THE VALUATION OF INTERNET COMPANIES: THE REAL OPTIONS APPROACH

Jyoti Gupta[1]
Alain Chevalier[2]

Abstract

The valuation of a company is difficult, even for companies which evolve in a well-known, mature industry. The problem is far more comple , when the firm is a new born start-up company, where the traditional methods based on future free cash flows are difficult to apply, given the difficulties of estimating the future cash flows. In addition, with the start up companies, we are confronted with a total lack of appropriate benchmarks. This is true for the internet companies where there is no universally acceptable method in financial theory. The problem is the valuation of uncertainty associated with the level of economic activity. Several approaches are used, including the concept of EVA (Economic Value Added) or Economic Profit, where certain modifications could be made in the evaluation of EVA. We propose in this paper the approach based on real options which are particularly suitable for valuation of uncertainty. The paper takes the case of a real internet company to illustrate the approach, and highlights the difficulties which are encountered. The paper is divided in six sections, the second section after the initial introduction discusses the traditional methods of valuation of companies. The methods discussed include: approaches based on benchmarking, the present value of Economic Value Added (EVA), the discounted value of the future Free cash Flows. The limits of these methods have also been discussed. The second chapter describes briefly the theory of Real options, and how it can be used to value companies. The stress is on the problems related to valuing uncertainty. The key issue in the valuing of internet or new economy companies is the uncertainty of the future cash flows that these companies are likely to generate , as the economic and technological environment in which these firms operate are subject to rapid changes which are difficult to predict. The third section highlights the issues related to the identification of the embedded real options in the firm's business plan. We underline the importance for the analyst to understand the sector in which the firm operates and also the likely changes that could take place in the technological options of the firm. In the fourth section the real options approach is used to value two internet companies. The different parameters that need to be estimated for using the real options method, are indicated. We also discussed how we identify the embedded options. In the last section we discuss the difficulties that are likely to be encountered and also the limits from a theoretical point of view of the real options method.

Key Words: Valuation, Internet companies, Eva, Real Options, New Economy Companies.

[1] Corresponding Author: Jyoti Gupta, ESCP-EAP, 79 Avenue de la République ; 75543 Paris Cedex 11

Telephone 33 1 49 23 22 94 ; Fax 33 1 49 23 20 80, email gupta@escp-eap.net

[2] Corresponding Author: Alain Chevalier, ESCP-EAP, 79 Avenue de la République ; 75543 Paris Cedex 11

Telephone 33 1 49 23 20 71 ; Fax 33 1 49 23 20 36, email chevalier@escp-eap.net

1. Introduction

Over the past few years, the internet has bought a wave of new entrepreneurs who created companies that tried to take advantage of the new possibilities created by the web. A significant number of these newly created companies went for IPOs, and some of these entrepreneurs made a lot of money, as the share prices soared to astronomical prices, sometimes they were multiplied by 1000. Then in May 2001, the crash came and the prices of shares tumbled, in other words, there was a market correction. Where these companies overvalued, was the level of market correction justified? These questions have yet to find a proper response among the Academics and practitioners. Both are at a loss to value these new start-up companies, as there is no universally recognised practice in financial theory to value these new economy companies. There is however, a general agreement that the traditional valuation tools are not adopted for these companies. These models do not fit the specific characteristics, of the new economy. The traditional valuation techniques are not able to quantify the worth of internet initiatives. The root of the problem is that the static valuation methods tend to undervalue investments made under uncertainty. Internet initiatives are characterised by; uncertainty of outcomes, high investments and the risk of loosing everything is real, at the same time the potential upside is huge. Therefore any valuation technique which ignores the value of uncertainty, does not capture the real worth of these companies at a particular point in time. One should however realise that as the uncertainties become certainties the market corrections are likely to be severe. The theory of real options has been put forward as a serious alternative to traditional methods for the valuation of internet companies. Real options recognise that today's investments in projects give the investors the choice of pursuing further investments later if the climate appears to be favourable, or abandoning the investment if the economic environment is not suitable thus limit the losses, but at the same time keep the doors open. The objective of this article is to look at the suitability of the real option approach to evaluating internet companies, and to highlight the problems associated with this approach from a conceptual and practical point of view. An attempt has been made to use the real options approach to value a real internet company.

