

Introduction

Chapter 1 answers some simple questions about financial modelling, such as: What is it? Who does it? What are the steps in building a financial model? But above all, why is financial modelling the single most important skill-set for the aspiring finance professional?

The framework for the development of a spreadsheet-based financial model is illustrated by using a simple concrete example. A spreadsheet is used in order to calculate the funding needs of a 2/10 net 30 credit policy on a certain turnover. The inputs and the output of the model are defined. Building this model is relatively straightforward. The model-builder needs to input estimates for certain items (i.e. turnover) and then make sure that the mathematical formulae are correct. From this simple base, the steps of the financial modelling process are described in order to build sophisticated and interconnected models for the income statement, balance sheet, and cash-flow statement, as well as “good/bad/base” scenarios that can be changed with a simple click or two. This ability of spreadsheets to deal with a lot of numbers, work with them, and produce answers is stressed, as well as the use of Excel as the ideal tool for financial modelling.

1.1 WHAT IS FINANCIAL MODELLING?

If you Google the term “financial model” you will get approximately 350 million hits. Yes, that’s right. Financial modelling has become the single most important skill-set for the aspiring finance professional. But what exactly is a financial model and what does financial modelling do? *Investopedia*¹ defines financial modelling as the process by which a firm constructs a financial representation of some, or all, aspects of it. The model is usually characterized by performing calculations, and makes recommendations based on that information. Moreover, *Moneyterms*² defines a financial model as anything that is used to calculate, forecast, or estimate financial numbers. Models can range from simple formulae to complex computer programs that may take hours to run. Finally, according to *Wikipedia*,³ financial modelling is the task of building an abstract representation (a model) of a real-world financial situation. This is a mathematical model designed to represent (a simplified version of) the performance of a

financial asset. Similar definitions exist on other financial websites like *BusinessDictionary.com*, *Divestopedia*, etc. Financial modelling is a general term that means different things to different people. In the context of this book it relates to accounting and corporate finance applications and usually involves the preparation of detailed company-specific models used for decision-making purposes and financial analysis. While there has been some debate in the industry as to the nature of financial modelling – whether it is a tradecraft, such as welding, or a science – the task of financial modelling has been gaining acceptance and rigour over the years.

Financial models can differ widely in complexity and application: some are simple 1-page sheets built to get a “quick-and-dirty” estimate of next year’s net income. Some span more than 40 worksheets and project various scenarios of the value of a company.

Although financial models vary in scope and use, many share common characteristics. For example:

- 1. Reported financials for past years are the basis for most projection models.** To forecast financial statements we make use of key performance drivers derived from historical records.
- 2. Projecting future years for the 3 main financial statements** – the income statement, the balance sheet, and the cash flow statement – is typically the first step. Income statement estimates for EBITDA and interest expense as well as balance sheet leverage statistics such as debt/equity and interest coverage are often the most important model outputs.
- 3. Incorporating financial statement analysis through the use of ratios.** More often profitability, liquidity, and solvency ratios are calculated in order to pinpoint any weaknesses in the financial position of a company.
- 4. Performing valuation.** Valuation involves estimating the value of a company using various techniques although the most commonly used are comparable company multiples and discounted cash-flow modelling.
- 5. Conducting various forms of sensitivity analysis after a forecast model has been built.** These analyses are often the real reason a model was built in the first place. For example, sensitivity analysis might be used to measure the impact on one model output – say free cash flow – from the changes of one or more model inputs, say revenue growth or the company’s working capital needs (“What happens to free cash flow if we increase sales growth by an extra 2% next year and at the same time reduce the payment terms to the suppliers by 5 days?”).

Financial modelling is about decision-making. There is always a problem that needs to be solved, resulting in the creation of a financial model.

Financial modelling is about forecasting. In the post 9/11 environment, forecasting has become much more difficult because the economic environment has become much more volatile. Since profit is not the only important variable, a projected financing plan into the future is imperative for a business to succeed.

