and then decreases with age. The measurement bias of a firm holding an unbalanced portfolio of the asset type will thus vary considerably over time. A portfolio of relatively newer assets (e.g. the growth case above) will have a smaller measurement bias compared with a completely balanced portfolio.

The illustrations above have been restricted to one level of inflation rate (10%) and an asset type with one particular economic life (10 years). Table 3.1 illustrates the measurement bias according to [3:7] (excluding the deferred tax effect), for different combinations of inflation rate and economic lives of a depreciable asset, given 5% constant annual growth, and the previously listed assumptions.[26]

---

26 Appendix A contains similar tables showing both 0% and 10% growth.

**Table 3.1 Calculated relative measurement biases before tax for a portfolio of assets given different degrees of annual unrecorded value change and economic lives of the asset type. The firm is assumed to acquire 5% more units of the asset every year. The real acquisition cost per unit of asset is constant over time.**

| Economic | Annual unrecorded value change | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| life | 0% | 1% | 2% | 3% | 4% | 5% | 6% | 7% | 8% | 9% | 10% | 15% | 20% |
| 5 | 0.00 | 0.02 | 0.04 | 0.06 | 0.08 | 0.10 | 0.12 | 0.14 | 0.16 | 0.18 | 0.20 | 0.30 | 0.41 |
| 10 | 0.00 | 0.03 | 0.07 | 0.10 | 0.14 | 0.18 | 0.21 | 0.25 | 0.29 | 0.32 | 0.36 | 0.55 | 0.75 |
| 15 | 0.00 | 0.05 | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 | 0.41 | 0.46 | 0.51 | 0.79 | 1.07 |
| 20 | 0.00 | 0.06 | 0.12 | 0.19 | 0.25 | 0.32 | 0.38 | 0.45 | 0.52 | 0.58 | 0.65 | 1.00 | 1.37 |
| 30 | 0.00 | 0.08 | 0.17 | 0.26 | 0.34 | 0.43 | 0.52 | 0.62 | 0.71 | 0.80 | 0.90 | 1.38 | 1.86 |
| 50 | 0.00 | 0.12 | 0.24 | 0.36 | 0.48 | 0.61 | 0.73 | 0.86 | 0.99 | 1.12 | 1.25 | 1.90 | 2.55 |

General observations from table 3.1 (and the tables in appendix A)

- The higher the historical inflation rate the higher the measurement bias.
- The longer the economic life, and thus the older the asset base, the higher the measurement bias.
- A structure of predominantly newer units (due to growth) generates a smaller measurement bias, (and vice versa for an older assets structure).
- The longer the economic life of the asset, the greater the impact the age structure of the asset base.[27]
- The lower the tax rate, the higher the value of the unrealized holding gain, and thus the higher the measurement bias after tax. Given a 50% tax rate, the measurement biases, as calculated in table 3.1, can simply be halved.

The above calculations have shown the measurement bias related to a particular asset. Combining formula [3:7] and [3:6], an expression can be generated for the marginal effect on the *equity measurement bias* from unrealized holding gains on a particular tangible asset type.

27 Asset types with long economic lives, such as paper mills and power plants, are probably also the most unusual in balanced portfolios. A company holding only one, or a few assets of this kind, will thus have a measurement bias that is expected to be non-constant over the years.

$$[3{:}8] \qquad PMB_k^{T.A.} = \frac{\frac{A_k^{(r)}}{TA^{(r)}} \cdot Bias_k^{T.A.}}{B^{(r)} / TA^{(r)}}$$

where

$PMB_k^{T.A.}$ = the marginal *PMB* of a tangible assets of type *k*

$\frac{A_k^{(r)}}{TA^{(r)}}$ = the relative importance of the asset type (*k*)

$\frac{B^{(r)}}{TA^{(r)}}$ = the ratio of book value of equity to total assets (solidity)

$Bias_k^{T.A.}$ = the measurement bias after tax of asset type k

The marginal measurement bias of an asset type can thus simply be generated by multiplying the measurement bias by the relative importance of the asset type for the firm, and dividing the product by the firm's solidity. Table 3.2 illustrates the effect of this additional factor—relative importance divided by solidity—for some possible combinations.

**Table 3.2 The relative importance of an asset type (as a percentage of total assets) divided by different possible solidity levels.**

| Relative importance | Solidity (equity-to-assets ratio) 10% | 20% | 30% | 40% | 50% | 60% | 70% | 80% | 90% | 100% |
|---|---|---|---|---|---|---|---|---|---|---|
| 0% | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10% | 1.0 | 0.5 | 0.3 | 0.3 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 |
| 20% | 2.0 | 1.0 | 0.7 | 0.5 | 0.4 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 |
| 30% | 3.0 | 1.5 | 1.0 | 0.8 | 0.6 | 0.5 | 0.4 | 0.4 | 0.3 | 0.3 |
| 40% | 4.0 | 2.0 | 1.3 | 1.0 | 0.8 | 0.7 | 0.6 | 0.5 | 0.4 | 0.4 |
| 50% | 5.0 | 2.5 | 1.7 | 1.3 | 1.0 | 0.8 | 0.7 | 0.6 | 0.6 | 0.5 |
| 60% | 6.0 | 3.0 | 2.0 | 1.5 | 1.2 | 1.0 | 0.9 | 0.8 | 0.7 | 0.6 |
| 70% | 7.0 | 3.5 | 2.3 | 1.8 | 1.4 | 1.2 | 1.0 | 0.9 | 0.8 | 0.7 |
| 80% | 8.0 | 4.0 | 2.7 | 2.0 | 1.6 | 1.3 | 1.1 | 1.0 | 0.9 | 0.8 |
| 90% | 9.0 | 4.5 | 3.0 | 2.3 | 1.8 | 1.5 | 1.3 | 1.1 | 1.0 | 0.9 |
| 100% | 10.0 | 5.0 | 3.3 | 2.5 | 2.0 | 1.7 | 1.4 | 1.3 | 1.1 | 1.0 |

**General observations from table 3.2**

- Obviously, the more dominant the asset type is in a firm's total asset base, the greater the impact of the asset's measurement bias on the firm's *PMB*.
- The lower the solidity, the greater the impact of a particular asset's measurement bias on the firm's *PMB*.
- A combination of large importance and low solidity will magnify any measurement bias considerably. For example, a typical real estate company often has around 90% of its capital invested in property, and has often financed these investments by taking large loans. If, for example, only 10% of the investments has been equity financed, any unrealized holding gain will be magnified 9 times in terms of an equity measurement bias.
- A typical manufacturing firm, on the other hand, may be expected to hold around 30% of its asset base in machinery, equipment and property. Given common levels of a solidity around 30%, the measurement bias will remain approximately unchanged in equity terms.

## Intangible assets

Combining formula [3:4′] and [3:6], generates an expression for the marginal effect on the equity measurement bias from immediate expensing of annual expenditures in an intangible asset that are expected to generate a 'fair but late return'.

[3:9]
$$PMB^{I.A.} = \frac{\dfrac{I}{TA^{(r)}} \cdot \left( \dfrac{1-\left(\dfrac{1+r^*}{1+\delta}\right)^h}{1-\left(\dfrac{1+r^*}{1+\delta}\right)} \right) \cdot (1-\tau)}{B^{(r)} \big/ TA^{(r)}}$$

where

| | |
|---|---|
| $I.A. =$ | intangible assets |
| $\frac{I}{TA^{(r)}} =$ | annual expenditure divided by total assets |
| $\frac{B^r}{TA^{(r)}} =$ | book value of equity divided by total assets (solidity) |
| $\tau =$ | the tax rate |

$r^* =$ expected real return
$\delta =$ annual real growth in expenditure $I$
$h =$ the average investment-to-harvest timelag

Table 3.3 illustrates the calculated bias related to investments in intangible assets. The table can be viewed as an illustration of the measurement bias as it relates to expenses for R&D, advertising campaigns or personnel training activities. The annual relative expenditure and the investment-to-harvest timelag are varied within the table. The reported solidity has been set equal to 50% and the tax rate is set at 30%.[28] The real discount rate and annual growth have been set at 5% and 0% respectively. Appendix B provides similar tables with other combinations of the discount rate and growth.

**Table 3.3 Calculated relative measurement biases for different degrees of annual expenditures for R&D, advertisement campaigns, etc. and different investment-to-harvest timelags. The reported solidity has been set equal to 50% and the tax rate is set at 30%. The real discount rate and annual growth have been set at 5% and 0% respectively.**

| Time | Annual relative expenditure (expenditure/total assets) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag | 0% | 1% | 2% | 3% | 4% | 5% | 6% | 7% | 8% | 9% | 10% | 15% | 20% |
| 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 | 0.00 | 0.01 | 0.03 | 0.04 | 0.06 | 0.07 | 0.08 | 0.10 | 0.11 | 0.13 | 0.14 | 0.21 | 0.28 |
| 2 | 0.00 | 0.03 | 0.06 | 0.09 | 0.11 | 0.14 | 0.17 | 0.20 | 0.23 | 0.26 | 0.29 | 0.43 | 0.57 |
| 3 | 0.00 | 0.04 | 0.09 | 0.13 | 0.18 | 0.22 | 0.26 | 0.31 | 0.35 | 0.40 | 0.44 | 0.66 | 0.88 |
| 4 | 0.00 | 0.06 | 0.12 | 0.18 | 0.24 | 0.30 | 0.36 | 0.42 | 0.48 | 0.54 | 0.60 | 0.91 | 1.21 |
| 5 | 0.00 | 0.08 | 0.15 | 0.23 | 0.31 | 0.39 | 0.46 | 0.54 | 0.62 | 0.70 | 0.77 | 1.16 | 1.55 |
| 6 | 0.00 | 0.10 | 0.19 | 0.29 | 0.38 | 0.48 | 0.57 | 0.67 | 0.76 | 0.86 | 0.95 | 1.43 | 1.90 |
| 7 | 0.00 | 0.11 | 0.23 | 0.34 | 0.46 | 0.57 | 0.68 | 0.80 | 0.91 | 1.03 | 1.14 | 1.71 | 2.28 |
| 8 | 0.00 | 0.13 | 0.27 | 0.40 | 0.53 | 0.67 | 0.80 | 0.94 | 1.07 | 1.20 | 1.34 | 2.01 | 2.67 |
| 9 | 0.00 | 0.15 | 0.31 | 0.46 | 0.62 | 0.77 | 0.93 | 1.08 | 1.23 | 1.39 | 1.54 | 2.32 | 3.09 |
| 10 | 0.00 | 0.18 | 0.35 | 0.53 | 0.70 | 0.88 | 1.06 | 1.23 | 1.41 | 1.58 | 1.76 | 2.64 | 3.52 |

The magnitude of the numbers in the tables indicates that marginal *PMB*s relating to an expensing procedure of fair-return-investments in intangibles can be quite substantial. For example, the combination of constant annual expenditures amounting to 10% of total assets generates a *PMB* amounting to 1, provided that the investment-to-harvest timelag is between 6 and 7 years. The same level of expenditures gives a *PMB* of 1.5 when the timelag

28 A higher tax rate and a higher solidity level will (as previously discussed regarding tangible assets), *ceteris paribus*, decrease the *PMB*, and vice versa.

approaches 10 years. Provided that, perhaps more realistically, the real amount spent every year has steadily increased (by 10%), the *PMB* for similar investment-to-harvest timelags will amount to 0.80 and 1.15 respectively.[29] How large estimated measurement bias does this zero-coupon-bond approach generate compared with an assumption of a conventional linear depreciation scheme? Appendix C shows a table that illustrates the necessary economic life of an intangible asset, depreciated linearly, in order to generate equivalent *PMB*s as calculated by the zero-coupon bond approach. The table shows, for example, that an investment-to-harvest timelag of 5 years generates approximately the same *PMB* as a 10 to 11 year economic life assuming linear depreciation.

It is well known that the timelag between the early research phase and the launching of a product in the pharmaceutical industry is generally very long (10 to 20 years). It is also well known that the annual expenditures on R&D in the pharmaceutical industry are significant.[30] The expected investment-to-harvest timelag of an advertising campaign cannot be expected to be as long as that of R&D efforts. The annual expenditures in, for example, brandname-intensive consumer goods industries can, however, be substantial.[31] For example, a two-year timelag and 15% annual expenditures generate a marginal *PMB* amounting to 0.43 according to table 3.3. The investment-to-harvest timelag for personnel training activities is, to my knowledge, almost unexplored. Documented knowledge of annual expenditures on such activities is also quite limited.[32]

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29 See appendix B. The tables also indicate that a higher real discount rate (e.g., taking large expected risk into account), somewhat increases the *PMB*s, especially for the longer investment-to-harvest timelags, but has only a marginal effect on the *PMB* for a shorter timelag.

30 Astra, a Swedish pharmaceutical firm, has annually expensed R&D efforts amounting to between 10-15% of total assets between the years 1966 and 1994 (see Astra's annual reports).

31 Swedish firms have in general not disclosed their annual marketing expenditures. International examples of marketing expenditures have been identified for Heineken, the Dutch Brewery, and Coca Cola, the US soft drink company, from the Extel company research database for 1993 and 1994. Heineken spent on average 14% and Coca Cola 10% in relation to total reported assets. Annual marketing and advertisement expenditures for a brandname-intensive firm can apparently amount to 10% of reported assets or more.

32 Swedish firms rarely disclose information concerning their annual expenditures on personnel training activities. Ångpanneföreningen, a Swedish consulting firm, is an exception. Ångpanneföreningen's average annual personnel training expenses

In summary, a firm that makes large annual investments in intangibles, that hardly holds any tangible assets, and that finances the asset base with a large proportion of liabilities, can be expected to have a large relative measurement bias.

**Deferred taxes**

Combining formula [3:5] and [3:6] generates an expression for the marginal effect on the equity measurement bias of an over-statement of the deferred tax liability.

[3:10] $$PMB^{DT} = -\frac{\frac{DT_0}{TA^{(r)}}\left(\frac{\sum_{t=1}^{\infty}\frac{\Delta UR_t \cdot \tau}{\left(1+r_{d,at}\right)^t}+\sum_{t=1}^{\infty}\frac{\Delta UHG_t \cdot \tau}{\left(1+r_{d,at}\right)^t}}{\left(UR_0 + UHG_0\right)\cdot \tau}-1\right)}{B^{(r)}/TA^{(r)}}$$

where

$\left(UR_0 + UHG_0\right)\cdot \tau =$ the deferred tax (*DT*) at time 0

$\Delta UR_t =$ the change in untaxed reserves at time *t*

$\Delta UHG_t =$ the change in unrealized holding gain at time *t*

$\tau =$ the tax rate

$r_{d,at} =$ the cost of debt after tax

$\frac{B^{(r)}}{TA^{(r)}} =$ book value of equity divided by total assets (solidity)

amounted to 4% in relation to total reported assets for the years 1987 to 1994 (see annual reports). Note that Ångpanneföreningen has not been a pure consulting firm, but is also involved in real estate (approximately 1/3 of their asset base). Had this not been the case, the relative expenditures would have been more significant.

Assuming that all the deferred taxes should be repaid at a single point in time, the equation can be simplified.[33]

$$[3:11] \qquad PMB^{DT} = -\frac{\frac{DT_0}{TA^{(r)}} \cdot \left( \frac{1}{\left(1 + r_{d,at}\right)^p} - 1 \right)}{B^{(r)} / TA^{(r)}}$$

where

$p =$ the average length of time until the tax liabilities are expected to be paid

Table 3.4 illustrates the calculated bias related to the over-valuation tendency of deferred taxes using equation [3:11]. The relative size of the deferred tax liability and the length of time until expected payment are varied in the table. The solidity is set at 30%, and an after-tax cost of debt amounting to 7% (consistent with, for example, 30% tax rate and 10% cost of debt) is used.[34]

33 This simplification can be viewed as an approximation to identifying the weighted average time period left until repayment of the liability.

34 A higher discount rate would generate a larger bias and vice versa.

**Table 3.4 Relative measurement bias for different sizes of the deferred tax liability and different time lengths until payment. The reported solidity is set at 30% and 7% is used as the after-tax cost of debt.**

| Time | Deferred tax liability/Total assets (%) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag | 0% | 5% | 10% | 15% | 20% | 25% | 30% | 35% | 40% | 45% | 50% | 55% | 60% |
| 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.07 | 0.08 | 0.09 | 0.10 | 0.11 | 0.12 | 0.13 |
| 2 | 0.00 | 0.02 | 0.04 | 0.06 | 0.08 | 0.11 | 0.13 | 0.15 | 0.17 | 0.19 | 0.21 | 0.23 | 0.25 |
| 3 | 0.00 | 0.03 | 0.06 | 0.09 | 0.12 | 0.15 | 0.18 | 0.21 | 0.24 | 0.28 | 0.31 | 0.34 | 0.37 |
| 4 | 0.00 | 0.04 | 0.08 | 0.12 | 0.16 | 0.20 | 0.24 | 0.28 | 0.32 | 0.36 | 0.40 | 0.43 | 0.47 |
| 5 | 0.00 | 0.05 | 0.10 | 0.14 | 0.19 | 0.24 | 0.29 | 0.33 | 0.38 | 0.43 | 0.48 | 0.53 | 0.57 |
| 6 | 0.00 | 0.06 | 0.11 | 0.17 | 0.22 | 0.28 | 0.33 | 0.39 | 0.44 | 0.50 | 0.56 | 0.61 | 0.67 |
| 7 | 0.00 | 0.06 | 0.13 | 0.19 | 0.25 | 0.31 | 0.38 | 0.44 | 0.50 | 0.57 | 0.63 | 0.69 | 0.75 |
| 8 | 0.00 | 0.07 | 0.14 | 0.21 | 0.28 | 0.35 | 0.42 | 0.49 | 0.56 | 0.63 | 0.70 | 0.77 | 0.84 |
| 9 | 0.00 | 0.08 | 0.15 | 0.23 | 0.30 | 0.38 | 0.46 | 0.53 | 0.61 | 0.68 | 0.76 | 0.84 | 0.91 |
| 10 | 0.00 | 0.08 | 0.16 | 0.25 | 0.33 | 0.41 | 0.49 | 0.57 | 0.66 | 0.74 | 0.82 | 0.90 | 0.98 |
| ↓ | | | | | | | | | | | | | |
| ∞ | 0.00 | 0.17 | 0.33 | 0.50 | 0.67 | 0.83 | 1.00 | 1.17 | 1.33 | 1.50 | 1.67 | 1.83 | 2.00 |

It is evident from table 3.4 that only a large deferred tax liability with a fairly long life expectancy generates a measurement bias that exceeds 0.5. Note that a deferred tax, related to untaxed reserves, in excess of 20-30% of reported assets, is an unlikely state.[35] The deferred tax related to a large unrealized holding gain (as discussed in the previous sections), can, however, be potentially fairly large. If the time to realization, and thus the time to payment of the tax liability is expected to be long, the relative overvaluation of the liability may be significant. In the extreme case when the timelag to repayment approaches infinity, the liability approaches zero and the measurement bias equals *DT/B*.

35 If the solidity amounts to 30%, as assumed in the table, the maximum deferred tax (related to untaxed reserves) is equal to $\frac{30\%}{(1-\tau)}\cdot\tau$ which, with a tax rate amounting to e.g. 50%, gives a maximum *DT/A* = 30%.

### *3.1.1.4 The measurement bias as calculated by Fruhan*

Fruhan (1979) made calculations of book value of owners' equity adjusted for capitalized investments in advertising and R&D, and with assets revalued to estimated replacement costs. His sample included 72 US firms at the end of 1976. He deliberately selected firms that consistently, over a ten-year period, had generated a high *ROE* (exceeding the cost of equity capital). The selection procedure generated a sample of firms that were extreme performers and/or for which the conservative accounting procedure tended to understate the book value of equity (and thus overstate *ROE*). Fruhan acknowledged the difficulty regarding the assessment of a reasonable life expectancy and amortizing schedule for R&D and advertising expenditures. Referring to previous studies, he assumed that an advertising expenditure had an economic life of six years and that its amortization would follow the double declining balance method. He further assumed that R&D expenditures had a ten-year life and straight line depreciation. Some 50% of the firms in his sample had disclosed domestic inventory and net plant and equipment at replacement cost.[36] Extracting data from tables 1-9 and 1-11 in Fruhan (ibid.), the following table has been generated. The data have been summarized for five different industry sectors.[37]

36 Note that the replacement cost of land and foreign assets is not adjusted for.

37 Specification of firms in each industry sector:

| Pharmaceutical | Consumer Goods | Retail | Specialized Service | Manufacturing |
|---|---|---|---|---|
| American Home pr. | Avon Products | Caldor, Inc. | Dow Jones | Champion Spark Plug |
| Bristol-Myers | Chesebrough-Ponds | Dillon Cos. | Dun & Bradstreet | Eastman Kodak |
| Eli Lilly | Coca-cola | Eckerd (Jack) | Emery Air freight | Emerson Electric |
| Marion Labs | Dr. Pepper | Loehmann's | H&R Block | IBM |
| Merck | Gillette | Longs Drug Stores | Marsh & McLennan | Lubrizol |
| Robins, A.H. | Heublein | Lucky Stores | McDonalds | Nalco Chemical |
| Rorer-Amchen | Kellogg | Melville Corp. | Merchants, Inc. | National Chemsearch |
| Scherling-Plough | PepCom Industries | New Process Co. | Prentice-Hall, Inc. | Purolator |
| Searle, G.D. | PepsiCo Inc. | Rockower Bros. | Roadway Express | Square D |
| Smithkline Corp. | Procter & Gamble | Weis-Market | Rollins, Inc. | Thomas & Betts Corp. |
| Sterling Drug | Revlon | Winn-Dixie | Stone & Webster | Xerox |
| Tampax | Reynolds,R.J. | | Wackenhut | |
| | Russell Stover Candies | | Yellow Freight Syst. | |

**Table 3.5 Calculated accounting measurement bias for five subgroups of firms extracted from tables 1-9 and 1-11 in Fruhan (1979).**

| Industry sector | (1) Number of firms used in each estimate (2)/(3) | (2) Estimated advertising and R&D premium (average) | (3) Estimated replacement cost premium (average) | (4) Estimated total premium (average) | (5) Market-to-book premium (average) |
|---|---|---|---|---|---|
| Pharmaceutical | 12/9 | 0.28 | 0.25 | 0.57 | 1.93 |
| Consumer Goods | 13/8 | 0.16 | 0.30 | 0.46 | 1.94 |
| Retail | 11/2 | 0.04 | 0.18 | 0.21 | 1.38 |
| Specialized Service | 12/4 | 0.04 | 0.12 | 0.15 | 2.29 |
| Manufacturing | 11/8 | 0.11 | 0.39 | 0.51 | 1.77 |

The first column indicates how many firm observations the premium averages rely on. The replacement cost adjustment has only been performed on some of the firms. The second column includes the average estimated premium related to the capitalization of advertising and R&D expenditure. It has been calculated as the unweighted average of firm specific adjusted equity divided by reported equity minus one. The third column includes the average estimated premium related to replacement cost valuation. It has also been calculated as adjusted equity divided by reported equity minus one. The fourth column includes the average total premium, and the fifth column includes the average market-to-book value premium for the same firms calculated at the end of 1976.[38] It is calculated as the market value of equity at the end of December 1976 divided by reported equity minus one.

Next follows a discussion of these calculated biases in the light of the 'measurement bias tables' presented in the previous section. It should be kept in mind that the data are US, and cover a small group of well performing firms at a single point in time. The marginal tax rate was approximately

38 Studying the last column of table 3.5, one may note that Fruhan's adjustment procedure explains between 7% to 30% of the actual market-to-book value premium. This means that expected positive abnormal earnings are expected to explain the remaining 93% to 70%. This may well be reasonable given that the best performing firms available were included in Fruhan's study. The utilized measurement bias estimation scheme may, however, also have been too conservative.

50% at this time[39] and the average annual inflation rate[40] had been 7.2% and 5.9% during the five and ten years respectively, preceding 1976.

## Estimated measurement biases related to intangibles—to be compared with table 3.3

- The R&D intensive group of pharmaceuticals had on average a bias of 0.28 caused by the capitalization of R&D and advertising expenditure. A similar measurement bias is consistent with, for example, a four-year investment-to-harvest timelag and annual R&D expenditures amounting to 5% in relation to total assets (given the solidity and tax assumptions of table 3.3).

- The brandname-intensive firms[41] in the consumer goods sector had an average measurement bias caused by the capitalization of intangible assets of 0.16. In terms of table 3.3, this measurement bias is equivalent to annual expenditures of 5% relative to the asset base of the firm and to slightly more than a two-year investment-to-harvest timelag.

- The manufacturing sector included 'high-tech' firms such as IBM, Xerox and Eastman Kodak, which can be expected to have 'invested' heavily in both R&D and marketing. The average estimated bias was still as low as 0.11 for this group. The relative bias effect of intangibles has presumably been reduced by the fact that these firms also held a large share of tangible assets. The relative measurement bias may have been reduced further by a particularly high solidity in this group of firms.

- With regard to the other sectors, the R&D and advertising capitalization scheme identified very small measurement biases. Note that Fruhan's adjustment scheme did not identify biases due to expenses for personnel training activities. Capitalization of such expenses would probably have the most important effect on the measurement bias of the firms in the specialized service sector.

39 Fruhan (1979)
40 See Consumer Price Index, Exhibit 17 in Ibbotson and Sinquefield (1989).
41 This group includes firms such as Coca-Cola, PepsiCo, Kellogg and Procter & Gamble.

**Estimated measurement biases caused by replacement cost valuation of inventory and plant and equipment—to be compared with tables 3.1 and 3.2**

- The estimated measurement bias caused by replacement cost valuation varied between 0.12 and 0.39. The highest average bias was shown for the firms classified as manufacturing firms. This is not surprising as these firms can be expected to have held a significant share of their assets as plant and equipment and have held a large inventory (possibly valued according to the LIFO method). The service sector had the smallest identified replacement cost bias. This is also in line with expectations as firms in this sector generally hold no inventory and often need a very small base of M&E.

- Fruhan's sample of firms did not include any firms with tangible assets with very long economic life (e.g. real estate firms). Such a group of firms would have been expected to have a large premium arising from the replacement cost adjustment.

### 3.1.2 Expected growth persistence factor (*GPF*)

One of the slope coefficients in several of the proposed regression specifications in Chapter 2 is assumed to be a function of the expected ability of a firm to persistently generate abnormal performance. Such ability is expected to differ among different types of firms. The level of the *GPF* is mainly expected to be a function of the firm's growth potential and the degree of industry competitiveness. A thorough analysis of the competitive characteristics of an industry, and their implications for an individual company's growth potential and expected success in defending competitive advantages, is obviously a major undertaking.[42] In order to control for the most extreme cases of heterogeneity in this respect, a simple classification scheme will, however, have to suffice in this study. The scheme used is based on published accounting data and the presumption that high *GPF* firms should be characterized by having experienced strong growth and a stable positive residual return.

### 3.1.3 Expected validity of historical *ROE*

Market-based accounting research has commonly relied on recently published earnings (or *ROE*) as the base for expected performance for future periods. The validity of relying on such a simple prediction procedure, however, is expected to be different for different types of business activities. The validity of short-term historical *ROE* performance as an indicator of future performance is expected to be particularly poor if the firm's business is characterized either by a long production cycle (several years) with revenue recognition at completion, or the realization of holding gains being the main source of profit generation.[43] The first is typical of the building and construction industry, and the latter is typical of real estate and investment companies. The expected short-term *ROE* validity problem stems from the fact that the recognition of profits in these industries tends to be particularly non-continuous and the timing can be particularly affected by management discretion.

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42 Such an analysis is presumably important for an investor considering which shares to buy on the stock market.

43 High and/or fluctuating inflation rates are expected to magnify these problems.

### 3.1.4 Summarized description of firm characteristics

Table 3.6 provides a summary of different aspects related to the three firm characteristics discussed in this chapter. The first column contains the three firm characteristics with further subgroups. The second column indicates the main factors that are thought to signify the importance and size of the characteristic. The third column gives examples of typical industries that are prone to be extreme in each dimension. The fourth column indicates how a firm characteristic can be identified and/or quantified. The final column provides examples of how a certain firm characteristic is expected to influence the regression coefficients in the proposed regression specifications of Chapter 2.

For a group of firms with a small expected persistent measurement bias, with similar general business conditions and with a current *ROE* that is informative, the simple valuation regression model M.1 can be expected, if ever, to perform well. A weaker and more unstable regression result can be expected, with a more heterogeneous sample of firms (in these dimensions). Given a reasonable quantification of the *PMB* and given that current *ROE* is informative, the valuation regression model M.2 is expected to perform better than M.1 with a heterogeneous sample of firms. In the value change regression specifications, M.3 and M.4, a sample including firms with large expected permanent measurement biases is expected to generate a slope coefficient, related to change in equity ( $\hat{c}_1$ ), that exceeds one.

**Table 3.6 Summary table of identified firm characteristics, the main factors signifying the characteristic, typical firms, some identification and quantification issues, and examples of expected effects on model coefficients.**

| Characteristic | Main Factors of Influence | Typical firms | How identify? How quantify? | Affected model coefficient |
|---|---|---|---|---|
| 1. Persistent measurement bias | | | | $PMB \neq 0$ |
| • Intangible assets | | | | |
| R&D | • Relative importance<br>• Timelag from cash out to cash in<br>• Growth | Pharmaceutical<br>High-tech | Capitalized R&D expenses | $PMB > 0$<br>$\hat{\alpha} > 0$ in M.1<br>$\hat{c}_1 > 1$ in M.3-4 |
| Marketing intensive (brandname) | | Consumer products | Capitalized advertising expenses | |
| Structure/personnel | | Consulting | Capitalized personnel training expenses | |
| • Assets with long economic life | • Relative importance<br>• Age of assets<br>• Relevance of depreciation pattern<br>• Growth<br>• Inflation rate | Real estate<br>Investment firms<br>Power plant<br>Paper mill<br>Shipping | Estimate current cost | |
| • Deferred taxes | • Relative importance<br>• Time to payment<br>• Cost of debt | | Estimate current liability | |
| 2. Firm experiencing abnormal growth and/or abnormal return persistence | • Industry growth<br>• Barriers to entry<br>• Substitutes<br>• Price elasticity | | Growth > x & $ROE > \rho$<br><br>$ROE_t$ is extreme | $G$, $\lambda$, & $T$ ($GPF$)<br>$\hat{\beta}_1$ & $\hat{c}_2$ are extreme or unstable |
| 3. Current *ROE* is likely to be a poor indicator of performance | | | | $E[RR] = ?$ |
| • Short-term *ROE* is easily 'manipulated' by management | • Revenue recognition criteria<br>• Realization of holding gains | Construction company<br>Holding activity | Industry sector | $\hat{\beta}_1$ & $\hat{c}_2$ are unstable<br>$R^2$ is low |

## 3.2 Changes in the economic climate

Some regressions in this study will be run repeatedly using yearly data for more than 25 different years. Other regressions will be run for windows as wide as up to ten years. It is obvious that the association between accounting information and the level or change in stock prices over such long periods of time may be influenced by a large array of changes in the economic climate, and changes in the institutional environment. Changes in the economic climate, in a broad sense, include issues such as general economic growth, inflation rates, foreign exchange rates, as well as issues such as trade agreements with other countries, company and accounting laws, and tax regulations. A continuously increasing number of actors on the stock market, for example, analysts, intermediaries, institutional and foreign investors constitutes another type of change over time. It is beyond the scope of this study to analyze the effects of all these factors on the actual regression results.

Two particular issues relating to the economic climate, however, are considered both possible and interesting to control for. These two issues are the level and the pattern of the inflation rate, and the observable fluctuations in the business cycle. The accounting description of a firm's value and value creation given an accounting regime based on historical cost valuation is affected by the level of the inflation rate over many years. To what extent the description is affected depends largely on the kind of assets the particular firm owns. Johansson and Östman (1995, p. 143) give examples of industry sectors that can be expected to be more or less affected by high and/or changing inflation rates. The most affected industry sectors are those in which firms hold a large number of assets with long economic life. If firms of this type also have an unstable age structure of plant and equipment, and the rate of inflation is high and fluctuating, the usefulness of the accounting descriptions as indicators of firm performance is expected to be very limited. To empirically test this proposition, the regression specifications will be run separately for different firm types at different points in time (or for different time periods). Time periods will be chosen considering the actual inflation rate pattern.

If investors tend to have different expectations (e.g. optimistic versus pessimistic expectations) about the future performance of firms at different stages in the business cycle, this factor could generate unstable regression coefficients in the level regressions, and should preferably be controlled for in the long window regressions of M.3 to M.5.

## 3.3 Accounting changes

Both the firm characteristics and the changes in the economical climate discussed above relate to accounting issues. The focus is on the expected ability, or lack of ability, of the accounting convention to capture value and value creation for different types of firms under different environmental conditions. These issues are related to the inherent difficulty for the outcome of an accounting procedure to explain value and value creation. Alongside these issues, changes in the accounting practice can be observed. The changing accounting practice may be seen as a response to a large array of factors. One such factor is a general trend towards international harmonization. The information demand of an increasing number of professional investors is another obvious force. Other examples of factors that may trigger changes in the accounting regime are the emergence of, new types of business activities, new financial instruments, new taxation regulations, higher inflation rate levels, and fluctuating exchange rates.

In this study, the association between certain accounting numbers and the stock market price, or the price change, will be assessed. The two key accounting variables are the book value of owners' equity and accounting earnings. These measures are further combined, generating return on equity and growth in equity. *ROE* will also be compared to an estimated cost of equity generating residual return estimates.

It is obvious from valuation equation [2:16] that value (*V*) is a positive function of both book value of equity (*B*) and expected return on equity (*ROE*).[44] As a simple guide to understanding (and classify) the effects of different measurement issues in terms of the chosen valuation model, consider figure 3.2.

44 In [2:32] *V* is also a positive function of a permanent measurement bias (*PMB*).

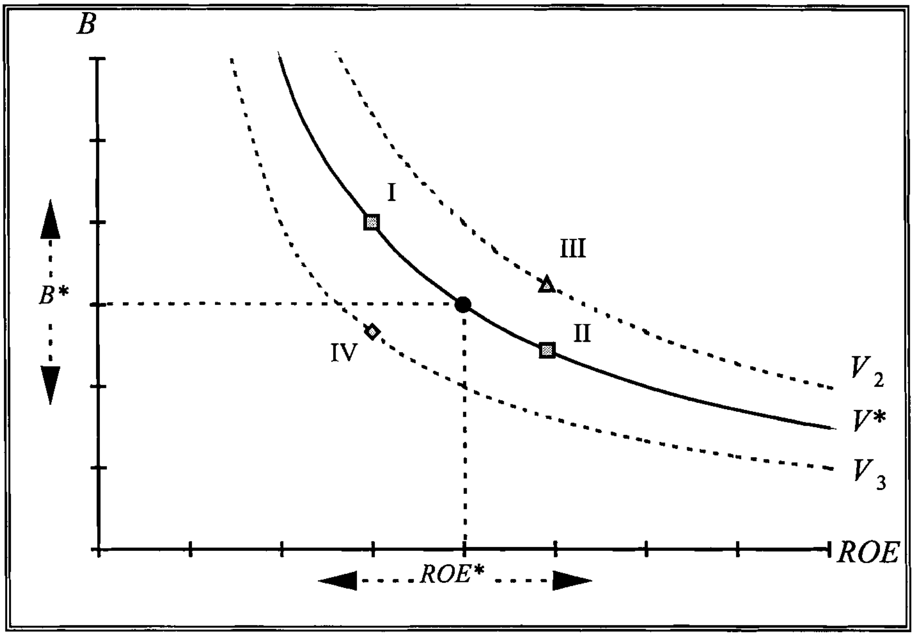


***Figure 3.2*** ***A simple illustration of the trade-off between book value of equity and ROE that generate economic value.***

Assume that given *B** and *ROE**, the value of a firm is *V**. Consider next an alternative accounting convention generating different levels of *B* and *ROE*. Two main situations emerge:

I Higher book value of equity, lower *ROE* and *V** is unchanged.
II Lower book value of equity, higher *ROE* and *V** is unchanged.

Most accounting measurement choices should be possible to classify in one of the two 'trade-off' categories (I & II), where, for example, an increased book value only comes at the expense of a lower *ROE*, and vice versa. For instance, a more conservative accounting convention will be expected to generate lower book value of equity in combination with higher expected *ROE*. Given comprehensive accounting, the two conventions will eventually have accounted for the same value creation and should thus also be valued similarly.[45] The management of many companies and the financial press,

45 This does not include effects related to the post-contracting role of accounting, such as taxation etc..

however, often seem to be very concerned about different accounting principles' effects on key financial ratios. Accounting for acquired goodwill, and its effect on earnings per share, return on equity and solidity is a typical example.

In the short-term (for one or a few years), a certain accounting measurement principle may simultaneously lead to both higher (or lower) book value of equity and *ROE*. Situations III and IV should still not occur—economic value ($V^*$) should remain unchanged, and provided that the market is efficient, the market price should also remain the same. However, it is naturally quite difficult in all situations to disentangle the effects of a chosen accounting method for the current year and for a long series of coming years. Given such problems, situations III or IV may at least for a 'shortsighted' observer seem to be the 'real' situation.

### 3.3.1 Accounting changes in Sweden 1965 - 1995

Accounting changes can be classified as being related to either disclosure of new information or changes of measurement principles.

Accounting changes can be manifested in new regulations (laws), new recommendations and a new practice. Table 3.7a is based on (and indicates the approximate date of) the initial formal issue of a new recommendation (regulation) regarding accounting disclosure issues during the period 1965 - 1995. Table 3.7b provides a similar overview of changing accounting methods.

**Table 3.7a A summary of event dates since the mid 1960s of when a new type of accounting disclosure first was formally recommended by a standard setting body or formally required by a new law.**
**Sources: FAR (1965 to 1995) and NBK's published recommendations.**

| More Information | 1965 | 1970 | 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|---|
| # Consolidated statements | | outline FAR 71 | ABL (75) | | | |
| # Open disclosure of inventory reserve | FAR # 2-66 | | ABL (75) | | | |
| # Open disclosure of depreciation according to plan | NBK (68) FAR # 1-69 | | | draft FAR 81, FAR # 3-83 | | |
| # Current cost accounting | | | | outline FAR 80 | | |
| # Interim reports | NBK (68) | | ABL (75) | | | |
| # Disclosure of effects due to changed accounting principles | | | ABL (75) | | | RR # 5-94 |
| # Disclosure of R&D expenses | | | | | BFN R 1-88 | |

**Abbreviation list**

| | |
|---|---|
| ABL | Companies Act (law) |
| BFL | Accounting Act (law) |
| FAR | Swedish Institute of Authorized Public Accountants (recommending body) |
| BFN | Accounting Board (recommending body) |
| RR | The Swedish Financial Accounting Standards Council (recommending body) |
| NBK | Industry and Commerce Stock Exchange Committee |

**Table 3.7b A summary of event dates since the mid 1960s of when a new type of accounting method first was formally recommended by a standard setting body or formally required by a new law. Sources: FAR (1965 to 1995) and NBK's published recommendations.**

| New Accounting Method | 1970 | 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|
| # Consolidation method | | | | | |
| - Par value method (≈Pooling method) | | | | | |
| - Purchase method | outline FAR 71 | draft FAR 76 | FAR # 11-78 | | RR # 1-91 |
| # Accounting for goodwill | | | | | |
| - Depreciation (maximum life) | outline FAR 71 | draft FAR 76 | FAR # 11-78 | | RR # 1-91 |
| - Write-off against equity | | | | triggered by Balans (Dec. 87) | |
| # Extraordinary items | | BFL (75) | out. FAR 83 | draft FAR 86 | FAR #13-88 RR # 4-93 |
| # Accounting for associated companies | | | | | |
| - Cost method | | | | | |
| - Information about retained share in profit | | | outline FAR 80 | | |
| - Equity method | | found not compatible with BFL (75) | | outline FAR 87 | |
| # Leasing | | | | | |
| - Delayed holding gain realization of a sale & lease back transaction | | | draft FAR 81 | | |
| - Substance over form accounting of a sale & lease back transaction | | | statement #12 FARs Accounting Committee (86) | | |
| - Capitalization of financial leases | | | | | RR # 6-95 |
| # Accounting for pension cost and liability | FAR # 4-66 | | FAR # 4-82 | | draft RR 95 |
| # Receivables and liabilities in foreign currency | | | | | |
| - Closing day currency rate | | | | | BFN # 7-90 |
| # Translation of foreign subsidiaries | | | | | |
| - Monetary/non-monetary method (temporal method) | | | draft FAR 76 | | if integrated |
| - All current method | | | | outline FAR (85) | if independent |

It is important to note that accounting practice in many cases tends to precede formal regulation. As an instructive example, Hanner (1980) discusses the effect of the Companies Act (ABL 1975) and the Accounting Act (BFL 1976):

> *"..... introduced many changes regarding the annual report. New requirements included: complete and public consolidated statements, for larger companies open disclosure of hidden reserves related to inventory valuation, cash-flow statements and interim reports. These new legal requirements, however, merely reflected the development that had already taken place in practice during the 10 - 20 years preceding 1975."*
>
> Hanner (1980)[46]

The continuous development of accounting practice naturally means that at any point in time the actual accounting practice will be very different for innovative firms and the 'reluctantly adapting' firms.

Over the years, the annual reports have on the whole become more open, contain more information and are considered 'better'.[47] Examples of major improvements, as mentioned by Hanner, are i) the increased uniformity in the layout of balance sheets and income statements, ii) the open disclosure of previously hidden reserves, iii) the introduction of consolidated financial statements. These improvements of accounting information may be expected to facilitate more precise estimates of firm performance and thus possibly ensure a better statistical map between accounting performance measures and stock market prices.

Other events, however, have introduced new accounting complications. An increasing number of mergers and acquisitions at prices largely exceeding book values have occurred, especially in the latter half of the 1980s. Accounting for these 'excess values', when not associated with physical assets

46 Translated from Swedish.

47 For a detailed description of the development of Swedish accounting practice see:

| **Author** | **Period described** |
| --- | --- |
| Hanner (1953) | 1949-1951 |
| Hanner (1964) | 1951-1962 |
| Hanner (1980) | 1900-1980 |
| Survey of Accounting Practices 1980, 1984, and 1987 | 1978-1986 |
| Rundfelt (1987, 88, 90, 91, 92, 93, and 94) | 1984-1994 |

(goodwill), has taken many forms and has been very controversial in the accounting profession.

> *"Accounting for goodwill is probably perceived as an area that more than any other indicates that something is wrong with Swedish accounting practice. The differences in how different companies treat goodwill is obvious to everybody and as the amounts are often significant, comparing companies becomes complicated. Frequent changes in accounting principles also complicate comparisons for a specific company over time."*
>
> Rundfelt (1990, p. 54)[48]

A related complication is pointed out in the following observation:

> *"Another trend has its origin in the fact that the listed groups have broadened their operations and become more difficult to form a clear picture of as well as that they are continually restructuring themselves through the purchase and sale of subsidiaries. This results firstly in the consolidated statements often being extremely complicated and difficult to follow. Secondly that the opportunities of making inter-period comparisons of a group's earnings and financial position is in principle impossible as the entity being reported on is continuously changing."*
>
> Survey of Accounting Practices 1987 (p. 14)

Accounting for financial agreements such as leasing and sale-and-lease-back has further led to comparability and interpretation difficulties. Fluctuating exchange rates and the fact that many firms own foreign subsidiaries generate measurement problems in the consolidated accounts.

The diversity in accounting measurement and disclosure practice between firms and over time illustrated by the previous discussion adds complexity to the empirical evaluation of the association between accounting information and stock prices. Awareness of this complexity should be a minimum requirement when such associations are analyzed. Attempting to grasp the effects of all the accounting changes seems, however, to be an unrealistic ambition. To explicitly test/evaluate the effect of a few selected accounting changes (issues) will hopefully shed some light on the general issue of the

48 Translated from Swedish.

effect of accounting changes and the association between accounting information and stock prices. A brief discussion of the potential candidates for such tests is offered below.

#### *3.3.1.1 Mandatory consolidated statements*

The information value of consolidated statements (complementing the parent company statements) is an interesting topic.[49] Requirements for disclosing consolidated statements were not in place until the Company Act (ABL) of 1975 came into force in January 1977. However, almost all listed companies on the Stockholm Stock Exchange had voluntarily provided such information much earlier. Having chosen to use data from the database compiled by Findata and thus to restrict the time period to the years after 1966 generates very few observations where consolidated statements are not provided. Since the present study's focus is on change in accounting information, it is not particularly relevant to evaluate this matter.[50]

#### *3.3.1.2 Open disclosure of inventory reserves and depreciation according to plan*

It is obvious that the use of large hidden reserves means that the 'informativeness' in the measurement of earnings, equity and thus return on equity is obscured. That the issue, nevertheless, was controversial is evident from the following comments from 1965, concerning the usefulness, and potential damage, of open disclosure of hidden reserves.

> *"The reserves that are created for the above mentioned reasons are primarily meant to prevent that too high or even fictitious earnings are presented, giving rise to large payments of taxes and dividends, and thus endangering the survival of the company"*
>
> *"Shareholders do not always understand what is beneficial and necessary from the company's point of view, they sometimes have a short-sighted speculative interest in withdrawing as large a dividend as possible, or in an increasing stock price."*

---

49 See analysis in Engshagen (1987).

50 However, this appears to now be a more relevant issue with regard to, e.g. Japanese accounting.

*"On the other hand, it is obvious that the hidden reserves create ambiguity around the financial statement."*

Sillén and Västhagen (1965)[51]

Open disclosure of inventory reserves (and its annual change) was formally required from January 1 1977, when the Company Act of 1975 came into force; it was, however, recommended as good accounting practice in FAR No. 2 from 1966. During the years available in Findata's database, practically all firms provide full disclosure of inventory reserves.

Disclosing depreciation (and gross value) according to plan for depreciable assets, supplementing the depreciation and value that is allowed for tax purposes, has never been formally required by law. Such disclosure was, however, first recommended by NBK in 1968, followed by a 'weak' recommendation in FAR No. 1 issued in 1969, which was later given a more prominent status in 1981, in the draft of FAR's No. 3 concerning accounting for material assets, (it received the status of a recommendation in 1983). Swedish listed companies have gradually adapted to open depreciation disclosure during the years between 1966 and the early 1980s. The question, then, is whether this change in accounting practice has also had an effect on the statistical association between accounting data and stock prices?

Consider the following analysis of the difference in the size of equity and return on equity when the only difference relates to whether or not accumulated depreciation in excess of plan (and its annual change) is disclosed. *ROE* is calculated using opening period equity. Given open disclosure, deferred tax is calculated according to what is called the comprehensive tax method.

**Notation**

$ROE^{H}$ = Return on equity with hidden disclosure of depreciation in excess of plan

$ROE^{O}$ = Return on equity with open disclosure of depreciation in excess of plan

51 Translated from Swedish.

| | | |
|---|---|---|
| $B^{H}$ | = | Book value of equity with hidden disclosure of depreciation in excess of plan |
| $B^{O}$ | = | Book value of equity with open disclosure of depreciation in excess of plan |
| $HR$ | = | Hidden reserve in accumulated depreciation in excess of plan before deduction of deferred tax |
| $\Delta HR$ | = | Change in hidden reserve |
| $\tau$ | = | The tax rate |

The relationship between book value of equity given open versus hidden disclosure of depreciation in excess of plan can thus be described as:

[3:12] $$B_t^O = B_t^H + HR_t \cdot (1-\tau)$$

If a hidden reserve exists,[52] it is obvious that the accounting convention that does not disclose its actual level will underestimate the 'true' level of a firm's equity. Similarly, the relationship between the *ROEs* calculated with open and hidden disclosure can be described as follows:[53]

[3:13] $$ROE_t^O = ROE_t^H \cdot \underbrace{\frac{B_{t-1}^H}{B_{t-1}^O}}_{i} + \underbrace{\frac{\Delta HR / B_{t-1}^H}{HR_{t-1} / B_{t-1}^H} \cdot \left(1 - \frac{B_{t-1}^H}{B_{t-1}^O}\right)}_{ii}$$

The first part shows the *ROE*-effect related to the existence of an opening period hidden reserve, the second part shows the *ROE*-effect related to the

52 This means that depreciation has been 'too large' in some previous year, and that this over-depreciation has not yet been reversed.

53 The relationship between earnings ($X$) with open and hidden disclosure of depreciation can be described as follows:

$X^O = X^H + \Delta HR \cdot (1-\tau)$. As $ROE_t^O = \frac{X_t^O}{B_{t-1}^O}$ the following relation must also hold:

$ROE_t^O = \frac{X_t^H + \Delta HR_t \cdot (1-\tau)}{B_{t-1}^H + HR_{t-1} \cdot (1-\tau)}$. This expression can be rearranged to equation [3:13].

current period's change in the hidden reserve. Whereas the first effect cannot be positive, the second effect can show all signs depending on whether the actual period is characterized by an increase in excess depreciation or vice versa. Three special cases can be summarized in the following way:

$$[3:14] \qquad ROE_t^O \overset{<}{\underset{>}{=}} ROE_t^H \text{ if } \frac{\Delta HR_t}{HR_{t-1}} \overset{<}{\underset{>}{=}} ROE_t^H$$

In terms of figure 3.2, the lack of disclosure of excess depreciation means that book value of equity is likely to be underestimated (although it is difficult to know by how much), and the disclosed *ROE* level may either be too 'low' or too 'high'. A bad year may well be hidden by a large reversal of previous years' excess depreciation and vice versa. This ambiguity, both related to the book value of equity and *ROE*, could possibly make it more difficult for investors to evaluate the value and value creation of a firm. Note that these contentions are based on an idea of a relative usefulness of accounting data to assess future performance. Valuation model [2:32] is by definition essentially immune towards these different accounting choices.[54] Given comprehensive accounting, the same economical events can be described differently, but the same value creation will nevertheless eventually be accounted for. In an *ex ante* situation, less informative accounting data may, however, make it more difficult to forecast future performance based on historical performance.

To run the value level and the value change regression specifications on two separate sub-samples of firms (grouped according to whether or not excess depreciation is openly disclosed) can thus shed light on this particular information issue.

54 Note, for example, that equation [3:13] is consistent with the relationship established in chapter 2, between unbiased accounting *ROE* and the measurement bias of accounting:

$$ROE^{(u)} = \rho + \left(\frac{B^{(u)}}{B^{(b)}} - 1\right) \cdot (\rho - g)$$

#### *3.3.1.3 Consolidation method and accounting for goodwill*

A consolidation method similar to the pooling method was dominant among Swedish firms in the late 1960s.[55] After a gradual conversion to the purchase method it eventually became completely dominant. The purchase method was initially recommended in a draft from FAR 1971 and achieved formal status as a recommendation in FAR No. 11 from 1978.

Goodwill appears as an accounting item when the purchase method is used, and an 'excess value' has been paid for a company's assets. If this excess value is not fully related to any of the firm's physical assets, *goodwill* has been acquired. According to FAR No. 11, depreciation of such acquired goodwill should be completed over a maximum period of 10 years. Triggered by a statement from the Accounting Committee[56] in December 1987 concerning the future changes of FARs recommendation No. 11, a number of firms chose to write-off goodwill directly against equity. The old pooling (par) method was, roughly speaking, similar to the purchase method with a direct write-off of goodwill that was equal to the full 'excess value'. One could thus state that this 'behavior' was a return to an 'old' accounting method. However, this was not the only new method chosen at this time. Several firms chose to go the other way, that is, to extend the depreciation period to (up to) 40 years. The diversity in accounting for goodwill was thus quite significant (particularly during the period 1987-1990). This matter was very controversial in the accounting profession, and was at least temporarily settled when the Swedish Financial Standards Council (RR) published its first recommendation No. 1 1991, on consolidation issues.

Compare the effects of a direct write-off of goodwill against equity with capitalized goodwill, with depreciation over a series of years, in terms of figure 3.2. The effects of changing from capitalized goodwill with annual depreciation to a complete write-off are i) the book value of equity is going to be reduced, and ii) the net income will be increased in all future periods when the remaining goodwill is not written off, all other things being equal.

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55 The method has been called 'parivärdemetoden' in Swedish. The expression 'par method' is sometimes used as an English translation, but as this expression does not seem to be commonly used, the method will be referred to as the pooling method as the methods are identical with regard to the valuation of assets and liabilities.

56 The Accounting Committee is the group of people that in FAR's name (the Swedish Institute of Authorized Public Accountants) puts forward accounting recommendations.

Thus the positive effect on future *ROE* has two sources: as no depreciation is deducted the numerator will increase, and simultaneously the denominator will decrease by the reduction of equity. At the future date when all goodwill has been fully depreciated, the book value of equity and *ROE* will coincide again. This is thus clearly a trade-off situation in terms of figure 3.2.

An empirical evaluation can reveal if any of the consolidation methods generate more value relevant descriptions. Regressions will be run on separate sub-samples; first firms are divided into different groups depending on whether or not a large acquisition has occurred, and subsequently the acquisition group of firms are classified according to their chosen method for goodwill treatment.

#### *3.3.1.4 Accounting for associated companies*

An associated company is normally defined as a company in which a firm holds a significant part of the shares (often quantified as more than 20 percent of the shares, capital or votes), but not a large enough share to make the firm a subsidiary. The internationally fairly widespread equity method was found to be inconsistent with the Swedish Accounting Act (BFL), in FAR's draft recommendation published in 1980. In a revised draft from 1987, FAR 'gave permission' to groups with particularly international constituencies to use the equity method. The cost method was, however, still recommended as the main method combined with rather extensive footnote information. In practice, the equity method has been used by several firms since the early 1970s, and gradually became the dominant method during the mid 1980s. In terms of *ROE* and book value of equity, the change to the equity method has some interesting implications. Book value of equity will increase in proportion to the increasing equity in the associated company, and the annual income will also increase provided that the income share exceeds dividends paid. Especially in the early years after an acquisition of an associated company when the acquisition cost of the firm is still quite close to the equity share, but when the income share in excess of dividends paid may well be significant, the choice of equity method rather than the cost method can lead to both higher book value of equity and higher *ROE* simultaneously. This fact may also be one reason for the method's increased popularity among firms.

Running both the level and the change regression specifications on two separate sub-samples of firms (grouped according to the choice of accounting for associated companies) will shed some light on whether this accounting choice affects the observable statistical association between accounting information and stock prices.

# Part II

## SAMPLE SELECTION, MEASUREMENT AND ESTIMATION OF MODEL PARAMETERS

# 4 SAMPLE SELECTION AND MEASUREMENT OF BASIC MODEL PARAMETERS

## 4.1 Sample selection

Performing statistical studies using Swedish stock price data is in a sense somewhat restrictive. The number of quoted firms has been comparatively few. The total population includes all Swedish firms that have ever been traded on the Stockholm Stock Exchange, including the A, OTC and the O listed firms (approximately 500 firms in total). The following criteria will be used to generate data for the empirical tests.

i) Accounting and stock price information must be available in the database as compiled by Findata. This means that banks and insurance companies are excluded and the time period is restricted to the years after 1966. Furthermore, the database is not complete until 1970—only the 40 largest firms are included from 1966.

ii) The firm must be listed for a period of at least four years. Several firm classification dimensions need information for a minimum of three years. One period is always lost when calculating ratios on opening period data. This criterion generated a total loss of 126 firms—83 de-listed firms and 43 recently listed firms.

iii) The firm must have an accounting period coinciding with the calendar year. This criterion is essentially chosen for computational convenience. Firms that have changed to calendar year accounting are included provided that they have a minimum of four listed years thereafter. These criteria generated a total loss of 34 and 15 firms respectively.

iv) The firm must provide accounting information in accordance with Swedish GAAP. Nine listed firms of foreign origin (mainly Norwegian and Finnish) were lost.

Screening the database with these criteria generated a total sample of 272 firms, 139 of which were de-listed by the end of 1993. The average firm has been listed for twelve years; 52 firms have been listed for 20 years or more. The second criterion might generate a sample of firms with an above normal ability to survive. Note, however, that more than 50% of the remaining firms in the sample have been de-listed for various reasons. The loss of firms due to the calendar year criterion, generated unfortunately a large loss of trading and retail companies—9 of 23 firms were lost.

The firms have been classified into different industries according to a slightly reduced version of Affärsvärlden's extended industry classification.[1] Affärsvärlden's industry categories were reduced to 15 separate industries (see appendix D). Firms that have not been listed after the extended industry classification was first introduced, have been classified with the help of Affärsvärlden's earlier (more crude) industry classification and firm specific industry information found in Affärsvärlden's yearbooks and in Öhman Stock Exchange Guides. The difficulty in classifying individual firms into one of the rather broad industry categories generated a final loss of 20 firms.

Table 4.1 summarizes the number of quoted firms in each industry at the end of December 1970, 1980 and 1990 for the remaining part of the population. The total number of firms for these particular years was 53, 100 and 166, respectively. The last row in the table provides the total number of different firms irrespective of year. The last column shows that a total of 252 firms (of which 52 firms were OTC- or O-listed) have remained in the final sample. The number of firms in some of the industries has obviously been very limited in general, and in the early periods some industries even lacked representation.

1 Published in Affärsvärlden, a Swedish business weekly, since the fall of 1993.

**Table 4.1** **Number of quoted firms at the end of December 1970, 1980 and 1990 in Findata's database categorized according to a reduced version of Affärsvärlden's industry codes. An OTC list was first created in Sweden in late 1982. The number of listed firms on the A list, the OTC and the O list respectively, are presented separately for 1990 (A-listed/OTC- and O-listed). The bottom row in the table shows the number of different firms in each industry irrespective of year.**

| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | | | | | | | | | | | | | | | | |
| 1970 | 24 | 10 | 7 | 2 | 1 | 2 | 7 | - | - | 2 | - | 13 | 2 | 3 | 6 | 53 |
| 1980 | 23 | 9 | 7 | 3 | 1 | 2 | 8 | 2 | 1 | 3 | 1 | 20 | 4 | 8 | 8 | 100 |
| 1990 | 20/7 | 5/- | 3/- | 9/5 | 2/1 | 2/- | 16/8 | 6/4 | 10/6 | 3/1 | 5/2 | 17/3 | 7/- | 14/3 | 7/- | 126/40 |
| 1966-93 | 38/10 | 12/- | 8/1 | 11/5 | 2/1 | 4/- | 26/11 | 7/5 | 11/10 | 4/1 | 6/2 | 30/3 | 10/- | 23/3 | 8/- | 200/52 |

**Industry codes**

1 Engineering
2 Pulp and paper
3 Chemical industry
4 Building and construction
5 Consumer goods
6 Pharmaceutical industry
7 Other production
8 Trading and retail
9 Consultants and computer
10 Capital-intensive service
11 Other service
12 Conglomerates and mixed investment
13 Shipping
14 Real estate
15 Investment companies (pure)

Appendix E contains a description of an additional procedure that was performed in order to check that the individual firm had not been incorrectly classified. This procedure led to the reclassification of a few firms that obviously had changed main business activity over the years, and it led to the introduction of an additional industry category—building, construction and real estate—containing the firms that could neither be classified as pure building and construction firms nor real estate firms.[2]

The final sample contains, in terms of firm-years, at least 75% of the total (1966 to 1993) population of firm-years.[3] The absence of banks and the loss of nine trading and retail companies means a slight under-representation of firms with a particularly low expected accounting measurement bias (*PMB*). The limited number of observations in some industries, obviously, makes statistical inferences related to that particular industry difficult. The industry classifications, however, are mainly meant to guide the separation of firms into different sub-groups related to expected *PMB*s and expected validity of historical *ROE* as a base for predictions. Also, the fact that the composition of firm types included in the sample varies somewhat over the years will to some extent make it difficult to produce unbiased comparisons of regression results for different time periods. This problem can probably be reduced, first of all, via the explicit inclusion of an estimated *PMB* in the regression specifications, but also via a careful choice of sub-sample compositions.

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2 Appendix F summarizes the final number of firms in each industry at the end of December each year. The most important reason for the fewer observations, as compared to the initial sample presented in table 4.1, can be traced to the calculation of data using opening period capital. This means that the earliest observation for each firm is lost.

3 It must be remembered that the largest loss of firms is related to the criterion requiring a minimum number of years on the stock exchange.

## 4.2 The measurement of current *ROE*, the estimation of required return and the prediction of future *ROE*

In order to run empirical tests of the regression specifications proposed in this study, a number of variables have to be specifically measured. This section will deal with three such issues, namely:

1. how to measure $ROE_{j,t}$ and shareholders' $\text{equity}_{j,t}$;
2. how to estimate $\rho_{j,t}$;
3. how to estimate $E_t[R\tilde{O}E_{j,t+1}]$.

### 4.2.1 Measurement of earnings, shareholders' equity and *ROE*

In this study, *ROE* for one period will be used as the base for the prediction of the level of *ROE* expected for the next period. The definition of *ROE* should thus be chosen to ensure that it is a ***reasonable*** indication of the firm's *current ability* to generate a profit. This naturally means that an earnings measure before extraordinary items is preferred (assuming that this is a transitory item).[4] Given this study's focus on the firm's value and value change on the stock market, it is obvious that an earnings measure excluding minority interest is preferred. It is also clear that an earnings measure after tax is desired, preferably with tax consequences arising from extraordinary items excluded. Two tax-related problems arise: one relates to disclosure practice, and the other to the treatment of the tax consequences associated with the changes in untaxed reserves (when openly disclosed). Appendix G contains a brief description of how Swedish practice concerning measurement of earnings and return on equity has changed over time.[5] The development is illustrated separately in terms of recommendations, practice in annual reports, practice in the financial press, and empirical accounting research practice.

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4 Given a longer term *measurement perspective,* it would be essential that *all* items were accounted for. This would lead to a preference for an earnings measure including extraordinary items. The change in book value of equity will, of course, be affected by all events, even if they are classified as extraordinary.

5 See also, Johansson (1984) for a discussion of the measurement of deferred taxes in financial ratios.

#### *4.2.1.1 Chosen definition of earnings*

In line with both research practice (Bertmar and Molin, 1977 and Skogsvik, 1988) and later recommendations by NBK (1983) and SFF (1985), earnings after financial items (before extraordinary items), excluding minority share of earnings, but including any earnings share of associated companies will be used. Tax expenses will be calculated according to the comprehensive tax method with yearly estimates of the tax rate. Note that especially until the mid 1970s, several firms did not openly disclose their annual and accumulated allocation to untaxed reserves. Tax consequences related to extraordinary items should ideally be controlled for. Given the typical lack of differentiated disclosure of this item and the lack of such disaggregation in Findata's database, an approximation is the best available alternative. The simplest approximation would be to multiply net extraordinary items by the tax rate and thus implicitly assume full taxation and full deductibility of all extraordinary items. However, given that the tax rate on many extraordinary gains has been relatively low and that several extraordinary costs have not been tax deductible, an approximation of this kind will overstate the tax consequences related to extraordinary items. A simple (although not perfect) way to reduce the magnitude of this error is to use only half the tax rate on net extraordinary items.

#### *4.2.1.2 Chosen definition of equity*

The choice of opening period ex-dividend equity is consistent with the specification of the valuation model being used in this study. Calculating equity as disclosed shareholders' equity (excluding minority equity) plus untaxed reserves minus a deferred tax liability (calculated at the estimated yearly tax rate)[6] is consistent with both the chosen earnings definition and with the NBK and SFF recommendations.

6 Since it has been possible in Sweden, to defer tax payment over substantial time periods, the use of the full tax rate will to some extent naturally overstate the deferred tax liability (and thus understate the value of equity). This matter will be addressed later when *PMB*s are to be calculated.

### *4.2.1.3 Operationalization of the chosen definitions*

The main definitions of earnings, equity and *ROE* can be summarized as follows:[7]

| *Earnings*$_t$ ($X_t$) | *Equity*$_{t-1}$ ($B_{t-1}$) |
|---|---|
| Earnings after financial items$_t$ | Disclosed shareholder's equity$_{t-1}$ |
| – (Allocation to untaxed reserves$_t$ · $\hat{\tau}_t$) | + Taxed reserves$_{t-1}$ |
| – Taxes payable$_t$ | + Untaxed reserves$_{t-1}$ (1 – $\hat{\tau}_t$) |
| + (Extraordinary items$_t$ · $\hat{\tau}_t$ · 0.5) | – Proposed dividend$_{t-1}$ |
| – Minority share of earnings after tax$_t$ | |

$$ROE_{j,t} = \frac{X_{j,t}}{B_{j,t\text{-}1}}$$

To test whether the regression results are likely to be affected by the chosen definition of *ROE*, the level and co-variability of three alternative specifications of *ROE* have been compared to the main specification for the entire sample of firms (the main *ROE* specification has been called $ROE^A$). To measure the effect of the rather arbitrarily chosen half tax rate on extraordinary items, an alternative *ROE* has been calculated assuming full taxation ($ROE^{A'}$). Furthermore, given the wide-spread use of earnings and *ROE* calculations according to the proxy-tax method (especially in the early periods), such an *ROE* alternative has also been calculated ($ROE^B$). Finally, an *ROE* specification after extraordinary items and comprehensive tax has been calculated ($ROE^C$). These alternative earnings measures can be summarized as follows:

7 Appendix H shows the principle layout of the income statement and balance sheet that these definitions are based on.

| $\text{Earnings}_t^{A'}$ $\left(X_t^{A'}\right)$ | $\text{Earnings}_t^{B}$ $\left(X_t^{B}\right)$ |
|---|---|
| Earnings after financial items$_t$<br>– (Allocation to untaxed reserves$_t$ · $\hat{\tau}_t$)<br>– Taxes payable$_t$<br>+ (Extraordinary items$_t$ · $\hat{\tau}_t$)<br>– Minority share of earnings after tax$_t$ | Earnings after financial items$_t$ · (1 – $\hat{\tau}_t$)<br>– Minority share of earnings after tax$_t$ |
| $\text{Earnings}_t^{C}$ $\left(X_t^{C}\right)$ | |
| Earnings after extraordinary items$_t$<br>– (Allocation to untaxed reserves$_t$ · $\hat{\tau}_t$)<br>– Taxes payable$_t$<br>– Minority share of earnings after tax$_t$ | |

The operationalization of these *ROE* definitions in terms of variables in Findata's database are presented, along with a discussion of some computing issues, in appendix I.

#### *4.2.1.4 Measurement of the annual tax rate*

Angelin and Jennergren (1994) provide a concise description of the development of the Swedish company tax rates:

> *"Until 1984, companies paid a municipal income tax finally averaging around 30% of taxable income. The previous year's municipal income tax was deductible from taxable income in computing the state tax in the following year. The state tax was 40% until 1983, 32% in 1984, and 52% between 1985 and 1988 (the increase in 1985 was intended to compensate for the elimination of the municipal income tax at the end of the previous year). Between 1989 and 1990, it was 40%. From 1991, it was 30%, as a result of the tax reform. Recently, it was changed to 28% (from 1994)."*
>
> Angelin and Jennergren (1994, p. 8)

In line with common practice,[8] the combined tax rate for the years preceding 1984 has been estimated as follows:

8 See e.g. Bertmar and Molin (1977).

[4:1] $$\hat{\tau}_t = \bar{\tau}_{m,t} + \tau_{s,t} \cdot \left(1 - \bar{\tau}_{m,t}\right)$$

where $\bar{\tau}_{m,t}$ denotes the average municipal tax rate for year $t$ and $\tau_{s,t}$ denotes the state tax rate for year $t$. The yearly estimated tax rates have thus been as follows:[9]

**Table 4.2 Estimated yearly tax rates from 1967 to 1993.**
**Source: for 1967 - 1968: Bertmar and Molin (1977)**
**for 1969 - 1993: Skogsvik (1994).**
**(Their calculations were equivalent to the presentation above.)**

| Year | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\hat{\tau}_t$ | .51 | .52 | .52 | .53 | .54 | .54 | .54 | .55 | .55 | .56 | .56 | .57 | .57 | .57 |
| Year | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | |
| $\hat{\tau}_t$ | .58 | .58 | .58 | .53 | .52 | .52 | .52 | .52 | .40 | .40 | .30 | .30 | .30 | |

### *4.2.1.5 Description of the data*

Table 4.3 and figure 4.1 provide annual return on equity statistics for the full sample of firms for the alternative earnings specifications. A number of observations can be made:

- the overall mean of the annual means of $ROE^{A} < ROE^{A'} < ROE^{C}$.