2. Characteristics of new economy

What is new about new economy or the internet economy? Does it modify the laws of economics? These questions need to be answered before new theories can be developed for the valuation of internet companies. During the early 1990s, several firms were launched with business models based on the idea of connecting customers to internet. In the second phase, which dates to around 1997, which coincided with faster transmission rates and made it possible for firms to get interconnected and thus reduce costs by connecting customers, suppliers and other partners. Originally, the internet companies started as dot. Coms or pure play click companies and dominated the news, captivated the venture capitalists and investment bankers even though they lacked profits or any business model. This explains the serious market correction of the prices of the shares of the listed internet companies in the early 2001. The stock market is demanding that the internet companies deliver profits and cash flows. In fact what happened is that the market is not convinced of the business model of the dot.com companies. The market wants these companies to explain clearly what business they are in and what are their products. The original valuation included an enormous premium for the future growth, and when the market perceived that this growth will never be attained under the existing business model the growth premium just disappeared. The internet economy is no longer limited to dot.com companies. Advances in data compression and broad band transmission, the web protocol for networks, and software are creating enormous opportunities and risks for the internet companies. This is also true for traditional old economy firms, who have the possibility to integrate these new technologies in their business model, that can use the internet to connect more effectively with customers, suppliers and other partners. This in term could lead to the improvement in productivity, increase market share and develop new products and compete more effectively in new areas of business. The problem is of course, the uncertainty. The technology is evolving rapidly, old economy companies are changing their strategy and integrating web concept in their business models and thus adding a new dimension in the economic environment. Only those firms which are capable of using successfully, the new leverage of web technology in their business model will come out to be the winners. This is where the uncertainty lies. The valuation of the firm should take into account the potential of this leverage. This could be done by integrating the value of this uncertainty either in the traditional model, or make an explicit valuation using the theory of real options. The firm usually develop a business plan, which projects the firm, its organisation and its products, the customer base into the future. In a competitive market, very few firms will devise a detailed plan and hope to adhere to it. Most firms will start with a business plan and then start to follow it. As soon as they start to move along the path, they begin learning about the technological evolution, the competitors' action, the opportunities for getting into new areas etc. The future action, therefore should take into account the lessons learned. This is of course true for most firms, but for new economy companies it is vital. The traditional methods of valuation which are based on discounted value of free cash flows or bench marking are not able to capture the value of the flexibility. This of course does not mean that the traditional methods of valuation are obsolete, in fact the reality is far from it. The financial analyst will continue to use these methods, and as such the market value of firms will continue to be influenced by these methods. We should not forget that the market value is based on supply and demand, and these are based on market expectations, which in turn are influenced by what the financial analyst report. This explains, to a large extent the extreme overvaluation of the dot.com companies.

3. Traditional valuation methods
3.1. The DCF method

The discounted cash flow analysis is one of the most commonly used method for valuation of firms. The free cash flow for every period in the future is estimated, based on the most likely scenario. The free cash flow takes into account the operational cash flows, investments in fixed and tangible assets, the investments in working capital. These cash flows are then discounted at an appropriate discount rate based on the cost of capital of the firm. One of the big advantages of the DCF approach is that the present values are additive. The firm can therefore be considered as a portfolio of different activities, and the value of the firm is the sum total of the present values of all the projects in which the firm has invested. The procedure gives the total company value i.e. the market value of all the assets and to get the market value of equity on has to subtract from the total value the present value of the debts. The main advantage of the DCF method is that it estimates the value of the firm based on its future cash-flows and therefore ignores, in principle, the prevailing market sentiments. However, the DCF model, assumes that the future evolution of the firm is known with certainty. The future cash-flows are estimated based on a few basic assumptions about the company's future performance. In addition, the DCF model is particularly sensitive to two parameters: namely, the time horizon and the discount rate. The expression illustrates the procedure for valuing the firm. All the parameters are supposed to be known.

$$V = \sum_{t=1}^{t=N} \frac{FCC_t}{(1+WACC)^t} + \frac{CV}{(1+WACC)^N}$$

FCC= Free cash Flow
CV= Continuing Value
WACC= Weighted Average Cost of capital
V= Total value of the firm
N= Horizon Period

Horizon values

When performing a valuation, one makes explicit forecasts for a limited number of years only and accounts for the time after that with a horizon value. The future is thus divided into two periods: the explicit forecast period , called the time horizon and the infinite future after the horizon period. The value corresponding to the infinite future period is called the continuing value. The continuing value formulas requires that the company is expected to settle down to steady state after the explicit forecast period. Continuing value (also called terminal value) estimation, thus requires very strong hypotheses about the company's forecasted financial performance. This assumption is far too strong for a new economy company.

