

Budgetary planning

**A Summary of
two Previous Books**



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Jan Bergstrand

Budgetary planning

A Summary of
two Previous Books

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Preface

This report is a summary of two books originally published in Swedish, "Budgetuppställande - metoder, praktikfall och beskrivningsmodeller", 1973, and "Budgetuppställande - Bedömning av budgetsamband", 1974, together constituting my doctoral thesis. They were written during the course of a continuous research project. Both books deal with methods of budgetary planning. First, an empirical study of budgetary relationships was made and then the budgetary planning procedure was investigated. The latter study changed my views on the analysis of relationships to such an extent that it was thoroughly revised and the books were published in reverse order. I think this final order is logical.

My friends Peter Gavatin, Åke Magnusson and Lars Samuelson, members of the budget research team at the Stockholm School of Economics, contributed considerably to my understanding of the budgetary planning procedure. Professor Erik Ruist taught me the statistical methods necessary for the study of budgetary relationships. Professor Paulsson Frenckner taught me managerial economics and suggested topics and plans for both studies. My wife Margarethe provided moral support and secretarial assistance during the various strenuous phases of the work. I want to express my gratitude to them all and I know that remaining weaknesses are solely due to my own inability to put their wisdom on paper.

Stockholm in March, 1974

Jan Bergstrand

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Introduction

Considerable resources in modern organizations are devoted to budgetary planning. A study of how these resources are used today is summarized in the first part of this report. This study was originally published in Swedish (Bergstrand, J., 1973, Budgetuppställande - metoder, praktikfall och beskrivningsmodeller, Stockholm). It demonstrates that certain budgetary planning procedures are very laborious and might be facilitated by budgetary models. These models depend on formalized budgetary relationships. The second part contains a summary of an investigation of the methods that are available for developing formalized relationships (Bergstrand, J., 1974, Budgetuppställande II - bedömning av budgetsamband, Stockholm).

Actually the two parts are not consecutive, but interdependent. We cannot choose budgetary planning procedures without regard to the methods available for determining relationships. Also, we cannot decide what methods of formalization to use if we ignore the planning procedure in which they are to be included.

The two studies are summarized in turn below. The references given are those mentioned in the summary only. Readers who would like complete lists of references are referred to the original reports.

BUDGETARY PLANNING - Methods, Cases and Descriptive Models

1. Introduction

During the past two decades budgetary planning has been accorded increasing resources in many Swedish corporations. It has developed from a passive registration of payments into a tool of analysis of corporate action.

In most corporations budgetary planning is carried out according to practices developed through experience. Generally top management distributes assumptions to be used as a basis for the budgetary planning process. The process is often completed by a dialogue where the parties concerned discuss the contents of the budget.

In certain cases scientific literature on budgetary planning is quite advanced as compared to ruling practice (see e.g. Jennergren, 1971, or Weitzman, 1970). In the literature computerized models are often mentioned and a fair number of these are budget simulation models (Gavatin, 1974). In order for a computerized model to be useful in practice, a detailed description of budgetary coordination is required.

These circumstances motivated the author to study how budgetary planning can be organized and coordinated in different situations and in different companies. The study included corporate manuals, textbooks and research reports. The main effort, however, was directed towards personal contacts with people using budgets (budgeters) in a number of Swedish companies. The aim of the study was to develop general descriptive models of budgetary planning procedures.

The following definitions will be helpful in reading this report (see also Samuelson, 1973):

Budget refers to a program of activities for the company based on certain explicit assumptions and expressed in economic terms.

The employees of a company are divided into top management (F1), responsible for corporate activities at large, a budget officer (Bc), responsible for the budgetary planning process as such, and budgeters (B). The term budgeters refers to all employees in the company responsible for a specific part of the budget.

The budget itself can be broken down into parts according to functions. These parts are called functionary budgets. A functionary budget may, but need not, coincide with a department budget.

Functionary budgets and department budgets are all regarded as budget sections. Budget sections may be expressed in different economic variables. There are e.g. budget sections that show profit and other sections that show cash flow. All budget sections which pertain to the same economic variable can be consolidated into a main budget. The corporate budget consists of all the main budgets combined.

