Real Options Valuation

Performing Due Diligence, Part 5

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ROV Technical Papers Series: Volume

Reading the Warning Signs in Real Options Analysis

In This Issue

1. Learn the key due diligence questions to ask or look out for in performing real options analysis

"What are the main due diligence issues to consider when performing real options analysis?"

Risk analysis is never complete without the analysis of real options. What are uncertainty and risk analyses good for if one cannot make use of them? Real options analysis looks at the flexibility of a project or management's ability to make midcourse corrections when uncertainty becomes resolved over time. At the outset, real options analysis looks like a very powerful analytical tool, but care should be taken when real options analysis is applied. For instance, consider the following issues.

1. Do Not Let Real Options Simply Overinflate the Value of a Project

One of the most significant criticisms of real options approaches is that of overinflating the value of a project. This criticism, of course, is false. Real options are applicable if and only if the following requirements are met: traditional financial analysis can be performed and models can be built; uncertainty exists; the same uncertainty drives value; management or the project has strategic options or flexibility to either take advantage of these uncertainties or to hedge them; and management must be credible in executing the relevant strategic options when they become optimal to do so, otherwise all the options in the world would be useless. Thus, an analyst should not simply apply real options analysis to every project that comes across his or her desk, but only to those that are appropriate and ripe for analysis.

An option will always bear a value greater than or equal to zero. Hence, critics argue that by applying real options analysis, a project's value will be artificially inflated. In reality, real options may sometimes appear without cost, but in most cases, firms need to pay to acquire these options (e.g., spending money to retrofit a refinery to obtain a switching option to choose between input fuels), and although the value of an option may be positive, its value can be clouded by the cost to obtain the option, making the entire strategy unprofitable and reducing the value of a project. So, although the value of an option is positive, the entire strategy's value may be negative. The lesson here is well learned—do not apply real options analysis to everything in sight, just to those projects that actually do have strategic options. Without doing so may mean leaving money on the table.

2. How Is Volatility Obtained and How Do You Reconcile Its Value?

Fifty percent of the value of a real options analysis is simply thinking about it and realizing that management has the flexibility to make midcourse corrections when uncertainty becomes resolved over time. Twenty-five percent is crunching the numbers, and the remaining twenty-five percent of the value in applying real options comes from being able to convince and explain the results to management. One of the toughest things to explain is the concept of where and how volatility is obtained. Volatility should be obtained from a project based on a project's level of uncertainty going forward. One major error is to use external market proxies for volatility. Using a firm's stock price to estimate volatility of a single project in a company with hundreds or even thousands of projects is not only incorrect, it is ludicrous. An analyst should hence be able to defend the choice of volatility estimates. See Johnathan Mun's *Real Options Analysis, Second Edition* (Wiley 2005) for details on converting volatility to probability, and explaining volatility to management in an easy to understand manner.

3. What About Competing Options or Options That Have Not Even Been Considered?

If a project has 10 strategic options, do you analyze all 10 options? What about projects in the distant future, where the options are not yet known for certain, that may be highly valuable? For a project with many options, the analyst has to determine which of these options are independent and which are interacting type options. If the options are interacting, dominant strategies will always dominate over less valuable options, and the value of the project's total

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set of options will revert to these dominant options. Thus, do not evaluate all the options in the world if only a few options capture a significant portion of the value. Focus instead on valuing those important or dominant options.

4. The Error of Interpretation of Option Results

Sometimes options come without a cost, while sometimes they do. On some occasions, option value is tangible or explicit, and sometimes option value is implicit or intangible.

> *Warning signs to watch out for in real options analysis and issues to explore include whether the real options analysis is applied inappropriately when there are no options such that the value of a project is inappropriately overinflated, how the volatility measure is obtained, if competing or omitted options appropriately considered, and whether the results are interpreted correctly.*

Reading the Warning Signs in Optimization Under Uncertainty

Finally, uncertainty and risk analyses are irrelevant if these quantified risks cannot be diversified away. Optimization looks at the ability to diversify away risks to find the best combination of projects subject to some prespecified constraints.

1. Why Are the Decision Variables the Decision Variables?

Decision variables are the variables that management has control over (e.g., which projects to execute, which product to manufacture, which vendors to purchase from, which wells to drill). However, sometimes things that are seemingly decision variables at the outset may not exactly be decision variables. For instance, the CEO's pet project is definitely a "go" decision no matter what the analytical results. The internal politics involved in decision making is something that cannot be taken lightly. Decision variables in an optimization analysis should most certainly be decision variables, not decisions that have already been made with the façade that their existence still has to be justified. Finally, certain decision variables are related to other decision variables and this interaction must be considered. For instance, Project A is a precursor to Projects B, C, and D; however, Project C cannot be executed if project B is executed, and Project C is a precursor to Project D.

2. How Certain Are the Optimization Results?

Has the analyst looked at enough combinations to obtain the optimal results? In static optimization without simulation, whether it is using ***Risk Simulator***, Excel's goal seek, or Excel's Solver add-in, the optimal solution will be found, if there is one, rather quickly, as the computer can calculate all possible combinations and permutations of inputs to yield the optimal results. However, in optimization under uncertainty, the process will take much longer and the results may not achieve optimality quickly. Even if the results do seem to be optimal, it is hard to tell, thus, it is safer to run the simulation much longer than required. An impatient analyst may fall into the trap of not running sufficient simulation trials to obtain robust stochastic or dynamic optimization results.

3. What Is the Analyst's Level of Training?

Little knowledge of probability will lead to more dangerous conclusions than no knowledge at all. Knowledge and experience together will prove to be an impressive combination, especially when dealing with advanced analytics. Almost always, the first step in getting more advanced analytics accepted and rolled out corporate-wide is to have a group of in-house experts trained in both the art and science of advanced analytics. Without a solid foundation, plans on rolling out these analytics will fail miserably.

> *Warning signs to watch out for in an optimization under uncertainty and issues to explore include whether the decision variables are indeed decisions to be made, what the levels of certainty of the results are, and the level of training of the analyst.*