Financial modelling is the single most important skill-set for the aspiring finance professional. It is as much an art as a science. Financial modelling encompasses a broad range of disciplines used across many fields of finance. A good financial modeller must first of all have a thorough understanding of Generally Accepted Accounting Principles (GAAP) and the statutory accounting principles. They must know how the 3 financial statements work and how these are linked together. They need to know corporate finance theory and be able to apply it in valuation exercises. They will have to be adequate in forecasting. Finally, they will have to think analytically, be good at business analysis, possess industry-specific knowledge and, last

but not least, have strong Excel skills. The applications of the above skill-sets are immense and somebody can develop them by applying and also by practising them.

In this book we look at the basics of most of these disciplines. In Chapter 2 we cover the fundamentals of accounting theory and the interrelationship of the 3 financial statements. In Chapter 3 we apply this theory in practice to build the proforma financial statements of a sample company of interest. In Chapter 4 we examine various forecasting techniques related to sales, costs, capital expenditures, depreciation, and working capital needs. In Chapter 5 we cover the theory behind Discounted Cash Flow (DCF) valuation.

During the financial crisis, the G20 tasked global accounting standard-setters to work intensively towards the objective of incorporating uncertainty into International Financial Reporting Standards (IFRS) (e.g. favourable and unfavourable scenarios are requested in estimating the fair value of an investment). In addition businesses are asked to prepare various scenarios in order to prove that they will be financially viable into the future and thus secure funding from their lenders or raw materials from their suppliers. Chapters 6, 7, and 8 deal with these types of uncertainty. Chapter 6 deals with sensitivity analysis, Chapter 7 elaborates on building multiple scenarios, and Chapter 8 introduces the Monte Carlo simulation and deals with building up a simulation model from scratch.

For the *Finance and the Accounting professional* in corporate finance and investment banking, financial modelling is largely synonymous with cash-flow forecasting and is used to assist the management decision-making process with problems related to:

- Historical analysis of a company
- Projecting a company's financial performance
- Business or security valuation
- Benefits of a merger
- Capital budgeting
- Scenario planning
- Forecasting future raw material needs
- Cost of capital (i.e. Weighted Average Cost of Capital (WACC)) calculations
- Financial statement analysis
- Restructuring of a company.

The same applies to the *equity research analyst* or the *credit analyst*, whether they want to examine a particular firm's financial projections along with competitors' projections in order to determine if it is a smart investment or not, or to forecast future cash flows and thus determine the degree of risk associated with the firm.

Furthermore, for the *small business owner* and *entrepreneur* who would like to project future financial figures of his business, financial modelling will enable him to prepare so-called proforma financial statements, which in turn will help him forecast future levels of profits as well as anticipated borrowing.

Finally, as more and more companies become global through the acquisition/establishment of international operations, there is an imminent requirement for sophisticated financial models. These models can assist the *business/financial analyst* in evaluating the performance of each country's operations, standardize financial reporting, and analyze complex information according to the various industry demand–supply patterns.

Financial modelling, unlike other areas of accounting and finance, is unregulated and lacks generally accepted practice guidelines, which means that model risk is a very real concept. Only recently certain accounting bodies, such as the Institute of Chartered Accountants in England

and Wales (ICAEW), published principles for good spreadsheet practice based on the FAST Standard which is one of the first standards for financial modelling to be officially recognized.⁴ The FAST (Flexible Appropriate Structured Transparent) Standard is a set of rules on the structure and detailed design of spreadsheet-based models and provides both a clear route to good model design for the individual modeller and a common style platform upon which modellers and reviewers can rely when sharing models amongst themselves.⁵ Other standards include SMART, developed by Corality, which provides guidance on how to create spreadsheets with consistency, transparency, and flexibility⁶ and the Best Practice Modelling (BPM)⁷ published by the Spreadsheet Standards Review Board (SSRB).⁸ Nevertheless the above standards have not yet been widely adopted and the reader should be aware of the scope, benefits, and limitations of financial modelling. Always apply the “Garbage in Garbage out” principle.

