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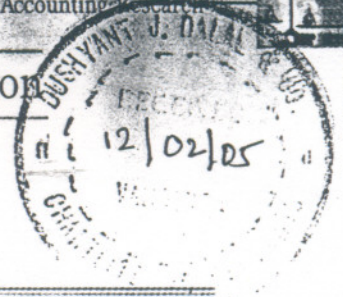
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Real Options - Novel Idea for Valuation

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INTRODUCTION

The world is witnessing a turnaround in the strategies and operations of businesses. It is clear that the tactics that made businesses successful in the past will not make them successful in the future. Management practices, maxims, theorems or methods are changing every day. The only thing certain in the current era is change. Change is the new mantra and to adapt to the changing environment is the philosophy generated from that mantra.

In the same vein, all the silos of a business have to comply with the changing environment. Finance is no exception. The markets have changed from segmented to integrated. The economies have changed from static to dynamic. The interest rates have changed from high to low. The investment pattern has changed from the typical "babu" styled investment in fixed deposits' to shares, stocks, options, futures, mutual funds, depository receipts, precious metals etc. In short, every function of finance - operating, investing and financing has changed and is changing, thus it has become uncertain.

In such an uncertain environment, the onus on CFO is quite high. The CFO is responsible for taking strategic decisions that would increase shareholder's value. Such decisions involve tedious long-term planning and tremendous calculations to decide whether a particular investment is worthwhile - will it add to shareholder's value? (*Assuming that all corporations aim at increasing shareholder's wealth*)

Hence, next issue is how appropriate could a CFO value its strategic financial decision, so as to generate maximum shareholder's value.

CONVENTIONAL METHODS

Over a period of time, businesses have been valuing their investments through discounted cash flow (DCF) or internal rate of return (IRR) methods. These methods have stood the test of time, so these methods can't be criticized. These methods are simple and easy to apply. Many corporations have applied one or more such conventional methods and have added value to their shareholder's coffers. But as highlighted earlier, the methods or practices that made businesses successful in the past are not going to make them same in future. This message suggests that the conventional valuation techniques now need to be replaced with something better. Today's valuation techniques require careful consideration of changes in *government policies, micro and macro economic conditions, social demographics and technological matters. It also requires providing for the market deviation from the prevailing conditions. It also requires providing for & factor that Justifies the management ability to influence some of the conditions and the ability to abandon, sell or change the strategic decision.* There is one technique that has the ability to incorporate the value of uncertainties in deriving the final value of a project. This technique is real options valuation.

OPTIONS

Before we understand real options, it is better to catch a glimpse of options. An option is a derivative. It means that it derives its value based on an underlying asset. An option is a right and not an obligation to sell or buy the underlying asset. There are two types of options, call option and put option. A call option is the right to buy the underlying asset, whereas put option is the right to sell the underlying asset. An investor has to pay a "premium" or a "price" to buy an option. Once an investor has bought the option, it is that investor's choice whether to sell or buy the underlying asset. In other words an investor has an "option" to invest or not to invest in that particular asset. Using the same analogy in business we have real options.



For ease, we shall consider only the call options, as it is quite similar to investing in a project. In a call option an investor has to spend money to buy an asset and in real option a company has to spend money to invest in a project. Valuation of a project through real option method means that with a project proposal on hand, a CFO has an option as to whether to invest in the project now, later or abandon the project. In such, and many more cases there is some value at every stage of a project, which can be considered whilst calculating the total value of the project.

REAL OPTIONS

Valuation under real option method is based on decision tree analysis. It simply means that there are various possibilities of occurrence of event(s), which can massively affect the valuation of a project. To have a detail insight into the matter, let's look at the valuation done for an IT company, under born DCF method and real option method.