Discount Rate

The discount rate should take into account the risk associated with the cash-flow stream. In the Free cash-flow method, the total cash-flow to the firm is used and therefore the discount rate should be the cost of capital of the firm. In the case of relatively stable firms, the cost of capital is easy to estimate, as the firms' capital structure is well established. In addition, the risk associated with each type of funding used by the firm is also fairly well known, given that there is track record of the firms' performance.

This is not true for new economy companies. It is extremely difficult to make a proper estimate of the cost of equity. Enormous differences could exist between the different analysts.

3.2. Economic Value Added (EVA)

The concept was proposed and patented by Stern Stewart & Co. EVA is a good indicator of the sustainability of the company's business model. The EVA measures the value created by a firm over a period of time. It can be estimated as follows:

EVA= NOPAT- Capital Charge

Value = Capital + PV(EVA)

Where *NOPAT* represents the Net Operating profit of the firm after tax. The capital charge takes into account the total cost of funds. It is equal to the cost of capital multiplied by the capital invested. The trouble with EVA, is that, it simply assesses the past performance of the company, rather than the future opportunities. It is therefore not suitable for the valuation of internet companies, which still have everything to prove in terms of economic performance. Economic Value Added also misses the value of flexibility enjoyed by the firm in terms of strategic decisions. The essential value of the internet companies resides in their ability to transform the potential offered by the technology into cash flow and therefore they can outperform large profitable companies with little or no profits.

The critisisms made against the Free Cash flow method is also valid for the EVA method. How can an analyst estimate the future values of EVA?

The big advantage of the EVA method is that it enables analysts to think in terms of the potential of value creation of the firm rather in term of cash flows. Many successful companies invest heavily in order to grow, which results in negative cash flow. In the case of internet companies a significant proportion of this investments are in marketing, Research and Development and Human Capital. In the traditional methods, these expenses are shown as operating costs, whereas, in EVA method, these expenses can shown as capital expenses, thus affect the capital charge rather than the profits. This approach is very helpful to value internet stocks, as most of these companies do not generate profits, let alone enough profits which enables them to cover the capital charge.

Stern and Stewart propose a variation of the basic EVA model which captures better the economic environment of the new economy companies. According to this approach, the EVA has two components. The first is simply the first is simply the present value of the EVA, in the case EVA is repeated forever. This is calculated as the current EVA divided by the cost of capital. When this is added to the capital base, one can see what would be the worth of the company if the market anticipates that the current performance will be repeated forever. This is called the current operations value.

The second component of EVA is the present value of the expected improvements in EVA and therefore represents the future growth value. For companies where a substantial value of the firm is attributed to the future growth value, it is recommended that the analysts carry out a detailed analysis of the components of the future growth value. It appears that the majority of the internet companies the major portion of the current valuation is in the future growth value. The valuation approach of the modified version of the EVA method can therefore be summarised as follows:

$$Value = Capital + PV(EVA)$$

$$Value = Capital + EVA\!\!\Big/\!\!_c + PV \text{ (Expected Improvement)}$$

Value = Current Operations Value + Future Growth Value

Where 'c' represents the cost of capital of the firm.

There are three sources of Future Growth Value.

Firstly, the expected growth in performance from the existing products, which is called the T1 value. The second is the expected contribution from the products which are currently in development or those products which are just being released, but not yet tested in the market. This is denominated as T2 value. Finally, there are products which the company has yet to identify but would depend upon the technological evolution and the changes that are likely to take place in the foreseeable future. This is the value that investors are willing to assign to a company to recognise that there is some probability that a successful team will come with new ideas in the future. The last segment is called the T3 value.

In principle this approach seems to be most appropriate for the valuation of the internet companies. None the less, the T3 component seems to be the major element, if one looks at the market valuation of the internet companies, and it is extremely difficult to assess what new products are likely to be developed in 6-8 years time, and more specifically what would be the demand for these products. In reality, the ability to come out with new ideas depends upon the human capital of the company. In other words, valuing T3 is the same as valuing the human capital of the firm. We all know that the human capital is not necessarily fixed.

We should however, underline that this approach is based on the principle of putting a value to uncertainty.

