IMD650
29.05.2012

NOTE ON COMPANY VALUATION BY DISCOUNTED CASH FLOWS (DCF)

Professor Nuno Fernandes prepared this technical note as a basis for class discussion.

The value of a firm depends not only on the cash flows it provides to its investors but also the timing, as well as the risk of those cash flows.

This note focuses on the main methods used to value companies, whether it is in a merger and acquisition setting or not. It covers concepts such as:

- The Discounted Cash Flow (DCF) method
- Discount rates and cost of capital
- Valuation using multiples
- Value creation through M&As.

It also includes updated data on many valuation indicators in 2012.

Valuation Using Discounted Cash Flows – The DCF Method

In this section, we present an overview of the key concepts behind company valuation by the discounted cash flow (DCF) method covering different aspects:

- What is a free cash flow
- Terminal value
- Appropriate cost of capital
- Forecasting future cash flows, based on proforma financial statements
- Discounting cash flows to get firm value.

The value of a company depends on the cash flows it generates. The same goes for a proposed investment project, whether it is a capital expenditure, a new product launch or a replacement of a machine. There is an old saying; "Cash is a fact, profit is an opinion." In a DCF valuation, it is thus important to distinguish between profits and cash flows.

Income (or profit) is different from cash flow for a variety of accounting methods. For instance, booking a sale usually translates into higher income. However, usually customers get trade credit, and only after some time will the cash actually be collected. One other major cause for the difference between cash flow and income is the treatment of fixed assets. In accounting terms, the value of a building or a car (any kind of fixed asset) depreciates over time. Thus, each year there is an accounting item that reflects how much depreciation the accounting tables allow for those fixed assets. However, in reality, cash is paid as the car is bought. And from then onwards there are no cash flows related to the acquisition of the car. This implies that when computing cash flows, we have to undo several accounting statement entries to clear them from virtual transactions that have no cash flow implication.

The most common method of company valuation using discounted cash flows is free cash flow to the firm (FCFF). Under this method, we attempt to determine the enterprise value, or value of the firm, by discounting all the cash flows over the life of the company. Then, we can estimate the equity value by subtracting the debt value from the resulting enterprise value. Alternatively, one can use the free cash flow to equity method (FCFE),[1] which is a slight modification of the main method described in this note – FCFF.

The FCFF method computes the value of a company based on the discounted cash flows to the firm over the life of the company. It is usually assumed that a company has an infinite life.[2] Thus, the analysis is broken into two (or sometimes more) parts: 1) An explicit forecasting period; and 2) a terminal value. In the forecast period, we make explicit forecasts of different items of the FCFF. The terminal value is estimated at the end of the forecast period and summarizes the present value of all future cash flows from that period onwards. For both terminal value and forecast period, a clear measurement of the free cash flows is required as well as an appropriate discount rate.

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[1] Alternatively, one can use the free cash flow to equity method (FCFE), which is only a slight modification of the main method described in this note – FCFF. In the case of FCFE, we focus on the cash flows (CF) to equity holders only after all debt-related cash flows have been deducted (interest and amortization of debt). The FCFE are then discounted at the cost of equity. It is important that the cost of equity reflects the appropriate business and financial risk. Also, like the FCFF method, a careful analysis of the terminal value should be performed.

[2] In some specific cases, related to concessions over a certain number of years, this infinite life assumption is obviously not used.

Defining Free Cash Flows to the Firm – FCFF

The free cash flow to the firm (FCFF) represents the cash generated by the firm that is available to all investors after having paid taxes and meeting investment needs. This money can be used to return money to shareholders (either through dividends or share buybacks), repay debt, acquire other companies, provide extraordinary bonus to key employees, and so on.