This shows that extraordinary items have on average been positive for the whole time period. On average, 2.6% of the net annual value creation has been classified as extraordinary ($ROE^{A}$ as compared to $ROE^{C}$). For the median firm, the difference has amounted to 1.2 %. Further, the sign of the difference between the *ROE* specifications has been very stable over the years, except for a dominance of extraordinary losses in 1991 and 1992. The average size of the difference has also been quite constant over time, with larger positive extraordinary items between 1982 and 1984 being the main exception.

9 These calculations disregard the existence of an additional type of taxation, the so-called 'profit sharing tax', which existed between 1984 and 1990. The marginal tax rate for the average firm during this period would have been approximately 5% higher.

- the overall mean of the annual means of $ROE^A > ROE^B$

The proxy tax *ROE* has, on average, been 1.8% lower than the *ROE* according to the comprehensive tax specification ($ROE^B$ as compared to $ROE^A$). This means that the calculated average comprehensive tax rate has been lower than the marginal tax rate. This can consistently be observed during the whole period, except again for the very poor years of 1991 and 1992.

- the overall mean of annual $std(ROE^B) < std(ROE^A) < std(ROE^C)$.

Perhaps not surprisingly, return specification C that measures earnings including extraordinary items ($ROE^C$) has been more variable than the return specifications measuring earnings before extraordinary items. The fact that the *ROE* specification measured after a proxy tax has been more stable (within each year except 1984) than the return specification that measures earnings after comprehensive tax, can probably (essentially) be explained by the differences in tax rate levels. Any extreme return level before tax is somewhat normalized by the higher proxy tax rate. The imperfect calculation of tax consequences on extraordinary items, according to the chosen specification, can further result in a variation 'spill-over' effect on the *ROE* measure.

The only difference between $ROE^A$ and $ROE^{A'}$ concerns the tax calculation related to extraordinary items. This difference generates a 1.0% difference in the overall average *ROE*.

**Table 4.3 The annual median, mean and standard deviation of four different specifications of *ROE* for a sample of 252 listed Swedish firms from 1967 to 1993. The number of firms each year is specified in the last column. For details regarding the *ROE* definitions, see Section 4.2.1.4.**

| | $ROE^A$ | | | $ROE^{A'}$ | | | $ROE^B$ | | | $ROE^C$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Median | **Mean** | Std | Median | **Mean** | Std | Median | **Mean** | Std | Median | **Mean** | Std | *n* |
| 1967 | 6.7 | **6.6** | 6.0 | 7.0 | **7.2** | 5.4 | 4.7 | **5.5** | 5.2 | 7.5 | **8.3** | 5.1 | 39 |
| 1968 | 8.8 | **9.5** | 7.4 | 8.9 | **10.4** | 7.5 | 6.6 | **7.3** | 6.3 | 10.7 | **12.1** | 10.4 | 39 |
| 1969 | 9.4 | **10.8** | 8.0 | 10.2 | **11.9** | 8.5 | 7.5 | **8.8** | 7.3 | 11.2 | **13.8** | 11.4 | 42 |
| 1970 | 9.0 | **8.9** | 5.6 | 9.1 | **9.4** | 5.4 | 7.5 | **7.8** | 4.7 | 9.5 | **10.4** | 6.3 | 43 |
| 1971 | 9.0 | **8.7** | 5.8 | 9.1 | **9.2** | 5.6 | 6.2 | **6.4** | 4.7 | 9.6 | **10.2** | 6.2 | 70 |
| 1972 | 9.3 | **9.9** | 7.7 | 10.0 | **10.7** | 8.2 | 6.8 | **7.1** | 5.8 | 10.8 | **12.1** | 10.3 | 72 |
| 1973 | 14.4 | **14.2** | 8.9 | 15.1 | **15.3** | 8.8 | 10.9 | **11.3** | 6.6 | 15.7 | **17.2** | 10.7 | 76 |
| 1974 | 17.5 | **17.9** | 12.2 | 17.8 | **19.2** | 11.8 | 13.5 | **15.7** | 10.7 | 18.4 | **21.3** | 13.3 | 79 |
| 1975 | 12.0 | **11.1** | 11.1 | 12.5 | **12.7** | 11.1 | 9.3 | **9.0** | 9.2 | 13.5 | **15.1** | 12.5 | 77 |
| 1976 | 10.5 | **10.1** | 13.7 | 11.4 | **10.9** | 13.8 | 7.5 | **7.2** | 9.3 | 11.6 | **12.2** | 14.8 | 83 |
| 1977 | 7.3 | **4.5** | 15.2 | 7.7 | **5.1** | 15.0 | 5.0 | **3.4** | 10.0 | 7.8 | **6.2** | 15.3 | 86 |
| 1978 | 8.1 | **4.7** | 16.9 | 8.4 | **5.0** | 17.6 | 4.6 | **3.4** | 11.2 | 8.8 | **5.4** | 20.0 | 88 |
| 1979 | 11.2 | **10.5** | 12.2 | 11.8 | **11.8** | 12.7 | 8.0 | **8.4** | 8.9 | 12.2 | **13.6** | 18.7 | 89 |
| 1980 | 11.3 | **11.3** | 14.1 | 11.6 | **12.7** | 11.2 | 9.2 | **9.1** | 10.0 | 12.4 | **14.8** | 11.1 | 91 |
| 1981 | 11.9 | **12.0** | 12.8 | 12.9 | **13.6** | 12.5 | 7.7 | **8.5** | 9.4 | 14.2 | **15.9** | 13.7 | 92 |
| 1982 | 11.3 | **11.9** | 18.5 | 11.9 | **14.4** | 22.3 | 7.8 | **8.7** | 12.3 | 13.1 | **18.0** | 30.7 | 95 |
| 1983 | 13.9 | **13.5** | 17.2 | 14.8 | **17.8** | 19.3 | 10.9 | **11.4** | 13.2 | 16.4 | **23.9** | 26.4 | 96 |
| 1984 | 16.9 | **18.0** | 22.4 | 18.1 | **19.9** | 22.2 | 13.4 | **16.1** | 23.6 | 19.6 | **23.2** | 25.2 | 152 |
| 1985 | 13.5 | **14.7** | 11.7 | 14.4 | **15.9** | 12.2 | 12.2 | **12.9** | 10.7 | 15.6 | **18.0** | 16.0 | 161 |
| 1986 | 14.5 | **15.8** | 23.2 | 15.0 | **16.9** | 22.9 | 12.6 | **14.3** | 21.6 | 16.6 | **19.0** | 23.8 | 164 |
| 1987 | 15.2 | **15.0** | 12.3 | 16.2 | **16.0** | 13.3 | 12.8 | **12.8** | 10.5 | 15.9 | **17.9** | 19.9 | 169 |
| 1988 | 17.2 | **18.9** | 29.2 | 18.0 | **20.0** | 28.1 | 13.7 | **15.4** | 18.9 | 19.0 | **22.1** | 28.3 | 168 |
| 1989 | 17.3 | **18.8** | 18.5 | 17.7 | **20.0** | 19.8 | 15.3 | **16.7** | 15.6 | 19.6 | **23.4** | 26.8 | 166 |
| 1990 | 11.8 | **11.3** | 18.4 | 12.5 | **11.4** | 19.0 | 10.6 | **10.7** | 14.0 | 12.9 | **11.8** | 23.6 | 152 |
| 1991 | 3.5 | **2.7** | 16.1 | 3.6 | **2.1** | 17.2 | 4.1 | **3.5** | 13.9 | 3.4 | **–0.5** | 27.9 | 131 |
| 1992 | 1.2 | **–4.5** | 23.6 | 1.0 | **–5.0** | 24.3 | 1.7 | **–2.5** | 18.8 | 0.2 | **–7.3** | 30.8 | 120 |
| 1993 | 8.4 | **7.3** | 24.5 | 8.4 | **7.4** | 24.5 | 6.1 | **6.1** | 20.1 | 8.5 | **7.4** | 26.8 | 108 |
| Mean | 11.2 | **10.9** | 14.6 | 11.7 | **11.9** | 14.8 | 8.8 | **9.1** | 11.6 | 12.4 | **13.5** | 18.0 | 102 |

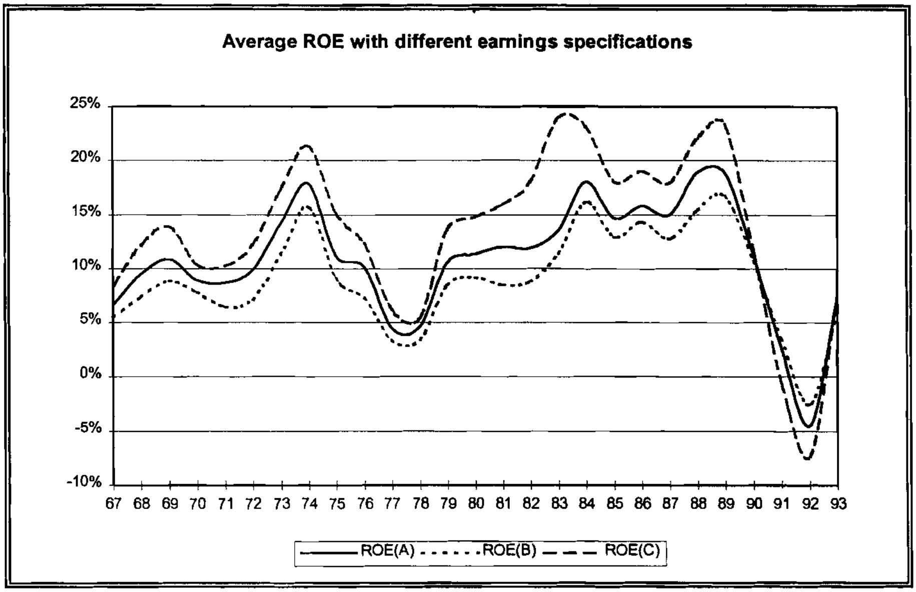


***Figure 4.1*** ***A graphical illustration of the annual mean ROE for the sample of 252 listed Swedish firms from 1967 to 1993 given three different earnings specifications.***

The choice of *ROE* specification can naturally be expected to affect the size of $\hat{\alpha}$ in the regression specifications to some extent. If the magnitude of the slope-coefficients in the regression models is likely to be affected by the choice of the *ROE* specification, can better be analyzed by studying the co-variability of the different *ROE* specifications. Do all *ROE* specifications tell the same story? In table 4.4, the correlation between $ROE^A$ and the three alternative specifications is presented for each year.

**Table 4.4 Pairwise annual correlation between the main *ROE* specification and three alternative specifications.**

| | Annual correlation coefficients | | | |
|---|---|---|---|---|
| Year | $\left(ROE^{A}_{j,t};ROE^{A'}_{j,t}\right)$ | $\left(ROE^{A}_{j,t};ROE^{B}_{j,t}\right)$ | $\left(ROE^{A}_{j,t};ROE^{C}_{j,t}\right)$ | $n$ |
| 1967 | 0.98 | 0.94 | 0.78 | 39 |
| 1968 | 0.92 | 0.89 | 0.57 | 39 |
| 1969 | 0.94 | 0.92 | 0.70 | 42 |
| 1970 | 0.96 | 0.92 | 0.72 | 43 |
| 1971 | 0.96 | 0.86 | 0.74 | 70 |
| 1972 | 0.95 | 0.88 | 0.75 | 72 |
| 1973 | 0.94 | 0.89 | 0.68 | 76 |
| 1974 | 0.96 | 0.91 | 0.73 | 79 |
| 1975 | 0.97 | 0.91 | 0.82 | 77 |
| 1976 | 0.99 | 0.94 | 0.92 | 83 |
| 1977 | 0.99 | 0.95 | 0.95 | 86 |
| 1978 | 0.98 | 0.95 | 0.88 | 88 |
| 1979 | 0.86 | 0.93 | 0.48 | 89 |
| 1980 | 0.94 | 0.92 | 0.46 | 91 |
| 1981 | 0.96 | 0.83 | 0.78 | 92 |
| 1982 | 0.94 | 0.85 | 0.80 | 95 |
| 1983 | 0.92 | 0.88 | 0.70 | 96 |
| 1984 | 0.97 | 0.96 | 0.79 | 152 |
| 1985 | 0.95 | 0.89 | 0.71 | 161 |
| 1986 | 0.99 | 0.93 | 0.90 | 164 |
| 1987 | 0.90 | 0.86 | 0.57 | 169 |
| 1988 | 0.99 | 0.95 | 0.89 | 168 |
| 1989 | 0.98 | 0.96 | 0.83 | 166 |
| 1990 | 0.99 | 0.96 | 0.84 | 152 |
| 1991 | 0.98 | 0.95 | 0.72 | 131 |
| 1992 | 0.99 | 0.97 | 0.87 | 120 |
| 1993 | 1.00 | 0.98 | 0.91 | 108 |
| Mean | 0.96 | 0.92 | 0.76 | 102 |

The correlation between $ROE^{A}$ and $ROE^{A'}$ is on average very close to 1.00 (0.96), indicating that the choice between these two specifications might be of little importance for the magnitude and significance of the estimated slope-coefficients in the regression models. $ROE^{B}$ also tells a very similar story, with an average correlation of 0.92. Naturally, the *ROE* specification including extraordinary items 'tells a somewhat different story'—nevertheless, the average correlation is 0.76 for the whole time period.

### 4.2.2 Required rate of return or the cost of equity capital

$E_t\left[R\widehat{O}E_{j,t+1}\right]$ is a key explanatory variable in this study. The estimated cost of equity capital is used to calculate the sign and size of abnormal performance. The standard procedure in financial market research has been to estimate the market's required rate of return as a function of a risk-free interest rate plus a risk premium. Relying on the capital asset pricing model (CAPM), common research practice has been to use a firm-specific risk parameter such as beta. Unfortunately, estimated historical betas have proved to be empirically rather weak as the explanatory variable for equity return.[10] Different portfolio approaches and estimation refinements have been proposed to mitigate the estimation problems.[11] The literature suggests a number of alternative routes for measuring risk. These include betas estimated utilizing accounting data,[12] several multi-dimensional risk models emanating from the arbitrage theory of asset prices (APT, Ross 1976),[13] and industry-factor betas.[14]

It is beyond the scope of this study to evaluate the 'best' risk differentiation methodology. The common approach that uses a firm- and time-specific estimate of beta based on historic market movements will thus be used as the main alternative. Findata's 48 month market beta will be used.[15] Some of the initial tests, will also be performed assuming no firm-specific risk differentiation at all (i.e. beta = 1 for all firms), in order to gain some indication of the consequences of this choice.

The main cost of equity capital specification can thus be described as follows:

[4:2] $$\hat{\rho}_{j,t} = \hat{r}_{f_t} + r\hat{p} \cdot \hat{\beta}_{j,t}$$

10 See e.g. the following studies: Reinganum (1981), Lakonishok and Shapiro (1986) and Fama and French (1992).
11 See e.g. Blume (1970) and Fama and MacBeth (1973).
12 See e.g. Beaver, Kettler and Scholes (1970) and Rosenberg and Guy (1976a and 1976b).
13 See e.g. Chen, Roll and Ross (1986) and Roll (1988).
14 See e.g. Kale, Hakansson and Platt (1992).
15 Monthly firm return is compared to changes in "Affärsvärldens generalindex" (AGI). This is a value weighted index based on all firms listed on the Stockholm Stock Exchange.

where

$\hat{\rho}_{j,t}$ = The estimated cost of equity capital for firm *j* at the end of period *t*.

$\hat{r}_{f_t}$ = The risk-free interest rate at time *t*.

$\hat{rp}$ = The estimated risk premium.

$\hat{\beta}_{j,t}$ = Findata's 48 month market beta for firm *j* at the end of period *t*.

The estimation of the risk-free interest rate and the level of the general risk premium is the topic of the following paragraphs.

In figure 4.2, the Swedish long-term risk-free rate of interest has been plotted over time. The Swedish money market was heavily regulated until the early 1980s.[16] Treasury notes were not introduced until 1982. In the fall of 1983, the National Bank of Sweden abolished some of the placement restrictions on Swedish banks. A year later, restrictions on insurance companies were also eased. Until then, the second-hand market for long-term government bonds was almost nonexistent. Thus the rates that were published before 1983 in the National Bank's Statistical Yearbook are to some extent hypothetical rather than based on actual trade. Furthermore, the available term structure of the bonds has changed over time; in some years only one of the 5, 10 or 15-year bonds has existed. The annual changes of the Swedish Consumer Price Index have also been plotted in figure 4.2. As can be seen from the figure, there seems to have been a fairly consistent positive margin of about 3-5% between the actual rate of inflation and the interest rate after 1982. The pattern is less clear for the years leading up to 1982; there are several years of zero margins and even negative margins. What was the investor's true risk-free alternative? When performing a study of the Swedish market in the 1960s and 1970s, it is not obvious which risk-free interest rate one should use. However, in this study published long-term government bond rates will henceforth be used.

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16 See Kvist, Nyberg and Wissén (1985) for a more complete discussion of the development of the Swedish money market.

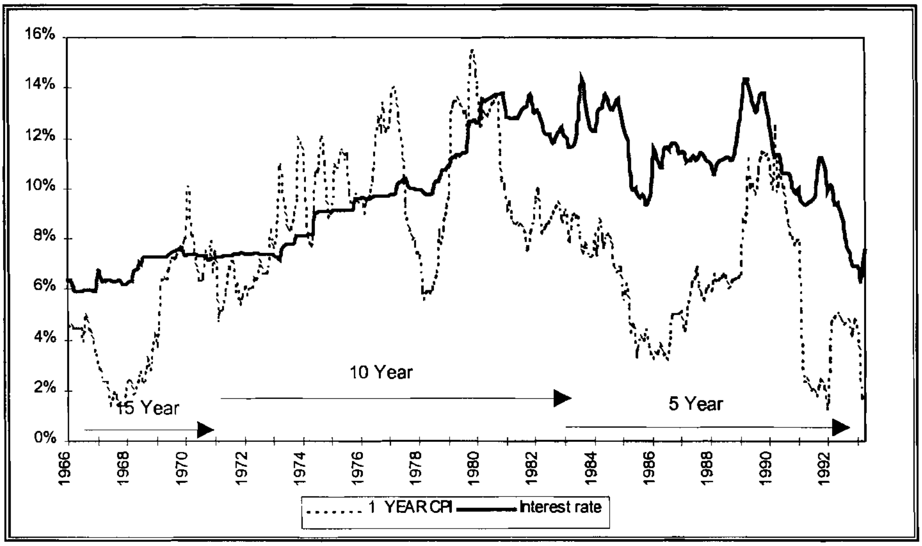


*Figure 4.2* ***The unbroken line illustrates the monthly Annualized Yield on Government Bonds. The yield has been calculated as the rate of return that equates the bond price with the stream of remaining cash flows. The figures have been compiled by the National Debt Office. Percentages are at the middle of the month until 1982 and averages per month for the following years.***
***The different term structure for different periods is indicated above the arrows.*** **Sources:** ***Swedish National Bank - Statistical Yearbooks and Findata.***
***The dotted line illustrates the monthly rolling annual change in the Swedish Consumer Price Index (Δ CPI).*** **Sources:** ***Statistical Yearbooks of Sweden, SCB and Findata.***

The risk premium to be used in this study should be an ***ex ante*** long-term risk premium. What risk premium does the marginal investor expect when buying the market portfolio of shares? Szombatfalvy (1971) discussed the level of a general risk premium in the Swedish market and he argued that the risk premium should be approximately 5%. A popular investment guide published by Affärsvärlden (a weekly business magazine) has used 2-3% as an approximation of a general risk premium.[17] Intermediaries in the Swedish market, such as representatives of investment banks, seem to have often used 3-5% as a rule of thumb.[18] Sharpe (1985) illustrated how an

17 "Att skilja vinnare från förlorare - Placerings Indikatorn" (1987) p. 28.
18 Gathered from informal discussions over the years with representatives of the 'financial community'.

American brokerage firm made projections of the risk premium. The estimates he provided indicate an expected risk premium for stocks for the period 1967-1984 of 2-7%.[19]

Studies of ***ex post*** risk premiums have generally used the annual change in a market index and added dividends (assumed to be reinvested), and then deducted an approximation of the risk-free interest rate. Unfortunately, depending on the period being studied, these *ex post* averages tend to fluctuate immensely. The results of some empirical studies performed on US and Swedish data are summarized in the tables below.

**Table 4.5** ***Ex post*** **risk premium for different periods in Sweden and the US. Long- and short-term refers to the term structure of the risk-free alternative.**

| Period/ type/ country | Geometric mean | Arithmetic mean | Source |
|---|---|---|---|
| 1926-87/ long-term/ US | 4.7 % | 6.8 % | Ibbotson & Sinquefield (89) |
| 1926-87/ short-term/ US | 6.2 % | 8.3 % | Ibbotson & Sinquefield (89) |
| 1926-87/ short-term/ SW | 5.6 % | 7.2 % | Frennberg & Hansson (91a) |
| 1919-89/ short-term/ SW | 4.4 % | 6.1 % | Frennberg & Hansson (91a) |
| 1938-87/ short-term/ SW | | 8.9 % | de Ridder (89) |

**Table 4.6** ***Ex post*** **risk premium in Sweden first for separate decades, then for successively longer periods starting in 1919 using data published in Frennberg and Hansson (1991a).**

| Period | Geometric mean | Arithmetic mean | Period | Geometric mean | Arithmetic mean | Years |
|---|---|---|---|---|---|---|
| 1919-29 | -3.7% | -2.3% | 1919-29 | -3.7% | -2.3% | 11 |
| 1930-39 | -3.3% | -0.7% | 1919-39 | -3.5% | -1.5% | 21 |
| 1940-49 | 7.4% | 7.7% | 1919-49 | -0.1% | 1.4% | 31 |
| 1950-59 | 12.3% | 13.6% | 1919-59 | 2.8% | 4.4% | 41 |
| 1960-69 | 2.8% | 3.9% | 1919-69 | 2.8% | 4.3% | 51 |
| 1970-79 | 0.1% | 1.3% | 1919-79 | 2.3% | 3.8% | 61 |
| 1980-89 | 17.6% | 19.9% | 1919-89 | 4.4% | 6.1% | 71 |

The *ex post* calculated risk premium is apparently very sensitive to which period is chosen for study (and how it is calculated). That is, of course, the

19 See figure 20-16 in Sharpe (1985).

very essence of risk. It is not known in advance what the return will eventually be. Apparently, even for a two-decade period, a portfolio of stocks may perform worse than the same period's risk-free alternative. Ibbotson and Sinquefield (1989) argued that the risk premium follows a random walk implying that the longest possible historic average is expected to be the best estimate. Using a probabilistic view ibid. (p. 125) further argued that an arithmetic mean should be used in future-oriented estimations of the cost of capital. Scott (1992 and 1993), however, agreed with neither Ibbotson and Sinquefield's calculations nor their conclusions:

> *"In conclusion, 8 per cent per annum is far too big an estimate of the risk premium on equities, both because it relies on too big an estimate of the expected mean return on equities, and because it relies on too small an estimate of the 'riskless' rate of return."*
>
> Scott (1993, p. 64)

Scott (1992) pointed at two crucial assumptions that must be satisfied for the arithmetic mean to be the relevant base for a risk premium estimate.

> *"The crucial assumptions are:*
> 1. *That past annual returns are a random sample of returns which are to be expected in the future;*
> 2. *That each annual return is drawn independently from the population of possible returns."*
>
> Scott (1992, p. 23)

Scott (1993) later concluded:

> *"The arithmetic mean would, nevertheless, be a better estimate of the future mean expected return **if** annual return could be regarded as independent drawings from a population. However, I argue that investors are more likely to form their expectations on the basis of current dividend yields and expected growth rates of dividends, and these do not behave in a random manner, and do conform to the geometric mean."*
>
> Scott (1993, p. 64)

Ibbotson and Sinquefield (1989) pointed out that the serial correlation between successive annual returns on equity had been approximately zero. Poterba and Summers (1988), however, identified a long-term mean reversion tendency in the development of US stock market prices. Frennberg and

Hansson (1991b), studying Swedish stock market prices over the period 1919 to 1990, also found a long-term mean reversion tendency in price development. Clinebell, Kahl and Stevens (1994) studying US data found an auto-regressive risk premium for 1926-58, but a random variation around a much lower mean risk premium for 1959-1990. In line with Scott's argumentation, and stating that: "*historical observations are not independent draws from a stationary distribution*", Copeland, Koller and Murrin (1991, p. 193) recommend the use of the geometric mean as the best estimate of an equity risk premium.

The valuation model presented in this study relies on the discounted value of a long lasting stream of future dividends. For a long-term estimate of the cost of equity capital, the chance that the arithmetic mean calculated risk premium overstates the expected cost of capital seems to be rather high. Further, the level of the long-term geometric mean is more consistent with actual observations, admittedly anecdotal, of *ex ante* risk premiums. For the longest periods studied, the geometric mean varies between 4 and 6 percent. A risk premium of 5 percent will henceforth be used as the estimate of the market general risk premium in this study.

### 4.2.3 Prediction of *ROE* for the next period—conceptually

A robust yet simple method to predict the next period's *ROE*, or $ROE - \rho$, is needed for this study. The prediction procedure will be used for different firms over the whole 27-year period being studied, and while it needs to be as simple as possible, a number of criteria need to be fulfilled. The procedure needs to:

1. be consistent with the specification of the valuation model,
2. be consistent with empirical observations,
3. generate predictions that are reasonable approximations of investor's expectations, and
4. make adequate use of historical observations without preventing the study of early time periods and firms with a limited history.

In the valuation model in Chapter 2, it was explicitly assumed that a firm's return on equity could deviate from the market's expected return only for a limited period of time (in the absence of a persistent accounting measurement bias). *ROE* is, in other words, expected to move towards the market cost of equity capital ($\rho$). The underlying forces were assumed to be competition and a struggle to survive. Monopoly or monopoly-like situations, due to, for example, patents or high barriers to entry, could be ***one*** explanation for persistent or slowly diminishing abnormal return. Given competition and a constant cost of equity capital, one would thus expect an ideally measured *ROE* to move towards the cost of capital. A process where *ROE* gradually moves towards $\rho$ over time was expressed in a previous section as follows:

$$ROE_{t+s} = \rho + \left(ROE_{t+1} - \rho\right) \cdot \lambda^{s-1} \qquad \text{where } 0 \leq \lambda < 1$$

Lambda is a 'fading' factor, deciding the speed of the reversion process.

A vast number of studies have been carried out to test the predictive ability of different forecasting approaches for ***accounting earnings***. Formal studies of the time series behavior, and the ability to forecast ***profitability ratios*** (e.g. *ROE*) are, on the other hand, relatively scarce. Below follows a brief review of the results.

### *4.2.3.1 Earnings forecasts*

Foster (1986) discussed alternative forecasting approaches and classified them in two times two dimensions: mechanical versus non-mechanical approaches, and univariate versus multivariate approaches.

**Table 4.7 Classification of forecasting approaches, from Foster, 1986, Table 8.1.**

| | Univariate | Multivariate |
|---|---|---|
| Mechanical | Moving average models<br>Box-Jenkins models | Regression models<br>Box-Jenkins models<br>Econometric models |
| Non-mechanical | Visual curve extrapolation | Security analyst approach |

#### 4.2.3.1.1 Univariate mechanical approaches

Authors of several studies have tried to identify the statistical process that best captures the earnings generation process. A univariate approach uses only the historical development of the variable being studied. The submartingale process has been found to most successfully capture the statistical properties of the earnings generation process for a randomly selected sample of companies.[20] A time series that follows a submartingale process can mathematically be expressed as follows:[21]

[4:3] $$X_t = \delta + \phi X_{t-1} + \tilde{\varepsilon}_t$$

where $\phi = 1$ and $\delta \geq 0$. In a pure martingale process $\phi = 1$ and $\delta = 0$. Translated to an earnings measure, the best guess of next period's earnings equals, according to the pure process, the earnings most recently disclosed.[22] The $\delta$ parameter captures an expected growth in the variable

20 Ball and Watts (1972) is an example of an early study of the earnings generation process. Watts and Zimmerman (1986) provide a good review of the field.

21 The notation in this section follows Foster (1986) p. 232.

22 In the accounting literature, the martingale process is often also referred to, even though it is really more restrictive, as the random-walk. If the error terms $(\varepsilon_t, \varepsilon_{t+1}, .... \varepsilon_{t+n})$ of a

over time, and $\tilde{\varepsilon}_t$ is a random variable with an expected zero mean. When an absolute nominal earnings measure is used, $\delta$ is expected to be larger than zero, due to, for example, inflation, reinvestment of earnings and acquisitions. Several studies, including Watts and Zimmerman (1986), have shown that this is the most successful univariate process in describing earnings changes for a '*normal*' sample. Brooks and Buckmaster (1976, 1980) have, on the other hand, illustrated that if a sample of *extreme* firms is chosen (i.e. firms with extreme values of earnings in the last period), a prediction model that assumes that the level of earnings returns to the pre-extreme level is more successful than the submartingale model.

The focus in the US has often been on quarterly earnings. It is natural that different methods for seasonal adjustments have been used under such circumstances. The Box-Jenkins methodology has successfully been used to first identify a seasonal pattern and thereafter to estimate a function that exploits all the information in the time series. Firm specific models are estimated and parameters for auto-regression and/or moving averages are generated. This approach has generated better predictions in tests (smaller prediction errors) than the submartingale method.[23] However, the estimated parameters often lack any economical interpretation, and also tend to be unstable both over time and between different samples of firms.

#### 4.2.3.1.2 Multivariate mechanical approaches

Using a multivariate forecasting approach, the dependent variable is thought to be a function of several explanatory variables. This approach has been common in, for example, the construction of econometric models forecasting the development of the whole economy or an industry, and for bankruptcy prediction. However, it has been less commonly used for predicting future company earnings, Ou (1986) being an exception. Ou constructed a logit-model for the prediction of next year's earnings change. From a list of more than sixty accounting numbers and ratios, eight ratios were selected. The predictive performance of the logit-model was subsequently compared

series are independent and identically distributed, the series is said to follow a stochastic process called the random-walk. This process is often used to describe the behavior of changes in stock market prices. See e.g. Copeland and Weston (1988).

23 See e.g. Foster (1986).

to four earnings-based models.[24] Especially when there were large earnings changes, Ou's prediction model was found to make more accurate predictions than the other four models.

#### 4.2.3.1.3 Non-mechanical approaches

The earnings predictions that security analysts provide are typical of the non-mechanical forecasting approach. Many factors, such as expectations with regard to the business climate, the development of interest rates, quotations by managements, and disclosed accounting information are presumably combined into a firm-specific forecast in an approach of this kind. Sometimes expectations are formed for a specific parameter, such as next year's earnings, and made public in business magazines. In Sweden, earnings per share predictions (for the next accounting year) have been published in Affärsvärlden (since 1973) and in Veckans Affärer (since 1974). Other actors, such as financial research departments of investment banks and brokerage firms, also produce firm-specific forecasts. Whether these forecasts are better than the mechanical forecasts is an empirical question, but since they are costly to produce and very much in demand, it appears that they might be considered superior.

Brown and Rozeff (1978) have made formal evaluations of the prediction performance of analysts. With a random sample of 50 firms, the prediction performance of three time series models[25] was compared to forecasts published by Value Line.[26] They concluded that the security analyst approach was superior to all the tested time series models. Brown, Griffin, Hagerman and Zmijewski (1984) drew equivalent conclusions. They studied 233 firms over the period 1975-80, using three different univariate Box-Jenkins models. Again, Value Line was used as a proxy for security analyst's forecasts. Liljeblom (1989) studied 89 stocks listed on the Stockholm Stock Exchange during the period 1977-1984. Studying EPS, Liljeblom compared the forecasting performance of a random-walk model against published forecasts in

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24 A random guess prediction, a trend model, a reversal model and a model based on Brooks and Buckmaster.

25 The time series models that were used were a seasonal adjusted martingale, a seasonal adjusted submartingale and a Box-Jenkins model.

26 Value Line Investment Survey published earnings forecasts for 1,600 American firms. A forecast for the next five quarters was published weekly.

the business weekly Veckans Affärer. She concluded that the forecasts provided by the business magazine significantly outperformed the naive forecasts given by the random-walk model.

Foster (1986) concluded that an important reason for the forecasting superiority of the security analysts is probably their use of a broad information set.

A more formal evaluation of the multivariate mechanical approach versus the security-analyst approach has not been found in the literature.

#### 4.2.3.1.4 Conclusions regarding the earnings process

- Earnings changes cannot generally be predicted by current and past earnings. (Ball and Watts [1972])
- Extreme levels of earnings tend to be followed by more normal earnings. (Brooks and Buckmaster [1976, 1980])
- In comparison with the sub-martingale prediction approach, the Box-Jenkins methodology has shown a better ability to identify additional predictive power for a firm-specific time series.
- Security analysts seem to generate more accurate forecasts than the univariate time series approaches. (Brown and Rozeff [1978], Brown, Griffin, Hagerman and Zmijewski [1984] and Liljeblom [1989]).
- More accurate predictions can be expected to be generated by adding a broader set of accounting variables to the mechanical approach. (Ou [1986])

### *4.2.3.2 Return on equity forecasts*

Foster (1986) noted that little evidence has been published on the time series behavior of financial ratios. Freeman, Ohlson and Penman (1982) rejected the hypothesis that *ROE* follows a random walk. They evaluated the correlation between $(ROE_{t+1} - ROE_t)$ and $ROE_t$, and interpreted the negative correlation they found as an indication of a mean-reversion process, that is, extreme ratios tend to be followed by normal ones. Freeman, Ohlson and Penman (1982) noted that the results in Beaver (1970) and in Lookabill (1976) also support the hypothesis of a mean-reversion process. However, they did not discuss to what mean *ROE* can be expected to move. The idea of a mean reversion process is obviously also consistent with the behavior of extreme earnings documented in Brooks and Buckmaster (1976, 80). In a sample of US firms, Ou and Penman (1994) observed that the *ROE* ratio has been positively serially correlated and mean reverting; further the reversion process has been slow (lasting over many years), and the *ROE* ratio of different portfolios of firms had apparently not converged to the same mean. The latter is, for example, consistent with the presence of a persistent accounting measurement bias that affects different types of firms differently. Ou and Penman (1994) further noted that the tendency of mean reversion has been much stronger for relatively low and high levels of *ROE*.

### Statistical conclusions regarding the *ROE* process

- Rather strong positive one period auto-correlation.
- Slow mean reversion tendency.
- All firms' *ROE* do not seem to converge towards the same mean.
- The reversion from extreme levels seems to be stronger.

#### *4.2.3.3 Choice of forecasting approach*

Alternative prediction models that can be used in this study:

**P1** $$E_t[\tilde{ROE}_{t+1}] = ROE_t$$ Martingale

**P2** $$E_t[\tilde{ROE}_{t+1}] = \rho_t + \lambda[ROE_t - \rho_t]$$ Mean reversion (MRP)

**P3** $$E_t\left[\tilde{ROE}_{t+1}\right] = \rho_t + a_1 \cdot \arctan\left[\left(ROE_t - \rho_t\right) \cdot a_2\right]$$ S-shaped MRP

**P4** $$E_t\left[\tilde{ROE}_{t+1}\right] = \frac{1}{n}\sum_{i=1}^{n} ROE_{t+1-i}$$ Historical mean over $n$ years

**P5** $$E_t\left[\tilde{ROE}_{t+1}\right] = \sum_{i=1}^{n} \omega_{t+1-i} \cdot ROE_{t+1-i}$$ Weighted historical mean over $n$ years

where $\sum_{i=1}^{n} \omega_{t+1-i} = 1$

**P6** $$E_t[\tilde{ROE}_{t+1}] = f\{ROE_{t-n} \rightarrow ROE_t\}$$ Estimated ARIMA model

**P7** $$E_t[\tilde{ROE}_{t+1}] = f\{\text{Accounting line items}\}$$ Broad information set

**P8** $$E_t\left[\tilde{ROE}_{t+1}\right] = \frac{E_t^{AV}\left[\tilde{ROE}_{t+1}\right] + E_t^{VA}\left[\tilde{ROE}_{t+1}\right]}{2}$$ Forecasts in business magazines[27]

**P9** $$E_t\left[\tilde{ROE}_{t+1}\right] = \frac{1}{n}\sum_{i=1}^{n} E_t^i\left[ROE_{t+1}\right]$$ Analysts' consensus; mean over $n$ analysts

The first three models only exploit information in the most recent performance measure, whereas the next three use information from a number of historic periods. The last three models exploit a wider set of information, either in a mechanic prediction model or as manifested in expectations published in the financial press or provided by financial analysts. It is beyond the scope of this study to formally test the prediction performance of each of these models—one must, however, be chosen.

The first model (a martingale in *ROE*) is the simplest. Its major disadvantage is that it ignores the observed mean reversion tendency. However, looking just one period ahead, this might not be a severe problem if extreme

27 AV = Affärsvärlden and VA = Veckans Affärer.

levels of *ROE* are controlled for. The MRP model does, on the other hand, specifically exploit the mean reversion tendency. It does not, however, take into account the observation that the mean reversion is stronger for the more extreme levels of *ROE*. The *S*-shaped model (P3) is especially designed to deal with this problem.[28] The use of several years of reported *ROE* in a prediction model can be expected to generate more stable predictions, but not necessarily predictions with smaller prediction errors in a one-period-ahead context. The unweighted historic mean is often criticized for putting too little weight on the most recent observation. That problem is mitigated in the weighted historic mean prediction model. A drawback inherent in both of these methods is the need for access to data for many historic years.

The advantages of an ARIMA model are particularly obvious if a seasonal pattern is expected in the data. Such patterns can be expected to be rather strong in quarterly data, but as this study is based on annual data, the advantages of such a model specification seem limited.[29]

The scope of this study further rules out the estimation of a broad information based prediction model (P7). The lack of published forecasts in the business press for the whole period being studied, eliminates the business press alternative (P8). The analysts' consensus database compiled by I/B/E/S unfortunately only includes Swedish firms from 1987 and onwards.

P1, P2 and P3 seem to best satisfy the simplicity and the 'low information consumption' criteria.

The specification of the *S*-shaped model needs further description. The properties of the trigonometric function ***arctan*** (the inverse tangent), is used in P3 as a ***transformation function***. Arctan has the properties of a first derivative that is positive for all values, a positive second derivative for negative values and a negative second derivative for positive values. These are the properties of a positively sloping *S*-function.

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28 Freeman and Tse (1992) successfully used a similar nonlinear model when they studied security price responses to unexpected ***earnings***.

29 Furthermore, the need for data for many historic years is a major drawback given this study's purposes.

[4:4] $y = \arctan(x)$

The slope of [4:4] is equal to one when $x$ is close to zero. The following boundary characteristics hold for the arctan function (see illustration in figure 4.3):

[4:5] $y = 0 \quad \text{when} \quad x = 0$

[4:6] $y \to \frac{\pi}{2} \quad \text{when } x \to \infty$

[4:7] $y \to -\frac{\pi}{2} \quad \text{when } x \to -\infty$

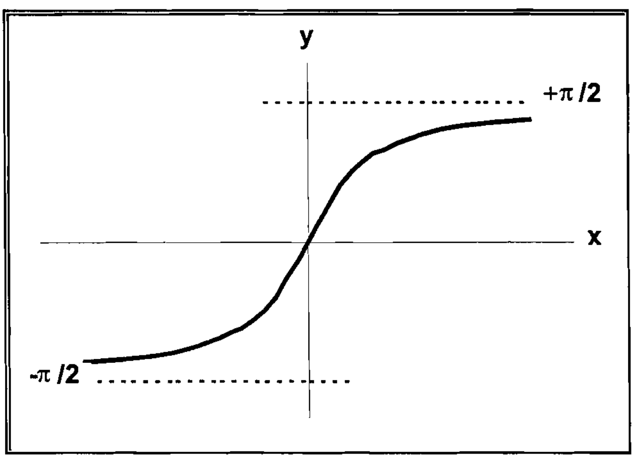


***Figure 4.3 Graphical illustration of the properties of the arctan function.***

Incorporating parameters $a_1$ and $a_2$, yields the following function.

[4:8] $y = a_1 \cdot \arctan(x \cdot a_2)$

The shape of the function can be altered by using different levels of the parameters ($a_1$ and $a_2$). The following characteristics hold for the transformed function:

i) the value of $a_1 \cdot a_2$ is equal to the slope of the line close to the origin,

ii) when $a_1$ decreases the *S*-shape is more pronounced,[30]
iii) when $a_2$ is close to zero, [4:8] is approximately linear.

Exchanging *x* for $(ROE-\rho)$ generates the prediction model P3, which given certain combinations of the parameters $a_1$ and $a_2$ may be equal to P1, P2 or simply be consistent with accelerating mean reversion for extreme *ROE* levels.

**P3** $$E_t\left[R\tilde{O}E_{t+1}\right] = \rho_t + a_1 \cdot \arctan\left[\left(ROE_t - \rho_t\right) \cdot a_2\right]$$

- P3 is approximately identical to P1 when $a_1 \cdot a_2 = 1$ and $a_2$ is very low (close to zero).
- P3 is approximately identical to P2 when $a_1 \cdot a_2 = \lambda$ and $a_2$ is very low (close to zero).
- P3 is *S*-shaped when $a_2$ is not close to zero, the maximum level of expected residual return is decided, regardless of the current level of *ROE,* by the level of $a_1$. (If, for example, $a_1$=0.25 then maximum and minimum $E_t\left[R\tilde{O}E_{t+1}\right] = \rho_t \pm 0.25 \cdot \frac{\pi}{2} \approx \rho_t \pm 0.39$).

$a_1$ and $a_2$ can thus, for example, be chosen to force the model to generate *ROE* predictions that are equal to the martingale model (or the MRP model) when current *ROE* is close to $\rho$, and predictions with an increasing mean reversion tendency the further current *ROE* is from $\rho$. Concrete illustrations of these properties follow below. Figure 4.4 illustrates current and predicted *ROE* graphically given prediction models P1, P2 and P3 (with specific parameters).

30 The following boundary conditions hold for the transformed function:
$y \to a_1 \cdot \frac{\pi}{2}$ when $x \to \infty$ and $y \to -a_1 \cdot \frac{\pi}{2}$ when $x \to -\infty$

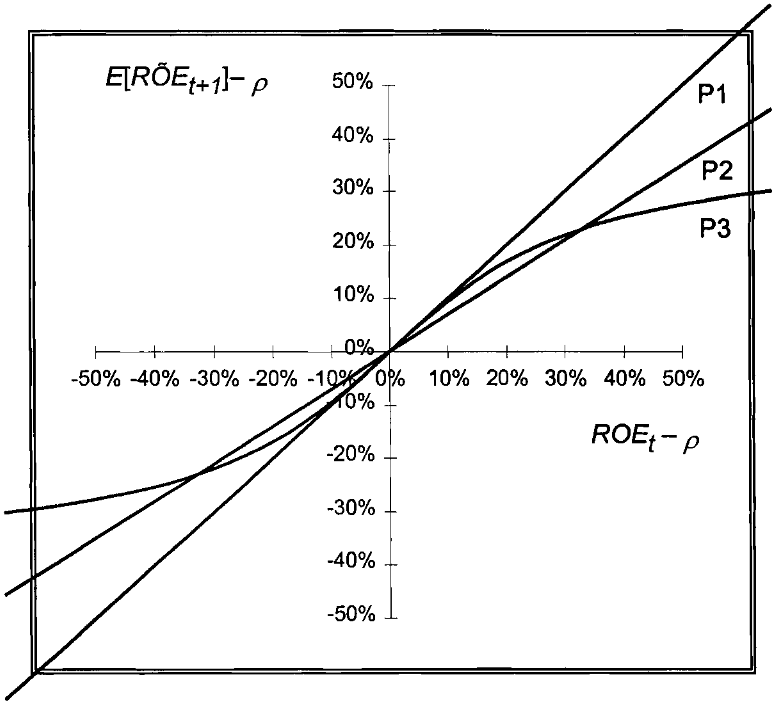


***Figure 4.4*** ***The relationship between current ROE–ρ and expected next period ROE–ρ for the Martingale model (P1), the Mean Reversion model (P2) with λ = 0.7, and the S-shaped model (P3) with $a_1$ = 0.25 and $a_2$ = 4 ($a_1 \cdot a_2$ = 1.0) when ρ = 15%.***

Table 4.8 illustrates the increasing and differing mean reversion speed for different combinations of $a_1$ and $a_2$ and two examples of current *ROE*. Note that when $a_2$ is close to zero, the mean reversion tendency is constant for all levels of *ROE* (a linear relationship). The reversion tendency is equal to 0.90 ($a_1 \cdot a_2 = \lambda$). At the other extreme, when $a_1$ is close to zero, the mean reversion tendency is complete; $E_t[R\tilde{O}E_{t+1}] = \rho_t$ for all levels of current *ROE* ($\lambda$ = 0.00). For all other parameter combinations, the mean reversion tendency increases the further *ROE* is from the expected norm ($\rho$). For example, given a combination of $a_1$ = 0.3 and $a_2$ = 3, the $\lambda$-equivalent equals 0.87 and 0.69 respectively, when current *ROE* equals 25% and 50% respectively.

**Table 4.8** **A numerical illustration of the different degrees of mean reversion for the *S*-shaped prediction model, given different combinations of $a_1$ and $a_2$ and two examples of current *ROE*. $\rho_t$ and $a_1 \cdot a_2$ are fixed at 15% and 0.90 respectively. As the multiple ($a_1 \cdot a_2$) in all cases is assumed to be a positive constant (0.90), $a_1$ and $a_2$ are assumed to only approach zero and infinity respectively, at each extreme of the table.**

| $E_t\left[R\tilde{O}E_{t+1}\right] = \rho_t + a_1 \cdot \arctan\left[\left(ROE_t - \rho_t\right) \cdot a_2\right]$ | | | | | |
|---|---|---|---|---|---|
| $\rho_t$ = 15 % & $a_1 \cdot a_2$ = 0.90 | | $ROE_t$ = 25 % | | $ROE_t$ = 50 % | |
| $a_1$ | $a_2$ | $E[R\tilde{O}E_{t+1}]$ | λ-equivalent | $E[R\tilde{O}E_{t+1}]$ | λ-equivalent |
| → ∞ | → 0 | 24.0% | 0.90 | 46.5% | 0.90 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| 1.00 | 0.90 | 24.0% | 0.90 | 45.5% | 0.87 |
| 0.90 | 1.00 | 24.0% | 0.90 | 45.3% | 0.87 |
| 0.80 | 1.13 | 24.0% | 0.90 | 45.0% | 0.86 |
| 0.70 | 1.29 | 24.0% | 0.90 | 44.6% | 0.85 |
| 0.60 | 1.50 | 23.9% | 0.89 | 44.0% | 0.83 |
| 0.50 | 1.80 | 23.9% | 0.89 | 43.1% | 0.80 |
| 0.40 | 2.25 | 23.9% | 0.89 | 41.7% | 0.76 |
| 0.30 | 3.00 | 23.7% | 0.87 | 39.3% | 0.69 |
| 0.20 | 4.50 | 23.5% | 0.85 | 35.1% | 0.57 |
| 0.10 | 9.00 | 22.3% | 0.73 | 27.6% | 0.36 |
| 0.05 | 18.00 | 20.3% | 0.53 | 22.1% | 0.20 |
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| → 0 | → ∞ | 15.0% | 0.00 | 15.0% | 0.00 |

Estimating the parameters of the *S*-shaped model, using empirical data can be viewed as a test of the relative statistical fit of P1, P2 and P3. Such an estimation can thus be used as a guide towards choosing the most reasonable prediction procedure.[31] However, before such estimations are performed, the firm-specific *PMB*s must be estimated.

31 The estimation of the parameters for the *S*-shaped model is done in two steps. Search the value of $a_2$ that maximizes the explanatory power of the following linear function:

- $\left(ROE_{j,t} - \rho_{j,t}\right) = a_0 + a_1 \cdot X_{j,t} + \tilde{\varepsilon}_{j,t}$

  where

  $X_{j,t} \equiv \arctan\left[\left(ROE_{j,t} - \rho_{j,t}\right) \cdot a_2\right]$

If a permanent firm-specific return on equity measurement bias ($\gamma_{j,t}$) is expected, an estimate of the bias is included in the estimation model:

- $\left(ROE_{j,t} - \rho_{j,t} - \gamma_{j,t}\right) = a_0 + a_1 \cdot X_{j,t} + \tilde{\varepsilon}_{j,t}$

  where

  $X_{j,t} \equiv \arctan\left[\left(ROE_{j,t} - \rho_{j,t} - \gamma_{j,t}\right) \cdot a_2\right]$

# 5 OPERATIONALIZATIONS

In the first section of this chapter a classification and quantification of the firm characteristics discussed in Chapter 3 will be performed. Section 5.2 presents an operationalization of the selected descriptors of change in the economic climate (related to the inflation rate and business cycle pattern). Finally, in Section 5.3, the actual adaptation process regarding some selected accounting measurement issues will be described with reference to the chosen sample.

## 5.1 Estimation and classification of firm characteristics

### 5.1.1 The permanent accounting measurement bias

In Chapter 3, the sources and factors that were thought to primarily influence the level of the expected permanent relative accounting measurement bias were discussed. It was argued that the main factors emanate from the common expensing procedure of 'investments' in R&D, marketing or personnel training activities, the unrealized holding gains in long-lived tangible assets, and the tendency to overstate the value of deferred taxes. As the factors that influence the level of the expected measurement bias vary between firms and over time, an estimate of the *PMB* for each firm and year should ideally be performed.

In this study, a somewhat crude estimate of a time constant *PMB* for each industry will be attempted. These calculations can be viewed as a first empirical effort, to assess the validity of the general idea of a permanent accounting measurement bias when attempting to explain the level and changes in stock prices.

The general technique used to estimate these measurement biases was discussed in detail in Section 3.1.1.3. Put simply, the marginal accounting measurement bias of type *X,* for industry *Y* can be calculated as follows:

$$[5:1] \qquad PMB_Y^X = BIAS_Y^X \cdot \frac{\text{Proportion}_Y^X}{\text{Solidity}_Y}$$

The relative proportion of each bias creating issue (*X*), has been calculated as a time-series median of the annual medians of all the firms in the industry.[1] The solidity of each industry has also been calculated as the time-series median. Finally, an estimate of the size of each type of bias has been performed. The estimates related to tangible assets have been calculated using expression [3:7]. Similarly, the marginal biases related to intangible assets and deferred taxes have been calculated using expressions [3:9] and [3:11] respectively. The total *PMB* for a company has subsequently been calculated as the sum of the partial *PMBs*. Details concerning these calculations are provided in the following sections.

In order to perform time constant *PMB* estimates, the mean tax rate, the mean annual inflation rate, the mean annual after tax cost of debt, and an estimate of the real growth in the economy have been calculated.[2] These means have, when applicable, been used in all calculations.

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1 The medians, rather than the means, have been used to reduce the influence of a few extreme observations.

2 The average tax rate has been calculated as the arithmetic mean of the annual estimated tax rates from table 4.2. The average inflation rate has been calculated as the arithmetic mean of the annual inflation rates from figure 4.2. The average after tax cost of debt has been calculated as the average risk free interest rate plus a 2% risk premium, minus the estimated tax rate (i.e. $(9.9 + 2.0)(1 - .507) = 5.9$). The annual geometric real growth in Swedish industrial production, for the 100-year period 1893 to 1993, has been 3% (according to data compiled in the database EcoWin). The mean real growth in annual sales, during the period 1967 to 1993, across the firms in the study's sample, has been approximately 5%. The average of these two indicators, 4%, has been used as an estimate of the real growth rate.

**Table 5.1 Descriptors of the economical environment.**

| | | 1967 - 1993 |
|---|---|---|
| Average tax rate | $\hat{\tau}$ | 50.7% |
| Average inflation rate | $\Delta\overline{CPI}$ | 7.4% |
| Average after-tax cost of debt | $r_{d,at}$ | 5.9% |
| Average real growth rate | $\delta$ | 4.0% |

### *5.1.1.1 Marginal PMB related to tangible assets*

The first step was to identify the relative importance of each item of interest. Company time-series medians have been calculated for the relative holdings of machinery, equipment and ships, buildings, trading property, land, and investment in shares, as percentages of total assets. Appendix J provides information on the median value of these ratios for each industry.

#### Machinery, equipment and ships

The estimated economic lives of machinery, equipment and ships (MES) have been calculated as the ratio of the gross acquisition cost and the annual depreciation according to plan:[3]

$$[5:2] \qquad \text{LIFE (MES)}_{j,t} = \frac{\text{Accumulated acquisition cost}_{j,t}}{\text{Depreciation}_{j,t}}$$

Such estimates have been performed for each company for each year. Subsequently, the industry median has been calculated for each year, and finally, a median has been calculated for each industry. Using equation [3:7] and these estimates of economic lives, combined with the mean historical inflation rate as a proxy for annual unrealized value change, the expected bias has been calculated for each industry. Equation [3:7] is based on an

3 $\text{LIFE (MES)} = \frac{\text{Var 47}}{\text{Var 206}}$

Estimated age has been calculated as the estimated life times one minus the estimated usage of the asset. The latter has been calculated as value after accumulated depreciation divided by gross acquisition cost.

$$\text{AGE (MES)}_{j,t} = \text{LIFE (MES)}_{j,t} \cdot \left(1 - \frac{\text{Value according to plan}_{j,t}}{\text{Accumulated acq. cost}_{j,t}}\right)$$

assumption of balanced portfolios of the asset type, but allows for a constant annual real growth rate.[4] The partial *PMB*s related to MES have finally been calculated for each industry using the relative proportion of MES, the median solidity, and the mean tax rate. See appendix K for detailed results of the calculated partial *PMB*s per industry.

An underlying assumption for these *PMB* calculations is that the companies hold balanced portfolios of the asset type. This means that the average age of the asset base should be approximately half the economic life of the asset type (somewhat younger, given real growth). The only industry in which this assumption has obviously been violated is the shipping industry. The average age of their ships has been only four years in comparison to an estimated economic life of 17 years. The companies in the shipping industry have thus apparently been active traders of ships, and therefore are the assumption of age-balanced portfolios of ships not very descriptive. Consequently, calculating the bias on an assumption of an average age of four years will probably generate a more reasonable (and smaller) measurement bias.[5]

## Buildings in operations and trading property

The estimated median economic lives of the buildings held as fixed assets have been calculated for each industry:[6]

$$\text{[5:3]} \qquad \text{LIFE (Buildings)}_{j,t} = \frac{\text{Accumulated acquisition cost}_{j,t}}{\text{Depreciation}_{j,t}}$$

4 A constant annual growth rate of 4% has been used in all calculations. See table 4.1.

5 $\text{Ship bias before tax} = \left((1+0.074)^4 - 1\right) = 0.33$

6 $\text{Life (Buildings)} = \frac{\text{Var 70}}{\text{Var 210}}$.

Estimated age has been calculated as the estimated life times one minus the estimated usage of the asset. The latter has been calculated as value after accumulated depreciation divided by gross acquisition cost.

$$\text{AGE (Buildings)}_{j,t} = \text{LIFE (Buildings)}_{j,t} \cdot \left(1 - \frac{\text{Value according to plan}_{j,t}}{\text{Accumulated acq. cost}_{j,t}}\right)$$

*PBM* calculations for buildings have followed a procedure similar to MES above. See appendix L for detailed results of the calculated partial *PMB*s per industry.

The assumption of a balanced age structure seems to have been violated in several of the industries. In the industries where property trade is a central part of operations—real estate, building and construction and mixed construction and real estate—the median age has been particularly low (between 3 to 6 years). Assuming that a permanent trading activity in property is a normal state among these firms, the bias has been calculated based on an average holding period of 4 years.[7] As the proportion of buildings has not been very large in any of the other industries, no further adjustments have been performed.

The property classified as trading property ('omsättningsfastigheter'), in the real estate, building and construction, and mixed construction and real estate industries, has naturally also been subject to frequent trade.[8] An average holding period of these assets is difficult to assess. An average holding period of three years does not seem unreasonable.[9] For the period after 1984, several companies in these industries have disclosed calculated market value of their property holdings. The median market-to-book value of property for these firm-years has been 1.4. The rather short holding period assumed (combined with the average inflation rate as a proxy for value change) generates a somewhat lower bias, but as the period (1984-1993) includes a number of years with a quite exceptional property market, this does not seem unreasonable. The marginal *PMB* estimate from trading property per industry is summarized in table 5.2 below.

7 Building bias before tax $= \left((1+0.074)^4 - 1\right) = 0.33$

8 The distinction between property classified as fixed assets versus current assets (trading property), has, however, not been very distinct for Swedish property firms. E.g. different tax related motives have made firms classify rather permanent holdings as trading property.

9 Property for trade bias before tax $= \left((1+0.074)^3 - 1\right) = 0.24$

## Land

A non-trivial median value of holdings of land (9% of total assets) has only been found for the paper and pulp industry.[10] The average age of these assets has not been disclosed. However, as an indication of the measurement bias, the taxable value of land can be used. This value has generally been disclosed in the notes (and coded in Findata) for the years following 1976. As a general guideline, the tax value is meant to approximate 75 percent of a 'fair market value'.[11]

To estimate the median unrealized holding gain in land for the paper and pulp firms, the ratio of the taxable value (multiplied by 1/0.75) to the disclosed book value of land has been calculated. The median of this ratio for 97 paper and pulp firm-year observations was approximately 1.4.[12] Similarly calculated, the two electric power companies in the sample have both had an average ratio of approximately 4.[13] These median biases (0.43 and 3.0) have been used regarding land for all the companies in the paper and pulp industry and for the two electric utility firms, respectively. Finally, a four-year average holding period of land, generating a bias of 0.33 before tax, has been assumed for the property trade-oriented industries. The marginal *PMB* estimate from holdings of land per industry is summarized in table 5.2 below.

## Investments in shares

Not surprisingly, very large median holdings of shares have been found among the investment companies (80% of total assets). A fairly large proportion of investments in shares has also been found among the conglomerate and mixed investment companies (13%). The average age (or holding period) of these assets has not been disclosed. However, the market value of listed shares has commonly been disclosed in the notes since 1977 (at least for the investment firms). The median ratio of market-to-book values of listed shares may thus be used as an indicator of the measurement bias for

10 The capital-intensive service industry showed the second largest median holdings in land (4% of total assets).

11 The property tax act (fastighetstaxeringslagen) chapter 5 § 5, see discussion in Lodin et al 1990 p. 162.

12 This value is equivalent to a 5.5 year average holding period, given an annual value change of 7.4%.

13 This value is roughly equivalent to a 20-year holding period, given an annual value change of 7.4%.

these firms. The median value of this ratio has been approximately 2.0 for the investment company observations and 1.4 for the conglomerate and mixed investment company observations.[14] These values have been used as a proxy for the measurement bias in these two industries. Furthermore, the lower bias (0.4) has been used on the holdings of shares for all the companies in the other industries. See appendix M for detailed results of the calculated partial *PMB*s per industry.

### *5.1.1.2 Marginal PMB related to intangible assets*

**R&D expenditures**

The only industry that discloses large annual expenses in R&D, measured as the median fraction of reported total assets, is the pharmaceutical industry.[15] Note, however, that a number of firms in other industries also spend large amounts of resources on R&D. In order to control for this source of a permanent measurement bias, the median R&D expenditures, and a partial *PMB* have been calculated for each individual firm.[16] Of the firms in the sample, 22 have disclosed median annual expenditures ranging between 0.5 and 13%.

To calculate the R&D related *PMB* according to equation [3:9], the most important additional factor is the expected average investment-to-harvest timelag. In Astra's annual report (1987, p. 30), a generation cycle for a new product in the pharmaceutical industry is said to take 10 to 15 years. It is further stated that after the product is first placed on the market, it usually remains protected for 8 to 10 years against competitors via different patents. Lev and Sougiannis (1996) show empirical results that indicate that the average duration of R&D benefits is approximately twice as long for companies in the chemical and pharmaceutical industry compared with, for

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14 These values are equivalent to holding periods of approximately 6 and 3 years respectively, under the assumption of annual unrealized value change amounting to 12%. The 12% have been derived from the mean cost of equity capital minus the mean dividend yield.

15 R&D expenses equal variable 200 in Findata.

16 Most of the firms that report large R&D expenditures have done so for all historic periods. Five of the firms in the engineering industry started to disclose their R&D expenditures rather late (around 1981). The median expenditure in these cases has been calculated for the years after the firm started to disclose this information item. However, the estimated *PMB*s have also been applied for all the previous years.

example, those in the scientific instrument industry. Referring to previous studies, Fruhan (1979) assumed a ten-year economic life (using straight line depreciation) for the capitalization of R&D for all the firms in his sample. Given the particularly long research cycle in the pharmaceutical industry, it seems reasonable to at least differentiate between pharmaceutical companies and other firms. Thus 14 and 7 years respectively have been assumed as average cycle lengths. Furthermore, assuming that expenditures related to a particular project are spread evenly over these cycles, half these period lengths have been used as estimates of the investment-to-harvest timelag.[17]

An annual real growth rate of 4%, a real rate of expected return of 8%, the median solidity for the industry, and the average tax rate have also been used in the estimation of the R&D related *PMB*s.

The calculated marginal *PMB*s related to R&D activities vary between 1.40 for Astra and 0.03 for MoDo. A complete description per company is presented in appendix N.[18]

### Personnel development expenditures

Most firms can be expected to spend resources on personnel development. Especially in industries such as IT and consulting, expenditures of this kind can be expected to be a significant percentage of tangible assets. Expenditures in this area, however, have only been disclosed by one of the firms in the sample (Ångpanneföreningen). For this reason, a crude approximation will have to suffice. Using equation [3:9] in a similar way as in the R&D calculations, a partial *PMB* of 0.40 can be shown to be approximately consistent with annual personnel development expenditures amounting to 6% and an investment-to-harvest timelag of 4 years.[19] As this combination does not seem implausible, a partial *PMB* of 0.40 related to personnel development expenses has been assumed for all the companies in

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17 This means 7 years for the pharmaceutical companies and 3.5 years for all other companies.

18 These estimated *PMB*s are equivalent to an assumption of an economic life amounting to approximately 18 years for pharmaceuticals and 7 years for the other companies assuming a linear depreciation scheme. See discussion in Section 3.1.1.3 and appendix C.

19 Given a tax rate of 50% and a solidity of 30%.

the consulting and computer industry and for the firms belonging to the non-capital-intensive service industry.[20]

### Marketing and advertising expenditures

The lack of disclosure of marketing and advertising expenditures generates obvious problems for the *PMB* estimation. The largest measurement bias among the firms in the sample can probably be found among the brandname-intensive firms in the consumer goods industry.[21] Relying on similar crude reasoning as for personnel development expenses, one can simply note that a partial *PMB* of 0.25 is consistent with annual advertising expenditures amounting to 10% and an investment-to-harvest timelag of 1.5 years.[22] As this combination does not seem implausible,[23] a partial *PMB* of 0.25 related to marketing and advertising expenditures has been assumed for the firms in the consumer goods industry.

### *5.1.1.3 Marginal* PMB *related to deferred taxes*

In Section 3.1.1.1 two sources of deferred tax were identified: one related to the disclosed level of untaxed reserves, and the other to unrealized holding gains. The median deferred tax as a percentage of total assets has been calculated for each industry.[24] The industry-specific measurement biases before tax, as estimated according to the previous sections, have been used as estimates of different unrealized holding gains. The sum of these values times the average tax rate has been used to assess the total value of deferred tax for each industry. To calculate the partial *PMB* using equation [3.11], the estimated average after-tax cost of debt (5.9%) from table 5.1 has been used. Furthermore, an estimate of the average length of time until the tax liabilities can be expected to be paid had to be assessed.[25]

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20 A partial measurement bias of zero has implicitly been assumed for the remaining industries.

21 E.g. Marabou and Spendrups.

22 Given a tax rate of 50% and a solidity of 30%.

23 Lev and Sougiannis (1996) referred to empirical evidence in Bublitz and Ettridge (1989) and Hall (1993) when arguing that the effect of advertising expenditures on subsequent earnings is short-lived (typically one to two years).

24 Deferred taxes have been calculated as untaxed reserves (variable 121 in Findata) times the prevailing tax rate. For the period 1991-93, several firms have disclosed their own estimate of the value of deferred taxes (variable 468 in Findata).

25 This is not a simple matter given the diversity and changes of the actual tax rules that make it possible to create and hold untaxed reserves.

The rules related to accelerated depreciation of machinery and equipment create a deferred tax that is gradually built up over the first five years after investment[26] and the liability is then gradually repaid during the remaining economic life of the asset. The so-called 'investment funds' could, from a taxation point of view, be used to make a complete and instant write-off of a new investment. Such a write-off could create a tax credit with a potentially very long-lasting repayment scheme (related to the economic life and depreciation pattern of the particular investment).

The particular rules related to inventory reserves (lagerreserver) or 'employment reserves' (resultatutjämningsfond or later L-SURV) generated significant delays in tax payments for many firms. However, conceptually, these delays lasted only one year at the time.

An assumed average length of time until repayment of five years does not seem to be inconsistent with the collection of tax rules and the empirical data. Regarding the assessed unrealized holding gains, the length of time until tax payment has been chosen to be consistent with the number of years involved in the generation of the deferred realization.[27]

See appendix O for detailed results of the calculated partial *PMB*s per industry.

### *5.1.1.4 Summarized estimated PMB*s

In table 5.2 all the estimated partial measurement biases have been summarized to a total *PMB* estimate for each industry. As is obvious from the pre-

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26 This is assuming that the asset has an economical life exceeding 5 years, and that the firm is in a tax paying position and can thus take advantage of additional tax deductible expenses.

27 Half the estimated economic lives related to MES and buildings have been used: 4 years for the ships of the shipping firms; 4 and 3 years respectively for buildings and trading property for the property-oriented companies; 5 and 20 years related to holdings of land for the paper and pulp and electric utility companies respectively; 6 and 3 years related to the holding of shares for the investment firms and all the other firms respectively. 7 and 3.5 years for the R&D investing firms in the pharmaceutical and other industries respectively. Finally, 5 years have been used for the unrealized holding gain related to the capitalization of investment in personnel training, and 1.5 years for marketing activities.

vious presentation these estimates must be interpreted with utmost caution. Some of the operationalizations rest on weak or simplified ground. Furthermore, the estimates are performed for the medium firm given the medium year conditions, and rely on the companies holding balanced portfolios of the different asset types.[28]

In spite of the crudeness of the estimation procedure, it has generated a significant spread between, in one end, the pharmaceutical industry, with an estimated *PMB* of 1.74, to in the other end the engineering, other production and conglomerate and mixed investment companies, with an estimated *PMB* of about 0.30. The magnitude and spread of the biases underpin, in my mind, the importance of at least attempting to control for this factor when empirical research is performed on the relationship between reported accounting earnings (and/or book value of equity) and stock market prices.

28 An effort was also made to estimate company specific *PMB*s, using company medians of the relative proportion of different items, and company medians of solidity. This approach, however, gave rise to a number of problems. First of all, the necessary accounting information has not commonly been disclosed by all individual firms; secondly, the variation achieved between different firms within an industry seemed to add more noise than descriptive precision. The effects on regression results of including firms that have held balanced portfolios of an asset type can, however, be controlled for in empirical tests. This can be done using company- and time-specific data on the estimated age and economic lives of machinery and equipment, and buildings.

