Risk Integrated

ProjectFinance

With the global liquidity crunch showing no signs of abating, many lenders are questioning whether established project risk analysis methodologies provide sufficient detail. Could advanced cashflow simulation give project lenders the comfort they are looking for?

Dr. Peter Andresén, Risk Integrated **June 2008**

Untangling the risk

The global liquidity crunch, spawned by the US subprime crisis, has left investors struggling to raise debt finance for new projects and exposed the shortfalls in established techniques for assessing the risk of highly structured financial assets.

In addition, the inherent complexity of project finance and the constant evolution of new deal structures means that methods that have been trusted and tested on past deals may not be able to adequately assess the risk in structures that add new features or risk mitigation techniques.

Two standard approaches are currently used for assessing risk in project finance deals--cashflow stress testing and expert scorecards.

Traditional analysis

Cashflow analysis is based on very detailed deal-specific cashflow models. The cashflow model is used to compare the expected cashflows to the expected debt service for the project.

Traditionally, when structuring a new deal the cashflow model is first analyzed in the base case, i.e. under the set of conditions that best represent the expected future, to ensure that there are sufficient cashflows to support the financing structure. Then to assess the risk, the cashflow model is analyzed in one or more stressed conditions, i.e. the cashflows are compared to the debt service under adverse economical conditions. The typical way to conduct such a stress test is to displace one or two (macroeconomic) variables away from their forecasted values and determine whether the project defaults under those conditions. A typical question that may be answered through such an analysis is, "What happens if energy costs rise 20% and interest rates increase by 25 basis points?"

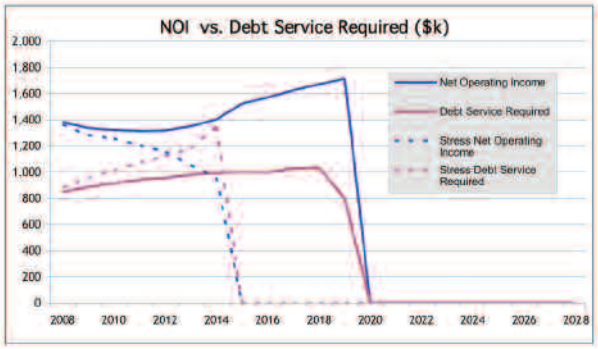
Expert scorecards on the other hand are built upon the experience and knowledge of experts within the field of project finance. These scorecards assign scores to different pre-determined characteristics and features of the deal. The inputs to the scorecard can be a mixture of financial information derived from the detailed scorecard analysis, as well as technical and historical experience with different types of projects, sponsors and risk mitigating structures. The final output from the scorecard is a weighted sum of the inputs. This weighted sum is the score for the deal and the score is then typically mapped to a credit rating.

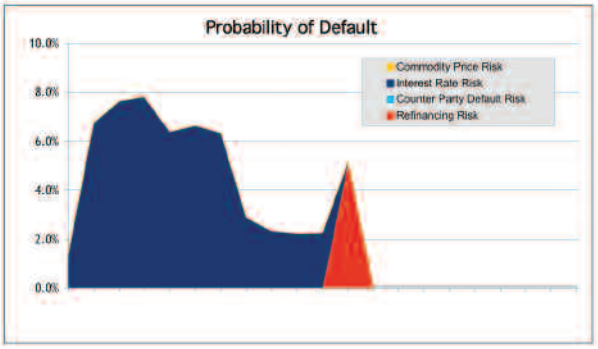
Both cashflow modeling and expert scorecards provide relatively static views of the risk within the deal, either by assessing the risk based on one or two specific stressed scenarios, or by relying on past historical experience with 'similar' projects.

Analysis shortfalls

From the perspective of assessing the risk for a single deal, these standard approaches have two significant shortfalls. Firstly, neither of the approaches takes into account the complexity of true economic conditions where multiple macroeconomic variables change simultaneously, often with intricate correlations. By altering the outlook for only one or two variables during a stress test, the knock-on effects of the changes on other project or economic variables are not captured. Furthermore, the displacement of the selected variables is often chosen to reflect what the experts consider to be a realistic, adverse scenario. However, in the stress testing approach, no measure exists to identify the probability of such a scenario occurring. Indeed, as the current crisis has shown, it is often very hard to anticipate what the true worst-case scenario would look like.

