

Proposed Methodology for Valuing Start-up or Research Companies

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Abstract

This paper suggests a simple process for valuing the acquisition of start-ups or research companies by an Energy Company. It provides a conceptual basis for the correct evaluation of these important assets.

The method is conceptually sophisticated, and correctly represents the best available thinking on valuing this class of assets.

The merit of the proposed procedure is that it provides the information needed by senior management, in a form intended to be transparent and acceptable to decision-makers.

Introduction

Energy Companies are more and more challenged by the need, and also the opportunity, to innovate in the way in which they do business. Technological change is one of the main drivers for this. Historically, Energy Companies have always been very pro-active in research and development activities. Nonetheless these fundamental in-house efforts now do not seem sufficient, on their own, to support a successful business performance. One of the reasons for this is that in-house efforts do not allow the necessary flexibility in an ever changing business environment.

A possible solution is to complement in-house activities by actively monitoring new technologies available on the market, thus scouting and selecting existing investment opportunities in Start-up or Research Companies. A standardized methodology is therefore needed to evaluate different business opportunities and to select the best ones for the Energy Company. Once a promising idea has been identified, an Energy Company has all the expertise and know-how to evaluate the success probability, the business size, and the costs to build, for example, the industrial facilities to develop it. However, the return on operations is not the only value Energy Companies should be interested in, and investments in technological capabilities should not be confused with venture capitalism. Acquiring new technologies should also maximize the value of the Company's core businesses, while making it more flexible. The problem obviously requires a new evaluation approach.

Importance of Valuing and Acquiring Start-up and Research Companies

Major companies should always be looking to acquire appropriate start-up or research companies. Appropriately, this is common practice among the best, world-class companies.

There are several major reasons why this policy benefits major companies:

- It reduces risk. The major company avoids the need to invest in the most risky, basic research, and can instead focus on ideas that have already demonstrated preliminary success.

- It provides access to new ideas. As any corporate research group inevitably develops special expertise in specific areas and activities, it also develops “blind spots” to various new ideas that may be desirable. These can be obtained by buying promising new groups – which is a way to recruit effective innovative teams within the company.
- The new technologies provide valuable options on future developments. They position the company to have access to new products and processes if they are needed, but do not commit the company to major investments until there is a proven market or use.

These concepts are widely documented through extensive reports by professionals expert in the area.

Concepts for Valuing Start-up and Research Companies

Start-up and Research opportunities should be valued as options – not by the traditional Net Present Value (NPV) or Discounted Cash Flow (DCF). This is fundamental. The truth of this perspective has been widely documented by economic and finance research and practice.

For a major company, acquiring a start-up is conceptually equivalent to buying a financial option:

- For a relatively small price (compared to an investment in full development), the major company gets the “right but not the obligation” to invest in later stage development in case the circumstances are favorable. This is equivalent to buying an option on the stock market, where the price to acquire an option on an asset is much less than the cost of the asset itself.
- If the circumstances are favorable, the option may be immensely valuable, and the major company can invest further to develop the asset. This is equivalent to exercising the option by paying the “strike price” to acquire the full asset. This strike price is generally expensive – but is undertaken only when the gain is known to be very much more, and is almost without risk.
- If the circumstances are not favorable, the major company does not go into full development, and loses nothing further than the relatively small cost of buying and maintaining the option. Again, this is equivalent to letting a financial option expire if it is never in the money and worth exercising.

In the sense described above, acquiring a start-up is an option in the same way that a lease on a potential petroleum reserve is an option. This analogy has been widely examined in the economic and petroleum industry. Indeed, the value of a lease on a potential field is evidently very different from its discounted cash flow – since a potential field has little if any cash flow.

The important point is that start-up and research companies should be valued as options.

Option Valuation of Start-up Enterprises

Major operating and production companies should not value start-ups and research enterprises using the traditional tools of financial analysis (such as the Black-Scholes approach and its derivatives, or the various lattice formulations). This is a fundamental point that is often missed by analysts who are not familiar with the technical operations.

The reason the well-known financial approaches are not appropriate is simply that they are based on assumptions that do not apply to the situation of a major operating company. In particular, the traditional financial options analysis assumes that:

- Options are traded (and thus valued) in a “perfect market”, that is, one in which no participant has any special knowledge or advantage, and that fluctuations in the value of the asset are governed by random processes. This assumption obviously does not apply to the market for new technologies, because major companies do have special knowledge about what they need, and have special ways they could use the asset (i.e. new technologies). Thus a company does have “insider information” and consequently the perfect market assumption is not valid.