1.2 DEFINING THE INPUTS AND THE OUTPUTS OF A SIMPLE FINANCIAL MODEL

A good model is easily recognizable. It has clearly identifiable outputs based on clearly defined inputs and the relationship between them can be tracked through a logical audit trail. Consider the following situation. Think of a wholesale company that wants to use a financial model to assess the financial implications of its credit policy. Let us say that the company has a 2-term trade credit agreement. In this agreement it offers a discount to its buyers if payment is made within a certain period, which is typically shorter than the net payment period. For example, a “2/10 net 30” agreement would give the buyer a discount of 2% if payment is realized by the 10th day following delivery. If the buyer fails to take advantage of the discount, there are still 20 additional days in which to pay the full price of the goods without being in default, that is, the net period has a total duration of 30 days. Finally, as with net terms, the company could charge penalties if the buyer still fails to meet the payment after the net term has expired. It is expected that 30% of the company’s buyers would adopt the discount. Trade credit can be an attractive source of funds due to its simplicity and convenience. However, trade credit is like a loan by the company to its customer. There are 2 issues associated with loans: (a) what is the necessary amount of the loan and (b) what is the cost of it?

Therefore, the company needs to build a model in order to estimate:

- (a) the cost of the trade credit it provides to its customers, and
- (b) the funding impact of it, on the basis that 70% of the company’s customers will not adopt the discount,

given that it has an annual turnover of €10,000,000.

So the model outputs should look like this:

Cost of the Discount

Effective Annual Rate (EAR) :
In absolute terms (€):

Funding impact of the credit period

Funding needs (€):
Cost of funding per year (€):

The Effective Annual Rate (EAR) is the cost of the discount offered by the company to encourage buyers to pay early and is given by the following formula:

$$EAR = \frac{\text{Discount percent}}{(100 - \text{Discount percent})} \times \frac{360}{(\text{Days credit is outstanding} - \text{Discount period})}$$

As far as the above situation is concerned:

$$EAR = \frac{2}{100 - 2} \times \frac{360}{30 - 10} = 36.7\%$$

This cost is really high and means that the company offering the discount is short of cash. Under normal circumstances it could get a bank loan much more cheaply than this. On the buyer side, as long as they can obtain a bank loan at a lower interest rate, they would be better off borrowing at the lower rate and using the cash proceeds of the loan to take advantage of the discount offered by the company. Moreover, the amount of the discount also represents a cost to the company because it does not receive the full selling price for the product. In our case this cost is:

$$(1 - 70\%) \times \text{€}10,000,000 \times 2\% = \text{€}60,000$$

Apart from the above cost, if we assume that the company's customers would wait until the last day of the discount period to pay, i.e. the 10th day, then the company should fund 10 days of receivables for turnover equal to:

$$(1 - 70\%) \times \text{€}10,000,000 \times (1 - 2\%) = \text{€}2,940,000$$

The factor (1–2%) takes into account the discount. These 10 days of receivables, assuming a 360-day financial year, are equal to the following amount (as we will see in Chapter 2):

$$10 \text{ days} \times \text{€}2,940,000/360 = \text{€}81,667$$

If the €81,667 are financed by debt and the cost of debt is 8% per year, then the company will bear interest of:

$$8\% \times \text{€}81,667 = \text{€}6,533/\text{year}$$

That is, the company will bear a cost of €60,000 per year arising from the discount of 2% plus a further cost of €6,533 as interest arising from the funding needs of the 10-day credit period.

Concerning the 70% of the company's customers that prefer the credit period of 30 days, this is equivalent to turnover of:

$$70\% \times \text{€}10,000,000 = \text{€}7,000,000$$

This turnover, if funded for 30 days, gives rise to receivables equal to:

$$30 \text{ days} \times \text{€}7,000,000/360 = \text{€}583,333.$$

Again, if the €583,333 are financed by debt and the cost of debt is 8% per year, then the company will bear interest of:

$$8\% \times \text{€}583,333 = \text{€}46,667/\text{year}.$$

To summarize: the company will bear a cost of €60,000 per year arising from the discount of 2% plus a further cost of €6,533 as interest arising from the funding needs of the 10-day credit period plus another cost of €46,667 as interest arising from the funding needs of the 30-day period.

All the numbers that feed into the above formulae should form the *inputs of the model* and all the formulae will be part of the *workings of the model* as we discussed in the previous paragraph.