3.3. The methods based on Multiples

The second category of methods, which are commonly used by financial analysts, are to use comparable benchmarks. Here the approach is to find companies that are similar to the company to be evaluated, and assume that if both companies are comparable in terms of activities and future profile, then they should have roughly the same value, if they have the same size. The most obvious difficulty encountered in using this valuation method, is that no two companies are the same. Even if the business model is the same, there could be significant differences in the competitive environment, the maturity of the home market may be different. It is thus very difficult to determine the correcting factor to be applied to take into account the specific characteristics of the firm.

There are a number benchmarks, the financial analysts use to value companies. The most widely used benchmark is the P/E (Price Earning) Ratio. This method is not applicable to the internet companies, as most of them are at a stage where they are not profitable. What is more, some internet companies have reached sky-high market capitalisation without ever making profits (Amazon.com, with a market value of $ 6.4 billion on January 17, 2001 with a negative P/E ratio is an example of the non relevance of this method).

Other commonly used multiples used are

Value/EBIT, where EBIT corresponds to the Earnings before interests and taxes.

Value/EBITDA, where EBITDA is the Earnings before interests, taxes, depreciation and amortisation.

These methods are based on the assumption that the income generated by a firm is the main driver of the firm's value and therefore companies with similar net income are likely to have similar market values.
Several other multiples have been developed by analysts:

Value/turnover

Value/turnover weighted by growth of revenues: this takes into account that most internet companies have a cost structure with relatively high fixed costs with respect to their variable costs, every dollar made above a certain threshold turns into profit.

Multiples based on number of visitors to the site, numbers of buyers or subscribers.

Multiples based on the number of visitors were specifically developed by the analysts to value internet companies. Such indicators can prove to be useful, because they take into account the company's brand name, which is an important criteria when valuing an internet company. Indeed, the first step for a start up company is to become known and acquire visibility in the market. The second step is to visitors into actual customers. Without customers, the firm cannot generate cash flow or profits.
The major problem encountered by analysts, in the case of the new economy companies is how to forecast the economic performance.

4. Real Options Approach

As an alternative to methods indicated above, the approach based on Real Options has been proposed for the valuation new economy companies. The idea behind the use of real options is the assumption that this method captures the value of uncertainty associated with the new economy companies. The real option theory, is an extension of the traditional options traded in the financial markets and the decision tree approach. The decision tree approach involves constructing a tree, which represents all the possible situations that can occur and the decisions that the management can take to respond to the situation. The analyst estimates the cash flow related to each situation and the probability associated with each situation which gives the expected cash flow. The value of the investment is then determined by calculating the present value using a discount rate which is usually the weighted average cost of capital. In other words, in the decision tree no adjustment is made in the discount rate to take into account, the changing level of risk. In the new economy companies, the value of the uncertainty depends upon the importance of the uncertainty to give an additional value or the growth component of the value of the firm. Traditional decision tree analysis using the constant cost capital can therefore, lead to over valuation or under valuation. First let us look at what is meant by real options.

The real options approach is an extension of the financial options theory for managing real assets. It takes into account the value of options that are embedded in an investment project. The future outcome of all real investments are uncertain, but most of them give the possibility of future payoffs in return for further fixed investments, but without any obligation to invest. It is therefore better suited to star ups: strategic investments whose returns are subject to high degree of uncertainty, often large capital investments and more importantly, the projects that must adapt to rapidly evolving conditions. This approach is fundamentally different from the DCF approach, at least on one point, i.e. the impact of uncertainty on the value of the investment. The DCF approach tends to penalise firms whose future outlook is uncertain, whereas, in the case of option theory, higher the volatility of the underlying asset, higher the value of the option. Therefore, the real options approach, makes uncertainty not a dangerous parameter to avoid, but as something which creates opportunities as such contributes to value creation. The real options approach can be used to evaluate investment projects, refocus firm's strategic positioning to take advantage of the underlying uncertainty and to value firms which are operating in a highly uncertain economical and technological environment, and where the track record cannot be used to project the future. The real options can be classified into the following categories: wait to invest options, growth options, flexibility options, exit options and learning options. Most of these options enables the analyst to capture the problems associated with uncertainty. Is the real options approach a panache for all valuation problems or are they suitable only under certain conditions, in our opinion the added value of real options approach is justified when:

> ➢ The firm evolves in a very uncertain environment
> ➢ There is a contingent decision to make, which makes the value of the firm highly dependant on the firms' ability to respond favourably to the opportunities opened to the firm, either through their internal break-through or the market potential. In this case, the value of the firm is captured in the value of the growth option.