The FCFF is also called unlevered cash flow since it represents the total amount of cash available to distribute by all suppliers of capital, including debtholders. It can also be interpreted as the free cash flow that a firm without debt (unlevered firm, or all-equity firm) would have.[3]

FCFF is defined for each year as:

$$FCFF = EBITDA - \Delta NWC - taxes - CAPEX$$

or

$$FCFF = \text{Unlevered Net Income} + \text{Depreciation} - CAPEX - \Delta NWC$$

where:

- Unlevered net income is equal to EBIT x (1- Tax rate); EBIT is earnings before interest and taxes; T is the tax rate. Unlevered net income is also called NOPAT – net operating profit after taxes.
- Depreciation includes all noncash operating expenses used for tax purposes, including depreciation, depletion and amortization.
- CAPEX is capital expenditures
- EBITDA is the earnings before interest taxes depreciation and amortization
- ΔNWC is the changes in net working capital

In the FCFF method, we do not include any debt-related payment in the cash flows. The cost of debt will be considered only in the cost of capital, and thus impact the company valuation through the discount rate.

There are thus two alternative routes (and potentially variants of these) to reach the FCFF. Under the first formula:

$$FCFF = EBITDA - \Delta NWC - taxes - CAPEX$$

we start with EBITDA and subtract changes in net working capital.[4] EBITDA minus changes in net working capital (ΔNWC) represents the operating cash flows. We then need to subtract the amount of taxes to be paid as well as the necessary capital expenditures to arrive at the FCFF.

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[3] Interest payments are tax deductible from the pre-tax income, which effectively lowers the cost of debt (tax shields). The tax advantage of debt is intentionally excluded from the FCFF calculation. This way we avoid double-counting the tax shields, as they will be incorporated in the WACC.

[4] Indeed, EBITDA is close to the operating cash flow, but not exactly, due to working capital account movements, related to trade payables, receivables, and inventory.

Under the second formula:

$$FCFF = \text{Unlevered Net Income} + \text{Depreciation} - \text{CAPEX} - \Delta NWC$$

we start from the unlevered net income, and then add back depreciation expenditures, as these are noncash expenses recognized only for tax purposes. Then, as for the first formula, we still need to subtract the capital expenditures in the period, as well as the additional investments in the net working capital.[5] The results are exactly the same using both methods correctly.

Forecasting Future Cash Flows

In order to estimate future FCFF, we need to generate proforma accounting statements for future years. Given the definition of FCFF, we need to generate projections of income statement and balance sheet going forward, so that we can compute the different items needed for the FCFF.

It is common to start with sales. Forecasting sales for future years requires market research analysis as well as competitive positioning, which allow us to compute forecasted sales growth rates into the future.

Then, assumptions related to the operating profit margin, namely the costs of goods and general expenses, must be made. Margins might be higher or lower than in the past for fundamental reasons, such as:

- Capacity utilization
- Unit labor cost
- Inflation
- Competition – local and foreign.

Net working capital also needs to be estimated. It can be defined as a percentage of sales, a fixed amount per customer, or be based on monthly terms (e.g. one month of credit to customers, two of inventories). It is important to always look at changes in net working capital from one year to the next.

Depreciations, despite not being a cash item, must also be estimated. Above all, depreciations will impact taxes. Depreciations reflect past capital expenditures made by the company and the average useful life of equipment.

For companies with no growth, it is common to assume that depreciation equals capital expenditures. Thus, by assuming that Depreciation = CAPEX, we are saying that the company is only replacing its assets, but not growing beyond its current capacity. Also, in this case, we can assume that net working capital is constant, and thus, on an annual basis, the firm will not change its receivables, inventory and payables. As a consequence, there is no required investment in working capital on an annual basis. In this particular case, the free cash flow equals the unlevered net income (or NOPAT).

[5] Important, it is the change from one year to the other that is relevant in terms of net working capital.

Example

Consider a company with:

- Previous year revenues = $10,000
- Estimated revenue growth = 5%, 4%, and 3% over the next 3 years respectively
- Costs of goods sold (COGS) = 50% of sales
- Selling, general & administrative expenses (SG&A) = 15% of sales
- The effective tax rate = 30.0%
- Net working capital requirements = 5% of sales
- Capital expenditures planned according to the below table:

	XXX1	XXX2	XXX3
CAPEX	$300	$294	$284

Regardless of the method chosen to compute the FCFF, we must always prepare a proforma income statement, in order to determine the amount of taxes to be paid, as well as other important components of the FCFF.