Then, the *inputs* of the model should look like this:

Particulars	UOM	Values
Discount offered:	(%)	2%
First term of credit:	(days)	10
Second term of credit:	(days)	30
Percentage of clients choosing to take the discount:	(%)	30%
Company's annual turnover:	(€)	10,000,000
Company's annual cost of debt:	(%)	8%

and the *outputs* of the model will look like this:

Cost of the Discount	
Effective Annual rate (EAR) :	36.7%
In absolute terms (€):	60,000
Funding impact of the credit terms	
Funding needs (€):	665,000
Cost of funding per year (€):	53,200

where the funding impact of €665,000 is the sum of both the 10-day discount period and the 30 credit days (€81,667 + €583,333) and €53,200 is the cost of these funds per year at 8%.

So far you may have the impression that financial modelling is purely maths and finance. However, for a model to be effective, precise financial calculations are not enough and are only part of the equation. The second and equally important part is the appropriate application of subjectivity. Financial models that combine both maths and art become the models that are relevant and are actually used in business.⁹ In this direction we have used a common style for the headings of both the inputs and the outputs. Moreover we could have used blue colour for the inputs. We have used 3 columns to separate the particular inputs from their relevant unit of measure (UOM) and their proposed value. We started by defining first *the outputs* of the model that will answer the business question the model will need to address. Then we identified any additional information required in order to complete the model (i.e. the cost of funds/debt for the company). Only then did we write down all the particular formulae and calculations that the model needs to perform.

As a final note to this specific modelling exercise, we mentioned previously that there was no need for any decision making. The model was constructed simply to enhance the business understanding of a particular company policy. Should any decision need to be taken about which credit policy is more efficient, we could model a number of different scenarios each with various credit policies. For example we could examine 3 different policies (2/10 net 30, 2/10 net 45, and 2/10 net 60) in order to choose the most favourable one.

1.3 THE FINANCIAL MODELLING PROCESS OF MORE COMPLEX MODELS

The financial modelling process is comprised of 4 steps as shown in Exhibit 1.1:

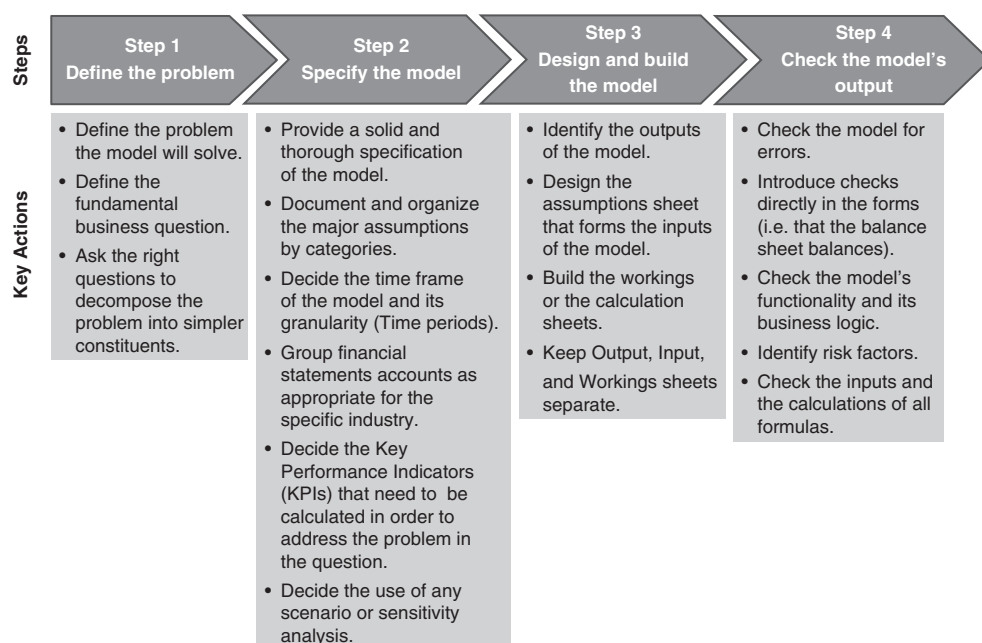


EXHIBIT 1.1 The 4 fundamental steps of the financial modelling process

Let us examine each of the above steps in detail.