The financial models for valuing financial options can also be used for real options. There are basically two approaches for valuing financial options; the binomial model and the Black & scholes model. The valuation models are based on the assumption that a riskless portfolio can be created using the options and the underlying asset, and the return on the portfolio should be therefore, the riskless rate. The underlying asset in the case of financial option, is a financial asset (Stocks, bonds, foreign exchange…), which are, usually traded in the financial market. As the portfolio, its return should be the same as the prevailing riskless rate. The price of the option can therefore be determined, and it is independent of the risk profile of the investor.

4.1. Framework for implementing Real Options

Real options can be used, either to value an investment or to value a firm from an external point of view. The approach to be used will vary depending upon the specific nature of the firm, but a general framework based on a four step process, as given below can be envisaged:

Step 1:

Compute the base case value using a straight forward DCF model. In this approach, the most likely free cash flows are estimated and the present value is calculated using the weighted average cost of capital.

Step. 2:

Identify and integrate the embedded real options in the valuation model. Identifying the embedded options needs a detailed analysis of the environment in which the firm is likely to evolve and assessing the capability of the firm to react positively to the changes taking place in the economic environment. More specifically it means:

> Understanding the market in which the firm evolves; competitors, products, technology.
> Understanding the firm's strategy and assessing the management's ability to identify and exercise the options they have; wait-to-invest, growth, flexibility, exit or abandon, learning through additional information. The analyst should be able to grasp of how the present value develops over time.
> Defining clearly each option, and the likely strategic consequences of exercising the options on the firm's value. The analysis should also clearly indicate the nature of the option (American or European, call or put). This can be formalised, in the form an event tree.

Step 3:

Next step is to determine the inputs for evaluating the value of the real options. The following inputs need to be determined.

The current value of the underlying asset

> In analogy with the options on stocks(S), this is the present value of the cash flows expected from the firm, excluding any additional cash flows, that might result, if the real option is exercised. For example, if there is an embedded growth option, the base value should not take into account the additional cash flows resulting from the new investments made in the firm.

The exercise Price

> The exercise price (X) is the predetermined price at which the option can be exercised. The real-market equivalent is the present value of all fixed costs expected over the investment opportunity.

Time to maturity

> The time to maturity (T), is the period during which the option can be exercised. Its real market equivalent is the period during which the management of the firm can effectively carry out the investment. This period will depend upon technology, the market(size, competition), and contracts (patents, licences…).

Volatility

> Volatility (s),n the case of financial options, this refers to the standard deviation of the returns on the underlying assets. Its real market equivalent would be, the standard deviation (on an annualised basis) of the growth rate of the cash flows from the investment.

Dividends

> Dividends (d) are the payments made to the shareholders. The dividends therefore have the effect of reducing the investments in the in assets of the firm and as such reduce the growth potential of the firm. I real market terms, this could be the costs incurred to keep the real options alive, or the cash flows lost by the firm when a competitor goes ahead with the investment and thus depriving others of the opportunities. We can take the example of a firm which has acquired a licence to exploit a new technology, which is valid for a designated period of time only. The firm might have to pay an additional amount to keep alive the possibility of using the license, if it considers that the market is not ripe for launching the product using the license.

The risk free rate

> The risk free rate (r) is the yield on a riskless security with the same maturity as the duration of the option. This is also true for the real options.

Step 4:

Determine the value of the firm

Once the parameters have been defined, the option pricing models can be used to value the real options. The value of the company would then be the sum of the base value of the firms and the value of the real options.

Firm's Value = Base value +   (Value of Real options).

The Black & Scholes formula for valuing an option is as follows:

$$c = Se^{-dT} * N(d_1) - Xe^{-rT} * N(d_2)$$

$$d_1 = \ln(S/X) + (r - d + s^2)T / s * T^{1/2}$$

$$d_2 = d_1 - s * T^{1/2}$$

As we mentioned earlier, one of the major characteristics of options is that the uncertainty increases the volatility of the option and as such increases the value of the option. The above parameters are also needed to evaluate an option using the binomial approach.