**Table 5.2 Summary of the estimated partial *PMB*s per industry. The industries have been ranked in descending *PMB* order.**

| Estimated partial *PMB*s due to different measurement problems for different industries | MES | Buildings | Trading property | Land | Investment in shares | R&D expenses | Personnel develop. expenses | Marketing expenses | Deferred taxes | = **Total *PMB*** |
|---|---|---|---|---|---|---|---|---|---|---|
| Pharmaceutical | 0.06 | 0.09 | | | | 1.08 | | | 0.51 | **1.74** |
| Capital-intensive service* | 0.23 | 0.15 | | ** | 0.06 | | | | 0.33 | **0.76** |
| Consumer goods | 0.15 | 0.11 | | | 0.01 | | | 0.25 | 0.20 | **0.72** |
| Investment companies | | | | | 0.53 | | | | 0.16 | **0.68** |
| Pulp and paper* | 0.23 | 0.08 | | 0.07 | 0.01 | | | | 0.27 | **0.67** |
| Shipping | 0.47 | 0.02 | | | 0.02 | | | | 0.14 | **0.65** |
| Other service | 0.03 | 0.04 | | | 0.02 | | 0.40 | | 0.14 | **0.62** |
| Consultants & computer* | 0.03 | | | | 0.01 | | 0.40 | | 0.15 | **0.59** |
| Real estate | | 0.31 | 0.12 | 0.01 | 0.01 | | | | 0.10 | **0.56** |
| Mixed build. and real est. | 0.02 | 0.02 | 0.35 | 0.01 | 0.01 | | | | 0.12 | **0.55** |
| Trading and retail | 0.03 | 0.21 | | | | | | | 0.23 | **0.47** |
| Chemical industry* | 0.10 | 0.12 | | | 0.01 | | | | 0.21 | **0.44** |
| Building and construction | 0.03 | 0.03 | 0.12 | 0.01 | 0.02 | | | | 0.16 | **0.38** |
| Engineering* | 0.07 | 0.10 | | | 0.01 | | | | 0.15 | **0.33** |
| Other production* | 0.07 | 0.10 | | | 0.01 | | | | 0.13 | **0.31** |
| Conglom. & mix. inv. * | 0.04 | 0.08 | | | 0.08 | | | | 0.09 | **0.28** |

* Industries that contain particular companies with an estimated bias related to R&D.
** Two electrical utility companies have partial *PMB*s amounting to approximately 0.30.

### 5.1.2 The hurdle rate ($\gamma$) increase from the *PMB*

The increased 'hurdle rate' factor $\gamma$ (or the expected permanent return measurement bias) is, according to equation [2:24], a function of the value of the *PMB* and the difference between $\rho$ - $g$. Median *PMBs* for different industries were estimated in the previous section. Using equation [2:24] a particular *PMB* can be translated into an expected level of $\gamma$ and thus to an expected level of $R\tilde{O}E_{t+s}^{(b)}$ given an estimate of future growth and the cost of equity capital.

Growth and cost of equity can naturally be expected to vary both over time and between firms and industries. However, an assumption of constant growth and cost of equity capital is consistent with the relative crudeness of the *PMB* estimation. Average cost of equity capital has been calculated as the average yield on government bonds plus the general risk premium assumed to be 5%. The average risk-free cost of capital for the period 1967 to 1993 has been 9.9%.[29] The average cost of equity capital for the 26-year period has thus been 14.9%. The real growth rate has been assumed to amount to 4%, which given the mean inflation rate for the period amounting to 7.4%, means a nominal growth rate amounting to 11.7%.[30]

Hence: $\rho - g = 14.9\% - 11.7\% = 3.2\%$

Given this assumption $\gamma$ can be calculated as follows:

$$PMB_Y \cdot (\rho - g) = \gamma_Y$$

Table 5.3 presents the industry-general estimates of $\gamma$.[31] $\gamma$ ranges between 5.6% and 0.9% depending on the size of the *PMB*.

29 The arithmetic mean of the annual yield on government bonds presented in figure 4.2.

30 $1.04 \cdot 1.074 = 1.117$

31 Note that related to the expenditures of resources on R&D, some 20 companies from different industries have an additional firm-specific partial *PMB* and thus, of course, also a partial increase in $\gamma$.

***Table 5.3*** **The calculated increase in the 'hurdle rate' ($\gamma$) for each industry given an expected difference between cost of equity capital and growth of 3.2%.**

| Expected permanent measurement bias for different industries | Total *PMB* | $\gamma$ |
|---|---|---|
| Pharmaceutical | 1.74 | 5.6% |
| Capital-intensive service* | 0.76 | 2.4% |
| Consumer goods | 0.72 | 2.3% |
| Investment companies | 0.68 | 2.2% |
| Pulp and paper* | 0.67 | 2.1% |
| Shipping | 0.65 | 2.1% |
| Other service | 0.62 | 2.0% |
| Consultants and computer* | 0.59 | 1.9% |
| Real estate | 0.56 | 1.8% |
| Mixed building and real estate | 0.55 | 1.7% |
| Trading and retail | 0.47 | 1.5% |
| Chemical industry* | 0.44 | 1.4% |
| Building and construction | 0.38 | 1.2% |
| Engineering* | 0.33 | 1.0% |
| Other production* | 0.31 | 1.0% |
| Conglomerate and mixed inv. * | 0.28 | 0.9% |

* Industries that contain particular firms with an estimated bias related to R&D.

### 5.1.3 Classification in different *GPF*-level categories

The size of the equity growth earnings persistence factor (*GPF*) is decided by a combination of the parameters labeled $\lambda$, $T$, $G$ and $\rho$ in the proposed valuation model. Table 2.12a-e in Chapter 2 illustrated that this factor can conceptually vary between one and beyond twenty (the latter in a situation of extreme persistence of abnormal performance and rapid growth). It was argued that the level of the *GPF* could mainly be expected to be a function of the degree of industry competitiveness and the firm's growth potential. A high *GPF* firm should be characterized by high growth and stable positive residual return. Ideally, a good estimate of expected growth and stability should be used.

First, as a proxy for stability in abnormal positive performance, all firm years with a history of five consecutive years of *ROE* exceeding $\rho + \gamma$ were identified. Secondly, two alternative operative measures of historical real growth were calculated, namely real growth in sales and assets.[32]

If the five-year annualized real growth rate in sales or assets has exceeded 8.0% (double the normal real growth rate) and *ROE* has exceeded $\rho + \gamma$ for five consecutive years, the firm-year observation has been classified as E[*GPF*] = High

It may also be reasonable to expect a particularly low *GPF* for loss firms (negative *ROE*) and firms with extremely high current *ROE*.[33] A simple way to identify firms with extremely high *ROE* is to use the calculated mean and standard deviation of *ROE* in table 4.3. The mean and the standard deviation amounted to 10.9 and 14.6% respectively. An *ROE* exceeding 55%

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32 Formally, these growth numbers were calculated as follows:

$$\left(\frac{Sales_{j,t}}{Sales_{j,t-5}}\right)^{1/5} - \left(\frac{CPI_t}{CPI_{t-5}}\right)^{1/5} = \text{Five-year annual geometric average real growth in sales.}$$

$$\left(\frac{Assets_{j,t}}{Assets_{j,t-5}}\right)^{1/5} - \left(\frac{CPI_t}{CPI_{t-5}}\right)^{1/5} \approx \text{Five-year annual geometric average real growth in assets.}$$

The latter growth calculation can rightly be questioned. Each asset of varying age has been valued at historical cost (at different money value), which makes the utilized calculation procedure formally incorrect.

33 The rationale being that a firm would be very unlikely to maintain an extreme level of *ROE* (especially combined with growth).

is thus approximately three standard deviations larger than the average *ROE* and should qualify as extreme. This classification rule can thus be summarized as:

if $ROE_{j,t} < 0$ or $ROE_{j,t} > 55\% \rightarrow Firm_{j,t}$ classified as $E[GPF] = \text{Low}$

The remaining firms have been classified as $E[GPF]$ = Medium

| E[*GPF*] | Number of firm-years |
|---|---|
| Low | 367 |
| Medium | 2,246 |
| High | 132 |
| Total | 2,745 |

### 5.1.4 Classification of validity of historical *ROE*

It was argued in Section 3.1.3 that the validity of recently published earnings (or *ROE*) as an indicator of a probable performance level for the future periods, can be expected to be particularly poor for some types of business activities. This short-term informativeness problem was argued to stem from the fact that the realization principle, combined with certain business characteristics, makes the recognition of profits particularly non-continuous and the timing particularly open to management discretion in some industries. Typical business activities are those characterized by a long production cycle (several years) with revenue recognition at completion, or those in which the realization of holding gains is the main source of profit generation. The first situation is typical of the building and construction industry and the latter is typical of industries such as shipping, real estate and investment companies. The latter may also be true for conglomerates and mixed investment companies, as they can easily change the portfolio of companies or stocks that they hold.[34] To make it possible to test the validity of these assertions, the sample of firms has been divided into two groups as follows:

34 For a young research-oriented company in an early research or development phase without any marketable products, a recently published (negative) *ROE* would probably also constitute a particularly poor estimate of future performance.

| **Profit recognition** | **Discrete** | **Continuous** |
|---|---|---|
| Industries | • Building and construction industry<br>• Building, construction and real estate<br>• Real estate<br>• Shipping<br>• Investment companies<br>• Conglomerates and mixed investment companies | • All others |
| Number of firm-year observations | 1,043 | 1,702 |

Wilcox (1984) pointed at another dimension of short-term *ROE*-validity from a different point of departure. He performed empirical tests of a valuation model where he attempted to explain the market-to-book value of equity with expected *ROE*. He noted:

> *"Nor does the relationship work well for industries in which the past is a poor predictor. Thus the samples used in the study excluded companies with a five-year standard deviation in return on equity that exceeded 0.05."*
>
> Wilcox (1984, p. 61)

This argument relates directly to the statistical problem of an *ROE* prediction procedure that relies on historical performance. In line with this argument, the standard deviation of the last five years' annual *ROE* has been calculated as a measure of the *ROE* stability during the previous years.[35] In

35 For firms that only have observations for three or four consecutive years, the standard deviation has been calculated based on the available data. For firms with fewer than three consecutive *ROE* years, this classification has not been performed.

addition to Wilcox's cut-off point of 0.05, a cut-off point of 0.10 has also been established.[36]

| ***ROE* history** | **Criteria** | **Number of firm-years** |
|---|---|---|
| 'Stable' | Std $(ROE_{j,t}) \leq 0.05$ | 998 |
| 'Intermediate' | $0.05 <$ Std $(ROE_{j,t}) \leq 0.10$ | 698 |
| 'Turbulent' | Std $(ROE_{j,t}) > 0.10$ | 547 |
| Not classified | Less than 3 *ROE* years | 502 |
| Total | | 2,745 |

36 To check if there is an overlap between the two *ROE* validity dimensions, a cross-tabulation has been performed. The following table seems to confirm, in fact, that the two dimensions do not tell same story—there is no clustering of observations in any particular part of the table.

| **Profit recognition** | **Discrete** | | **Continuous** | | |
|---|---|---|---|---|---|
| ***ROE* history** | # firm-years | Percentage of row total | # firm-years | Percentage of row total | Total # firm-years |
| 'Stable' | 381 | 38.2% | 617 | 61.8% | 998 |
| 'Intermediate' | 269 | 38.5% | 429 | 61.5% | 698 |
| 'Turbulent' | 205 | 37.5% | 342 | 62.5% | 547 |
| Not classified | 138 | 37.5% | 314 | 62.5% | 502 |
| Total | 1,043 | 38.0% | 1,702 | 62.0% | 2,745 |

# 5.2 Measurement of changes in the economic climate

## 5.2.1 Inflation rate pattern

Figure 4.2 illustrated the annual change in the Swedish Consumer Price Index and the annualized monthly long-term interest rate. This information is supplemented below with a longer-term change in the consumer price index to illustrate three aspects of the Swedish inflation rate.

i) "Current inflation rate": The annual change in the Swedish CPI (the dotted and most fluctuating line in the figure).

ii) "Historical inflation rate": The rolling seven-year geometric average rate of inflation is illustrated by the bold unbroken line.[37]

iii) "Expected inflation rate": The long-term risk-free interest rate is often used as a proxy for the expected future inflation rate level (the thin unbroken line in the figure; note that a real risk-free component is usually subtracted in order to assess the expected inflation rate level).

37 Historical inflation rate: $\left(\frac{CPI_t}{CPI_{t-7}}\right)^{1/7} - 1$

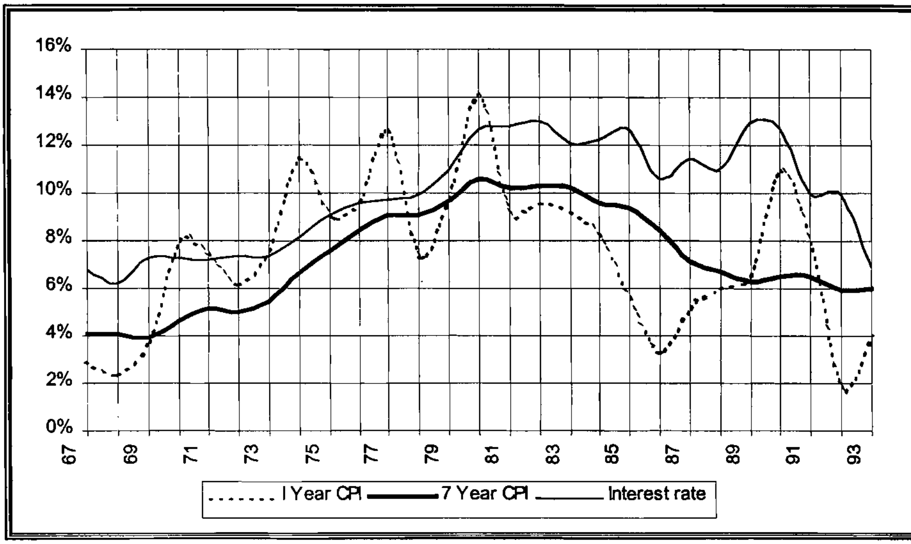


***Figure 5.1*** ***The dotted line illustrates the one year change in the Swedish Consumer Price Index (Δ CPI).***
***The bold unbroken line illustrates the annualized 7-year change in the Swedish CPI.***
***The thin unbroken line illustrates the annualized yield on government bonds. The yield is calculated as the rate of return that equates the bond price with the stream of remaining cash flows.***[38]

Relying chiefly on the smoother historic inflation rate pattern, a few inflation rate phases can be identified:

| | Period | Inflation rate characteristics |
|---|---|---|
| A | 1967 - 1972 | Low |
| B | 1973 - 1980 | Rising—low to high |
| C | 1981 - 1984 | High |
| D | 1985 - 1993 | Falling—high to medium |

In Johansson and Östman (1995, p. 131) it is stated that return on equity measures given historic cost accounting can be misleadingly overstated (as compared to current cost accounting *ROE*), particularly during the initial

38 Inflation rate figures obtained from the Statistical Yearbooks of Sweden, SCB and Findata.
Interest rate figures obtained from the Swedish National Bank–Statistical Yearbooks and Findata.

period following a significant fall in the rate of inflation. The consequences will be reversed if there is a significant increase in the rate of inflation. Basing expected *ROE* on reported earnings at a time when current *ROE* is deemed to poorly reflect performance, can have a detrimental effect on the significance of the coefficients in value regressions M.1 and M.2.

Johansson and Östman further maintain that the difference between the two accounting methods will be insignificant—even in inflationary periods—if monetary assets dominate a company's asset base.[39] Thus meaningful capital return comparisons can be made between, for example, banks and other companies with non-monetary assets that are only of minor importance. As the sample of firms in this study, does not include banks, and only relatively few companies with insignificant amounts of non-monetary assets (such as pure trading and retail companies), the inflationary 'problematic periods' will be expected to create general performance interpretation difficulties for most companies in the sample. However, these problems are expected to be especially important for companies that hold large amounts of assets with long economic lives, such as firms in the real estate, shipping and paper and pulp industries.

Two extreme samples have been chosen to test this hypothesis. Six of the 16 industries have been found to include firms that tend to hold large amounts of long-life assets. Five industries have been found to include firms with a smaller relative share of long-life assets.

| Industries in which firms tend to hold large amounts of long life-assets | Industries in which firms tend to hold small amounts of long-life assets |
|---|---|
| • Shipping | • Trading and retail |
| • Real estate | • Engineering |
| • Mixed real estate and construction | • Other production |
| • Paper and pulp | • Other service |
| • Capital-intensive service | • Consultants and computer |
| • Pure investment companies | |

The median fixed-asset-to-total-asset-ratios in these two groups were 0.67 and 0.27 (for 791 and 1,220 firm-year observations respectively). Furthermore, in order to maximize the difference between the two sub-

39 Ibid p. 132.

groups, both the least and the most fixed asset-intensive observations were excluded from each group.[40] Finally, any firms in the 'limited long-life sample' with an estimated *PMB* exceeding 0.50 have been excluded from this sample in order to minimize the potential effect of the inflation rate. This criterion reduced this final sub-sample to 644 firm-years.

### 5.2.2 Changes in the business climate

Level studies (valuation) often refer to the tendency of the regression coefficients to be unstable when data are run in cross-section at different points in time (see, e.g. Foster 1986 p. 445). Unstable coefficients may, however, be quite reasonable from an economic point of view. The general market belief concerning future prospects of growth and potential to retain (or eliminate) abnormal performance may be expected to be systematically different under varying business conditions. A simple *factor* that attempts to link *next period's* expected performance to *market value* could thus be expected to vary over time. The regression coefficient $\beta_1$, in valuation model specification M.1 and M.2, is an estimate of such a link, called the growth persistence factor (*GPF*) in this study. To investigate whether the fluctuations in the business cycle can be an important source for any instability in the mentioned regression coefficient in this study, an operationalization of the 'business cycle' is needed.

The overall business cycle descriptions in the "Business Tendency Surveys" published quarterly by the National Institute of Economic Research (Konjunkturinstitutet) consist of a weighted sum of the degree of full capacity utilization and labor shortage in the Swedish industrial sector. Figure 5.2 illustrates the level of this index from 1963 to 1994.[41] Particular industries may have led or lagged in this general pattern. Further precision regarding this issue could possibly have been reached by using industry-specific business cycle indexes. Such an effort will, however, not be considered.[42]

40 After excluding observations when the fixed-asset-to-total-asset-ratio was below and above 0.40 respectively, the sub-samples consisted of 701 and 992 firm-years, with median fixed-asset-to-total-asset-ratios of 0.70 and 0.25 respectively.

41 The level of the index has actually been measured three months after the end of the year to match the date of the market values being used in this study.

42 It should perhaps be mentioned that another shortcoming of the chosen index relates to the fact that it describes the Swedish business cycle. Several firms contained in this study operate to a large degree in a global market.

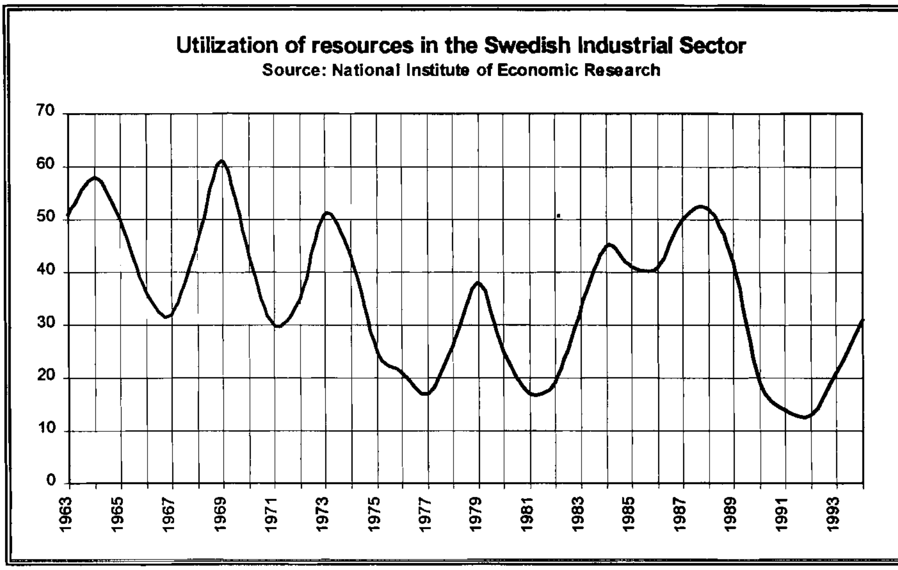


*Figure 5.2* ***The Swedish industrial resource utilization from 1963 to 1994 measured three months after the end of the year. The weighted sum of reported incidences of full capacity utilization and labor shortages in the Swedish industrial sector.***[43]

This figure shows that the length of the Swedish industrial business cycles has varied slightly over the period. Most cycles seem to have lasted four to six years, except during the 1980s when no deep recession were experienced.

Similar phases in the business cycle will be evaluated separately in order to investigate if any systematic differences regarding the regressions can be uncovered. All in all, five distinct '*low turning points*' seem to have occurred between 1967 and 1993, namely 1967, 1971, 1977, 1981, and 1992. Similarly four distinct '*high turnings points*' have occurred, namely 1969, 1973, 1979, and 1988. In the extended boom period of the 1980s, the minor turning points in 1984 and 1986 have thus been viewed to be non-distinct.

43 Source: "Business Tendencies Surveys", Swedish National Institute of Economic Research

Value change regression models M.4 and M.5 both rely on the assumption that the *GPF* coefficient is constant over time. If it is shown that the *GPF* coefficient tends to vary systematically between different business cycle phases, it should preferably be controlled for in the change specifications. Given the varying lengths of the cycles, such a control can only be performed for some of the longer value change windows. In appendix P, a classification of each point in time according to four categories—'Boom', 'Down', 'Recession' and 'Up'—is shown. The business cycle phases have subsequently been compared at the beginning and at the end of each possible five- and ten-year value change window. Unfortunately, the phases at the beginning and end of the windows have only coincided in four of the 21 five-year value change windows. In the ten-year value change windows, the business cycles have coincided at each end in nine of the 16 possible windows. The regression results of these nine windows will be studied separately in order to shed some light on the effects of running the proposed regression specifications both with and without control for changes in the business climate.

## 5.3 Description of accounting change

The purpose of this section is to provide detailed descriptions of the gradual change in, and the expected consequences of, some selected accounting measurements and disclosure issues. These issues are open disclosure of value and depreciation according to plan, group consolidation method and accounting for goodwill, and the accounting method for associated companies.

### 5.3.1 Open disclosure of value and depreciation according to plan

The transition in disclosure practice is particularly interesting for the firms in industries that hold relatively large amounts of depreciable assets.[44] To describe the gradual transition to open disclosure of values according to plan (i.e. open disclosure of the accumulated untaxed reserves related to depreciation for tax purposes in excess of depreciation according to plan), the relative frequency of firms with non-zero values of untaxed reserves related to accumulated depreciation on machinery and equipment, and ships and buildings has been calculated.[45]

Figure 5.3 illustrates i) that approximately only 10% of the firms disclosed untaxed reserves openly in 1967, ii) that a gradual transition to open disclosure occurred during the period leading up to 1985, and iii) that the strongest transition took place before 1980.[46] One problem in using Findata's variable number 128 to evaluate the transition of actual disclosure behavior, is that in some instances Findata has updated the historic data by including later disclosed information. With regard to untaxed reserves, the database often includes the new information at least one period before the first actual publication. In order to control for this, the actual annual reports

44 A prerequisite for reporting non-zero depreciation, in excess of normal depreciation, is that the firm holds assets that can be depreciated more aggressively for tax-purposes (and that the firm has generated sufficient profits to have a reason to utilize such an option). The following industries and companies have thus been excluded: trading and retail, consultants and computer, other service, investment companies, conglomerate and mixed investment companies and real estate.

45 Variable 128 in Findata's database.

46 The transition to open disclosure has been a two stage process for some firms. First these firms provided information in the income statement, and not until one or several years later was information given in the balance sheet.

were checked for the years surrounding the first year of disclosure as found in Findata. The result of this screening can be seen in the figure below (the dark area). Actual open disclosure was apparently published only in less than 5% of the firms in 1967.[47]

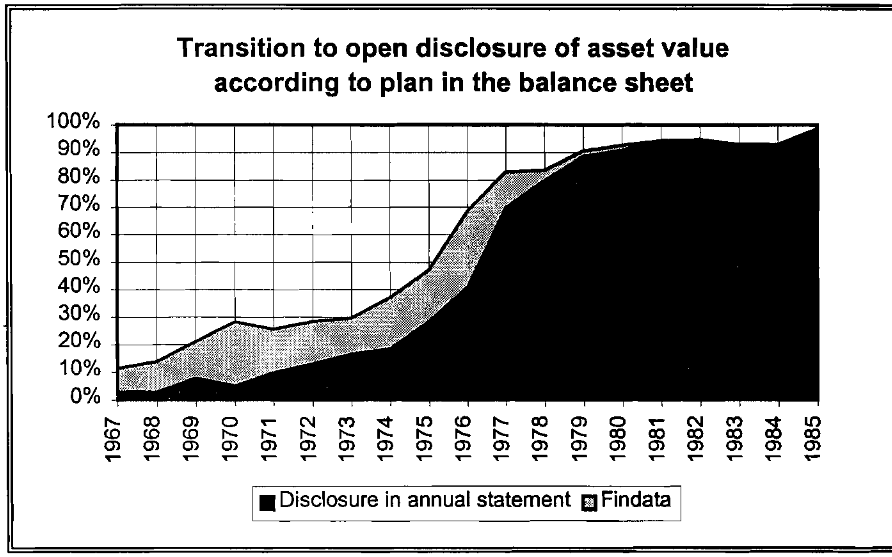


***Figure 5.3*** ***The relative frequency of firms with non-zero values of untaxed reserves related to accumulated depreciation of machinery and equipment, ships and buildings (variable 128 in Findata). The light gray area indicates the frequency of firms that in fact did not provide open disclosure according to a manual check of the firm's annual reports.***

Two ratios have been calculated, in order to quantify the potential effect of this accounting issue in terms of book value of equity and return on equity. The unbroken line in figure 5.4 illustrates the after-tax median accumulated depreciation in excess of depreciation according to plan (only the firms with a non-zero value have been included) divided by book value of equity (including the equity share of untaxed reserves).[48] The median ratio ranges

47 Using Findata's variable 128 to estimate disclosure behavior thus overstates the amount of open disclosure firms by approximately 10-20 percentage units for the years leading up to 1978.

48 $\frac{\text{VAR } 128_t \cdot (1 - \hat{\tau}_t)}{B_t}$

between 10 and 20% (for individual companies the variation is much larger). Assuming that the firms with non-open disclosure have similar values of hidden untaxed reserves, it is obvious that their book values are largely underestimated. Given the individual variation between firms, the uncertainty concerning a specific firm's underestimation can be expected to be significant. The broken line illustrates the median absolute after-tax effect of the reported changes in depreciation in excess of plan relative to opening period equity.[49] The level of this ratio is possible to interpret in relation to *ROE*. The median value ranged between 2 and 4% in this group of firms.[50] This obviously means that *ROE* measurement can be significantly affected (disturbed) for the non-open disclosure firms, provided that the same levels of depreciation in excess of plan also have been used among these firms.

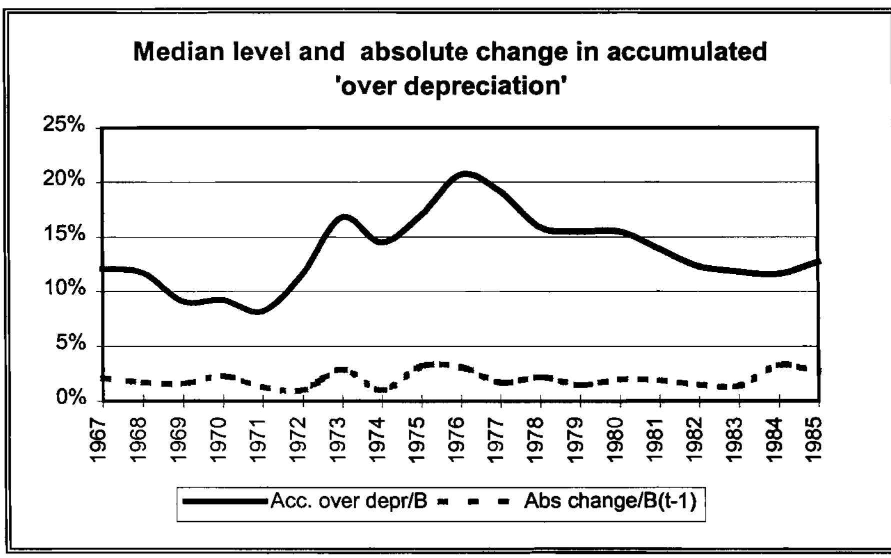


***Figure 5.4*** ***The unbroken line illustrates the after-tax median accumulated depreciation in excess of plan divided by book value of equity. The broken line illustrates the median absolute after-tax effect of the reported depreciation in excess of plan relative to opening period equity.***

49 $\frac{\text{VAR } 297_t \cdot (1-\hat{\tau}_t)}{B_{t-1}}$

50 This amounts to plus/minus 20 to 40% in comparison to an *ROE* of 10%. Note also that the variation between individual firms in particular years has been very large.

The regression models will be run separately on two samples which have been formed according to whether or not firms disclose openly.

### 5.3.2 Group consolidation methods—accounting for acquisitions and treatment of goodwill

To test whether the acquisition activity of a company in general, and the choice of an accounting group consolidation method in particular, affect the association between accounting data and stock prices, the actual acquisition activity and accounting methods used must first be identified.

Figure 5.5 illustrates the annual frequency of firms in the sample that have made a large acquisition.[51] The acquisition activity in general was very low until the early 1980s, but particularly intensive acquisition activity followed in 1983, and then from 1986-90. In some of these years, more than 20% of the firms made a large acquisition.

51 Large acquisitions have been defined according to one of two criteria:

$$\frac{Acquisition_t}{B_t} > 0.25 \quad \text{or} \quad \frac{GW_t - GW_{t-1} - GW_t^{Depr} - GW_t^{Write\text{-}off}}{B_t} > 0.10$$

Acquisition = Variable 343 (investment in shares and acquisitions) in Findata; unfortunately, this variable seems to be unreliably coded in the database.
GW = Variable 41 (accumulated goodwill), GW depr. = Variable 212 + 276, GW write-offs are identified in Rundfelt (1987, 88, 90, 91, 92 and 93). Note that the 'avoided' goodwill in connection with acquisitions paid by issues below market value, is also viewed as a goodwill write-off. Rundfelt's surveys focus essentially on the firms on the A lists, implying that some write-off firms among the OTC-listed firms may have been missed.

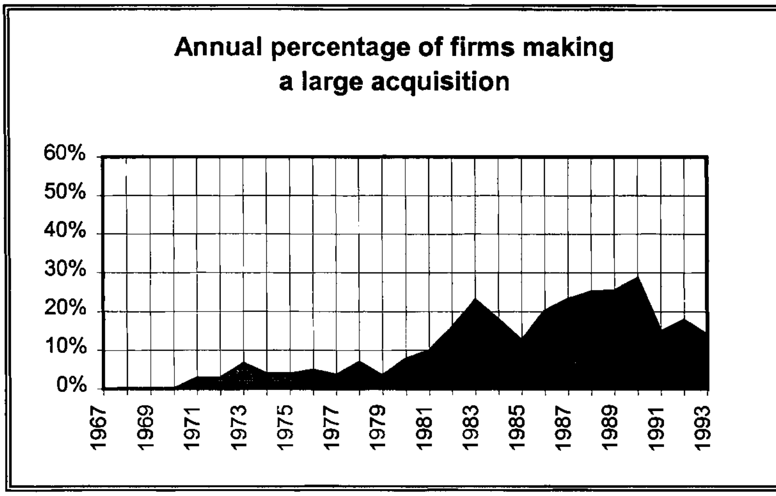


***Figure 5.5*** ***Annual percentage of the firms in the total sample that make a large acquisition. (See footnote for definition of large.)***

The first figure in appendix Q illustrates the transition in chosen consolidation method over the period 1967 to 1993.[52] While the pooling (par) method was apparently the most common method in the late 1960s, the purchase method gradually took over during the 1970s. The second figure in appendix Q illustrates the steadily increasing number of firms that report goodwill in their financial report (more than 50% of firms in 1993). This development is, of course, a combined result of increased acquisition activity and the transition to the purchase method.

The increasing importance of goodwill as an item in the income statement is illustrated in the third figure in appendix Q. The annual (arithmetic) mean of each goodwill reporting firm's goodwill depreciation divided by opening book value of equity has been calculated. The size of this number can directly be related to the value of *ROE*. Observe the steady growth from 0 to 2.5%. This shows that the reported *ROE* has been reduced on average by 2.5 percentage points for the group of firms that reported goodwill as an asset in

52 Findata has coded different group consolidation methods in variable 336. The relative frequency has been calculated for groups only.

the early 1990. The last figure in appendix Q illustrates the relative frequency of large goodwill write-offs amongst these firms.[53]

It is obvious from these graphs that the late 1980s were unique in terms of significant acquisition activity and diverse accounting treatment of the acquired goodwill. How can these phenomena be expected to affect the association between the accounting descriptions of these firms and the level and change of the firms' stock prices?

The reliance on traditional conservative accounting and the purchase method for group consolidation means that a company that grows organically will have different levels of book value of equity, earnings and *ROE* compared with a similar company achieving its growth via several acquisitions. These differences will be particularly pronounced if the business activity uses either long-lived tangible assets, and/or treats large expenditures that could qualify as investments in intangible assets by immediate expensing. Traditional conservative accounting and organic growth create the type of measurement biases discussed at length in this thesis. It has been argued that for a company that grows at a steady pace and holds a balanced portfolio of its resources, the size of this accounting measurement bias will be permanent (in a relative sense). A company that is involved in large acquisitions, and uses the purchase method to account for its business activities, will at least temporarily reduce these accounting measurement biases as the (new) tangible assets are revalued to current acquisition cost and acquired intangible assets are capitalized under the heading of goodwill. Thus one effect of the use of this accounting method is that it obviously 'disturbs' the old reference points for different ratios of financial performance and financial structure.[54] A write-off of acquired goodwill can be viewed as a partial reintroduction of the accounting measurement bias. This reintroduction, however, may increase the comparability of the firm's financial ratios to other firms. In the late 1980s, many financial analysts and business magazines such as Affärsvärlden,

53 The firms that have reported a goodwill write-off were identified in Rundfelt (1987, 88, 90, 91, 92 and 93).

A large goodwill write-off has been defined as $\frac{GW_t^{Write-off}}{B_{t-1}} > 0.10$

54 This is evident when comparisons are made with a peer group of non-acquiring firms or the acquiring firm's own history.

adjusted the financial numbers in this way for all firms, presumably in order to gain increased comparability. Which accounting method that is associated with the best statistical map between the share price and the accounting numbers is an empirical question.

The expected effect of acquisition activity and the use of the purchase method on the main variables of this study's regression specifications, can quite easily be inferred. The mean market-to-book value premium of firms that have recently made large acquisitions is expected to be smaller than the mean premium for similar firms that have not made recent acquisitions.

$$Mean\left(\frac{M_t}{B_t}-1\right)^{Acq} < Mean\left(\frac{M_t}{B_t}-1\right)^{No\ Acq}$$

Similarly, the mean premium is expected to be larger for the firms that have recently made a large goodwill write-off.

$$Mean\left(\frac{M_t}{B_t}-1\right)^{No\ Write\text{-}off} < Mean\left(\frac{M_t}{B_t}-1\right)^{Write\text{-}off}$$

In terms of regression specification M.2, a relatively smaller regression coefficient associated with the *PMB* ($\beta_2$) is expected for the group of acquiring firms in general, but in particular for the firms that have chosen not to write off the acquired goodwill. In terms of the valuation model, as previously discussed in Section 3.3.1, the relatively lower book value of equity that is associated with a goodwill write-off, will be 'compensated' for by higher future earnings and thus higher future *ROE* ratios. A powerful procedure for predicting future *ROE* that takes these accounting differences correctly into account, should ensure that the regression coefficient that is intended to capture the expected persistence of abnormal performance ($\hat{\beta}_1$ in regression specification M.1 and M.2) remains unaffected. Relying, however, on a performance prediction procedure that uses the most recent level of *ROE* as its starting point, the slope coefficient and the regression's explanatory power cannot be expected to be unaffected. An observation that was quoted in Section 3.3.1[55] pointed at the general difficulty involved in understanding and analyzing companies that were continuously restructured via the purchase and sale of different subsidiaries. The analytical obstacles (generating uncertainty of future performance) that are thus likely to result from acquisition activity in general, combined with the uneven practice of goodwill accounting, can be expected to result in $\hat{\beta}_1$-coefficients in M.1 and M.2, being comparatively low (with low significance), generating simultaneously comparatively low $R^2$ of the regression specifications.

In terms of the value change regression specification M.4, similar problems related to the change in expected residual income variable may be expected, resulting in comparatively lower and less significant $\hat{c}_2$-coefficients for a group of acquiring firms. The negative change in book value of equity resulting from a write-off of goodwill can be expected to generate a $\hat{c}_1$-coefficient that is negative during the write-off year for a group of write-off firms, assuming that the write-offs are not perceived to represent real reductions in value.[56] The $\hat{c}_1$-coefficient should regain its expected normal positive value (close to 1.0) in the years following such a write-off.

Empirical tests of the validity of these assertions will be presented in Chapters 7 and 8.

### 5.3.3 Accounting for associated companies

Figure 5.6 below illustrates both the frequency of firms in the sample that hold shares in associated companies and the relative share of firms that have chosen a particular accounting method.[57] The relative drop in associated company frequency in 1984 is due to the inclusion of OTC firms from that year and onwards. Holding shares in associated companies is apparently

55 From FAR's Survey of Accounting Practices 1987, p. 14.

56 If the write-off, on the other hand, is perceived to represent a real reduction in value, the regression coefficient should receive a 'normal' value of approximately 1.0.

57 Identification of associated companies has been performed using variable 239 (dividends paid from associated companies), variable 234 (profit share after tax in excess of dividend paid, reported in the income statement), and variable 235 (profit share after tax in excess of dividend paid, disclosed in the notes). Note that only the frequency of firms that use the equity method, and given the cost method, the firms that disclose profit shares in the notes, have been presented in the figure. An additional number of firms use the cost method without providing profit share information in the notes.

much more common among the larger firms on the A-lists. It is noteworthy that some firms used the equity method as early as in 1972, but the main change, however, did not begin until the early to mid 1980s. Towards the end of the period studied, the equity method has dominated.

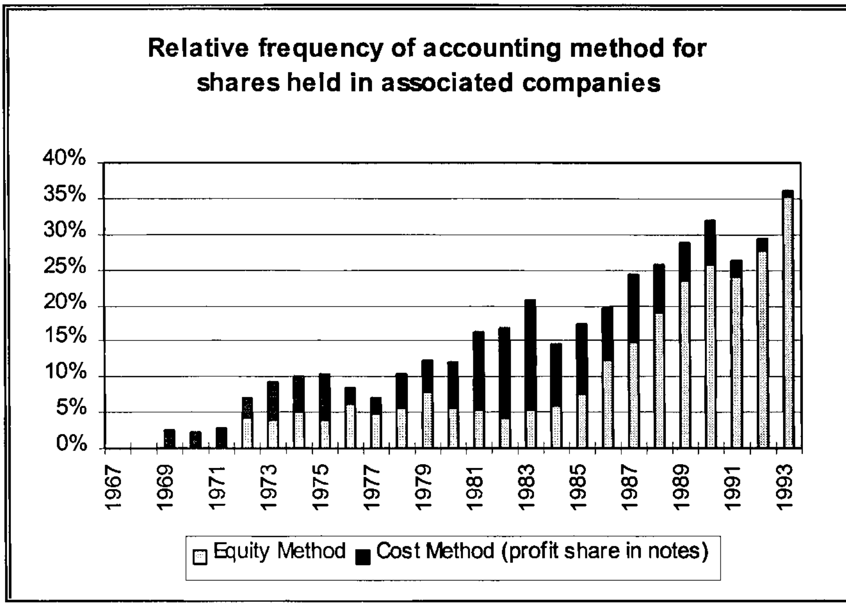


***Figure 5.6*** ***Relative frequency of firms in the sample that hold shares in associated companies and the relative share of firms choosing a particular accounting method***

Figure 5.7 illustrates the median consequence in terms of reported *ROE* related to how firms have chosen to account for associated firms. Firms using the equity method show a median positive *ROE* effect between 0 and 2% (but a negative median effect during the recession in the early 1990s). The 'hidden' *ROE* effect (only reported in the notes) related to the cost method has been quite similar during most of the period (1983 being an exception).

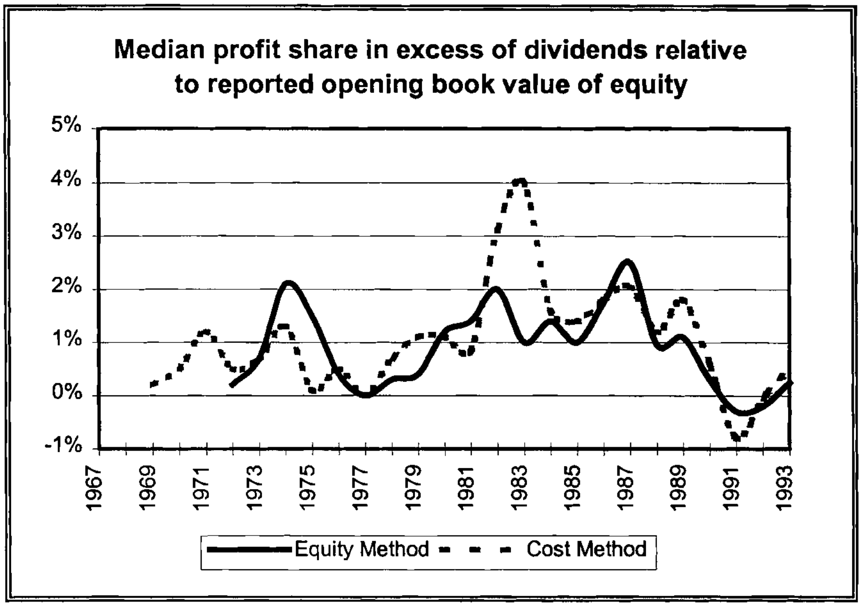


***Figure 5.7*** ***The median profit share in excess of paid dividends relative to reported opening book value of equity for firms reporting according to the equity method and the cost method.***

The size of these median *ROE* effects implies that investors who base their valuation of firms utilizing *ROE* from published annual statements can receive different signals of a firm's performance, depending on how the company has chosen to account for their associated companies (if the information in the notes is not utilized). As noted previously in Section 3.3.1.4, a company switching to the equity method, besides being likely to show a higher *ROE*, will also simultaneously show a higher book value of equity.

In order to investigate if the variables of the regression specifications M.1 to M.5, and/or the resulting regression coefficients are systematically affected by a switch from the cost method to the equity method, the actual switch year will first need to be identified. Observations from the switch year, and from the two years before and after the switch will then be analyzed separately.

# 6 REGRESSION VARIABLES

## 6.1 Calculation of the main variables for the specified regression models

### 6.1.1 Market-to-book value premiums

The dependent variable in M.1 and M.2 is the market-to-book value premium, that is the ex-dividend market value divided by the ex-dividend book value, reduced by one. Ex-dividend book value at the end of December each year follows the definition in Section 4.2.1.3. Ex-dividend market value is measured at the end of March each year to ensure that the market has had a chance to incorporate at least the information contained in a press announcement of unaudited annual earnings. Findata's definition of market value has been used,[1] that is the last bid price (on the most traded type of share) multiplied by the total number of shares outstanding at the same date. The market value has been reduced by deducting proposed dividends (typically to be paid in May).[2]

1 NYC # 143 in Finlis.

2 At first, this measurement procedure appears to be unproblematic. A number of measurement problems may, however, be identified. Firstly, a measurement mismatch can occur if a firm issues new stock during the three-month time span, January to March, creating an 'unfair' comparison between the market and the book value. Using information in Findata, 20 such issues could be identified. To correct this mismatch, the book values of the issues were identified and added to the year-end book values of equity. While this correction was being made, an unfortunate shortcoming in Findata's market value calculation procedure was discovered. If several issues occurred at different times during the same year, or if an issue later the same year was followed by a stock dividend, the number of shares outstanding has not been correctly matched with the actual stock prices during the period in between the two issues. This error can lead to a significant overstatement of a firm's market value. Four such instances were identified and, with very helpful assistance from Erik Eklund at Findata, corrected manually.

Another measurement issue relates to the fact that many firms have several classes of shares outstanding. Findata's market value calculation uses the price of the most traded share, multiplied by the total number of shares outstanding. A voting power difference between so-called A and B shares has sometimes lead to non-trivial price differences on the two types of shares. According to a study by Rydqvist (1987) the annual cross-

The calculation of the market-to-book value premium for firm *j* at time *t* can thus be written as follows:

$$[6:1] \qquad \frac{M^*_{j,t}}{B^*_{j,t}} - 1 = \frac{M_{j,March:t+1} - D_{j,May:t+1}}{B_{j,Dec:t} - D_{j,May:t+1} + N_{j,Jan\ to\ March:t+1}} - 1$$

Table 6.1 shows annual market-to-book value statistics for the full sample.

sectional mean of the voting-power premium varied between 1.4% and 6.1% between 1975 and 1985; for individual firms at particular points in time the premium did, however, exceed 40% (see table 5.9 in Rydqvist 1987). The most traded share-type has predominantly been the lower valued B shares. This means that the Findata calculated market value generally excludes a potential 'voting-power premium'. As the proposed valuation model utilized in this study does not capture 'voting-power issues' this is probably also a reasonable choice. An alternative market value calculation would utilize detailed information of the market price and the number of outstanding shares of each type. Given the lack of such data, however, it would involve very cumbersome manual calculations. Furthermore, one could argue that these calculations of a total market value, as a multiple of the share price times the number of shares outstanding, in any sense is fictional, not necessarily perfectly representing an expected transaction value of the whole stock of shares.

Furthermore, two measurement complications can be noted. If a firm happens to have traded subscription right certificates outstanding (due to an ongoing new issue) at a market valuation point in time, the market value of the firm's equity may be underestimated. Underestimation of the market value of equity may also be caused by the existence of other financial instruments with non-trivial value, e.g. convertible debt being 'deep into the money' (having a stock price that significantly exceeds the striking price). Neither of these problems are, however, expected to have serious effects on this study.

**Table 6.1 Annual statistics for the market-to-book value premium. The last row contains the same statistics for all firm-years.**

| | | $\frac{M^*_{j,t}}{B^*_{j,t}}-1$ | | |
|---|---|---|---|---|
| Year | Median | Mean | Std | $N$ |
| 1967 | –0.31 | –0.13 | 0.48 | 39 |
| 1968 | –0.05 | 0.09 | 0.55 | 39 |
| 1969 | –0.30 | –0.18 | 0.35 | 42 |
| 1970 | –0.35 | –0.24 | 0.39 | 43 |
| 1971 | –0.09 | 0.13 | 0.73 | 70 |
| 1972 | –0.09 | 0.12 | 0.65 | 72 |
| 1973 | –0.03 | 0.18 | 0.69 | 76 |
| 1974 | –0.16 | 0.04 | 0.64 | 79 |
| 1975 | –0.03 | 0.13 | 0.61 | 78 |
| 1976 | –0.12 | 0.02 | 0.60 | 83 |
| 1977 | –0.29 | –0.15 | 0.57 | 86 |
| 1978 | –0.35 | –0.08 | 0.76 | 88 |
| 1979 | –0.33 | –0.06 | 0.78 | 89 |
| 1980 | –0.14 | 0.18 | 0.93 | 91 |
| 1981 | 0.02 | 0.45 | 1.18 | 92 |
| 1982 | 0.68 | 1.13 | 1.34 | 95 |
| 1983 | 1.00 | 1.45 | 1.34 | 96 |
| 1984 | 0.51 | 0.80 | 1.10 | 152 |
| 1985 | 0.67 | 0.96 | 1.11 | 161 |
| 1986 | 1.15 | 1.67 | 1.91 | 164 |
| 1987 | 1.13 | 1.73 | 2.22 | 169 |
| 1988 | 1.64 | 2.33 | 2.65 | 168 |
| 1989 | 1.10 | 1.78 | 2.29 | 166 |
| 1990 | 0.43 | 0.77 | 1.40 | 151 |
| 1991 | 0.00 | 0.25 | 1.16 | 129 |
| 1992 | –0.10 | 0.13 | 0.92 | 119 |
| 1993 | 0.51 | 0.81 | 0.97 | 108 |
| **Total** | **0.38** | **0.76** | **1.60** | **2,745** |

In figure 6.1 the frequency distribution of all the calculated market-to-book value premiums is shown (2,745 firm-year observations). The bulk of observations clusters around a premium between –0.5 and 1.0. The distribution of observations obviously does not follow the normal distribution. Observations below –1.00 are not possible, whereas a number of quite extreme positive observations are present (including 10 firm-year observations outside the boundaries of the graph).[3]

3 The maximum market-to-book value premium observation is 20.4 in 1989, for a real estate company called Lodet. The same company has three more observations exceeding 10. To check for the presence of outliers caused by errors in the market-to-

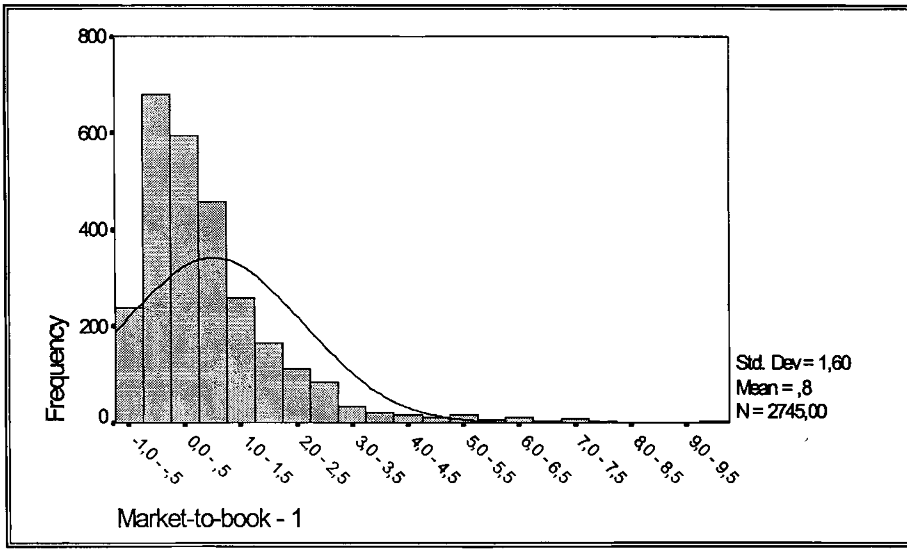


***Figure 6.1*** ***Frequency distribution of calculated market-to-book value premium for all firm-years. Ten observations with premiums exceeding 10 are not included in the graph.***

### 6.1.2 Prediction of *ROE* for the next period—in practice

In Section 4.2.3.3 different potential prediction procedures of *ROE* for the next period were discussed. In this section, the *S*-shaped model (P3) will be evaluated on the data presented in Section 4.2.1.5. The estimation of the parameters for the *S*-shaped model is performed in two (iterative) steps. The value of $a_2$ that maximizes the explanatory power of the following linear function is searched for:[4]

[6:2] $$\left(ROE_{j,t+1} - \hat{\rho}_{j,t} - \hat{\gamma}_j\right) = a_1 \cdot X_{j,t} + \tilde{\varepsilon}$$

where

book value calculation, a firm specific check was performed. The size of all the premiums was ranked on individual firm level. Firm-years when the most extreme premium(s) deviated significantly from the second (or third) most extreme premium were then closely analyzed. Extreme observations from approximately 20 firms were identified. None of these observations was found to be incorrect.

4 See Freeman and Tse (1992) for further discussion of this two-stage approach.

[6:3] $$X_{j,t} \equiv \arctan\left[\left(ROE_{j,t} - \hat{\rho}_{j,t} - \hat{\gamma}_j\right) \cdot a_2\right]$$

The regression has been specified without an intercept to be consistent with prediction model P3.[5]

The estimation of the market's cost of equity capital ($\rho_t$) follows the presentation in Section 4.2.2. All the firms in the sample have an accounting year ending in December. Investors are assumed to be aware of the firms' previous year's accounting performance at the end of March (the following year)—communicated via a press release of unaudited annual earnings or an early annual report. The end of March has also been used as the measurement date of market value in the regression specifications M.1 to M.5. Consistent with these choices, $\rho_{j,t}$ has also been measured at the end of March. This means that the long term government bond rate and Findata's 48-month firm specific market beta have been measured at this date every year. In order not to lose observations, beta has been assumed to be equal to 1.0 during the first four years (= 48 months), after the firm has been listed. $\gamma_j$ varies between industries, but has been set constant over time.

All *ROE* observations from 1967 until 1993 have been used in a pooled time-series and cross-sectional regression. Actual *ROE* (adjusted for the 'hurdle rate') for 1967 has thus been compared to the similarly adjusted actual *ROE* for 1968; similarly, 1968 has been compared to 1969 and so on until 1993. To assess the robustness of the regression results, the sample has been divided into three separate time periods, in two *ROE* history groups, and two profit recognition groups.[6] The following linear regression has finally also been estimated on the same data as a benchmark.

[6:4] $$\left(ROE_{j,t+1} - \hat{\rho}_{j,t} - \hat{\gamma}_j\right) = b_1 \cdot \left(ROE_{j,t} - \hat{\rho}_{j,t} - \hat{\gamma}_j\right) + \tilde{\varepsilon}$$

---

5 The same regression specification has also been run including an intercept. The inclusion of an intercept yielded generally marginally higher $R^2$'s, and estimated intercepts close to zero.

6 The classification of firms according to *ROE* history and profit recognition has been discussed in Section 4.3.1.4, under the heading *ROE* validity.

Note that [6:4] is equal to [6:2] when $a_2$ approaches zero. This means that the *S*-shaped regression will always generate explanatory power that is at least as high as the linear regression. If the *S*-shaped model dominates the linear model, the degree of domination can be assessed in terms of the differences in the regression's $R^2$. Regression results are presented in table 6.2.[7]

**Table 6.2** **The results of the ordinary least square regressions of [6:2] and [6:4]. The first column shows the period studied. The following columns include the regression coefficients of the two models. The number of observations in each regression is marked *n*. The last column indicates alterations from the full-sample-all-years specification.**

| | *S*-shaped function | | | | Linear function | | | |
|---|---|---|---|---|---|---|---|---|
| Period | $\hat{a}_1$ | $\hat{a}_2$ | $\hat{a}_1 \cdot \hat{a}_2$ | $R^2$ | $\hat{b}_1$ | $R^2$ | $n$ | Sample |
| 1967 → 93 | 0.25** | 3.56 | 0.90 | 0.23 | 0.50** | 0.14 | 2,490 | **Full sample** |
| 1961 → 77 | 0.69** | 1.16 | 0.80 | 0.39 | 0.76** | 0.38 | 617 | *Early* |
| 1977 → 85 | 0.25** | 3.52 | 0.89 | 0.32 | 0.51** | 0.18 | 761 | *Middle* |
| 1985 → 93 | 0.23** | 4.05 | 0.94 | 0.17 | 0.46** | 0.10 | 1,112 | *Late* |
| | | | | | | | | ***ROE* Validity** |
| 1967 → 93 | → ∞ | → 0 | 0.94 | 0.35 | 0.94** | 0.35 | 934 | *ROE* History **'Stable'** |
| 1967 → 93 | 0.30** | 3.18 | 0.96 | 0.28 | 0.56** | 0.19 | 1,057 | *ROE* History **'Interm. or Turbu.'** |
| 1967 → 93 | 0.23** | 3.87 | 0.87 | 0.21 | 0.42** | 0.12 | 1,545 | Profit recognition **'Continuous'** |
| 1967 → 93 | 0.29** | 3.21 | 0.94 | 0.26 | 0.67** | 0.21 | 945 | Profit recognition **'Discrete'** |

A one-sided test for slope coefficients.
* significant at $0.01 < \alpha < 0.05$
** significant at $\alpha < 0.01$

7 The regressions have been run using the statistics and spread sheet functions in EXCEL 7.0. $a_2$ has initially been set as an arbitrary constant. $X_{j,t}$ is calculated in one column of cells using $a_2$, actual $ROE_{j,t}$, estimated $\rho_{j,t}$ and $\gamma_j$, and the arctan transformation according to [4:2]. $ROE_{j,t+1}$ minus $\rho_{j,t}$ and $\gamma_j$ is calculated in a parallel column of cells. [4:3] is then run as an ordinary least square regression (OLS). Using the iterative '*problem solver function*' in EXCEL, the level of $a_2$ that maximizes the regression's $R^2$ has been located.

The first column shows the period studied. The following columns include the regression coefficients of the two models. The product of $a_1$ and $a_2$ is also presented, as it indicates the slope of the regression close to the origin. The product is thus comparable to the slope coefficient of the linear regression ($b_1$). The explanatory power ($R^2$) of both regressions for each alteration is presented in separate columns. The number of observations in each regression is marked $n$. The last column indicates alterations from the full-sample-all-years specification.

The regression results support the hypothesis of a general mean reversion tendency in the development of *ROE*. Both $b_1$ and $a_1 \cdot a_2$ are less than one. However, the linear function indicates a rather strong mean reversion tendency ($b_1$ = 0.50 for the full sample), whereas the *S*-shaped function indicates weak mean reversion for normal *ROE* ($a_1 \cdot a_2$ = 0.90) and stronger mean reversion for more extreme *ROE* ($a_1$ in the full sample is 0.25). Fitting a straight line to data with a number, extreme observations with a particularly strong mean reversion will tend to give a low slope coefficient. Furthermore, the explanatory power of the *S*-shaped function is almost twice as high in comparison to the linear function (23% versus 14%).

Separating the data in three sub-periods, an early period (1967-77), a middle period (1977-1985), and a late period (1985-93), further support the dominance of the *S*-shaped function.

Separating the data according to historical stability in *ROE* generated interesting results. For the sub-sample of firms with a 'stable' *ROE* history (std(*ROE* $\leq$ .05)), the relationship is best described by the linear function, but with a slope coefficient of 0.94. This slope coefficient is similar to the close-to-the-origin slope coefficients of the *S*-shaped function achieved when the more turbulent firms were included in the regression. For the sub-sample of firms with an 'intermediate or turbulent' *ROE*-history (std(*ROE* > .05)), the relationship is best described by the *S*-shaped function. The explanatory power is 28% versus 19%, and the slope coefficient close-to-the-origin of the *S*-shaped function ($a_1 \cdot a_2$) is much higher than slope coefficient of the linear function (0.94 versus 0.56). These results further support the hypothesis of a mild mean reversion tendency at 'normal' levels of *ROE*, but a stronger mean reversion tendency at more extreme levels.

Splitting the sample according to the profit recognition categories 'continuous' versus 'discrete', the *S*-shaped function performs best for both categories.[8]

In summary, the regression results support the hypothesis of one period persistence in *ROE*, with a small mean reversion tendency in *ROE* for non-extreme levels and a larger mean reversion tendency for extreme levels. Hence, the use of the *S*-shaped prediction model (P3), rather than the linear models P1 or P2, is supported.

The choice of 'suitable' levels of $a_1$ and $a_2$ could follow two strategies:

1. Use different estimated coefficients for different years.
2. Estimate $a_1$ and $a_2$ once, and use these coefficients for the whole period of study.

To prevent the prediction procedure from becoming too complicated, the same coefficients for all periods have been used. The estimated slope coefficients of the full sample have been used, hence the prediction function of next periods *ROE* can finally be written as in [6:5]:

[6:5] $$E_t\left[R\tilde{O}E_{j,t+1}\right] = \hat{\rho}_{j,t} + \hat{\gamma}_j + 0.25 \cdot \arctan\left[\left(ROE_{j,t} - \hat{\rho}_{j,t} - \hat{\gamma}_j\right) \cdot 3.56\right]$$

8 Several other re-runs of the regressions were done to check how sensitive the regression results are to the use of a firm-specific risk measure ($\beta_{j,t}$) (as opposed to no risk differentiation between firms (beta = 1)), the inclusion of a firm-specific expected permanent measurement bias ($\gamma_j$), and the choice of the risk premium (5% vs. 3% and 0%). The results are summarized in the table below. As can be seen, the regression results vary very modestly between the different specifications.

| | *S*-shaped function | | | | Linear function | | | |
|---|---|---|---|---|---|---|---|---|
| Period | $\hat{a}_1$ | $\hat{a}_2$ | $\hat{a}_1 \cdot \hat{a}_2$ | $R^2$ | $\hat{b}_1$ | $R^2$ | $n$ | Alterations |
| 1967 → 93 | 0.25** | 3.56 | 0.90 | 0.23 | 0.50** | 0.14 | 2,490 | Base case |
| 1967 → 93 | 0.26** | 3.48 | 0.89 | 0.22 | 0.50** | 0.14 | 2,490 | $\beta_{j,t} = 1$ |
| 1967 → 93 | 0.24** | 3.68 | 0.88 | 0.24 | 0.48** | 0.17 | 2,490 | $\gamma_j = 0$ |
| 1967 → 93 | 0.24** | 3.63 | 0.86 | 0.24 | 0.47** | 0.16 | 2,490 | Risk prem. = 3 % |
| 1967 → 93 | 0.22** | 3.86 | 0.83 | 0.24 | 0.43** | 0.18 | 2,490 | Risk prem. = 0 % |

### 6.1.3 Expected residual return

A key independent variable in regression model M.1 and M.2 is the expected residual return. This variable was specified in Chapter 2 (note that $\gamma_{j,t}$ is equal to zero in M.1):

$$[2{:}35] \qquad E_t\left[R\tilde{R}_{j,t+1}\right]=\frac{E_t\left[R\tilde{O}E_{j,t+1}\right]-\rho_{j,t}-\gamma_{j,t}}{1+\rho_{j,t}}$$

A prediction model for the expected return on equity for the next period was specified in the previous section:

$$[6{:}5] \qquad E_t\left[R\tilde{O}E_{j,t+1}\right]=\hat{\rho}_{j,t}+\hat{\gamma}_j+0.25\cdot\arctan\left[\left(ROE_{j,t}-\hat{\rho}_{j,t}-\hat{\gamma}_j\right)\cdot 3.56\right]$$

Combining these two functions achieves:

$$[6{:}6] \qquad E_t\left[R\hat{R}_{j,t+1}\right]=\frac{0.25\cdot\arctan\left[\left(ROE_{j,t}-\hat{\rho}_{j,t}-\hat{\gamma}_j\right)\cdot 3.56\right]}{1+\hat{\rho}_{j,t}}$$

In figure 6.2 below, the frequency distribution of all the calculated expected residual return estimates is showed (2,745 firm-year observations).[9] A normal distribution curve is also drawn in the figure, based on the mean and standard deviation of the observations (–3.4% and 8.5%, respectively). The shape of the actual distribution indicates a slight leptokurtic pattern, that is, too many observations close to the mean and tails that are 'too fat' compared to the normal distribution. Note that the negative mean means that the generated average *ROE* has not reached the estimated hurdle rate (the cost of equity capital plus the return measurement bias); this can partly be explained by the chosen *ROE* definition that excludes the on average positive extraordinary items.[10]

9 A useful side-effect of the prediction procedure is that it also serves as a truncation rule. The potential problem with outliers is thus alleviated.

10 In order to check for sensitivity [6:6] was re-calculated without firm-specific risk differentiation (beta = 1), without the inclusion of a firm-specific expected permanent measurement bias ($\gamma_j = 0$) and with *ROE* including extraordinary items ($ROE^C$). The correla-

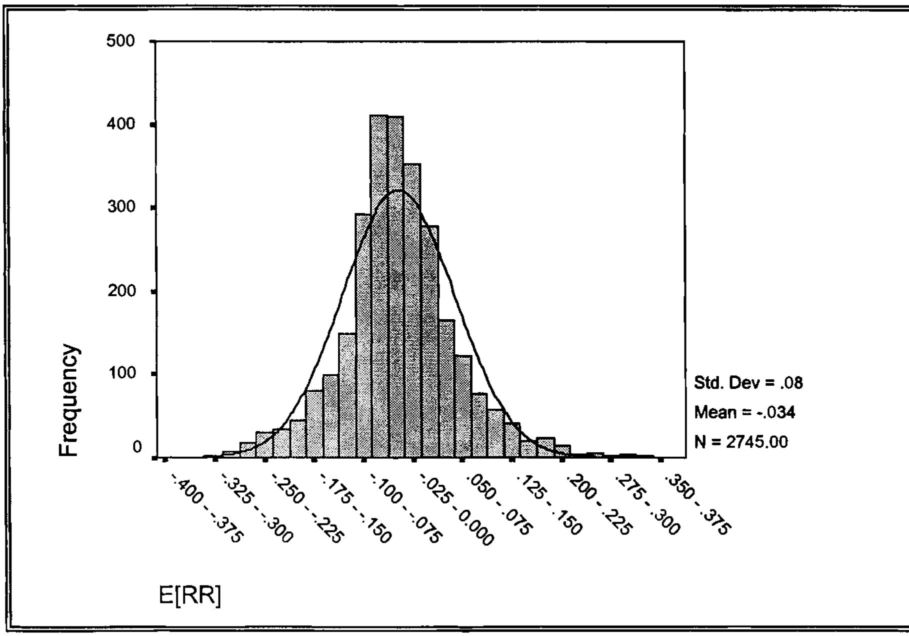


***Figure 6.2*** ***Frequency distribution of calculated expected residual return for all firm-years.***

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tion coefficients amounting to 0.99 (see table below) imply that the attempted 'fine-tuning' related to risk-differentiation and the inclusion of an annual measurement bias neither adds nor distorts the *discriminating* ability of the performance measure. However, the choice of earnings definition has a more significant impact.

The pairwise correlation coefficients for all firm-year observations estimated using [6:6] and different specifications.

| | Base-case | $\beta_{j,t} = 1$ | $\gamma_j = 0$ | $ROE^C$ | Mean | Standard-deviation | $N$ |
|---|---|---|---|---|---|---|---|
| Base-case | 1.0 | 0.994 | 0.997 | 0.819 | -3.4% | 8.5% | 2,745 |
| $\beta_{j,t} = 1$ | | 1.0 | 0.991 | 0.815 | -3.6% | 8.4% | 2,745 |
| $\gamma_j = 0$ | | | 1.0 | 0.817 | -2.3% | 8.6% | 2,745 |
| $ROE^C$ | | | | 1.0 | -1.7% | 9.7% | 2,745 |

### 6.1.4 Calculation of the dependent and independent variables for the change specifications

The same calculations as described for the level specification above have in general been used for all the individual components in the change specifications: market value and book value of equity, earnings, *ROE*, cost of equity capital, expected residual return, and *PMB*. The calculations are, however, performed on a per share basis. The estimated number of shares outstanding adjusted for stock splits and stock dividends (NYC # 19 in Findata) has been used.[11]

#### *6.1.4.1 The change in market value*

The variable to explain in regression specifications M.3, M.4 and M.5 is the change in the share price for periods ranging between one and ten years. Value change has been measured from the last trading day in March of a certain year until the last trading day at the end of March 1, 2, 5 and 10 years later. Price has been measured as the ex-dividend market value divided by the number of shares outstanding. Figure 6.3 shows the distribution of annual price changes for the whole sample, ($p_{j,t}$ denotes price per share). As can be seen from the figure, there are a few extreme positive observations—with an annual price change exceeding 150%. These few extreme observations may have a large impact on ordinary least square regressions, and for this reason the regressions will also be run using a reduced sample.

11 Findata's adjustment procedure follows the recommendation by the Swedish Association for Financial Analysts (SFF). Manual corrections have been made, when issues between January and March have occurred.

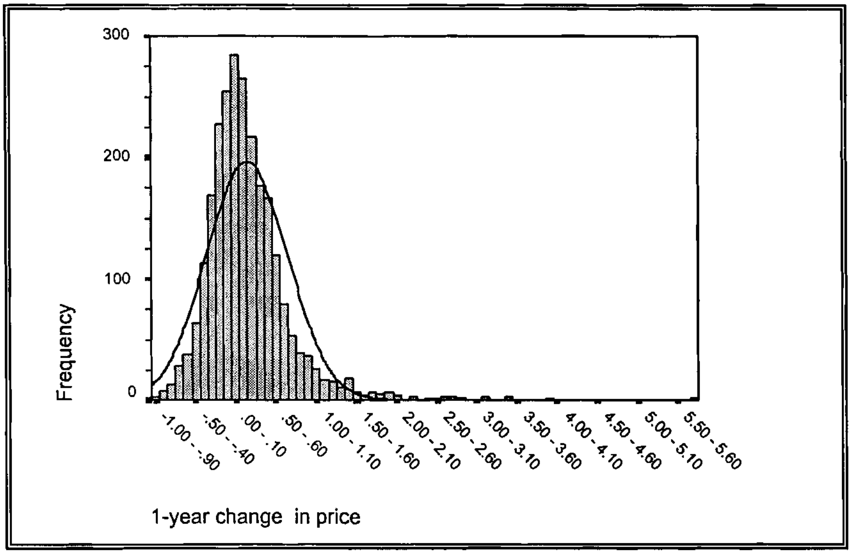


*Figure 6.3* *Frequency distribution of annual price changes for all firm-years.*

Table 6.3 provides summary data for the period lengths studied. Note that the number of extreme firm-year observations (more than two standard deviations from the mean) comprise less than 3% of the data for all time periods.

