GUIDELINES FOR SELECTING A FINANCIAL MODELING LANGUAGE

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ABSTRACT

The purpose of this paper is two-fold. First, to describe some of the different types of computer software which can be used to develop financial models, and to indicate the advantages and disadvantages of each type. Second, to suggest a set of guidelines for relating the financial modeling needs of the user to the attributes of the numerous financial modeling languages which are currently available.

The discussion and guidelines are based on Ernst & Ernst's experience in carrying out over 150 consulting engagements which involved the development and use of financial models, as well as Ernst & Ernst's extensive survey and analysis of the some 75 financial modeling languages available from software houses, time sharing vendors, and computer manufacturers.

INTRODUCTION

Never before have executives faced an environment as complex, as uncertain, and as rapidly changing as the one they face today. The challenges of severe business cycles, high inflation, scarce resources, government regulations and reporting requirements, labor and consumer demands, and fierce competition are combining to complicate and frustrate the planning and decision-making process. More and more variables need to be considered before a rational planning decision can be made -- and the penalties associated with making the wrong decision are great. Management is being forced to re-examine the whole process involved in planning and decision-making.

An impressive number of new techniques have emerged in recent years, designed specifically to help management plan and make decisions more effectively and efficiently. One of the most promising of these new approaches is the growing use of financial planning models as an integral part of the planning and decision-making process. Financial models are not new -- accountants have been preparing and using them (i.e., spread sheets) for years. But now, manual models are being superseded by computer-based models, which combine the speed and accuracy of computers with special facilities, allowing planning executives to analyze a variety of "what if ...?" questions, and evaluate, quickly and easily, the likely results of alternative courses of action. For an ever-increasing number of organizations, computer-based financial models are providing a new and more effective basis for the development of meaningful goals and objectives, sound decision rules and well-conceived plans for the future.

The computer software which is available for financial modeling varies considerably with respect to modeling capabilities, ease of use, flexibility, and cost. As a result, the selection of the most appropriate software for a financial modeling application is extremely important. During the selection process, you will need to obtain answers to the following questions. What are my financial modeling needs? What types of financial modeling software are available? What are the advantages and disadvantages of each? If I decide to use a financial modeling language (instead of one of the three other types of financial modeling software), what criteria should I use to evaluate the numerous languages? Which financial modeling language should I use? Answering these questions is a difficult, but important task -- one which isn't getting any easier!

We hope that this paper, based on our firm's extensive experience with financial modeling, will assist you in answering these questions.

THE FINANCIAL MODELING SOFTWARE EXPLOSION

Management's increasing use and acceptance of financial models has not gone unnoticed by the computer services industry, which has been quick to respond with a plethora of computer software for financial modeling. Over 100 software packages are currently available, and the number continues to increase. The new user can select a "Planning and Modeling System" (PAMS), or a "Planning Control and Decision Evaluation System" (PLANCODE). Also available is a "Financial Planning Simulator" (EPS), as is an "Economic Modeling System" (EMS), and even an "Econometric Programming System" (EPS). The list goes on and on!

The bewildering number of software packages is not the only problem with which the new user must contend. A glance at a typical marketing brochure describing the features of a financial modeling package will be enough to convince the reader that financial modeling has created a new language of its own. The facilities offered by some systems include "parameter ranging" and "imminent event simulation", "backward iteration", and "conditional branching". To whet the appetite even more, some packages offer "polynomial distributed lags", "two-stage least squares", and even "multivariate State Space Forecasting"!

Faced with this proliferation of software packages and financial modeling "vocabulary", it is hardly surprising that many a would-be modeler has found his (her) enthusiasm blunted and has retreated to the comparative comfort of spread sheets and electronic calculators. This is unfortunate, and highlights the need for a systematic means of selecting the most appropriate software package from the many systems currently available.

DEFINITIONS

A financial model consists of a set of interrelated accounts, some associated data, and a method of projecting each account into the future, based upon a defined set of assumptions and logical relationships.

Financial models are used to project financial results based on various assumptions, evaluate the financial impact of alternative strategies, and prepare financial projections and pro forma financial statements. "Financial modeling" refers to the field of computer-assisted financial planning and analysis, including the development and use of financial models.

Financial modeling software refers to the commercially available (via time sharing or installed in-house) computer-based packages (i.e., languages, programs, "canned" systems, etc.) which can be used to develop financial models.

