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Volume 5

Valuation of the Liability Structure by Real Options

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Table of Contents

List of Illustrations

Tables

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Introduction

The traditional approaches to valuating companies are currently grouped into three categories: the patrimonial method is based on the value of company assets, the multiples method consists of determining a value using similar companies as a reference or transactions that took place in the same sector, and the method of discounted cash flows tries to consider the development potential of the company. These different methods are used by those who think the value obtained by one of them should not be the focus, but rather an approach that seeks to link them. This recommendation is justified given that the practice is not an exact science.

Nevertheless, these different approaches have specific and common limits. Indeed, the multiples method can lead the analyst to false sector-specific multiples when the company reference contains large disparities in terms of financial structure or investment policy. The DCF method depends on hypotheses, which in turn depend on the analyst's subjectivity. In this way, each one can justify a level of provisional cash flow and weighted mean cost of capital by justifying the pertinence of the established business plan. The patrimonial approach counts on the value of assets in the current portfolio and excludes, as such, any potential for growth.

Otherwise, they have the common disadvantage of considering an accounting net debt rather than an economic net debt[1], and omitting the notion of flexibility with respect to investment decisions. In practice, indeterminate elements can lead a company to account for unforeseen cash flow at the moment of investment. In order to obtain the economic value of personal equity, we

subtract the value of net debt from the value of the company. But to be completely methodologically coherent, in each approach, we would have to take the economic value of the net debt into account instead.

Furthermore, these methods do not include the notion of flexibility, which is essential for any investment decision. Indeed, the unforeseen cash flows of model creation can appear while devising an investment plan. In this case, considering the total risk through the volatility of assets is something that would allow us to reach a better value.

Real options give us solutions with respect to this lack of flexibility. They are based on the concept of traditional financial options and by extension, have their utility. Thus, if real options are used for the study and valuation of an investment project (just like an NPV, or Net Present Value), we can suppose that there is a possible extension for the structure of liabilities and shareholders' equity[2].

In the case of real options, the implication is a "real" asset that has not been assessed. Because of this, the potential investment of a company can be seen as an entrance fee that allows us to access future opportunities. Thus, the value of a project is not limited to the present value of anticipated cash flow, but must capture all of the opportunities for growth that will present themselves in the future. Real options will then offer the advantage of incorporating the possibility of an increase, as well as a decrease in future cash flows through the parameter of volatility. Indeed, the incertitude is the reflection of the volatility of assets and the prospects of evolution in the project that would result in strategic decisions. The company can, for example, make the choice to abandon its project, follow through with it or extend it… This concept of flexibility is not taken into account in the NPV criteria and, thus, in the DCF method.

From this perspective, since liabilities are the mirror of company assets, its economic value and the value of its debts can also be studied with respect to options. By adopting a logic based on the sale of a company, shareholders, who have a limited responsibility with respect to creditors in a capital company, can recover assets from the company, as long as they pay back the nominal value of the debt. And, as in a capital company, the shareholders have a limited responsibility with regard to creditors, the economic value, which corresponds to their wealth, and is analogous to the value of the purchasing option of assets. In other words, shareholders have a claim over the assets. They can buy them as long as they reimburse the creditors. The optional references (notably Black and Scholes (1973)[3] and Merton (1974)[4]) thus propose a new company value taken from the sum of the economic value and the net debt.

The theoretical comparison between traditional methods and the real options method must extend to practical use. Whether a company's investment plan is more or less risky, and as a consequence, if the asset portfolio – and thus the liabilities structure – is more or less volatile whether the value of the net debt is bigger or smaller and whether its maturity is longer or shorter, the results from different valuation methods could very well vary and become more or less pertinent and reliable within a particular sector. Indeed, by trying to consider the economic value of net debt from an optional perspective, the analyst evaluating the economic value of a company using the Black–Scholes–Merton method could detect a potential for growth, meaning that stock prices are somewhat underestimated. In other words, in this case, the valuation of economic value results in the following estimation:

Since a company's investment portfolio value, that is, its assets, is equal to the value of its liabilities, to what extent

can the approach using real options be applied to the valuation of a company’s liabilities structure?