2. Activities Included in the Budgetary Procedure

To define the budgetary planning procedure in a company we must be able to denote what activities occur and who is responsible for them. In so doing, the procedure can be clarified and alternative procedures can be analyzed systematically.

In order to arrive at the descriptive models mentioned above, the author made a survey of the literature¹⁾ on budgetary planning. The survey indicated that ten types of activities could be regarded as essential building blocks of descriptive models. These types were ordered chronologically as follows:

1) Books included were e.g. those by Argyris, 1953, Crecine, 1969, Heckert & Willson, 1967, Heiser, 1959, Hofstede, 1967, Knight & Weinwurm, 1964, Madsen, 1963, Stedry, 1960, and Welsch, 1957.

- 0) introductory administrative activities
- 1) clarifying goals
- 2) clarifying basic assumptions
- 3) developing preliminary budget sections
- 4) participation in budget dialogue
- 5) developing a budgetary forecast
- 6) consolidating sections into a corporate budget
- 7) suggesting changes in preliminary budget sections
- 8) reworking the corporate budget
- 9) concluding administrative activities.

It is also important to know what kind of employee executes the above activities. When this is clarified, we can also provide a somewhat more detailed list of items belonging to the budgetary planning procedure. In the list below, the first number indicates the type of employee, the second the activity and the third identifies the individual items.

- a) Activities executed by top management
 - 111 developing goals
 - 112 considering tentative goals
 - 113 reworking goals
 - 121 developing basic assumption
 - 122 considering tentative assumptions
 - 123 reworking assumptions
 - 131 developing budgets
 - 132 considering tentative budget sections
 - 141 participating in budget dialogue
 - 151 considering budgetary forecast
 - 161 considering corporate budget
 - 171 developing changes in tentative budgets
 - 181 reworking tentative budget
 - 191 confirming budget sections and corporate budget

- b) Activities executed by budget officer
 - 201 giving starting time
 - 202 developing and distributing procedural instructions
 - 211 developing tentative goals

- 212 consolidating tentative goals
- 213 dividing tentative goals among the several departments
- 221 developing tentative assumptions
- 222 dividing tentative assumptions among the several departments
- 231 developing tentative budget
- 232 dividing tentative budget among budget sections
- 233 providing budgetary expertise
- 241 participating in budget dialogue
- 251 developing budgetary forecast
- 261 collecting and consolidating tentative budget sections
- 262 providing additional information for the examination of departmental budgets
- 263 introducing tentative corporate budget to top management
- 271 dividing suggested budgetary changes
- 281 reworking the corporate budget
- 291 distributing the budget after confirmation

- c) In addition to the above list, there are two items which may be executed by the budget officer. Occasionally, however, they are performed by specialists. These items include executing simple consistency tests in budget sections and developing suggestions for changes. We define a special employee, called a coordinator, whose main duty is to execute these activities.

Activities executed by the coordinator:

- 361 checking the consistency of specific items of developed budget sections
- 371 developing suggestions for changes

- d) Activities executed by budgeters

- 411 developing tentative goals
- 412 dividing tentative goals among subordinated departments
- 421 developing tentative basic assumptions
- 431 developing tentative budget section
- 432 developing details of budget section
- 433 considering feasibility of tentative budget section

- 441 participating in budget dialogue
- 481 reworking tentative budget section
- 491 distributing preliminary budgets to budget officer or coordinator
- 492 distributing budget section to budget officer.

3. A Theoretical Model

In the literature on budgetary planning, two extremes - called build-up and break-down budgeting - are considered (see Frenckner, 1953, or Madsen, 1970). Starting from these extremes, different models can be considered. Three such models are developed in this part of the study:

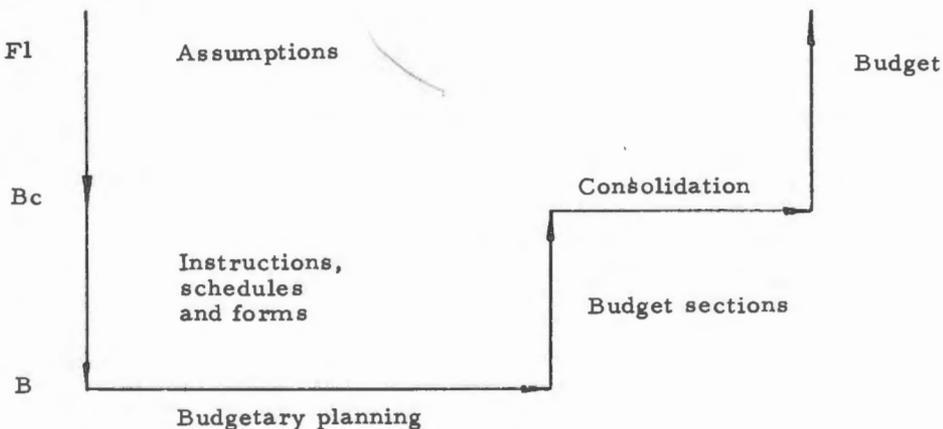
- a) a build-up model
- b) an intermediate model
- c) a break-down model

a) A Build-up Budgetary Planning Model

A build-up routine occurs if the assumptions and instructions provided by top management are so complete that no changes in tentative budget sections are expected to be required. This situation could arise, e. g. if the company is highly divisionalized and the divisions have very few resources and restrictions in common.

A possible routine of this type is outlined in Figure 1.

Figure 1



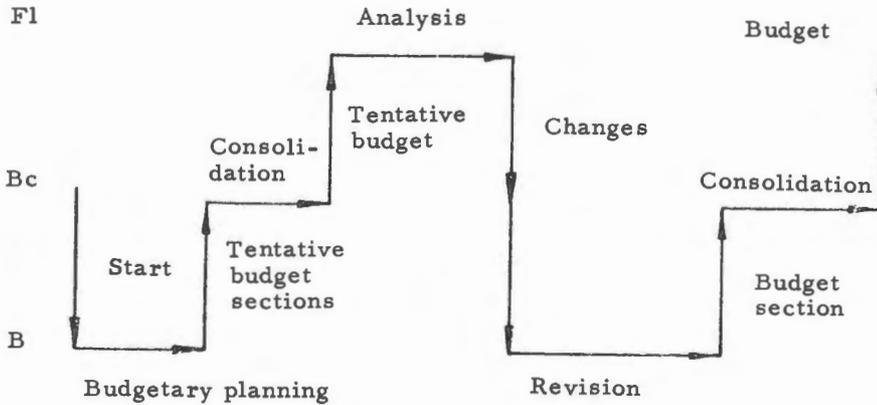
A situation corresponding to this model can occur in companies of all sizes. An interesting case, however, consists of large divisionalized companies. The divisions may be allowed to make their budgets more or less independently. Planning and coordination may be conducted along different lines within divisions.

The model of Figure 1 presupposes the following distribution of labor between employees in the organization:

- F1: Assumed to be informed about products and markets. Develops goals (item 111) and basic assumptions (121). Has the authority required to enforce goals and assumptions. Considers and confirms corporate budget (161, 191).
- Bc: Gives starting time (201). Develops and distributes procedural instructions (202). Supposed to be informed about local conditions. Distributes and explains information from top management to divisions and sections (213, 222). Provides budgeting experts when needed (233).
- B: Receive information on goals and assumptions. Develop tentative budget sections (431). Distribute tentative budget to Bc (491).

b) An Intermediary Solution

In certain cases top management wishes to participate more actively in budgetary planning than is possible according to the above model. This may be the case, for example, when budgeters submit tentative budget sections for consideration. Top management may accept these budgets or suggest changes. Then, the budgeters may rework the budgets before they are presented to top management again. Such reconsiderations may occur several times within one budgetary planning process. Figure 2 shows a model which assumes that all exchange of information occurs through commenting on and reworking tentative budgets. In order to limit the size of the figure, only one series of reconsiderations is illustrated.

Figure 2

In order for tentative budgets developed according to this model to be useful, budgeters must know certain basic assumptions. This knowledge may be obtained from a budget manual or through experience.

