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Real Option Strategic Approach to Find Optimal Company's Source of Financing

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Abstract

This article is devoted to investigation and evaluation of the project expanded NPV rather than simple or passive NPV depending on its available options of financing using real option approach. This approach combines ideas of corporate finance, real options and game theory and concludes to the Risk-Neutral Probability measure and the value of a Call Option that comes from Black-Scholes-Merton model. The findings enable us to estimate the value of managerial decisions, project flexibility and help managers to select the best choice of strategic financing and its available options and their respective combination.

Keywords: Strategic Real Options, Strategic Planning, Strategy Valuation, Expanded Net Present Value (ENPV), Call Option, Exercise Value (EV).

Introduction

Any project whether it is launching or developing requires financing, that in most cases is covered by own funds partially, whereas the rest of by attracted facilities. On the one hand, financing attraction varies in different forms, e.g. loan, mezzanine, equity financing, or even concluding forward contracts. On the other hand, the proportion of each available source is important and stays under question. Therefore, the problem of better choice between available financing options and their respective combination exists.

Correct decision thus is especially important as a real option implies the value that includes any direct and indirect costs and benefits connected with using such an option, besides its direct influence on investment attractiveness ratios and ultimate valuation of a project. Moreover, since financing attraction requires a valid business valuation, the real option effect is an integral part of any calculations connected with such.

Theory

Corporate or strategic real option models synthesize the newest developments in corporate finance and real options and game theory to help bridge the gap between traditional corporate finance and strategic planning. It enables to estimate the value of a managerial decision, timing it depending on key variables and market conditions and thus is suitable to valuing strategy and its flexibility. The opportunity to invest or make any other decision that implies an ultimate cash flow effect is thus analogous to a call or put option with an inherent exercise price.

In pursuit of its decision-making goals, real-options modelling conclude into expanded Net Present Value (ENPV), rather than simple NPV, that is much more relevant base for either a feasibility study of any project, an investment and managerial decision. The key here is that ENPV criterion incorporates, along with simple NPV of expected cash flows from an immediate investment, the flexibility of the combined options embedded in the project. Such an option could be for instance the opportunity to change a source of financing due to a certain circumstance occurred in future.

In order to assess the company ENPV depending on its available financing options we use real option approach that concludes to the Risk-Neutral Probability measure (1) and the value of a Call Option that comes from adjusted Black-Scholes-Merton equation (3).

$$p = \frac{(1+r)S - S^d}{S^u - S^d} \qquad (1)$$

where S is the initial stock price that can go either up to S^u or down to S^d. If the risk-free interest rate is $r>0$, and $S^d \le (1+r)S \le S^u$, then the risk-neutral probability of an upward stock movement is given by the number p.

Adjusting the equation (1) to a real option case we get

$$p=\frac{(1+r)V-V^-}{V^+-V^-} \qquad (2)$$

where V is the gross value of expected cash inflows that can go either up to V^+ or down to V^-.

$$C=\frac{p\times C^+ +(1-p)\times C^-}{1+r} \qquad (3)$$

where C is the ENPV or Call Option, $C^+ = Max(V^+ - I,0)$, $C^- = Max(V^- - I,0)$, I is the investments or Exercise Value of Call Option.

Risk-Neutral Probability is the most important principle in derivative valuation. It states that the value of a derivative is its expected future value discounted at the risk-free interest rate. This is exactly the same result that we would obtain if we assumed that the world was risk-neutral. In such a world, investors would require no compensation for risk. This means that the expected return on all securities would be the risk-free interest rate.

Methods

We apply Discounted Cash Flow (DCF) rather than standard NPV approach because of two fundamental differences between them. The first is that DCF allows apply different discount rate through analysed periods whereas NPV just single discount rate does (left-site part of formula (4)). On the other hand, using DCF valuation we apply Terminal Value (TV, formula (4, 6)) that is the present value at a future point in time of all future cash flows when we expect stable or perpetuity growth rate forever. TV is most often used in multi-stage cash flow analysis and allows for the limitation of cash flow projections to a several-year period.

$$DCF=\sum\frac{FCFE}{(1+WACC)^n}+TV \qquad (4)$$

where $FCFE$ or Free Cash Flow to Equity is the cash flow paid to the equity shareholders of the project after all expenses, reinvestment and debt repayment in time n.

$$WACC=\frac{E}{E+D}R_e+\frac{D}{E+D}R_d(1-T) \qquad (5)$$

where $WACC$ or the Weighted-Average Cost of Capital, E and D is the company's equity and debt respectively, R_e is the cost of equity or required Return on Equity (ROE), T is a corporate tax rate.

$$TV=\frac{1-\frac{1}{(1+WACC)^n}}{WACC-g}\times\frac{CF_n}{(1+WACC)^n} \qquad (6)$$

where g is perpetuity growth rate of the company's cash flows.

Results

Whereas ENPV criterion incorporates the flexibility of the combined options embedded in the project we assume the company has an option to change a source of financing after the project has been launched shown in Figure 1.