FOUR TYPES OF FINANCIAL MODELING SOFTWARE

Virtually all financial modeling software can be classified into one of four types:

1. Fill-in-the-blanks models
2. Report generation packages
3. General purpose computer programming languages
4. Financial modeling languages

Although each of the four types of financial modeling software has been widely used to develop financial models of varying size and complexity, each has unique characteristics, advantages, and disadvantages.

Fill-in-the-blanks models are "canned" systems, in which the model logic and reports are predetermined and pre-programmed. These models are immediately available, complete with input sheets, and ready for use. Once the corporate planner provides the data and has it keyed into the model, a set of pre-specified reports are printed. Because such a model has inflexible "Black Box" logic, you can't customize the model's logic to meet your specific needs. However, under some circumstances, the minimal development time, simplicity, and ease of use outweigh such a model's greatest disadvantage -- inflexibility.

Report generation packages are designed primarily to "automate" the preparation of financial reports. Report generators have been widely and successfully used for the routine production of financial tables and reports in which calculations are relatively simple. These packages usually have limited logic capabilities, limited facilities for "what if ...?" and sensitivity analysis, and limited forecasting capabilities. With the availability of powerful financial modeling languages -- which contain excellent report generation facilities -- there seems little to be gained from the use of a report generator other than for routine reporting applications.

General purpose computer programming languages (e.g., APL, BASIC, COBOL, FORTRAN, etc.) consist of a combination of English-language words, mathematical notation, and flexible logic structure which adhere to international standards. Models developed using one of these languages can be custom-developed to your requirements, are usually inexpensive to run once programmed, and are transferable between different computer systems. These apparent advantages, however, are often outweighed by the following drawbacks: a) a computer programmer must develop the model, b) model development and changes to the model's logic are time-consuming and costly, c) model logic cannot be readily understood by non-programmers, and d) some languages have technical limitations. However, many organizations, having programming and/or management science staffs who are expert in the use of these languages, have used these resources to develop complex financial models.

Financial modeling languages are "high level", "English-like" programming languages, offering sophisticated logic capabilities and having special routines for financial computations, report generation, and consolidation. These powerful, yet easy to learn, languages are designed specifically for use in financial planning and analysis. They offer extensive facilities for "what if ...?" and sensitivity analysis, and statistical analysis and forecasting. There are a few minor potential limitations of financial modeling languages: a) although most of the languages are relatively inexpensive to use, the very powerful languages are relatively costly to use, b) some are proprietary and may not be purchased, and c) since there are no national standards for modeling

languages, converting a model from one language to another or from one type of computer to another can be difficult.

RECOMMENDATION

Because financial modeling languages are flexible, powerful, oriented toward the needs of a corporate planner, and easy to learn and use, we strongly recommend they be used to develop customized financial models which can reflect the complexities of the particular financial situation being modeled.

Assuming that you have decided to use a financial modeling language, the obvious question is "Which one should I use?". Before this question can be answered, you must determine your financial modeling needs. Only after this has been done, can you properly evaluate the numerous financial modeling languages which are commercially available.

DETERMINING FINANCIAL MODELING NEEDS

To determine which financial modeling language is most appropriate for your financial modeling application, you need to collect information which will define the:

1. Purpose and use of the model;
2. Operating environment in which the model will be used;
3. Model logic requirements;
4. Data requirements for the model;
5. Reports which the model must generate; and,
6. "What if ...?" and sensitivity analyses, and statistical forecasting and analytical techniques which will be needed.

Within Ernst & Ernst, we have developed an extensive checklist (the Client's Needs Checklist) used by our consultants to collect this type of information for each financial modeling engagement. This checklist consists of a comprehensive set of questions for each of the six key areas of need listed above. For example:

What will be the primary application area for the model?

Who in the organization will use the model?

Will the model be run on an external time sharing service, or is the modeling language to be purchased or leased?

Will the model need to perform consolidations?

Will the model logic include simultaneous equations? (i.e., Will there be any circular relationships in the model? EXAMPLES: Will interest be a function of debt? Will commissions be a function of sales?).

What is the approximate size of the row-column matrix of the model?

Will special financial routines be needed?

Will the model need to access external data bases?

What types of reports will the model generate?

Will the model require a backward iteration facility (i.e., the ability to find the combination of input values needed to attain a specified goal)??

Will the risk analysis capabilities be required?

The importance of carrying out this initial survey of user needs cannot be over-emphasized! Unless detailed information relating to questions such as the above has been gathered, you have no basis for making a rational decision about financial modeling language selection!