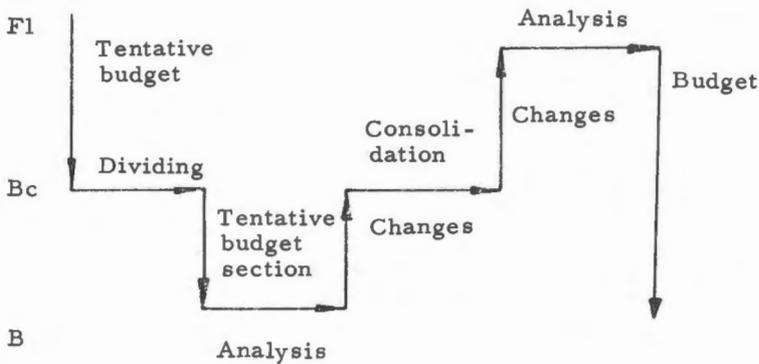
The model presupposes the following distribution of labor:

- Fl:** Does not need intricate information at the outset. Considers budget sections (161) and suggests changes (171). Considers and may confirm corporate budget.
- Bc:** Needs to be informed about divisionary conditions. Gives starting time (201). Collects and consolidates tentative budget sections (261). Distributes suggested budgetary changes to divisions (271).
- B:** Need to be informed about products, markets and strategy. Develop tentative budget sections (431). Rework tentative budget sections (481).

c) A Break-down Budgetary Planning Model

In the preceding models, the tentative budget sections were developed by the budgeters. It is also possible to conceive of a routine according to which top management develops tentative budgets. In this case the budget officer will have to break down the budget into sections to be turned over to budgeters for consideration. One possible design of such a model is illustrated in Figure 3.

Figure 3



The model presupposes the following distribution of labor:

- F1: Needs to have detailed information about corporate conditions at large. Develops tentative corporate budget (131). Reworks the budget after receiving suggested changes (181). Confirms corporate budget (191).
- Bc: Needs to have detailed information about company and divisions. Develops and distributes instructions (202). Divides tentative budget among budget sections (232). Collects and consolidates tentative budget sections and suggested changes (262). Presents tentative corporate budget to top management (263).
- B: Receive tentative budget section from budget officer. Develop details of budget section (432). Consider tentative budget section

- (433). Distribute preliminary budget section to budget officer (491).

According to this model, the budget officer has more duties than in the other models. He may also have greater power.

4. A Survey of Existing Methods

A survey of budgetary planning procedures in eleven large organizations was carried out. The organizations were selected because they were willing to participate in the study. There was no random choice process.

In certain companies far-reaching interviews were made in order to clarify the whole budgetary process. In other companies manuals and interviews with budgeting personnel were the main sources of information. These differences do not appear to have any important effects on the conclusions.

The following organizations were included in the survey:

AGA	(diversified industrial)
Alfa-Laval	(dairy equipment)
ASEA	(power equipment)
Astra	(pharmaceutics)
Domänverket	(forestry)
Göteborgs stad	(City of Gothenburg)
LKAB	(mining)
LM Ericsson	(telephones)
SAAB	(aviation)
Skandia	(insurance)
Vägförbättringar	(constructions)

The most important features of the budgetary process in each company were outlined, and a diagram was constructed, similar to the ones presented above.

Many of the items listed were excluded from the budgeting procedures of all the companies studied. This does not mean that they should be excluded from the check-list since we want to establish a generally applicable tool of analysis. Other items may be checked by other companies.

The check-list includes a large number of items (44). Each of them may be included in or excluded from the system of a certain company. Therefore, the analysis can differentiate between 2^{44} different systems of budgetary planning. But most of the systems are inconsistent and many others may be regarded as insignificant deviations from a few basic systems.

The order in which the companies were listed in Figure 4 was selected so that the differences could be perceived as clearly as possible. After an analysis of the differences, three major types of procedures may be discerned. These are:

- direct Methods
- iterative Methods and
- combined Methods.

5.2. Direct Methods

According to Figure 4 there are certain companies where the budgeters fulfill a fairly limited number of activities. Item no. 481, reworking tentative budget sections, is excluded from the routine schedule in Skandia, Göteborgs stad and Alfa-Laval. The structure of the budgetary process is more "direct" in these companies than in the others. The main course of work is performed only once, although in somewhat different ways in the various companies.