1.3.1 Step 1: Defining the Problem the Model Will Solve: The Fundamental Business Question

Financial modelling is used, as we mentioned previously, in order to solve various problems. The first step of the process includes teams or individuals asking the right questions at the start of the problem-solving process. This is sometimes hard to believe as it often seems that people are trying to solve a problem before they have properly defined it. Asking the right questions helps break down the problem into simpler constituents.

For example the commercial manager of the company requests the financial analyst to present the impact on the bottom line results of the company of a New Product Development (NPD).

Let us say that the costs of the whole NPD process are available and can be largely funded through government subsidy. In order to tackle the problem the financial analyst needs to ask the following questions:

1. What will be the forecast sales volume of the new product per year?
2. What will be the unit price?
3. What will be the credit terms?
4. What will be the inventory needs of the product?
5. What will be the payment terms of the suppliers of the raw materials?
6. What will be the incremental variable and fixed cost per year for the proposed production?
7. When is it anticipated that the governmental subsidy for the initial investment costs will be received?

The problem, then, can be broken down as per Exhibit 1.2:

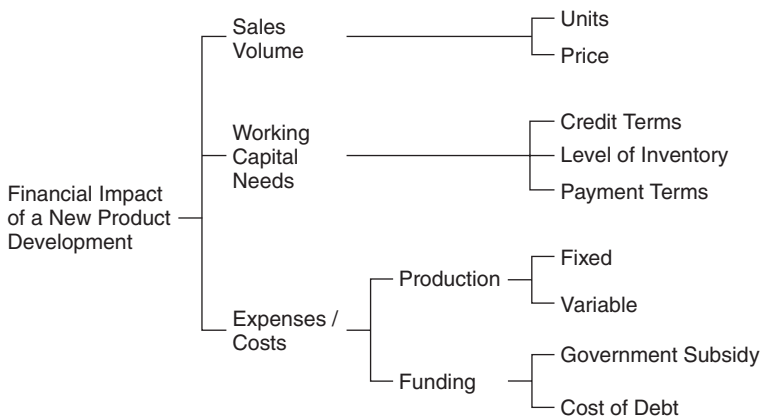


EXHIBIT 1.2 Breaking down a business problem into simpler constituents

1.3.2 Step 2: Specification of the Model

Now we have identified the variables of the problem, we need a solid and thorough specification for a successful financial modelling process. The major assumptions should be documented and organized by category (such as market prices, sales volumes, costs, credit terms, payment terms, capital expenditures, and so on). All assumptions should be placed separately on a single sheet so that we do not have to hunt through formulae to figure out where a number came from.

Moreover, the specification of the model, depending on the problem we have to address, might include the following:

- To formulate the standard financial statements, including the income statement, balance sheet, and statement of cash flow. For the problem described in Step 1, the balance sheet and cash-flow statements are used to determine the level of additional borrowing, although they are more time consuming than a plain income statement, provided that the new product development will be funded by debt. The interest expense of this borrowing is an expense line in the income statement that we need to forecast in order to answer the

original question. In other cases, i.e. where a valuation is required, we would have to derive both the free cash flow and the Weighted Average Cost of Capital schedules as well.

- To decide the time frame of our forecast and its granularity (time periods). This refers to whether calculations will be done at the monthly level of detail or on a yearly basis. This is important when projecting cash flows in order to ensure enough liquidity to withstand cash-flow spikes due to factors such as inventory replenishment, slow accounts receivable cycles, large quarterly tax payments, major capital purchases, and other events. Output results are normally monthly for the first forecast year, quarterly for the next, and annual for the rest of a full 5-year plan.
- To group operating expenses by departments as appropriate for the specific industry. Typical departments might be General and Administrative, Sales & Marketing, Research & Development, or Operations. This allows a comparison of departmental expenses as a percentage of total expenses with other companies in the industry.
- To decide which Key Performance Indicators (KPI) need to be calculated in order to address the problem in question. KPIs expressed as ratios such as revenue EBITDA cover or the quick ratio allow projections to be benchmarked against other companies in the industry.
- To create various scenarios, in order to assess the impact of different strategies. That is, to evaluate a series of different model output variables given a set of different input variables.
- To create a sensitivity analysis that shows what will be the impact of changing the major assumptions by equal amounts, in percentage terms. This allows us to determine which assumptions have the greatest impact on our forecast, and must therefore be thought out most carefully. It will also allow us to focus on the important model variables rather than getting lost among all model variables.
- Finally, to create a control panel, i.e. a one-page summary where we can change the most important assumptions and see immediately how this impacts on the KPIs of interest.

