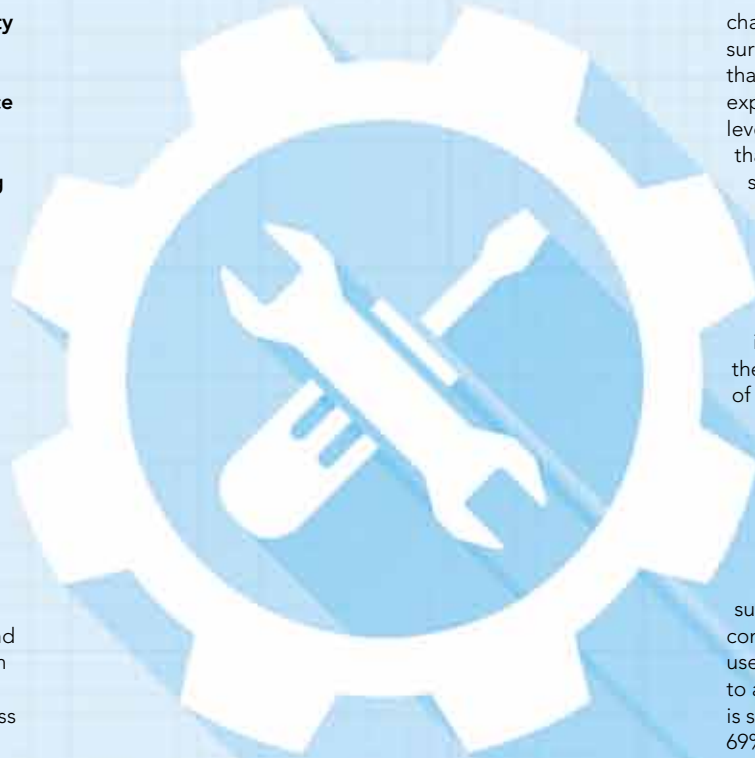


Tools for our times

Michael Samonas FCCA discusses the risk assessment tools that can be helpfully used in times of economic uncertainty and business volatility

The economic uncertainty and volatility of today's business environment highlights the importance of incorporating risk assessment tools into forecasting and planning processes (risk-adjusted forecasting). Senior financial professionals are rightly focused on how potential political and regulatory risks and competition could destabilise corporate performance as companies emerge from the prolonged economic downturn.

A risk survey conducted last year by the Association for Financial Professionals (AFP) in North America and consultancy Oliver Wyman reveals that organisations expect the current business environment to remain

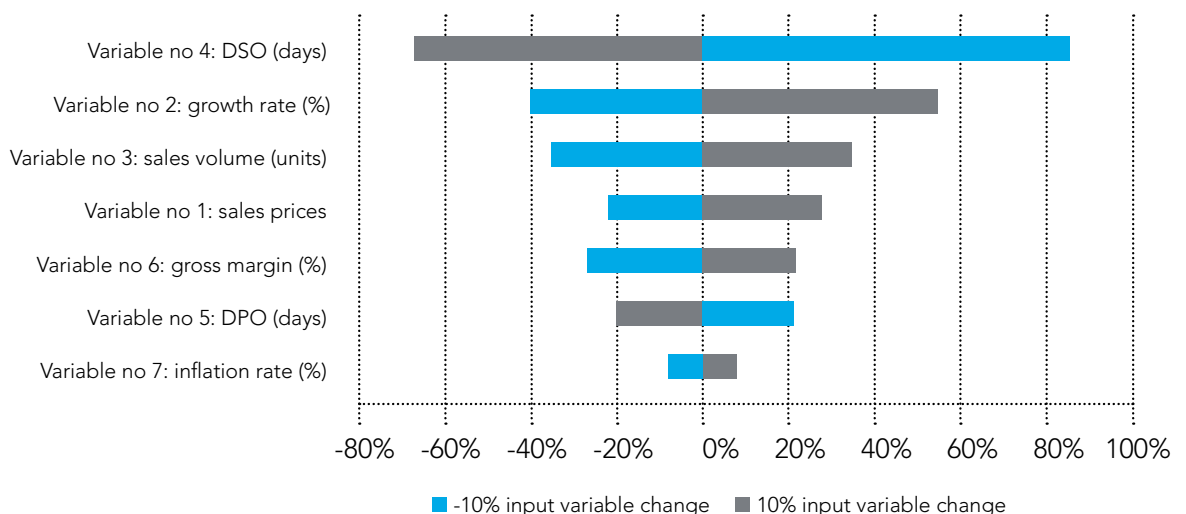


challenging. Some 84% of survey respondents report that their organisations are exposed to the same or higher levels of uncertainty today than three years ago. At the same time, the majority of the respondents believe their organisations need to bring their risk assessment and financial forecasting capabilities into alignment so that they can take advantage of strategic openings and differentiate themselves from their competitors.