**Table 6.3 Summary data on periodical price change for the full sample.**

| $\frac{p_{j,t+k} - p_{j,t}}{p_{j,t}}$ | Median | Mean | Std | Maximum | Minimum | $N$ |
|---|---|---|---|---|---|---|
| 1 year | 0.12 | 0.19 | 0.51 | 5.79 | –0.93 | 2,483 |
| 2 years | 0.23 | 0.41 | 0.90 | 11.43 | –0.99 | 2,223 |
| 5 years | 0.71 | 1.35 | 2.20 | 28.96 | –0.99 | 1,539 |
| 10 years | 3.15 | 5.01 | 6.91 | 103.88 | –0.79 | 801 |

### *6.1.4.2 The change in book value*

The change in ex-dividend book value per share ($b_t$), divided by opening share price, has been calculated for all observations. Figure 6.4 illustrates the distribution of the variable for the whole sample, and shows a large concentration of observations close to the mean. It is also interesting to note that the mean change in book value of equity is approximately half the size of the mean change in the share price. This appears to be the case for both short and long periods. There are also a number of extreme observations (some of these are outside the boundaries of the histogram). Minimum and maximum observations along with other summary statistics for all the periods are provided in table 6.4.

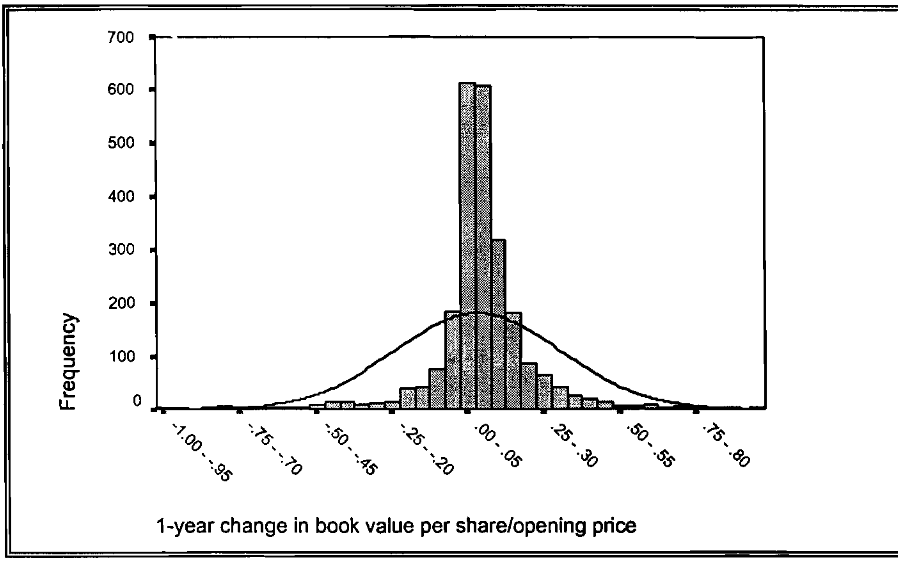


***Figure 6.4*** ***Frequency distribution of annual change in book value of equity per share divided by opening period price for the full sample.***

**Table 6.4** **Summary data on change in book value of equity per share divided by opening period price for the full sample.**

| $\frac{b_{j,t+k} - b_{j,t}}{P_{j,t}}$ | Median | Mean | Std | Maximum | Minimum | $N$ |
|---|---|---|---|---|---|---|
| 1 year | 0.06 | 0.06 | 0.27 | 2.03 | –3.29 | 2,483 |
| 2 years | 0.14 | 0.16 | 0.34 | 2.53 | –2.67 | 2,223 |
| 5 years | 0.51 | 0.66 | 0.73 | 7.09 | –2.99 | 1,539 |
| 10 years | 1.84 | 2.41 | 2.71 | 30.91 | –3.48 | 801 |

### *6.1.4.3 The change in expected residual income*

Firm-specific estimates of expected residual return, calculated as illustrated in Section 6.1.3, have been multiplied by the book value of equity per share to gain an estimate of expected annual residual income. The change (difference) in expected residual income per share between two points in time has then been divided by the opening share price.[12] The same procedure has been used for the 2, 5 and 10 year change calculations. Figure 6.5 illustrates the distribution of annual change in residual income for the whole sample. As can be seen from the figure, a large concentration of observations are found close to the mean. Furthermore, the mean is close to zero, the distribution is symmetric (but not normally distributed), and the occurrence of extreme cases is rather small (about 2 percent of the observations). The variable has been constructed to measure changes in the ability to create value. In a 'good news' versus 'bad news' sense, in the terminology of Ball and Brown, a zero mean of this variable indicates that the average signal contains 'no news'.

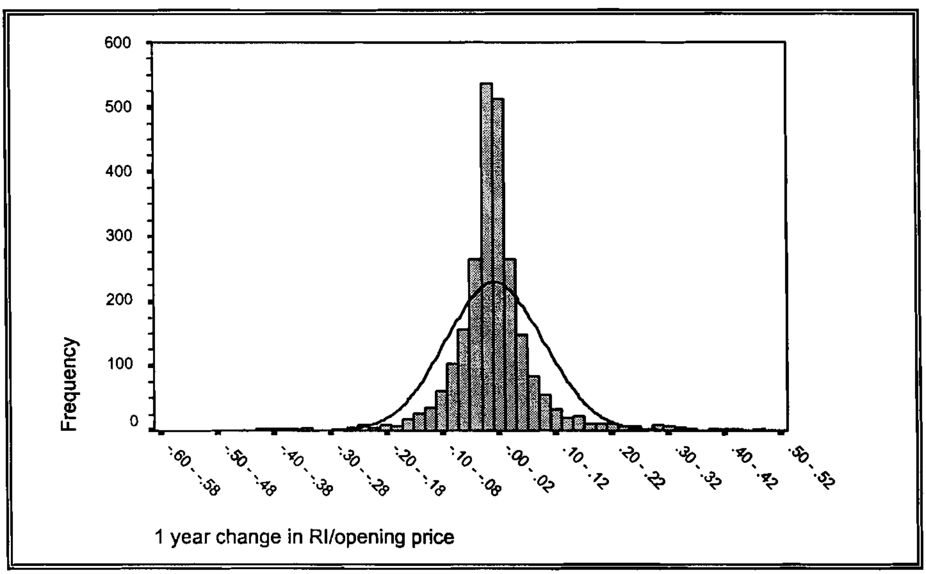


***Figure 6.5*** ***Frequency distribution of the annual change in expected residual income per share divided by opening period price for the full sample.***

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12 See Section 2.5.2 for more details regarding this specification.

Table 6.5 provides summary data for all the periods studied. Note that the mean change is negative for the longer periods, especially for the 10 year period. This is not surprising, however, given the design of the variable and an on average estimated negative residual return (see Section 6.1.3) combined with growth in equity (which especially over a 10-year period may be very large, see table 6.4 for summary data).

**Table 6.5 Summary data on change in expected residual income per share divided by opening period price for the full sample.**

| $\frac{\Delta RI}{P}$ | Median | Mean | Std | Maximum | Minimum | $N$ |
|---|---|---|---|---|---|---|
| 1 year | 0.00 | 0.00 | 0.09 | 0.71 | –0.60 | 2,483 |
| 2 years | 0.00 | 0.00 | 0.11 | 1.46 | –0.63 | 2,223 |
| 5 years | –0.02 | –0.01 | 0.17 | 2.44 | –0.77 | 1,539 |
| 10 years | –0.09 | –0.07 | 0.52 | 9.45 | –2.62 | 801 |

$$\frac{\Delta RI}{P} = \frac{E\left[RI_{j,t+k+1}\right] - E\left[RI_{j,t+1}\right]}{P_{j,t}}$$

### *6.1.4.4 The change in book value times the PMB*

In regression specification M.5, a multiple of the change in book value of equity and the estimated level of the industry- (firm-) specific permanent measurement bias (*PMB*) has been added as an explanatory variable.[13] The calculation of this variable is straightforward, given the calculated change in book value and the estimated *PMB*s. Given no expected measurement bias this variable amounts, of course, to zero. Figure 6.6 illustrates the distribution of annual book value changes multiplied by the estimated *PMB*s for the full sample.

13 See Section 2.5.2 for more details regarding this specification.

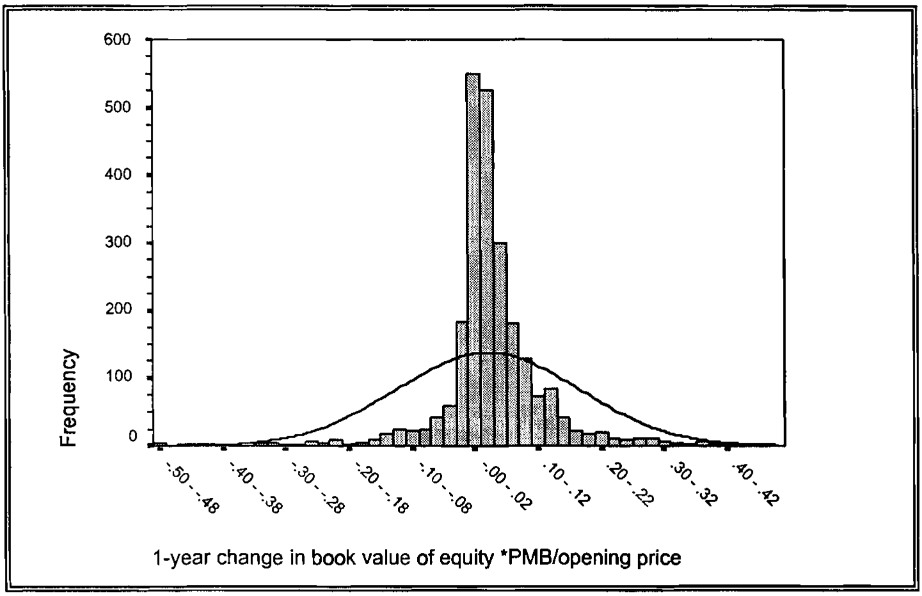


*Figure 6.6* ***Frequency distribution of annual change in book value of equity per share times the estimated industry-specific PMB divided by opening period price for the full sample.***

# Part III

# EMPIRICAL RESULTS

# 7 EMPIRICAL RESULTS: THE LEVEL APPROACH

The level specifications, M.1 and M.2, and the change specifications, M.3 to M.5, have all been modeled as linear equations and they will be evaluated using an ordinary least square (*OLS*) approach. This statistical regression approach has been commonplace in previous market-based accounting research (MBAR). The relative level of the explanatory power ($R^2$) of linear regressions has often been used as a key metric in MBAR (see e.g. the often quoted review article by Lev [1990]). Furthermore, the size and significance (relative $t$-values) of the so-called 'earnings response coefficients' (*ERC*) have been widely discussed in most published MBAR. This study will rely on the same statistical method. It should, however, be emphasized that this statistical approach is rather sensitive to the properties of the data utilized.[1]

As a first step in Section 7.1, the simple bi-variate regression model M.1 has been evaluated. This model specification is consistent with an accounting procedure with no accounting measurement bias. Regressions have been run both annually in cross-section and in pooled time series and cross-section, first for the full sample of firms and subsequently for different sub-samples. The sub-samples have been based on the previously presented firm characteristics. In Section 7.2 the same regressions have been repeated, using regression specification M.2 including the permanent measurement bias. Sections 7.3 and 7.4 present regression results evaluating different changes in the economic climate and some accounting issues.

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1 See appendix R for a discussion of some critical aspects related to this study. For a general discussion, see an econometrics text book, such as Gujarati (1988) or Greene (1993).

# 7.1 Regression model M.1

M.1 $$\frac{M_{j,t}}{B_{j,t}} - 1 = \alpha + \beta_1 \cdot E_t\left[\widetilde{RR}_{j,t+1}\right] + \tilde{\varepsilon}_{j,t}$$

## 7.1.1 The full sample

In table 7.1 the annual regression results for the full sample of firms are presented. This presentation format will be used in several tables that follow. The years in the table refer to the book value year-end. As explained earlier, the market value is measured three months into the following year. The last two rows contain the mean of all the annual regressions and the regression results for a pooled regression of all firm-year observations, respectively. *t*-statistics are provided in the parenthesis next to each coefficient estimate. These *t*-statistics give an indication of the precision of the coefficient estimate. As the 'true' limit for significance judgment is uncertain, statements of significance must be judged cautiously. Nevertheless, the degree of significance given conventional limits for the 5 percent and 1 percent levels are provided, and distinguished by one (*) or two asterisks (**). $R^2$ denotes the explanatory power of the independent variable, that is the variation in the market-to-book value premium that can be explained by the expected residual return variable. The number of observations in each regression is provided in the last column.

**Table 7.1 Annual regression results for regression specification M.1 using the full sample.**

| YEAR | $\hat{\alpha}$ | $\hat{\beta}_1$ | $R^2$ | $n$ |
|---|---|---|---|---|
| 1967 | 0.13 (1.7) | 7.23 (5.4)** | 44.3% | 39 |
| 1968 | 0.21 (2.9)** | 6.72 (5.2)** | 42.3% | 39 |
| 1969 | -0.14 (-3.1)** | 3.98 (5.1)** | 39.4% | 42 |
| 1970 | -0.10 (-1.7) | 5.54 (4.4)** | 32.1% | 43 |
| 1971 | 0.46 (6.3)** | 12.54 (8.4)** | 51.1% | 70 |
| 1972 | 0.21 (3.0)** | 5.66 (4.4)** | 21.4% | 72 |
| 1973 | 0.12 (1.5) | 3.80 (2.9)** | 10.0% | 76 |
| 1974 | 0.04 (0.5) | 0.27 (0.3) | 0.1% | 79 |
| 1975 | 0.19 (3.1)** | 4.22 (4.6)** | 22.0% | 78 |
| 1976 | 0.18 (3.1)** | 5.01 (7.0)** | 37.8% | 83 |
| 1977 | 0.07 (1.0) | 3.49 (5.0)** | 23.1% | 86 |
| 1978 | 0.15 (1.7) | 3.96 (4.3)** | 17.7% | 88 |
| 1979 | 0.11 (1.3) | 4.36 (4.2)** | 16.8% | 89 |
| 1980 | 0.44 (4.3)** | 5.75 (4.8)** | 20.3% | 91 |
| 1981 | 0.77 (6.8)** | 8.87 (6.5)** | 32.0% | 92 |
| 1982 | 1.41 (11.2)** | 8.24 (6.1)** | 28.3% | 95 |
| 1983 | 1.54 (11.6)** | 4.65 (3.2)** | 9.9% | 96 |
| 1984 | 0.84 (9.9)** | 4.87 (4.5)** | 11.8% | 152 |
| 1985 | 1.00 (11.9)** | 4.31 (3.8)** | 8.1% | 161 |
| 1986 | 1.69 (11.4)** | 3.11 (1.8)* | 2.0% | 164 |
| 1987 | 1.74 (10.2)** | 2.43 (1.1) | 0.7% | 169 |
| 1988 | 2.36 (11.3)** | -1.93 (-0.7) | 0.3% | 168 |
| 1989 | 1.76 (9.9)** | -2.66 (-1.3) | 1.1% | 166 |
| 1990 | 0.80 (6.8)** | 1.20 (1.0) | 0.7% | 151 |
| 1991 | 0.63 (5.6)** | 5.72 (5.8)** | 21.2% | 129 |
| 1992 | 0.45 (4.2)** | 3.35 (4.3)** | 13.9% | 119 |
| 1993 | 0.88 (9.8)** | 2.74 (4.0)** | 13.2% | 108 |
| Mean | **0.66** | **4.35** | **19.3%** | **102** |
| Pooled | 0.86 (28.1)** | 4.40 (12.8)** | 5.6% | 2,745 |

$t$-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

The slope coefficient ($\hat{\beta}_1$) is positive and significant at the 1 percent level for 21 of the 27 annual regressions. $\hat{\beta}_1$ varies between 2.74 and 12.54 for these years. $\hat{\beta}_1$ is non-significant in the regression of 1974 and in a series of years between 1987 and 1990. The overall mean of $\hat{\beta}_1$, for all annual regressions is 4.35, which in turn is very similar to the pooled regression coefficient (4.40).

The slope coefficient can be interpreted as an estimate of the average growth persistence factor (*GPF*). Recall that the *GPF* in valuation specification [2:16] was constructed from the components i) expected persistence in abnormal performance (with a 'fading-factor' ($\lambda$) and length of time ($T$) as sub-components), ii) expected growth ($G$=1+$g$), and iii) the cost of equity capital ($\rho$). Formally the *GPF* was specified as follows in Chapter 2:

$$[2:36] \qquad GPF = \left( \frac{1 - \left( \frac{G \cdot \lambda}{1+\rho} \right)^{T}}{1 - \left( \frac{G \cdot \lambda}{1+\rho} \right)} \right)$$

Table 2.3a-e in Chapter 2 provides an illustration of how different combinations of these components together generate different levels of the factor. Table 2.3c, for example, shows that a ten-year period with abnormal performance that gradually fades away with a fading speed of 0.80, combined with an annual growth rate between 10 to 15% generates a *GPF* in the range between 4.0 and 4.5 (given a cost of equity of 15%). The same level of *GPF* is also consistent with 5 years of a permanent ($\lambda$ = 1) abnormal *ROE* level and an annual growth rate amounting to between 5 and 10%.

The intercept ($\hat{\alpha}$) is often close to zero until 1980; from this year onwards $\hat{\alpha}$ is significantly positive in all regressions. On average $\hat{\alpha}$ amounts to 0.66.

The average explanatory power of all the annual regressions is 19.3%. A striking result is that the expected residual return has no or very limited explanatory power during the period 1983 to 1990. This is also the case for 1973 and 'especially' 1974.

The pooled regression gives strongly significant regression coefficients $\hat{\alpha}$ = 0.86 and $\hat{\beta}_1$ = 4.40 (with $t$-statistics = 28.1 and 12.8 respectively); the explanatory power is, however, as low as 5.6%.

The unstable and partly weak results in table 7.1 are not unexpected. A heterogeneous group of firms is studied over a period of time that is characterized by important changes in accounting practice and economic climate. The use of a simple regression specification and a crude approach for estimating the expected next period return (based on previous year's performance) are other influential factors. The relative importance of each of these factors will be elaborated on in the following sections.

### 7.1.2 Sub-sample regressions controlling for different expected validity of historical *ROE* and *GPF* levels

The complete results of all performed regressions will not be presented. However, table 7.2 contains the results of several pooled cross-sectional and time-series regressions and table 7.3 contains the mean of repeated annual cross-sectional regressions of some selected sub-samples.

Two dimensions of the validity of historical *ROE* as a base for prediction of next period performance were discussed and operationalized in Section 5.1.4. One dimension related to whether profit recognition could be expected to occur continuously or to follow a more discrete pattern. The other dimension related to the stability of the firm's profitability.

Pooled regressions have first been estimated for individual sub-samples. Subsequently, three pooled regressions have been estimated controlling for the first *ROE* validity criterion. Three pooled regressions have then been estimated with the data divided according to the estimated *GPF* criteria.[2]

Finally a *'homogenized sub-sample'* has been specified. This sub-sample consists of firms from industries with a continuous profit recognition, firm-years with a non-turbulent *ROE* history, and firm-years with medium expected *GPF*. The purpose of using this sub-sample is to establish if the elimination of firm-years that are expected to be most extreme, in the specified *a priori* dimensions, improves the explanatory power of the regression specification and if it increases the stability of the regression coefficients.

2 The operationalization and estimation of different subgroups related to the expected *GPF* were performed in Section 5.1.3.

Should this be the case, it indicates the relevance of the dimensions and suggests that this homogenized sample may be a better base-sample for some of the later regressions testing accounting change issues. The annual regression results given this last sample specification are provided in table 7.4.

**Table 7.2 Summarized pooled regressions for different sub-samples of firms using regression model M.1.**

| Sample characteristics | $\hat{\alpha}$ | $\hat{\beta}_1$ | $R^2$ | $n$ |
|---|---|---|---|---|
| Full sample | 0.86 (28.1)** | 4.40 (12.8)** | 5.6% | 2,745 |
| | | | | |
| Profit rec. = Continuous | 0.65 (22.8)** | 5.38 (16.2)** | 13.4% | 1,702 |
| Profit rec. = Discrete | 1.22 (18.3)** | 3.91 (5.5)** | 2.9% | 1,043 |
| | | | | |
| *ROE* hist. = Stable | 0.80 (14.3)** | 5.76 (5.4)** | 2.8% | 998 |
| *ROE* hist. = Intermediate | 0.96 (14.6)** | 5.74 (6.8)** | 6.2% | 698 |
| *ROE* hist. = Turbulent | 0.80 (12.5)** | 3.12 (7.0)** | 8.2% | 547 |
| | | | | |
| Profit rec. = Continuous & | | | | |
| *ROE* hist. = Stable | 0.55 (15.4)** | 10.90 (14.5)** | 25.5% | 617 |
| *ROE* hist. = Intermediate | 0.78 (11.5)** | 7.86 (8.7)** | 15.1% | 429 |
| *ROE* hist. = Turbulent | 0.68 (9.2)** | 2.64 (4.9)** | 6.7% | 342 |
| | | | | |
| E[*GPF*] = Low | 0.90 (7.3)** | 3.47 (5.1)** | 6.6% | 367 |
| E[*GPF*] = Medium | 0.85 (25.2)** | 5.71 (10.4)** | 4.6% | 2,246 |
| E[*GPF*] = High | 0.42 (2.4)** | 9.62 (5.5)** | 18.9% | 132 |
| | | | | |
| Homogenized sample | 0.62 (16.8)** | 10.42 (14.7)** | 18.8% | 941 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

**Table 7.3 Mean of annual regressions for different sub-samples of firms. The last column summarizes how often the slope coefficients are significant.**[3]

| Sample characteristics | $\hat{\alpha}$ | $\hat{\beta}_1$ | $R^2$ | $n$ | Proportion of significant $\hat{\beta}_1$ years |
|---|---|---|---|---|---|
| | | | | | $\alpha \leq 0.05$ |
| Full sample | 0.66 | 4.35 | 19.3% | 102 | 81.5% |
| Profit rec. = Continuous | 0.51 | 5.12 | 26.9% | 63 | 85.2% |
| Profit rec. = Discrete | 1.03 | 3.57 | 11.5% | 44 | 47.8% |
| Homogenized sample | 0.54 | 8.54 | 31.9% | 38 | 96.0% |

## Continuous versus discrete profit recognition

The short-term validity of a firm's *ROE* is expected to be relatively low for firms belonging to industries where a significant source of the value creation is due to the realization of holding gains or the result of revenue recognition at completion of long production cycle projects. The distinction between firms belonging to industries classified as having continuous versus discrete profit recognition is thus a way of testing whether the value relevance of *ROE* is different for firms with different business characteristics.[4]

The regression results for the firms belonging to the discrete profit recognition industries are clearly weaker. The E[*RR*] variable has a significant positive coefficient (at the 5 percent level) in less than half of the annual regressions. It is further notable that the E[*RR*] variable is insignificant every year from 1984 to 1993. In the continuous profit recognition subgroup, however, more than 85% of the annual regressions have a significant slope coefficient at the same level of significance.[5] Furthermore, the mean of the explanatory power of the regressions is less than half for the discrete

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3 A minimum of 10 observations have been required for each annual regression. This requirement has led to the regression coefficients from the early years (1967 - 1972) not being included in all mean calculations.

4 Bear in mind that the 'holding-gain-intensive' industries are also likely to have a large permanent measurement bias (given the realization principle); this is why regression specification M.1 is expected to be under-specified.

5 At the 1 percent significance level, the difference between the two sub-samples is even more pronounced.

profit recognition subgroup of firms, as compared to the continuous subgroup (11.5% vs. 26.9%). In the pooled regressions this pattern is even more pronounced (2.9% vs. 13.4%).

### Relative stability in *ROE* history

The rationale behind dividing the firm-year observations into three subgroups depending on the relative stability of the most recent (five) years' reported *ROE*, relates to the estimation procedure of the expected next year *ROE*. A stable history is assumed to be associated with more reliable predictions.

It is notable that all three subgroups of firm-years show low statistical association, with similar levels of the slope coefficient. If any trend regarding the level of $R^2$ can be traced, it is in the opposite direction as compared to *a priori* expectations (slightly higher $R^2$ the more unstable the *ROE* history). Given the results discussed in the previous paragraph, one could argue that a stable *ROE* track-record may be the result of a chosen smooth recognition policy of profits in 'holding-gain-intensive' firms, rather than actual stable value creation. This argument is supported by the regressions controlling for different profit recognition characteristics. Results are reported for the pooled sample in table 7.2. The $R^2$ is 25.5%, 15.1% and 6.7% for the stable, intermediate, and the turbulent *ROE* history groups respectively, when only continuous profit recognition industries are included in the regressions.

Another interesting result from the regressions dividing the sample according to historical *ROE* stability, is the size of the slope coefficients. More stable historical returns seem to be associated with larger *GPF*s ($\hat{\beta}_1$ = 10.9, 7.9 and 2.6 for the stable, intermediate, and the turbulent *ROE* history groups respectively, when only continuous profit recognition industries are included in the regressions). This result is consistent with stating that investors expect higher persistence in abnormal performance (*T* being larger and/or the fading factor ($\lambda$) being larger (closer to one)) for firms that have shown a higher stability in past *ROE* values.

### Expected *GPF*

In Section 5.1.3 the sample of firms was divided into three categories with regard to the *a priori* expected level of the *GPF*. A group of high expected *GPF* firm-years was identified using the combined selection criteria of high historic growth and a track-record of positive residual return. Low expected *GPF* firms-years were similarly selected as firm-years when the most recent *ROEs* were either extremely high or low. These selection criteria did not provide a sufficient number of observations in the extreme groups to make annual regressions meaningful. The results of three pooled regressions are, however, provided in table 7.2.

The level of the estimated *GPF* coefficients ($\hat{\beta}_1$ = 3.5, 5.7 and 9.6 for the low, medium, and the high *GPF* groups respectively) supports the validity of the classification. Note, however, that the exclusion of extreme expected *GPF* firm-years actually slightly reduces the overall explanatory power as compared to the full sample ($R^2$ = 4.6% versus 5.6%). On the other hand, the two subgroups classified as having extreme *GPF* firm-years show improved statistical association.

### A homogenized sample—combining *ROE* validity criteria and controlling for extreme *GPFs*

A homogenized sub-sample meeting the following criteria has been selected: i) The firm belongs to an industry classified as having continuous profit recognition, ii) the firm has a non-turbulent *ROE* track-record (the standard deviation of the past five years has not exceeded 10%), and iii) the expected growth persistence factor is classified as being medium. The results of running regressions with these sample characteristics are found in the last row of the summary tables above, in a complete annual presentation in table 7.4, and the annual regression results are contrasted with the full sample regression results in figures 7.1, 7.2 and 7.3.

**Table 7.4 Annual regression results for regression specification M.1 using observations from the homogenized sub-sample.**

| YEAR | $\hat{\alpha}$ | $\hat{\beta}_1$ | $R^2$ | $n$ |
|---|---|---|---|---|
| 1967 | | | | |
| 1968 | | | | |
| 1969 | −0.12 (−2.0) | 4.01 (3.1)** | 26.3% | 29 |
| 1970 | −0.10 (−1.5) | 5.65 (3.3)** | 27.5% | 31 |
| 1971 | 0.33 (4.0)** | 11.74 (6.4)** | 56.4% | 34 |
| 1972 | 0.06 (0.9) | 5.08 (3.5)** | 27.9% | 34 |
| 1973 | −0.04 (−0.5) | 8.75 (3.5)** | 22.1% | 45 |
| 1974 | −0.11 (−1.2) | 3.77 (2.0)* | 9.6% | 38 |
| 1975 | 0.06 (0.9) | 5.05 (3.3)** | 24.5% | 36 |
| 1976 | 0.09 (1.3) | 6.15 (4.3)** | 38.5% | 31 |
| 1977 | −0.01 (−0.1) | 5.56 (4.3)** | 39.6% | 30 |
| 1978 | 0.04 (0.4) | 8.60 (5.2)** | 48.5% | 31 |
| 1979 | −0.14 (−2.3)* | 5.44 (4.9)** | 40.2% | 38 |
| 1980 | 0.12 (1.8) | 6.99 (6.7)** | 53.9% | 40 |
| 1981 | 0.25 (2.3)* | 6.50 (4.2)** | 31.8% | 39 |
| 1982 | 1.41 (6.5)** | 16.53 (5.0)** | 40.2% | 39 |
| 1983 | 1.10 (8.3)** | 10.80 (3.9)** | 28.2% | 40 |
| 1984 | 0.36 (4.4)** | 4.56 (2.4)** | 14.1% | 38 |
| 1985 | 0.68 (7.6)** | 9.21 (4.8)** | 40.1% | 37 |
| 1986 | 1.24 (9.0)** | 9.64 (3.2)** | 16.3% | 55 |
| 1987 | 1.20 (9.9)** | 9.71 (3.6)** | 17.7% | 61 |
| 1988 | 1.82 (5.4)** | 5.65 (0.8) | 1.3% | 57 |
| 1989 | 1.46 (8.1)** | 13.99 (3.8)** | 22.9% | 51 |
| 1990 | 0.97 (5.3)** | 14.01 (5.0)** | 38.0% | 43 |
| 1991 | 0.96 (3.9)** | 13.94 (4.2)** | 44.8% | 24 |
| 1992 | 1.05 (4.6)** | 16.80 (5.4)** | 61.5% | 20 |
| 1993 | 0.73 (5.3)** | 5.39 (2.5)* | 26.3% | 20 |
| **Mean** | **0.54** | **8.54** | **31.9%** | **38** |
| **Pooled** | 0.62 (16.8)** | 10.42 (14.7)** | 18.8% | 940 |

$t$-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \le \alpha \le 0.05$

** Significant at $\alpha \le 0.01$

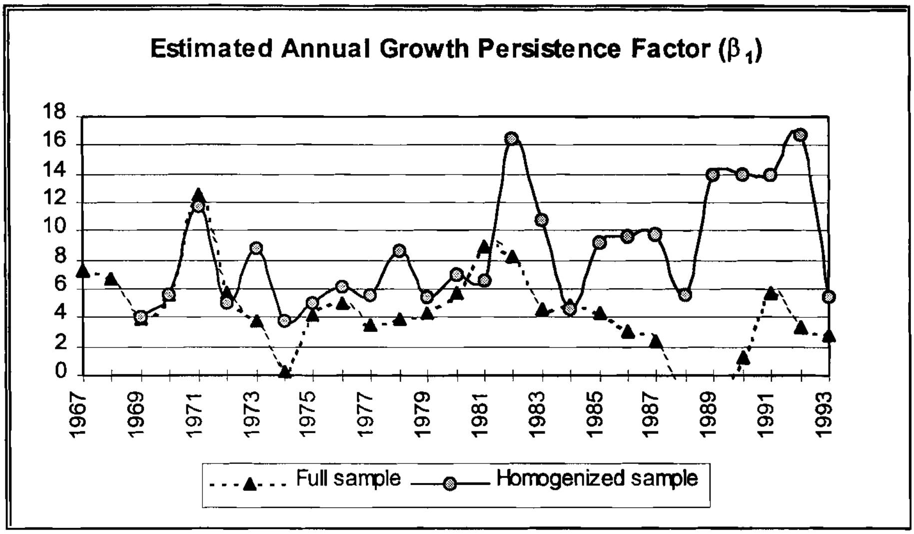


*Figure 7.1* ***The estimated annual growth persistence factor ($\hat{\beta}_1$) for the full and homogenized sample of firms.***

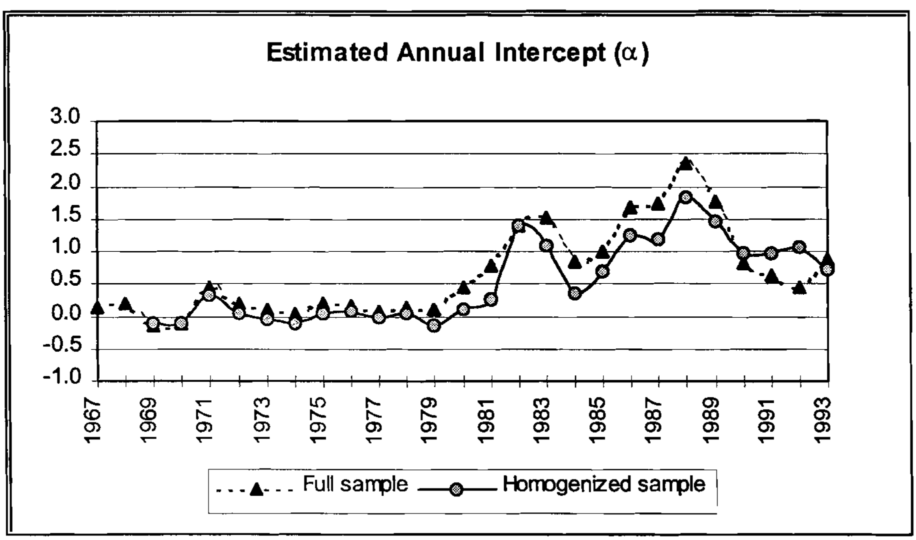


*Figure 7.2* ***The estimated annual intercept (α) for the full and for the homogenized sample of firms.***

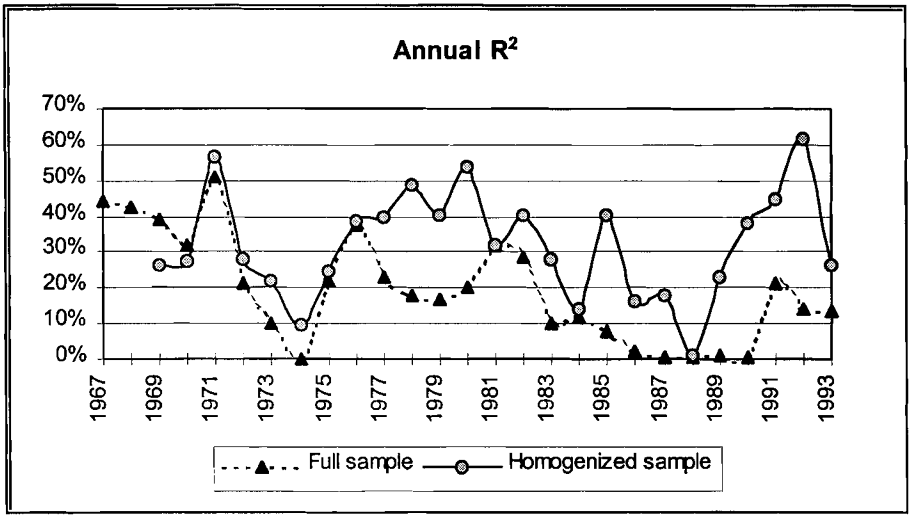


***Figure 7.3*** ***The annual explanatory power of regression specification M.1 for the full and homogenized sample of firms.***

As table 7.4 shows, the slope coefficient ($\hat{\beta}_1$) is positive and significant at the 5 percent level in all but one of the 25 annual regressions. In 22 of the 25 regressions, the significance exceeds the 1 percent level. The $\hat{\beta}_1$ coefficient still varies strongly over the years (between 3.8 and 16.5), but around a higher mean level (the mean $\hat{\beta}_1$ amounts to 8.54 as compared to 4.35 for the full sample, see also figure 7.1). A *GPF* amounting to 8.3 is consistent with, for example, 10 years of a permanent ($\lambda = 1$) abnormal *ROE* level combined with an annual growth rate amounting to 10% (given cost of equity capital of 15%). This combination does not seem unreasonable, but it certainly implies expectations of strong average persistence of current performance. It also implies that every percentage point of reported *ROE* gives a strong mean effect on the level of market-to-book value premium. There is no obvious trend over time in the level of the $\hat{\beta}_1$ coefficient. However, it might be possible to note a slightly higher stability in the years leading up to 1980.

The average explanatory power of the regression using the homogenized sample is higher compared to the full sample (31.9% versus 19.3% for the annual regressions and 18.8% versus 5.6% for the pooled regressions), but there is evidently still a large amount of variation in the market-to-book value premium that is not explained by the expected residual return.

Studying figure 7.2, where the estimated annual intercepts are graphically displayed, it is obvious that the average Swedish market-to-book value premium has systematically increased since the early 1980s in a way that cannot be explained by the average level of reported return on equity.

## 7.2 Regression model M.2

M.2 $$\frac{M_{j,t}}{B_{j,t}} - 1 = \alpha + \beta_1 \cdot E_t\left[R\tilde{R}_{j,t+1}\right] + \beta_2 \cdot PMB_j + \tilde{\varepsilon}_{j,t}$$

The presentation in this section closely follows the format of the previous section. The same sample characteristics have been used. The main difference is the introduction of another explanatory variable—the permanent measurement bias (*PMB*). Recall that only time- and industry-constant *PMB*s have been estimated, with additional firm-specific partial *PMB*s related to R&D expenditures. Acknowledging the presence of a *PMB*, an annual return measurement bias ($\gamma$) has also been incorporated in the residual return estimate.[6]

### 7.2.1 The full sample

In table 7.5 the annual regression results for the full sample of firms are presented. The estimated *GPF* coefficient ($\hat{\beta}_1$) remains very similar after adding the *PMB* as an explanatory variable. It is positive and significant to the same degree, and it is still insignificant in 1974, and between 1987 and 1990. The mean $\hat{\beta}_1$ coefficient is slightly lower (4.03 as compared to 4.35).

The new explanatory variable (the *PMB*) has a regression coefficient that is significantly larger than zero in 26 of the 27 annual regressions (18 of these at the 1 percent level). $\hat{\beta}_2$ varies between 0.35 and 3.07, with a mean value of 1.09. In general, the coefficient is below 1.0 in the first half of the period being studied and most often above 1.0 from the early 1980s and onwards.

6 Summarized calculations of *PMB*s were presented in Section 5.1.1.4, $\gamma$ in Section 5.1.2, and residual return calculations in Section 6.1.3.

For the pooled sample, $\hat{\beta}_2$ amounts to 1.03 and is strongly significant (a *t*-value of 9.3). Since the $\hat{\beta}_2$ coefficient is close to its theoretical value of 1.0, both as the mean of repeated annual regressions and in the pooled regression, this implies that the estimation procedure of the *PMB*s has ***on average*** been relatively reasonable. Regarding the increased value of the $\hat{\beta}_2$ coefficient over time, recall that time-constant *PMB*s have been used in spite of the fact that, for example, the known historical inflation rate pattern would imply smaller *PMB*s in the earlier part of the period being studied. The regression coefficients of M.2 will more directly be evaluated in the light of the historical inflation rate pattern in a later section.

The two explanatory variables together have a significant explanatory power at the 1 percent level (calculated *F* values) for all annual regressions except for 1974, 1987 and 1988.[7] The average adjusted R-square ($\bar{R}^2$) is 24.3%, as compared to 19.3% using the M.1 regression specification (or 8.0% vs. 5.6% in the pooled regression). The estimated intercepts are often insignificantly different from zero (most of the 1980s being an exception) and on average 0.13 for the repeated annual regressions. The inclusion of a *PMB* in the regression specification has apparently reduced the estimated intercept and it is now closer to its theoretical value (zero). Figure 7.4 illustrates graphically the estimated intercepts with the two model specifications.

7 The regressions for 1987 and 1988 are significant at the 5 percent level.

**Table 7.5 Annual regression results for regression specification M.2 using the full sample.**

| YEAR | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\overline{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1967 | –0.23 (–1.8) | 6.65 (5.5)** | 0.75 (4.5)** | 56.4% | 39 |
| 1968 | –0.22 (–1.8) | 6.31 (5.7)** | 0.91 (4.8)** | 57.8% | 39 |
| 1969 | –0.30 (–3.5)** | 3.45 (4.4)** | 0.35 (2.9)** | 42.6% | 42 |
| 1970 | –0.27 (–2.5)* | 4.92 (3.8)** | 0.40 (2.8)** | 34.3% | 43 |
| 1971 | 0.21 (1.6) | 12.53 (8.5)** | 0.76 (3.8)** | 53.6% | 70 |
| 1972 | 0.05 (0.4) | 5.53 (4.2)** | 0.42 (1.8)* | 20.6% | 72 |
| 1973 | –0.12 (–0.7) | 3.78 (2.9)** | 0.52 (2.0)* | 10.8% | 76 |
| 1974 | –0.08 (–0.5) | 0.23 (0.2) | 0.22 (0.9) | –1.6% | 79 |
| 1975 | 0.00 (0.0) | 4.25 (4.6)** | 0.45 (2.1)* | 22.9% | 78 |
| 1976 | 0.00 (0.0) | 4.93 (6.9)** | 0.43 (2.4)** | 38.7% | 83 |
| 1977 | –0.17 (–1.3) | 3.32 (4.7)** | 0.51 (2.7)** | 25.7% | 86 |
| 1978 | –0.16 (–0.9) | 3.65 (3.8)** | 0.64 (2.5)** | 20.2% | 88 |
| 1979 | –0.14 (–0.8) | 4.26 (4.1)** | 0.55 (2.0)* | 17.7% | 89 |
| 1980 | 0.21 (1.0) | 5.72 (4.7)** | 0.55 (1.7)* | 20.2% | 91 |
| 1981 | 0.30 (1.3) | 8.58 (6.5)** | 1.06 (3.0)** | 35.0% | 92 |
| 1982 | 0.62 (2.4)** | 7.57 (5.8)** | 1.62 (4.0)** | 35.7% | 95 |
| 1983 | 1.12 (3.9)** | 4.39 (3.0)** | 0.87 (1.8)* | 10.5% | 96 |
| 1984 | 0.51 (2.8)** | 4.83 (4.5)** | 0.76 (2.4)** | 13.4% | 152 |
| 1985 | 0.44 (2.4)* | 3.87 (3.5)** | 1.18 (3.7)** | 13.5% | 161 |
| 1986 | 0.66 (2.0)* | 3.08 (1.9)* | 2.05 (3.6)** | 7.9% | 164 |
| 1987 | 0.90 (2.2)* | 1.94 (0.9) | 1.69 (2.3)* | 2.5% | 169 |
| 1988 | 1.37 (2.8)** | –2.11 (–0.8) | 1.90 (2.2)* | 2.0% | 168 |
| 1989 | 0.45 (1.1) | –2.66 (–1.4) | 2.54 (3.4)** | 6.5% | 166 |
| 1990 | –0.76 (–2.9)** | 0.72 (0.7) | 3.07 (6.5)** | 21.2% | 151 |
| 1991 | –0.75 (–3.3)** | 4.23 (4.8)** | 2.61 (7.1)** | 42.0% | 129 |
| 1992 | –0.45 (–2.0)* | 2.31 (3.0)** | 1.62 (1.6)** | 26.6% | 119 |
| 1993 | 0.37 (1.8) | 2.61 (3.9)** | 1.04 (2.8)** | 18.1% | 108 |
| **Mean** | **0.13** | **4.03** | **1.09** | **24.3%** | **102** |
| **Pooled** | 0.36 (5.5)** | 4.20 (12.2)** | 1.03 (9.3)** | 8.0% | 2,745 |

$t$-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$
** Significant at $\alpha \leq 0.01$

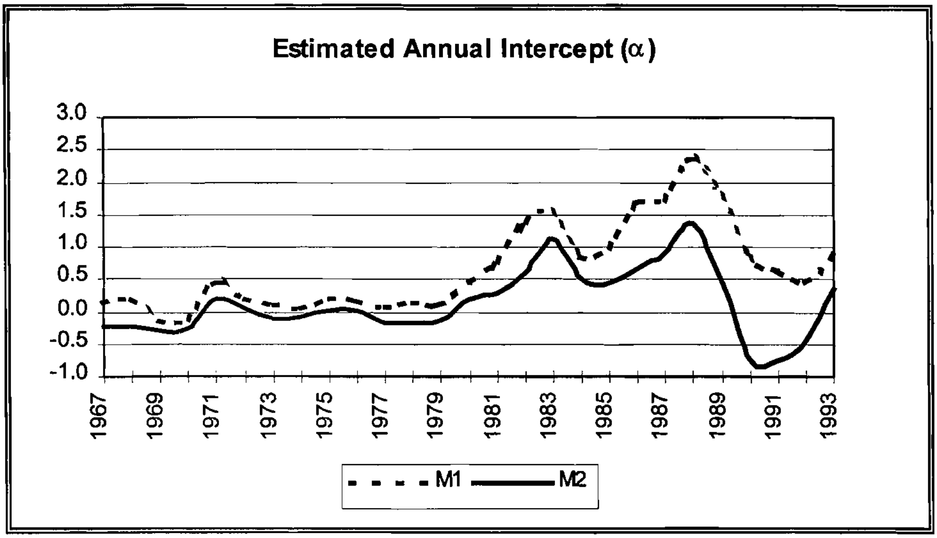


*Figure 7.4* ***Estimated annual intercepts ($\hat{\alpha}$) for the full sample of firms using regression specification M.1 versus M.2.***

## 7.2.2 Sub-sample regressions controlling for different expected validity of historical *ROE* and *GPF* levels

Table 7.6 contains the results of pooled regressions with several different sub-sample specifications;[8] table 7.7 contains the mean of repeated annual regressions for the full sample, the sample divided according to the profit recognition dimension, and for the homogenized sample.

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[8] Observe that the regression coefficients ($\hat{\beta}_1$ and $\hat{\beta}_2$) were also significant for all sub-samples using White (1980) heteroscedasticity-consistent standard errors. Appendix S illustrates the regression results for the same sub-samples, but truncating with regard to the dependent variable—excluding all firm-years when the market-to-book value premium exceeds 4. As a consequence, $\bar{R}^2$ is generally somewhat higher, $\hat{\beta}_1$ is generally only marginally affected, $\hat{\beta}_2$ is generally slightly lower and non-significant for a few of the small more extreme sub-samples.

**Table 7.6 Summarized pooled regressions for distinct sub-samples of firms using regression model M.2.**

| Sample characteristics | $\hat{\alpha}$ | | $\hat{\beta}_1$ | | $\hat{\beta}_2$ | | $\overline{R}^2$ | $n$ |
|---|---|---|---|---|---|---|---|---|
| Full sample | 0.36 | (5.5)** | 4.20 | (12.2)** | 1.03 | (9.3)** | 8.0% | 2,745 |
| Profit rec. = Continuous | 0.20 | (3.5)** | 5.08 | (15.6)** | 0.93 | (10.5)** | 17.9% | 1,702 |
| Profit rec. = Discrete | 0.08 | (0.4) | 4.09 | (5.8)** | 2.42 | (6.4)** | 6.0% | 1,043 |
| *ROE* hist. = Stable | 0.40 | (3.6)** | 5.09 | (4.7)** | 0.84 | (4.9)** | 4.3% | 998 |
| *ROE* hist. = Intermediate | 0.26 | (1.8)* | 4.87 | (5.7)** | 1.36 | (6.1)** | 9.9% | 698 |
| *ROE* hist. = Turbulent | 0.13 | (0.8) | 3.11 | (7.0)** | 1.41 | (4.4)** | 11.0% | 547 |
| Profit rec. = Continuous & | | | | | | | | |
| *ROE* hist. = Stable | 0.28 | (4.2)** | 10.39 | (13.8)** | 0.71 | (7.6)** | 28.5% | 617 |
| *ROE* hist. = Intermediate | 0.00 | (0.0) | 6.58 | (7.5)** | 1.46 | (7.5)** | 22.9% | 429 |
| *ROE* hist. = Turbulent | 0.09 | (0.5) | 2.47 | (4.6)** | 1.22 | (3.4)** | 9.4% | 342 |
| E[*GPF*] = Low | 0.24 | (1.0) | 3.53 | (5.2)** | 1.40 | (5.2)** | 8.9% | 367 |
| E[*GPF*] = Medium | 0.38 | (5.2)** | 5.20 | (9.5)** | 1.00 | (8.3)** | 6.8% | 2,246 |
| E[*GPF*] = High | 0.00 | (0.0) | 8.37 | (5.0)** | 1.23 | (2.9)** | 21.4% | 132 |
| Homogenized sample | 0.15 | (2.1)** | 9.12 | (12.8)** | 0.99 | (10.1)** | 23.9% | 941 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

**Table 7.7 Mean of annual regressions for different sub-samples of firms using regression specification M.2.**[9]

| Sample characteristics | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\overline{R}^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{\beta}_1$ years $\alpha \leq 0.05$ | $\hat{\beta}_2$ years $\alpha \leq 0.05$ |
| Full sample | 0.13 | 4.03 | 1.09 | 24.3% | 102 | 81.5% | 96.3% |
| Profit rec. = Continuous | –0.02 | 4.46 | 1.04 | 36.3% | 63 | 81.5% | 88.9% |
| Profit rec. = Discrete | –0.10 | 3.98 | 2.40 | 16.5% | 44 | 65.2% | 73.9% |
| Homogenized sample | –0.07 | 6.04 | 1.09 | 44.1% | 38 | 92.0% | 88.0% |

## Continuous versus discrete profit recognition

It was earlier observed that for the M.1 specification the explanatory power of the expected residual return was very weak for the group of firms characterized by a discrete pattern of profit recognition (especially for the last 10 years of the period being studied). In addition to being suspected of having less informative reported earnings, these firms can also be expected to have particularly large unrealized holding gains. Thus regression specification M.1 can be expected to be especially under-specified for these firms.

Evaluating M.2 on the observations from discrete profit recognition industries separately, the following observations can be made. The mean *GPF* coefficient has increased slightly (from 3.57 to 3.98). The E[*RR*] variable is now significant in 65.2% of the annual regressions as compared to the previous frequency of 47.8%.

The inclusion of a *PMB* estimate in M.2 contributes to a somewhat larger mean explanatory power; an $\overline{R}^2$ of 16.5% compared to 11.3% for the repeated annual regressions (and 6.0% compared to 2.9% for the pooled regression). The coefficient related to the *PMB* ($\hat{\beta}_2$) is significant in 73.9% of the annual regressions at the 5 percent level. The mean $\hat{\beta}_2$ coefficient is 2.40, and it varies between 1.25 and 2.50 for the years leading up to the mid

9 A minimum of 10 observations have been required for each annual regression. This requirement leads to the regression coefficients from the early years (1967 - 1972) not being included in all sub-sample mean calculations.

1980s; the period 1985 to 1990 shows slope coefficients amounting to between 3.0 and 6.0. These latter values indicate quite extreme market-to-book values that are not accompanied by 'sufficiently high' reported *ROE*. The values can also be interpreted as an indication of that the estimation procedure of the *PMB* has on average been too conservative for this group of firms. Recall from the discussion in Section 3.1.1.3, concerning the level of partial *PMB*s related to tangible assets, that long lived tangible assets (held to a large degree in most of the firms in this sub-sample) are particularly sensitive to the age structure of the portfolio of assets held, and that any measurement bias would further be magnified the more important the particular asset type is for the firm and the lower the equity-to-asset ratio of the firm. A combination of these characteristics that generates a measurement bias for certain firms exceeding 10 is not impossible to imagine. The use of industry-constant estimates of the *PMB*s may thus be particularly non-representative for the discrete profit recognition firms.

The M.2 specification also increased the explanatory power for the continuous profit recognition group of firms (36.3% versus 26.9% for the mean of annual regressions, and 19.9% versus 13.4% for the pooled regression).

The *PMB* coefficients ($\hat{\beta}_2$) are significant in 88.9% of the annual regressions at the 5 percent level, and the mean coefficient estimate is in this case close to the theoretical value of 1.0 (1.09 in the repeated annual regressions and 0.93 in the pooled regression).

**Relative stability in *ROE* history**

The observations that were made when model specification M.1. was used can essentially be repeated when M.2 is estimated. Once again, the conclusive observation is that more stable historical returns seem to be associated with larger *GPF*s.[10] Contradictory results in terms of explanatory power also appear depending on whether or not the profit recognition characteristics of the sample of firms are controlled for. Given that the continuous profit recognition firms are used alone, higher *ROE* stability is also related to higher explanatory power.

10 $\hat{\beta}_1$ = 10.4, 6.6 and 2.5 for the stable, intermediate, and the turbulent *ROE* history groups respectively, when only firms from continuous profit recognition industries are included in the regressions.

## Expected *GPF*

The observations that were made when model specification M.1 was used, can be repeated when M.2 is estimated. The level of the estimated *GPF* coefficients ($\hat{\beta}_1$ = 3.5, 5.2 and 8.4 for the low, medium, and the high *GPF* groups respectively) supports the validity of the classification. One can further note that the added *PMB* variable is significant in all three sub-samples (with a value of 1.40, 1.00 and 1.23, for the three sub-samples respectively) and improves the total explanatory power somewhat.

## A homogenized sample—combining *ROE* validity criteria and controlling for extreme *GPF*s

The results for the homogenized sub-sample are found in the last row of the summary tables above, in a complete annual presentation in table 7.8, and the annual regression results are contrasted with the full sample regression results in figures 7.5, 7.6 and 7.7.[11]

11 The homogenized sub-sample was selected according to the following criteria: i) The firm belongs to an industry classified as having continuous profit recognition, ii) the firm has a non-turbulent *ROE* track-record (the standard deviation of the past five years has not exceeded 10%), and iii) the expected growth persistence factor is classified as medium.

**Table 7.8 Annual regression results using regression specification M.2 and observations for the homogenized sub-sample.**

| YEAR | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\overline{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1967 | | | | | |
| 1968 | | | | | |
| 1969 | −0.27 (−2.3)* | 3.22 (2.4)* | 0.34 (2.1)* | 26.2% | 29 |
| 1970 | −0.27 (−2.1)* | 5.03 (2.9)** | 0.40 (2.3)* | 28.4% | 31 |
| 1971 | −0.02 (−0.2) | 10.17 (6.2)** | 0.74 (5.8)** | 67.8% | 34 |
| 1972 | −0.16 (−1.4) | 4.15 (2.9)** | 0.42 (2.9)** | 32.4% | 34 |
| 1973 | −0.14 (−0.9) | 8.40 (3.3)** | 0.39 (1.7)* | 19.6% | 45 |
| 1974 | −0.17 (−1.1) | 3.69 (1.9)* | 0.19 (0.8) | 5.0% | 38 |
| 1975 | −0.06 (−0.5) | 4.93 (3.2)** | 0.32 (1.9)* | 22.9% | 36 |
| 1976 | −0.01 (−0.1) | 5.72 (3.6)** | 0.28 (1.8)* | 35.5% | 31 |
| 1977 | −0.25 (−2.3)* | 4.81 (4.0)** | 0.47 (3.8)** | 49.0% | 30 |
| 1978 | −0.37 (−2.5)* | 5.75 (3.3)** | 0.65 (4.6)** | 59.4% | 31 |
| 1979 | −0.46 (−4.8)** | 4.20 (4.2)** | 0.55 (5.0)** | 55.8% | 38 |
| 1980 | −0.18 (−1.8)* | 6.70 (7.3)** | 0.63 (5.0)** | 65.0% | 40 |
| 1981 | −0.38 (−3.0)** | 5.42 (4.8)** | 1.07 (7.2)** | 65.4% | 39 |
| 1982 | −0.47 (−1.3) | 5.45 (1.8)* | 2.32 (7.0)** | 68.6% | 39 |
| 1983 | 0.13 (0.6) | 7.18 (3.2)** | 1.69 (6.2)** | 57.1% | 40 |
| 1984 | −0.23 (−0.2) | 1.22 (0.7) | 0.93 (5.2)** | 44.7% | 38 |
| 1985 | 0.03 (0.2) | 5.52 (3.6)** | 1.18 (6.5)** | 66.4% | 37 |
| 1986 | 0.45 (1.8) | 7.12 (2.6)** | 1.56 (4.2)** | 31.2% | 55 |
| 1987 | 0.68 (2.9) | 7.14 (2.6)** | 1.12 (3.1)** | 23.5% | 61 |
| 1988 | 0.94 (1.2 | 3.55 (0.5) | 1.79 (1.4) | 0.7% | 57 |
| 1989 | 0.44 (1.4) | 10.24 (2.9)** | 1.94 (4.4)** | 37.6% | 51 |
| 1990 | −0.56 (−2.0) | 9.67 (4.5)** | 2.86 (6.9)** | 67.5% | 43 |
| 1991 | −0.76 (−2.4)* | 7.51 (3.3)** | 2.86 (6.7)** | 78.8% | 24 |
| 1992 | −0.28 (−0.6) | 9.22 (2.7)** | 2.10 (3.7)** | 75.2% | 20 |
| 1993 | 0.56 (1.2) | 5.10 (2.3)** | 0.44 (0.6) | 18.1% | 20 |
| **Mean** | **−0.07** | **6.04** | **1.09** | **44.1%** | **38** |
| **Pooled** | 0.15 (2.1)** | 9.12 (12.8)** | 0.99 (10.1)** | 23.9% | 941 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

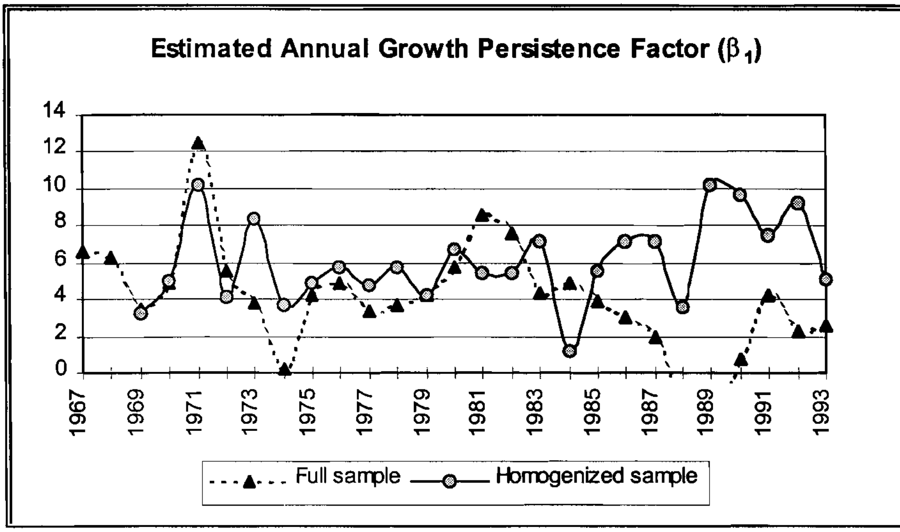


*Figure 7.5* ***The estimated annual growth persistence factor ($\hat{\beta}_1$) for the full and homogenized sample of firms.***

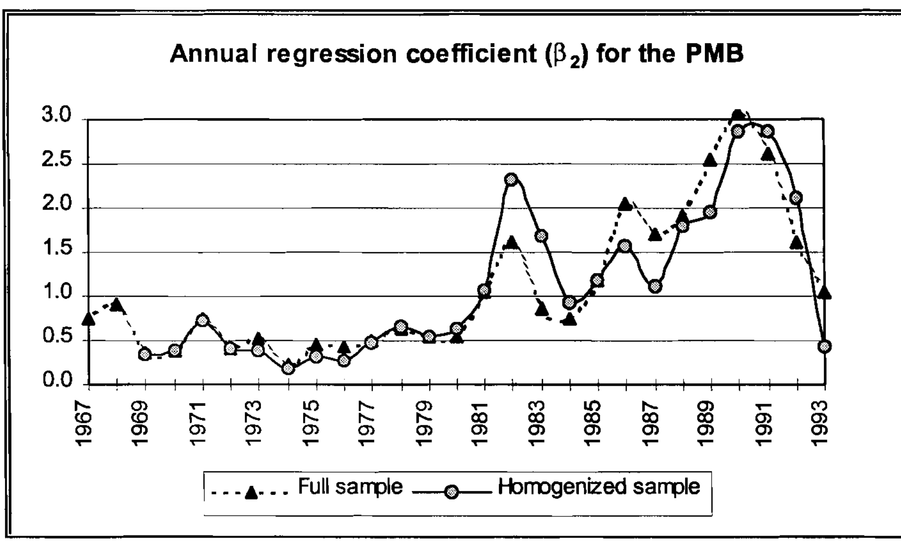


*Figure 7.6* ***The estimated PMB coefficient ($\beta_2$) for the full and homogenized sample of firms.***

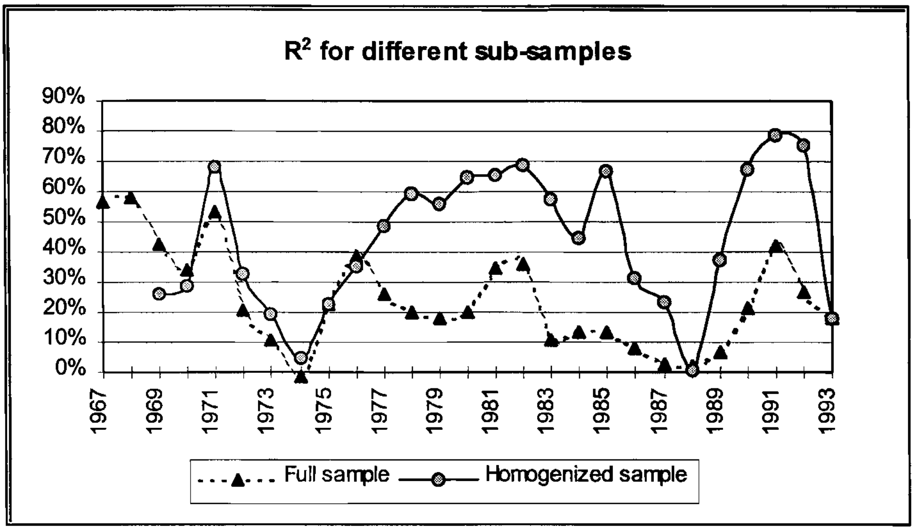


***Figure 7.7*** ***The adjusted explanatory power ($\overline{R}^2$) for each annual estimation of regression specification M.2 for the full and homogenized sample of firms.***

The *GPF* coefficient ($\hat{\beta}_1$) is positive and significant at the 5 percent level in 23 of the 25 annual regressions. In 20 of the 25 regressions the level of significance further exceeds the 1 percent level. The $\hat{\beta}_1$ coefficient varies between 3.22 and 10.24 for the years when it is significant (the insignificant year, $\hat{\beta}_1$ is still positive, but only amounts to 1.22). In comparison to the previously presented regression results using M.1 and the same sample specification, it is noteworthy that the mean *GPF* coefficient has been reduced from 8.54 to 6.04 and is somewhat more stable over time. Most coefficients vary between the economically reasonable values of 4 and 8.

The regression coefficient for the estimated *PMB* parameter is on average 1.09, and exceeds zero significantly in 22 of the 25 annual regressions at the 5 percent level. The $\hat{\beta}_2$ coefficient varies between 0.32 and 2.86 for the years when it is significant (in the insignificant years, $\hat{\beta}_2$ also shows positive values). The value of the coefficient over time shows a very similar pattern for the homogenized sample compared with the full sample (see figure 7.6), a rather stable coefficient around 0.5 until the early 1980s when the coefficient value increases and becomes rather variable over the years.

***The average adjusted explanatory power of the regression is 44.1%, with two years (1974 and 1988) standing out as being particularly poor. It is further noteworthy that the explanatory power is also lower than 'normal' in the years surrounding these two particularly poor years (see figure 7.7). A similar but less distinct pattern is present for the full sample.***

Several alternative factors offer a conceivable explanation for this pattern:
1. the two periods coincide with two particularly large fluctuations in the Swedish business cycle (see Section 5.2.2);
2. the first period coincides with the start of a 'new era' of a higher inflation rate (see Section 5.2.1);
3. both the periods coincide with periods of particularly uneven accounting practices (transition periods), the first concerning open disclosure of value and depreciation according to plan and group consolidation method, the second related to the goodwill issue and accounting for associated companies (see Section 5.3).

Further investigation of these issues will be undertaken in the forthcoming sections.

## 7.3 Regression results and changes in the economic climate

### 7.3.1 Business cycle fluctuations

Figure 7.8 illustrates the median market-to-book value premium each year along with the indicator of the business cycle identified in Section 5.2.2.

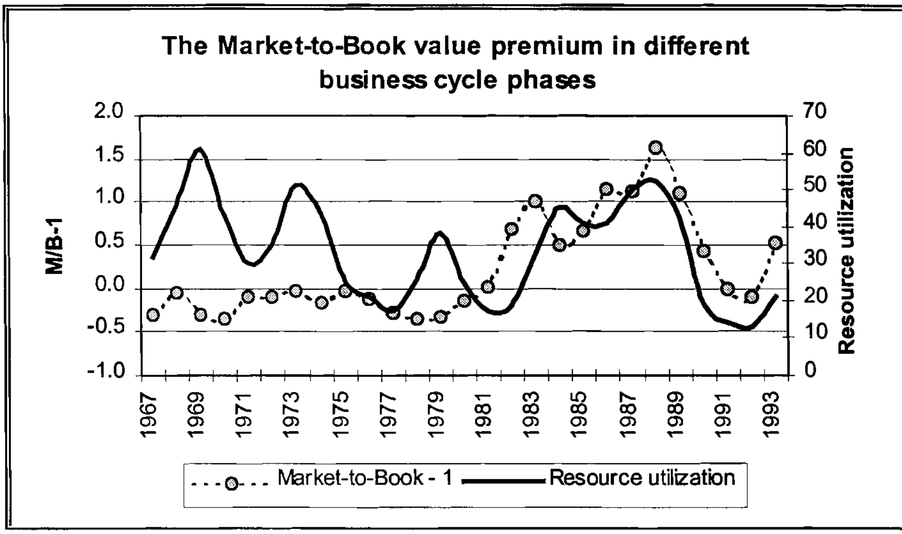


*Figure 7.8* ***The median market-to-book value premium for the full sample combined with an index of the Swedish industrial resource utilization.*** [12]

After a period of rather stable market-to-book value premiums around or slightly below zero that ended in 1981, the premiums show increasing variability around much higher values. During the latter more variable period, a positive co-variability between the business cycle phase and the market-to-book value premium is quite obvious.

In order to investigate whether fluctuations in the business cycle are an important source of instability of explanatory power and value of the regression coefficients when attempting to explain the market-to-book value pre-

12 The weighted sum of reported incidences of full capacity utilization and labor shortages in the Swedish industrial sector. Source: "Business Tendencies Surveys", National Institute of Economic Research.

mium with M.2, the annual regression results from the previous section are plotted together with the business cycle indicator. Figures 7.9, 7.10, 7.11 and 7.12 contrast the adjusted explanatory power, and the three regression coefficients for each annual regression using the full sample with the phases of the business cycle.