5. Application of Real Option Approach to the evaluation of an Internet Company.

We will attempt to use the above mentioned framework for the evaluation of an internet company. At the outset, we want to underline that there is no way we can establish that a particular method is better than another, on the basis of the results obtained. The only benchmark which can be used is the market value with all the limitations that it imposes. The market value is really determined by the consensus in the market which determines the equilibrium between the supply and demand. We would also like to point out that internet companies includes a wide range of companies which have totally different business models. In our example, we have chosen a company which is in online brokerage business. There are several firms, that are currently involved in the online brokerage business. Moreover, they are probably amongst the most matured category of the web based industry. Before, we can determine the relevant parameters necessary for the evaluation of a company, one has to understand the basic nature of the industry and the forces which are at work, which will determine the future directions in which a company can move.

5.1. Structure of the Online Brokerage Industry

The traditional brokerage is dominated by the large investment banks both in Europe and USA. Since the development of the internet, a whole range of small players have entered the market and at the same time the old players are gearing up to use the internet technology to improve the efficiency of their brokerage business and of course increase or improve their market share and at the same time profit from the increase in the number of investors in the financial markets. The basis of the online line brokerage industry's competitiveness is that it enables traders to intervene in a wide range of financial markets and products at a relatively low prices. The traditional players in the brokerage industry are hindered by their old information systems, that do not permit a high degree of straight through processing. Their strength lies in the quality of services, including financial advice, analysis, security, backed up by their capacity to leverage the operations through financing possibilities.

The online brokerage industry appeared in the USA in the middle of the 1990s. The driving force in the development of this industry was the rapid development of the internet. At the same time there was a demand for cheap brokerage services from the retail clients. The number of retail clients was also growing at a rapid pace. The internet technologies allowed e-brokers to provide their clients at significantly cheaper prices brokerage services, though of lower quality. The retail clients were less sensitive to quality than price as they were trading in sums which were significantly lower than the institutional investors. Thus online brokers , due to their recent information system, were able to provide low quality, but highly flexible, quick and cheap services to the retail customers, whose expectations are mainly focused on price and accessibility. This enabled them to get a significant share of the brokerage business. The European brokerage industry is following the same trend. Currently there are a host of new e-based brokerage service companies are emerging and at the same time the traditional incumbents are diversifying into the e-based services, to attract the growing niche of retail clients.

It is estimated that, in the US, the share of the online brokerage industry is around 25 % of all transactions made in the financial markets. The market is highly competitive with big players such as Charles Schwab, TD Waterhouse, E-Trader and a host of small players who compete on differentiation. In addition, the players include the traditional bulge bracket players like Morgan Stanley, Merril Lynch, Goldman Sachs who have also entered the online market.

The online brokerage industry is characterised by heavy investments in information technology. In many cases, the online brokers developed their own IT system with the state of the art technology, as it is important that the IT system is able to achieve a high rate of Straight Through Processing without error. This is an essential condition for attracting the large institutional investors with higher margins. It is therefore vital for these firms to diversify into other online financial services (online life insurance sales, direct banking, small business loans, market analysis…), to improve their return on investment.

Consequently, it is very difficult to value an online brokerage firm, because each firm is trying to develop their own niche to improve their sales and profitability. In addition, the technological choices made by the firms are different, and therefore the options for diversification into other areas are also different from one firm to another. Given these facts, it is difficult to apply the multiple based methods as no two firms are directly comparable. The discounting of free cash flow approach is also extremely difficult to implement without making unfounded assumptions on the growth rates and market shares. The main difficulty comes from the fact that the future growth is highly dependent on the firm's capability to seize at the right time the opportunities, in terms of new products, new technologies, alliances etc.

We decided to value three American companies in the online brokerage business with slightly different business models. These are ETrade, Charles Schwab and TD Waterhouse. In each case above mentioned framework was applied. We first looked at the business model of the firm, and analysed their strategic positioning in terms of products offered and the markets covered. The objective of the strategic analysis, is to determine how the firm can use its business and human assets best and most likely scenario of its future evolution. For instance how quickly a online brokerage firm could move into the financial services provider and then to online banking. The analysis is fairly complex, because not only one has to determine the likely evolution but also one has to estimate the investments which have to be made to carry out the necessary transformation. The most difficult part is to estimate the likely size and the share of the market that firm will capture. This then should enable the analyst to estimate the future cash flows if the firm succeeds in meeting its strategic objectives.

In fact what the analyst has to do is to recognise the embedded options and then to estimate the parameters of these options in order to value them.

5.2 The case of E-Trade:

The evaluation is based on the estimations in the early 2001.

The business model adopted by the firm is based on the following strategy:

Start as an online broker, use its Information Technology System, and the knowledge of the financial sector to expand into the financial services sector as a first step. Once the firm succeeds in reinventing itself into an online service provider, the solid customer base of corporate clients should enable them to provide banking services via the internet.