The importance of this step is to ensure that the proposed model is easy to read, easy to understand, easy to change, and simply easy to use. The way to make a model useful and readable is to keep it simple. The complexity of the transaction which has to be modelled and the complexity of the model itself are 2 different things.

1.3.3 Step 3: Designing and Building the Model

Designing and building the financial model is the next phase of the process. The specification phase (Step 2) should lay out the structure of the model in detail. In this step we first identify the *outputs* of the model. It is good practice to present the output of the model on a separate sheet. This output sheet is a combination of model inputs and formulae and should read directly from the *workings* sheet of the model. There may be more than one output sheet in case the resolution of step 1 requires the handling of uncertainty and creating sensitivity analyses. Moreover, the control panel described in the specification part of the modelling process, if any, is part of the output of the model. Next we build the *assumptions* sheet that forms the *inputs* to our model. If our model needs past data to build on, i.e. historic financial statements, we collect them and adjust them to the right level of detail. Depending on the problem we have to solve we will not need all of the income statement, balance sheet, and cash flow statement accounts, and thus some will need to be grouped together. Finally we

build the *workings* or *calculation sheets* and fill their cells with formulae. Thus, the sheets where the calculations are taking place should always be separate from both the input and the output sheets. Also no hard-coded values should be typed directly into the calculations of the workings sheet. In case the purpose of the model is to forecast future financial statements, all the relevant key drivers of the historic financial statements are calculated and forecast into the future. The forecast key drivers will make the building blocks of the future financial statements as we will see in Chapter 3 where we will build a financial model from scratch in order for the reader to grasp all the aforementioned abstract rules.

The following indicate best practices that will help you build models that are robust, easy to use, easy to understand, and painless to update. Best practices are of greatest concern when documents are used by more than one person:

- Use a modular design to divide your model into sections such as: Documentation, Data, Assumptions/Inputs, Workings, and Outputs, as we have already mentioned above. The first sheet of the model should serve as a user guide, step-by-step documentation as to how the model works. It may seem time-consuming, but it greatly increases the productivity of the whole team, and frees up time when, at a later stage, as you try to remember how you built the model, you will need to revise it.
- Always avoid hard-coding numbers into formulae and try to keep your formulae as short as possible. Always split complex formulae into multiple, simple steps.
- Use formatting for description rather than decoration. For example use different colour text for assumptions compared with formulae and output results. Use consistency in colours (e.g. blue for inputs) to highlight cells where data must be entered. When using more colours do not forget to add a legend explaining what each colour means. Always keep in mind the KISS principle: Keep It Simple Stupid.
- Present the data as clearly and in as uncluttered a form as possible. Always separate inputs into at least 3 columns, one with the particular inputs, the second describing the Units of Measure (UOM) of each input, and the last one with the values of each input.
- If you distribute your model to others, do protect it to prevent inadvertent changes. By default, anyone can change anything on any spreadsheet. To prevent unauthorized changes you should either protect your worksheets or your workbook as a whole. As a workbook owner you should always keep one copy of your original model in a directory that only you can change.
- Designate ownership and track who is changing what. If you decide not to prevent changes in your model then try at least to monitor them. To do so you can simply make use of the Track Changes tool in Excel 2010 and 2013. Microsoft's Track Changes function allows revisions to be made to a document and keeps a complete record of all changes made. Track Changes can be invaluable if you have created a business document and you distribute it to others to work with it.
- Design your worksheets to read from left to right and from top to bottom, like a European book. This is a common recommendation in the literature. Perhaps it is a remnant of paper-based documents, but it seems that following such a design does make spreadsheets easier to navigate and understand.
- Finally when incorporating charts in your model, always label the axes and use titles.