OTHER CONSIDERATIONS

Although the purpose and use of the model are of primary importance when selecting a financial modeling language, you should also consider the following factors:

Language Documentation by Vendor

What types of manuals and reference guides are available?

Are they clearly and adequately indexed?

Can a non-programmer understand them?

Error Detection and Messages

At what point are errors detected?

Do error messages indicate the true cause of the problem?

Language Complexity

Is the language easy to use and understand by a non-programmer?

Can a user learn to operate a portion of the language based on a small number of the available commands?

Vendor Support

Are vendor representatives expert in the use of the language?

How many such representatives are there, and where are they located?

Is there a hot-line?

Response Time, and Network Service and Reliability

What is the response time?

Is the system full or half duplex?

Is there local dial-up?

Many of the "other considerations" are difficult to quantify. Consequently, evaluation of these factors will be largely subjective. However, based on Ernst & Ernst's financial modeling experience, we believe that vendor support and documentation are extremely important criteria in selecting a financial modeling language and, in the selection process, may often override the technical capabilities of the language.

Cost is another important consideration, because of the wide variation in the cost effectiveness of the various languages. For this reason, Ernst & Ernst has carried out a number of cost benchmarks. In addition, we have made extensive use of detailed cost information available from the Real Decisions Corporation.

SURVEY

To select the most appropriate financial modeling language, you need to compare your financial modeling needs and "other considerations" to the specific capabilities and features of the numerous financial modeling languages and their respective suppliers. This is no easy task! There are currently some 75 financial modeling languages available from software houses, time sharing vendors, and computer manufacturers. Your task is to select one specific language which will "best" satisfy your needs.

At Ernst & Ernst, we have conducted an extensive survey and analysis to narrow the field to a relatively few number of languages worthy of detailed and continuing examination. A comprehensive questionnaire consisting of 100 key questions was designed, pre-tested, and then sent to all significant suppliers of financial modeling languages. These questions were designed to find out what desirable modeling features are available in each language and to uncover areas of differences among the languages. The questionnaire requested data specifically related to the questions on our Client's Needs Checklist, as well as the "other considerations" which have been discussed.

EVALUATION

As a first step, seven major criteria were used for evaluating the financial modeling languages:

1. Modeling capabilities
2. System and operating features
3. Logic structure and capabilities
4. Data input and management facilities
5. Reporting capabilities
6. Analytical features -- "What if ...?" and sensitivity analysis and analytical techniques
7. Other considerations

During the evaluation, these seven major criteria were further subdivided into a total of 62 individual criteria, based on the detailed Client's Needs Checklist and "other considerations". A composite (and weighted) score for each language was calculated as the sum of the individual weighted scores. Deductions were made where there were significant deficiencies (e.g., limited number of allowable logic lines, restricted data matrix size, etc.).

SELECTION

After evaluating, tabulating, and summarizing the questionnaire data, the field was narrowed to several languages which we believe are best suited to our consulting needs and to the needs of our clients. Even though these are powerful and easy-to-use "high level" languages, they differ in terms of their ability to deal with various modeling situations.

When we start a financial modeling engagement with a client, we first determine the client's needs, using the Client's Needs Checklist and referring to the list of "other considerations". Then these needs are compared to the features/capabilities of the several languages, and a specific language which we believe best satisfies the client's needs is selected and recommended.

As you might suspect, the financial modeling field and the numerous financial modeling languages are constantly changing. Accordingly, Ernst & Ernst monitors all the commercially available languages, surveys new languages, and reviews enhancements to existing languages, to ensure that our questionnaire data base is continually updated.

SUMMARY

Perhaps all this can be summarized by saying that you won't be able to select the perfect financial modeling language. It doesn't exist! No one language can do everything for everyone. Some languages are easy-to-use, yet very simplistic. Some languages are well-suited for working with and reporting tabular data. Some languages have been designed specifically for complex financial modeling applications.

Since you must select a particular financial modeling language for your specific modeling application, we suggest that you sequentially perform these tasks:

- Determine your financial modeling needs.
- Determine the features and capabilities of the available languages (and their vendors).
- Compare your needs to the features/capabilities of each language.
- Select the language that "best" satisfies your needs.

Only after you have completed the first three tasks; can you begin to work on the last one. As a result of following this structured approach and considering the guidelines presented in this paper, a knowledgeable selection can be made in an atmosphere of informed judgment.