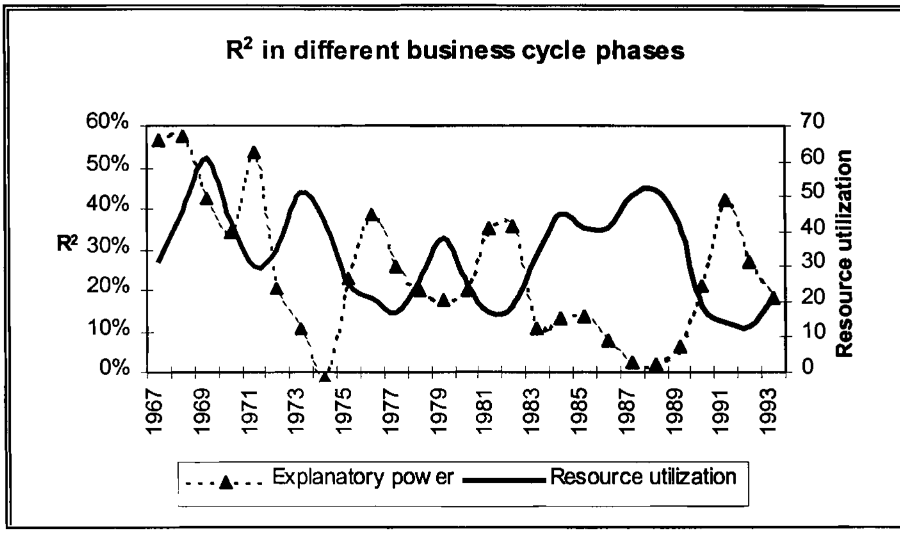


*Figure 7.9* ***The adjusted explanatory power ($\overline{R}^2$) for each annual estimation of regression specification M.2 for the full sample of firms combined with an index of Swedish industrial resource utilization.***

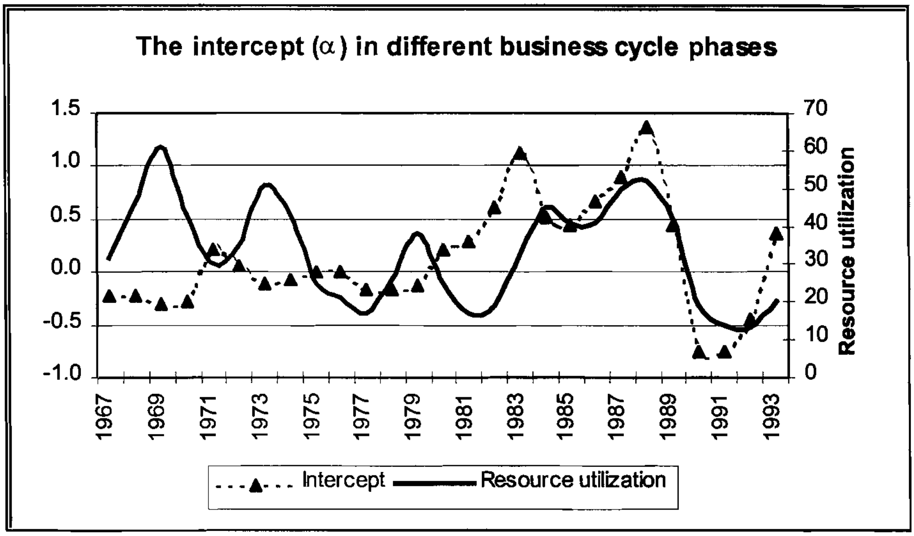


*Figure 7.10* ***The intercept ($\hat{\alpha}$) for each annual estimation of regression specification M.2 for the full sample of firms combined with an index of Swedish industrial resource utilization.***

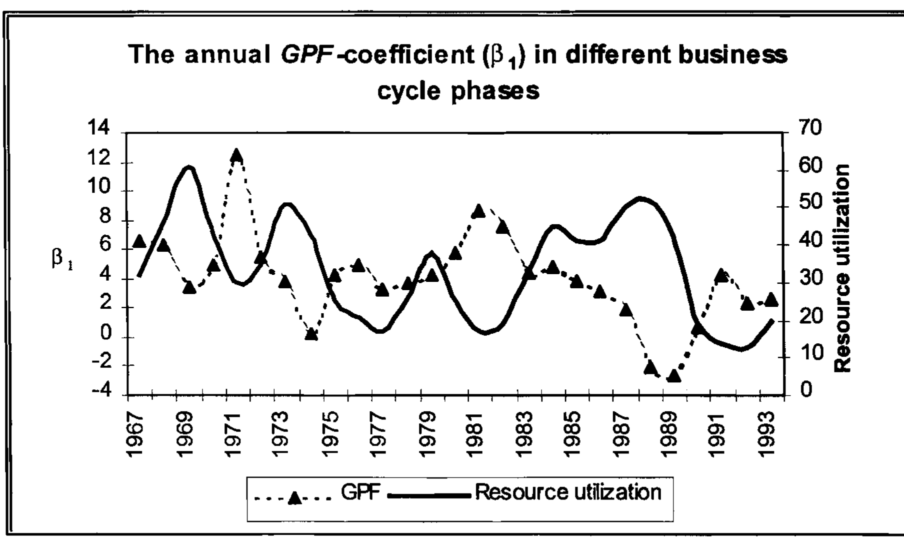


*Figure 7.11* ***The growth persistence factor ($\hat{\beta}_1$) for each annual estimation of regression specification M.2 for the full sample of firms combined with an index of Swedish industrial resource utilization.***

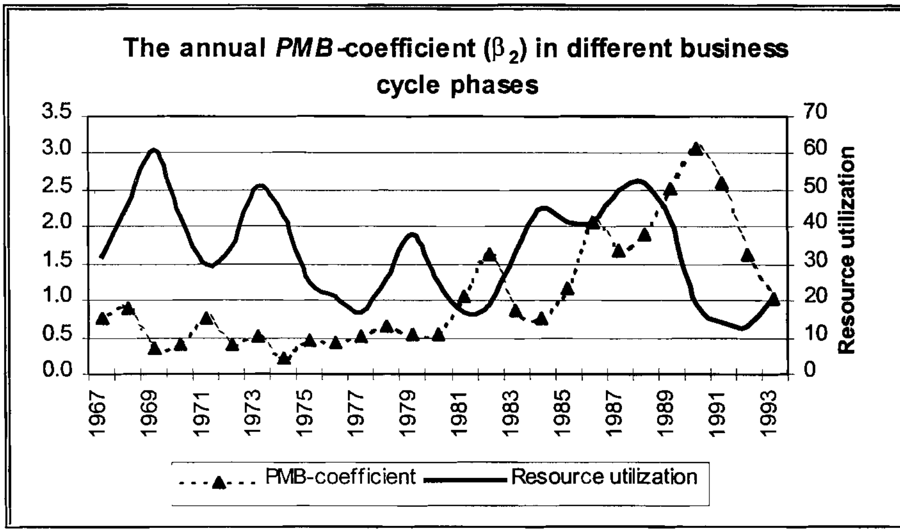


***Figure 7.12*** ***The PMB coefficient ($\hat{\beta}_2$) for each annual estimation of regression specification M.2 for the full sample of firms combined with an index of Swedish industrial resource utilization.***

To shed additional light on whether the business cycle phases are associated with systematic differences in the regression coefficients, a simple mean has been calculated for all the annual regressions that belong to the same phase of the business cycle. Five low (1967, 71, 77, 81 and 92) and four high (1969, 73, 79 and 88) turning points in the business cycle have previously been identified. Average regression coefficients have been calculated for the year of the actual turning point as well as for the year before and after. Panel A of table 7.9 contains the results for the full sample; panel B presents the results for the homogenized sample.

**Table 7.9 Mean of annual regressions for different years clustered on business cycle phase using regression specification M.2.**

**Panel A: The full sample**

| | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\overline{R}^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{\beta}_1$ years $\alpha \leq 0.05$ | $\hat{\beta}_2$ years $\alpha \leq 0.05$ |
| All business cycle phases | 0.13 | 4.03 | 1.09 | 24.3% | 102 | 81.5% | 96.3% |
| Year before top | 0.14 | 4.36 | 0.92 | 25.3% | 92 | 75.0% | 100.0% |
| **Top (1969, 73, 79, 88)** | **0.21** | **2.35** | **0.83** | **18.3%** | **94** | **75.0%** | **100.0%** |
| Year after top | 0.08 | 2.05 | 0.92 | 14.9% | 95 | 50.0% | 75.0% |
| Year before bottom | –0.20 | 4.95 | 1.00 | 33.8% | 87 | 100.0% | 100.0% |
| **Bottom (1967,71,77,81,92)** | **–0.07** | **6.68** | **0.94** | **39.5%** | **81** | **100.0%** | **100.0%** |
| Year after bottom | 0.13 | 5.14 | 0.92 | 30.5% | 80 | 100.0% | 100.0% |

**Panel B: The homogenized sample**

| | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\overline{R}^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{\beta}_1$ years $\alpha \leq 0.05$ | $\hat{\beta}_2$ years $\alpha \leq 0.05$ |
| All business cycle phases | –0.07 | 6.04 | 1.09 | 44.1% | 38 | 92.0% | 88.0% |
| Year before top | 0.05 | 5.68 | 0.73 | 38.4% | 42 | 100.0% | 100.0% |
| **Top (1969, 73, 79, 88)** | **0.02** | **4.84** | **0.77** | **25.6%** | **42** | **75.0%** | **75.0%** |
| Year after top | –0.04 | 6.41 | 0.79 | 34.0% | 40 | 100.0% | 75.0% |
| Year before bottom | –0.30 | 6.24 | 1.04 | 51.9% | 32 | 100.0% | 100.0% |
| **Bottom (1971, 77, 81, 92)** | **–0.23** | **7.40** | **1.10** | **64.4%** | **31** | **100.0%** | **100.0%** |
| Year after bottom | –0.11 | 5.11 | 0.96 | 44.6% | 31 | 100.0% | 75.0% |

Figure 7.9 gives a visually very convincing indication of a negative association between the explanatory power of M.2 and the phase of the business cycle. The adjusted $R^2$ is lower in and around the boom periods of the economy, and higher in and around a recession. This association is corroborated by the mean $\overline{R}^2$ in table 7.9. The mean $\overline{R}^2$ is 18.3% vs. 39.5% and 25.6% vs. 64.4% at the top versus the bottom of the business cycles for the full and the homogenized sample respectively. A similar pattern, but not as pronounced, is present in the surrounding periods.

At least for the latter half of the period studied, the value of the intercept seems to be positively associated with the phase of the business cycle. Note the co-movement in figure 7.10 from 1980 onwards. This observation is strengthened by the generally positive mean intercepts for the boom periods versus negative mean intercepts in recessions, as illustrated in table 7.9.

A negative association is evident between the value of the *GPF* coefficient ($\hat{\beta}_1$) and the phase in the business cycle. This is visually obvious from figure 7.11 and corroborated by the mean coefficients in the table. The mean $\hat{\beta}_1$ is 2.35 vs. 6.68 and 4.84 vs. 7.40 at the top versus the bottom of the business cycles for the full and homogenized sample respectively.

Finally, the coefficient related to the *PMB* variable ($\hat{\beta}_2$), also seems to be negatively associated with the business cycle phase. This pattern is most obvious in the latter half of the period when the coefficient is more variable.

***These results clearly support the hypothesis that some of the intertemporal instability in the cross-sectional regression coefficients are related to the fluctuations in the business cycle. An unresolved question is why this pattern is present?***

- First of all, the positively varying intercept indicates that the valuation specification lacks some explanatory variable.
- In a discussion of the estimation of '*T*', the expected period over which abnormal performance can be defended, Stewart (1991, p. 298) argues that the length of time (beyond specific business characteristics) may depend on the general economic and political outlook. He exemplifies this with the optimistic times of the 1960s and the pessimistic times of the 1970s. One could thus (contradictory to the regression results) argue for higher expected *GPF* coefficients in booming periods due to assumingly more optimistic times.
- One may suspect that the unstable results are to some extent driven by the primitive estimation procedure of expected *ROE*. If investors can foresee the changes in the business cycle, and adjust their expectations accordingly, a prediction of next period's *ROE* based on the most recent period's performance may be a particularly unreliable approach around the fluctuations in the business cycle. In Chapter 4, the option of using earnings forecasts from business magazines was ruled out as an earnings

prediction input in this study. The lack of such data for the entire period was the main obstacle. However, since February 1985 Affärsvärlden (a Swedish business weekly) has on a weekly basis published forecasts of the coming years' earnings per share for firms listed on the Stockholm Stock Exchange. To shed some light on the importance of utilizing an expectation procedure based on the most recent period's reported *ROE* rather than this business press alternative, the regression specification M.2 has been re-run for a small group of companies using Affärsvärlden's published earnings forecasts. Details regarding this endeavor are found in appendix T. The results indicate that Affärsvärlden's earnings forecasts better map expectations on the stock market than the simple estimation procedure utilized in the main part of this study. It is observed that the mechanical historic performance method seems to be somewhat 'noisier', but that the two return on equity estimation procedures seem to capture essentially the same phenomena. It is further demonstrated that the negative association between the explanatory power of M.2, and the phase of the business cycle, remains even when Affärsvärlden's earnings forecasts are used.

- Finally, consider the following statement from a player on the stock market during the booming period of the 1980s: "*There is no time for fundamental analysis in a booming market, investors just have to act.*" If such a statement bears any resemblance to actual behavior, it would be consistent with a case when many companies tend to be valued high irrespective of performance in good times, whereas quality performance yields a stronger premium in bad times. Such a scenario is consistent both with the observation of higher *GPF* coefficients and higher $\bar{R}^2$ in recessions and vice versa in booming periods.

### 7.3.2 Changes in the rate of inflation

In Section 5.2.1 four inflation rate phases occurring during the period 1967 to 1993 were identified.

| | Time period | Inflation rate characteristics |
|---|---|---|
| A | 1967 - 1972 | Low |
| B | 1973 - 1980 | Rising—low to high |
| C | 1981 - 1984 | High |
| D | 1985 - 1993 | Falling—high to medium |

It was argued that the increasing inflation rate of the early 1970s could be expected to decrease the informative value of traditional accounting based profitability ratios, especially for firms whose asset base is dominated by non-monetary assets with long economic lives. Also, the period with a sharp fall in the inflation rate (1985-1987) was hypothesized to be especially problematic. To test whether these phases are associated with any systematic differences in the regression coefficients, the mean of annual regressions have been clustered for the four phases. The mean of the first two years of each 'problematic' period is also going to be reported separately. In table 7.10, the M.2 regression results for the full sample are presented, followed in table 7.11 by similar M.1 regression results for two extreme sub-samples. These two sub-samples were generated in Section 5.2.1, in an attempt to maximize the difference in tendency to hold non-monetary assets with long economic lives. It can be noted that the estimated *PMB*s are almost constant within the two subgroups. It is thus not meaningful to use regression specification M.2 for the separate sub-samples. However, the higher expected *PMB*s for the group of firms holding large amounts of non-monetary long-life assets is expected to be captured by a larger intercept ($\alpha$) in specification M.1.

**Table 7.10 Mean of repeated annual M.2 regressions for different time-clusters based on inflation rate characteristics.**

| Full Sample | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\overline{R}^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{\beta}_1$ years $\alpha \leq 0.05$ | $\hat{\beta}_2$ years $\alpha \leq 0.05$ |
| All years | 0.13 | 4.03 | 1.09 | 24.3% | 102 | 81.5% | 96.3% |
| A: 1967-72 | –0.13 | 6.57 | 0.60 | 44.2% | 51 | 100.0% | 100.0% |
| B: 1973-80 | –0.06 | 3.77 | 0.48 | 19.3% | 84 | 87.5% | 87.5% |
| C: 1981-84 | 0.63 | 6.34 | 1.08 | 23.7% | 109 | 100.0% | 100.0% |
| D: 1985-93 | 0.25 | 1.55 | 1.97 | 15.6% | 148 | 55.6% | 100.0% |
| Early B: 1973-74 | –0.10 | 2.01 | 0.37 | 4.6% | 78 | 50.0% | 50.0% |
| Early D: 1985-86 | 0.55 | 3.47 | 1.62 | 10.7% | 163 | 100.0% | 100.0% |

Some notable observations emerge from the regression results for the full sample. The mean explanatory power ($\overline{R}^2$) for the low inflation rate period, prior to 1973, is 44.2%, which is almost twice as high as in any of the following periods. The mean $\overline{R}^2$ is particularly low during the rising and falling inflation rate periods (period B and D). During these inflationary problematic periods, the frequency of significant regression coefficients is the lowest.

One may also note that $\hat{\beta}_2$—the slope coefficient of the estimated *PMB*s—follows a pattern similar to the general inflation rate development, but with a lag. The estimated *PMB*s were specified to reflect issues relating to the holding of assets that are not captured in traditional accounting. With an ideal measurement procedure of the *PMB*s, $\hat{\beta}_2$ should thus be expected to equal one. However, in this study the *PMB*s were (for simplicity) assessed to be constant over time, utilizing the average inflation rate as a proxy for value change. The below average inflation rates during the early years of the study followed later by higher inflation rates, will thus result in overstated *PMB*s in the early periods and vice versa, and could thus be one plausible explanation for the development of the $\hat{\beta}_2$ coefficient. Annual re-estimation of the *PMB* is an improvement that could possibly reduce this instability.

**Table 7.11 Mean of repeated annual M.1 regressions for different time-clusters based on inflation rate characteristics.**[13]

**Panel A: Firms holding an extensive degree of non-monetary long-life assets**

| Extensive long-life asset firms | $\hat{\alpha}$ | $\hat{\beta}_1$ | $R^2$ | $n$ | Proportion of significant $\hat{\beta}_1$ years $\alpha \le 0.05$ |
|---|---|---|---|---|---|
| All years | 1.40 | 6.70 | 21.2% | 30 | 56.5% |
| A: 1971-72 | 0.97 | 16.97 | 66.0% | 18 | 100.0% |
| B: 1973-80 | 0.76 | 6.93 | 27.9% | 21 | 75.0% |
| C: 1981-84 | 1.56 | 8.30 | 22.2% | 29 | 50.0% |
| D: 1985-93 | 1.98 | 3.50 | 4.9% | 41 | 33.3% |
| Early B: 1973-74 | 0.56 | 4.41 | 12.4% | 17 | 0.0% |
| Early D: 1985-86 | 2.42 | 9.35 | 6.3% | 39 | 50.0% |

**Panel B: Firms holding a small degree of non-monetary long-life assets**

| Limited long-life asset firms | $\hat{\alpha}$ | $\hat{\beta}_1$ | $R^2$ | $n$ | Proportion of significant $\hat{\beta}_1$ years $\alpha \le 0.05$ |
|---|---|---|---|---|---|
| All years | 0.40 | 4.93 | 31.5% | 26 | 82.6% |
| A: 1971-72 | 0.30 | 14.64 | 53.5% | 20 | 100.0% |
| B: 1973-80 | –0.04 | 3.48 | 31.1% | 20 | 87.5% |
| C: 1981-84 | 0.61 | 4.26 | 34.8% | 24 | 75.0% |
| D: 1985-93 | 0.72 | 4.37 | 25.4% | 34 | 77.8% |
| Early B: 1973-74 | 0.01 | 2.21 | 7.5% | 23 | 50.0% |
| Early D: 1985-86 | 0.83 | 6.38 | 39.6% | 45 | 100.0% |

The previous observation of weakened explanatory power after the new era of higher and more variable inflation rates can be made again with regard to both sub-samples. This tendency, however, is stronger for the *'long-life asset sample'*. The most striking difference between the two subgroups occurs during the period 1985-93 with falling inflation rates. The *'long-life asset firms'*, show very weak regression results during this period. The overall mean explanatory power is very poor (4.9% during 1985 to 1993), and the expected residual return variable is only significant in three of the nine

[13] The years between 1967 and 1970 have been excluded due to a limited number of observations.

years on the five percent level. For the *'limited long-life assets sample'* the expected residual return variable is significant in seven of the nine years on the five percent level, and the mean explanatory power remains just above 25% for the same time period.

As a general observation, one can note that $\hat{\alpha}$ is consistently larger for the *'long-life asset sample'* (1.40 as compared to 0.40 for all years), with an even more pronounced difference for the years with falling inflation. This is consistent with the fact that the *'long-life asset sample'* firms tend to hold assets for which value gains are not fully captured within the traditional historical cost accounting procedure (until realization). The median *PMB* for the two sub-samples are 0.67 and 0.31 respectively. For this reason, the value of $\hat{\alpha}$, especially for the *'long-life asset sample'*, indicates that the *PMB* estimation on average has been 'too conservative' or possibly that some fundamental variable that explains the level of the market-to-book value premium is missing in the specified valuation model.

# 7.4 Regression results and large accounting changes

## 7.4.1 Open disclosure of depreciation according to plan

In Section 5.3.1 a gradual transition in accounting practice regarding depreciation and valuation of depreciable assets was observed, from a tax-based practice to a practice attempting to describe value and depreciation in accordance with the estimated economic lives of the assets. The transition essentially took place between 1967 and 1980, with the strongest change between 1975 and 1976. The three figures below illustrate the annual averages of the dependent and independent variables for the sample grouped according to the chosen accounting practice.[14]

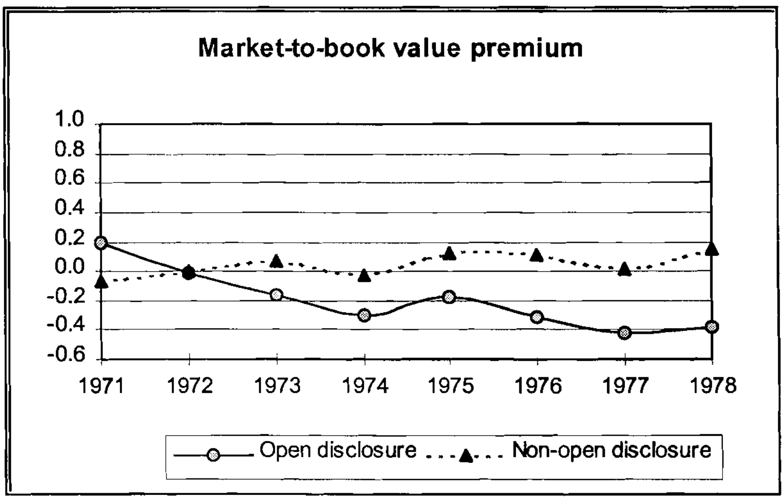


***Figure 7.13*** ***The annual averages of the market-to-book value premium for two subgroups of firms using different depreciation practice.***

14 Recall from Section 5.3.1, that the industries with firms that are expected to hold relatively small amounts of depreciable assets have been excluded. Note also that the number of observations (firms) behind each average varies considerably over time (from 5 to 44). With this shortage of annual data, annual regressions controlling for accounting procedure are difficult to carry out. Therefore pooled regressions have to be used.

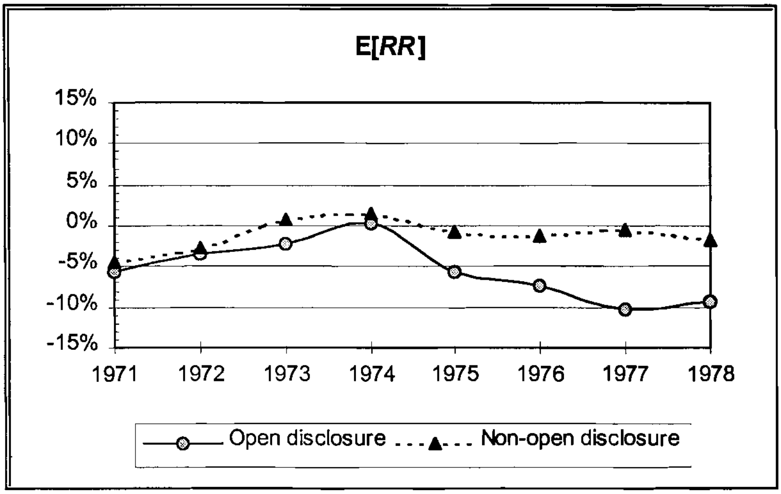


***Figure 7.14*** ***The annual averages of the expected residual for two subgroups of firms of firms using different depreciation practice.***

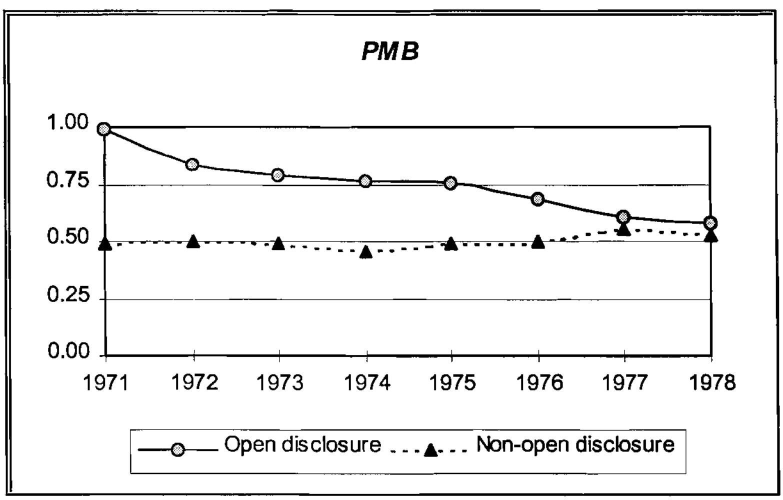


***Figure 7.15*** ***The annual averages of the estimated permanent measurement bias (PMB) for two subgroups of firms using different depreciation practice.***

A number of observations can be made from these figures. Figure 7.15 suggests that the early open-disclosure firms are different in this dimension.

The early adopters have a higher measurement bias.[15] This group contains pharmaceuticals, R&D-intensive engineering firms, and paper & pulp firms. When most firms have changed to open disclosure towards the end of the period, this difference has vanished. The average E[*RR*][16] is essentially equivalent for both groups during the early years in the graph. Towards the end of the period (that includes the beginning of a recession), the group of non-open disclosure firms shows a mean residual return that remains at around zero, while the group of open disclosure firms shows a return that drops considerably.[17] One explanation for this result can be that the non-open disclosure firms have accumulated hidden untaxed reserves, in earlier periods, that they choose to dissolve in a recession to show positive earnings. The subgroup of firms disclosing asset values according to economic plan consistently show a lower average market-to-book value premium compared to the other subgroup (1971 being an exception).[18] Given similar *PMB* and E[*RR*] this is not unexpected as these firms, *ceteris paribus*, show a relatively higher book value of equity.[19]

Pooled regression results for the two subgroups are showed in table 7.12. The pooled regressions are run for the period 1967 to 1980, 1971 to 1978, and finally also for two main transition years, 1975 to 1976 (panel A, B, and C). Since the observations in these three sub-periods do not constitute independent samples, the regression results are also provided for two separate periods: 1970 to 1974 and 1975 to 1978 (panel D and E).

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15 The mean difference in *PMB*s is significant, at the 5 percent level, as a total over the period 1971 to 1978, and the differences are also significant for each individual year between 1971 and 1975, but not thereafter.

16 Given the estimation procedure of E[*RR*], utilizing the most recent published *ROE*, these figures can be interpreted as cost of equity normalized *ROE*.

17 The mean difference in E[*RR*] is significant, at the 5 percent level, as a total over the period 1971 to 1978, and the differences are also significant for each individual year between 1975 and 1978, but not before.

18 The mean difference in market-to-book value premium is significant, at the 5 percent level, as a total over the period 1971 to 1978, and the differences are also significant for each individual year between 1975 and 1978, but not before.

19 $(1-\tau)$ times the disclosed untaxed reserve is included in the equity calculation given that the untaxed reserve is openly disclosed.

**Table 7.12 Pooled regression results using regression specification M.2 and all firm years from nine industries with firms where the most depreciable assets are held.**

**Panel A: 1967-80**

| 1967-80 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.26 (−7.7)** | 2.92 (12.9)** | 0.43 (8.9)** | 26.4% | 682 |
| Non-disclosure | −0.08 (−1.0) | 4.68 (9.4)** | 0.30 (1.8)* | 24.9% | 263 |
| Open disclosure | −0.50(−11.6)** | 2.09 (7.5)** | 0.55 (11.7)** | 47.3% | 252 |

**Panel B: 1971-78**

| 1971-78 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.21 (−4.8)** | 2.62 (9.1)** | 0.35 (5.3)** | 20.3% | 427 |
| Non-disclosure | 0.00 (0.1) | 4.10 (5.7)** | 0.15 (0.7) | 16.5% | 153 |
| Open disclosure | −0.53 (−9.5)** | 1.90 (5.4)** | 0.54 (9.5)** | 48.5% | 149 |

**Panel C: 1975-76**

| 1975-76 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.12 (−1.8) | 3.69 (7.7)** | 0.32 (3.2)** | 38.3% | 107 |
| Non-disclosure | 0.00 (0.0) | 3.52 (3.0)** | 0.28 (0.8) | 18.2% | 33 |
| Open disclosure | −0.35 (−3.7)** | 3.41 (5.0)** | 0.45 (5.2)** | 64.3% | 37 |

**Panel D: 1970-74**

| 1970-74 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.19 (−3.2)** | 2.45 (4.9)** | 0.31 (3.3)** | 11.2% | 251 |
| Non-disclosure | −0.04 (−0.3) | 4.87 (5.7)** | 0.17 (0.7) | 19.0% | 131 |
| Open disclosure | −0.44 (−4.3)** | 1.65 (1.8)* | 0.44 (4.1)** | 33.6% | 33 |

**Panel E: 1975-78**

| 1975-78 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.26 (−4.7)** | 2.74 (8.3)** | 0.42 (5.4)** | 31.4% | 215 |
| Non-disclosure | 0.01 (0.1) | 3.21 (3.6)** | 0.25 (0.9) | 20.2% | 46 |
| Open disclosure | −0.56 (−8.2)** | 1.87 (4.5)** | 0.59 (8.3)** | 48.1% | 118 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

The $\bar{R}^2$ is approximately twice as high for the *'open disclosure firms'* compared to the *'non-disclosure firms'* (47.3% vs. 24.9%) for the whole transition period 1967 to 1980; the difference increases to more than three times (64.3% vs. 16.5%) for the main transition period 1975 to 1976. Differences of the same magnitude can be observed for the two separate—early and late—periods presented in panel D and E. These results indicate that the market-to-book value premium is better explained by the residual return and the *PMB* variable for the firms with open disclosure of value and depreciation of tangible assets. The more informative, open accounting procedure, thus appears to be associated with a better mapping to the stock price.

In order to test if these results are driven by some systematic difference in the sub-samples, the same regressions have also been run using the homogenized sub-sample.[20] Complete results are reported in appendix U. These results indicate an informative advantage that is at least as strong for open disclosure firms. The adjusted $R^2$ for the period 1967 to 1980 is, for example, 62.5%, 23.1%, and 36.4%, for the open disclosure, the non-disclosure, and all the firms respectively. These values indicate that the uneven (and uninformative) accounting practice has a strong detrimental effect on the explanatory power of the valuation specification.

Besides the lower explanatory power for the non-disclosure firms, one can also note that the $\hat{\beta}_2$ coefficient is lower and most often non-significant. The main reason for this appears to be a lower variation of the *PMB*s within this group of firms. It is important to note, however, that the differences in significance related to the *PMB* alone do not drive the overall results. A rerun for the period 1967 to 1980 using regression specification M.1 on the homogenized sample, after excluding all observations when the *PMB* exceeds 0.50, resulted in an explanatory power of 47.2% vs. 25.7% for the open disclosure vs. non-disclosure sub-samples.[21]

20 i) The firm belongs to an industry classified as having continuous profit recognition, ii) the firm has a non-turbulent *ROE* track-record (the standard deviation of the past five years has not exceeded 10%), and iii) the expected growth persistence factor is classified as medium.

21 Similar differences also remained for the other periods.

### 7.4.2 Regression results and acquisition activity

In Section 5.3.2 the period 1986-1990 was identified as being unique in terms of acquisition activity among the firms listed on the Stockholm Stock Exchange. Whether this acquisition activity has had an impact on the relationship between market-to-book value premiums and expected return is the focus of this section. The sample has been divided in two subgroups: i) an '*acquisition group*'—where at least one recent large acquisition has taken place, and ii) a *'no acquisition group'*—where no recent acquisition has taken place. [22]

Reduced stability of *ROE* is one potential effect of an acquisition. The sample control criteria related to stability of historical *ROE* should thus not be applied. However, in order to improve the control of the sample, only the firms from industries classified as having a continuous profit recognition have been used.[23]

In order to check for systematic differences between the two groups in terms of the dependent and independent variables, the mean market-to-book value premium, the mean *E*[*RR*], and the mean *PMB* have been calculated.[24] As can be seen from figure 7.16, the mean market-to-book value premiums of the two subgroups have been practically identical (this is also true for the mean *PMB*, graph not provided).[25] Neither do the mean *E*[*RR*]s—illustrated in figure 7.17—give any indications of systematic differences between the two subgroups.

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22 A firm has been classified as having made a recent acquisition during a particular year if such an acquisition has taken place during the current year or during any of the two preceding years. See details regarding the identification procedure of acquisitions in Section 5.3.2.

23 This choice gives an improved explanatory power for all the regressions, but appears not to make any qualitative difference in terms of relative explanatory power.

24 The period illustrated has been extended to 1992 in order to include the two years after the most acquisition-intensive period (1986-1990).

25 The slightly higher mean market-to-book value premium for the acquisition group is not significant.

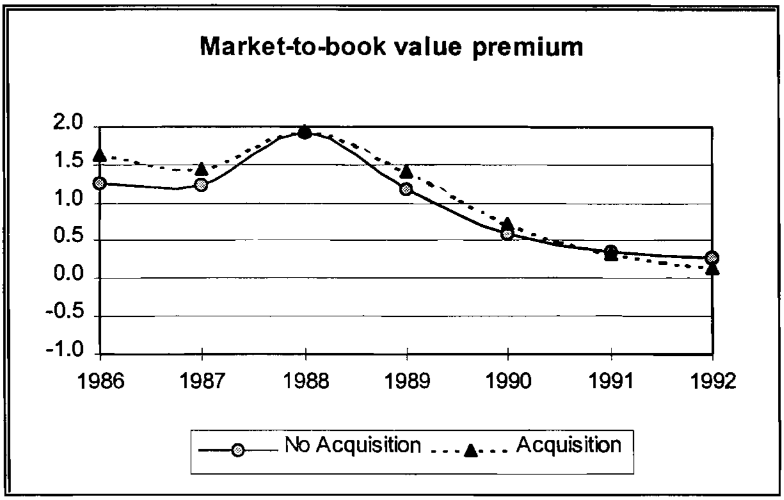


***Figure 7.16 Annual averages of the market-to-book value premium for two subgroups of firms.***

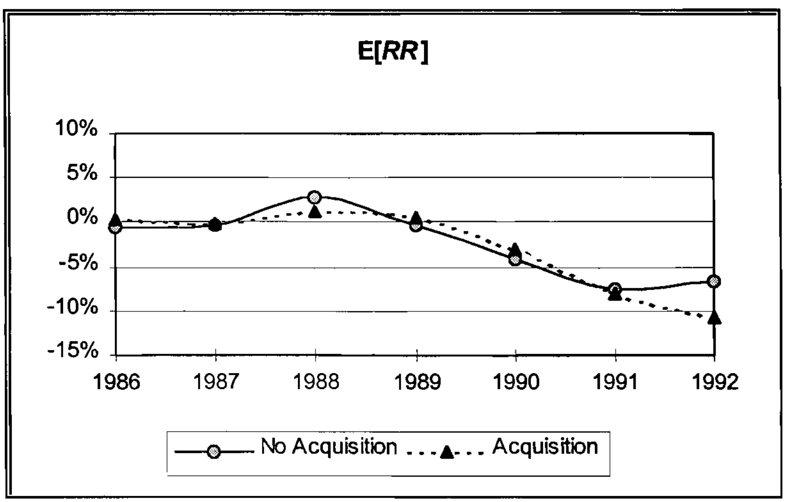


***Figure 7.17 Annual averages of the*** E[*RR*] ***for two subgroups of firms.***

Table 7.13 shows annual and pooled M.2 regressions for the years 1986-1992 with firms from industries classified as having a continuous profit recognition. Panel A show the results for all observations, Panel B for the firm-years not affected by any recent acquisition, and Panel C for the firm-years that have been affected by at least one large recent acquisition.

**Table 7.13 Annual M.2 regression results for the period 1986-1992 using observations from industries with continuous profit recognition.**

**Panel A: All firm-years**

| YEAR | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1986 | 0.41 (2.1)* | 3.82 (3.6)** | 1.83 (5.6)** | 27.9% | 106 |
| 1987 | 0.70 (3.1)** | 1.68 (1.3) | 1.20 (3.1)** | 8.6% | 107 |
| 1988 | 1.17 (2.7)** | −1.21 (−0.5) | 1.54 (2.1)* | 2.6% | 104 |
| 1989 | 0.23 (0.8) | 1.86 (1.2) | 2.06 (3.9)** | 13.0% | 102 |
| 1990 | −0.83 (−2.9)** | 1.91 (1.5) | 3.03 (6.3)** | 30.9% | 92 |
| 1991 | −0.63 (−2.2)* | 5.64 (5.1)** | 2.73 (6.3)** | 55.2% | 74 |
| 1992 | −0.47 (−1.8)* | 3.39 (3.2)** | 1.86 (5.0)** | 46.2% | 67 |
| **Mean** | **0.08** | **2.44** | **2.04** | **26.3%** | **93** |
| Pooled | 0.18 (1.5) | 4.29 (7.8)** | 1.95 (9.8)** | 20.6% | 652 |

**Panel B: Firm-years not affected by any recent acquisitions**

| YEAR | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1986 | 0.63 (2.7)** | 6.83 (4.9)** | 1.34 (3.3)** | 33.8% | 75 |
| 1987 | 0.73 (2.6)* | 4.48 (2.2)* | 1.05 (2.1)* | 11.3% | 65 |
| 1988 | 1.12 (1.8) | 4.37 (1.1) | 1.39 (1.3) | 1.0% | 58 |
| 1989 | −0.17 (−0.5) | 5.22 (3.0)** | 2.64 (5.0)** | 40.4% | 48 |
| 1990 | −0.80 (−2.9)** | 6.53 (4.3)** | 3.11 (7.5)** | 67.6% | 43 |
| 1991 | −0.76 (−2.3)* | 6.26 (4.2)** | 3.08 (6.6)** | 71.0% | 41 |
| 1992 | −0.77 (−2.8)** | 4.01 (2.9)** | 2.46 (6.4)** | 66.9% | 39 |
| **Mean** | **0.00** | **5.39** | **2.15** | **41.7%** | **53** |
| Pooled | 0.20 (1.4)** | 7.35 (9.4)** | 1.97 (8.4)** | 32.7% | 369 |

**Panel C: Firm-years affected by at least one recent acquisition**

| YEAR | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1986 | 0.42 (1.1) | 1.08 (0.6) | 2.01 (3.5)** | 25.4% | 31 |
| 1987 | 0.66 (1.8) | −0.85 (−0.5) | 1.40 (2.3)* | 8.0% | 42 |
| 1988 | 0.85 (1.6) | −6.59 (−2.6) | 2.20 (2.5)** | 18.4% | 46 |
| 1989 | 0.83 (1.5) | −1.13 (−0.5) | 1.15 (1.2) | −0.7% | 54 |
| 1990 | −0.30 (−0.5) | −1.18 (−0.7) | 2.02 (1.8)* | 3.9% | 49 |
| 1991 | 0.21 (0.4) | 4.80 (3.0)** | 0.96 (1.0) | 21.0% | 33 |
| 1992 | 0.62 (1.3) | 3.92 (2.6)** | −0.13 (−0.2) | 18.6% | 28 |
| **Mean** | **0.47** | **0.01** | **1.37** | **13.5%** | **40** |
| Pooled | 0.27 (1.4) | 1.63 (2.1)* | 1.73 (5.0)** | 9.2% | 283 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$
** Significant at $\alpha \leq 0.01$

The *'no acquisition group'* shows more than three times as high $\bar{R}^2$ as compared to the *'acquisition group'*, both as a mean of annual regressions and in the pooled regressions (41.7% vs. 13.5%, and 32.7% vs. 9.2% respectively). $\hat{\beta}_1$ is non-significant for the *'acquisition group'* for the years 1986-90 and even shows the ***wrong sign*** for four years. In the *'no acquisition group'* the $\hat{\beta}_1$ estimates are much more stable (between 4.01 and 6.83) and more often significant.

The results indicate that the use of *E*[*RR*] to explain the market-to-book value premium for a group of firms that recently have made large acquisitions is very limited. This result may have several causes, such as the increased complexity of the organization after an acquisition implying increased uncertainty, the diverse treatment of acquired goodwill,[26] or simply the use of a poor estimation procedure of *E*[*RR*].

One can suspect that the mechanical, historical performance based *ROE* prediction procedure used in this study is particularly inferior to, for example, analysts forecasts for firms that have recently made a large acquisition. The analyst can supposedly make adjustments related to differences in goodwill treatment, 'odd accounting' for restructuring expenses, expected synergy gains, and so forth.

The regression results presented in table 7.14 provide some evidence regarding this matter. Regressions using earnings forecasts taken from Affärsvärlden (the business weekly) is contrasted to regressions using the historical *ROE*-based prediction approach for the small group of companies.[27] The sample has again been grouped according to acquisition activity.

26 The goodwill issue will be addressed in the next section.

27 See appendix T for details about this sample and the utilized earnings prediction approach.

**Table 7.14 Pooled M.2 regressions for a small sample of companies.**

**Panel A: *E[ROE]* based on previous year's performance**

| 1986-92 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All observations | –0.44 (–3.0)** | 6.71 (6.0)** | 2.33 (13.8)** | 74.6% | 112 |
| No Acquisition | –0.59 (–3.1)** | 5.42 (3.3)** | 2.57 (13.1)** | 83.1% | 60 |
| Acquisitions | 0.41 (1.4) | 7.28 (5.3)** | 0.91 (2.2)* | 39.5% | 52 |

**Panel B: *E[ROE]* based on forecasts in Affärsvärlden**

| 1986-92 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All observations | 0.05 (0.4) | 10.62 (10.7)** | 2.02 (14.2)** | 83.5% | 112 |
| No Acquisition | –0.07 (–0.4) | 10.45 (7.0)** | 2.18 (12.8)** | 89.2% | 60 |
| Acquisitions | 0.70 (2.8)** | 10.02 (7.9)** | 0.94 (2.7)** | 57.9% | 52 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

The explanatory power is larger in all cases using Affärsvärlden's forecasts. However, a reduced explanatory power for the acquisition group is present irrespective of earnings prediction approach. The relative reduction appears, however, to be larger when using a current performance based *ROE* prediction. The first observation is consistent with the hypothesis that acquisition intensive firms are more complex or difficult to value, the second observation is consistent with increased inferiority of the mechanical prediction approach for firms growing by acquisitions.

It is further notable that the $\hat{\beta}_2$ coefficient is lower for the acquisition group, irrespective of earnings prediction approach. The $\hat{\beta}_2$ coefficient is also lower and often non-significant for the acquisition group in the annual regressions presented in table 7.13. The *PMB* calculations in this study have been based on an assumption that the firm holds an age-balanced portfolio of their particular combination of assets, and that intangible assets are not capitalized. It was argued in Section 5.3.2 that a company that grows via large acquisitions reduces the measurement bias at least temporarily, as acquired tangible assets are revalued to present acquisition cost and acquired intangible assets are capitalized. It is thus reasonable that the *PMB* loses discriminating ability—being less often significant—and shows a lower regression coefficient for the acquiring group of firms. In the extreme case, when the acquired company is much larger than the acquirer, the *PMB* should be expected to lose all discriminating ability.

### *7.4.2.1 Goodwill treatment method*

The diverse accounting treatment of goodwill during the acquisition-intensive period 1986 to 1990 can be one explanation for the weak explanatory power for the acquiring firms.[28] This question is possible to study if the acquiring firms are divided into different 'goodwill treatment' groups. Two such groups have been specified: i) a *'goodwill write-off group'*— where at least one large goodwill write-off has been done during the last or any previous period, and ii) a *'no goodwill write-off group'*—where no such large goodwill write-offs has been done.[29] The sample of all firms with a continuous profit recognition has been used.

One effect of a writing off goodwill directly against equity is a reduced book value of equity and an increased *ROE*.[30] To investigate whether any such systematic differences can be observed in this study, figures 7.18, 7.19 and 7.20 are presented. These figures show the annual means of the market-to-book value premiums, the E[*RR*] and the *PMB*s for the firms that have recently made a large acquisition, grouped according to their method of goodwill treatment.[31]

28 Between 1986 and 1990 a number of firms chose to write off goodwill directly against equity.

29 Firm-years have been assigned to the goodwill write-off group if a large goodwill write-off has been done during the last period or during any previous period. See details regarding the identification procedure of goodwill write-off firms in Section 5.3.2.

30 *Ceteris paribus*, this will be the case for several years after the actual goodwill write-off. If the write-off is included in the income statement, the actual write-off year will, of course, look different.

31 Note that the number of goodwill write-off firms is relatively small. The means are based on between 7 and 13 observations each year.

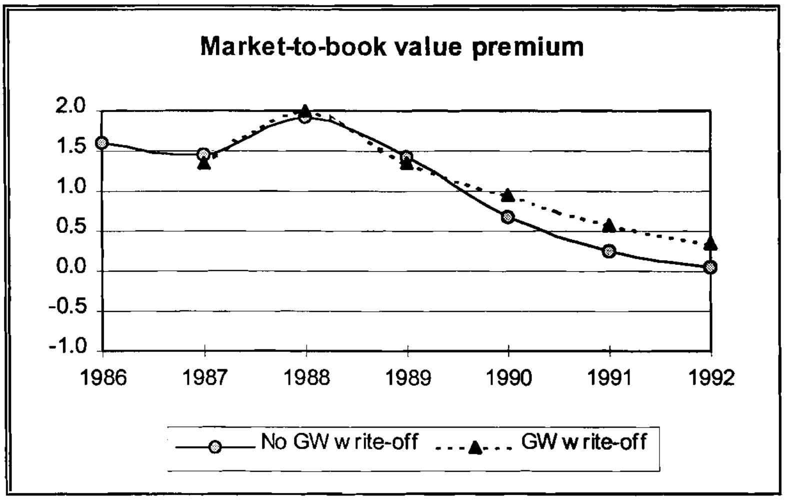


***Figure 7.18** The average market-to-book value premium for the acquisition-intensive firms, grouped according to the chosen method of goodwill treatment.*

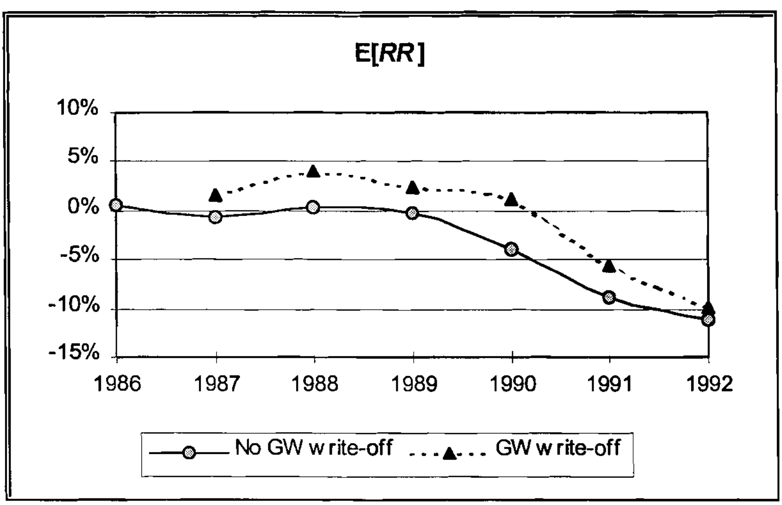


***Figure 7.19** The average E[RR] for the acquisition-intensive firms, grouped according to the chosen method of goodwill treatment.*

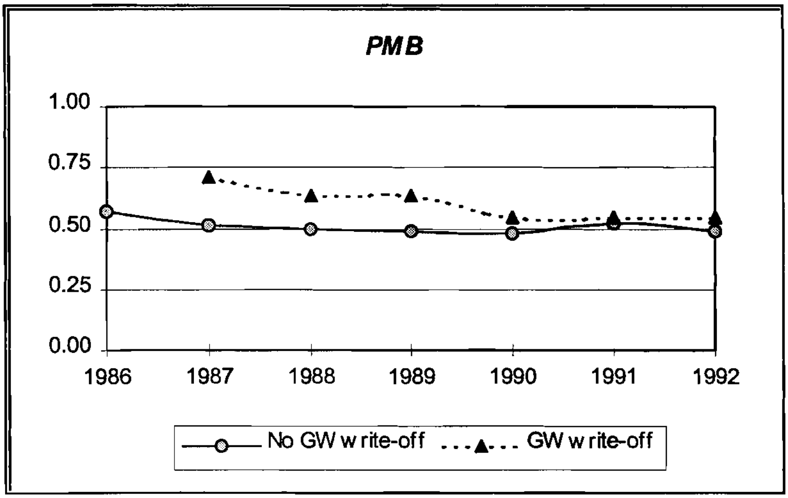


***Figure 7.20 The average PMB for the acquisition-intensive firms, grouped according to the chosen method of goodwill treatment.***

The mean market-to-book value premiums are practically identical for the two groups, whereas a consistent difference is evident concerning the mean values of E[*RR*]. The mean E[*RR*] is approximately 3 percentage points higher for the goodwill write-off firms.[32] Simultaneously, a significant but diminishing difference in the measurement bias appears to be present. The early write-off firms show a slightly higher average *PMB*.

In table 7.15 regression results for pooled 1986-92 data, grouped according to the goodwill treatment method are provided.

32 The mean difference is significant at the 5 percent level, as a total over the years between 1987 to 1992, but not for each individual year.

**Table 7.15 Pooled M.2 regression results for the period 1986-1992 using observations from industries with continuous profit recognition and firm-years affected by at least one recent acquisition.**

| 1986-92 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All observations | 0.27 (1,4) | 1.63 (2,1)* | 1.73 (5,0)** | 9.2% | 283 |
| No goodwill write-off | –0.07 (–0,3) | 0.76 (0,9) | 2.43 (5,2)** | 10.2% | 225 |
| Goodwill write-off | 0.78 (3,4)** | 7.16 (6,3)** | 0.72 (2,2)* | 42.7% | 58 |

$t$-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$
** Significant at $\alpha \leq 0.01$

Interestingly, a strongly significant $\hat{\beta}_1$ coefficient amounting to 7.16 is showed for the goodwill write-off group, whereas the group of acquiring firms not writing off any goodwill, shows a non-significant $\hat{\beta}_1$ coefficient amounting to 0.76. Furthermore, the adjusted explanatory power of the regression is 42.7% vs. 10.2%, in favor of the group of goodwill write-off firms.

*A priori*, the capitalization of goodwill can be expected to be a more descriptive accounting valuation principle. Nevertheless, the level of *ROE* appears to have a very limited ability to explain the market-to-book value premium for the average acquiring firm with capitalized goodwill. A lack of confidence among investors regarding the substance of goodwill values and the economic meaning of goodwill depreciation can be one explanation for these results. Recall that the diversity of goodwill accounting during the period led many stock markets analysts (including Affärsvärlden, the business weekly) to exclude all goodwill in their calculations.

### *7.4.2.2 The pooling versus the purchase method*

It was previously argued that the consolidation method called 'par' (≈'pooling'), the dominant method for Swedish groups until the mid 1970s, was in principle equivalent to the 'purchase method' with an immediate write-off of purchased goodwill. In figures 7.18, 7.19 and 7.20 a systematic difference in the mean level and the *E*[*RR*] and *PMB* (but not for the market-to-book value premium), were observed for the two groups of firms choosing different goodwill accounting methods. To check if similar differences can be observed related to the chosen consolidation method, comparable figures have been constructed.[33]

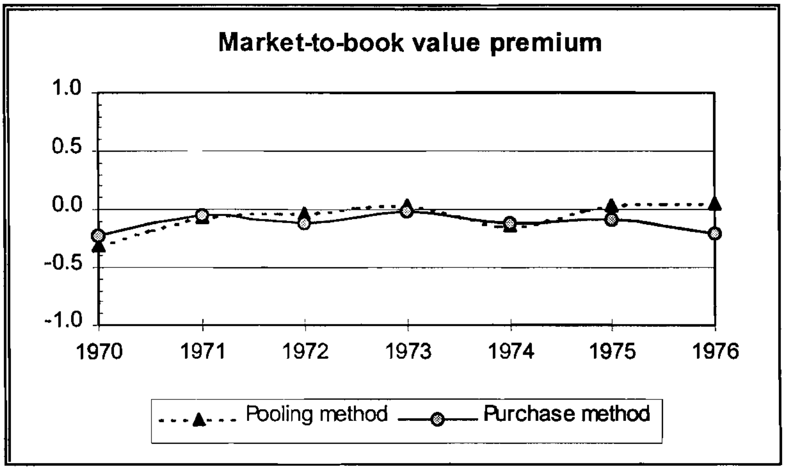


***Figure 7.21*** ***The average market-to-book value premium for firms grouped according to the chosen method of consolidation.***

33 The main period of transition to the purchase method took place between 1970 and 1976. The sample of firms with continuous profit recognition has been used.

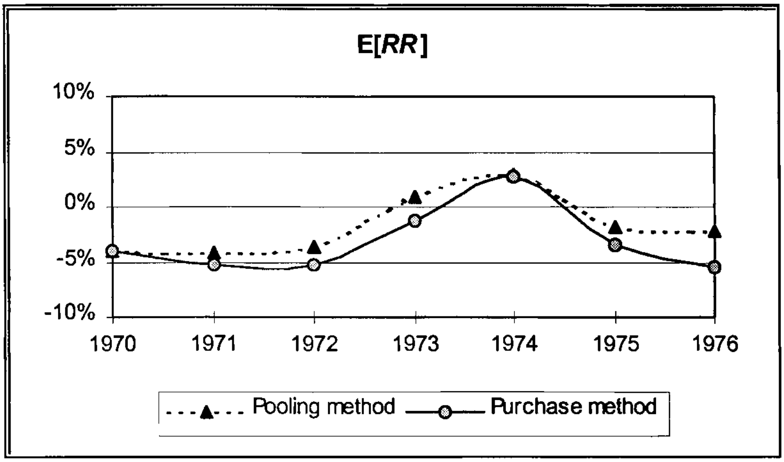


***Figure 7.22 The average E[RR] for firms grouped according to the chosen method of consolidation.***

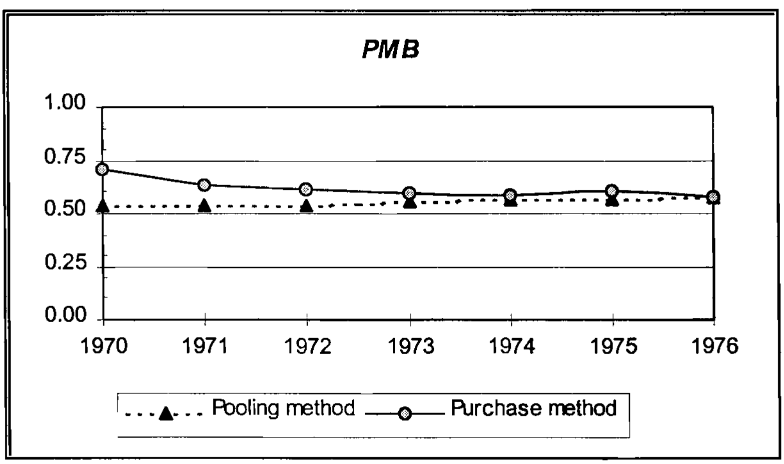


***Figure 7.23 The average PMB for firms grouped according to the chosen method of consolidation.***

A similar but weaker pattern can be observed as compared with the previous goodwill write-off issue. The mean market-to-book value premium cannot be separated between the two groups, whereas the mean E[*RR*] appears to be higher for the pooling method firms.[34] The firms that adapt to the purchase method earliest appear to have a somewhat higher mean *PMB*.

Table 7.16 shows annual and pooled regression results for 1970-76, with the sample of companies grouped according to chosen consolidation method.

**Table 7.16 Annual M.2 regression results for observations from industries with continuous profit recognition.**

**Panel A: Pooling method used for consolidation.**

| YEAR | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1970 | –0.44 (–3.3)** | 2.96 (2.4)* | 0.48 (2.6)* | 45.1% | 18 |
| 1971 | –0.03 (–0.3) | 12.26 (7.5)** | 0.88 (6.1)** | 76.8% | 23 |
| 1972 | –0.09 (–0.7) | 6.13 (3.2)** | 0.54 (2.7)** | 36.8% | 23 |
| 1973 | –0.49 (–3.7)** | 4.15 (3.6)** | 0.86 (4.3)** | 55.5% | 20 |
| 1974 | –0.23 (–2.0) | –1.25 (–1.3) | 0.23 (1.4) | 7.9% | 17 |
| 1975 | –0.09 (–0.7) | 4.90 (2.9)** | 0.38 (2.1)* | 40.8% | 16 |
| 1976 | –0.12 (–1.0) | 7.88 (4.7)** | 0.61 (3.5)** | 73.3% | 11 |
| **Mean** | **–0.21** | **5.29** | **0.57** | **48.0%** | **18** |
| Pooled | –0.29 (–5.3)** | 2.81 (5.0)** | 0.51 (5.9)** | 30.6% | 128 |

**Panel B: Purchase method used for consolidation.**

| YEAR | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1970 | –0.41 (–1.7) | 2.20 (0.5) | 0.38 (2.0)* | 17.1% | 11 |
| 1971 | 0.39 (1.7) | 15.05 (4.5)** | 0.56 (3.0)** | 66.5% | 14 |
| 1972 | 0.18 (0.8) | 8.22 (2.7)** | 0.22 (1.1) | 32.9% | 16 |
| 1973 | –0.11 (–0.7) | 2.01 (1.1) | 0.18 (0.8) | 1.6% | 20 |
| 1974 | –0.15 (–0.9) | –0.40 (–0.4) | 0.07 (0.3) | –8.5% | 23 |
| 1975 | –0.17 (–1.3) | 3.49 (2.9)** | 0.34 (1.9)* | 32.2% | 23 |
| 1976 | –0.17 (–1.3) | 3.24 (2.7)** | 0.25 (1.5) | 22.3% | 30 |
| **Mean** | **–0.06** | **4.83** | **0.29** | **23.4%** | **20** |
| Pooled | –0.25 (–4.1)** | 1.60 (3.1)** | 0.29 (3.6)** | 13.4% | 137 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \le \alpha \le 0.05$

** Significant at $\alpha \le 0.01$

Higher explanatory power and more significant $\hat{\beta}_1$ and $\hat{\beta}_2$ coefficients can be observed every year for the group of pooling method firms. The $\hat{\beta}_2$ coefficient is particularly low for the group of purchase method firms.

34 The mean difference, however, is not statistically significant at the 5 percent level.

It should be noted that the main transition period of accounting method for consolidation coincides with the transition period to open disclosure of economic value and depreciation of tangible assets. Attempting to control for differences in such accounting, all firm-years with non-open depreciation accounting were eliminated. However, this control eliminated almost all pooling method observations (only eight firm-years remained). This indicates that the companies that were late in adapting to the purchase method were also late adapters to new disclosure practice regarding depreciation. This in turn implies that the higher explanatory power observed for the pooling method firms is not driven by more informative depreciation accounting.

### 7.4.3 Accounting for associated companies

A gradual transition from the cost method to the equity method when accounting for associated companies took place during the 1980s for firms listed on the Stockholm Stock Exchange. The sample has been divided into two groups; i) firms using the equity method, and ii) firms using the cost method (but providing the share of the associated company's earnings in the notes). The sample of firms with a continuous profit recognition have been used.

1985 to 1987 is the only period when about ten different firms used the two methods simultaneously. The opportunities for statistical analysis are therefore very limited,[35] but two efforts have, nevertheless, been attempted. First, pooled M.2 regression results for the period 1985 to 1987, with the sample grouped according to accounting method for associated companies, are provided in table 7.17. Secondly, M.2 regression results with firm-years clustered around the actual switch year in accounting method are provided in table 7.18.

35 Appendix V illustrates the mean value of the dependent and the independent variables, grouped according to different accounting methods for associated companies.

**Table 7.17 Pooled M.2 regressions for companies using the cost method versus companies using the equity method. Data for the period 1985-87 with companies from industries with continuous profit recognition have been used.**

| 1985-87 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All companies | 0.50 (4.3)** | 3.70 (5.2)** | 1.34 (6.9)** | 19.1% | 314 |
| Cost method | 0.74 (2.7)** | 4.16 (2.8)** | −0.22 (−0.5) | 16.6% | 31 |
| Equity method | −0.01 (−0.0) | 0.28 (0.1) | 1.72 (2.6)** | 13.5% | 36 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

**Table 7.18 M.2 regressions for companies switching from the cost method to the equity method. Data for the period 1980-93 and companies from industries with continuous profit recognition have been used.**

| | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 2 years before switch | 0.81 (1.7) | 6.21 (3.1)** | −0.22 (−0.3) | 35.2% | 15 |
| 1 year before switch | 0.64 (1.3) | 5.84 (3.0)** | 0.24 (0.3) | 36.7% | 15 |
| **Switch year** | 1.27 (2.1) | 4.86 (1.4) | −0.94 (−1.0) | 1.9% | 15 |
| 1 year after switch | 0.91 (1.5) | 4.74 (1.1) | −0.70 (−0.7) | −3.4% | 12 |
| 2 years after switch | 0.60 (1.0) | 8.87 (1.9)* | 0.49 (0.5) | 15.1% | 11 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

The regression results appear to indicate that the $E[RR]$ variable is particularly weak as an explanatory variable of the market-to-book value premium for firms using or switching to the equity method. However, given the limited sample size, this indication should be interpreted very cautiously.

# 8 Empirical Results: The Change Approach

As a first step, changes in market prices have been explained by the growth in accounting equity on its own, utilizing regression specification M.3. As in Easton, Harris and Ohlson (1992) and Ohlson and Penman (1992), the studied value change window has successively been increased from a one-year period, to a value change window of ten years. The regressions have been estimated for each possible individual period. For windows exceeding one year, the value change window has been moved forward one year at a time. This means that for a value creation period of two years, the period 1967 to 1969 has been estimated first,[1] then the period 1968 to 1970, and so forth. This means that the number of different regressions has been 26 at most for the one-year time interval and 16 for the ten-year time interval. The one-year value change regressions have also been estimated in pooled cross-section and time-series. Note that a pooled regression using both cross-sectional and time-series data for the longer periods (two years or more) would overexploit the data (given the time overlap approach).[2]

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1 To be precise, recall that the value change is actually measured, in this example, between the end of March 1968 and the end of March 1970.

2 For general statistical considerations see appendix R.

## 8.1 Regression model M.3

$$\text{M.3} \qquad \frac{p_{j,t+k} - p_{j,t}}{p_{j,t}} = a + c_1 \cdot \frac{b_{j,t+k} - b_{j,t}}{p_{j,t}} + \tilde{\varepsilon}_{j,t+k}$$

In table 8.1 the annual one-year value change regression results for the full sample of firms are reported.[3] The slope coefficients ( $\hat{c}_1$ ) had the expected positive sign in all annual regressions. The average coefficient was 0.56 and varied between 0.15 and 1.48 in the 26 regressions. In 18 of the 26 annual regressions, the change in book value of equity variable had a significant explanatory power of the change in market value (on at least the 5 percent level). The pooled regression generated a highly significant slope coefficient of 0.77 ($t$-statistic = 13.7) and an explanatory power of 7.4%. The average explanatory power ($R^2$) of the annual regressions was 8.7%. The change in book value of equity (retained value creation) thus explained only a small part of the value change observed in the stock market. For some years, 1969 to 1972, 1980, 1987 and 1993, the change in equity hardly explained any of the market price changes.

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3 In order to reduce the potential effect of a few extreme observations the following truncation rule has been utilized: exclude observations (firm-years) if either

i) $$\frac{p_{j,t+k} - p_{j,t}}{p_{j,t}} \gtrless mean(\Delta p) \pm 3 \cdot \sigma(\Delta p)$$

ii) $$\frac{b_{j,t+k} - b_{j,t}}{p_{j,t}} \gtrless mean(\Delta b) \pm 3 \cdot \sigma(\Delta b)$$

iii) $$\frac{\left[E_{t+k}\left(RT_{j,t+k+1}\right) - E_t\left(RT_{j,t+1}\right)\right]}{p_{j,t}} \gtrless mean(\Delta RI) \pm 3 \cdot \sigma(\Delta RI)$$

The means and standard deviations of each variable, for each period length have been presented in section 6.1. The use of this truncation rule somewhat reduces the overall explanatory power of the regressions, but beyond that, seems to only marginally affect the regression coefficients.

**Table 8.1 Annual one-year M.3 value change regressions for the full sample of firms.**

| YEAR | $\hat{a}$ | $\hat{c}_1$ | $R^2$ | $n$ |
|---|---|---|---|---|
| 1968 | 0.34 (8.0)** | 0.90 (3.4)** | 24.1% | 38 |
| 1969 | −0.18 (−5.0)** | 0.27 (0.9) | 2.1% | 38 |
| 1970 | −0.06 (−1.5) | 0.18 (0.6) | 1.0% | 41 |
| 1971 | 0.24 (4.5)** | 0.21 (0.7) | 1.2% | 42 |
| 1972 | 0.09 (3.7)** | 0.15 (1.0) | 1.5% | 68 |
| 1973 | 0.09 (3.0)** | 0.77 (4.2)** | 20.5% | 71 |
| 1974 | −0.04 (−0.1) | 0.27 (2.0)* | 5.2% | 73 |
| 1975 | 0.16 (4.0)** | 0.89 (4.1)** | 20.0% | 68 |
| 1976 | −0.03 (−1.0) | 0.33 (2.2)* | 6.0% | 75 |
| 1977 | −0.19 (−9.0)** | 0.39 (3.0)** | 10.9% | 77 |
| 1978 | 0.04 (1.3) | 0.48 (2.5)** | 7.7% | 79 |
| 1979 | 0.07 (2.3)** | 0.49 (3.3)** | 12.3% | 78 |
| 1980 | 0.37 (8.2)** | 0.19 (1.0) | 0.7% | 83 |
| 1981 | 0.29 (7.4)** | 0.38 (2.0)* | 4.4% | 85 |
| 1982 | 0.71 (13.5)** | 0.99 (3.6)** | 14.5% | 77 |
| 1983 | 0.39 (7.9)** | 0.61 (1.6) | 2.9% | 89 |
| 1984 | −0.23 (−9.5)** | 0.36 (2.1)* | 4.6% | 91 |
| 1985 | 0.23 (6.5)** | 0.59 (2.0)* | 2.7% | 143 |
| 1986 | 0.41 (10.5)** | 0.90 (3.2)** | 6.8% | 146 |
| 1987 | 0.12 (4.6)** | 0.39 (1.5) | 1.4% | 153 |
| 1988 | 0.29 (9.3)** | 1.48 (5.4)** | 16.4% | 150 |
| 1989 | −0.03 (−1.0) | 0.93 (3.5)** | 7.1% | 158 |
| 1990 | −0.27 (−12.5)** | 0.61 (3.7)** | 9.1% | 138 |
| 1991 | −0.24 (−7.6)** | 0.82 (4.9)** | 16.1% | 125 |
| 1992 | −0.07 (−2.5) | 0.74 (5.6)** | 22.2% | 97 |
| 1993 | 0.62 (12.4)** | 0.36 (1.5) | 1.5% | 80 |
| **Mean** | **0.12** | **0.56** | **8.7%** | **91** |
| **Pooled** | 0.11 (12.0)** | 0.77 (13.7)** | 7.4% | 2,363 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.
* Significant at $0.01 \leq \alpha \leq 0.05$
** Significant at $\alpha \leq 0.01$

Very similar overall regression results have been presented in Easton and Harris (1991) and Ohlson and Penman (1992), both using US data for the periods 1968-86 and 1970-87 respectively (see table 8.2).[4]

4 Note that the regression specification used in Easton and Harris (1991) included dividends paid in the dependent and independent variable. Thus they explained total return using accounting earnings (normalized with opening period stock price). In spite of this difference, the results are remarkably similar.

**Table 8.2 One-year M.3 value change regression results of this study compared to results presented in Easton and Harris (1991) and Ohlson and Penman (1992).**

| Study | $\hat{a}$ | $\hat{c}_1$ | $R^2$ | $n$ | Proportion of significant $\hat{c}_1$ years $\alpha \leq 0.05$ |
|---|---|---|---|---|---|
| *Mean of annual regressions* | | | | | |
| Easton & Harris[A] | 0.08 | 1.02 | 10.5% | 1,052 | 100.0% |
| Ohlson & Penman[B] | 0.07 | 0.87 | 11.0% | 1,600 | n.a. |
| Runsten | 0.12 | 0.56 | 8.7% | 91 | 69.2% |
| *Pooled regressions* | | | | | |
| Easton & Harris[A] | 0.11 (30.8)** | 0.82 (40.3)** | 7.5% | 19,996 | |
| Runsten | 0.11 (12.0)** | 0.77 (13.7)** | 7.4% | 2,363 | |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.
* Significant at $0.01 \leq \alpha \leq 0.05$
** Significant at $\alpha \leq 0.01$

A) Calculated from Levels model results in table 1, Easton and Harris (1991).
B) From panel A in table 1, Ohlson and Penman (1992).