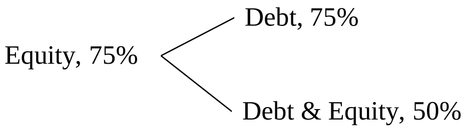

Fig. 1. Financing options decision tree

Options reproduced in Fig. 1 anticipate the company's investment (I) to launch the project is initially structured as 75% of Equity and 25% of Debt capital. The company has an option to change the capital structure after starting the project due to decrease of its riskiness. Thus it can choose between increase in Debt 1) up to 50% or 2) up to 75%. Hence, the calculations showed in Table 1 depict all consecutive NPV components for each option.

Table 1. NPV components

	Base	**Equity**	**D&E**	**Debt**	**STD**
NPV, USD mln	(7.2)	14.4	15.9	17.8	15.0%
FCFE, USD mln	(7.2)	9.0	9.1	9.1	1.4%
Gross FCFE, USD mln	1.3	9.0	9.1	9.1	1.4%
less CapEx (I), USD mln	8.5	-	-	-	-
TV, USD mln	-	5.4	6.8	8.6	32.7%
WACC, %	*17.4%*	*17.4%*	*14.9%*	*12.3%*	*24.5%*

The Base figures in Table 1 mean zero (0) or a launch period, which is a set base for all other scenarios (options) available. Hence, the NPV figure include the Base part and a particular variable inherent to each Equity, D&E and Debt financing option that is separated only in Table 1.

It is obvious that the key company valuation component TV hugely depends on the cost of capital, as we can see by the standard deviation (STD) measure in Table 1. The reason for such a deep tie of it to WACC can be explained by the equations (6) and (5). Behind that, we can see the extremes of NPV due to a key WACC component deviation, i.e. Debt interest rate (IR) showed in Table 2.

Table 2. NPV sensitivity analysis

	+25%	**Base IR**	**-25%**
NPVe, USD mln	6.6	**7.2**	7.8
FCFEe, USD mln	1.5	1.8	2.1
TVe, USD mln	5.2	5.4	5.7
WACCe, %	*18.0%*	*17.4%*	*16.8%*
NPVde, USD mln	**7.3**	8.7	10.2
FCFEde, USD mln	1.2	1.9	2.6
TVde, USD mln	6.1	6.8	7.6
WACCde, %	*16.1%*	*14.9%*	*13.6%*
NPVd, USD mln	8.2	10.6	**13.5**
FCFEd, USD mln	0.9	2.0	3.1
TVd, USD mln	7.3	8.6	10.4
WACCd, %	*14.1%*	*12.3%*	*10.5%*

We assume the initial IR is 12% per annum and can deviate within 25%. Since the change in IR affects NPV non-linear, it takes negative and positive effect in case of IR ups and downs respectively. The company can grasp possible benefits from IR change once any occurred or even can suffer negative impact. Moreover, the company can secure its utmost IR risk connected with Equity scenario by switching to other available ones. Therefore, the worst NPV in such case is $\$7.3$ million instead of $\$6.6$ million showed in Table 2, whereas the best one $\$13.5$ million is still available to achieve.

Following the equations (2) and (4) we calculate V, V^+ and V^- in Table 3 by adding Exercise Price to NPV, NPV^+ and NPV^- respectively.

Table 3. Gross cash inflows calculation

	Equity	D&E	Debt
Exercise price, USD mln	8.5	8.5	8.5
NPV, USD mln	7.2	8.7	10.6
NPV+, USD mln	7.8	10.2	13.5
NPV-, USD mln	6.6	7.3	8.2
V, USD mln	15.7	17.2	19.1
V+, USD mln	16.4	18.7	22.0
V-, USD mln	15.1	15.8	16.7

Summarizing the data in Table 3 we obtain the capital investment opportunity showed in Fig. 2.

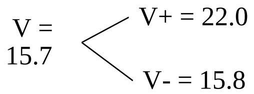

Fig. 2. Investment opportunity decision tree

Conclusions

Consider again the financing opportunity shown in Fig. 2. The company has an option to launch the project that involves making a capital expenditure (CapEx) of $I_0 = \$8.5$ million (in present value terms). The gross value of expected future cash inflows from the project, $V_0 = \$15.7$ million, may differ in line with financing options available to $V^+ = \$22.0$ million or $V^- = \$15.8$ million (with equal probability, $q = 0.5$) due to uncertainty over the Debt interest rate including. The opportunity to invest provided by the project is analogous to a Call Option on the value of the completed project (V) with an exercise price equal to the required outlay, $I_0 = \$8.5$ million.

The value of this investment opportunity obtained from the end-of-period expected values with expectations taken over risk-neutral probabilities calculated by equation (2) in Fig. 3, discounted at the risk-free rate (here $r = 0.09$): the ENPV or Call Option according to the equation (3) is $\$7.9$ million, showed in Fig. 4.

$$p = \frac{(1+r)V - V^-}{V^+ - V^-} = \frac{(1+0.09)15.7 - 15.8}{22.0 - 15.8} = 0.2$$

Fig. 3. Risk-neutral probability calculation

$$C = \frac{p \times C^+ + (1-p) \times C^-}{1+r} = \frac{0.2 \times 13.5 + (1-0.2) \times 7.3}{1+0.09} = 7.9$$

Fig. 4. Call option calculation

The value of the financing option (ENPV) exceeds passive NPV of Equity scenario commitment of 15.7 – 8.5 (i.e., 7.9 > 7.2 million). Therefore, it is reasonable to change the capital structure after starting the project and replace Equity capital by increasing Debt up to 75%.

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