The company - Mobile Commerce Centre (MCC) has a firm foothold in automation tools and instruments. It has currently devised a system that enables total mobile banking solution. This system if used by any bank enables its account holders; all those who have a mobile phone to receive, pay and even transfer any sum of money from their account to any other person who is also a part of such system. The revenue model for MCC is just 1% on every transaction. The concern for the company is that how many number of persons would be actually interested in such services. How many banks would be interested in opting for the system? How many transactions would actually place? What would be the increase in number of mobile users having accounts with such banks? What would happen if the IT policy of the government changes? What would happen if the prices of telecom components rise? Such and other firms would have similar set of facts, which would show an uncertain future and complexities.

However, the firm has decided to go ahead with the project and thus has tried to value the whole project as per the DCF method. The DCF Analysis is in Table 1.

Table 1

(all figures in Indian Rupees)

	Year1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CF op	15.57	(1.20)	7.98	(209)	(3.73)	(7.11)	44.83	(142.03)	234.04	(155.61)
PV (CFop)	7.41									
CFinv	(5,032.66)	(85.18)	(183.24)	(140.41)	(330.22)	(630.42)	(188.82)	(71390)	(25656)	(1,347.16)
PV (CFinv)	(6,498.14)									
G Ffin	5,057.02	153.48	287.15	367.38	813.35	1,643.45	3,108.31	5,079.51	6,447.95	9,767.75
PV (CFfin)	17,088.64									
Value as per DCF			10,597.91							
(PV(CF op)+PV(CF inv) + PV(CFfin))										

Notes:

1. CF = Cash Flow
2. op = operations, inv = investment, fin = finance
3. PV = Present Value
4. Figures in brackets depict negative figures

Thus the value of the project as envisaged under the lens eye of DCF comes to Rs. 10,597.91. Now let us compare the valuation of the project under the real option valuation method. Real option valuation shall be done with the help of Black-Scholes Model, which is expressed as a formula hereunder:

$$C = SN(d_1) - Xe^{-rt}N(d_2), \text{ Where}$$

$$d_1 = \frac{\ln\left(\frac{S}{X}\right) + \left[r + \left(\frac{s^2}{2}\right)\right] \times T}{\sigma\sqrt{T}} \quad \& \quad d_2 = d_1 - \sigma\sqrt{T},$$

- C = value of the project
- S = Present Value of cash flows of finance (fin) and operations (op)
- X = PV of cash flow of investment (inv)
- s = uncertainty expected in the cash flow
- r_f = Risk Free Rate
- T = Time to Maturity

To apply the formula and to find C, we shall first compute d_1 & d_2 . To find the d_1 & d_2 we would need other parameters, such as S, X, s, T, r_f . Out of these, S, X, T are already available as mentioned in table 2.



TABLE 2: VALUE OF S, X & T TAKEN FROM THE CALCULATION DONE UNDER DCF METHOD IN TABLE 1

S = Present Value of cash flows of finance (fin) and operations (op)	Rs. 17,096.05
X = PV of cash flow of investment (inv)	Rs. 6,498.14
T = Opportunity time to implement the project	2 years

TABLE 3: COMPUTATION OF UNCERTAINTY FACTOR

	Year 1	Year 2
Uncertainty for CF op	85.00%	80.00%
Uncertainty for CF inv	10.00%	10.00%
Uncertainty for CF fin	10.00%	10.00%
Average uncertainty (year wise)	35.00%	33.33%
Average uncertainty (of two years)	34.17%	
S = uncertainty expected in the cash flow (rounded off)	34%	

The value of r_f is based on 10 year government equal bonds, which comes to 6%.

The final and the most important compent in the formula is the uncertainty factor represented by s for which computation has been done in table 3. The approach here is that the years under consideration have been assigned an uncertainty percentage which suggests that the uncertainty for that particular year for that particular type of cash flow is uncertain to that extent. The cash flow from operation is the one that decreases in the level of uncertainty, however the other cash flows, cash flow from financing and investing have been constant throughout the period. This persistent uncertainty level suggests that the investment is a fixed cost that would certainly incur and that the fund requirement to finance the investment is also a similar mandatory requirement.