As is evident from the table, the pooled regression result in this study was practically identical to the result in Easton and Harris (1991), both in terms of explanatory power and regression coefficients. In terms of the means of repeated annual regressions, the present study on Swedish data showed a lower estimate of the slope coefficient and a slightly lower $R^2$. The most striking difference, however, concerns the relative frequency of significant $\hat{c}_1$ coefficients. In Easton and Harris (1991), annual earnings provided a significant explanation of returns in all annual regressions, whereas in the present study this was the case in only 69% of the years. Given the overall rather low explanatory power in both studies, this difference can probably be attributed to the large difference in sample sizes (91 observations per year in this study as compared to 1,052 in Easton and Harris).

In table 8.3, M.3 regressions with successively increased time intervals are presented. The average explanatory power of the regressions showed a monotonous increase from 8.7% for the one-year time interval to 35.4% for the ten-year time interval. For the two-year time interval regressions the change in accounting equity had a significant explanatory power in 21 of the 25 regressions. For the five- and ten-year intervals, all individual regressions were significant.

**Table 8.3 The mean of repeated M.3 value change regressions for different intervals for the full sample.**

| Time interval (Year) | $\hat{a}$ | $\hat{c}_1$ | $R^2$ | $n$ | Proportion of significant $\hat{c}_1$ years $\alpha \leq 0.05$ |
|---|---|---|---|---|---|
| 1 | 0.12 | 0.56 | 8.7% | 91 | 69.2% |
| 2 | 0.20 | 0.75 | 12.5% | 85 | 88.0% |
| 5 | 0.52 | 1.03 | 26.6% | 67 | 100.0% |
| 10 | 1.43 | 1.32 | 35.4% | 46 | 100.0% |

Again, it is notable how similar these results are to those presented in Ohlson and Penman (1992). The mean $R^2$ in their study followed the increasing pattern 11%, 16%, 29% and 43%, for the same time intervals. Furthermore, Easton, Harris and Ohlson (1992) in a similar study using US data for the period 1968-86 showed a $R^2$ pattern increasing from 6%, 15%, 33% to 63%. Also O'Hanlon and Pope (1997) using UK data show results that are consistent with increasing explanatory ability of earnings as the time interval studied is prolonged.[5] These results are all in line with the hypothesis that value creation is described with less error for a longer time interval. Easton, Harris and Ohlson drew the following conclusion:

> *"The idea of a correlation increase as the return interval increases stems from an application of accounting concepts. That is, earnings aggregate over periods, so that earnings are more likely to reflect the value-relevant events and their effect on value changes over longer periods. This framework naturally leads to the conclusion that investors 'buy earnings'."*
>
> Easton, Harris and Ohlson (1992, p. 140)

According to the simple assumptions behind M.3, a unit of recognized value creation according to the accounting convention is expected to be translated

5 The mean $R^2$ in their study followed the pattern 14%, 23%, 41%, 40% and 65%, for the time intervals, 1, 2, 5, 10 and 20 years.

into a unit of value creation in market value terms (implying that the $\hat{c}_1$ coefficient should equal 1.0). From the table above, one may conclude that the $\hat{c}_1$ coefficients successively increase when the time interval is lengthened. For the ten-year period, it actually exceeded 1.0 (1.32 as a mean of repeated regressions). A similar pattern has been noticed both in Easton, Harris and Ohlson (1992) and in Ohlson and Penman (1992).

> *"A dollar of earnings evidently is associated with more than a dollar of change in value for long return periods."*
> Easton, Harris and Ohlson (1992, p.139)

*Ibid.* further noticed that they have no easy and direct explanation as to why this pattern occurs. O'Hanlon and Pope (1997) received slope coefficients that fluctuated around 2.0 for both short and long intervals. According to the valuation model outlined in this study (see Chapter 2), the $\hat{c}_1$ coefficient is expected to equal 1.0 only if the firms studied are not expected to have a permanent measurement bias. Given the mixed sample of firms in this study, a $\hat{c}_1$ coefficient exceeding 1.0 is thus not unexpected. (Inclusion of control for different expected levels of *PMB*s will be evaluated with regression specification M.5 later.) Also note that the total mean of the annual median market-to-book value premiums of the firms included in this study was 0.38 (see table 6.1). Table 6.1, also shows a systematic change in the market-to-book value premium over time. The market-to-book value premium was consistently lower during the first half of the period studied (1967 to 1980). This systematic change is likely to influence the estimated $\hat{c}_1$ coefficient (and probably also the intercept, $\hat{a}$) in the long window regressions, given the simple specification of M.3.

There are several possible reasons behind a general change in market-to-book value premiums: i) changed accounting principles, ii) the effect of a long period of high inflation, iii) the median firm investing on average more in intangible assets, iv) a changed mix of business types represented on the stock exchange, v) generally changed business climate, and vi) new groups of investors with other investment policies (i.e., institutional and international investors). Some of these sources will be controlled for in later sections, while others could ideally be picked up by time- and firm-specific calculations of the expected *PMB*.

Besides the general shift in the market-to-book value premium over time, a considerable short-term instability in the average premium may also be noted. According to the valuation approach in this study, short-term fluctuations in the market-to-book value premium should be explained by changed expectations of future value creation. In regression model M.4 a variable (change in expected residual income) is added. This variable has been designed to capture such changes in expected value creation.

## 8.2 Regression model M.4

M.4 $$\frac{p_{j,t+k} - p_{j,t}}{p_{j,t}} = a + c_1 \cdot \frac{b_{j,t+k} - b_{j,t}}{p_{j,t}} + c_2 \cdot \frac{\left[E_{t+k}\left(\widetilde{RI}_{j,t+k+1}\right) - E_t\left(\widetilde{RI}_{j,t+1}\right)\right]}{p_{j,t}} + \widetilde{\varepsilon}_{j,t+k}$$

In table 8.4 the annual one-year value change regression results for the full sample of firms are reported (excluding extreme observations). The slope coefficients for change in book value of equity ($\hat{c}_1$) once again had the expected positive sign in all annual regressions. The average coefficient was slightly lower (0.46) and varied between 0.04 and 1.26 in the 26 regressions. The 'change in book value of equity' variable had a significant explanatory power of the 'change in market value' (on at least the 5 percent level) in 15 of the 26 annual regressions. The slope coefficients for change in residual income ($\hat{c}_2$) also had the expected positive sign in all annual regressions. The average coefficient was 1.41 and varied between 0.14 and 3.01 in the 26 regressions. The change in residual income variable had a significant explanatory power of the change in market value (on at least the 5% level) in 19 of the 26 annual regressions. The pooled regression generated a highly significant slope coefficient of 0.66 ($t$-statistic = 12.0) for the change in equity variable and 1.75 ($t$-statistic = 13.0) for the change in residual income variable. The explanatory power (adjusted $R^2$) was 13.5% for the pooled regression and 14.8% as a mean of the annual regressions. The explanation of the value change observed on the stock market was thus still low, but it was almost doubled by the inclusion of the second explanatory variable.

**Table 8.4 Annual one-year M.4 value change regressions for the full sample of firms.**

| YEAR | $\hat{a}$ | $\hat{c}_1$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1968 | 0.31 (7.0)** | 0.58 (1.8)* | 1.74 (1.7) | 25.7% | 38 |
| 1969 | –0.19 (–5.2)** | 0.33 (1.1) | 0.67 (1.3) | 1.2% | 38 |
| 1970 | –0.03 (–0.7) | 0.04 (0.1) | 0.75 (1.3) | 0.4% | 41 |
| 1971 | 0.33 (6.3)** | 0.04 (0.1) | 3.01 (3.9)** | 24.8% | 42 |
| 1972 | 0.07 (3.2)** | 0.07 (0.5) | 1.07 (2.1)** | 4.8% | 68 |
| 1973 | –0.06 (–2.2)* | 0.50 (3.0)** | 1.70 (5.1)** | 40.9% | 71 |
| 1974 | 0.00 (–0.1) | 0.15 (1.1) | 0.68 (2.0)* | 7.7% | 73 |
| 1975 | 0.17 (3.5)** | 0.87 (3.9)** | 0.14 (0.3) | 17.7% | 68 |
| 1976 | 0.01 (0.4) | 0.27 (1.9)* | 1.42 (3.9)** | 20.1% | 75 |
| 1977 | –0.14 (–5.6)** | 0.44 (3.7)** | 1.47 (4.2)** | 26.0% | 77 |
| 1978 | 0.01 (0.4) | 0.47 (2.8)** | 1.91 (5.0)** | 28.6% | 79 |
| 1979 | 0.07 (2.1)* | 0.42 2.9)** | 1.37 (2.6)** | 17.4% | 78 |
| 1980 | 0.38 (8.5** | 0.29 (1.2) | 1.00 (2.0)* | 3.0% | 83 |
| 1981 | 0.32 (8.4)** | 0.28 (1.5) | 1.75 (3.6)** | 15.5% | 85 |
| 1982 | 0.72 (14.0)** | 0.95 (3.5)** | 2.05 (2.4)* | 18.3% | 77 |
| 1983 | 0.39 (8.2)** | 0.26 (0.6) | 2.12 (2.4)* | 6.7% | 89 |
| 1984 | –0.23 (–9.3)** | 0.33 (1.9)* | 0.23 (0.6) | 2.9% | 91 |
| 1985 | 0.26 (7.3)** | 0.35 (1.2) | 1.80 (3.4)** | 9.0% | 143 |
| 1986 | 0.43 (11.2)** | 0.53 (1.8)* | 2.62 (3.4)** | 12.5% | 146 |
| 1987 | 0.13 (5.2)** | 0.18 (0.7) | 1.89 (3.0)** | 5.8% | 153 |
| 1988 | 0.29 (9.5)** | 1.26 (4.4)** | 1.41 (2.3)* | 18.2% | 150 |
| 1989 | –0.02 (–0.6) | 0.85 (3.0)** | 0.55 (0.9) | 6.3% | 158 |
| 1990 | –0.26 (–11.8)** | 0.69 (4.2)** | 1.29 (2.9)** | 13.1% | 138 |
| 1991 | –0.20 (–6.2)** | 0.81 (4.9)** | 1.61 (3.3)** | 21.6% | 125 |
| 1992 | –0.06 (–2.1)* | 0.68 (4.8)** | 0.61 (1.6) | 23.3% | 97 |
| 1993 | 0.53 (9.7)** | 0.25 (1.1) | 1.83 (3.2)** | 12.0% | 80 |
| **Mean** | **0.12** | **0.46** | **1.41** | **14.8%** | **91** |
| **Pooled** | 0.12 (13.7)** | 0.66 (12.0)** | 1.75 (13.0)** | 13.5% | 2,363 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

In table 8.5 the regression results of this study are compared to the results presented in Easton and Harris (1991).[6] Their multiple regression model is quite similar to M.4,[7] even if their motive for the regression specification

6 The regression results in Easton and Harris (1991) were generated from a large sample of US firms for the period 1968 to 1986.

7 The multiple regression model specified in Easton and Harris (1991) was as follows (Easton and Harris denoted earnings $A$ rather than $X$):

differs from the one proposed in this study. They set out to test whether market return is best explained by 'accounting earnings' or 'change in accounting earnings'—viewing the two variables more or less as competitors. In this study, 'change in equity' (earnings minus dividends) and 'change in expected residual income', are viewed as two complementary indicators, each explaining different aspects of value changes—value creation (retained) and changed expectations regarding the firm's ability to create value. The 'change in earnings' variable has long been used in market-based accounting research as an indicator of unexpected earnings. For example, the line of research that Lev (1989) evaluated, and expressed concern about, used 'change in earnings' as the main explanatory variable of return in most cases.

**Table 8.5 One-year M.4 value change regression results of this study compared to the results presented in Easton and Harris (1991).**

| Study | $\hat{a}$ | $\hat{c}_1$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{c}_1$ years $\alpha \leq 0.05$ | $\hat{c}_2$ years $\alpha \leq 0.05$ |
| *Mean of annual regressions* | | | | | | | |
| Easton & Harris[A] | 0.10 | 0.85 | 0.24 | 11.4% | 1,052 | 100.0% | 52.6% |
| Runsten | 0.12 | 0.46 | 1.41 | 14.8% | 91 | 57.7% | 73.1% |
| *Pooled* | | | | | | | |
| Easton & Harris[A] | 0.12 (31.6)** | 0.71 (28.3)** | 0.16 (7.1)** | 7.7% | 19,996 | | |
| Runsten | 0.12 (13.7)** | 0.66 (12.0)** | 1.75 (13.0)** | 13.5% | 2,363 | | |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

A) Calculated from multiple regression model result in table 3, Easton and Harris (1991).

---

$$\frac{p_{j,t+1} + D_{j,t+1} - p_{j,t}}{p_{j,t}} = a + c_1 \cdot \frac{X_{j,t+1}}{p_{j,t}} + c_2 \cdot \frac{X_{j,t+1} - X_{j,t}}{p_{j,t}} + \tilde{\varepsilon}_{j,t+k}$$

The change in earnings variable equals the change in residual income variable if the firm has no growth in equity and the cost of equity capital is a constant.

It is noteworthy that Easton and Harris showed weaker results concerning the complementarity of the two explanatory variables than those found in the present study.[8] The overall explanatory power did not increase as much, and the 'change in earnings' variable was not as often significant, despite the much larger US sample. Easton and Harris did, nevertheless, reach the following conclusion:

> *"Overall, the evidence suggests that both the current earnings levels variable ($A_{jt}/P_{jt-1}$) and the earnings changes variable ($\Delta A_{jt}/P_{jt-1}$) are relevant for explaining returns, and the two variables are not just substitutes. They are complements in the sense that, for the pooled sample and several individual years, significantly more cross-sectional variation in returns is explained by* **both** *earnings levels and earnings changes than is explained by either variable considered alone "*
>
> Easton and Harris (1991, p. 31)

The main difference in regression results, besides the slightly less frequent significance of the 'change in earnings' variable, concerns this variable's estimated slope coefficient. The slope coefficient of the pooled and the mean of annual regressions were only 0.16 and 0.24 respectively, as compared to the 'change in residual income' variable with regression coefficients amounting to 1.75 and 1.41 respectively. The slope coefficient of M.4 can be given an economic interpretation, given the proposed valuation framework of this study. The slope coefficient can be viewed as an indicator of the expected permanence of the 'new performance level'. According to the discussion in Chapter 2, a *GPF* amounting to 1 indicates no permanence and a *GPF* exceeding, for example, 10 indicates strong expected permanence of the new performance level, possibly combined with expected growth. The slope coefficient of the 'change in earnings' variable has been given a similar economic interpretation in the market-based accounting research literature; it has often been called the 'Earnings Response Coefficient' (ERC). A rather low estimated ERC is a well-recognized phenomena. A plausible explanation for this observation was provided in Ali and Zarowin (1992):

8 Recall that the utilized earnings change variables are not identical. Likely consequences of this fact will be further developed below.

> *"In the presence of transitory components of earnings, the previous period's earnings are a poor proxy for the current period's expected earnings and the change in earnings is a poor proxy for unexpected earnings. We show that using the change in earnings as a proxy for unexpected earnings causes earnings response coefficients (ERCs), the slope coefficients in regressions of returns on unexpected earnings, to be biased toward zero and is a potential reason for the widely documented, empirically low ERCs*)"*
>
> *) *"As Ball and Watts (1972) and Watts and Zimmerman (1986) point out, if annual earnings follow a random walk, earnings response coefficients are expected to be* 1+ 1/r, *where r is the rate for discounting future earnings. Thus, for historically experienced discount rates of about 12%, earnings response coefficients are theoretically expected to be about 9; however they are typically estimated at below 3."*
>
> Ali and Zarowin (1992, p. 250)

The 'change in residual income' variable used in this study is, as such, a crude proxy for unexpected performance. It is, however, potentially 'richer' than the simple 'change in earnings' variable in three respects: i) it controls for growth in earnings which is merely associated with retained earnings (via growth in equity), ii) it controls for changes in the cost of equity capital, and iii) the effect of an extreme period of transitory earnings is reduced via the utilized mean regression function (arctan). Together these differences may well be an important reason behind the higher coefficients in this study. A sample of heterogeneous firms that includes firms with low predictive validity of their historical *ROE*, such as the full sample in the present study, can also cause low slope coefficients. This possibility will be evaluated in forthcoming sections.

The results of running M.4 on longer time intervals are presented in table 8.6. As observed regarding M.3, the 'change in equity' variable was increasingly significant for the longer windows. Its slope coefficient also increased and on average exceeded one (1.40) for the longest window. The inclusion of the 'change in residual income' variable increased the explanatory power of the regressions for all time intervals. The mean $\bar{R}^2$ more than doubled for the two-year window. The smallest relative increase was shown for the ten-year interval—from 37.9% to 47.1%—but it was still a considerable rise. The coefficients significantly exceeded zero in most of the regressions, but not all. The mean level of the slope coefficients ($\hat{c}_2$) also followed an increasing pattern—from 1.41 for one-year value change regressions to 3.93 for the ten-year interval. These higher values are more consistent with the estimated *GPF*s in the value level regressions in the previous chapter. The mean *GPF* coefficient for the full sample using M.2 was 4.03 (see table 7.5).

**Table 8.6 The mean of repeated M.4 value change regressions for different intervals for the full sample.**

| Time interval (Year) | $\hat{a}$ | $\hat{c}_1$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{c}_1$ years $\alpha \leq 0.05$ | $\hat{c}_2$ years $\alpha \leq 0.05$ |
| 1 | 0.12 | 0.46 | 1.41 | 14.8% | 91 | 57.7% | 73.1% |
| 2 | 0.22 | 0.68 | 2.23 | 26.3% | 85 | 92.0% | 80.0% |
| 5 | 0.58 | 1.05 | 2.88 | 37.9% | 67 | 100.0% | 72.7% |
| 10 | 1.70 | 1.40 | 3.93 | 47.1% | 46 | 100.0% | 70.6% |

## 8.3 Regression model M.5

M.5
$$\frac{p_{j,t+k}-p_{j,t}}{p_{j,t}} = a + c_1 \cdot \frac{b_{j,t+k}-b_{j,t}}{p_{j,t}} + c_2 \cdot \frac{\left[E_{t+k}\left(\widetilde{RI}_{j,t+k+1}\right) - E_t\left(\widetilde{RI}_{j,t+1}\right)\right]}{p_{j,t}} + c_3 \cdot \frac{\left(b_{j,t+k}-b_{j,t}\right)\cdot PMB_j}{p_{j,t}} + \tilde{\varepsilon}_{j,t+k}$$

In regression specification M.5, a third explanatory variable is added—change in book value of equity multiplied by the estimated industry specific *PMB*, divided by opening market value.[9] This new variable will naturally be highly correlated with the 'change in book value of equity' variable.[10] This causes collinearity, and the economic interpretation of individual regression coefficients is therefore strongly impaired. A large positive $\hat{c}_1$ coefficient may be combined with a large negative $\hat{c}_3$ coefficient, or vice versa.

9 Recall that the estimated *PMB*s in general are industry-specific, with the exception of the R&D intensive firms, for which firm specific estimates have been used.

10 See discussion regarding multicollinearity in appendix R.

Furthermore, one individual variable's degree of significance is strongly influenced by the other.[11]

To avoid problems of multicollinearity without excluding the effect of different *PMB*s, the following regression model has been specified. Here the measurement bias has been incorporated into the value creation variable. The slope coefficient $\hat{c}_1'$ in M.5′ is expected to equal 1.0, given valid estimates of the measurement bias.

M.5′
$$\frac{p_{j,t+k} - p_{j,t}}{p_{j,t}} = a + c_1' \cdot \frac{\left(b_{j,t+k} - b_{j,t}\right) \cdot \left(1 + PMB_j\right)}{p_{j,t}} + \\ + c_2 \cdot \frac{\left[E_{t+k}\left(R\tilde{I}_{j,t+k+1}\right) - E_t\left(R\tilde{I}_{j,t+1}\right)\right]}{p_{j,t}} + \tilde{\varepsilon}_{j,t+k}$$

Table 8.7 includes regression results for successively longer windows using specification M.5′.

**Table 8.7 The mean of repeated M.5′ value change regressions for different intervals for the full sample.**

| Time interval (Year) | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{c}_1'$ years $\alpha \leq 0.05$ | $\hat{c}_2$ years $\alpha \leq 0.05$ |
| 1 | 0.13 | 0.31 | 1.41 | 15.1% | 91 | 65.4% | 76.9% |
| 2 | 0.22 | 0.47 | 2.23 | 26.8% | 85 | 88.0% | 84.0% |
| 5 | 0.57 | 0.69 | 2.83 | 40.6% | 67 | 100.0% | 72.7% |
| 10 | 1.74 | 0.86 | 3.59 | 53.5% | 46 | 100.0% | 64.7% |

The new combined slope coefficient ($\hat{c}_1'$) was significant as often as $\hat{c}_1$ when using M.4 and the same data.[12] The mean coefficient increased from

11 The explanatory power can, however, still be interpreted. Regression results of M.5 with increasing time intervals are not reported; it can be noted, however, that the mean $\bar{R}^2$ increased (compared to M.4) for all four intervals studied, with a more pronounced effect regarding the two longer intervals.

12 All individual regressions were significant (at the 5 percent level) for the two longer intervals. In comparison to the M.4 specification, the coefficient was significant in one more and one less regression respectively, when the one- and two-year change regressions were run.

0.31, 0.47, 0.69 to 0.86 when the interval increased successively from 1 to 10 years. For the shorter windows the mean explanatory power was only marginally higher as compared to the results using specification M.4—however, for the longest window the mean $R^2$ increased from 47.1% to 53.5%, indicating that the *PMB* has some discriminating ability. The increasing explanatory power supports the hypothesis that firms are different with respect to their degree of measurement bias and that the estimation procedure of this study captures some of these differences. Specification M.5′ will be used as the main model in the forthcoming sections.

### 8.3.1 Stability in association over time

From the annual value change regressions of M.3 and M.4 presented in table 8.1 and 8.4 above, it is clear that the explanatory power of the tested regressions have been unstable over time. To create a visual illustration of how the explanatory power of regression specification M.5′ has changed over time, four graphs have been constructed. Figures 8.1a, b, c and d illustrate value change intervals of 1, 2, 5 and 10 years respectively.[13]

13 ***dB(1+PMB) = the change in book value of equity times (1+PMB) variable***
***dRI = the change in expected residual income variable***

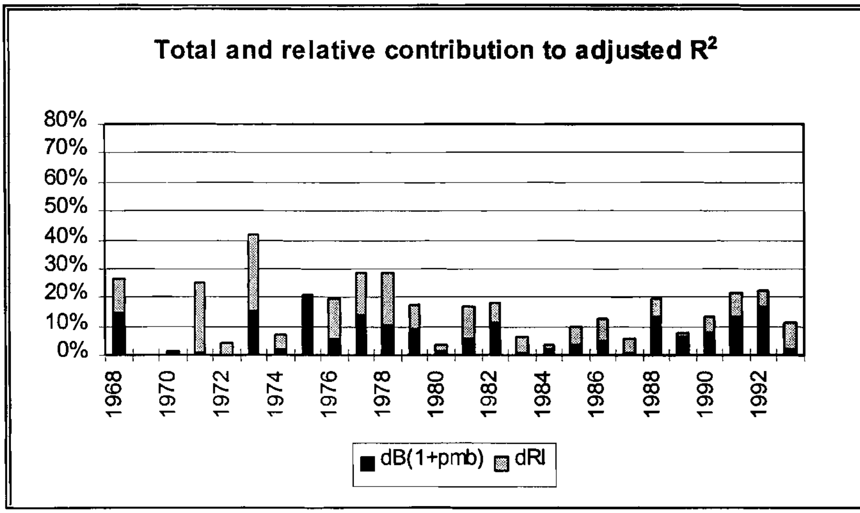


***Figure 8.1a*** *The adjusted $R^2$ per year of repeated one-year value change regressions (M.5′), for the full sample. The total $R^2$ is sub-divided into the relative contribution from each of the two explanatory variables.*

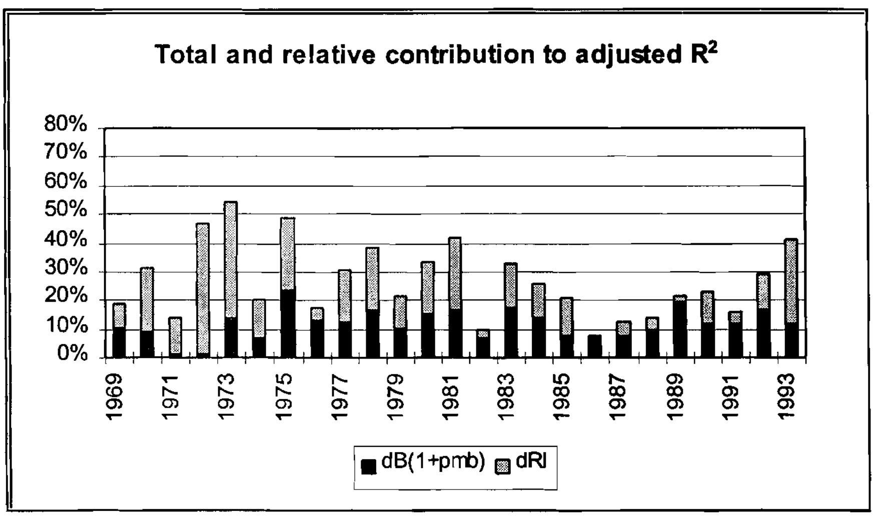


***Figure 8.1b*** *The adjusted $R^2$ per period of repeated two-year value change regressions (M.5′), for the full sample. The years in the graphs relate to the end of each period.*

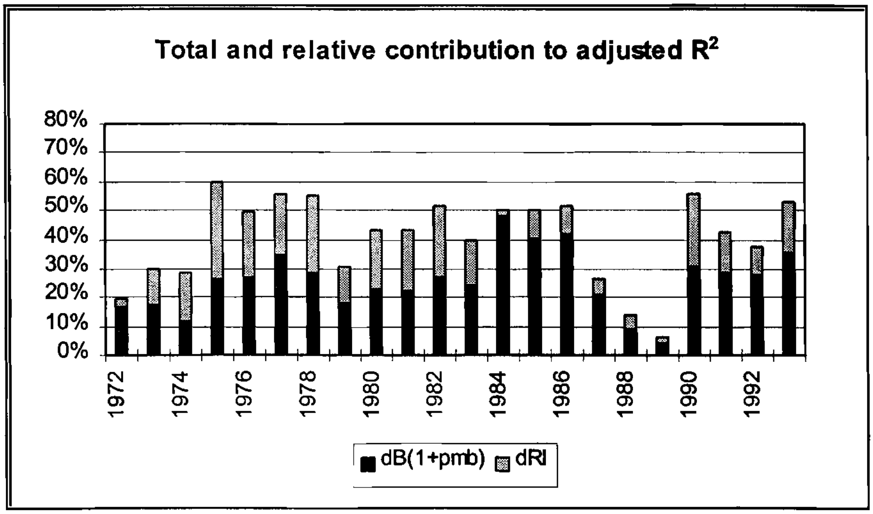


***Figure 8.1c*** *The adjusted* $R^2$ *per period of repeated five-year value change regressions (M.5′), for the full sample. The years in the graphs relate to the end of each period.*

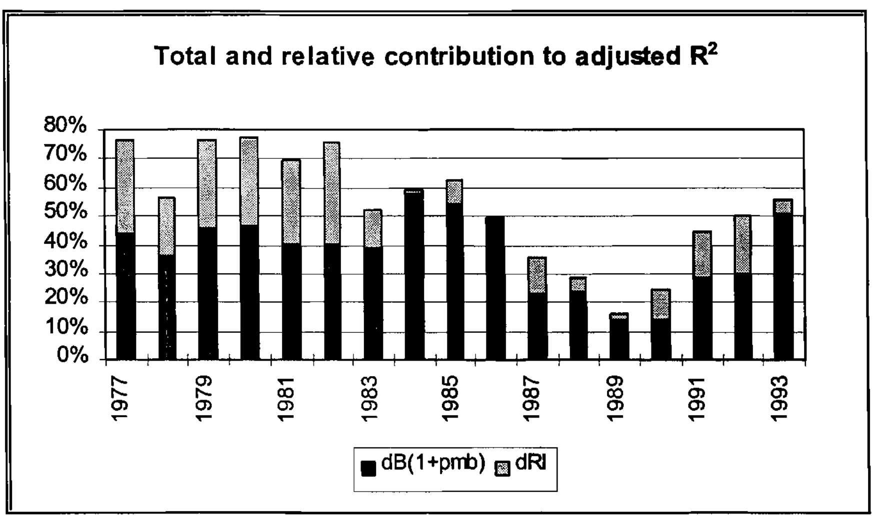


***Figure 8.1d*** *The adjusted* $R^2$ *per period of repeated ten-year value change regressions (M.5′), for the full sample. The years in the graphs relate to the end of each period.*

Each period's total adjusted $R^2$ has further been sub-divided into the relative contribution from each of the two explanatory variables (change in equity times (1+*PMB*) and change in expected residual income).[14] The mean contribution to the adjusted $R^2$ from each explanatory variable in the repeated regressions is presented in table 8.8.

**Table 8.8 The mean adjusted $R^2$ sub-divided into the relative contribution from each of the two explanatory variables, for different time intervals for the full sample, using regression specification M.5′.**

| Time interval (Year) | Relative $\bar{R}^2$ $\Delta b \cdot (1+PMB)$ | Relative $\bar{R}^2$ $\Delta E[RI]$ | Total $\bar{R}^2$ |
|---|---|---|---|
| 1 | 7.0% | 8.1% | 15.1% |
| 2 | 11.7% | 15.2% | 26.8% |
| 5 | 25.6% | 15.0% | 40.6% |
| 10 | 37.4% | 16.1% | 53.5% |

Two observations appear to be of particular interest. First, the change in expected residual income variable has had, by a small margin, the largest relative explanatory power for the two shorter intervals. For longer intervals, it appears, however, that the variable ceased to add more explanation. Secondly, the change in book value of equity variable showed, on the other hand, increasing explanatory power for each added period. For the two longer intervals, the change in equity variable was clearly the most important variable. This result makes sense as the relative importance of value created (and retained) should become more dominant as the interval is expanded. (For the extreme case of the full life of a company, 100 percent of the firm's market value change is expected to be explained by total change in equity.)

Returning to the four figures illustrating the relative stability of the associations over time, a number of observations can be made. Regarding the one-year value change regressions, no apparent trend is observable. Possibly, one may note a weaker association for several of the years during the 1980s and some particularly weak years of the early 1970s. For the two-year value

14 The relative sizes of the standardized regression coefficients (beta coefficients) have been used to determine the relative explanatory power of the two variables. This comparison is equivalent to a comparison of the relative *t*-statistics of the two coefficients.

change regressions, the explanatory contribution of the change in equity variable seems to have been rather stable over the years, whereas the change in expected residual income variable contributed practically nothing during the second half of the 1980s. In the five-year value change regressions, two periods with a particularly weak association can be observed. These periods were the five-year periods ending 1972, 73 and 74 and the periods ending 1987, 88 and 89. At least two common characteristics can be identified for these periods. They can be characterized as periods of a particularly uneven accounting practice (see Section 5.3)—the earlier periods mainly related to the chosen accounting method for depreciation and valuation of depreciable assets and the method of group consolidation, the latter periods related to the accounting methods of goodwill treatment and accounting method for associated companies. Further, the mid years in each period, 1973 and 1988, were both peaks in the Swedish business cycle (see figure 5.2). The importance of these characteristics will be elaborated in later sections. In the final, ten-year value change figure, it is notable that the explanatory power was between 70% and 80% for the periods ending 1977 to 1982.[15] Subsequently the explanatory power was significantly weakened. The value changes for the periods ending 1987 to 1991 were particularly weakly explained ($\bar{R}^2$ amounting to only between 20% and 40%). During these periods, both explanatory variables performed poorly as descriptors of value changes on the market. A weak association of this kind may be related to a number of factors, for example: i) model misspecification, ii) a heterogeneous sample of firms iii) the accounting regime not being descriptive of the company value creation (poor and/or uneven accounting practice), and iv) more complex business activities being performed by more complex organizations. A number of tests attempting to control for some of these factors will be performed in the following sections. However, distinguishing between these and other factors is not an easy task, especially as the observations appear to be more visible for the longer interval regressions, while several of the controls only can be performed for shorter intervals.

15 The period ending 1978 being an exception, with an $\bar{R}^2$ amounting to 53%.

### 8.3.2 Different profit recognition characteristics

The difference between continuous versus discrete profit recognition firms is interesting to evaluate with the value change regression models for different time intervals. The idea behind the distinction relies on the idea that discrete profit recognition firms tend to report earnings for a particular period that is largely influenced by whether the outcome of a multi-period project 'happens' to be recognized during this period, or some adjacent period. Short period accounting earnings are thus expected to be poor, both as a description of value creation and as a signal of value creation ability for the discrete profit recognition firms. Reported earnings' lack of descriptive validity of the contemporaneous value creation is expected to diminish as longer intervals are studied.

Table 8.9 includes the means of repeated regressions for successively longer windows using specification M.3. Panel A shows the results for the sub-sample of firms classified as having continuous profit recognition; and panel B contains the results for discrete profit recognition firms.

**Table 8.9 The mean of repeated M.3 value change regressions for different intervals.**

**Panel A: Continuous profit recognition firms**

| Time interval (Year) | $\hat{a}$ | $\hat{c}_1$ | $R^2$ | $n$ | Proportion of significant $\hat{c}_1$ years $\alpha \leq 0.05$ |
|---|---|---|---|---|---|
| 1 | 0.12 | 0.64 | 9.2% | 62 | 68.2% |
| 2 | 0.17 | 1.02 | 17.4% | 57 | 95.2% |
| 5 | 0.37 | 1.37 | 30.8% | 45 | 100.0% |
| 10 | 1.40 | 1.61 | 36.1% | 29 | 84.6% |

**Panel B: Discrete profit recognition firms**

| Time interval (Year) | $\hat{a}$ | $\hat{c}_1$ | $R^2$ | $n$ | Proportion of significant $\hat{c}_1$ years $\alpha \leq 0.05$ |
|---|---|---|---|---|---|
| 1 | 0.15 | 0.52 | 13.0% | 39 | 50.0% |
| 2 | 0.26 | 0.62 | 16.7% | 36 | 57.1% |
| 5 | 0.96 | 0.84 | 26.9% | 29 | 72.2% |
| 10 | 3.24 | 1.25 | 35.5% | 19 | 84.6% |

In terms of mean $R^2$, the two sub-samples showed no important differences for any of the four time intervals. Most strikingly, the mean $R^2$ for the shortest time interval was, counter intuitively, actually higher for the discrete profit recognition firms. However, there appears to be a clear difference in terms of how often the change in equity variable has a significant explanatory power of change in market value in the individual regressions. Change in equity more often explained the change in market value for the continuous profit recognition firms for the three shorter intervals—for the ten-year interval this difference has disappeared.

Table 8.10 includes the means of repeated regressions for successively longer windows using specification M.5′.

**Table 8.10 The mean of repeated M.5′ value change regressions for different intervals.**

**Panel A: Continuous profit recognition firms**

| Period length (Year) | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $R^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{c}_1'$ years $\alpha \leq 0.05$ | $\hat{c}_2$ years $\alpha \leq 0.05$ |
| 1 | 0.12 | 0.40 | 1.54 | 18.1% | 62 | 63.6% | 77.3% |
| 2 | 0.18 | 0.59 | 2.40 | 33.6% | 57 | 90.5% | 81.0% |
| 5 | 0.48 | 0.78 | 3.75 | 52.2% | 44 | 88.9% | 88.9% |
| 10 | 1.51 | 1.01 | 4.83 | 60.7% | 29 | 100.0% | 69.2% |

**Panel B: Discrete profit recognition firms**

| Period length (Year) | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $R^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{c}_1'$ years $\alpha \leq 0.05$ | $\hat{c}_2$ years $\alpha \leq 0.05$ |
| 1 | 0.15 | 0.29 | 1.05 | 16.1% | 39 | 50.0% | 45.5% |
| 2 | 0.31 | 0.46 | 1.48 | 22.1% | 36 | 61.9% | 47.6% |
| 5 | 0.99 | 0.64 | 1.87 | 33.9% | 29 | 83.3% | 55.6% |
| 10 | 3.05 | 0.90 | 2.25 | 41.7% | 19 | 92.3% | 23.1% |

Including the change in residual income variable as an explanatory variable generated stronger separation between the two sub-samples. The mean $R^2$ was higher for the continuous profit recognition firms for all four intervals; the relative difference was most pronounced for the three longer intervals. In line with expectations, the change in residual income added more explanatory power for the continuous profit recognition firms. This is manifested in the higher $\bar{R}^2$ and in the almost twice as high frequency of significant regression $\hat{c}_2$ coefficients. It is also noteworthy that the estimated slope coefficients for change in equity ($\hat{c}_1^f$) followed very similar patterns,[16] approaching 1.0 for both sub-samples, whereas the slope coefficients for change in residual income ($\hat{c}_2$) showed an increasing difference, with the continuous profit recognition firms having on average an approximately twice as high coefficient. These results are consistent with the hypothesis that disclosed earnings for the group of firms classified as having continuous profit recognition, are more informative (in the sense of more explanatory power) and more value relevant (in the sense of being associated with a larger price change).

### 8.3.3 Regression results for different industries

To run separate regressions for each industry is another way to study differences among different subgroups of firms. Table 8.11 presents pooled time-series and cross-sectional regressions from each industry.[17] The one-year M.5′ value change regression specification has been used. The industries are ranked in descending $\bar{R}^2$ order.

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16 Note that change in equity is multiplied by $1 + PMB_j$ in the utilized specification.

17 The small number of firms in several of the industries prevents the annual regression alternative.

**Table 8.11 Pooled regressions for one-year value change, dividing the sample according to industry classification, using regression specification M.5′. The industries are ranked in descending $\bar{R}^2$ order.**

| Industry | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| Other service | 0.07 (1.1) | 0.82 (3.5)** | 2.44 (2.5)** | 37.6% | 47 |
| Trading and retail | 0.03 (0.8) | 1.14 (6.4)** | 2.19 (2.8)** | 36.2% | 76 |
| Consultants and computer | 0.04 (1.0) | 0.84 (4.7)** | 4.16 (5.3)** | 31.4% | 104 |
| Consumer goods | 0.24 (2.3)* | –0.01 (–0.0) | 2.29 (2.5)** | 16.8% | 34 |
| Investment companies (pure) | 0.17 (5.2)** | 0.33 (1.9)* | 3.41 (4.6)** | 16.2% | 172 |
| Shipping | 0.13 (2.8)** | 0.43 (3.3)** | 1.29 (2.2)* | 15.7% | 87 |
| Building, constr. and real estate | 0.07 (1.0) | 1.00 (3.1)** | 1.32 (0.9) | 15.6% | 66 |
| Engineering | 0.12 (7.7)** | 0.27 (3.8)** | 2.14 (8.8)** | 15.5% | 568 |
| Conglomerates and mixed inv. | 0.12 (5.2)** | 0.57 (5.6)** | 1.48 (4.6)** | 15.3% | 342 |
| Building and construction | 0.11 (1.8) | 0.57 (2.2)* | 1.42 (1.7)* | 14.4% | 68 |
| Other production | 0.12 (4.7)** | 0.41 (3.1)** | 2.15 (5.0)** | 14.1% | 251 |
| Pharmaceutical industry | 0.08 (1.4) | 0.54 (2.7)** | 1.68 (1.1) | 13.3% | 53 |
| Chemical industry | 0.13 (3.7)** | 0.38 (2.4)** | 1.70 (3.3)** | 11.6% | 143 |
| Real estate | 0.12 (3.0)** | 0.64 (3.1)** | 2.36 (2.1)* | 9.5% | 152 |
| Pulp and paper | 0.21 (5.6)** | –0.08 (–0.7) | 0.35 (0.9) | –0.4% | 148 |
| Capital-intensive service | 0.13 (2.6)** | 0.15 (0.9) | 0.78 (0.9) | –0.4% | 52 |
| **Mean** | **0.12** | **0.50** | **1.95** | **16.4** | **148** |

$t$-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.
* Significant at $0.01 \leq \alpha \leq 0.05$
** Significant at $\alpha \leq 0.01$

Note that the number of observations in some of the industries is very limited, which obviously implies that one has to be cautious about drawing any strong conclusions. An interesting pattern can, however, be observed. The top three industries in terms of high explanatory power ($\bar{R}^2$ exceeding 30%), other service, trading and retail and consultants and computer companies, are all particularly non-capital intensive. On the other hand, the industries found in the low explanatory power end of the table ($\bar{R}^2$ close to zero), are the very capital-intensive paper and pulp and capital-intensive service industries. These differences are consistent with the proposition that the traditional accounting language has particular problems in capturing short-term value creation for companies holding assets with long economic lives.

These results are consistent with the results in Warfield and Wild (1992). They divided a US sample of firms into three groups, meant to capture differences related to earnings recognition. Their focus was not directly on continuous or discrete profit recognition, but rather related to whether one can expect a long lag before the full effect of a business decision is translated into accounting consequences. They expected the earnings recognition lag to be large for industries such as mining, construction and manufacturing and small for the wholesale trade, retail trade and service industries.[18] The $R^2$ for these two sub-samples when attempting to explain one-year return using one-year earnings divided by the opening stock price (approximately equivalent to M.3 in this study) amounted to 3.8% and 21.6% respectively.[19] After also attempting to explain returns using subsequent periods' earnings, they concluded:

> *"In summary, these findings document a substantial earnings recognition lag and, more importantly, highlight cross-sectional differences in the extent of this lag. We attribute these differences in lag to fundamental cross-sectional differences in the application of accounting recognition criteria at the company level, which affect earnings' explanatory power for returns."*
>
> Warfield and Wild (1992, p. 836)

### 8.3.4 A homogenized sub-sample

In Chapter 7, three criteria were combined in order to obtain a homogenized sub-sample. The homogenized sub-sample was selected according to the following criteria: i) the firm belongs to an industry classified as having continuous profit recognition, ii) the firm has a non-turbulent *ROE* track-record (the standard deviation of the past five years has not exceeded 10%), and iii) the expected growth persistence factor is classified as being medium.[20] Table 8.12 includes the regression results for successively longer windows using specification M.5′ and this particular sample.

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18 Warfield and Wild (1992) also specified an in-between group consisting of the finance, insurance, real estate, public utilities, and transportation industries.

19 See table 5 in Warfield and Wild (1992).

20 The second and third selection criteria have only been applied to the closing 1-year period irrespective of the time interval studied.

**Table 8.12 The mean of repeated M.5′ value change regressions for the homogenized sample of firms for different time intervals.**

| Period length (Year) | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{c}_1'$ years $\alpha \leq 0.05$ | $\hat{c}_2$ years $\alpha \leq 0.05$ |
| 1 | 0.12 | 0.34 | 1.85 | 14.2% | 38 | 25.0% | 50.0% |
| 2 | 0.14 | 0.57 | 3.04 | 31.4% | 37 | 70.8% | 75.0% |
| 5 | 0.35 | 0.81 | 4.28 | 46.7% | 30 | 95.5% | 77.3% |
| 10 | 1.18 | 0.87 | 5.48 | 63.0% | 23 | 100.0% | 70.6% |

Surprisingly, a rather low frequency of significant coefficients for the 1-year value change window was observed for the homogenized sample. The short-term value change specification may possibly be especially sensitive to problems associated with small sample sizes. However, for longer value change windows, the frequencies strongly improved and the mean explanatory power amounted to 63% for the longest window. The mean level of the slope coefficients once again followed an increasing pattern—$\hat{c}_1'$ increasing from 0.34 for one-year value change regressions to 0.87 for the ten-year interval and $\hat{c}_2$ increasing from 1.85 to 5.48. The higher level of the $\hat{c}_2$ coefficient is consistent with the estimated *GPF*s in the value level regressions in the previous chapter. The mean *GPF* coefficient for the homogenized sample was 6.04 using M.2 ( see table 7.8).

## 8.4 Regression results and changes in the economic climate

### 8.4.1 Business cycle fluctuations

It was proposed in Section 5.2.2 that the lack of control regarding whether the general business conditions were in a similar phase or not at the beginning and the end of the periods under study could be expected to influence the regression results. An underlying assumption behind regression specification M.5′ is that the *GPF* is constant over time. In the level regressions in the previous chapter, this was shown not to be the case, especially not when the full sample of firms was studied. Only nine of the 17 ten-year intervals studied were found to qualify as being in the same business cycle phase at the beginning and end of the interval. The mean regression results of these particular periods are contrasted to the results of all time periods in table 8.13. Further, the sample has also been divided according to the profit recognition classification.

**Table 8.13 The mean of repeated 10-year M.5′ value change regressions for all periods and for the particular periods with a similar opening and ending business cycle phase.**

| 10-year time interval | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{c}_1'$ years $\alpha \leq 0.05$ | $\hat{c}_2$ years $\alpha \leq 0.05$ |
| **All firms** | | | | | | | |
| All years | 1.74 | 0.86 | 3.59 | 53.5% | 46 | 100.0% | 64.7% |
| Similar business cycle | 0.83 | 0.78 | 4.71 | 61.9% | 43 | 100.0% | 88.9% |
| **Continuous profit recognition firms** | | | | | | | |
| All years | 1.51 | 1.01 | 4.83 | 60.7% | 29 | 100.0% | 69.2% |
| Similar business cycle | 1.24 | 1.00 | 6.79 | 64.7% | 27 | 100.0% | 100.0% |
| **Discrete profit recognition firms** | | | | | | | |
| All years | 3.05 | 0.90 | 2.25 | 41.7% | 19 | 92.3% | 23.1% |
| Similar business cycle | 1.79 | 0.88 | 3.51 | 63.9% | 18 | 100.0% | 40.0% |

The mean $\bar{R}^2$s were higher in all three cases when controlling for business cycle phase. However, the change was the largest for the discrete profit recognition sub-sample (from 41.7% to 63.9%) and the least for the continuous profit recognition sub-sample (from 60.7% to 64.7%). The mean $\hat{c}_1'$ coefficients were only moderately altered by the control for business cycle phase. However, the size of the mean $\hat{c}_2$ coefficient was higher and more often significant in all three cases when controlling for the business cycle phase. The change in residual income variable was still non-significant in 60% of the different regressions in the discrete profit recognition sub-sample, whereas it was significant in all regressions for the continuous profit recognition sub-sample.

Furthermore, note also the large reduction in the mean $\hat{a}$ coefficient for the full sample and the discrete profit recognition sub-sample, when controlling for the business cycle phase. The business cycle fluctuations thus seem to have been a more serious factor to omit when the discrete profit recognition firms were included in the regression. The control for a constant business cycle phase reduces the chances of performance expectations being very different at the beginning and end of the return window. As the change in the residual income variable has been specified to capture changes in expected performance, the improvement in explanatory power is sensibly largest when the change in residual income variable is the poorest proxy for change in expected value creation ability.

### 8.4.2 Changes in the rate of inflation

This section presents the mean of repeated one-year value change regressions (M.5′) for different time-clusters based on inflation rate patterns, identified in Section 5.2.1. The mean of the first two years of each 'problematic' period is also going to be reported separately.

| | Time period | Inflation rate characteristics |
|---|---|---|
| A | 1967 - 1972 | Low |
| B | 1973 - 1980 | Rising—low to high |
| C | 1981 - 1984 | High |
| D | 1985 - 1993 | Falling—high to medium |

In table 8.14, the regression results for the full sample of firms are presented, followed in table 8.15 by similar regression results for two extreme sub-samples. These two sub-samples have been generated in an attempt to maximize the difference in tendency to hold non-monetary long-life assets.[21] The inflationary 'problematic periods' were hypothesized to create general performance interpretation difficulties for most companies in the sample. However, these problems were expected to be especially important for companies that hold large amounts of assets with long economic lives. Dividing the sample into these two extreme groups provides an opportunity to evaluate if any such systematic differences can be found between the groups.

21 For detailed specifications, see section 5.2.1.

**Table 8.14 The mean of repeated one-year M.5′ value change regressions for different time-clusters based on the inflation rate development.**

| Full sample | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{c}_1'$ years $\alpha \le 0.05$ | $\hat{c}_2$ years $\alpha \le 0.05$ |
| All years | 0.13 | 0.31 | 1.41 | 15.1% | 91 | 65.4% | 76.9% |
| A: 1968-72 | 0.10 | 0.15 | 1.43 | 11.5% | 45 | 20.0% | 60.0% |
| B: 1973-80 | 0.07 | 0.28 | 1.22 | 20.8% | 76 | 75.0% | 87.5% |
| C: 1981-84 | 0.30 | 0.30 | 1.54 | 11.2% | 86 | 75.0% | 75.0% |
| D: 1985-93 | 0.12 | 0.44 | 1.50 | 13.8% | 132 | 77.8% | 77.8% |
| Early B: 1973-74 | 0.03 | 0.21 | 1.22 | 24.2% | 72 | 50.0% | 100.0% |
| Early D: 1985-86 | 0.34 | 0.36 | 2.17 | 11.4% | 145 | 100.0% | 100.0% |

The only notable result from the full sample regressions is that the mean $\bar{R}^2$ was somewhat higher for the period 1973 to 1980 with increasing inflation rates.

**Table 8.15 The mean of repeated M.5′ one-year value change regressions for different time-clusters based on the inflation rate development.**

**Panel A: Firms holding an extensive degree of non-monetary long-life assets**

| Extensive long-life asset firms | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{c}_1'$ years $\alpha \le 0.05$ | $\hat{c}_2$ years $\alpha \le 0.05$ |
| All years | 0.15 | 0.32 | 0.64 | 16.4% | 26 | 40.9% | 27.3% |
| A: 1968-72 | - | - | - | - | - | - | - |
| B: 1973-80 | 0.10 | 0.35 | 0.64 | 27.7% | 18 | 50.0% | 37.5% |
| C: 1981-84 | 0.29 | 0.32 | 0.80 | 0.1% | 24 | 0.0% | 25.0% |
| D: 1985-93 | 0.14 | 0.44 | 0.54 | 14.5% | 36 | 55.6% | 22.2% |
| Early B: 1973-74 | 0.03 | 0.43 | 0.52 | 31.2% | 16 | 50.0% | 50.0% |
| Early D: 1985-86 | 0.53 | 0.49 | 2.74 | 16.6% | 34 | 50.0% | 50.0% |

**Panel B: Firms holding a small degree of non-monetary long-life assets**

| Limited long-life asset firms | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $R^2$ | $n$ | Proportion of significant | |
|---|---|---|---|---|---|---|---|
| | | | | | | $\hat{c}_1'$ years $\alpha \leq 0.05$ | $\hat{c}_2$ years $\alpha \leq 0.05$ |
| All years | 0.11 | 0.40 | 1.77 | 22.6% | 23 | 22.7% | 54.5% |
| A: 1968-72 | - | - | - | - | - | - | - |
| B: 1973-80 | 0.04 | 0.30 | 1.89 | 30.6% | 19 | 25.0% | 50.0% |
| C: 1981-84 | 0.30 | 0.24 | 0.34 | 14.0% | 17 | 0.0% | 25.0% |
| D: 1985-93 | 0.09 | 0.62 | 2.31 | 21.8% | 30 | 33.3% | 77.8% |
| Early B: 1973-74 | 0.05 | 0.18 | 1.39 | 26.5% | 21 | 50.0% | 0.0% |
| Early D: 1985-86 | 0.23 | 0.78 | 1.85 | 14.2% | 42 | 50.0% | 50.0% |

A strong systematic difference between the two sub-samples relates to which of the two explanatory variables that most often provides a significant explanation of the market return. For the firms holding extensive amounts of long-life assets, the change in equity variable was almost twice as often significant as the change in residual income variable; for the other subgroup the case is reversed. This indicates that the usefulness of accounting earnings as a descriptor of generated value creation and as a signal of value creation ability varies between different types of business activities. This observation is similar to the previously noted larger information content of the change in residual income variable for the subgroup of firms classified as having continuous profit recognition.

It can be noted that the mean $R^2$ over all years was slightly lower (16.4% as compared to 22.6%) for the group of firms that held extensive amounts of long-life assets. This pattern was slightly more pronounced for the periods with persistently high inflation rates (period C) and the period with falling inflation rates (period D).

In table 8.16 pooled regression results for the different time-clusters are presented with the data grouped according to the type of assets held.

**Table 8.16 Pooled M.5′ one-year value change regressions for different time-clusters based on the inflation rate development.**

**Panel A: Firms holding an extensive degree of non-monetary long-life assets**

| Extensive long-life asset firms | $\hat{a}$ | | $\hat{c}_1'$ | | $\hat{c}_2$ | | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|---|---|---|
| All years | 0.15 | (7.9)** | 0.35 | (5.1)** | 1.72 | (5.4)** | 8.6% | 596 |
| A: 1968-72 | 0.09 | (2.1)* | 0.00 | (0.0) | 0.10 | (0.1) | –6.6% | 33 |
| B: 1973-80 | 0.11 | (4.7)** | 0.23 | (3.0)** | 1.00 | (3.3)** | 11.0% | 141 |
| C: 1981-84 | 0.31 | (5.5)** | 0.19 | (1.0) | 1.84 | (1.6) | 1.4% | 96 |
| D: 1985-93 | 0.13 | (4.8)** | 0.46 | (4.1)** | 2.21 | (4.2)** | 10.8% | 326 |

**Panel B: Firms holding a small degree of non-monetary long-life assets**

| Limited long-life asset firms | $\hat{a}$ | | $\hat{c}_1'$ | | $\hat{c}_2$ | | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|---|---|---|
| All years | 0.12 | (7.7)** | 0.29 | (3.7)** | 2.31 | (9.5)** | 18.4% | 548 |
| A: 1968-72 | 0.13 | (2.9)** | 0.15 | (0.6) | 2.68 | (3.4)** | 19.4% | 58 |
| B: 1973-80 | 0.04 | (1.9) | 0.20 | (2.4)** | 2.01 | (6.7)** | 27.5% | 148 |
| C: 1981-84 | 0.29 | (4.8)** | 0.06 | (0.3) | –0.46 | (–0.5) | –2.6% | 68 |
| D: 1985-93 | 0.11 | (5.0)** | 0.62 | (4.1)** | 3.10 | (8.7)** | 31.2% | 374 |

$t$-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

Value changes are poorly described for both sub-samples during the period of high inflation (1981 to 1984); for other periods, value changes are better explained for the subgroup of firms holding a small degree of non-monetary long-life assets irrespective of inflationary conditions. These results provide some weak support for the hypothesis that accounting performance measures are particularly non-informative for firms holding an extensive degree of long-life assets when the inflation rate is high and/or fluctuating.

# 8.5 Regression results and large accounting changes

## 8.5.1 Open disclosure of depreciation according to plan

Table 8.17 shows pooled one-year M.5′ value change regression results for the transition period in accounting practice regarding depreciation and valuation of depreciable assets.[22] Recall from Section 5.3.1, that the industries with firms that are expected to hold relatively small amounts of depreciable assets have been excluded. The sample has been grouped according to the accounting method for depreciation. To be classified as providing 'open disclosure' of depreciation, such information must have been available in the annual report both at the beginning and end of each studied one-year value change window. The pooled regressions are run for the period 1968 to 1981, the period 1972 to 1979, and finally also for the years 1976 to 1977 (panel A, B, and C in the table).[23] Since the observations in these three subperiods do not constitute independent samples, the regression results are also provided for two separate time periods, 1971 to 1975 and 1976 to 1979 (panel D and E).

**Table 8.17 Pooled one-year M.5′regressions for the nine industries with firms where most depreciable assets are held.**

**Panel A: 1968-1981**

| 1968-1981 | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | 0.07 (5.8)** | 0.26 (6.4)** | 1.08 (7.0)** | 13.1% | 635 |
| Non-disclosure | 0.08 (3.6)** | 0.35 (3.2)** | 0.86 (2.8)** | 10.1% | 207 |
| Open disclosure | 0.06 (2.5)* | 0.37 (5.0)** | 1.09 (3.6)** | 22.3% | 172 |

**Panel B: 1972-1979**

| 1972-1979 | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | 0.02 (1.5) | 0.27 (6.1)** | 1.01 (6.0)** | 17.0% | 393 |
| Non-disclosure | 0.07 (2.9)** | 0.38 (3.4)** | 0.38 (1.2) | 11.5% | 116 |
| Open disclosure | –0.02 (–0.8) | 0.35 (4.0)** | 1.27 (3.8)** | 30.6% | 108 |

22 From a tax-based practice to a practice attempting to describe value and depreciation in accordance with the estimated economic lives of the assets.

23 The longest period means that the total number of observations is maximized; the shorter periods reduce confounding effects of including many early observations with no disclosure and many late observations with open disclosure.

**Panel C: 1976-1977**

| 1976-1977 | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.08 (−3.4)** | 0.29 (4.7)** | 1.66 (5.3)** | 31.8% | 98 |
| Non-disclosure | −0.06 (−0.6) | 1.03 (1.5) | 1.49 (0.8) | 6.1% | 17 |
| Open disclosure | −0.13 (−3.6)** | 0.51 (4.9)** | 0.97 (1.8)* | 48.8% | 32 |

**Panel D: 1971-1975**

| 1971-1975 | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | 0.13 (6.0)** | 0.21 (2.9)** | 0.38 (1.6) | 4.5% | 238 |
| Non-disclosure | 0.13 (4.6)** | 0.24 (2.0)* | 0.54 (1.5) | 5.6% | 113 |
| Open disclosure | 0.05 (0.6) | 0.49 (1.6) | 0.12 (0.1) | 4.1% | 31 |

**Panel E: 1976-1979**

| 1976-1979 | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.04 (−2.3)* | 0.25 (5.3)** | 1.77 (8.1)** | 32.8% | 192 |
| Non-disclosure | −0.11 (−1.3) | 1.44 (2.3)* | 0.55 (0.4) | 13.2% | 23 |
| Open disclosure | −0.04 (−1.6) | 0.31 (3.9)** | 1.68 (5.1)** | 44.5% | 80 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.
* Significant at $0.01 \le \alpha \le 0.05$
** Significant at $\alpha \le 0.01$

Analyzing the first three panels, where a more narrow period is successively studied, the open disclosure firms showed an $\bar{R}^2$ that was twice as high (for the period 1968 to 1981), and finally eight times as high (for the period 1976 to 1977). These results indicate that the open disclosure practice regarding depreciation and valuation of depreciable assets has indeed provided a more informative description of the value creation. It is notable, however, that the annual value change during the earlier period (1971 to 1975), was very weakly explained irrespective of the chosen accounting procedure.

## 8.5.2 Regression results and acquisition activity

The period 1986-1990 has been identified as unique in terms of acquisition activity among listed companies on the Stockholm Stock Exchange. Table 8.18 shows annual and pooled one-year M.5′ value change regressions with the sample divided according to acquisition intensity.[24] Observations from industries with continuous profit recognition have only been included in these regressions.

**Table 8.18 Annual and pooled one-year M.5′value change regressions with the sample grouped according to acquisition intensity. Observations from industries with continuous profit recognition have been used.**

**Panel A: All firm-years**

| YEAR | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1986 | 0.34 (8.3)** | 0.49 (2.4)** | 2.43 (2.6)** | 13.2% | 93 |
| 1987 | 0.09 (3.3)** | 0.20 (0.9) | 3.21 (3.8)** | 12.8% | 99 |
| 1988 | 0.24 (6.5)** | 1.02 (3.6)** | 2.19 (3.2)** | 21.9% | 93 |
| 1989 | –0.02 (–0.4) | 0.34 (1.1) | 1.39 (1.6) | 5.0% | 95 |
| 1990 | –0.21 (–0.2)** | 0.69 (4.8)** | 1.70 (3.1)** | 26.2% | 83 |
| 1991 | –0.05 (–1.2) | 0.61 (4.5)** | 2.64 (4.2)** | 33.3% | 72 |
| 1992 | 0.00 (0.1) | 0.34 (2.1)* | 1.47 (2.7)** | 19.9% | 57 |
| **Mean** | **0.06** | **0.53** | **2.15** | **18.9%** | **85** |
| Pooled | 0.07 (4.3)** | 0.62 (8.1)** | 2.61 (8.9)** | 22.5% | 592 |

**Panel B: Firm-years not affected by any recent acquisitions**

| YEAR | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1986 | 0.37 (7.8)** | 0.51 (1.9)* | 4.09 (3.5)** | 19.7% | 69 |
| 1987 | 0.09 (2.8)** | 0.24 (1.0) | 3.68 (4.2)** | 22.7% | 62 |
| 1988 | 0.26 (4.2)** | 0.99 (2.1)* | 2.41 (2.4)** | 17.2% | 50 |
| 1989 | 0.03 (0.2) | 0.29 (0.5) | 2.01 (1.5) | 5.0% | 45 |
| 1990 | –0.19 (–4.3)** | 0.87 (4.0)** | 2.40 (2.1)** | 29.3% | 39 |
| 1991 | –0.04 (–0.8) | 0.70 (2.9)** | 3.34 (3.6)** | 38.6% | 40 |
| 1992 | 0.04 (0.8) | 0.63 (2.1)* | 1.32 (1.3) | 16.9% | 34 |
| **Mean** | **0.08** | **0.60** | **2.75** | **21.3%** | **48** |
| Pooled | 0.09 (4.3)** | 0.76 (6.3)** | 3.06 (7.1)** | 24.5% | 339 |

24 A firm has been classified as having made a recent acquisition during a particular year if such an acquisition has taken place during the current year or during any of the two preceding years. See details regarding the identification procedure of acquisitions in section 5.3.2. The illustrated period has been extended to 1992 in order to include the two years after the most acquisition-intensive period.

**Panel C: Firm-years affected by at least one recent acquisition**

| YEAR | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1986 | 0.26 (3.2)* | 0.51 (1.6) | 0.15 (0.1) | 3.9% | 24 |
| 1987 | 0.10 (1.7) | 0.15 (0.4) | 2.33 (1.3) | −0.3% | 37 |
| 1988 | 0.23 (4.9)** | 1.01 (3.0)** | 1.95 (2.1)* | 24.2% | 43 |
| 1989 | −0.06 (−1.0) | 0.33 (1.0) | 0.51 (0.5) | 0.1% | 50 |
| 1990 | −0.22 (−5.5)** | 0.54 (2.7)** | 1.52 (2.4)** | 21.9% | 44 |
| 1991 | −0.07 (−1.0) | 0.53 (3.1)** | 1.86 (2.1)* | 24.0% | 32 |
| 1992 | −0.09 (−1.8) | 0.22 (1.4) | 0.88 (1.4) | 13.8% | 23 |
| **Mean** | **0.02** | **0.47** | **1.31** | **12.5%** | **36** |
| Pooled | 0.02 (1.0) | 0.49 (5.2)** | 2.05 (5.3)** | 19.5% | 253 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.
* Significant at $0.01 \leq \alpha \leq 0.05$
** Significant at $\alpha \leq 0.01$

The mean $\bar{R}^2$ was 21.5% for the '*no acquisition group*', as compared to 12.5% for the '*acquisition group*'. The slope coefficients ($\hat{c}_1'$ and $\hat{c}_2$), both showed higher values, and were more often significant for the firms in the '*no acquisition group*'. These results imply that change in equity and, especially, change in residual income have a particularly weak explanatory ability of change in market value for companies that have recently been involved in large acquisitions.

It was argued in the previous chapter that the utilized prediction model for expected next period *ROE* may be especially weak when substantial changes, such as large acquisitions, have taken place.[25] A small sample of firms for which business magazine forecasts are available, has been used in order to shed some light on this issue. Table 8.19 shows pooled regression results for the acquisition intensive period for a small group of companies. The sample has been grouped according to acquisition intensity, and first run with the *ROE* prediction procedure based on historical performance (panel A), and secondly, utilizing earnings forecasts published in Affärsvärlden, the weekly business magazine (panel B).

25 This argument is, of course, also valid for the variable *'change in expected residual income'*.

**Table 8.19 Pooled one-year M.5′value change regressions for a small sample of companies grouped according to acquisition intensity.**

**Panel A: Change in residual income based on the main *ROE* prediction procedure.**

| 1986-1992 | $\hat{a}$ | | $\hat{c}_1'$ | | $\hat{c}_2$ | | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|---|---|---|
| All | 0.16 | (4.0)** | 0.16 | (0.7) | 3.30 | (3.8)** | 11.1% | 112 |
| No acquisition | 0.19 | (2.9)** | 0.31 | (0.7) | 5.55 | (3.3)** | 15.5% | 60 |
| Acquisitions | 0.10 | (2.0) | 0.08 | (0.3) | 1.84 | (2.0)* | 4.0% | 52 |

**Panel B: Change in residual income based on earnings forecasts published in Affärsvärlden, the business weekly.**

| 1986-1992 | $\hat{a}$ | | $\hat{c}_1'$ | | $\hat{c}_2$ | | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|---|---|---|
| All | 0.10 | (3.0)** | 0.63 | (3.1)** | 6.12 | (7.0)** | 30.6% | 112 |
| No acquisition | 0.11 | (2.2)* | 0.79 | (2.3)* | 8.85 | (7.2)** | 47.7% | 60 |
| Acquisitions | 0.07 | (1.5) | 0.35 | (1.4) | 3.07 | (2.6)** | 8.6% | 52 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \le \alpha \le 0.05$

** Significant at $\alpha \le 0.01$

Despite the limited sample size, there are some interesting observations to be made. The observation that it seems more difficult to explain value change (with the specified regression model) for firms involved in one or several acquisitions remains, irrespective of the earnings prediction approach used. When basing *ROE* predictions on historical performance the $\bar{R}^2$ was 15.5% for the 'n*o acquisition group*', as compared to 4.0% for the '*acquisition group*'. Similarly, when the earnings forecasts in Affärsvärlden were used, $\bar{R}^2$ was 47.7% as compared to 8.6%. Using earnings forecasts from the business magazine apparently improve the explanatory power extensively, both for all observations and for the two subgroups. It is interesting to note the higher value of the change in residual return regression coefficients ($\hat{c}_2$) when using the earnings forecasts in Affärsvärlden. These estimated slope coefficients indicate strong expected permanence of a new performance level. Another interesting observation concerns the slope coefficient of the change in equity variable. In panel A, where the main mechanical *ROE* prediction procedure has been used, change in equity added little explanatory power to the change in market value; the $\hat{c}_1'$ coefficients were low and non-significant. However, when the change in expected residual income was based on Affärvärlden's earnings forecasts, the same variable showed higher and more significant coefficients.[26] This implies that a period's change in equity (or a period's earnings) may well be a valid description of the period's value creation that is associated with the change in the stock price; however, the omission of using a variable that captures changes in future expectation—or the use of a poor proxy—may conceal this association. The fact that $\bar{R}^2$, when Affärsvärlden's earnings forecasts were used, largely exceeded $\bar{R}^2$ when earnings predictions were based on the most recent *ROE* (30.6% and 11.1% respectively, for all the 112 observations), certainly casts some doubt on the widely used proxy for unexpected earnings in the market-based accounting literature (including the proxy used in this study).

### *8.5.2.1 Goodwill treatment method*

Table 8.20 shows pooled one-year M.5′ value change regression results, grouped according to the goodwill treatment method. The firm-years affected by one or several large acquisitions during the acquisition intensive period 1986-1990 plus the following two years have been used. These firm-years have been divided into three groups: i) *'a large goodwill write-off the current period'*, ii) *'a large goodwill write-off any previous period,* and iii)*"no goodwill write-off'*—that is, an ordinary depreciation scheme for capitalized goodwill has been used. If the goodwill written off reflects a real drop in value (during the current period) a significant positive $\hat{c}_1'$ coefficient is expected. If, however, the write-off is not perceived as representing a real drop in value by the investors, a negative $\hat{c}_1'$ coefficient would be expected for the write-off year and normal positive coefficients in the following years.

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26 The coefficients were significant at the 1 percent level for all 112 observations, at the 5 percent level for the *'no acquisition group'*, but non-significant for the *'acquisition group'*.