- In a standard financial market the volatility of an asset can be known, for example from the record of trades over the last 3 months. On the other hand there is no record of volatility for a Start-up or a Research Company that has never been in business.
- While over the short time in which financial options are mostly traded (3 and 6 months, for example) it is reasonable to assume that volatility is constant, this assumption is not valid over a longer term, especially in the case of a constantly evolving technology, under the pressure of market driving forces.
- The volatility process is “path independent”, that is, future conditions do not depend on the history of how a company got to where it is at present. Again, this is an assumption that may be valid in perfect markets that evolve randomly and independently, but it is not valid for the operation of major enterprises. The fact is that senior managers react to changing conditions, the state at which they are in at any time depends very much on their previous decisions (to open, close or alter a facility, for example).

In short, a major company needs to value Start-up companies that it could acquire into its business under the above considerations. The proper valuation should therefore be:

- As options, but
- Using a process different from the traditional financial analysis, that does not apply.

Proposed Method to value Start-ups and Research Companies

The proposed method is a process that provides a check-list of important information that should be included in a proposal to top management, such as that prepared for the Ford Motor Company (de Neufville and Neely, 2001).

The process includes an important set of financial calculations, but these are only part of the process. It features a transparent decision analysis, coupled with a financial options analysis -- to the extent this may be appropriate. This part of the process is called a “hybrid real options analysis” – hybrid because it combines methods, applying each one only where it is relevant to do so.

The process goes through these steps:

1. **Verify the technical promise** of the proposed start-up – this is crucial as the information available is often biased or otherwise misleading.
2. **Define the Technical Gap** this technology fills within the acquiring company, that is, what are the specific capabilities this technology will provide, which the company does not have, and anticipates that it will need. This is what will make the acquisition particularly valuable – and will give the company a reason to pay the winning price to acquire the target company. [If there is no such gap, then perhaps the company should not have a special interest in the start-up.]
3. **Identify the major scenarios that give value to this option.** Investment in a start-up, as in any other option, should be done with a recognition of the circumstances that will make the option valuable and worthy of further investment.
4. **Quantify the probabilities** associated with these scenarios. In other words, how likely is it that the new technology will succeed technically, and that it will also be economically worthwhile for the acquiring company? [The main problem being that many technical successes ultimately have no value, because the economic environment or the technological context has changed.]
5. **Quantify the financial benefits and costs** associated with each of the important scenarios. This consists of the standard financial analysis (Net Present Value or Discounted Cash Flow) for these situations, calculated according to the standard process for the company.
6. **Include the financial option evaluation if and where appropriate.** To the extent that any of the scenarios results in the production of assets that are traded commercially, it may be possible to calculate and use a standard financial options analysis for these portions. However for many technological assets, such circumstances will not arise.

7. **Do the Decision Analysis for the Scenarios.** This step combines the data in Steps 3 to 6. It essentially evaluates the expected value of the possible decisions that management could take with company to be acquired.

It is important to note that the result of this process differs fundamentally from the standard financial analysis. This is because the standard analysis assumes a single cash flow. In actuality, however, and as represented by this procedure, management will make decisions at key points about whether, and to what degree, to put more money in the company acquired. These possibilities lead to multiple possible cash flows, starting at different times.

The end result of this evaluation is also, correctly, higher than that obtained from a similar standard Net Present Value or Discounted Cash Flow analysis. This is because the process recognizes that management makes rational decisions, such as to close a process if it is not working out, and to exploit the option when circumstances are favorable. A standard cash flow analysis is in fact unable to recognize flexibility.

The results of this process can conveniently be summarized for management decision in a table in one page, supported by relevant documentation as an appendix. For example, the Table can include such items as the:

- Expected Net Present Value, that is the average return
- Initial cost or Capex (Capital Expenditure)
- Minimum possible gain (or the maximum possible loss)
- "value at risk or gain" which are standard economic measures for projects
- Maximum possible gain, which is often the point of the exercise

As indicated by work at MIT (for example by Hassan et al, 2005) such a table provides management with a convenient and comprehensive perspective on the decision that could be taken about acquiring a start-up or research company.

References

[Hybrid Real Options Valuation of Risky Product Development Projects](#)

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