But which risk assessment capabilities and tools are they referring to?

As far as the AFP risk survey is concerned, the most common risk assessment tool used by finance professionals to analyse business situations is scenario analysis (cited by 69% of all respondents), »

Tornado sensitivity chart: effect on operating cashflows of 10% change in input variables



These risk assessment tools can be easily incorporated into the financial planning process by the average Excel user

values of its inputs. It attempts to provide a ranking of the model inputs based on their relative contributions to model output variability and uncertainty.

Sensitivity analysis is a widely used technique that supports the decision-making process. It helps

followed by sensitivity analysis (64%). A far less utilised tool is Monte Carlo simulation (13%), although it is beginning to gain momentum.

The rest of this article will consider these three risk assessment tools.

Sensitivity analysis

The most basic risk assessment tool is sensitivity analysis, which examines the variation in output of a model with respect to changes in the

answer what-if questions by (a) selecting the most sensitive variables to change (the risk drivers), (b) assigning them a proper range of values, and (c) constructing either one-dimensional or two-dimensional sensitivity analysis tables.

The first step in this three-stage process is how to choose the right variables for effective sensitivity analysis – in most financial models there are a great many

variables. A very useful chart, which helps in presenting variables according to their relative importance in the model output is the so-called Tornado chart.

A Tornado chart is a pictorial representation of a sensitivity analysis of the model. It is obtained by changing each input variable at some consistent range (eg $\pm 10\%$ from the base case), one at a time, and comparing the output results to the base case.

For example, for a model built to forecast the operating cashflow of a company with, let's say, seven input variables, the Tornado chart will look like that in the graphic on the previous page.

It is obvious from this graphic that variable number 4 is the most critical one, followed by variable number 2. These two variables form the key risk drivers of operating cashflow and their impact can be further analysed through a two-dimensional data table.

As far as the second step (assigning a proper range of values) in the sensitivity analysis process is concerned, the best practice is to assign a symmetrical range around the base-case value of the variable of interest. In doing so, you should specify a range with an even number of entries where the median is the base case. The outcome of such an analysis should point out the combination of credit policy (days sales outstanding – DSO) and growth rate (%), which leads to negative operating cashflow. Every company should identify the worst case scenario and plan for it so that it is not taken by surprise.