The embedded options therefore are call options; firstly the option to get into the online financial services industry, by an additional investment in IT technology and human resources development. The second option is the opportunity to become an online banking services provider if the environment is suitable, which will necessitate a second level of investment. The passage from a simple online brokerage services provider to an integrated online financial institution depends on the conditions being right at the appropriate time, and also the management's ability to respond to the market needs. As, we mentioned earlier, in terms of valuation one is justified to include in the current valuation of the firm, the value of the embedded options. It should however, be pointed out that as we progress in time, the market is likely to make corrections to the original estimation. The correction will depend on the new information coming in and this new information, might have an impact on the future cash flows and the value of the imbedded options. For instance, if a new information is received that the firm is not likely to move in the financial services sector, the firms' value will be reduced as the real option will be worth nothing.

The above mentioned framework was applied for the valuation of the firm:

Step 1:

First of all the base value of the firm was estimated. The future cash flows were estimated using the hypothesis business as usual. In other words, assumption is made that no strategic changes are likely to take place in the foreseeable future. It should take into account all the activities of the firm. This obviously means that we need to estimate the most likely future cash flows of the firm and the appropriate discount rate to be used. The discount rate should represent the cost of funding. The free cash flows were based on the analysis of the US online brokers and the financial reports and the published research reports on the US banking sector. The estimated discount rate of 25 %, was based on the risk premium of the sector. The time horizon retained was 5 years. The continuing value was estimated on a growth rate of 10 %. Based on these assumptions the base value works out to 3.13 Billion USD. In the year 2000, the firms' sales were 1.336 Billion USD.

The above value, based on the hypothesis business as usual, assumes that the free cash flows estimated are the most likely estimates and does not take into account the scenario analysis. In fact in the case of a internet company, it is extremely difficult to predict the most likely cash flows. We therefore integrated a scenario analysis, which has been classified as reverse discounted cash-flow method of valuation. In this approach probabilities are associated to the likely cash flows under different scenarios and the company value is estimated under each scenario and the expected value is determined by taking into account the probabilities of each scenarios. Using this approach we get the firm value to be 1.72 Billion US$. The three most likely scenarios considered were:

➢ Online brokerage industry achieves a state of maturity after 5 years with a yearly growth rate of 10 % from there on.
➢ Online brokerage industry does not take off, and dies within the next five years with growth rates going down and becoming negative from the third year.
➢ Online industry is faced with recession, but growth become normal and reaches maturity.

The probabilities associated with the three scenarios were 0.3, 0.3 and 0.4.

Step 2.

Next we have to take into account the value of the embedded options. This necessitates an in-depth strategic analysis of the way the firm could best uses business assets best for its future development. The opinion of the experts was sought to draw any meaningful conclusion. We came to the conclusion that the firm could turn itself into a truly integrated financial services company. The know-how of operating online brokerage services gives the firm an option to develop into an online financial service provider, which in turn enables them to built up a customer base and the know how acquired in financial risk analysis, opens up the possibility for the ETrade to become an investment bank providing advisory services.

5.2.1 Valuation of the options:

To value the embedded options, we need to determine the parameters. Without going into the details at this stage, we will simply indicate the parameters which were retained in our analysis and later on explain the difficulties that one is likely to encounter in estimating the right inputs.

As regards the option to become the online services provider, our estimates were as follows:

S: The present value of the underlying asset = $1.119

S : The volatility of the underlying asset, this in reality is the standard deviation of the expected future cash flows. It was estimated by reference to the volatilities of the main competitors, in this case Charles Schwab and TD Waterhouse.

T: Time to maturity. This was estimated to be 2 years, because after this period it would be very difficult for the firm to enter the financial services market.

X: The strike price corresponds to the cost entering the market. A figure of 300 million was retained after a careful examination of the capabilities needed.

$r=$ The riskless rate based on the yield of T-Bills is 3.68 %.

Having chosen the parameters the option value was estimated using the Black & Sholes formula. The option value was estimated at $ 0.851 billion.

The second option refers to the possibility of E-Trade to become a corporate advisory services provider. Based on the estimated values of the parameters

$S=$ $ 2.298 billion
S = 44 %
$T=$ 1 Year
$X=$ $ 0.9 billion
$r=$ 3.68 %

The option value is estimated to be $ 1.433 billion.