**Table 8.20 Pooled one-year M.5′value change regressions with the sample grouped according to the chosen method and timing of goodwill treatment. Firm-years from industries with continuous profit recognition being affected by one or several large acquisitions during the last and/or the two previous years have been used.**

| 1986-1992 | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $R^2$ | $n$ |
|---|---|---|---|---|---|
| All | 0.02 (1.0) | 0.49 (5.2)* | 2.05 (5.3)* | 19.5% | 253 |
| No goodwill write-off | 0.01 (0.5) | 0.57 (5.6)** | 1.97 (4.8)** | 23.1% | 196 |
| Goodwill write-off ($t$=1) | 0.17 (2.3)* | –0.06 (–0.1) | 3.26 (1.7) | 4.7% | 21 |
| Goodwill write-off ($t$=–1, .. ,–6) | –0.02 (–0.3) | 0.17 (0.6) | 1.64 (1.2) | 1.7% | 36 |

$t$-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \le \alpha \le 0.05$

** Significant at $\alpha \le 0.01$

According to table 8.20, the firms that have not written off goodwill showed 'normal' regression coefficients, whereas the goodwill write-off firms showed a non-significant negative $\hat{c}_1'$ coefficient for the actual year of the write-off, and a non-significant positive $\hat{c}_1'$ coefficient for the years thereafter. The $\hat{c}_2$ coefficients were non-significant, and the overall explanatory power was also very low for the goodwill write-off firms. It has to be recognized, however, that the sample of firms that wrote off goodwill was small, making it difficult make any strong inferences.

### *8.5.2.2 The pooling versus the purchase method*

Table 8.21 shows annual and pooled regression results for 1970 to 1976, with the sample grouped according to chosen method of consolidation. Observations from industries with continuous profit recognition have been used.

**Table 8.21 Annual and pooled one-year M.5′ value change regressions with the sample divided according to group consolidation method.**

**Panel A: Pooling method used for consolidation.**

| | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1970 | −0.02 (−0.4) | 0.15 (0.7) | 0.89 (0.7) | −2.9% | 17 |
| 1971 | 0.44 (4.3)** | −0.05 (−0.1) | 3.58 (2.3)* | 18.5% | 16 |
| 1972 | 0.14 (3.8)** | −0.47 (−1.9) | 3.01 (2.6)** | 24.1% | 23 |
| 1973 | 0.07 (0.9) | 0.09 (0.3) | 1.61 (1.9)* | 11.1% | 20 |
| 1974 | 0.00 (0.1) | −0.08 (−0.5) | 0.17 (0.2) | −12.8% | 16 |
| 1975 | 0.19 (2.0) | 0.83 (3.1)** | 1.29 (1.7) | 39.8% | 14 |
| 1976 | 0.03 (0.4) | 0.45 (1.2) | 1.48 (1.7) | 20.8% | 11 |
| **Mean** | **0.12** | **0.13** | **1.72** | **14.1%** | **17** |
| Pooled | 0.14 (4.6)** | 0.09 (0.8) | 0.46 (1.1) | 0.1% | 117 |

**Panel B: Purchase method used for consolidation.**

| | $\hat{a}$ | $\hat{c}_1'$ | $\hat{c}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1970 | −0.10 (−1.4) | −0.43 (−0.9) | 1.15 (1.4) | 2.1% | 11 |
| 1971 | 0.24 (2.2) | −0.09 (−0.4) | 0.75 (0.4) | −17.4% | 12 |
| 1972 | 0.07 (0.9) | −0.24 (−0.7) | 1.99 (1.1) | −4.3% | 15 |
| 1973 | 0.01 (0.1) | 0.09 (0.4) | 3.14 (4.0)** | 52.8% | 19 |
| 1974 | 0.12 (1.5) | −0.44 (−1.5) | 1.31 (2.0)* | 13.3% | 21 |
| 1975 | 0.05 (0.5) | 0.72 (2.7)** | −1.08 (−1.2) | 20.6% | 21 |
| 1976 | −0.07 (−1.8) | 0.17 (1.7)* | 1.09 (2.3)* | 18.6% | 30 |
| **Mean** | **0.05** | **−0.03** | **1.19** | **12.2%** | **18** |
| Pooled | 0.06 (2.1)* | 0.12 (1.3) | 0.63 (2.0)* | 3.2% | 129 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

Apparently, very weak and unstable regression results have been obtained, irrespectively of the chosen group consolidation method; there is thus no clear difference related to the consolidation method to be observed.

## 8.5.3 Accounting for associated companies

A gradual transition from the cost method to the equity method when accounting for associated companies took place during the 1980s for firms listed on the Stockholm Stock Exchange. As previously noted, the amount of data available relating to the associated company issue is very limited. No regression results are therefore reported.

# 9 SUMMARY AND CONCLUDING REMARKS

## 9.1 Research problem and research design

An important starting point of this study has been the idea that value and value creation of a company can be captured from three related, but conceptually different, perspectives. The theoretical construct, economic value, is based on present value calculations of future expected cash flows. Value according to the traditional cost-based accounting measurement procedure is based on actual transactions, hence actual cash outlays used to gain access to resources constitute the base for accounting value. The market value of a share observed on the stock market is based on trade between investors. Value and value creation as manifested in market prices and as described in published accounting reports can easily be observed, while economic value cannot. Assuming that investors use accounting information to evaluate the financial status of a firm and to form (or revise) expectations of its future performance, a link can be expected between accounting and market values. Given that the valuation approaches used by investors are reasonably consistent with economic valuation theory, a conceptual link can be established between accounting values and market values based on economic valuation theory.

The purpose of this study has been to empirically investigate the presence of such a link for Swedish companies. Previous research, using data from other countries, has—in general—documented inconsistent results and widely fluctuating regression parameters, when evaluating such associations. It has been argued in this study that stable intertemporal regression parameters can hardly be expected. A fundamental difference is generated by market values being forward-looking (driven by expectations of future performance) and accounting value being historically oriented (value calculated as a result of specific measurement procedures that follows conventions and rules). Events that change the expectations of the future performance of a firm may affect the stock price instantaneously, whereas the financial consequences may not be reflected in the accounting descriptions until several periods later. This fundamental difference implies that stable regression coefficients cannot generally be expected. Changes in the economic climate and changes in accounting principles can exaggerate such fluctuations. Moreover, the use of differently composed samples of firms is also considered a likely source of cross-sectional and intertemporal instability in regression parameters. Thus an important purpose of this study has been to investigate differences in the association between accounting numbers and stock prices for different firm characteristics, changes in the economic climate, and a few major changes in accounting practice.

In order to investigate the association in question, it was deemed important to first outline a valuation model that ties accounting value concepts to economic value. Such a valuation model was developed and discussed in Chapter 2. The chosen model is based on viewing the value of shareholders' equity as the discounted sum of expected future dividends. The particular valuation structure utilized, where dividends are substituted with accounting concepts—essentially earnings and book value of shareholders' equity—can be traced back to Preinreich (1938).[1]

Before deriving a valuation model, suitable for large scale empirical testing, two requirements were established. First, return on equity (*ROE*) should be included as a central accounting performance indicator, and second, a variable that captures the consequences of a conservative accounting regime should be incorporated into the valuation equation.

In order to reduce a fairly general valuation expression to a model driven by a few key factors, several rather strong assumptions have been required. First, the basic assumptions are: a flat term structure of the future required rate of return, cash flows—net dividends—occurring at the end of each period and an accounting language complying with the clean surplus relation of accounting. Second, the firm's expected growth rate (*g*) is known and constant, which in turn implies a residual dividend policy. Third, from

1 This valuation approach has subsequently been further developed and refined. The framework used in this study is particularly inspired by the work of Ohlson (1989a, 1989b and 1995), Brief and Lawson (1992) and Skogsvik (1993).

some future horizon point in time ($t+T$) and onwards the firm is expected to generate 'normal' profitability. Fourth, the future expected return on equity follows a mean reversion process (captured by the fading factor $\lambda$) from the level of return on equity expected for the next period. Fifth, an expected level of a relative accounting measurement bias can be assessed. Sixth, the relative accounting measurement bias is assumed to be permanent from today and onwards (thus the bias is denoted *PMB*).

With this set of assumptions, value ($V$) at time $t$ has been modeled as follows:[2]

[2:32] $$V_t = B_t^{(b)} \cdot (1+PMB) + B_t^{(b)} \cdot \frac{\left(E\left(R\tilde{O}E_{t+1}^{(b)}\right) - r - \gamma\right)}{1+r} \cdot \left( \frac{1-\left(\frac{G \cdot \lambda}{1+r}\right)^T}{1-\left(\frac{G \cdot \lambda}{1+r}\right)} \right)$$

The value of owners' equity is hence described as the sum of two terms: i) the level of current accounting equity adjusted for any measurement bias of the accounting regime, and ii) the present value of all abnormal profits that the firm is expected to generate from time $t$ to a date $T$ periods ahead. The latter element has in turn been formulated as a multiple of three factors: i) the level of current accounting equity, ii) the next period's expected abnormal return (discounted one period), and iii) a factor that depends on a combination of the future expected growth, the development pattern and persistence of abnormal performance, and the discount rate. The hurdle rate used to calculate abnormal profits has been adjusted to incorporate the annual measurement bias, $\gamma$.

Based on this valuation equation, two level regression models and three value change regression models were specified. M.2 is the most complete level specification utilized in this study:

M.2 $$\frac{M_{j,t}}{B_{j,t}} - 1 = \alpha + \beta_1 \cdot E_t\left[R\tilde{R}_{j,t+1}\right] + \beta_2 \cdot PMB_j + \tilde{\varepsilon}_{j,t}$$

2 A list of all symbols and abbreviations are provided at the end of this book.

In specification M.2, the market-to-book value premium is explained by the expected next period residual return (based on expected *ROE*) and the *PMB*. The regression coefficients can easily be given economic interpretations. The simplicity of the model is an advantage, but also its main weakness. All firms cannot be expected to have the same constant growth potential, to be equally capable of maintaining a competitive advantage or recuperating from the consequences of a poor investment decision, nor to hold such a balanced portfolio of assets that a permanent relative measurement bias can realistically be expected. An obvious consequence of a lack of stability in these factors over time and between firms, is that the regression parameters should be expected to vary and that an explanatory power of less than 100% is to be expected. The constant *PMB* assumption can be expected to be particularly invalid for firms whose key asset base has an unbalanced age structure. This situation is most likely to occur for firms that make large discrete investments in assets with long economic lives. The investment in a new power plant by an electric utility firm, or the investment in a new paper mill by a paper and pulp firm, constitute typical examples. Firms growing by making large acquisitions and accounting for these acquisitions using the purchase method constitutes another example.

Creating three subgroups based on *a priori* expectations of the level of the growth persistence factor (*GPF*) and grouping firms according to industry membership are two ways in which an attempt has been made to add control for the problems indicated above. It was thus argued that the regression coefficients should be expected to be $\hat{\alpha} = 0.0$, $3.0 < \hat{\beta}_1 < 8.0$, and $\hat{\beta}_2 = 1.0$ for a 'normal' sample of firms.

M.5′ is the most complete value change specification that has been utilized in the study: [3]

M.5′
$$\frac{p_{j,t+k} - p_{j,t}}{p_{j,t}} = a + c_1' \cdot \frac{\left(b_{j,t+k} - b_{j,t}\right)\cdot\left(1 + PMB_j\right)}{p_{j,t}} + c_2 \cdot \frac{\left[E_{t+k}\left(RT_{j,t+k+1}\right) - E_t\left(RT_{j,t+1}\right)\right]}{p_{j,t}} + \tilde{\varepsilon}_{j,t+k}$$

3 See the list of symbols and abbreviations at the end of this book.

According to M.5′ the change in the stock price ($p$) between two points in time is explained by the change in book value of equity per share ($b$), the estimated *PMB*, and the change in expected residual income (*RI*). The change in equity is viewed as a measure of the value created (and retained), while the change in expected residual income is an indicator of changes in the expected profitability of the firm. These interpretations are somewhat different than what has used to be the common practice in the market-based accounting research literature. For example, in Easton and Harris (1991) earnings levels and earnings changes are viewed as competitive explanatory variables of return. In the 'good news' versus 'bad news' setting following Ball and Brown (1968), earnings changes have often been interpreted as a signal (surprise) of a new performance level. However, in the long window value change regressions of Easton, Harris and Ohlson (1992) and Ohlson and Penman (1992), aggregated earnings have been viewed as a measure of value creation. M.5′ thus combines the signaling perspective of Ball and Brown and the measurement perspective of Easton, Harris and Ohlson (1992) and Ohlson and Penman (1992).

Provided that good estimates of the firm-specific residual income are available and that the assumptions of constant *GPF* and *PMB* are reasonably valid, the following regression coefficients are to be expected: $\hat{a}$ is expected to be zero, $\hat{c}_1'$ is expected to equal one, and $\hat{c}_2$ is an estimate of the growth persistence factor (and should thus be expected to be between 3 to 8 for a 'normal' sample).

An important parameter in both the level and the change model specifications of this study, is the expected level of next period *ROE*. Given previous research results regarding earnings and return predictions, and inspired by a study of Freeman and Tse (1992), a non-linear mean-reversion prediction function was chosen. Regression results (presented in Section 6.1.2) comparing $ROE_{j,t}$ to $ROE_{j,t+1}$ supported the hypothesis of one-period persistence in *ROE*. Notably, a small mean reversion tendency in *ROE* for non-extreme levels and a larger mean reversion tendency for extreme levels was observed.

A rather large effort has been made in order to estimate the extent to which the traditional historical cost-based accounting convention tends to understate the 'true value' of shareholder's equity. In the conceptual descriptions in Chapter 3, it was shown that this tendency is different for different types of tangible and intangible assets, as well as for different types of liabilities. It was further argued that since companies engaged in different business activities, hold different combinations of assets and often finance them differently, one should expect different degrees of accounting measurement biases for different types of businesses. In Chapter 5, a rather crude estimation of permanent measurement biases (*PMB*s) was performed. These estimations relied on, for example, median indicators of asset type intensity, the economic life of the asset type, the equity-to-asset ratio, and the inflation rate. The estimation procedure generated a significant spread between, at one end, the pharmaceutical industry with an estimated *PMB* of 1.74, and at the other end, the engineering, other production and conglomerate and mixed investment companies with an estimated *PMB* of about 0.30.

It was argued in Section 3.1.2 that the *GPF* of a firm could be expected to mainly be a function of the firm's growth potential and the degree of industry competitiveness. It was consequently argued that a high *GPF* firm should be characterized by high growth and stable future positive residual return, and that a low *GPF* could be expected for loss firms (negative *ROE*) and firms with extremely high current *ROE*. Operationalizations of these ideas were presented in Section 5.1.3.

Published earnings or return on equity are often used as indicators of the financial performance of a firm. In this study, return on equity is given such an interpretation. However, it was argued in Section 3.1.3 that the validity of published earnings (or *ROE*) as an indicator of a performance level for future periods, can be expected to be quite poor for certain types of business activities. This short-term *ROE* validity problem was argued to stem from the fact that the realization principle, combined with certain business characteristics, makes the recognition of profits particularly non-continuous and the timing particularly open to management discretion in some industries. In Section 5.1.4 the sample of firms was divided into two groups based on industry classifications to test whether these assertions were valid.

Two aspects of a changing economic climate were considered in this study—the level and the pattern of the inflation rate and the observable fluctuations in the business cycle.

The diversity and change in the accounting measurement and disclosure practice between firms and over time, were discussed in Section 3.3.1. It was argued that these phenomena obviously add complexity to the empirical evaluation of the association between accounting information and stock prices. However, it felt unrealistically ambitious to attempt to grasp the effects of all the accounting changes. Thus the ambition stopped at attempting to test/evaluate the effect of a few selected accounting changes — change to open disclosure of value and depreciation according to plan, group consolidation method and accounting for goodwill, and the accounting method for associated companies.

## 9.2 Empirical results

In Chapter 4, a sample of Swedish firms was presented. Data were collected for the period 1966 to 1993. Companies were excluded from the sample if they i) were not included in the database FINLIS, ii) were not listed for more than four consecutive years, iii) had an accounting period that did not coincide with the calendar year, and iv) did not provide accounting information according to Swedish GAAP. From the population of all listed Swedish firms, 252 companies were selected. The final sample contains at least 75% of the total population in terms of firm-years. The absence of banks and insurance companies, the loss of relatively many trading and retail companies, and the loss of firms with less than a four-year history on the stock exchange, constitute the main systematic departures from studying the full population of Swedish firms listed on the Stockholm Stock Exchange during the period 1966 to 1993.

Chapter 7 presented statistical tests based on the specifications M.1 and M.2. A brief summary of the most important results is provided below.

The expected residual return and the permanent measurement bias are both significant explanatory variables for market-to-book values. As return on equity has proven to be an important explanatory variable in previous studies, the importance of the expected residual return variable in this study might not be surprising. The significance of the industry-specific *PMB* variable indicates that industries are different in terms of the size of accounting measurement biases, and that the estimation procedure of the expected *PMB* proposed in this study captures some of these differences.

When cross-sectional regressions have been repeated annually for the total (heterogeneous) sample of firms, a low explanatory ability, as well as highly unstable regression coefficients have been observed.

A number of potential sources for the weak and unstable regression results were evaluated in Chapter 7. First, it was demonstrated that disclosed *ROE* is generally a more informative profitability measure for the group of firms characterized by profits being recognized continuously. Second, a firm's historical stability of *ROE* was shown to be associated with the estimated *GPF*. A higher historical stability was associated with a higher $\bar{R}^2$ and a higher *GPF* coefficient, provided that profit recognition characteristics were controlled for. Third, dividing the sample into three *ex ante* generated *GPF*-groups indicated that such differentiation has some merit—the estimated slope coefficients varied in accordance with expectations. Finally, combining these characteristics in an effort to homogenize the sample—selecting firms with continuous profit recognition, a non-turbulent *ROE* history, and non-extreme expected *GPF*—produced the reasonable mean regression coefficients ($\hat{\alpha} = -0.07$, $\hat{\beta}_1 = 6.04$, $\hat{\beta}_2 = 1.09$), and a mean $\bar{R}^2$ amounting to 44.1%. It was noted that the explanatory power of the regression was particularly poor during the years around 1974 and 1988.

The evidence in Section 7.3.1 provided support for the hypothesis that some of the cross-sectional instability in the regression coefficients has been related to the fluctuations in the business cycle. Clearly, the explanatory power of the valuation model specification was very low during business cycle booms, and high during recessions. Alternative reasons for these patterns were discussed, and a hypothesis was advanced implying that stock prices might be 'detached' from fundamentals during boom periods.

In Section 7.3.2 a weakening of the regression results was noted after the new era of higher and more variable inflation rates which began after the oil crisis in 1973. For the sub-sample of firms characterized by large holdings of non-monetary assets with long economic lives, E[*RR*] was practically useless as an explanatory variable of the market-to-book value premium during the period of falling inflation rates (1985-1993). A similar pattern was not present for the group of firms holding limited amounts of long-life assets.

The results in Section 7.4.1 imply that the more informative, open accounting of value and depreciation of tangible assets that was gradually introduced during the 1970s, has increased the explanatory power of the residual return and the *PMB* variable of the stock price.

Using data from the acquisition intensive period 1986-1990, it was shown in Section 7.4.2 that the usefulness of E[*RR*] to explain the market-to-book value premium for a group of firms that has recently made large acquisitions is very limited. After a complementary test on a small sample of firms (utilizing forecasts of earnings published in business magazines), it was suggested that the weak explanatory power is partly related to an inferiority of the mechanical prediction approach for firms growing through acquisitions. However, the results are also consistent with the hypothesis that acquisition-intensive firms are more complex and difficult to value.

*A priori*, the capitalization of goodwill was expected to be a more descriptive accounting valuation principle. Nevertheless, the level of *ROE* appeared to have a very limited ability in explaining the market-to-book value premium for the average acquiring firm with capitalized goodwill. This result is shown both for the early 1970s, contrasting firms choosing the pooling instead of the purchase method, and for the period 1986-1992, contrasting firms writing off goodwill directly against equity versus firms that have chosen to capitalize and amortize goodwill.

The statistical tests based on value change specifications M.3, M.4 and M.5′ reported in Chapter 8 generated, in summary, the following results:

In Section 8.1, the change in market value was explained by created and retained value as measured by the accounting convention using regression specification M.3. The annual change in book value of equity was first shown to explain a significant but small part (less than 10%) of the annual change in the market price. This result was found to be comparable to results in several previous US studies. By increasing the time interval over which value creation was measured, and aggregating the change in book value of equity up to a ten-year period, a monotonous increase from an $R^2$ of

8.7% to 35.4% was shown. A similar pattern has previously been shown for US data by Ohlson and Penman (1992) and Easton, Harris and Ohlson (1992). Another observation that the studies have in common is that the slope coefficients of the regressions increased as the time interval was prolonged, and exceeded 1.0 for the longer intervals. In this study, this pattern has been interpreted as an indication of a permanent conservative accounting measurement bias.

In Section 8.2 another explanatory variable was added to the regression model, namely change in expected residual income. This variable was hypothesized to capture changes in expectations regarding the firm's ability to create value and it was shown to add significantly to the explanation of changes in stock prices. The relative contribution was largest for the two shorter intervals. For the 5- and 10-year intervals change in book value of equity became the most important explanatory variable. One conclusion is thus that in the short run, changes in the expectations of the future prospects of a specific firm's ability to deliver abnormal performance, have a very strong impact on price changes. As the time interval is prolonged, created and retained value as described by growth in book value of equity becomes an increasingly important explanatory variable.

In Section 8.3, specification M.5′ was used as a refinement of M.4. The change in book value of equity for each firm was multiplied by (1+*PMB*) before the regressions were re-run. The study of a heterogeneous sample of firms, combined with expected different accounting consequences for different types of business activities using the prevailing conservative accounting convention, was the rationale behind this specification.[4] For the two longer intervals, M.5′ showed significantly improved explanatory power. This increased explanatory power was interpreted as supporting the hypothesis that firms are different with respect to their degree of measurement bias, and that the estimation procedure of this study in fact captures some of these differences.

In Section 8.3.1, dividing the sample into two groups according to profit recognition characteristics, showed that the change in book value of equity had very similar explanatory ability for the two subgroups, whereas the

4 Recall that M.5′ was chosen instead of M.5 due to problems of multicollinearity.

change in residual income variable was more often significant, had a higher coefficient, and added more to the total explanation for the companies characterized by a more continuous profit recognition pattern. Thus the value relevance and information content of reported *ROE* appears to be different for different types of business activities. These differences were also observed when pooled regressions were run separately for different industries.

The results in Section 8.4.1 indicate that firms for which the specified change in residual income is a poor proxy for the changed ability to perform (the discrete profit recognition firms), omission in controlling for changes in the business cycle causes the largest reduction in explanatory power.

The results in Section 8.5.1 indicate that the transition to an open disclosure practice, regarding depreciation and valuation of depreciable assets, has given more informative descriptions of value creation and of value creation ability.

The results in Section 8.5.2 imply that change in equity, and especially change in residual income, have a particularly weak explanatory ability for companies that have recently been involved in large acquisitions. This observation was shown not to be sensitive to the chosen prediction approach for next period's *ROE*.

The value change research design failed to produce any conclusive results regarding the goodwill treatment issue and the consolidation issue.

## 9.3 The validity of the applied research design

The association between certain selected accounting numbers and stock prices has been studied for a sample of Swedish firms over a period of almost 30 years. A number of observations and conclusions regarding the association have been advanced. The validity of these conclusions is obviously an important issue, and will be discussed using the taxonomy of Cook and Campbell (1979). The structure of the discussion is inspired by Ball and Foster (1982), who, in a methodological review article, illustratively used this taxonomy to discuss empirical accounting research problems. Cook and Campbell (1979) distinguished between i) internal validity, ii) construct validity, iii) statistical conclusion validity, and iv) external validity.

### Internal validity

"*Internal validity refers to the approximate validity with which we infer that a relationship between the variables is causal or that the absence of a relationship implies the absence of cause.*"[5] A basic result in this study is that value and value creation as manifested in the stock price can (partly) be explained with value concepts from the accounting convention (book value of equity, earnings and return on equity). The internal validity of this conclusion is backed up by the formal modeled link between accounting variables and economic values. The theoretical fundament for a causal link emanates from the assumption that good financial performance generates long-run capacity to pay dividends, which in turn is assumed to be appreciated by investors. To dispute this link, one fundamentally has to dispute the idea of capital value being a function of discounted future dividends. However, it is important to note that accounting descriptions *per se* are not regarded as the cause of stock prices (or movements). The underlying cause is the business activities that accounting attempts to describe. The issue is thus whether accounting is successful in providing useful descriptions of the real phenomena. From another perspective, if a significant association between accounting performance and stock prices had not been documented, one could have argued that the valuation specification (including the prediction of next period's *ROE*) is too simplistic to capture the details of the link, that the accounting procedure generates completely uninformative descriptions of value and value creation, and/or that the market is irrational (that is, it

5 Cook and Campbell (1979, p. 37), quotation from Ball and Foster (1982, p. 180).

does not use accounting information in a rational way). This line of argumentation implies that the regression tests performed in this study are in reality simultaneous tests of several issues. The fact that the observed associations are far from being perfect, points at a general difficulty in assessing the relative 'noise contribution' from each potential type of problem. This observation is important to keep in mind as some particular issues have been evaluated relying largely on the relative strength of the measured association.

A number of propositions of causal relationships have been advocated and subsequently evaluated in this report:

- *Involvement in certain types of business activities makes it difficult for traditional cost-based accounting to describe value and short-term value creation.* The regression results presented (both level and change) support this proposition. However, it cannot be completely ruled out that these results can be partly driven by, for example, the chosen valuation specification being more suitable for a certain type of business activities.
- *High and varying inflation rate levels cause particular interpretation problems of short-term accounting performance for some types of firms.* The level regression results support this proposition, whereas the change specification provides rather inconclusive indications.
- *More informative accounting procedures should cause better mapping between accounting descriptions and stock prices.* The empirical evaluation of the transition to an open disclosure practice, regarding depreciation and valuation of depreciable assets, has provided considerable evidence of such a relationship.
- *Acquisition intensity causes particular interpretation problems of short-term accounting performance.* The regression results presented (both level and change) support this proposition.

The number of factors that may influence the stock price of a firm at a particular point in time, however, is enormous and the possibility to fully control for all factors (except for the particular one under study) in a real setting is rather limited. Ball and Foster (1982, p.180) discuss two different threats to internal validity: "*Ambiguity about the direction of causal inference*" and "*Selection*".

Several studies have documented that market prices lead accounting earnings (or that market-to-book values can predict future accounting return).[6] This observation, however, cannot be interpreted as a causal relationship. A high stock price does not cause good performance. The observation is merely a reflection of the fact that market prices are future oriented and accounting measurements tend to lag behind, documenting realized transactions.

*"Selection"* occurs when *"an effect may be due to the difference between the kinds of people in one experimental group as opposed to another"*.[7] In the creation of sample designs, several steps have been taken in this study to minimize the chance of presence of systematic confounding effects (for example, by homogenizing the sample). In the study of accounting practice transition, such systematic differences still appear to have been present. For all the accounting issues that have been studied, a striking and consistent pattern can be observed regarding the gradual transition to a new accounting practice. The early adapting firms have consistently had a higher mean estimated *PMB*.[8] The early adapters of the new accounting procedures have thus apparently been over-represented by firms in industries which have been classified as having a large permanent measurement bias. A common denominator for the companies with business characteristics that generate large accounting measurement biases, is that their business activities are particularly difficult to describe within the traditional accounting language. In Skogsvik (1993c) it is argued that managers of companies that perceive their shares to be undervalued have the strongest incentive to adopt more value-relevant accounting practices. A reasonable analogy suggests that companies whose businesses are difficult to capture with accounting descriptions will have incentives to lead the accounting development.

A consequence of this line of reasoning is that if the early adopters of new accounting procedures tend to be firms with more complex business activi-

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6 See, for example, Beaver, Lambert and Morse (1980), Warfield and Wild (1992) and Penman (1994).

7 Cook and Campbell (1979, p.37), quotation from Ball and Foster (1982, p. 180).

8 See Section 7.4.1 regarding the change to open disclosure of depreciation according to plan, Section 7.4.2.1 regarding the early goodwill write-off firms, Section 7.4.4.2 regarding the switch to the purchase method firms for group consolidation, and Section 7.4.3 regarding the switch to the equity method when accounting for associated companies.

ties, an observed relative change in explanatory power can be systematically biased. Such issues may have particularly influenced the results related to capitalized goodwill.

## Construct validity

*"Construct validity refers to the possibility that the operations which are meant to represent a particular cause or effect construct can be construed in terms of more than one construct... What one investigator interprets as a causal relationship between the theoretical constructs labeled A and B, another investigator might interpret as a causal relationship between constructs A and Y or between X and B or even between X and Y"*[9] Ball and Foster (1982, p.182) add: *"When making inferences from empirical research, the tightness of the linkage between theoretical constructs and their operational proxies is a major concern."*

An illustrative example of a variable that is chosen to be proxy for a large number of theoretical constructs in the accounting research literature is firm size; it has been used in different studies to be a proxy for factors such as competitive advantage, information production costs, political costs, and risk.[10]

The choice of empirical proxies to represent the theoretical constructs of this study has been rather straightforward. Change in book value of equity describes (retained) value creation. Expected ability of a firm to perform is based on current accounting performance (*ROE*). This is thus a direct test of the strength of the current accounting performance signal as a performance indicator. However, it is obvious that this 'mechanic' prediction procedure can neither capture large shifts regarding the general business climate, nor particular circumstances affecting a certain firm. An alternative proxy for expected performance was utilized on a limited sub-sample (business magazine forecasts of next period's *ROE*.) This proxy was shown to be more distinct, but appears to convey similar overall results. Nevertheless, the qualitative difference between the two approaches are not insignificant.

9 Cook and Campbell (1979, p.59), quotation from Ball and Foster (1982, p. 182).
10 See discussion in Ball and Foster (1982, p. 190).

Several measurement issues concerning earnings, equity, *ROE* and cost of capital (and its components) were discussed in Chapter 4. A number of precautions and tests were utilized to check that the chosen definitions did not introduce systematic errors. Change in expected ability to create value has been operationalized as the change in expected residual income. This proxy may be viewed as a continuous version of Ball and Brown's (1968) 'good news' versus 'bad news' variable, but furthermore also incorporating the cost and size of equity capital as inputs in the indicator. The final basic construct, the *PMB,* is obviously measured with error. It has been crudely estimated as constant within industries and over time. This theoretical construct is meant to capture the relative degree of conservativeness in the accounting descriptions. As this conservativeness is expected to be systematically different for different types of business activities, it is obvious that the size of the *PMB* may also be a proxy for other aspects.

In this study, additional theoretical constructs that in some way have been constructed proxies for include: the *ex ante* classification of data into three *GPF* groups based on historical performance and growth rates; the classification of industries into two groups—discrete and continuous profit recognition—based on an idea of difference in the expected validity of historical accounting *ROE* as an indicator of performance; the use of the long-term historical change in the Swedish consumer price index as a basis for the identification of four distinct sub-periods; a particular index of the utilization of resources in the Swedish industrial sector used to capture the phases of the Swedish business cycle, and finally, three different examples of accounting change. None of these constructs are likely to be perfect. However, I believe that they all capture rather well what they are meant to capture.

## Statistical conclusion validity

*"In evaluating any experiment, three decisions about covariation have to be made with the sample data at hand: (1) Is the study sensitive enough to permit reasonable statements of covariation? (2) If it is sensitive enough, is there any reasonable evidence from which to infer that the presumed cause and effect covary? And (3) If there is such evidence, how strongly do the two variables covary?"*[11] Ball and Foster (1982, p. 186) add: *"A key factor in*

11 Cook and Campbell (1979, p. 39), quotation from Ball and Foster (1982, p. 186).

*accounting research is the number of observations available to make inferences about covariation."*

The study of Swedish data is quite limiting in a sample-size sense. The number of annual observations in this study varies between 39 and 169; however, the full sample consists of more than 2,000 firm-years. Naturally, when attempting to control for different factors (e.g. profit recognition characteristics and *GPF*-group) the sample sizes are further reduced. This means that it is practically impossible to control for all potential factors simultaneously. Thus, most tests have been performed attempting to control for one or a few factors at a time. Given this restriction, the sample sizes generally appear to have been large enough to generate fairly robust results. The sign and significance of regression coefficients are shown to be fairly consistent and generally 'behave' in line with *a priori* expectations. The sample size problem is most severe in the study of different accounting procedure changes. These changes naturally only take place over a few years, and do not necessarily involve all firms. Concerning the change to an open disclosure practice regarding depreciation and valuation of depreciable assets, the degree of improvement of information quality appears to be so large that it still can be captured with the utilized research design. Finally, even though problems with multicollinearity and heteroscedasticity do not appear to have been severe in this study, some general precaution is always recommended when interpreting the results from a small sample study relying on an ordinary least square regression technique.

**External validity.**
*"External validity refers to the approximate validity with which we can infer that the presumed causal relationship can be generalized to and across alternate measures of the cause and effect and across different types of persons, settings, and times."*[12] Ball and Foster (1982, p. 188) add: *"External validity issues do not arise in projects whose sole object is to describe a particular data base. ... Projects which deal with populations also do not raise external validity problems. ... Typically, however, authors (or readers) do seek to generalize the findings of a study beyond the sample of firms examined or the time period covered."*

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12 Cook and Campbell (1979, p. 37), quotation from Ball and Foster (1982, p. 188).

The fact that this study deals almost with the whole population of Swedish listed firms during the period 1966-1993 implies that the external validity problem is not a key issue. However, it does not seem unreasonable to attempt to generalize the results to other time periods, and to attempt to draw parallels with other countries.[13] A general observation from this study is that the regression results (the size of coefficients and the strength of the association) are sensitive to the composition of the sample (in terms of firm characteristics), the economic climate, the relative frequency of acquisitions, and the quality of accounting information. This observation constitutes a strong general warning against making 'unreflected' comparisons over time and between samples.

13 *"A very healthy trend in the literature is the existence of researchers in different countries examining similar questions."* Ball and Foster (1982, p. 187).

## 9.4 Concluding remarks

The often documented weak ability of accounting earnings to explain the level of stock prices and changes in stock prices for short periods can be attributed to:

i) the limited ability in general of traditional cost-based accounting to describe value creation for shorter periods, an ability being disparate for different types of business activities, which in turn appears to be magnified by, for example, 'troublesome' inflationary periods;
ii) the sample studied often being heterogeneous in terms of industrial diversity, firms with different growth potential and competitive conditions, acquisition activity differences, and accounting procedures employed;
iii) the common use of a rather simple operationalization of future performance expectations.

The often documented intertemporal instability in regression coefficients has further been shown to partly stem from the fluctuations in the business cycle.

Prolonging the perspective, change in book value of shareholders' equity can describe an increasing amount of the value creation as expressed by changes in stock prices. In other words, value relevant events appear sooner or later to be incorporated into the accounting descriptions. It has been argued that the observation that one unit of change in equity seems to be associated with more than one unit of change in stock price, largely stems from the general use of a prudent cost-based accounting convention.

It has, furthermore, been shown that the disclosed level of earnings of a firm is associated with changes in the stock price beyond what is merely reflected in the growth in shareholders' equity resulting from the current earnings level. Earnings thus appear to provide information regarding both value creation of the period and the firm's ability to generate future value.

The study of a number of sub-samples of firms possessing different firm characteristics, changes in the economic climate and changes in accounting procedures has further generated a number of insights:

i) large amounts of assets with long economic lives appear to make short-term historical cost-based accounting descriptions particularly poor as indicators of value creation. Furthermore, high and varying inflation rates appear to magnify these problems;
ii) the accounting change leading to open disclosure of value and depreciation according to plan of tangible assets, has evidently led to more informative descriptions. However, it is not clear whether the market can (does) take advantage of information on acquired and capitalized goodwill.

A discussion of some additional implications of this study's results from the perspective of three presumably interested parties—investors, providers of accounting information and standard setting bodies, and research colleagues—will conclude this report.

## Implications for investors

*Accounting as a language for evaluation of different scenarios*

Long-term stock market value changes have been shown to correlate well with long-term growth in book value of equity. If long-term growth in book value of equity can be projected, an important aspect of the future stock price of a company can thus be predicted. This implies that the generation of long-term projections in terms of future income statements and balance sheets appears to be a sensible endeavor.

*Terminal value calculations*

What market-to-book value of equity can be expected for a firm in a steady-state generating a perpetual 'normal performance' from time $t+T$ and beyond? If projections of future income statements and balance sheets are performed utilizing traditional conservative accounting concepts, the idea of differential effects in terms of an accounting measurement bias for different business activities could be utilized. The estimated *PMB*s in this study appear to have empirical validity, which implies that the estimation procedure for evaluating an expected *PMB* outlined in this study could be useful when estimating the terminal value.

$$\text{Terminal value}_{j,t+T} = \text{Equity}_{j,t+T} \cdot (1+PMB_j)$$

This approach can be used as a complement or an alternative to the commonly used perpetual growth formula.

*Fundamental analysis and the business cycle*
Stock prices appear to have been detached from fundamental accounting variables in and around the periods of economic boom. This pattern has consequently been present for the whole period studied, 1967-1993. This may mean that some fundamental variable is missing in common valuation specifications or that a systematic market inefficiency exists that can possibly be exploited.

*A suggested alternative to P/E ratio comparison*
The comparison of P/E ratios for different firms in an endeavor to find over- or under-priced shares is commonplace in the investment community. A rather simple, but potentially richer alternative can be specified given the valuation approach presented in Chapter 2 of this study. First, calculate the implicit growth persistence factor (*GPF*) given a company's stock price, current book value of equity, expected *ROE* for the next period, cost of equity capital, and the expected *PMB*. In other words, what *GPF* is necessary to justify the current stock price? Secondly, compare the implicit *GPF* level for different firms. How realistic the *GPF* values are can be evaluated in terms of differences in, for example, expected growth opportunities and heights of barriers to entry. Tables such as 2.3a-e, presented in Chapter 2, can be used to evaluate required combinations of growth and sustainability of abnormal performance to justify a particular price level.

## Implications for providers of accounting information and standard setting bodies

The research design of this study can at best provide evidence concerning 'how the world works'. Walker (1997) notes that one cannot deliver direct policy advice from market-based accounting research:

> *"...because you can never derive a normative proposition from positive observations alone. Someone needs to specify what the*

*objectives are, then MBAR may be able to help advising how to achieve those objectives."*

Walker (1997, p. 344)

The result of this study that indicates an informative advantage for the firms that switched to an open disclosure practice of value and depreciation of tangible assets,[14] appears to be an instructive example of 'improved accounting principles', given that an objective of 'good accounting' is to provide information that is useful and relevant for investors.

To apply the valuation model utilized in this study, a difficult but necessary task is the calculation of a measurement bias. The measurement bias is the result of an application of traditional conservative accounting principles. It has been argued that the main sources of an understatement of value according to the Swedish (and probably most western) accounting conventions are the valuation of long-lived tangible assets at historical cost and the tendency to treat expenditures that create intangible assets, such as R&D, brandname development and personnel training, as expenses. There are probably good reasons for the existence of such prudent accounting conventions, given the uncertainty regarding future benefits associated with these items. Investors that wish to make their own judgment of the *PMB* for a particular firm could, however, be assisted by more information regarding annual R&D, marketing and personnel training expenditures. Information regarding the age structure of the tangible asset base as well as current cost or market values of important tangible assets could also prove helpful. While it is easy to always ask for more information, issues such as information production costs and consequences of information overload should, of course, not be neglected.

## Implications for researchers and suggested future research

It was argued early in this study that the bottom-line measure of earnings disclosed in an income statement can be viewed from two perspectives—as a measure of the firm's value creation during a period and as an indication (or signal) of the firm's ability to create value. These two views constituted the base for the value change regression specifications M.4 and M.5, where

14 The informative advantage appears to have led to a better statistical map between the stock price (and stock price changes) and fundamental accounting variables such as *ROE* and book value of equity.

value change has been explained by both change in book value of equity (value creation) and change in expected residual return (change in expected ability to create value). This view is conceptually different from the 'competitive view' of the role of 'earning levels' versus 'earnings changes' as explanatory variables of return found in many published *MBAR* articles. Studying raw return, it appears important to include both variables in order to achieve economically sensible regression coefficients (unless the variation in the other variable somehow is controlled for). It has been suggested that the regression coefficients that should be expected for these two variables are 1.0 for the value creation variable, and around 3 to 8 (for normal *GPF* firms) for the change in value creation ability variable.

Historical short-term accounting performance appears to be a particularly poor starting point for predictions of future performance for business activities characterized by non-continuous profit recognition. Expected *ROE* and change in (expected) residual income have generally had a lower slope coefficient and have less often been significant for the firms in the long production cycle industries with revenue recognition at completion (i.e. building and construction firms) and for the 'holding-gain-intensive' industries (such as real estate, shipping and investment companies).

It should be noted that in certain years several of these firms have voluntarily disclosed the market value of their key assets. These voluntary disclosures have not been utilized in this study. It would, however, be interesting to extend this study to also include these reported unrealized holding gains in the book value of equity and the annual change in the unrealized holding gains in the earnings measure. The inclusion of these unrealized holding gains should, of course, reduce the expected level of the *PMB* and the return on equity measure could be expected to become more value relevant. An obvious problem relates to the lack of an accepted standard procedure for these value calculations and the resulting uncertainty of the estimated unrealized holding gains.

The observation that one unit of retained earnings seems to be associated with more than one unit of market value change, as observed in Ohlson and Penman (1992) and Easton, Harris and Ohlson (1992), has been suggested to stem from the existence of an accounting measurement bias. The mean level of the slope coefficient for the longer time intervals is consistent with the estimated levels of *PMB*s.

It has further been observed that the slope coefficient of the change in expected residual return variable increases as the studied time interval is prolonged. For the ten-year interval, the coefficient has generally reached approximately the same levels as the residual return variable showed in the level specification (the coefficient being, of course, also an indication of the *GPF*). These results are in accordance with the conclusions advanced in Kothari and Zimmerman (1995), stating that the earnings response coefficients are substantially less downward biased in price models than in return models. This downward bias for the return specification appears to be reduced when the return interval is prolonged. Further, this downward bias may also explain why the 1-year value change specification appears to be more sensitive to small sample sizes than the levels approach.

The empirical results of this study imply that the common use of heterogeneous samples of firms (both in terms of types of business activities and chosen accounting measurement procedures) can explain parts of the often observed unstable regression coefficients and the commonly low $R^2$ in market-based accounting research. Additionally, the fluctuations in the business cycle have been shown to constitute a very important source of instability for both regression coefficients and the $R^2$s in the Swedish sample of firms. Thus, the previously suggested warning against making 'unreflected' comparisons over time and between samples should be emphasized once again.

It has been suggested that a poor proxy for, for example, expected next period *ROE* (or *EPS*), besides giving poor statistical fit in general, may also conceal the association of another relevant explanatory variable, such as the change in book value of equity (in value change specifications such as M.4 or M.5).[15]

Several research questions that have not been explicitly addressed in this report have surfaced during the process of performing and documenting this study. Obvious extensions include the study of: the potential benefit of util-

15 See discussion in Section 8.5.2.

izing firm- and time-specific *PMB*s, the consequences of new accounting issues such as the switch to the percentage of completion method, and the value relevance of voluntary disclosures of market values of certain long life assets. *PMB*s have been estimated through a procedure where estimated partial *PMBs* have been added to a total *PMB*. Each partial *PMB* emanates essentially from conservative valuation of different types of material and immaterial assets. It would thus be possible to evaluate the relevance of each source of the bias, given that decomposed measures of the *PMB* are included in a regression. A general investigation of the usefulness of the permanent measurement bias concept in other countries could also be performed.

The fact that the switch from the cost method to the equity method when accounting for associated companies tends to imply a simultaneous increase in both book value of equity and return on equity, constitutes a particularly interesting situation which deserves further research attention. To increase the statistical validity of such a test, this question should preferably be empirically evaluated in a country where more observations can be obtained than in the Swedish case.

It would also be interesting to investigate on a broader international scale whether different phases of the business cycle are associated with similar regression patterns as observed in this study on Swedish data.

In a study of the accuracy and explainability of dividend, free cash flow and abnormal earnings valuation models, Francis, Olsson and Oswald (1997) utilize two principally different approaches to calculate the terminal value: a P/E value approach using expected earnings at time $t+T$ and a Gordon approach using free cash flow, dividends and abnormal earnings at time $t+T$ as a starting point in perpetual calculations (with and without growth). A third approach, consistent with the valuation model suggested in this study (provided that $T$ is set large enough to ensure that it is reasonable to expect that the firm will only generate normal true performance), would be to calculate the terminal value as expected book value of equity at time $t+T$ times 1+*PMB* given the dividend approach, as expected book value of capital employed at time $t+T$ times 1+*PMB* of capital employed given the free cash flow approach, or as expected book value of equity at time $t+T$ times the *PMB* given the abnormal earnings valuation approach.

Several studies have documented a so-called P/E effect, where portfolios of high P/E ratio firms have underperformed in comparison to low P/E ratio firms. A similar evaluation of a trading strategy based on high and low implicit *GPF*s could constitute an interesting extension.

# Appendix A Table of *PMB*s—tangible assets

**Table A.1 Calculated relative measurement biases before tax for a portfolio of assets given different degrees of annual unrecorded value change and economic lives of the asset type. The firm holds a constant number of units of the asset type over the years. The real acquisition cost per unit of asset is constant over time.**

| Economic | Annual unrecorded value change | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| life | 0% | 1% | 2% | 3% | 4% | 5% | 6% | 7% | 8% | 9% | 10% | 15% | 20% |
| 5 | 0.00 | 0.02 | 0.04 | 0.06 | 0.08 | 0.10 | 0.12 | 0.14 | 0.16 | 0.18 | 0.20 | 0.31 | 0.42 |
| 10 | 0.00 | 0.04 | 0.07 | 0.11 | 0.15 | 0.19 | 0.23 | 0.27 | 0.31 | 0.35 | 0.39 | 0.60 | 0.81 |
| 15 | 0.00 | 0.05 | 0.11 | 0.16 | 0.22 | 0.28 | 0.34 | 0.40 | 0.46 | 0.52 | 0.58 | 0.90 | 1.24 |
| 20 | 0.00 | 0.07 | 0.14 | 0.22 | 0.30 | 0.37 | 0.45 | 0.54 | 0.62 | 0.70 | 0.79 | 1.23 | 1.68 |
| 30 | 0.00 | 0.11 | 0.22 | 0.33 | 0.45 | 0.57 | 0.69 | 0.82 | 0.95 | 1.08 | 1.22 | 1.91 | 2.62 |
| 50 | 0.00 | 0.18 | 0.37 | 0.56 | 0.77 | 0.99 | 1.21 | 1.43 | 1.66 | 1.90 | 2.13 | 3.34 | 4.57 |

**Table A.2 Calculated relative measurement biases before tax for a portfolio of assets given different degrees of annual unrecorded value change and economic lives of the asset type. The firm is assumed to acquire 10% more units of the asset every year. The real acquisition cost per unit of asset is constant over time.**

| Economic | Annual unrecorded value change | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| life | 0% | 1% | 2% | 3% | 4% | 5% | 6% | 7% | 8% | 9% | 10% | 15% | 20% |
| 5 | 0.00 | 0.02 | 0.04 | 0.06 | 0.08 | 0.10 | 0.12 | 0.14 | 0.15 | 0.17 | 0.19 | 0.29 | 0.39 |
| 10 | 0.00 | 0.03 | 0.07 | 0.10 | 0.13 | 0.16 | 0.20 | 0.23 | 0.27 | 0.30 | 0.34 | 0.51 | 0.69 |
| 15 | 0.00 | 0.04 | 0.09 | 0.13 | 0.18 | 0.22 | 0.27 | 0.32 | 0.36 | 0.41 | 0.46 | 0.70 | 0.94 |
| 20 | 0.00 | 0.05 | 0.11 | 0.16 | 0.22 | 0.27 | 0.33 | 0.38 | 0.44 | 0.50 | 0.55 | 0.85 | 1.14 |
| 30 | 0.00 | 0.07 | 0.14 | 0.20 | 0.27 | 0.34 | 0.41 | 0.48 | 0.56 | 0.63 | 0.70 | 1.06 | 1.43 |
| 50 | 0.00 | 0.08 | 0.17 | 0.25 | 0.34 | 0.42 | 0.51 | 0.60 | 0.68 | 0.77 | 0.86 | 1.29 | 1.73 |

# Appendix B Table of *PMB*s—intangible assets

**Table A.3 Calculated relative measurement biases for different degrees of annual expenditures in an intangible asset and different investment-to-harvest timelags. The reported solidity has been set equal to 50% and the tax rate set at 30%. The real discount rate and annual growth have been set at 5% and 10% respectively.**

| Time | Annual relative expenditure (expenditure/total assets) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag | 0% | 1% | 2% | 3% | 4% | 5% | 6% | 7% | 8% | 9% | 10% | 15% | 20% |
| 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 | 0.00 | 0.01 | 0.03 | 0.04 | 0.06 | 0.07 | 0.08 | 0.10 | 0.11 | 0.13 | 0.14 | 0.21 | 0.28 |
| 2 | 0.00 | 0.03 | 0.05 | 0.08 | 0.11 | 0.14 | 0.16 | 0.19 | 0.22 | 0.25 | 0.27 | 0.41 | 0.55 |
| 3 | 0.00 | 0.04 | 0.08 | 0.12 | 0.16 | 0.20 | 0.24 | 0.28 | 0.32 | 0.36 | 0.40 | 0.60 | 0.80 |
| 4 | 0.00 | 0.05 | 0.10 | 0.16 | 0.21 | 0.26 | 0.31 | 0.37 | 0.42 | 0.47 | 0.52 | 0.78 | 1.05 |
| 5 | 0.00 | 0.06 | 0.13 | 0.19 | 0.26 | 0.32 | 0.38 | 0.45 | 0.51 | 0.58 | 0.64 | 0.96 | 1.28 |
| 6 | 0.00 | 0.08 | 0.15 | 0.23 | 0.30 | 0.38 | 0.45 | 0.53 | 0.60 | 0.68 | 0.75 | 1.13 | 1.50 |
| 7 | 0.00 | 0.09 | 0.17 | 0.26 | 0.34 | 0.43 | 0.51 | 0.60 | 0.68 | 0.77 | 0.86 | 1.28 | 1.71 |
| 8 | 0.00 | 0.10 | 0.19 | 0.29 | 0.38 | 0.48 | 0.57 | 0.67 | 0.77 | 0.86 | 0.96 | 1.44 | 1.91 |
| 9 | 0.00 | 0.11 | 0.21 | 0.32 | 0.42 | 0.53 | 0.63 | 0.74 | 0.84 | 0.95 | 1.05 | 1.58 | 2.11 |
| 10 | 0.00 | 0.11 | 0.23 | 0.34 | 0.46 | 0.57 | 0.69 | 0.80 | 0.92 | 1.03 | 1.15 | 1.72 | 2.29 |

**Table A.4 As above, but the real discount rate and annual growth have been set at 10% and 0% respectively.**

| Time | Annual relative expenditure (expenditure/total assets) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag | 0% | 1% | 2% | 3% | 4% | 5% | 6% | 7% | 8% | 9% | 10% | 15% | 20% |
| 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 | 0.00 | 0.01 | 0.03 | 0.04 | 0.06 | 0.07 | 0.08 | 0.10 | 0.11 | 0.13 | 0.14 | 0.21 | 0.28 |
| 2 | 0.00 | 0.03 | 0.06 | 0.09 | 0.12 | 0.15 | 0.18 | 0.21 | 0.24 | 0.26 | 0.29 | 0.44 | 0.59 |
| 3 | 0.00 | 0.05 | 0.09 | 0.14 | 0.19 | 0.23 | 0.28 | 0.32 | 0.37 | 0.42 | 0.46 | 0.70 | 0.93 |
| 4 | 0.00 | 0.06 | 0.13 | 0.19 | 0.26 | 0.32 | 0.39 | 0.45 | 0.52 | 0.58 | 0.65 | 0.97 | 1.30 |
| 5 | 0.00 | 0.09 | 0.17 | 0.26 | 0.34 | 0.43 | 0.51 | 0.60 | 0.68 | 0.77 | 0.85 | 1.28 | 1.71 |
| 6 | 0.00 | 0.11 | 0.22 | 0.32 | 0.43 | 0.54 | 0.65 | 0.76 | 0.86 | 0.97 | 1.08 | 1.62 | 2.16 |
| 7 | 0.00 | 0.13 | 0.27 | 0.40 | 0.53 | 0.66 | 0.80 | 0.93 | 1.06 | 1.20 | 1.33 | 1.99 | 2.66 |
| 8 | 0.00 | 0.16 | 0.32 | 0.48 | 0.64 | 0.80 | 0.96 | 1.12 | 1.28 | 1.44 | 1.60 | 2.40 | 3.20 |
| 9 | 0.00 | 0.19 | 0.38 | 0.57 | 0.76 | 0.95 | 1.14 | 1.33 | 1.52 | 1.71 | 1.90 | 2.85 | 3.80 |
| 10 | 0.00 | 0.22 | 0.45 | 0.67 | 0.89 | 1.12 | 1.34 | 1.56 | 1.78 | 2.01 | 2.23 | 3.35 | 4.46 |

**Table A.5 As above, but the real discount rate and annual growth have been set at 10% and 10% respectively.**

| Time | Annual relative expenditure (expenditure/total assets) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lag | 0% | 1% | 2% | 3% | 4% | 5% | 6% | 7% | 8% | 9% | 10% | 15% | 20% |
| 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 | 0.00 | 0.01 | 0.03 | 0.04 | 0.06 | 0.07 | 0.08 | 0.10 | 0.11 | 0.13 | 0.14 | 0.21 | 0.28 |
| 2 | 0.00 | 0.03 | 0.06 | 0.08 | 0.11 | 0.14 | 0.17 | 0.20 | 0.22 | 0.25 | 0.28 | 0.42 | 0.56 |
| 3 | 0.00 | 0.04 | 0.08 | 0.13 | 0.17 | 0.21 | 0.25 | 0.29 | 0.34 | 0.38 | 0.42 | 0.63 | 0.84 |
| 4 | 0.00 | 0.06 | 0.11 | 0.17 | 0.22 | 0.28 | 0.34 | 0.39 | 0.45 | 0.50 | 0.56 | 0.84 | 1.12 |
| 5 | 0.00 | 0.07 | 0.14 | 0.21 | 0.28 | 0.35 | 0.42 | 0.49 | 0.56 | 0.63 | 0.70 | 1.05 | 1.40 |
| 6 | 0.00 | 0.08 | 0.17 | 0.25 | 0.34 | 0.42 | 0.50 | 0.59 | 0.67 | 0.76 | 0.84 | 1.26 | 1.68 |
| 7 | 0.00 | 0.10 | 0.20 | 0.29 | 0.39 | 0.49 | 0.59 | 0.69 | 0.78 | 0.88 | 0.98 | 1.47 | 1.96 |
| 8 | 0.00 | 0.11 | 0.22 | 0.34 | 0.45 | 0.56 | 0.67 | 0.78 | 0.90 | 1.01 | 1.12 | 1.68 | 2.24 |
| 9 | 0.00 | 0.13 | 0.25 | 0.38 | 0.50 | 0.63 | 0.76 | 0.88 | 1.01 | 1.13 | 1.26 | 1.89 | 2.52 |
| 10 | 0.00 | 0.14 | 0.28 | 0.42 | 0.56 | 0.70 | 0.84 | 0.98 | 1.12 | 1.26 | 1.40 | 2.10 | 2.80 |

# Appendix C Intangible assets—linear depreciation

**Table A.6 The necessary economic life of an annual investment an intangible asset, depreciated linearly, in order to generate equivalent *PMBs* as calculated by the zero-coupon bond approach at varying investment-to-harvest timelags. The real discount rate (in the zero-coupon bond approach) has been set at 5% and the annual real growth rate is varied between 0%, 5% and 10%.**

| Time-lag | Equivalent estimated life (in years)<br>Annual real growth rate 0% | 5% | 10% |
|---|---|---|---|
| 0 | 0.0 | 0.0 | 0.0 |
| 1 | 0.6 | 0.6 | 0.6 |
| 2 | 3.1 | 3.1 | 3.2 |
| 3 | 5.3 | 5.4 | 5.5 |
| 4 | 7.6 | 7.9 | 8.3 |
| 5 | 10.1 | 10.6 | 11.3 |
| 6 | 12.6 | 13.5 | 14.7 |
| 7 | 15.3 | 16.7 | 18.7 |
| 8 | 18.1 | 20.3 | 23.5 |
| 9 | 21.1 | 24.3 | 29.9 |
| 10 | 24.1 | 28.8 | 37.9 |

The measurement bias given linear depreciation over $L$ years given an annual investment in an intangible asset (that has grown annually by a constant rate, $\delta$) has been calculated according to the following formula:

$$PMB^{I.A:Linear.} = \frac{\frac{I}{TA^{(r)}} \cdot \left( \sum_{l=0}^{L} \frac{L-l}{L} \cdot \frac{1}{(1+\delta)^{l}} \right) \cdot (1-\tau)}{B^{(r)} / TA^{(r)}}$$

where

$\frac{I}{TA^{(r)}} =$ annual expenditure divided by total assets

$\frac{B^{r}}{TA^{(r)}} =$ book value of equity divided by total assets (solidity)

$\tau =$ the tax rate

$\delta =$ annual real growth in the expenditure $I$

$L =$ the economic life of the asset type

$l =$ the age of the asset (in years)

# Appendix D Industry classification

**Table A.7 An illustration of Affärsvärlden's crude, finer and finally the industry classification chosen in this study. A and OTC refers to the listing on the A and OTC lists.**

| Affärsvärlden's old crude industry classifications | | Affärsvärlden's finer industry classifications | | **Industry classification used in this study** |
|---|---|---|---|---|
| Engineering (A & OTC) | → | Engineering (A & OTC) | → | Engineering (A & OTC) |
| Pulp & paper (A & OTC) | → | Pulp & paper (A & OTC) | → | Pulp & paper (A & OTC) |
| Trading & retail (A & OTC) | → | Trading & retail (A & OTC) | → | Trading & retail (A & OTC) |
| Real estate & construction (A & OTC) | → | Real estate & construction (A & OTC) | → | Real estate (A & OTC) |
| | | | ↘ | Building & construction (A & OTC) |
| Shipping (A) | → | Shipping (A) | → | Shipping (A) |
| Other (A) | | Building & construction related (A) | | Other production (A & OTC) |
| | | Office equipment (A) | | |
| | | Medical engineering (A) | | |
| | | Raw materials (A) | | |
| | | Chemical industry (A) | → | Chemical industry (A & OTC) |
| | | Consumer goods (A) | → | Consumer goods (A & OTC) |
| | | Pharmaceutical industry (A) | → | Pharmaceutical industry (A & OTC) |
| | | Electric utility (A) | → | Capital-intensive service (A & OTC) |
| | | Service companies (A) | → | Other service (A & OTC) |
| | | Transportation (A) | | |
| | | Consultants (A) | → | Consultants & computer (A & OTC) |
| | | Conglomerates (A) | → | Conglomerates & mixed investment companies (A & OTC) |
| | | Media (A) | | |
| | | Research companies (A) | | |
| Other (OTC) | → | Other (OTC) | | |
| Computer industry (OTC) | → | Computer industry (OTC) | | |
| Mixed investment companies (A) | → | Mixed investment companies (A) | | |
| Pure investment companies (A) | → | Pure investment companies (A) | → | Pure investment companies (A) |

## Appendix E Check of the industry classification

As a simple indicator of whether a firm had been incorrectly assigned to a certain industry, the ratio of annual sales to opening year total assets has been calculated. The minimum, median and maximum level of this ratio was calculated for each firm over the years. Comparisons in terms of these three indicators were performed within each industry. A firm or (firm-year) that obviously deviated from the industry norm was then analyzed closer. This analysis led to the reclassification of NK from trading and retail to real estate from 1991 and onwards; ASEA was deleted from the engineering industry from 1990 and onwards; Svea was reclassified as a shipping company; G.Carnegie was reclassified as a pure investment company, and Barkman was reclassified as a conglomerate.

It was also found that the building and construction and real estate classifications were not satisfactory. Over time it was obvious that a number of firms had drifted from a core business in the building and construction industry, towards a large degree of investment in real estate. In some cases, the real estate business has become quite dominant. 'Pure real estate businesses' are characterized by low annual income (essentially rents) as compared to the total asset base, and a very dominant share of the asset base is buildings and land. On the other hand, 'pure building and construction firms' have significantly higher assets turnover and much less property. Given these very different characteristics of the industries in their pure form, an additional in-between industry category was introduced: an industry with firms with mixed business in building, construction and real estate. Two ratios for each firm were calculated annually to operationalize this classification. These ratios were i) sales to opening period assets and ii) M&E and property to assets. The median levels of these ratios within each original industry are provided in the table below.

| | Median | | Classification rules | | |
|---|---|---|---|---|---|
| Industries | $\frac{Sales_t}{Assets_{t-1}}$ | $\frac{M\&E + Property}{Assets}$ | $\frac{Sales_t}{Assets_{t-1}}$ | | $\frac{M\&E + Property}{Assets}$ |
| Real estate | 0.22 | 0.87 | $\leq 0.50$ | & | $> 0.50$ |
| Building and construction | 1.16 | 0.32 | $\geq 1.00$ | & | $\leq 0.50$ |
| Building, construction and real estate | | | Residual | | |

It is apparent that the industries are actually quite different in both these dimensions. In order to identify the firms that did not clearly belong to any of the two industries, a couple of cut-off points were chosen. The assets turnover ratio was chosen as the main divider. The chosen cut-off points were as follows: to be classified as a *'real estate firm'* the assets turnover must be equal to or less than 0.50 and the M&E and property to assets ratio must exceed 0.50. To be classified as a *'building and construction firm'* the assets turnover must equal or exceed 1.00 and the M&E and property to assets ratio must be less than or equal to 0.50. The remaining firms were classified as *'building, construction and real estate'*. This industry category contains at most eight different firms in 1989.

A finer partitioning of firms within some of the other industries could, of course, also be performed. Such an endeavor was, however, considered beyond the scope of this study.

The next appendix (A.5) summarizes the number of firms in each industry at the end of December each year in the final sample.

# Appendix F Number of quoted firms

**Table A.8** **Number of quoted firms at the end of December every year in the final sample, categorized according to a reduced version of Affärsvärlden's industry codes. The number of listed firms on the A list, the OTC and the O list respectively, are presented separately from 1984 (A-listed/OTC- and O-listed).**

| Year | Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1967 | | 17 | 4 | 6 | 1 | 1 | 1 | 3 | | | | | 2 | 2 | | | 1 | 38 |
| 1968 | | 16 | 4 | 6 | 2 | 1 | 1 | 3 | | | | | 2 | 2 | | | 1 | 38 |
| 1969 | | 17 | 5 | 7 | 1 | 1 | 2 | 3 | | | | | 2 | 2 | | | 1 | 41 |
| 1970 | | 17 | 5 | 7 | 2 | 1 | 2 | 3 | | | | | 3 | 2 | | | 1 | 43 |
| 1971 | | 24 | 5 | 7 | 1 | 1 | 2 | 6 | | | 2 | | 8 | 3 | 2 | 7 | 1 | 69 |
| 1972 | | 24 | 6 | 7 | 2 | 1 | 2 | 6 | | | 2 | | 8 | 3 | 2 | 8 | 1 | 72 |
| 1973 | | 24 | 7 | 7 | 2 | 1 | 2 | 6 | 1 | | 2 | | 9 | 3 | 3 | 8 | 1 | 76 |
| 1974 | | 25 | 7 | 7 | 1 | 1 | 2 | 6 | 2 | | 2 | | 10 | 3 | 3 | 8 | 1 | 78 |
| 1975 | | 24 | 7 | 7 | 2 | 1 | 2 | 5 | 2 | | 2 | | 11 | 3 | 3 | 8 | 1 | 78 |
| 1976 | | 24 | 6 | 7 | 2 | 1 | 2 | 6 | 2 | 1 | 2 | | 13 | 4 | 3 | 9 | 1 | 83 |
| 1977 | | 25 | 6 | 7 | 1 | 1 | 2 | 5 | 2 | 1 | 2 | | 15 | 4 | 3 | 9 | 2 | 85 |
| 1978 | | 25 | 6 | 7 | 2 | 1 | 2 | 6 | 2 | 1 | 2 | | 15 | 4 | 4 | 9 | 1 | 87 |
| 1979 | | 23 | 7 | 7 | 1 | 1 | 2 | 6 | 2 | 1 | 2 | 1 | 16 | 4 | 4 | 9 | 2 | 88 |
| 1980 | | 24 | 8 | 6 | 1 | 1 | 2 | 5 | 2 | 1 | 2 | 1 | 17 | 5 | 4 | 9 | 2 | 90 |
| 1981 | | 22 | 8 | 7 | 1 | 1 | 2 | 5 | 2 | 1 | 2 | 1 | 18 | 5 | 4 | 9 | 3 | 91 |
| 1982 | | 22 | 8 | 7 | 4 | 1 | 2 | 6 | 2 | 1 | 2 | 1 | 18 | 5 | 3 | 9 | 3 | 94 |
| 1983 | | 21 | 8 | 7 | 4 | 1 | 2 | 6 | 2 | 1 | 2 | 1 | 18 | 5 | 5 | 9 | 3 | 95 |
| 1984 | | 26/8 | 10 | 5/1 | 5/2 | 2/1 | 4 | 13/6 | 4/3 | 2/4 | 2/1 | 2/0 | 22/2 | 3 | 10/1 | 9 | 3/1 | 152 |
| 1985 | | 25/8 | 8 | 5/1 | 4/2 | 2/1 | 4 | 14/8 | 4/3 | 5/6 | 2/1 | 3/1 | 21/2 | 5 | 10/3 | 8 | 5/0 | 161 |
| 1986 | | 22/7 | 8 | 4/1 | 5/2 | 2/1 | 4 | 18/8 | 4/3 | 7/8 | 2/1 | 4/2 | 17/2 | 6 | 11/3 | 7 | 5/0 | 164 |
| 1987 | | 23/7 | 7 | 4/1 | 4/3 | 2/1 | 3 | 17/9 | 4/3 | 9/7 | 2/1 | 5/1 | 18/2 | 7 | 12/3 | 7 | 6/0 | 168 |
| 1988 | | 20/8 | 4 | 3/1 | 3/2 | 1/1 | 3 | 17/10 | 5/3 | 9/8 | 3/1 | 5/2 | 18/2 | 7 | 12/5 | 7 | 7/1 | 168 |
| 1989 | | 21/7 | 5 | 3/1 | 3/2 | 1/1 | 3 | 15/8 | 5/4 | 9/8 | 3/1 | 5/2 | 18/3 | 6 | 13/4 | 7 | 6/2 | 166 |
| 1990 | | 18/7 | 5 | 3 | 2/2 | 0/1 | 2 | 12/8 | 6/4 | 8/7 | 3/1 | 5/2 | 15/3 | 7 | 13/3 | 7 | 5/1 | 151 |
| 1991 | | 14/4 | 5 | 3 | 2/2 | 0/1 | 2 | 10/7 | 4/3 | 8/4 | 3/0 | 4/2 | 14/3 | 7 | 13/3 | 6 | 4/1 | 129 |
| 1992 | | 14/4 | 5 | 3 | 2/1 | 0/1 | 2 | 10/5 | 4/2 | 6/4 | 3/0 | 3/1 | 14/3 | 7 | 11/4 | 6 | 3/1 | 119 |
| 1993 | | 14/4 | 4 | 2 | 2/2 | 0/1 | 2 | 9/4 | 3/2 | 6/4 | 3/0 | 3/1 | 13/3 | 6 | 8/4 | 6 | 2/0 | 108 |

**Industry codes**

| | | | |
|---|---|---|---|
| 1 | Engineering | 9 | Consultants and computer |
| 2 | Pulp and paper | 10 | Capital-intensive service |
| 3 | Chemical industry | 11 | Other service |
| 4 | Building and construction | 12 | Conglomerates and mixed investment |
| 5 | Consumer goods | 13 | Shipping |
| 6 | Pharmaceutical industry | 14 | Real estate |
| 7 | Other production | 15 | Investment companies (pure) |
| 8 | Trading and retail | 16 | Building, construction and real estate |

# Appendix G Swedish earnings measurement practice

The following paragraphs provide a brief description of how the Swedish earnings and return on equity measurement practices have changed over time. The development is illustrated separately in terms of recommendations, annual report practice, financial press practice, and empirical accounting research practice.

