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What Everyone Needs to Know about Financial Modeling

WHAT is a Financial Model?

WHY do we need a Financial Model?

WHEN and WHERE are they applicable?

WHO builds Financial Models and HOW do they do it?

Would you be willing to pay $1,000,000 for a perfect financial forecasting tool? Does one exist? No, but it certainly would be nice if we could create a perfect financial forecast. Wouldn't it be wonderful to find a tool that assured us of the best possible end result? Wouldn't it be amazing if we could easily alter key assumptions and instantly see the results of those changes? Although such a tool doesn't yet exist, we can approximate its effects by utilizing a *Financial Model*. Below we thoroughly explore this concept through the time-honored journalistic rubric—*Who, What, Where, When, Why* and *How*.

WHAT Is A Financial Model?

Experts hold divergent views on what constitutes a financial model. Here are some of their varied definitions:

"A system of postulates, data and interfaces presented as a mathematical description of an entity or state of affairs." (Webster's Collegiate Dictionary)

"…A mathematical representation of the relationships among the variables of a financial problem so that it can be used to answer 'what-if' questions or makes projections." (Chandan Sengupta's *Financial Modeling Using Excel and VBA*)

"…The practice of projecting a business's operating results." (K. Scott Proctor from *Building Financial Models with Microsoft® Excel*)

"Financial modeling covers a wide area from simple spreadsheets to add up expenses to sophisticated risk modeling of projects." (Alastair Day from *Mastering Financial Modeling*)

So, while there is no agreement, four common themes emerge. A financial model will:

1. contain *Input Parameters*
2. produce *Mathematical Formulas and Calculations*

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3. identify *Outputs*
4. involve *Currency (e.g., $, £, ¥, €)*

Financial models can be created using various software and hardware platforms, but Microsoft Excel® is most widely used for financial modeling, so for the purpose of this White Paper we refer to it exclusively.

With little consensus on the definition of financial modeling, the *bright line* we use to separate rudimentary spreadsheets from sophisticated financial models is whether the model is *Static or Dynamic*.

A **spreadsheet** can be defined as:"A program for organizing numerical data in tabular formats allowing rapid calculations with changing variables."

A **spreadsheet model** can be defined as:"A theoretical construct in a spreadsheet that represents numerical processes by a set of variables and a set of logical and quantitative relationships between them."[4]

Static Model

A spreadsheet displaying the following characteristics:

1. A set of fixed assumptions (input parameters)
2. Relatively simple formulas that may require reworking when assumptions are changed
3. Not designed for changes
4. Not user-friendly when changes need to be made
5. Designed for one-time use

Examples of typical static models include financial pro formas, simple expense budget roll-ups, and simple loan calculations.

Dynamic Model

A spreadsheet displaying the following characteristics:

1. Multiple, key input parameters clearly identified
2. Complex formulas that automatically adjust for wide fluctuations in input parameters

3. User-friendly, interactive interface, including differentiating between input and output cells (usually color-coded) and *Microsoft Excel*® features such as controls, custom menus (User Forms), and macros

Dynamic models are typically robust, cover multi-periods and produce all the important financial output metrics. They are like static models on steroids.

WHY Do We Need Financial Models?

Financial modeling allows you to see into the financial future of your organization, to plan, and to understand if sufficient cash is available to meet your future operating needs. A robust, dynamic model cannot guarantee an accurate forecast but it vastly improves your forecasting ability. However, the old adage—*garbage in, garbage out*—is operational in this construct. According to CFO magazine, 70 percent of financial model developers surveyed reported that they can't forecast more than one quarter out[1]. This is unfortunate because a well designed, robust financial model does allow the user to test alternative scenarios, perform sensitivity analyses, observe the impact of possible risk factors and comfortably forecast beyond one month. It can't anticipate every possible risk factor, but perfection may not be necessary if you bracket the most likely scenarios—from worst case to best case—and develop contingency plans for each potential outcome.

> "…70% of survey respondents say they can't forecast more than one quarter out."[1]

WHEN And WHERE Are Financial Models Applicable?