5.2.3 Valuation of the Firm:

The value of the firm would be the sum of the basic DCF Value and the value of the embedded option, which is reality the value of the uncertainty at the time of the valuation. One can argue that the basic DCF value should be replaced by the most likely value. The figures give the value of the E-Trade company under the two assumptions:

Value of the Firm = Basic DCF Value + Value of the two embedded real options
= $ 5.414 billion.

If we replace the Basic DCF Value by the most likely value; the firms' value works out to be $ 4.004 billion.

The Table below summarises the results:

Basic DCF	Most likely DCF estimate	Real options with basic DCF	Real options with most likely DCF	Market Value
3.132	1.752	5.414	4.004	2.991

We can see that the real options approach using the basic DCF as the basis will always a value which would always be higher than the traditional DCF valuation method. We feel that the real options approach should be used in conjunction with the most likely value, as the most likely value does not include the value of the uncertainty, which is

captured by the real options approach. In this particular case the options approach gave a valuation which was superior to market value by around 34 %.

6. The limits of the Real Option Approach to Valuation of Firms

The real option approach has been put forward by many authors as the ideal solution of valuing uncertainty, and as such valuing new economy firms, which operate under highly volatile economic environment. In our opinion, although the approach is attractive, there are some basic problems which makes the application difficult both from a conceptual and a practical point of view. We will try to address these two issues in this section.

Practical issues related to the use real options approach:

As discussed in the E-Trade case, we need to spot the embedded options in the firms' strategic growth path, and then we need to estimate the parameters needed to value the options. To spot the options, we need to construct a decision tree indicating the options open to the firm. This supposes that the analyst has a very good grasp of the firms' capabilities both in managerial and technological terms. In addition, the analyst should be able to understand the technological challenges that the firm is likely to encounter, including the reaction of the competitors. This is of course extremely difficult for an outsider, with all the problems related to the asymetry of information. In the case discussed above, an assumption was made that the firm is capable of moving into the financial services and eventually into the advisory service business. A deep insight into the business of the firm is needed to carry out a proper and relevant analysis. Even if we suppose that the analyst is capable of spotting the options, the next step, which is to estimate the parameters needed to value these embedded options is not an easy exercise. In order to estimate the parameters, we need to forecast the cash flows that the firm will generate if the firm is able to capture the option to move into the new business, and the time that the firm disposes to make the move. The analysis we carried out, showed that this is an extremely difficult exercise. We should also highlight that the estimation of volatility is often based on guess work rather a thorough understanding of the business process. In practice, one looks at the volatility of firms which are operating in the same business area. The option values could be very sensitive to the value of the parameters retained.

Conceptual problems:

The option valuation models, assume that the underlying assets are trading, and the market is frictionless, where the transaction costs are non-existent, and a riskless portfolio can be created using a combination of the underlying asset and the options. In the case of the real options, the underlying asset is an investment project, therefore it is not a tradable product and there is no market in the real sense of the world. It is therefore not possible for the firm to hedge against the down side risk, while at the same time maintaining the upside potential. Under these conditions, the valuation approaches based on the Black & Sholes formula are really not applicable.

7. Conclusions

Valuing firms even in the best of conditions is a difficult exercise. But valuing firms in the internet business is extremely difficult. The results obtained are often based on subjective estimates of cash flows, based on the business plan provided by the firm. The problem is that these estimates are highly uncertain, given the nature of the business, which itself is undergoing rapid changes. In addition there is the complexity related to the possibility of the technological changes that could take place in the near future. The real options approach is ideally suited to capture the value of the uncertainties. This approach is therefore intellectually very appealing. The main problem is that the method suffers from the same handicaps as the Free Cash Flow method. The analyst needs to estimate the future cash flows, and in addition, one has to spot the real options embedded in the firms' business plan. Although, one does not need to associate probabilities to the different scenarios as in the case of the Reverse Discounted Cash Flow method, we need to estimate the volatility (S).In reality, there is no correct basis for evaluating the volatility.

In the E-Trade case, the valuation was 34 % higher than the market value. In other cases we found the values were lower than the market value. This is of course to be expected, given the high level of volatility in the stocks of the new economy companies.

We feel that the real options approach, in spite of all its limitations, enables the analyst to get a better understanding of the firms' potential for growth and thus contributes positively to the valuation of firms. In addition, the analysis is useful for the management of the company, as it brings out more clearly how the firms' value is made up.

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