The first section will focus on the application of real options to the liabilities structure. The limits of traditional valuation methods, which the approach using options is aiming to resolve, will first be presented. Then, the optional valuation models in discrete time and continuous time will be developed, in order to locate their convergence. This theoretical framework will end in a valuation of economic value and debt using an optional approach. The second section will be dedicated to the study of the financial literature, which will specify the aspects and the stakes of economic debt and examine the adjustment of systematic risk in economic value. Then, the scientific articles that have been studied will elucidate the impact of the agency conflicts that exist between shareholders and creditors on the optional approach to the issue. Finally, debt refinancing mechanisms and their impact on economic value will be addressed. A third part will deal with two studies carried out on different dates, including statistical tests of the traditional valuation methods and following the real options approach. The first study concentrates on companies in the CAC 40 index. The second study examines companies in the cinema industry.

1 The net debt is the difference between the financial debt on the one hand, and the cash flow and equivalent of cash flows, on the other.

2 To the extent that the economic value of assets is equal to the economic value of liabilities and shareholders’ equity.

3 Black, F. and Scholes, M. (1973). The pricing of options and corporate liabilities. *Journal of Political Economy*, 81(3), 637–654.

4 Merton, R.C. (1974). On the pricing of corporate debt: The risk structure of interest rates. *Journal of Finance,* 29(2), 449–470.

1
The Utility of Real Options in the Valuation of Liabilities

1.1. Introduction

Traditional valuation methods can appear overly static when faced with the need to account for the notion of the overall company risk through the volatility of its assets, as well as the need to determine the economic value of the debt, which until now, has been ignored. Indeed, insofar as the final objective of each of these valuation methods is to obtain the economic value of equity, that of net debt cannot be separated from this consideration if we take it to its logical conclusion.

Moreover, each of these traditional methods can be critiqued. The subjectivity of hypotheses in the construction of a business plan at the heart of the DCF method, the disparities at the heart of a sample set of companies belonging to the same business sector leading to falsified sector-specific multiples, and even the failure to consider any potential growth at the heart of the patrimonial approach are all faults that bias the valuation and raise the question of the pertinence of these traditional methods, suggesting the possibility that a complementary and innovative method exists.

Insofar as the assets of a company can be considered a portfolio of real options, nothing negates the idea that it would be the same for liability. And indeed, the value of company equity and debts can also be studied in the field of options.

This approach allows us to separate the equity of a company into intrinsic value and time value. The intrinsic value is the difference between the present economic value of the asset and the nominal amount of debt. The time value is the expectation that the company value will become greater than the amount of net debt to be repaid. Otherwise, the time value is zero. In this case, real options are therefore useful in valuating equity economically by distinguishing the possible creation of value for shareholders after a merger-acquisition, but they turn out to be just as necessary for economically valuating the net debt. It then turns out that the risk of debt can have an entirely different impact on the value of a company, due to the emergence of a probability of bankruptcy and the rate of non-recovery in the models.

1.2. Real options: a mitigating alternative to the deficiency of traditional valuation methods

Traditional valuation methods are subject to fundamental methodological critiques in general and in the case of each one. In each method, the volatility of assets is not accounted for and the value of net debt is counted when it should be, as with equity, economic. Furthermore, the multiples method can give the impression of large gaps in the multiples of the standard, tied in particular to significant differences in terms of marginal rates, investment politics, accounting norms used, financial structures or tax rates between companies. Thus, the sector-specific multiples used to valuate a company can be biased. An intuitive and legitimate reflex, at the end of the day, leads to the removal of elements that seem inacceptable.

Nonetheless, this reflex is subjective. If, theoretically, the DCF method is infallible in the sense that its logic brings us to the conclusion that a company is worth what it will become, the necessary parameters for the creation of a model are based on strong hypotheses that can vary considerably from one analyst to another. Finally, the patrimonial method, which remains difficult for an external analyst to apply, finds its limit in the fact that, by focusing on the patrimonial present of a company, any forecasts are voluntarily excluded.

By insisting on economically valuating the structure of liabilities, real options allow us to adopt an alternative point of view. By adopting an optional logic, it becomes possible to consider that equity is the reflection of the purchase from a call and that debt is that of a sale from a put. Thus, the Black–Scholes model (1973) is legitimized.