The budgetary planning procedures in these companies are quite similar to the model of Figure 1. But the basic model has no built-in controls that check the acceptability of the corporate budget. Therefore additions to the model may be necessary. In Göteborgs stad there is a detailed goal formulation procedure which sets certain

limits for the budget sections to be developed. In Vägförbättringar there is a budgetary dialogue between budgeters on different hierarchical levels. In Skandia and Alfa-Laval the budget officer makes a number of last-minute adjustments after consulting with the budgeters.

The strengths of this method are:

- the obvious similarity between tentative budgets and final budgets has a motivating effect on the budgeters;
- the direct approach saves resources.

Still, the precision of the corporate budget is doubtful and depends to a great extent on the various additions that most companies make to the basic direct method.

5.3. Iterative Methods

All companies except those mentioned in the preceding section may be said to use iterative methods. However, the iterative approach is more important in some companies than in others. In LKAB, ASEA, LM Ericsson and Saab Scania iterative budgeting is the main means of achieving a reasonable budget. Thus the term "iterative methods" is used to describe the budgetary procedures of these companies.

Iterative budgeting methods, as compared to the direct methods, may be expected to lead to greater precision. Top management and budgeters can evaluate the budget several times before it is definitely confirmed. In addition, iterative methods do not require the excessive attention of top management.

A weakness inherent in the iterative methods is that they may require a great deal of time and effort from budgeters in general. It is not easy to determine whether the increase in precision motivates the additional time and effort involved. There is also a psychological problem. The budgeters may have to revise their budget sections

several times. This may be a frustrating experience. But if the number of details can be reduced, or part of the work automatized, this weakness may be insignificant as compared to the gain in precision that can be obtained.

Budgetary models may possibly ease the burden of future revisions. However, the process of developing models is a difficult and expensive activity.

5.4. Combined Methods

Iterative routines sometimes occur in the budgetary procedures of AGA, Astra and Domänverket. But the most characteristic feature of the procedures of these three companies is the initial goal-setting discussion between top management and budgeters. This discussion is reflected by items 111 and 412 in Figure 4. These items give the budgetary planning procedure a certain break-down appearance. But later on the work turns into a build-up process. In order to distinguish this combination of break-down and build-up budgeting from the other methods, we denote this routine combined methods.

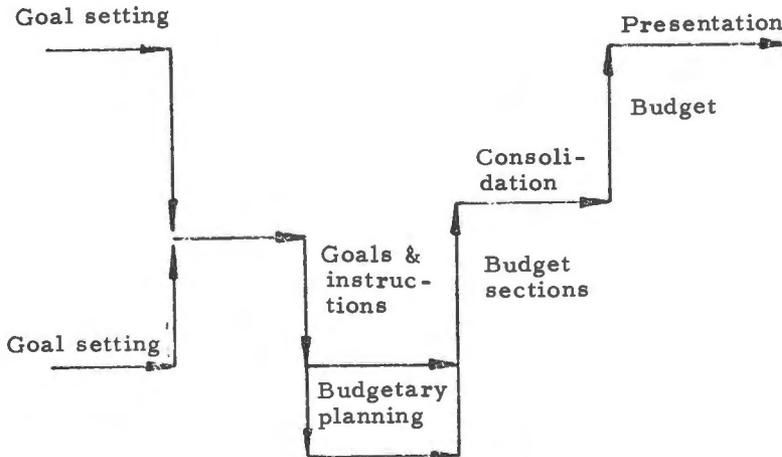
Figure 3 is not very well-suited for describing this approach. It is too break-down oriented. Instead, we should outline a method similar to the procedures of AGA and Astra. This method can be described as follows.

Tentative goals are formulated by top management and budgeters (111, 411). The goals are conveyed to the budget officer. He works out instructions and distributes them and the goal information to all budgeters (202). Further details are added to the goals after general discussions among the budgeters (412). This is followed by an ordinary build-up procedure, characterized by items 191, 261, 263 and 431. The model is shown in Figure 5.