TABLE 4: CALCULATION OF THE REQUIRED VALUES

d_1	2.4919
d_2	2.0087
C	Rs. 9,824.07

Thus, as evident from table 4, the value as per real option method is Rs. 9,824.07, which is lower than the one found by DCF method. The primary reason for the difference is uncertainty factor. Going further into the matter, and using the basic principle of financial option. An option is exercised only when it is "in-the-money". An option is said to be "in-the-money" when the pay off is $\text{MAX}(0, S-X)$. This pay off is considered to be the option value. As per the general principle of option, an option is to be exercised when the option value is greater than the option price.

TABLE 5: COMPARISON BETWEEN THE VALUE OF THE OPTION AND THE PRICE OF THE OPTION

Option premium or price	Rs. 9,824.07
Value or the payoff from the option	Rs. 10,597.91

In the same vein, we can consider that

Therefore we compare the value of C (found in table 4) with the price of the option (table 5). It is seen that the option value is greater than the option price or the premium, hence the company can go ahead with the project.

The trade-off for using real option method versus DCF method is the element of uncertainty. It is quite clear that businesses today operate in an uncertain environment and that leads to uncertainty of cash flow in business. The DCF technique fails to provide for the element of uncertainty but real option valuation does take into account that, which makes the valuation carried out by real options method very authentic.

However, valuation under any system is just an estimate of the future cash flows based on the information available. Thus in light of the prevailing methods such as DCF and real option, it is felt that to accept a project as per real option method, the primary check is that the project should at least have Net Present Value (NPV) greater than zero.

Flexibility in options

Valuation as per real option method allows a strategic planner to have great flexibility. A brief idea about them is mentioned hereunder.



- *Growth option* - Values the ability to invest further in a project if the primary or original investment was a success. This is ideal for pharmaceutical and R & D businesses.
- *Abandonment option* - Values the ability to scale down a project in case it turns out to be unsuccessful. Oil exploration or gas exploration or such business that depend upon natural resources and find that the resources are not being extracted as per the initial planning.
- *Flexibility option* - Values the ability to vary a firm's inputs, output or production methods in response to changes in prices or demand. For instance when a business unit changes the method of production or develops a supply chain management. Such capital expenditure (capex) can be valued today.
- *Timing option* - Values the ability to invest or defer a project due to any reason in the prevalent uncertain environment.

When these different options are incorporated the calculation of real option becomes complex and tedious.

EVALUATION OF REAL OPTIONS

Real option valuation is a highly acceptable method of valuation for risky projects having uncertain cash flow, but that is just one side of coin. There are certain limitations of this method. A CFO has to weigh the limitations as against the advantages and then decide the importance for implementing this valuation method.

The advantages of real option valuation are:

1. Flexibility

The flexibility to comply with uncertainties of the market is the most important advantage. This flexibility is to incorporate value generated due to the growth, or abandonment of the project.

2. Timing

A real option valuation can incorporate the effect of timing. It means that in case of a project the decision to invest now or later has some effect on the value of the project. Such value can be easily incorporated in valuation done under real options.

3. Large Projects

Real options would be very useful for large projects such as explorations or projects which have high amount of risk or when the project is rejected or accepted under DCF analysis by a thin margin.

Although real options offer great flexibility in valuing projects, it suffers from serious limitations. Some of them are mentioned below:

1. Complex Formula

The formula of options that plays a significant role in the calculation of real options is derived from Black Scholes Model of calculating value of an option.

2. Time consuming

The working of real option requires great time devotion and the ability to work on minor details.

3. Cost Benefit Ratio

Benefits or real options analysis should outweigh its costs, to justify application to an investment decision.

CONCLUSION

There have been different schools of thought in financial management that have always tried to suggest a method which is or deems to be better than other methods. However, that's not the rule. There is no correct answer in management and therefore real option may seem to be a good alternative, but not the correct answer in valuation. There would be other prevalent and



prospective valuation techniques which might be better than the existing ones, nevertheless real option valuation method seems wonderful and convincing.

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