In this case, given the above assumptions, revenues grow at 5%, 4%, and 3% respectively and the income statement will look like:

(in $)	**XXX1**	**XXX2**	**XXX3**
Revenues	10,500	10,920	11,248
- COGS	5,250	5,460	5,624
- SG&A	1,575	1,638	1,687
EBITDA	**3,675**	**3,822**	**3,937**
- Depreciation	200	210	218
EBIT	**3,475**	**3,612**	**3,718**
- Taxes (EBIT * tax rate)	1,043	1,084	1,115
Unlevered Net Income	**2,433**	**2,528**	**2,603**

Given that the firm will always require 5% of sales in working capital, for each year the working capital requirements are:

(in $)	**XXX1**	**XXX2**	**XXX3**
Net working capital	525	546	568

Example (cont.)

Under the first method to compute FCFFs:

> FCFF= EBITDA – ΔNWC – taxes – CAPEX

(in $)	XXX1	XXX2	XXX3
EBITDA	3,675	3,822	3,937
- Changes in NWC	(25)	(21)	(16)
- Taxes	(1,043)	(1,084)	(1,115)
- CAPEX	(300)	(294)	(284)
Free cash flow to the firm	**2,308**	**2,423**	**2,521**

Alternatively, under the second method, one can compute the FCFF as:

> Free Cash Flow = Unlevered Net Income + Depreciation – CAPEX - ΔNWC

(in $)	XXX1	XXX2	XXX3
Unlevered net income	2,433	2,528	2,603
+ Depreciation	200	210	218
- CAPEX	(300)	(294)	(284)
- Changes in NWC	(25)	(21)	(16)
Free cash flow to the firm	**2,308**	**2,423**	**2,521**

We reach an FCFF of $2,308, $2,423 and $2,521: exactly the same result using both methods.

Importantly, we do not include (or subtract out) interest payments since the objective is to compute the FCFF, which is the cash flow available to pay all owners (or suppliers of capital). All interest and debt-related costs will be included in the discount rate – WACC. Thus, the FCFF is independent of the amount of debt in the capital structure of the company. Changes in capital structure and, consequently, the tax shield implications of debt are incorporated in the WACC calculation.

How Long is the Explicit or Forecasting Period?

Since companies are assumed to have an infinite life, we usually split the valuation into two components: the explicit period (also called forecast period) and the terminal value.

In the explicit period, we compute forecasts of the FCFF for each year. The cash-flow forecasts should be based on sound industry and company analysis, reflecting industry trends, market research data, competitive pressures and firm strategy.

Having computed the explicit period FCFFs, one then needs to compute the terminal value. The terminal value is estimated in the last year of explicit cash flows and represents the sum of all the future cash flows that the firm is going to generate, in steady state, thereafter.

The length of the recommended explicit period varies. There is no absolute truth here. The explicit period depends on our scenario for the firm growth. It basically depends on the length of time that one believes the company will be able to grow at fast rates. But eventually, every company reaches a mature stage. At this stage, the terminal value can be computed. For mature firms, it is typical to use five years of explicit period. For higher growth firms, where it is reasonable to assume above average growth for a longer time frame, 10 years can be used. But in certain sectors or companies, higher growth periods could be used.

The standard formula for terminal value is:

$$TV_t = \frac{FCFF_{t+1}}{WACC - g} = \frac{FCFF_t \times (1+g)}{WACC - g}$$

where:

- TV_t is the terminal value expressed at time *t*. It is important to remember that it should still be discounted to the present.
- $FCFF_t$ represents the free cash flow to the firm at time *t*
- *WACC* is the weighted average cost of capital
- *g* is the constant growth rate that is expected in perpetuity.

The terminal value is equal to the present value of all the cash flows occurring after the explicit period ends. In perpetuity, it is assumed that the firm's cash flows will grow at a constant rate (can be negative, if one assumes a perpetual decline in FCFF).

