Consider this possible situation - a prospective client has approached your firm about arranging the necessary funding for their renewable energy project. Working through their financing model, your standard practice would include generating 'what-if' scenarios around a number of key indicators. But perhaps this has caught you out in the past, and as a result you need to look 'deeper', as it were, investigating what happens when certain inputs to the deal you are trying to structure become volatile.

One such variable might be interest rates. What will changes in the forward curve do to your debt structure and financing plan? But we shouldn't stop there. What about changes to the swap rate over time? Both of these variables will directly affect your debt service coverage ratio, among other things. And what happens should the ratio rise to such a level that available free cash is insufficient for your needs? What is your cut-off point?

Again, single or double-factor scenario analysis may provide a glimpse of what may occur, but discounts the effect other project variables have on how you manage the project finance and thereby, the deal structure. Have you factored in exchange rate volatility across the multiple currencies in which the deal will be transacted? There is also possible variability in construction costs. Procurement delays and construction schedule variation will have an effect on your NPV/IRR. But how big an effect will it be?

Finally, just how probable are any or all of these scenarios? Is there any other way to evaluate the myriad changes you need to investigate so you can recommend a deal structure that is robust, effective and has a high confidence level?

The use of Monte Carlo methods and other sensitivity analysis tools such as tornado charts in a simulation environment allows you to see the likely outcomes to all the questions posed above. Each of the variables previously mentioned will fall within a range of values during the life of the project, rather than staying at a 'base-case' level or varying up or down homogenously by *x*% (which is what you get with standard 'deterministic' scenario analysis). This range (otherwise known as the distribution) for each variable is key, and the question the deal evaluation team must ask is quite simply "what's the distribution" for each of the variables?

Once you have designated (ideally from a large historical data source) the distribution for each variable, and also decided which outcome/model output you would like to see forecast as a result of sampling from these distributions, you can run a number of simulation trials.

These simulation trials are simply a matter of choosing, at random, a variable from each of your input distributions and calculating the model outputs such as NPV or IRR, to choose two of the most commonly employed metrics. The tricky part is you need to run several thousand of these trials - thankfully there are a number of excellent software packages in the market that perform this kind of analysis (Analytica uses Crystal Ball by Oracle) each with excellent reporting functions to show you the information you need to make better decisions.

But how many trials should you run? 500? 1000? The concept of mathematical convergence plays a part (don't worry, I won't be explaining it here), but what is important for your confidence levels is the number of trials you need to run to have a certain level of accuracy. There is a general rule of thumb for Monte Carlo simulations that they converge (to the mean of the total number of trials) at the rate of 1 divided by the square root of the number of trials you run. Far more simply put, if you want accuracy within approximately 5%, you need to run about 500 trials. If you prefer accuracy within 1%, you need 10,000 trials.

Completion of the simulation generates output distributions for your model forecasts, such as the example depicted below in Figure 1 (which are estimates of LCOE for a solar power plant). The key point here is there are numerous ways to look at the simulation outputs, with one of the more attractive being the probability of a particular outcome (NPV, IRR, etc) being achieved.