Figure 1





Secondly, both stress test analysis and scorecards only provide a very limited temporal resolution of the potential risks within the deal. The results obtained through the simple stress tests applied to the deal-specific cashflow model only gives a view of what could happen in one specific scenario. It pays no attention to the multitude of other adverse economic conditions that the project could encounter. Expert scorecards provide even less information as their only objective is to provide an overall assessment of the risk within the project. The risk identified through these methods only presents itself as a singular metric with all the intricate and complex mechanisms that are responsible for the risk all tangled up within.

Advanced cashflow simulation

To address these issues, new approaches for risk assessment must be employed. Advanced cashflow simulation is based on the concept of generating a stochastic macroeconomic scenario with standard deviations and correlations based on historical market data, and feeding this scenario into a cashflow model. By generating a large number (e.g., 1,000 or 10,000) of such stochastic macroeconomic scenarios and analyzing the cashflow model in each instance, results can be collected and analyzed in a statistical framework. As each scenario represents one plausible evolution of future economic conditions, it is possible to extensively explore and analyze the future performance of the deal under many complex circumstances.

This approach goes far beyond the standard stress test which only provides insight into a limited number of simplified variations of the expected future economic path. In particular, due to the correlations built into the macroeconomic scenarios, the effect is to analyze all possible results of the interaction of all the variables within the model. It effectively answers all possible "What if?" questions, such as: "What happens if oil prices fall, interest rates fall and CPI rises?" or, "What happens if oil prices fall, interest rates fall then rise and CPI rises?"

Additionally, advanced cashflow simulation naturally provides a very detailed temporal resolution of the risk along with its sources in the output of the annual probabilities of default. It is possible, when analyzing a graph of the annual probability of default, to clearly associate different peaks in the probability of default with specific deal features and events. The risk is no longer limited to being characterized by a single metric representing the overall risk of the project, but can be untangled and analyzed in its individual components for detailed deal structuring and risk mitigation. Figure 1 represents a simple illustration of this for a power generation project. It compares the results of a typical cashflows stress test with that of an advanced cashflow simulation. From the base case analysis comparing NOI with debt service, it appears that the project is healthy and is expected to end in 2019. From the stress test analysis – oil prices up 20% and interest rates increasing by 25 bps per year compared to the forecast (base case) – it is revealed that the project under these particular circumstances will default in 2014. However no information is provided as to with what probability this will happen.

By looking at the results of the advanced cashflow simulation, a lot more information is uncovered. First it is clear that the deal is not only vulnerable in year 2014, but that it faces a significant risk of defaulting throughout its first six years, and that this risk is due to the floating rate interest on the debt. Secondly, it shows the deal also has a considerable refinancing risk at the maturity of the debt.

Advanced cashflow insights

The temporal insights that advanced cashflow simulation can provide along with the untangling of the individual risk components that the project faces, allows deals to be structured in a way that would not be possible using traditional stress test analysis. For example, if we consider the results of the advanced cashflow simulation above, the lender might consider imposing an interest rate cap on the deal to mitigate the significant interest rate risk embedded within it.

Advanced cashflow simulation not only provides the means to quantify the different risk factors and their temporal impact within a project, but also provides the insight to identify, evaluate and price risk mitigating structures that can address these issues.

Figure 2 illustrates the analysis of the same deal as above, now with an interest rate cap imposed on it. As can be seen from the base case and stress scenario analysis, the overall risk of the deal appears to be almost identical to that of the deal without a cap. The deal still defaults in 2014 in the stress case, and there is therefore no apparent impact of introducing the interest rate cap. When we look at the results of the advanced cashflow simulation it becomes quite clear that the risk profile of the deal has changed dramatically. The interest rate risk has all but disappeared but a peak in the probability of default due to commodity prices has been revealed in 2014 (due to a supply agreement terminating that year). The refinancing risk at maturity is still present.

Since advanced cashflow simulation uses all available information about the deal, new deal features, structures, and agreements can easily be included in the analysis (e.g., covenants for reserve account, sweeps or equity lockup). Advanced cashflow simulation not only provides the means to quantify the different risk factors and their temporal impact within a project, but also provides the insight to identify, evaluate and price risk mitigating structures that can address these issues. ■

Figure 2