## Recommended practice

Disclosure of the annual allocation to untaxed reserves (and the accumulated sum of untaxed reserves) was formally first recommended for *'inventory reserves'* in FAR No. 2 1966 (later followed by a formal law, ABL 1975). Separate disclosure of *'depreciation according to plan—normal depreciation'* (in addition to the depreciation allowed for tax purposes) was recommended by NBK 1968, but was not formally recommended by FAR, until in FAR No. 3 1983 (published as a proposed recommendation 1981).

Regarding the actual calculation of earnings measures and profitability ratios two different standard setting bodies have attempted to generate a common practice both for firms and financial analysts. Their recommendations have also been concerned with the disclosure of certain items. Näringslivets Börskommitté (NBK) published recommendations in 1968 and 1983, and Sveriges Finansanalytikers Förening (SFF is an association for Swedish financial analysts) published a recommendation in 1972 with minor revisions in 1974 and 1979, followed by larger adjustments in the mid 1980s, again followed by new editions with minor revisions. The early recommendations from SFF stated a calculation of earnings that was based on earnings after financial items with '*estimated current cost depreciation*'; from this result a standard tax rate of 50% should be deducted. This method can be called the '*proxy-tax method*'. SFF later (1985) recommended the use of historic cost depreciation (according to plan), that tax should preferably be calculated according to the *'comprehensive tax method'* (taxes payable plus a standard tax rate times the annual allocation to untaxed reserves), and that tax consequences related to extraordinary items should preferably be disclosed and corrected for in the earnings calculation. Finally, the earnings measure should exclude minority interests but include the earnings share of associated companies. This earnings calculation is essentially identical to the one recommended by NBK 1983. NBK did, however, recommend the use of the prevailing tax rate (rather than a standard tax rate of 50%) on the annual allocation to untaxed reserves. NBK also recommended a complementary calculation of an earnings and *ROE* measure after extraordinary items. SFF (1990) noted that the proxy tax method had been the most commonly used method among Swedish financial analysts; nevertheless SFF recommended the use of the comprehensive tax method. An important argument in favor of the comprehensive tax method stems from the fact that several income statement items do not generate tax consequences (e.g. goodwill depreciation); the proxy tax method cannot distinguish and capture such items.

## Disclosure practice in annual reports

Open disclosure of inventory reserves was common in the early 1960s (see Hanner, 1964), and an almost complete adoption to such disclosure practice, among the listed companies, can be observed by 1966. Disclosures of depreciation according to plan show a gradually increasing pattern. Studying the firms in Findata, one can note that a minority (≈ 20%) of the listed firms disclosed this information by the late 1960s and a majority of the firms (≈ 80%) did so by the late 1970s. Published studies of the accounting practice in Sweden among listed companies include a study by Wessman (1975) of the practice in 1973 and a number of surveys from 1980 to 1993 performed by FAR and Rundfelt.[1] Here, their results regarding how earnings and profitability measures have been defined will briefly be described. In the early surveys, a very diverse measurement practice was observed. In 1973 only 31 of 74 firms (42%) disclosed a return measure. Earnings calculated according to the proxy tax method dominated between 1979 and 1986 and the comprehensive tax method started to be common in 1983. Rundfelt (1987) noted that earnings after proxy tax was calculated by approximately 75% of the firms between 1984 and 1987 and earnings after comprehensive tax was calculated by approximately 50% of the firms in 1987. The trend towards the use of the comprehensive tax method has continued according to the later published surveys by Rundfelt.

1 "Survey of Accounting Practices" by FAR 1980, 1984 and 1987 and "Tendenser i börsbolagens årsredovisningar" ("Accounting practice tendencies among the listed companies") by Rundfelt 1987, 1988, 1990, 1991, 1992 and 1993.

## Adopted practice in the financial press

The description is limited to the practices adopted in the two major Swedish magazines, Affärsvärlden (AV) and Veckans Affärer (VA), during the period studied. AV introduced "*Placeringsindikatorn*" early in 1968 (No. 5). This monthly investment guide included a calculation of earnings before extraordinary items, minus 'calculative' depreciation (a proxy of current cost depreciation) and calculated tax expenses (a standard tax rate of 50% was used).

An earnings measure was first published in VA No. 1 1971 and continued on a regular basis. VA's definition was similar to AV's. In early 1976, both magazines abandoned their detailed depreciation calculation, but continued using the proxy tax method.[2] The standard tax rate was 50% until 1988 and 30% thereafter. From No. 21 1983, VA also published earnings after extraordinary items and comprehensive tax.

## Examples from Swedish empirical research

Forsgårdh and Hertzen (1975) used a definition of earnings before extraordinary items minus a standard tax rate of 50% in their study of the efficiency of the Swedish stock market (see pp. 209-212). Bertmar and Molin (1977) used a comprehensive tax approach with the prevailing tax rates in their study of Swedish companies (see pp. 85-88). Skogsvik (1988) used several definitions of earnings and *ROE* in his study of the ability of financial ratios to predict business failure (see p. 178). He used both the prevailing tax rates in comprehensive tax calculations and approaches using only paid tax. He further calculated tax costs and the deferred tax liability as a present value, acknowledging that the deferral of tax payments with a zero interest cost has a value. Skogsvik (1988) found, using principal component analysis, that the choice between these definitions did not significantly affect the information content of the ratios concerned.

2 If a firm received non-taxable dividend income, this was corrected for.

# Appendix H Income statement and balance sheet

## The layout of a common Swedish income statement:

| | |
|---|---|
| | Revenues |
| - | Expenses |
| - | Depreciation |
| = | Operating earnings |
| ± | Financial items |
| = | Earnings after financial items |
| ± | Extraordinary items |
| = | Earnings after extraordinary items |
| ± | Allocation to untaxed reserves |
| = | Earnings before tax |
| - | Disclosed tax (taxes payable) |
| - | Minority share of earnings after tax |
| = | Net earnings |

## The layout of a common Swedish balance sheet:

| | |
|---|---|
| Assets | Liabilities |
| | Untaxed reserves |
| | Minority interest |
| | (Taxed reserves) |
| | Shareholders' equity (including retained earnings and proposed dividends related to last years earnings) |

# Appendix I Operationalization of accounting information in terms of Findata variables

The accounting items must be operationalized in terms of variables in Findata's database. The following table summarizes the chosen variables that were selected with the help of FINLIS (see FINDATA's user's manual version March 1985).

| Earnings items | FINDATA Variable number | Equity items | FINDATA Variable number |
|---|---|---|---|
| Earnings after financial items | var 254 | Disclosed equity | var 152 |
| Minority share of earnings after tax | var 318 | Taxed reserves | var 135 |
| Allocation to untaxed reserves | var 286 | Untaxed reserves | var 121 |
| Tax affecting group transfers[3] | var 315 | Other reserves[4] | var 136 |
| Disclosed tax | var 317 | Proposed dividend | var 163 |
| Extraordinary items | var 256 | | |

Note that Findata has consistently classified a holding gain or loss on shares sold as an extraordinary item, irrespective of how the individual firm has chosen to classify it. Especially for the investment firms, such a holding gain is, however, more likely to be ordinary.

Note also that information regarding untaxed reserves has sometimes been updated to the earlier years (before such disclosure was public) on the basis of later disclosure. This fact will be controlled for later when regressions are run that particularly attempt to study the effect of open untaxed reserve disclosure.

Raw data for 252 firms were transferred from Findata for the period 1966 to 1993, and processed in the spreadsheet program EXCEL. Several methods to ensure the correct transferal of data and correct calculations have been

3 A small number of the firms in the sample have been part of a sub-group of firms. Within such a group it has been possible to transfer earnings on a before-tax basis (koncernbidrag). To control for a potentially too high or too low disclosed tax due to such transfers, any group transfer times the estimated tax-rate has been added back to the earnings measure.

4 For some firms during the early years in the database, Findata classified some reserves as *'other reserves—tax consequence unclear'*. This item affects very few firms, and it has, for the sake of simplicity, been classified as 100% equity.

performed. Most importantly, manual control calculations of each *ROE* specification have been performed for a small number of firms at different points in time, directly from published annual reports.

The data was screened and firm-year observations were deleted when either:

i) opening or closing fiscal year was not December 31;
ii) market value was zero;
iii) opening or closing book value of equity was zero;
iv) opening book value of equity was extremely low.

Book value of equity has been used as the denominator in both the calculation of *ROE* and the calculation of the market-to-book value. Extremely low book values can generate extreme ratios which, in turn, can have a detrimental influence on the regressions that are to be run in this study.

To qualify for the OTC list on the Stockholm Stock Exchange, a firm must have reported book value of equity amounting to a minimum of SEK 4 millions. Most firms in the sample have much larger equity values (the average and median equity in the total sample of firms at the end of 1970 was SEK 530 millions and SEK 294 millions respectively. At the end of 1985, including OTC-firms, the average and median equity was SEK 998 millions and SEK 257 millions respectively). An equity base (including untaxed reserves $\cdot$ $(1-\tau)$) below SEK 5 millions has thus been classified as extremely low. Furthermore, to screen out large firms with very low equity, an additional criterion has been used. A firm with a solidity (the ratio of equity-to-total-assets) below 2 percent has been classified as extreme. Together, these two criteria disqualified 13 of the approximately 2,800 firm-year observations.

# Appendix J Median balance sheet items

**Table A.9 The time-series median value of different balance sheet items calculated across all firms, and then across different industries.**

| Industry | ME & Ships / Total assets | Buildings / Total assets | Trading prop. / Total assets | Land / Total assets | Inv in shares / Total assets |
|---|---|---|---|---|---|
| Engineering | 0.14 | 0.09 | 0.00 | 0.01 | 0.01 |
| Pulp and paper | 0.32 | 0.08 | 0.00 | 0.09 | 0.02 |
| Chemical industry | 0.17 | 0.11 | 0.00 | 0.02 | 0.02 |
| Building and construction | 0.06 | 0.04 | 0.22 | 0.01 | 0.02 |
| Consumer goods | 0.32 | 0.12 | 0.00 | 0.02 | 0.01 |
| Pharmaceutical | 0.16 | 0.08 | 0.00 | 0.01 | 0.00 |
| Other production | 0.17 | 0.11 | 0.00 | 0.01 | 0.01 |
| Trading and retail | 0.07 | 0.11 | 0.00 | 0.01 | 0.00 |
| Consultants and computer | 0.12 | 0.00 | 0.00 | 0.00 | 0.01 |
| Capital-intensive service | 0.31 | 0.10 | 0.00 | 0.04 | 0.09 |
| Other service | 0.06 | 0.03 | 0.00 | 0.01 | 0.02 |
| Conglomerate and mixed inv. | 0.09 | 0.08 | 0.00 | 0.01 | 0.13 |
| Shipping | 0.55 | 0.01 | 0.00 | 0.00 | 0.02 |
| Real estate | 0.01 | 0.40 | 0.22 | 0.01 | 0.02 |
| Investment companies | 0.00 | 0.00 | 0.00 | 0.00 | 0.80 |
| Mixed building and real estate | 0.02 | 0.02 | 0.42 | 0.01 | 0.01 |

**Definitions of the variables:**

- ME and Ships has been calculated as the sum of machinery and equipment and ships, valued according to historical acquisition cost minus accumulated depreciation (variable 48 in Findata). The calculation of this variable can only be performed for those years when the firm actually disclosed depreciation according to plan.
- Buildings (variable 71 in Findata).
- Trading property ("omsättningsfastigheter" = variable 361 in Findata).
- Land (variable 77 in Findata).
- Investment in shares includes listed and unlisted shares classified as fixed assets (variable 26 in Findata).

# Appendix K Partial *PMB*s related to M&E and ships

**Table A.10 Calculated partial *PMB*s per industry related to the median holdings of machinery, equipment and ships. The industries have been ranked in descending *PMB* order.**

| Industry | Median age | Median economic lives | Bias before tax [3:7] | $\frac{\text{ME \& Ships}}{\text{Total assets}}$ | Solidity | $PMB_Y^{MES}$ [4:9] |
|---|---|---|---|---|---|---|
| Shipping | 4 | 17 | 0.33* | 0.55 | 0.19 | 0.47 |
| Pulp and paper | 8 | 18 | 0.45 | 0.32 | 0.31 | 0.23 |
| Capital-intensive service | 7 | 18 | 0.45 | 0.31 | 0.30 | 0.23 |
| Consumer goods | 6 | 14 | 0.36 | 0.32 | 0.38 | 0.15 |
| Chemical industry | 7 | 13 | 0.34 | 0.17 | 0.29 | 0.10 |
| Engineering | 6 | 11 | 0.29 | 0.14 | 0.30 | 0.07 |
| Other production | 6 | 11 | 0.29 | 0.17 | 0.35 | 0.07 |
| Pharmaceutical | 5 | 11 | 0.29 | 0.16 | 0.36 | 0.06 |
| Conglomerate and m. inv. | 6 | 11 | 0.29 | 0.09 | 0.34 | 0.04 |
| Building and construction | 5 | 9 | 0.24 | 0.06 | 0.19 | 0.03 |
| Trading and retail | 4 | 8 | 0.22 | 0.07 | 0.24 | 0.03 |
| Consultants and computer | 3 | 7 | 0.20 | 0.12 | 0.34 | 0.03 |
| Other service | 4 | 9 | 0.24 | 0.06 | 0.23 | 0.03 |
| Mixed build. and real est. | 5 | 9 | 0.24 | 0.02 | 0.18 | 0.02 |
| Real estate | 3 | 8 | 0.22 | 0.01 | 0.21 | 0.00 |
| Investment companies | 5 | 9 | 0.24 | 0.00 | 0.75 | 0.00 |

* The bias calculation has been based on an average age of the asset base of four years, rather than assuming a balanced portfolio of assets with a 17-year economic life.

$$\text{Ship bias before tax} = \left((1 + 0.074)^4 - 1\right) = 0.33$$

Solidity has been calculated as equity (according to the definition discussed in Section 4.2.1) divided by total assets (variable 91 in Findata).

# Appendix L Partial *PMB*s related to buildings

**Table A.11 Calculated partial *PMBs* per industry related to the median holdings of buildings as a fixed asset. The industries have been ranked in descending *PMB* order.**

| Industry | Median age | Median economic lives | Bias before tax [3:7] | $\frac{\text{Buildings}}{\text{Total assets}}$ | Solidity | $PMB_Y^{Buildings}$ [4:9] |
|---|---|---|---|---|---|---|
| Real estate | 3 | 56 | 0.33* | 0.40 | 0.21 | 0.31 |
| Trading and retail | 9 | 45 | 0.93 | 0.11 | 0.24 | 0.21 |
| Capital-intensive service | 14 | 42 | 0.89 | 0.10 | 0.30 | 0.15 |
| Chemical industry | 9 | 27 | 0.63 | 0.11 | 0.29 | 0.12 |
| Consumer goods | 8 | 31 | 0.71 | 0.12 | 0.38 | 0.11 |
| Engineering | 9 | 31 | 0.71 | 0.09 | 0.30 | 0.10 |
| Other production | 7 | 28 | 0.65 | 0.11 | 0.35 | 0.10 |
| Pharmaceutical | 5 | 38 | 0.83 | 0.08 | 0.36 | 0.09 |
| Pulp and paper | 12 | 27 | 0.63 | 0.08 | 0.31 | 0.08 |
| Conglomerate and m. inv. | 8 | 29 | 0.67 | 0.08 | 0.34 | 0.08 |
| Other service | 7 | 34 | 0.76 | 0.03 | 0.23 | 0.04 |
| Building and construction | 6 | 79 | 0.33* | 0.04 | 0.19 | 0.03 |
| Shipping | 4 | 33 | 0.74 | 0.01 | 0.19 | 0.02 |
| Mixed build. and real est. | 4 | 31 | 0.33* | 0.02 | 0.18 | 0.02 |
| Consultants and computer | 5 | 55 | 1.06 | 0.00 | 0.34 | 0.00 |
| Investment companies | 8 | 35 | 0.78 | 0.00 | 0.75 | 0.00 |

* The bias calculation has been based on an average age of the asset base of four years, rather than assuming a balanced portfolio of assets with a long economic life.

$$\text{Property bias before tax} = \left((1+0.074)^4 - 1\right) = 0.33$$

# Appendix M Partial *PMB*s related to investments in shares

**Table A.12 Calculated partial *PMB*s per industry related to the median investments in shares. The industries have been ranked in descending *PMB* order.**

| Industry | Bias before tax | $\frac{\text{Inv. in shares}}{\text{Total assets}}$ | Solidity | $PMB_Y^{Shares}$ [4:9] |
|---|---|---|---|---|
| Investment companies | 1.00* | 0.80 | 0.75 | 0.53 |
| Conglomerate and mixed inv. | 0.40** | 0.13 | 0.34 | 0.08 |
| Capital-intensive service | 0.40** | 0.09 | 0.30 | 0.06 |
| Building and construction | 0.40** | 0.02 | 0.19 | 0.02 |
| Other service | 0.40** | 0.02 | 0.23 | 0.02 |
| Shipping | 0.40** | 0.02 | 0.19 | 0.02 |
| Engineering | 0.40** | 0.01 | 0.30 | 0.01 |
| Pulp and paper | 0.40** | 0.02 | 0.31 | 0.01 |
| Chemical industry | 0.40** | 0.02 | 0.29 | 0.01 |
| Consumer goods | 0.40** | 0.01 | 0.38 | 0.01 |
| Other production | 0.40** | 0.01 | 0.35 | 0.01 |
| Consultants and computer | 0.40** | 0.01 | 0.34 | 0.01 |
| Real estate | 0.40** | 0.02 | 0.21 | 0.01 |
| Mixed building and real estate | 0.40** | 0.01 | 0.18 | 0.01 |
| Pharmaceutical | 0.40** | 0.00 | 0.36 | 0.00 |
| Trading and retail | 0.40** | 0.00 | 0.24 | 0.00 |

* The bias calculation has been based on the median disclosed market-to-book value of listed shares held by the companies in the investment company industry.

** The bias calculations have been based on the median disclosed market-to-book value of listed shares held by the companies in the conglomerate and mixed investment industry.

# Appendix N Partial *PMB*s related to R&D expenditures

**Table A.13 Calculated partial *PMBs* per company related to their median annual expenditures in R&D. The companies have been ranked in descending *PMB* order.**

| Company | Industry code | R&D exp / Total assets | Expected timelag | Solidity | $PMB_{Firm}^{R\&D}$ [3:9] |
|---|---|---|---|---|---|
| Astra | 6 | 0.13 | 7 years | 0.36 | 1.40 |
| LKB | 6 | 0.10 | -"- | 0.36 | 1.08 |
| Old Pharmacia | 6 | 0.10 | -"- | 0.36 | 1.03 |
| Saab-Scania | 1 | 0.08 | 3.5 years | 0.30 | 0.49 |
| Datalogic | 9 | 0.07 | -"- | 0.34 | 0.38 |
| Ericsson | 1 | 0.06 | -"- | 0.30 | 0.37 |
| Volvo | 1 | 0.06 | -"- | 0.30 | 0.36 |
| Procordia/Pharma | 12 | 0.05 | -"- | 0.34 | 0.28 |
| Inter Innovation | 7 | 0.05 | -"- | 0.35 | 0.25 |
| Gambro | 7 | 0.05 | -"- | 0.35 | 0.23 |
| Asea | 1 | 0.03 | -"- | 0.30 | 0.21 |
| Atlas Copco | 1 | 0.03 | -"- | 0.30 | 0.20 |
| Garphytt | 1 | 0.03 | -"- | 0.30 | 0.20 |
| Alfa Laval | 1 | 0.03 | -"- | 0.30 | 0.19 |
| Sandvik | 1 | 0.03 | -"- | 0.30 | 0.17 |
| Old Incentive | 12 | 0.03 | -"- | 0.34 | 0.16 |
| Trelleborg | 12 | 0.03 | -"- | 0.34 | 0.16 |
| Old Cardo | 12 | 0.03 | -"- | 0.34 | 0.15 |
| Nobel | 3 | 0.02 | -"- | 0.29 | 0.12 |
| Husqvarna | 1 | 0.02 | -"- | 0.30 | 0.12 |
| PLM | 1 | 0.02 | -"- | 0.30 | 0.11 |
| Electrolux | 1 | 0.02 | -"- | 0.30 | 0.10 |
| SKF | 1 | 0.02 | -"- | 0.30 | 0.09 |
| AGA | 3 | 0.01 | -"- | 0.29 | 0.08 |
| Iggesund | 2 | 0.01 | -"- | 0.31 | 0.07 |
| Euroc | 7 | 0.01 | -"- | 0.35 | 0.06 |
| Kockums | 1 | 0.01 | -"- | 0.30 | 0.06 |
| SCA | 2 | 0.01 | -"- | 0.31 | 0.05 |
| Höganäs | 7 | 0.01 | -"- | 0.35 | 0.05 |
| Sydkraft | 10 | 0.01 | -"- | 0.30 | 0.04 |
| Modo | 2 | 0.01 | -"- | 0.31 | 0.03 |

- The bias calculations have been based on an annual real growth rate of 4%, a real rate of expected return of 8%, the median solidity for each industry, and the average tax rate for the period 1967 to 93.

# Appendix O Partial *PMB*s related to deferred taxes

**Table A.14 Calculated partial *PMB*s per industry related to the median deferred tax in unrealized holding gains and untaxed reserves. The industries have been ranked in descending *PMB* order.**

| Industry | $\frac{\text{UHG}}{\text{Total assets}} \cdot \tau$ | $\frac{\text{UR}}{\text{Total assets}} \cdot \tau$ | Solidity | $PMB^{DT}_{Industry}$ [3:11] |
|---|---|---|---|---|
| Pharmaceutical | 0.44 | 0.11 | 0.36 | 0.51 |
| Capital-intensive service | 0.13 | 0.15 | 0.30 | 0.33 |
| Pulp and paper | 0.12 | 0.14 | 0.31 | 0.27 |
| Trading and retail | 0.06 | 0.06 | 0.24 | 0.23 |
| Chemical industry | 0.07 | 0.13 | 0.29 | 0.21 |
| Consumer goods | 0.18 | 0.13 | 0.38 | 0.20 |
| Build. and construction | 0.04 | 0.09 | 0.19 | 0.16 |
| Investment companies | 0.41 | 0.00 | 0.75 | 0.16 |
| Engineering | 0.05 | 0.08 | 0.30 | 0.15 |
| Consultants and computer | 0.14 | 0.08 | 0.34 | 0.15 |
| Other service | 0.12 | 0.04 | 0.23 | 0.14 |
| Shipping | 0.10 | 0.02 | 0.19 | 0.14 |
| Other production | 0.06 | 0.08 | 0.35 | 0.13 |
| Mixed build. and real est. | 0.06 | 0.03 | 0.18 | 0.12 |
| Real estate | 0.10 | 0.01 | 0.21 | 0.10 |
| Conglomerate and m. inv. | 0.07 | 0.03 | 0.34 | 0.09 |

**Definitions of the variables:**

- Deferred tax in untaxed reserves has been calculated as disclosed untaxed reserves (variable 121) times the prevailing tax rate. Variable 468 includes each firm's own disclosed estimate of deferred taxes from approximately 1991 and onwards.

# Appendix P Business cycle patterns

**Table A.15 A classification of the Swedish industrial business cycle phases in four categories. The business cycle phases are compared at the beginning and end of each possible five- and ten-year value change window.**

| Time | Business cycle phase | Business phase in and out in five-year change regressions | | Business phase in and out in ten-year change regressions | |
|---|---|---|---|---|---|
| 1967 | Recession | | | | |
| 1968 | Up | | | | |
| 1969 | Boom | | | | |
| 1970 | Down | | | | |
| 1971 | Recession | | | | |
| 1972 | Up | 1967 - 72 | R - U | | |
| 1973 | Boom | 1968 - 73 | U - B | | |
| 1974 | Down | 1969 - 74 | B - D | | |
| 1975 | Recession | 1970 - 75 | D - R | | |
| 1976 | Recession | 1971 - 76 | **R - R** | | |
| 1977 | Recession | 1972 - 77 | U - R | 1967 - 77 | **R - R** |
| 1978 | Up | 1973 - 78 | B - U | 1968 - 78 | **U - U** |
| 1979 | Boom | 1974 - 79 | D - B | 1969 - 79 | **B - B** |
| 1980 | Down | 1975 - 80 | R - D | 1970 - 80 | **D - D** |
| 1981 | Recession | 1976 - 81 | **R - R** | 1971 - 81 | **R - R** |
| 1982 | Up | 1977 - 82 | R - U | 1972 - 82 | **U - U** |
| 1983 | Up | 1978 - 83 | **U - U** | 1973 - 83 | B - U |
| 1984 | Boom | 1979 - 84 | **B - B** | 1974 - 84 | D - B |
| 1985 | Boom | 1980 - 85 | D - B | 1975 - 85 | R - B |
| 1986 | Boom | 1981 - 86 | R - B | 1976 - 86 | R - B |
| 1987 | Boom | 1982 - 87 | U - B | 1977 - 87 | R - B |
| 1988 | Boom | 1983 - 88 | U - B | 1978 - 88 | U - B |
| 1989 | Down | 1984 - 89 | B - D | 1979 - 89 | B - D |
| 1990 | Down | 1985 - 90 | B - D | 1980 - 90 | **D - D** |
| 1991 | Recession | 1986 - 91 | B - R | 1981 - 91 | **R - R** |
| 1992 | Recession | 1987 - 92 | B - R | 1982 - 92 | U - R |
| 1993 | Up | 1988 - 93 | B - U | 1983 - 93 | **U - U** |

# Appendix Q Accounting for acquisitions

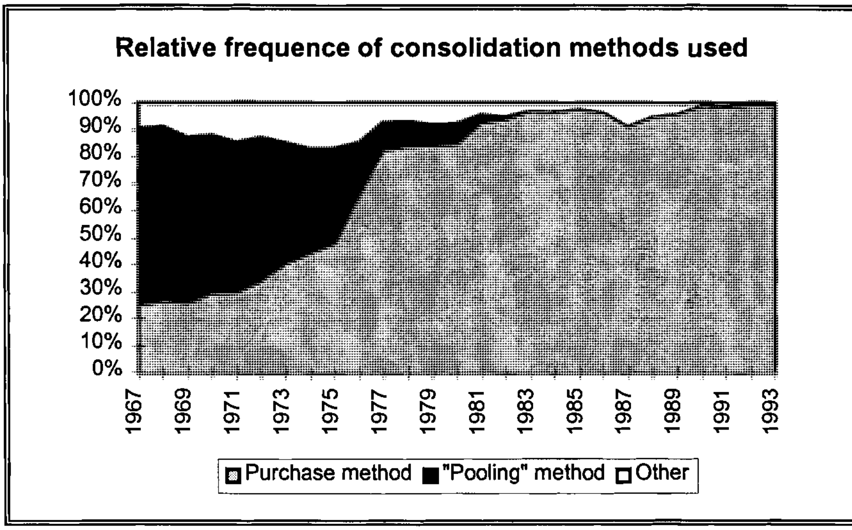


*Figure A.1 Relative frequency of chosen consolidation method in the sample of firms.*

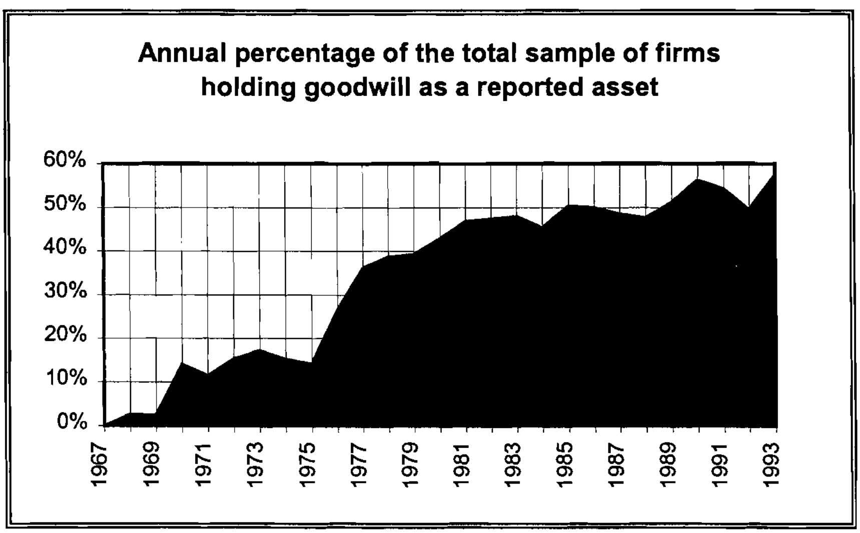


*Figure A.2 Frequency of the sample firms that report goodwill as an asset.*

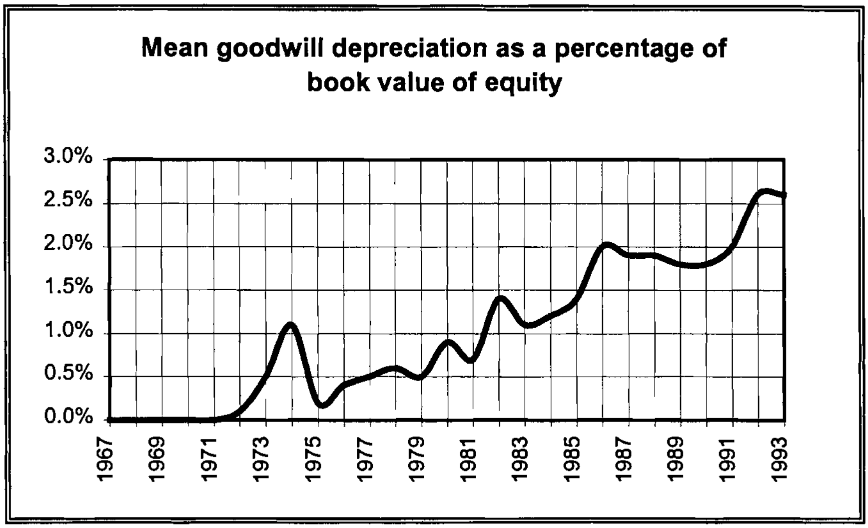


*Figure A.3* ***The unweighted mean of each goodwill reporting firm's annual goodwill depreciation divided by opening book value of equity.***

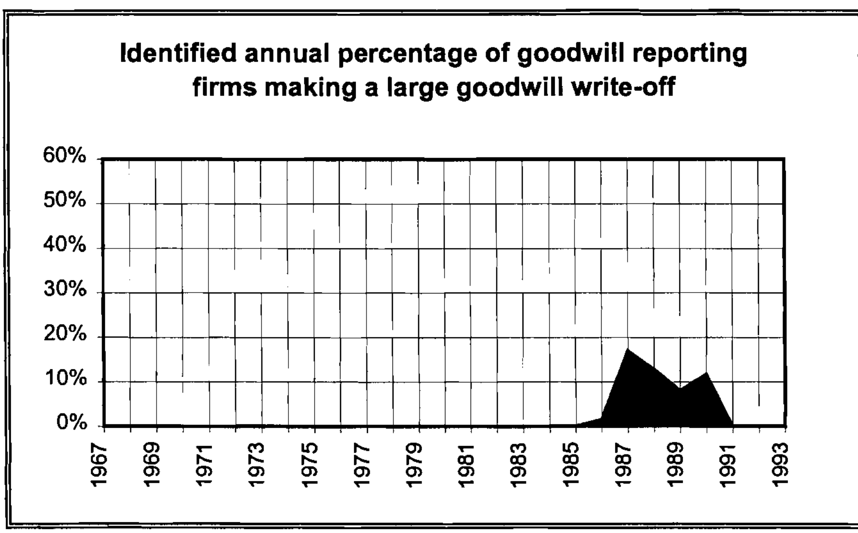


*Figure A.4* ***The relative frequency of goodwill reporting firms that have chosen to make a large goodwill write-off.***

# Appendix R Ordinary least squares—statistical considerations

In this appendix the following issues will be discussed: complications arising from multicollinearity, heteroscedasticity, autocorrelation and cross-sectional dependence as well as the distribution of the residuals, when estimating M.1 to M.5 using an OLS approach.

## Multicollinearity

Multicollinearity means that two or more of the explanatory variables are linearly correlated. If this correlation is strong it becomes difficult to separate the relative influence on the dependent variable of the different collinear variables. A possible consequence is that regression coefficients show values that depart largely from population values (even show the wrong sign) and/or are insignificant even when the combined explanatory power is high. A number of tests have been performed to establish the extent to which the regression coefficients might be affected by collinearity between the variables. The Pearson correlations between the explanatory variables in the pooled samples have been calculated and are presented in table A.16.

**Table A.16 The Pearson correlation between the explanatory variables in the pooled full samples.**

**Panel A: Level model**

| M.2 | $PMB_j$ | $N$ |
|---|---|---|
| $E_t\left[RR_{j,t+1}\right]$ | 0.03 | 2,745 |

**Panel B: Change models**

| | *1-year* | | *2-year* | | *5-year* | | *10-year* | |
|---|---|---|---|---|---|---|---|---|
| M.4 & M.5 | $\frac{\Delta RI}{P}$ | $\frac{\Delta b \cdot PMB}{P}$ | $\frac{\Delta RI}{P}$ | $\frac{\Delta b \cdot PMB}{P}$ | $\frac{\Delta RI}{P}$ | $\frac{\Delta b \cdot PMB}{P}$ | $\frac{\Delta RI}{P}$ | $\frac{\Delta b \cdot PMB}{P}$ |
| $\frac{\Delta b}{P}$ | −0.20 | 0.94 | 0.03 | 0.91 | 0.20 | 0.85 | 0.41 | 0.83 |
| $\frac{\Delta RI}{P}$ | | −0.20 | | 0.01 | | 0.14 | | 0.32 |

$$\frac{\Delta b}{P} = \frac{b_{j,t+k} - b_{j,t}}{P_{j,t}} \quad ; \quad \frac{\Delta RI}{P} = \frac{E\left[RI_{j,t+k+1}\right] - E\left[RI_{j,t+1}\right]}{P_{j,t}} \quad ; \quad \frac{\Delta b \cdot PMB}{P} = \frac{\left(b_{j,t+k} - b_{j,t}\right) \cdot PMB_j}{P_{j,t}}$$

Edlund (1995) states that a correlation between two explanatory variables in excess of 0.8 (absolute value) is a sufficient but not necessary condition for the presence of collinearity (correlation exceeding 0.5 between several variables may also be an indicator of multicollinearity). According to these criteria, it appears that collinearity should not cause any general problems for the level specification. Neither does the correlation between the change in book value of equity and the change in residual earnings variable of the change regression M.4 seem to be alarmingly high for any of the window lengths. However, the correlation between change in book value of equity variable and the change in book value of equity times the estimated *PMB* variable is (perhaps not surprisingly) strong. This unfortunately makes the interpretation of the regression coefficients of specification M.5 suspect. To avoid the problems of multicollinearity of regression specification M.5, without excluding the effect of different *PMB*s, the following regression model has been specified. Here, the measurement bias has been incorporated into the value creation variable. The slope coefficient $\hat{c}_1'$ in M.5′ is expected to equal 1.0, given valid estimates of the measurement bias.[5]

M.5′
$$\frac{M_{j,t+k} - M_{j,t}}{M_{j,t}} = a + c_1' \cdot \frac{\left(B_{j,t+k} - B_{j,t}\right) \cdot \left(1 + PMB_j\right)}{M_{j,t}} + $$
$$+ c_2 \cdot \frac{\left[E_{t+k}\left(R\tilde{I}_{j,t+k+1}\right) - E_t\left(R\tilde{I}_{j,t+1}\right)\right]}{M_{j,t}} + +\tilde{\varepsilon}_{j,t+k}$$

When running the actual regressions, the collinearity diagnostic, known as the condition index has further been evaluated for several sub-samples. According to Edlund (1995, p. 80), a condition index between 10 and 30 indicates collinearity growing from mild to strong. A condition index exceeding 30 indicates severe collinearity. With the exception of specification M.5, no alarmingly high condition indexes have been observed.

5 The correlation between the explanatory variables of M.5′ is very similar to the variables of M.4.

## Heteroscedasticity

An assumption of the classical linear regression model is that the disturbance terms appearing in the regression function are homoscedastic, that is, that they all have the same variance independent of the value of the explanatory variables. If this is not the case, the ordinary $t$- and $F$-test of the regression will not be valid. A common approach in the MBAR literature has been to check for the presence of heteroscedasticity using the general test proposed by White (1980). When heteroscedasticity cannot be rejected, it has been common to use the heteroscedasticity-consistent standard errors suggested by White (1980) when calculating $t$-statistics. In a methodological article evaluating the pros and cons of return and price models, Kothari and Zimmerman (1995) note that price models more frequently reject tests of homoscedasticity than return models.[6] They further note that this problem is most severe for undeflated price models. In the present study, price has been deflated by book value of equity, and therefore the most important source of heteroscedasticity should have been eliminated.

Utilizing the test proposed by White (1980), homoscedasticity cannot be rejected for either the level or the change specification for the full pooled sample. Unadjusted $t$-statistics will therefore generally be used as a descriptive metric. However, $t$-statistics utilizing White's heteroscedasticity-consistent standard errors have also been calculated for a large number of the regressions presented in the next two chapters.

## Autocorrelation and cross-sectional dependence

> *"The term autocorrelation may be defined as correlation between members of observations ordered in time [as in time-series data] or space [as in cross-sectional data]."*
>
> Gujarati (1988, pp. 353)

In the presence of autocorrelation or cross-sectional dependence between the error terms, an *OLS* regression can still provide unbiased coefficient estimates, but the cross-sectional dependence in the data may generate an underestimation of the standard errors of the regression coefficients. This in

6 This was further predicted to be the case by Christie (1987).

turn implies that the standard norm for judging the significance of *t*-values is violated.[7] Bernard (1989) notes:

> *"In tests involving slope coefficients in cross-sectional regressions (e.g., most valuation/information content studies), the degree of bias is difficult to predict, but it is more likely to be serious when long return intervals (monthly, quarterly, or annual) are used. Unfortunately, these happen to be the contexts where it is most difficult to deal with the issue. ... in some cases the researcher may have no choice but to add a note of caution when drawing conclusions."*
>
> Bernard (1989, p. 104)

In this study, regressions are mainly run in cross-section, but also in pooled cross-section and time-series. Autocorrelation resulting from the way observations are ordered in time should not cause severe problems in this study. However, cross-correlation in space may result from consequences of, for example, fluctuations in the business cycle, inflation rate changes, and changed accounting practice. Problems related to these issues have been tackled in two ways in this study: i) inferences are largely made from the mean of estimated coefficients across all years, ii) a number of regressions that explicitly attempt to control for a potential source of cross-correlation are evaluated. Nevertheless, 100 percent precise judgments of statistical significance are difficult to generate from the regression specifications suggested in this study. As a consequence, estimated *t*-statistics have to be viewed mainly as descriptive statistics.

## The probability distribution of the residuals

An assumption of normally distributed error terms is not needed to obtain best linear unbiased estimators (BLUE) of the regression coefficients.[8] However, to enable inferences to be drawn regarding the true level of the coefficients, knowledge of the probability distribution of the error terms is essential.

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7 See Bernard (1987).

8 See Gujarati (1988, p. 88) and Edlund (1995, p. 126).

For the full pooled sample, a hypothesis of normally distributed error terms can be rejected. This appears to be driven mainly by the presence of too many extreme observations (too many large and too few small market-to-book value premium observations in the level specification). As these extreme observations may have an undue influence on the regression results, the regressions will also be run excluding the extreme observations.

## Interpreting the $R^2$ and testing for significant differences

The explanatory power ($R^2$) or adjusted explanatory power ($\bar{R}^2$) of the regressions in this study are of interest in several dimensions. First, it is a general indication of how much of the variation in the market-to-book value premium (in the level specifications) can be explained by expected residual return (M.1) and subsequently by adding the *PMB* variable (M.2). Similarly, the level of explanatory power is interesting as an indicator of the extent to which the value change observed on the stock market can be explained by accounting measures (M.3 to M.5). Whether or not the adjusted $R^2$ increases when an additional explanatory variable is included in a regression is an indication of the marginal explanatory power of the added variable.

The relative explanatory power for different sub-groups of firms (grouped, e.g. according to a firm-specific characteristic or the choice of particular accounting method) is also of interest. However, the interpretation of different levels of $R^2$ for different sub-samples of firms or periods is not uncomplicated. Can the change in $R^2$ really be attributed to the specific treatment? Is the change significant?

Based on the properties of $R^2$ observed by Cramer (1987), Harris, Lang and Möller (1994) constructed a variable to test for differences in $R^2$ between two different sub-samples. A $Z$-statistic that is approximately standard normal in large samples was computed as follows:[9]

$$\frac{R_1^2 - R_2^2}{\sqrt{\sigma_1^2 \cdot R_1^2 + \sigma_2^2 \cdot R_2^2}}$$

9 See Harris, Lang and Möller (1994) p. 198.

The estimated level of variance ($\sigma^2$) depending on the sample size, the number of regression coefficients and the underlying true association generated via simulation in Cramer (1987) was used. After having derived the expected mean and standard deviation of $R^2$, Cramer concluded:

> *"The mean of $R^2$ converges to its probability limit from above, and in this sense it has an upward bias which can be substantial in small samples. In this respect $\bar{R}^2$ is superior. The standard errors show, however, that for sample sizes of up to 40 or 50 either measure is a very unreliable statistic."*
>
> Cramer (1987, p. 253)

Using the indicator suggested by Harris, Lang and Möller (1994) and the variance estimations from Cramer (ibid.)[10] calculations can be made that show that to obtain a *Z*-statistic in excess of, for example, 2.00[11] the relative absolute difference between two estimated $R^2$s must at least amount to approximately 20% for sample sizes of 20 observations, to 15% for sample sizes of 50 observations, to 10% for sample sizes of 100 observations, and to approximately 7% for sample sizes of 200 observations. (See table below for more details.)

**Table A.17 The necessary difference in $R^2$ in order to obtain a $Z$-score=2.00 for different sample sizes and different levels of $\hat{R}_1^2$, given the calculated standard deviations in Cramer (1987, table 1) and a regression with two explanatory variables.**

| | $\hat{R}_1^2 = 66.7\%$ | $\hat{R}_1^2 = 50.0\%$ | $\hat{R}_1^2 = 33.3\%$ |
|---|---|---|---|
| $n$ | $\hat{R}_1^2 - \hat{R}_2^2 \rightarrow Z = 2.00$ | $\hat{R}_1^2 - \hat{R}_2^2 \rightarrow Z = 2.00$ | $\hat{R}_1^2 - \hat{R}_2^2 \rightarrow Z = 2.00$ |
| 20 | 20.8% | 23.8% | 20.9% |
| 30 | 17.2% | 19.9% | 17.8% |
| 40 | 15.2% | 17.4% | 15.7% |
| 50 | 13.6% | 15.8% | 14.3% |
| 100 | 9.8% | 11.5% | 10.5% |
| 150 | 8.1% | 9.5% | 8.7% |
| 200 | 6.3% | 7.5% | 6.8% |

10 The variance of $R^2$ decreases most notably as the sample size increases.

11 Implying approximately a 5 percent significance level for a two-tailed test.

The actual observed $R^2$ differences in the Chapters 7 and 8 can be evaluated with these estimated values in mind. However, given the sensitivity of $R^2$ to, for example, the presence of outliers, these calculations of necessary $R^2$ differences should only be viewed as crude indications of the minimum necessary difference.

# Appendix S M.2 regressions results

**Table A.18 Summarized pooled M.2 regressions excluding all observations when the dependent variable (the market-to-book value premium) exceeds 4.**

| Sample characteristics | $\hat{\alpha}$ | | $\hat{\beta}_1$ | | $\hat{\beta}_2$ | | $\overline{R}^2$ | $n$ |
|---|---|---|---|---|---|---|---|---|
| Full sample | 0.39 | (9.9)** | 4.07 | (17.6)** | 0.58 | (8.1)** | 14.8% | 2 650 |
| Profit rec. = Continuous | 0.36 | (8.1)** | 4.98 | (15.8)** | 0.42 | (5.4)** | 22.6% | 1 666 |
| Profit rec. = Discrete | 0.03 | (0.4) | 3.49 | (9.6)** | 1.73 | (10.1)** | 14.0% | 984 |
| *ROE* hist. = Stable | 0.39 | (6.5)** | 6.11 | (9.0)** | 0.59 | (6.1)** | 12.7% | 974 |
| *ROE* hist. = Intermediate | 0.36 | (4.3)** | 4.91 | (10.0)** | 0.64 | (4.3)** | 18.2% | 664 |
| *ROE* hist. = Turbulent | 0.63 | (5.4)** | 3.05 | (9.0)** | –0.01 | (–0.1) | 16.9% | 527 |
| Profit rec. = Continuous & | | | | | | | | |
| *ROE* hist. = Stable | 0.38 | (5.7)** | 10.36 | (13.7)** | 0.45 | (4.8)** | 33.1% | 611 |
| *ROE* hist. = Intermediate | 0.30 | (3.3)** | 6.49 | (11.1)** | 0.66 | (4.0)** | 31.1% | 416 |
| *ROE* hist. = Turbulent | 0.89 | (6.0)** | 2.89 | (6.6)** | –0.71 | (–2.5) | 16.9% | 331 |
| E[*GPF*] = Low | 0.40 | (2.4)* | 2.55 | (5.0)** | 0.29 | (0.9) | 8.3% | 351 |
| E[*GPF*] = Medium | 0.39 | (9.7)** | 5.07 | (14.4)** | 0.58 | (8.1)** | 13.0% | 2 170 |
| E[*GPF*] = High | 0.21 | (1.0) | 5.77 | (3.6)** | 1.01 | (2.5)** | 13.7% | 129 |
| Homogenized sample | 0.31 | (5.6)** | 7.94 | (13.2)** | 0.49 | (5.9)** | 26.2% | 924 |

*t*-statistics (with White (1980) homoscedasticity-consistent standard errors) in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

# Appendix T Earnings expectations from a business magazine for a small group of companies

Affärsvärlden's earnings forecasts are not found in any accessible database, and therefore manual extraction from the actual magazines is required. A small group of 16 continuous profit recognition firms that have been listed for the whole period studied was selected.[12] These 16 firms are larger than the average firm in the study and belong to six different industries.[13]

Market value is measured at the end of March every year. To be consistent, this should also be the date for the measurement of earnings expectations. From early 1992 and onwards, this causes no problems as Affärsvärlden has since then published forecasts of earnings per share two years ahead. Before 1992 (with only a one-year ahead estimate), Affärsvärlden had generally not updated its forecast for the following year at the end of March. Instead the earliest possible published forecast of next period earnings per share has been chosen.[14]

In order to translate the earnings per share prediction into a return on equity prediction, the earnings per share forecast has been multiplied by the number of shares outstanding and divided by the book value of equity according to the definition generally used in this study (see Section 4.2.1.3). This *ROE* prediction has then been transformed into a residual return prediction using the same firm and time specific $\rho$ and $\gamma$ as before (see Section 4.4.3, equation 2:35).

Table A.19 shows the annual results of M.2 regressions for this small sample of firms. Panel A shows the results when the standard prediction approach, based on historical *ROE*, has been utilized; panel B presents the results generated when the earnings forecasts from Affärsvärlden is utilized.

12 These 16 firms are: AGA, Astra, Atlas Copco, Eldon, Electrolux, Ericsson, ESAB, Euroc, Garphyttan, MoDo, Sandvik, SCA, SKF, Stora, Sydkraft, and Volvo. An important caveat is, of course, that the small sample size also makes the annual regressions especially sensitive to individual extreme observations.

13 9 engineering firms, 3 paper & pulp firms, 1 firm from pharmaceuticals, chemicals, other production and capital-intensive service, respectively.

14 For some firms with late publication of the annual report this means mid May, but for most of the firms it means sometime during April.

**Table A.19 Annual regression results using regression specification M.2.**

**Panel A: E[*ROE*] based on previous year's performance**

| YEAR | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1984 | −0.40 (−1.9) | 3.56 (2.0)* | 0.94 (3.7)** | 52.1% | 16 |
| 1985 | −0.28 (−1.3) | 5.02 (2.5)* | 1.35 (4.9)** | 68.4% | 16 |
| 1986 | −0.43 (−1.1) | 6.02 (1.2) | 2.15 (5.1)** | 69.5% | 16 |
| 1987 | −0.08 (−0.3) | 8.30 (1.9)* | 1.45 (3.9)** | 57.6% | 16 |
| 1988 | 0.24 (0.8) | 5.85 (2.2)* | 1.58 (4.3)** | 56.4% | 16 |
| 1989 | −0.82 (−1.9) | 4.21 (0.7) | 2.95 (5.8)** | 68.9% | 16 |
| 1990 | −1.01 (−2.6)** | 8.15 (2.4)* | 3.14 (7.4)** | 88.3% | 16 |
| 1991 | −1.09 (−1.6) | 4.26 (1.2) | 3.15 (4.9)** | 83.1% | 16 |
| 1992 | −0.37 (−0.6) | 5.81 (1.9)* | 2.25 (3.7)** | 77.2% | 16 |
| 1993 | 0.28 (0.3) | 4.52 (1.7) | 1.36 (2.3)** | 63.7% | 16 |
| **Mean** | **−0.40** | **5.58** | **2.03** | **68.5%** | **16** |
| **Pooled** | −0.43 (−3.4)** | 4.90 (5.2)** | 2.06 (13.7)** | 65.3% | 160 |

**Panel B: E[*ROE*] based on forecasts published in Affärsvärlden**

| YEAR | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\bar{R}^2$ | $n$ |
|---|---|---|---|---|---|
| 1984 | −0.03 (−0.2) | 6.61 (3.3)** | 0.82 (3.7)** | 65.7% | 16 |
| 1985 | 0.07 (0.3) | 6.52 (3.1)** | 1.29 (5.0)** | 72.8% | 16 |
| 1986 | 0.41 (1.1) | 16.04 (3.8)** | 1.85 (6.0)** | 84.1% | 16 |
| 1987 | 0.28 (0.8) | 10.58 (2.3)* | 1.48 (4.3)** | 62.2% | 16 |
| 1988 | 0.50 (1.7) | 9.82 (2.6)* | 1.50 (4.3)** | 60.6% | 16 |
| 1989 | −0.16 (−0.5) | 13.82 (4.7)** | 2.52 (7.7)** | 88.0% | 16 |
| 1990 | −0.46 (−1.2) | 10.98 (3.8)** | 2.61 (6.3)** | 91.9% | 16 |
| 1991 | −0.39 (−0.9) | 8.42 (3.8)** | 2.59 (6.0)** | 91.1% | 16 |
| 1992 | −0.14 (−0.3) | 7.54 (2.8)** | 2.01 (3.7)** | 81.8% | 16 |
| 1993 | 0.45 (1.2) | 8.36 (3.3)** | 1.03 (2.3)* | 75.9% | 16 |
| **Mean** | **0.05** | **9.87** | **1.77** | **77.4%** | **16** |
| **Pooled** | 0.06 (0.5) | 9.55 (10.7)** | 1.75 (13.6)** | 76.4% | 160 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \le \alpha \le 0.05$

** Significant at $\alpha \le 0.01$

Figure A.5 and A.6 visualize the difference between the $\bar{R}^2$ and the estimated $\hat{\beta}_1$ - coefficient with the two different return on equity prediction procedures.

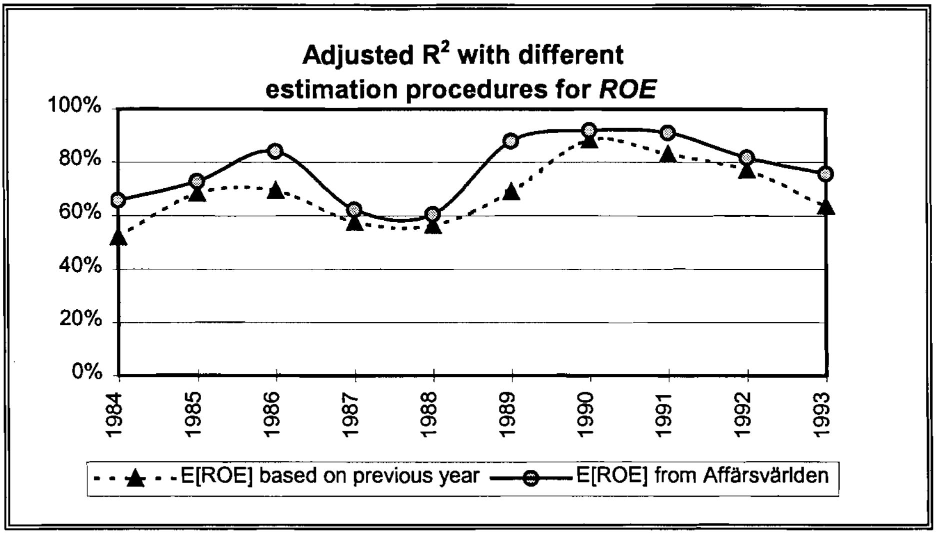


*Figure A.5* ***The $\bar{R}^2$ for the annual M.2 regressions for a 16-company sample using two estimation procedures for next period's ROE.***

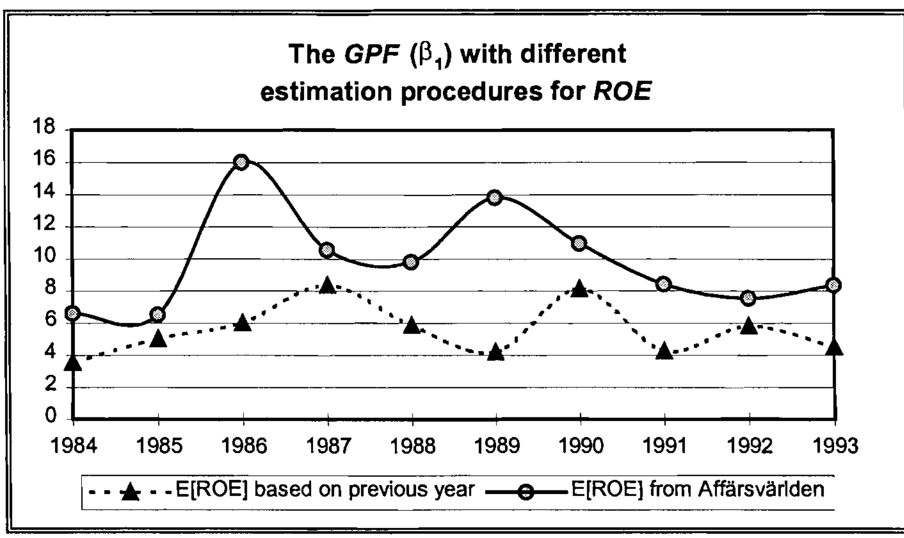


*Figure A.6* ***The estimated annual growth persistence factor ($\hat{\beta}_1$) for annual M.2 regressions for a 16-company sample using two estimation procedures for next period's ROE.***

It is striking that the prediction procedure used by the business magazine clearly dominates the more mechanical historical performance-based prediction approach, both in terms of consistently higher explanatory power and in terms of a higher frequency of significant *GPF* coefficients. It is notable, however, that both specifications yield high explanatory power for this sample of firms during the period studied (a mean of 68.5% vs. 77.4%), and that the difference in explanatory power is rather small and quite constant over time.

Another notable result concerns the level of the estimated $\hat{\beta}_1$ coefficients. Relying on Affärsvärlden's earnings forecasts, the $\hat{\beta}_1$ coefficients are higher every single year and on average almost 10 (as compared to 5.6 when the main earnings prediction procedure is used). Given the economic interpretation of this coefficient, a value of 10 indicates that the market expects a highly persistent abnormal performance from this group of companies. The small sample size makes it difficult to assess if the different variability in the slope coefficients over time is the result of individual extreme observations or if it is related to a more fundamental underlying cause.

These results indicate that Affärsvärlden's earnings forecasts constitute a better description of the earnings expectations on the stock market than the simple estimation procedure utilized in main part of this study. However, it is encouraging to observe in figure A.5 the close covariability over the years between the level of explanatory power. This indicates that the two return on equity prediction procedures seem to capture essentially the same phenomena. The mechanical historic performance method, however, seems to be somewhat more 'noisy'.

In order to evaluate if the varying explanatory power of M.2 (observed in Section 7.3.1) with regard to the phases of the business cycle remains when Affärsvärlden's earnings forecasts are used figure A.7 is provided.

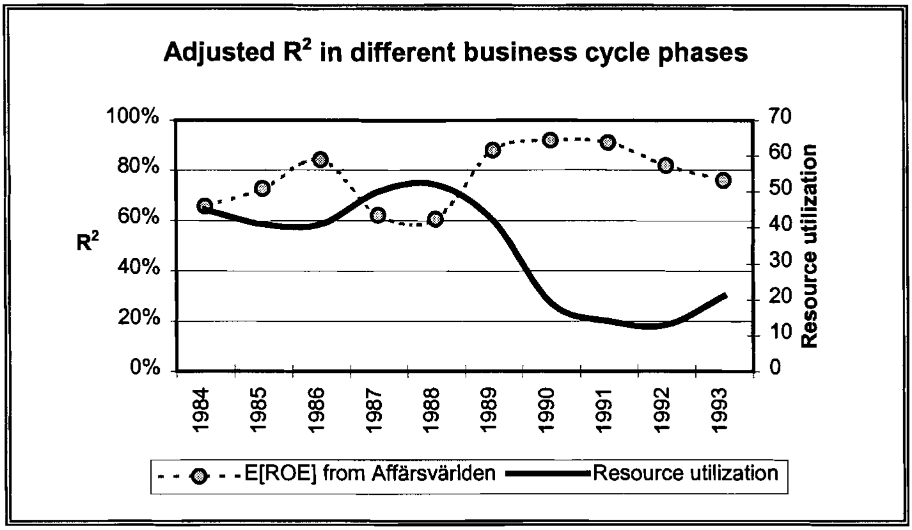


***Figure A.7*** ***The adjusted explanatory power ($\overline{R}^2$) for each annual estimation of M.2 for the 16-company sample using ROE forecasts from Affärsvärlden, combined with an index of the Swedish industrial resource utilization.***

The figure clearly shows that the negative association between the explanatory power of M.2 and the phase of the business climate remains when Affärsvärlden's earnings forecasts are used. The adjusted $R^2$ is apparently lower during and around the boom periods of the economy, and higher during and around a recession.

# Appendix U Accounting for depreciation

**Table A.20 Accounting for depreciation: Pooled regression results using regression specification M.2 and the homogenized sub-sample of firm-years starting from the nine industries with firms where most depreciable assets are held.**

**Panel A: 1967-80**

| 1967-80 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\overline{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.22 (−6.0)** | 5.18 (12.2)** | 0.45 (9.3)** | 36.4% | 409 |
| Non-disclosure | −0.11 (−1.0) | 5.41 (6.7)** | 0.40 (1.9)* | 23.1% | 153 |
| Open Disclosure | −0.46(-10.7)** | 3.39 (7.0)** | 0.56 (13.9)** | 62.5% | 164 |

**Panel B: 1971-78**

| 1971-78 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\overline{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.18 (−3.9)** | 5.17 (9.1)** | 0.44 (6.9)** | 31.4% | 275 |
| Non-disclosure | −0.02 (−0.2) | 5.26 (5.2)** | 0.29 (1.1) | 18.7% | 110 |
| Open Disclosure | −0.45 (−7.8)** | 3.31 (4.7)** | 0.54 (10.5)** | 60.4% | 94 |

**Panel C: 1975-76**

| 1975-76 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\overline{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.06 (−0.7) | 5.19 (4.9)** | 0.31 (2.8)** | 31.3% | 65 |
| Non-disclosure | 0.07 (0.3) | 5.19 (2.8)** | 0.32 (0.7) | 19.7% | 25 |
| Open Disclosure | −0.41 (−3.0)** | 2.94 (1.8)* | 0.48 (4.9)** | 62.9% | 21 |

**Panel D: 1970-74**

| 1970-74 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\overline{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.20 (−3.2)** | 4.98 (6.3)** | 0.43 (4.9)** | 24.1% | 182 |
| Non-disclosure | −0.13 (−0.8) | 5.77 (5.0)** | 0.40 (1.3) | 20.6% | 96 |
| Open Disclosure | −0.37 (−3.8)** | 2.92 (2.3)* | 0.45 (4.4)** | 39.7% | 30 |

**Panel E: 1975-78**

| 1975-78 | $\hat{\alpha}$ | $\hat{\beta}_1$ | $\hat{\beta}_2$ | $\overline{R}^2$ | $n$ |
|---|---|---|---|---|---|
| All firms | −0.17 (−2.7)** | 5.55 (7.6)** | 0.44 (5.8)** | 43.3% | 124 |
| Non-disclosure | 0.15 (0.7) | 4.93 (3.3)** | 0.14 (0.4) | 22.6% | 32 |
| Open Disclosure | −0.49 (−5.9)** | 3.21 (3.2)** | 0.58 (9.4)** | 65.1% | 66 |

*t*-statistics in parenthesis, a two-sided test is used for intercepts and a one-sided test for the slope coefficients.

* Significant at $0.01 \leq \alpha \leq 0.05$

** Significant at $\alpha \leq 0.01$

# Appendix V Accounting for associated companies

The mean value of the dependent and the independent variables with the data grouped according to different accounting methods for associated companies.

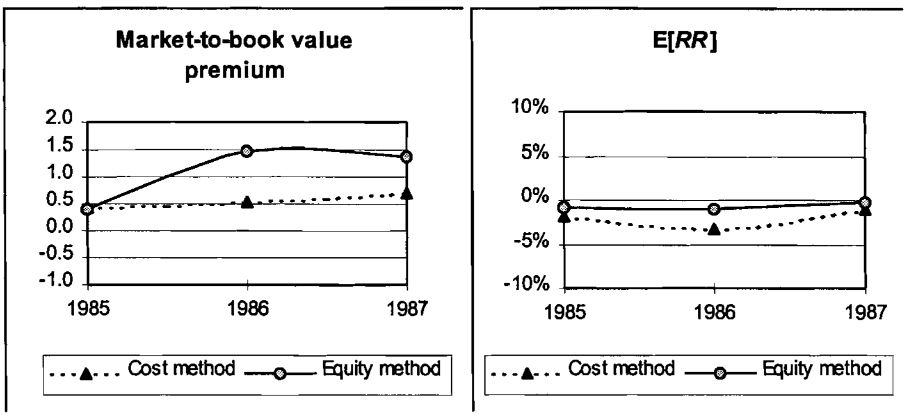


*Figure A.8 The mean market-to-book value premium and the mean E[RR] for the companies using the cost method versus companies using the equity method.*

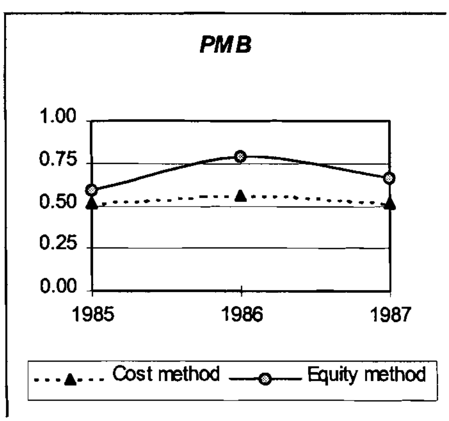


*Figure A.9 The mean PMB for the companies using the cost method versus companies using the equity method.*

# SYMBOLS AND ABBREVIATIONS

The symbols and abbreviations for different variables, parameters and indexes used in this study fall into four categories:

A. Symbols used when specifying the valuation model (chapter 2)
B. Symbols used in the regression specifications (chapter 2, 6, 7 and 8)
C. Symbols used for accounting measurement bias calculations (chapter 3)
D. Other abbreviations

The list below contains short descriptions of each symbol, grouped according to these four categories. Note that additional symbols have been used in restricted sections of this study, and are only described in these sections.

**A. Symbols used in specifying the valuation model**

| | | |
|---|---|---|
| $a$ | = | Superscript for abnormal performance |
| $B$ | = | Book value of equity |
| $b$ | = | Book value of equity per share |
| $(b)$ | = | Superscript for biased accounting |
| $(u)$ | = | Superscript for unbiased accounting |
| $\beta$ | = | A risk parameter |
| $D$ | = | Dividends |
| $E_t(..)$ | = | Expectations at the end of time $t$ |
| ~ | = | Denotes a stochastic variable |
| $\varepsilon$ | = | An unpredictable disturbance term |
| $g$ | = | Growth rate |
| $G$ | = | 1 plus the growth rate |
| $\gamma$ | = | Annual return measurement bias |
| $\lambda$ | = | A fading factor of abnormal return |
| $GPF$ | = | Equity Growth earnings Persistence Factor |
| $j$ | = | Subscript for firm |
| $M$ | = | Market value |

| | | |
|---|---|---|
| $p$ | = | Market value per share |
| $m$ | = | A time index |
| $N$ | = | New issues |
| $NT$ | = | Net transactions to owners |
| $PMB$ | = | Permanent measurement bias |
| $r$ | = | Risk-free rate of interest |
| $\rho$ | = | Cost of equity capital including a risk premium |
| $RI$ | = | Residual income |
| $ROE$ | = | Return on owners' equity |
| $rp$ | = | Risk premium |
| $RR$ | = | Residual return |
| $s$ | = | A time index |
| $t$ | = | Subscript for time; when related to a flow variable, such as return on equity, describes a time period ($t$-1, $t$), when related to a stock variable, such as price or book value of equity, $t$ refers to the end of the time period. |
| $T$ | = | A number of periods into the future |
| $\tau$ | = | A time index |
| $V$ | = | Economic value |
| $x$ | = | Earnings |

## B. Symbols used in the regression specifications

| | | |
|---|---|---|
| $\hat{\alpha}$ | = | Estimated intercept in the level models (M.1 and M.2) |
| $\hat{\beta}_1$ | = | Estimated slope coefficient for $E[RR]$ |
| $\hat{\beta}_2$ | = | Estimated slope coefficient for the *PMB* |
| $\hat{a}$ | = | Estimated intercept in the change models (M.3 to M.5) |
| $\hat{c}_1$ | = | Estimated slope coefficient for change in book value of equity |
| $\hat{c}_2$ | = | Estimated slope coefficient for change in $E[RI]$ |
| $\hat{c}_3$ | = | Estimated slope coefficient for change in book value of equity times the *PMB* |
| $\hat{c}_1'$ | = | Estimated slope coefficient for change in book value of equity times (1 plus the *PMB*) in regression model M.5′ |

## C. Symbols used for accounting measurement bias calculations

| | | |
|---|---|---|
| $A$ | = | Asset |
| $acc[...]$ | = | The accumulated value of an asset type |
| $AP$ | = | Acquisition price |

| | | |
|---|---|---|
| $\Delta$ | = | Annual change |
| $\delta$ | = | Annual real growth rate in the level of expenditures |
| $DT$ | = | Deferred tax |
| $h$ | = | The number of years until an investment pays off |
| $I$ | = | Annual expenditures creating an intangible asset |
| $i$ | = | Annual value change |
| $I.A.$ | = | Superscript for intangible assets |
| $k$ | = | Subscript for asset type |
| $L$ | = | Liability |
| $n$ | = | The age of an asset (0 years to $N$ years) |
| $Off$ | = | Off-balance sheet item |
| $p$ | = | Number of periods until a tax liability is expected to be paid |
| $q$ | = | The annual percentage growth rate in number of acquired units |
| $r^*$ | = | A real discount rate |
| $r_{d,at}$ | = | Cost of debt after tax |
| $(r)$ | = | Superscript for reported value |
| $\tau$ | = | The tax rate |
| $T.A.$ | = | Superscript for tangible assets |
| $TA$ | = | Total assets |
| $UHG$ | = | Unrealized holding gain |
| $UR$ | = | Untaxed reserves |
| $\phi$ | = | Subscript for intangible asset type |
| $\eta$ | = | Subscript for type of off-balance sheet item |
| $\theta$ | = | Subscript for liability type |
| $\varphi$ | = | Subscript for type of deferred tax liability |

## D. Other abbreviations

| | | |
|---|---|---|
| ABL | = | Companies Act |
| BFL | = | Accounting Act |
| BFN | = | Accounting Board |
| CPI | = | Consumer Price Index |
| FAR | = | Swedish Institute of Authorized Public Accountants |
| NBK | = | Industry and Commerce Stock Exchange Committee |
| RR | = | the Swedish Financial Accounting Standards Council |
| SFF | = | Swedish Association for Financial Analysts |

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