Every organization intent on achieving specific financial goals should employ financial modeling at some level. Even one-person start-ups can use financial modeling to answer these critical questions:

- How much capital will I need?
- How many widgets do I need to sell by when?
- What pricing should I use?
- What is my break-even point?
- What is the forecasted cash impact of my billing schedule?

Companies in financial trouble should use financial modeling to answer these questions:

- How long will my current cash last under various scenarios?
- What sales assumptions need to occur to allow the company to recover?

- What assumptions could be 'tweaked' to help conserve cash?
- What external factors am I not taking into consideration?, etc.

Well run, growing companies should use financial modeling to explore these questions:

- What will it take to get to the next level financially?
- What would be the impact of the most likely risks to the current growth plan?
- Which capital projects should we invest in to maximize growth and minimize risk?
- What is our best strategy?

In essence, a robust, dynamic financial model that accurately reflects the business environment is one of the most valuable tools a company can possess.

WHO Builds Financial Models And HOW Do They Do It?

Microsoft Excel® is the tool of choice for most financial model developers for these key reasons:

1. Excel® is relatively *inexpensive*
2. Excel® is very *powerful* and *flexible*
3. Excel® has a *vast user base* of 350 million +

Almost everyone who has ever used Excel® senses that the application is capable of much more than we ask it to do. Studies have shown that average Excel® users employ less than 5 percent of Excel®'s capability while power users employ only 10 to 20 percent of its potential functionality. After gaining proficiency in the mechanics of Excel®, you need to master three major *Spheres of Knowledge* to build robust financial models. We refer to these *Spheres of Knowledge* as the 3 Ts:

1. The *TOOL*
2. The *THEORY*
3. Putting TOOL and THEORY *TOGETHER* into the model

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The most difficult sphere to master by far is #3—designing and building the model. The ideal person for this task is someone who has extensive competency in Spheres #1 and #2.

Sphere #1: The TOOL

Gaining knowledge of how Excel® works is relatively straightforward. There are many books, seminars, CDs and on-line training courses and tutorials available. All it takes is time and dedication.

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Sphere #2: The THEORY

It is basically impossible to build a financial model if the builder does not understand the financial theories upon which the model will be based. In other words, you can't expect the model's developer to create a cash flow statement if he/she has no knowledge of what a cash flow statement should look like or how the logic should be set up. Mastery of Sphere #2 skills must be accomplished through formal education, certifications (e.g., accounting courses, CPA, MBA) and/or on the job training.

Sphere #3: Putting the TOOL and the THEORY TOGETHER into the model

This is where *the rubber meets the road*, as they say. If the model's developer doesn't have sufficient prior experience, it may be best to follow a structured process, available from several sources. One such example is the 10-step process outlined by C. Sengupta:

1. Define & structure the problem
2. Define the input & output variables of the model
3. Decide who will use the model & how often
4. Understand the financial & mathematical aspects of the model
5. Design the model
6. Create the spreadsheet
7. Test the model
8. Protect the model
9. Document the model
10. Maintain the model

(C. Sengupta – *Financial Modeling Using Excel© & VBA)*

Another example is the 13-step, structured approach proposed by Alastair Day[6.] (See inset below).

No two financial models are exactly alike, and no *one size fits* all model works very well in our experience. Even organizations in the same industry demand unique approaches to financial modeling. Often, the financial model developed last year for a single organization needs extensive reworking to meet the demands of new market opportunities, operating environments, or changes in financial conditions the following year. *Flexibility* is a fundamental element in the design and construction of a robust, dynamic financial model. Selecting input parameters that can easily be retooled is also critical. In theory, the major focus of the model should be the most sensitive inputs, those that will most affect the key outputs such as Units Produced, Market Demand, Net Income, Revenue Growth, or Cash Flow, etc.

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Blending ART and SCIENCE in Building a Financial Model

HOW something is presented is equally important as ***WHAT*** is presented, and this holds true with financial models as well. Know your audience. Many people prefer to view results in graphical format, using pie charts, scatter charts and other visual representations. Other people are more comfortable viewing tabular results or columns of numbers. Given that there is no one right way to present the data, this aspect of building a financial model is where ART and creativity compliments the science.