The characteristic feature of the combined methods is the initial procedure of goal setting. This procedure goes a long way towards eliminating the need for iterations, and the precision of the corporate

budget may be considerably better than that which can be achieved by direct methods. A fair share of the workload occurs at an early stage in the process. This procedure results in effective control of the budgetary planning process and limits inputs of resources.

Figure 5



Top management has to devote a considerable amount of time to the goal-setting procedure. The managers are also required to have detailed knowledge about their company and its future possibilities. Much of this knowledge depends on vertical lines of information throughout the corporate hierarchy.

6. Conclusion

On the basis of the analysis presented above, existing budgetary planning procedures can be assigned to the following groups.

1. Direct methods
 - build-up methods
 - break-down methods

2. Iterative methods
 - goal iterations
 - budget iterations

3. Combined methods
 - break-down of goals
 - break-down of budgets
 - iterative combined approach

The author is of the opinion that different methods should be used in different companies. Direct methods save time and effort. Iterative methods waste budgeters' time but may be automatized in the future. Combined methods save resources, with the exception of top management time.

Many Swedish companies appear to be in the process of changing their budgeting procedures from direct methods into iterative or combinative methods. More resources are being allotted to achieving more satisfactory budgets. An interesting subject for future research is the study of whether the gains from improved precision really offset the resources required.

BUDGETARY PLANNING II -

The Formulation of Budgetary Relationships

1. Introduction

During the process of budgetary planning in an organization, budgeters make decisions as to the future values of decision variables. Decision variables interact with other kinds of variables to produce the consequences of decisions made. This interaction is described by budgetary relationships.

Certain budgetary relationships (e. g. $\text{income} = \text{price} \times \text{volume}$) are regarded as given by logic or common sense. But other relationships are complex (e. g. volume equals a function of price, but what function?). The budgeters also have to understand complex relationships in order to make correct decisions. Nowadays these relationships are known only intuitively, and intuitive knowledge is difficult to communicate. It is also difficult to use this kind of knowledge in automatic budgetary planning systems.

Given the above circumstances, the object of this study is to inquire into the possibilities of using statistical methods in order to formulate quantitative budgetary relationships. In certain cases this will require quantifying intuitive information. It will also require methods for revising already quantified relationships with respect to empirical information received after an introductory analysis.

2. Alternative Ways of Quantifying Relationships

The literature in this field covers demand functions and cost-volume relationships. Both subjects are generally treated on a macroeconomic level, which is much too abstract to be useful in budgetary planning. Still, certain findings from cost-volume analysis can be used.

Cost-volume relationships can be analyzed from the point of view of

- bookkeeping,
- engineering and
- statistics.

However, the first two approaches necessarily involve an undefined element of subjectivity. By means of the statistical approach, all methods can be clearly defined and many calculations automatized. This line of reasoning motivates further inquiry into statistical analysis.

3. Estimation of Averages

In some cases relationships are so simple that they can be replaced by point estimates. Or they can be so complex that no other means of analysis can be found. This type of analysis, which, in principle, is simple, will be used to exemplify the quantification of intuitive information.

4. Cost-volume Relationships

Cost-volume relationships are used in economic theory to describe the behavior of the average firm under various circumstances. Generally, non-linear marginal cost curves are assumed to be predominant.

From the viewpoint of cost accounting, linear relationships would be preferred in order to facilitate analysis and provide widespread understanding of cost behavior.

Linear relationships can be estimated by regression analysis. This technique enables the analyst to divide total cost into parts supposedly caused by different products or different operations. The uncertainty of such partitions may be considerable. Still, the analysis may well

lend itself to estimation of total cost, given volumes of the various products. Thus it can be used for budgetary planning in certain cases.

5. Empirical Evidence on Cost-volume Relationships

Empirical evidence on relationships relevant to budgetary planning is scarce. Existing evidence indicates an unsatisfactory state of affairs. This seems to be due to

- failure to fulfill the theoretical assumptions of regression analysis;
- a need to specify the mathematical form and content of every relationship prior to statistical analysis;
- difficulty in giving all statistical outputs an acceptable economic interpretation.