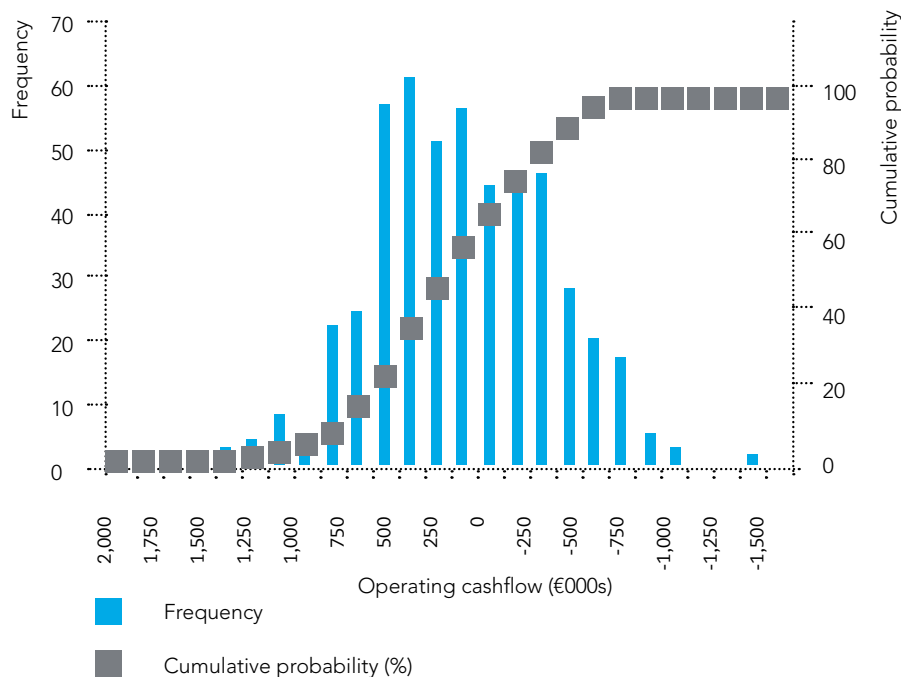
Scenario analysis

So far, sensitivity analysis has been a means of incorporating uncertainty and risk into financial models. While sensitivity analysis varies one or two key input variables in a financial model (ie DSO and growth rate), scenario analysis involves a reasonable combination of some or all of the input variables of a financial model and not just one or two. Scenario analysis is the strategic process of analysing decisions by considering many alternative possible outcomes or scenarios. In practice it does so by changing the input values of each alternative scenario and feeding them into the model of reference.

While both scenario and sensitivity analysis can be important components in determining possible future outcomes, only scenario analysis can address many different crucial factors affecting a model all at the same time. For example, a worst case scenario for the operating cashflow of the company could include:

- * increasing days sales outstanding due to financing drying up as a result of a liquidity crisis in

Monte Carlo analysis of top three input variables





the banking system of the country where the company operates (variable 4)

- * below-expectation sales growth due to an economic downturn (variable 2)
- * shrinking gross margin due to greater competition or discount specials or price reductions (variable 6)
- * unfavourable payment terms (days payable outstanding – DPO) to foreign suppliers due to rising sovereign risk of the country where the company operates (variable 5)

Monte Carlo simulation
Sensitivity analysis and scenario planning are good for assessing the effect of discrete risk, but provide little help when it comes to continuous risk. Monte Carlo simulation, on the other hand, provides a way of examining the consequences of continuous risk. To the extent that most

risks we face in the real world can generate hundreds of possible outcomes, a simulation can give a fuller picture of risk.

Monte Carlo simulation makes use of random numbers and probability distributions. It represents uncertainties by specifying model inputs as probability distributions and generates the model's output as a probability distribution rather than a single number.

Monte Carlo simulation has brought the world of scenarios into a new, scientific age by combining hundreds – and quite possibly thousands – of probability-weighted scenarios into one result.

The following series of steps are necessary for performing a Monte Carlo risk analysis output:

- 1 Identify the key risk drivers (input variables) that are critical to the output of the model.

- 2 Identify the probability distribution that each input variable, under analysis, is most likely to follow. For each probability distribution, supply the required parameters. For example, in a normal distribution, supply its mean and its standard deviation. A common question to ask is which probability distribution to choose for each variable and how to figure out its characteristic parameters. Such answers might be based on historic data, on opinions of management, on one's own subjective feelings about the future, or it might be a combination of all of these.

- 3 Create sampled inputs for the identified variables and perform simulation runs based on these inputs (recalculating the model for each sampled input). On each simulation run, a value from the relevant probability distribution is selected at random for each input, so that, over a large number of runs, the distribution of the selected values reflects the input probability distribution.

- 4 Present the model outputs graphically by building a histogram (a frequency distribution chart).
- 5 Statistically analyse the simulation runs. The probability distribution of the output of the model shows the likelihood of occurrence of all

modelled output values. In other words it presents in a graphical form the uncertainty that exists in the output value.

For example, a typical Monte Carlo analysis output for the model in the graphic on page 55 would look like that in the graphic on page 56. It is based on three input variables: sales volume, gross margin and days sales outstanding with the following probability distributions respectively:

- * a triangular distribution with most likely value, a minimum and a maximum
- * a uniform distribution with minimum and maximum
- * a normal distribution with mean and standard deviation.

The histogram shown in the graphic on page 56 can answer questions like 'What is the chance of the operating cashflow of the company being negative?' or 'What is the range of operating cashflow at a 95% confidence level?'

The above risk assessment tools can be easily incorporated into the financial planning process by the average Excel user. Even Monte Carlo simulation can be implemented by using a simple VBA code without the need for specialised software packages. Which tool or combination of tools you can use depends on the particular situation and the number of key risk variables that are involved. ■

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For more information:

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Read the 2014 AFP risk survey report at tinyurl.com/AFP-risksurvey