An artistic sensibility is also helpful in designing an intuitive interface that allows the user to easily make changes to the financial model. Sometimes a simple set of Option Buttons or a Combo Box display three scenarios to choose from will suffice. Sometimes it may require an extensive, custom menu and/or sub-menus (VBA User Forms) that provide a maximum number of choices without sacrificing usable spreadsheet real estate.

Starting with an Instructions page ensures consistency across users. Keeping key input parameters on a single tab in the workbook is a wise approach since the user won't have to jump around the model to make *What-if* changes. If key *Outputs* can also be displayed on this same tab, all the better. This design approach allows the user to remain on a single tab, operate all the key input controls, and see the output results instantly. Think *Camera* function.

The 13-step Approach

1. Follow a design process & method for all models
2. Set aims & objectives
3. Examine user needs & required user interfaces
4. Set out key variables & rules
5. Break down calculations into manageable groups
6. Produce the individual modules
7. Determine/build a menu structure
8. Design management reports & summaries
9. Develop sensitivities
10. Testing & auditing
11. Protection
12. Documentation
13. Feedback from peers

Terry Lillis, CFO of The Principle Group, advises that the "best models are those that identify four or five key drivers and focus on the interplay between them."[2] Although it is, indeed, possible to measure hundreds of results, it is not necessary to do so. Just a few carefully chosen drivers can tell us most of what we need to know initially. This is why dashboards have become so popular. Without the time or desire to look at every number daily, looking at a few key indicators is sufficient to tell us whether we can move ahead or if we need to drill down to find the source of a problem.

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Kaplan & Norton's Balanced Scorecard (BSC) is based on this principle—look at a few critical indicators that will convey what is going on deeper in the detail of the organization. With more than 20 years in the marketplace, this approach to linking strategy and metrics is today used by thousands of firms both national and global.

It can be created relatively easily in an Excel® model guided by Pareto's 80 / 20 rule: 80% of the impact (output) will be caused by changing just 20% of the input parameters. The trick is identifying which input parameters are the critical 20% and then building a dynamic financial model that enables the user to easily change these parameters.

Common Pitfalls to Avoid When Building Financial Models

• *Misunderstanding CASH*

A common mistake in financial models is not having a solid understanding of what CASH is and is not. Revenues are not cash. Gross margins are not cash. Profits are not cash. Only cash is cash. For example, suppose you sell something this month for $100, and it cost you $60 to make it. You have to pay your suppliers within 30 days, while the buyer probably won't pay you for at least 60 days. In this case, your revenue for the month was $100, your profit for the month was $40, and your cash flow for the month was zero. Your cash flow for the transaction will be negative $60 next month when you pay your suppliers. Although this example may seem trivial, slight changes in the timing between cash receipt and disbursement—even just a couple of weeks—can bankrupt your business. Therefore, a good model will reflect not only cash flows generated by your firm but also their timing.

• *Lack of Proper Detail*

Your financials should be constructed from the bottom-up and then validated from the top-down. A bottom-up model starts with details such as when you expect to make certain sales, or when you expect to hire specific employees. Top-down validation means that you examine your overall market potential and compare that to the bottom-up revenue projections. Round numbers—like one million in R&D expenses in Year 2, and two million in Year 3—are a sure sign that you do not have a bottom-up model.

• *Unrealistic Assumptions*

Few companies achieve huge growth in revenues, profits and cash flow after a slower period. Projecting numbers that your company cannot support is never a good idea as it not only wastes your time but compels you to make decisions that will have long-term negative impact. Nobody

ever believes that assumptions are conservative, even if they truly are. Develop realistic assumptions you can support but refrain from using words like "conservative" or "aggressive" in describing them. Financial forecasts are a litmus test of your understanding of how your business works. When you build your financial model, make sure that your assumptions are realistic, particularly if you are creating the model to attract capital.

• *Missing Key Financial Statements*

Basic financial projections consist of three fundamental elements: Income Statements, Balance Sheets, and Cash Flow Statements, all of which must conform to generally accepted accounting principles. It is common to project out three to five years into the future. Of course, nobody can see five years into the future, but the model will show you, and anyone else reading the model, that you have thought through the process and validated your initial assumptions.

Your financial model should also include benchmark comparisons to other companies in your industry—indicators like revenues per employee, gross margin per employee, gross margin as a percentage of revenues, and various expense ratios (general and administrative, sales and marketing, research and development, operations as a percentage of total operating expenses).