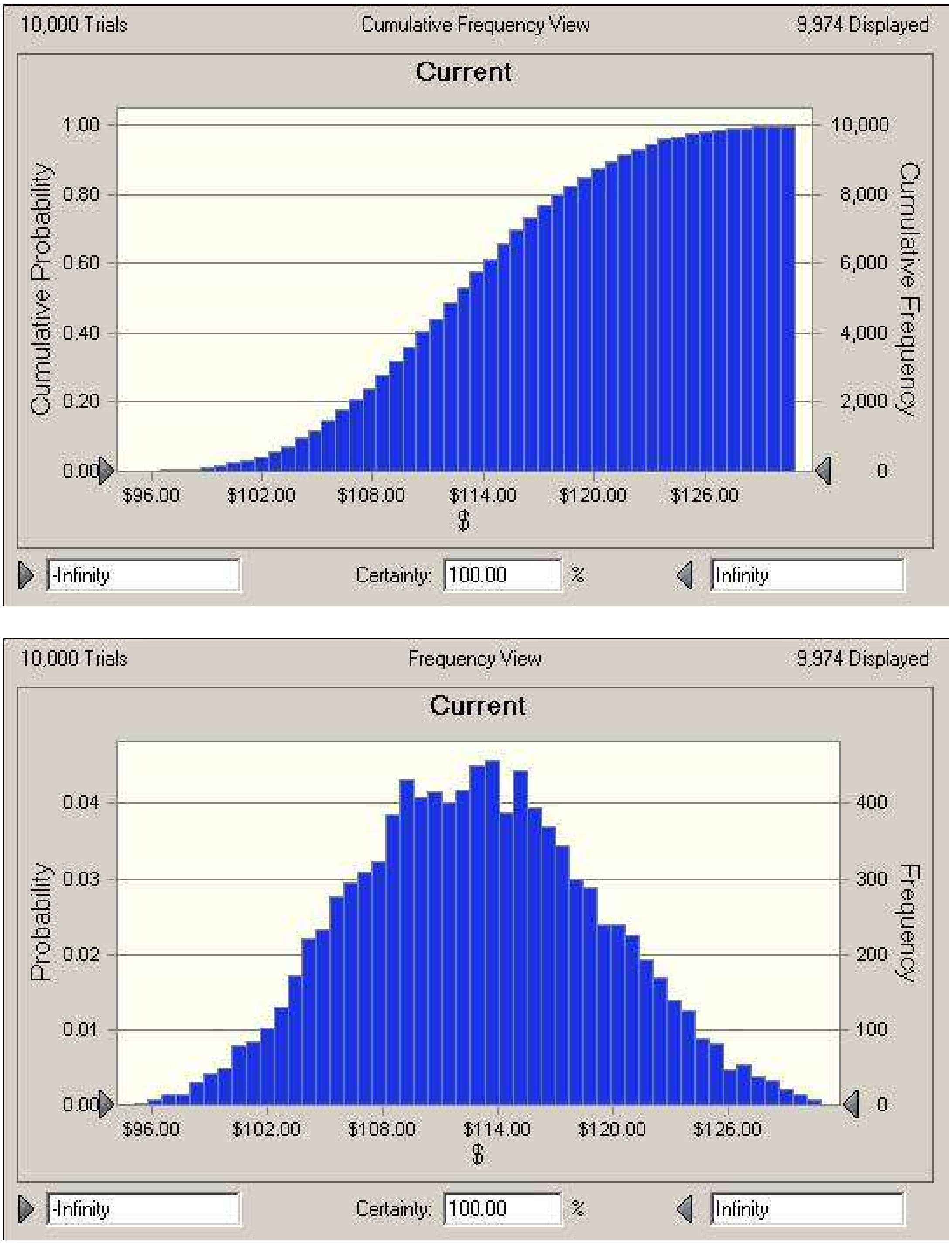

Figure 1. Output distributions

The main driver in all our work is the question of whether what is being proposed makes sense, is probable, and factors all likely sources of variability.

As you can easily imagine this approach can very quickly be applied to the actual project within the project management sphere, to model multiple inputs: multiple currency cash flows, suppliers in different countries, multiple deliveries, multiple dates, a lot of parts (BOM), many contractors, different stakeholders (company, regulators, suppliers, financial institutions, etc.), and project timelines.

Summary

Analytica has a proven record in both assessing the strength of project and business management systems and process in the face of uncertainty and risk, and providing bottom-up solutions that are applied, practice-based and dogma free.

Our best-practice-based, applied approach means we build solutions sensitive to a client's organisational culture that deliver the maximum impact on project and business profitability.

Because that's pretty well all we do, we have the time to do it properly.

For a more detailed discussion please contact:

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