1.2.1. *The limits of traditional approaches*

The comparables approach must allow us to define pertinent standards. This is a complicated task, however. In order for the sample to be reliable, it must indeed be representative of the business sector and account for a certain level of risk and development related to financial performance and a similar model. Moreover, significant deviations can be seen in the fact that the chosen standards might include international companies that apply different accounting norms. To limit large disparities, it is possible to apply regressive statistical tools. This reveals a linear relationship between a valuation multiple and the principal performance criteria that affects them. In the case of transactional comparables, we must recall that a control premium was applied by the buyer.

It is therefore necessary to subtract value in order to correct this effect. Traditionally, practitioners begin with a

large standard that becomes smaller over time to maintain companies or “satisfying” transactions, with respect to the different points raised here. Otherwise, the major inconvenience of the patrimonial approach is that it does not consider the growth potential of a company. In the DCF approach[1], the company value (or enterprise value, *EV*) is the discounted value of future free cash flows *FCF*, the discount rate being the weighted mean cost of capital or WACC *K*:

$$\mathrm{EV} = \sum_{t=1}^{+\infty} \frac{\mathrm{FCF_t}}{(1+\mathrm{K})^t} \text{ with } \mathrm{K} = \mathrm{k}\frac{\mathrm{E}}{\mathrm{E+D}} + \mathrm{i}(1-\tau)\frac{\mathrm{D}}{\mathrm{E+D}} \qquad [1.1]$$

where *E* is the value of equity and *D* is the net debt. The WACC contained in the calculation of the company value is based on the equity value, which is found using the DCF method. It is the reason why practitioners include an iterative life cycle in their approach. By supposing an infinite rate of growth of FCF *g* starting at year 1 and a WACC equal to *K*:

$$\mathrm{EV} = \frac{\mathrm{FCF}(1+\mathrm{g})}{\mathrm{K}-\mathrm{g}} \text{ and } \mathrm{K} = \mathrm{k}\frac{\mathrm{E}}{\mathrm{EV}} + \mathrm{i}(1-\tau)\frac{\mathrm{D}}{\mathrm{EV}} \qquad [1.2]$$

By referring to the cost of capital adjusted by Modigliani and Miller (1963), we can eliminate the life cycle. Indeed, $K = \rho.\left(1 - \frac{D.\tau}{EV}\right)$, where ρ is the cost of capital for a debtless company with the same sector-specific rate risk. In other words, thanks to the CAPM, $\rho = \mathrm{r} + \beta^*[E(R_M) - r]$, where *r* is the rate without risk. Thus:

$$\mathrm{EV} = \frac{\mathrm{FCF}(1+\mathrm{g})}{\rho.\left(1-\frac{D.\tau}{EV}\right)-\mathrm{g}} \text{ and } \mathrm{EV} = \frac{\mathrm{FCF}(1+\mathrm{g})+\mathrm{D}.\tau.\rho}{\rho-\mathrm{g}} \qquad [1.3]$$

where $D\tau$ is the tax rate that results from fiscal deductibility of interest to the extent that we suppose an infinite net debt. Indeed, in the Modigliani–Miller theory,

$D\tau$ comes from the simplification of $\frac{i.D.\tau}{i}$, where $iD\tau$ is the interest tax economy and i is the corresponding tax rate. In this case, D is obviously the remaining debt owed, found in the latest available financial statements. When practitioners deduct D from EV to obtain the value of equity, the following formula E is obtained:

$$E = \frac{FCF.(1+g)+D.[g-\rho.(1-\tau)]}{\rho-g} \quad [1.4]$$

The Modigliani–Miller theory shows that the strike price on risky debt has no impact on the WACC, and, as a result of this, it has no impact on the value of equity: the cost of debt does not appear in the two previous formulas, and a rise in the strike price of the debt corresponds to a rise in the risk that can be tolerated by the investors and banks. It is therefore logical that a drop in risk is tolerated by shareholders. For a simple example, Table 1.1 shows that the transfer of risk between shareholders and investors does not change the value of the WACC.

With an FCF equal to 100, a risk-free rate of 2%, a market risk premium of 7% and a debtless *beta* of 0.9, two hypotheses about the cost of debt before taxes arise: 3.40%, based on a debt *beta* of 0.20, and 5.50%, based on a debt *beta* of 0.50. The corresponding indebted *betas*, based on the Hamada formula, are, respectively, 1.18 and 1.06, and the deducted equity costs are 10.27% and 9.43%, respectively. Thus, the two WACC and adjusted capital costs are 7.06%. Finally, the company value is the same in both cases: 2,538.