Although this is not a book on how to build good spreadsheets, the interested reader could visit the site of The European Spreadsheet Risks Interest Group – EuSpRIG¹⁰ where they can find plenty of information and research papers about spreadsheet best practices. Perhaps

one of the most important papers on this site is that of IBM – Spreadsheet Modelling Best Practice. This is a 100-page guide on how to develop high quality spreadsheets. This guide is of interest to anyone who relies on decisions from spreadsheet models. The techniques described include areas such as ensuring that the objectives of the model are clear, defining the calculations, good design practice, testing and understanding, and presenting the results from spreadsheet models.

1.3.4 Step 4: Checking the Model's Output

The model is not ready until we ensure that it produces the results it was designed to. Errors in the data or formulae could be costly, even devastating. The received wisdom is that about 5% of all formulae in spreadsheet models contain errors, and this rate is consistent across spreadsheets. Errors may occur at the functionality level, the logic level, the design level, etc. A simple way to check our model is to introduce checks directly in the forms. Some of these checks will be very generic and will therefore be included early. For example in case of a balance sheet the obvious check is the sum of assets vs the sum of equity and liabilities. In case of a cash flow statement the cash and cash equivalents at the beginning of a period should be equal to the cash and cash equivalents at the end of the previous period. Moreover the cash and cash equivalents at the end of a period should be the same as the cash account of the balance sheet of that period. Other checks will be more model-specific, and the need for them will not be obvious at the beginning – therefore, new checks will be included throughout the model building phase.

As a minimum, we can test our model subsequent to the building phase by playing with the inputs and see if this produces reasonable results (reasonableness tests). For example, if a formula is supposed to add a set of values then we can test it by providing known data, and checking that the answer is the expected one. Moreover we can change each of the input parameters and see if the output results change accordingly.

There is free textbook on Wikibooks (*Financial Modelling in Microsoft Excel/Testing*)¹¹ which provides a detailed checklist of the best practices on how to error-check a spreadsheet. From checking its functionality, i.e. whether the model does what it is supposed to do, to checking the business logic in the model. From identifying the risk factors, i.e. what could go wrong, and how serious that could be, to checking the inputs of the model and its calculations, i.e. examining all formula cells, where they read from, and where they feed their result to.

Of course there are error-checking tools that can make our life easier. Excel 2003 and later versions have a built-in error-checking tool. For example in Excel 2003 under the Tools menu, just select Error Checking. If the Excel Error Checking tool detects a possible error, it pops up a dialog box. This box gives several choices, which range from ignoring the warning to taking action. The more updated the version of Excel the better the error-checking tools that have been incorporated. However, the error-checking tools built into Excel are simple but limited. A number of more sophisticated error-checking products are available on the market.

1.4 EXCEL AS A TOOL OF MODELLING: CAPABILITIES AND LIMITATIONS

Microsoft Excel is the ideal tool for the kind of modelling covered in this book. Its immense popularity throughout the business world today for processing quantitative data and developing analytical solutions is widely acknowledged. One could argue that it is one of the most

powerful and most important software applications of all time. It would not be an exaggeration to claim that if civilization were about to vanish and somebody could pass future generations a single wonder of our time, this should be Excel. Excel is everywhere you look in the business world – especially in areas where people are handling numbers, such as marketing, business development, sales, and finance. In a 2011 study, Weiser Mazars found that Excel was the favorite tool of insurance finance and accounting. Teams relied heavily on Excel to compensate for shortcomings in the information flow. Most leaders they questioned did not have plans to change this process. Moreover, they found that 87% of companies rely on Excel in their planning, budgeting, and other performance management processes.¹² In a different survey performed by *gtnews* during 2014 in relation to the technology that Financial Planning and Analysis (FP&A) professionals are using, almost three-quarters (73%) of those surveyed indicated that Excel is still the primary tool they use in more than half of all their analytical work, even if they also have a standalone system.¹³