• *Scenario vs. Sensitivity Analysis*

A good financial model must include scenario and sensitivity analyses showing how your projected results will change if your assumptions turn out to be incorrect. This allows users of the model to identify the assumptions that can have a material effect on future performance allowing you to focus your energies on validating those assumptions.

Scenario analysis is the process of creating a basic model or *base case* and then changing *all* the variables to extremes. One extreme creates the *best case* while the other develops the *worst case* version, allowing you to see the full range of possible outcomes. If the *range* between the best and worst case is too large for comfort, more research may be warranted before proceeding.

Sensitivity Analysis, performed after scenario analysis, is similar with one significant difference. Instead of changing all the variables simultaneously, you change one variable at a time to its own *best and worst case value* and rerun the model. Then reset the assumptions to the *base case* and go on to the next individual variable, and so on. The result of this series of iterations shows which of the assumptions drives the greatest variation is the results or outputs. These specific variables are the ones the user must control to optimize future results. This can be accomplished either directly in the model you have built (using Scroll bars or Spinners typically) or by using

Scenario Manager in Excel®. Adept use of sensitivity analysis helps you develop contingency plans and feasibility studies—real necessities in today's uncertain times.

Model Guidelines

- Use modular spreadsheet blocks so that one part of the file can be changed independently without affecting other areas. A modular design also allows individual components to be used as building blocks for future extensions.

- Separate data inputs, calculations, and outputs and clearly identify each to make them easier to recognize and utilize. Color-coding helps users navigate and improves the model's visual presentation.

- Design a template that can be used to create new, similar sheets, either by manually creating a copy or using a macro to do the same (apply formatting and enter specific information to the new sheet). To maintain multiple sheets that have identical architecture, group the sheets (by holding the Ctrl key while clicking each tab), then make changes to one sheet which will automatically be applied to all grouped sheets.

- Enter information and headings once and then link them to each subsequent sheet. This makes the file easier to maintain and reduces the chance for error.

- Label sheets, columns and rows with appropriate headings to make files easy to understand. The sheet name and/or subheading should indicate the sheet's function. Column and row headings should include units and currencies where relevant. Columns and rows should only contain data in one unit and/or currency.

- Consider using protection techniques to reduce unauthorized changes. (e.g., password protection of cells, groups of cells or entire worksheets or workbooks, sheet protection, data validation, hiding rows/columns, hiding entire sheets, group function, changing scroll area properties, etc). Selecting the appropriate technique depends primarily on who will be using the model.

- When linking multiple files together, ensure dependency information (e.g., "must have X, Y, and Z files open when making changes to this file") is provided in the file using a *Set Up* or *Directions* worksheet to assist with future maintenance. Avoid using external file linkages, as they can easily be broken and require careful maintenance. Whenever possible, organize your

- financial model in a single workbook. If external data must be used, macros can be written to access these data on demand, eliminating hard links.
- Consider using dynamic ranges for chart data and named ranges to ensure these always cover all your data.
- If using pivot tables, make sure the database has unique, single-cell field names. Avoid blank cells, blank columns, and blank rows. Make sure you eliminate any subtotaled rows residing in the data base. Neglecting any of these rules can cause unwanted results.
- Minimize or eliminate the use of blank lines in data/calculation blocks as these cause problems with formatting and manipulation.

In Conclusion

We believe strongly that having a robust, sophisticated financial model is absolutely essential to the success of any company. It is the firm's financial road map. With this living document updated frequently to reflect changing assumptions and market conditions, the path to financial success will be clearly illuminated for the company.

"Financial personnel have to think in terms of business factors instead of dry lines of a general ledger."[5] This is exactly what a financial model can help you do. "Forecasting can't be just about number-crunching."[6] Indeed, a good financial model does the number crunching automatically and allowing you, the forecasters, to concentrate on the business factors that drive the numbers.

So, if you don't yet have a robust financial model for your company, get started on one right now. You can't change the past, but you can impact the future—and having a well designed financial model is one of the best tools to ensure that the future looks the way you want it to.

For more information

For additional information, explanation or discussion on *Financial Modeling*, please contact either:

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