These difficulties can to a large extent be overcome by increasing sample sizes. But this is often not a feasible solution. Two other possibilities involve

- constructing more realistic and thus more complex statistical models, and
- using an improved method of analysis.

These two possibilities are developed in Chapter 6 and Chapters 7 - 10, respectively.

6. An Extension of the Problem

According to Alchian (1959) and Hirschleifer (1962), one reason for these empirical difficulties is that the total production to date is not taken into account in general economic theory. They apply mathematical reasoning to prove that if this is done, the marginal cost

curve can be expected to have another shape than that assumed at the outset.

According to Frenckner (1953), increasing volume cannot be expected to provide information about the same cost functions as decreasing volume. Costs show a certain irreversibility, which has to be taken into account in the analysis. Provided the nature of the irreversibility is known beforehand, it can be handled by transformation of data.

The transformation required may be quite demanding for the analyst and the budgeter. Are there other methods that are easier to work with and understand? There may well be, if the intuitive knowledge of the budgeter is taken into account.

7. Quantification of a priori Knowledge

There are three sources of information prior to statistical data collection:

- a) conclusions based on general experience and known theory;
- b) already completed partial statistical analyses;
- c) subjective evaluations based on experience and intuition.

If our conclusions provide us with exact information about a parameter or an exact relation between several parameters, this information can easily be used in the continued analysis. If conclusions indicate an interval for a certain parameter, this has to be transformed into a statistical distribution to facilitate further analysis. Theil & Goldberger (1961) have suggested a suitable transformation.

Schlaifer (1959) has suggested a way of quantifying intuitive information. The budgeter is given a package of questions concerning his beliefs as to a certain parameter. This information is used to define a distribution. In order to facilitate further analysis, one might want to make this distribution normal.

8. Analysis Including all Quantitative Information

If certain parameters are supposed to be known with certainty, their impact is excluded from the material before the statistical analysis is performed. If our supposition is correct the analysis is strengthened; but if it is not correct there is no way of removing the mistake or easing its consequences.

If relations between certain parameters are supposed to be known, Lagrange multipliers are used to incorporate them into the analysis. If our suppositions are in doubt, the consequences are similar to those mentioned above.

If we have an intuitive estimate of a parameter, as well as a number of empirical observations of the same parameter, these two kinds of informations can be used to produce a new intermediate estimate. The same procedure is also available if there are several intuitive estimates from different budgeters.

Finally, if we have intuitive estimates of one or more parameters in a regression equation and a number of observations of the variables in the equation, the method of generalized least-squares can be applied to obtain a synthesis. One advantage of this method is that all estimates can be refined in the synthesis and thus there is no requirement that the a priori estimates contain an exact representation.

Given the above methods for revising intuitive information in the light of an increasing amount of empirical evidence, the estimation of budgetary relationships can be regarded as an iterative process involving many small refinements of intuitive evaluations.

9. Organization of Analysis

Descriptions of the budgetary cycle often begin with budgetary planning and end with variance analysis. But the organization of an analysis of relationships starts with empirical evidence. This evidence is used

to revise relationships in preparation for the next period of budgetary planning.

This revision can be achieved by means of

- intuition,
- general statistics, or
- Bayesian statistics.

If the revision is made on the basis of intuition, the budgeter has control over the process. But it may be laborious and probably conditioned by subjectivity.

If revision is achieved by means of general statistics, there may be inconsistency between the formal outcome and prevailing intuitive evaluation.

Finally, if revision is arrived at through Bayesian statistics, the two approaches may be integrated - to the benefit of future budgetary planning.

10. Intuitive or Formalized Analysis?

It is easy to find uses for formalized budgetary relationships. These relationships may contribute to deeper thought, faster and clearer decisions, more meaningful variance analysis and a possibility of automatizing parts of the planning process. To what extent are they used? A study of American models showed that statistical methods are indeed used, although rather infrequently.

The author believes that the lack of acceptance of statistical methods is largely due to the fact that, in certain situations, they appear to contradict intuitive knowledge. However, by using the Bayesian procedure outlined in Chapters 8 and 9 above, this limitation could be removed. Therefore, the next project in this area should be aimed at presenting these procedures to budgeters for practical use and studying how they will be applied.

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