But while Excel is reasonably robust, the spreadsheets that people create with Excel are incredibly fragile. For starters, there is no way to trace where your data came from, there is no audit trail (so you can overwrite numbers and not realize it), and there is no easy way to test spreadsheets. The biggest problem is that anyone can create Excel spreadsheets – badly. Because it's so easy to use, the creation of even important spreadsheets is not restricted to people who understand programming and do it in a methodical, well-documented way. That is why one should be aware of Excel's limitations. Tim Worstall, a *Forbes* contributor, proclaimed recently in a *Forbes* article that "Microsoft's Excel Might Be The Most Dangerous Software on the Planet" after JP Morgan's loss of several billion dollars due to a spreadsheet error.¹⁴ Moreover, a *CFO.com* article states that the error rates in spreadsheets are huge; Excel will dutifully average the wrong data right down the line and there's no protection against that.¹⁵ Finally, an article entitled "Beware of the Spreadsheet" appeared in the international edition of *Accounting and Business*, in which David Parmenter argued that the use of large spreadsheets for reporting, forecasting, and planning should be abandoned because of their susceptibility to errors.¹⁶ Excel is a tool and as such its use should be underpinned by proper controls as we mentioned earlier in this chapter.

In this direction both the Switzerland-based Basel Committee on Banking Supervision (BCBS) and the Financial Services Authority (FSA) in the UK have recently made it clear that when relying on manual processes, desktop applications, or key internal data flow systems such as spreadsheets, banks and insurers should have effective controls in place that are consistently applied to manage risks around incorrect, false, or even fraudulent data. The citation by the BCBS is the first time that spreadsheet management has ever been specifically referenced at such a high level, a watermark in the approach to spreadsheet risk.

Readers of this book should bear in mind that, although Excel is an incredible tool and without it we would not have had the incredible financialization of the world economy over the past 30 years, errors can easily happen while trying to model real life situations. Proper controls put in place can minimize possible errors and prevent wrong decisions.

BIBLIOGRAPHY AND REFERENCES

1. Investopedia, <http://www.investopedia.com/terms/f/financialmodeling.asp>.
2. Moneyterms, <http://moneyterms.co.uk/financial-model/>.
3. Wikipedia, http://en.wikipedia.org/wiki/Financial_modeling.

4. Institute of Chartered Accountants in England and Wales (ICAEW) “Twenty principles for good spreadsheet practice”, June 2014, <http://www.icaew.com/home/technical/information-technology/excel/twenty-principles>.
5. The FAST Standard, <http://www.fast-standard.org/>.
6. The SMART Standard, Corality, <http://www.corality.com/financial-modelling/smart>.
7. Best Practice Spreadsheet Modeling Standards <http://www.bestpracticemodelling.com>.
8. Spreadsheet Standards Review Board-SSRB, <http://www.ssrp.org/>.
9. Juan Arangote, “Subjective Viewpoint. Financial Modeling: The math and art of painting the future today” (July/August 2014) 34(6) *AFP Exchange* 40–42, <http://www.afponline.org/exchange/>.
10. The European Spreadsheet Risks Interest Group – EuSpRIG, <http://www.eusprig.org/index.htm>.
11. WIKIBOOKS, http://en.wikibooks.org/wiki/Financial_Modelling_in_Microsoft_Excel/Testing.
12. Weiser Mazars, 2011, Insurance Finance Leadership Study, http://www.weisermazars.com/images/2011_Insurance_Finance_Leadership_Study.pdf.
13. 2014 gtnews FP&A Technology Survey, http://gtnews.afponline.org/Research/2014_gtnews_FP_A_Technology_Survey.html.
14. Tim Worstall, “Microsoft’s Excel Might Be The Most Dangerous Software on the Planet”, *Forbes*, 13 February 2013, <http://www.forbes.com/sites/timworstall/2013/02/13/microsofts-excel-might-be-the-most-dangerous-software-on-the-planet/>.
15. “Imagine there is no Excel”, CFO.COM, 18 January 2012, <http://ww2.cfo.com/analytics/2012/01/imagine-there-is-no-excel/>.
16. “Beware of the Spreadsheet”, *Accounting and Business International*, May 2014, http://issuu.com/acaglobal_publications/docs/ab_int_may14_comp_rgb.