For example, suppose we are interested in computing the terminal value for a company for which we have estimated the first five years of explicit FCFF:

(in $)	XXX1	XXX2	XXX3	XXX4	XXX5
Unlevered net income	2,433	2,528	2,603	2,653	2,706
+ Depreciation	200	210	218	225	229
- CAPEX	(300)	(294)	(284)	(270)	(275)
- Changes in NWC	(25)	(21)	(16)	(11)	(11)
FCFF	**2,308**	**2,423**	**2,521**	**2,597**	**2,649**

The assumption is that after year 5, FCFF is expected to grow into perpetuity at 2%. The cost of capital for this company (WACC) equals 9.31%.

We can thus compute the terminal value in year 5, since the firm will then grow at a constant rate of 2%.

$$TV_5 = \frac{FCFF_6}{WACC - g} = \frac{FCFF_5 \times (1+g)}{WACC - g} = \frac{2,649 \times (1.02)}{9.31\% - 2\%} = 36,963$$

The terminal value is estimated at $36,963. This terminal value, in the final year of the forecast period (year 5), capitalizes all future cash flows occurring thereafter. It is important to remember that this value is, however, computed in year 5, and thus must also be discounted 5 years to be expressed in present value terms. In this case, the present value of the terminal value (in year 5) equals $23,685.[6]

(in $)	XXX1	XXX2	XXX3	XXX4	XXX5
Unlevered net income	**2,433**	**2,528**	**2,603**	**2,653**	**2,706**
+ Depreciation	200	210	218	225	229
- CAPEX	(300)	(294)	(284)	(270)	(275)
- Changes in NWC	(25)	(21)	(16)	(11)	(11)
Free cash flow to the firm	**2,308**	**2,423**	**2,521**	**2,597**	**2,649**
Terminal value (TV)					**36,963**
Present value FCFF + TV	2,111	2,028	1,930	1,819	25,382

Growth in Perpetuity

The free cash flow used in the constant growth formula used for the terminal value above must be a steady-state cash flow for the year after the forecast period ends. The assumption then is that this cash flow will grow at a constant steady-state rate in perpetuity.

For the terminal value calculation, it is usually assumed that most financial statement line items will grow at the expected constant steady-state rate. One must recall that necessary calculations might be required for the capital expenditures (CAPEX) and net working capital (NWC), in order to get the final FCFF. The CAPEX in steady state must maintain a certain growth. First, it is necessary to replace assets that are being depreciated. Second, if one assumes a certain long-term growth rate for sales, then the assets of the company also have to grow over time. It is common to assume a certain constant long-term assets/sales ratio, which implies that in steady state, the operating efficiency of the assets will be maintained. Another commonly used alternative is to specify a certain ratio of CAPEX/sales, that will be maintained into perpetuity. Alternatively, if we assume growth in revenues for the calculation of the FCFF but do not allow for growth in CAPEX, we would be assuming an infinite improvement in the efficiency of the assets in place. The same thing applies to the NWC. If a certain growth is assumed across the firm, then the working capital items will also

[6] Present value of $36,963 received in five years = $36,963 /1.093^5 = $23,685.

need to grow with time. It is common to assume a certain long-term relation between NWC and sales: for instance, NWC is expressed as a certain percentage of sales, which is maintained constant through the long term.

Every company eventually reaches a mature stage. At this point long-term growth is moderate and *g* is likely to be close to the inflation rate with some small adjustment for other factors.

It is important to remember that small changes in the growth rate produce large changes in terminal value. The following table shows the present value of the terminal value for the example above, using different growth rates.

	1.00%	1.50%	2.00%	2.50%	3.00%
Present value of the terminal value (in $)	20,839	22,171	23,685	25,421	27,432

Under the base case scenario, where long-term growth is assumed to be 2%, the present value of the terminal value equals $23,685. However, if the long-term growth rate is 1.5%, the terminal value goes down to $22,171. Alternatively, if long-term growth equals 2.5%, terminal value grows to $25,421.

It is then advisable to dedicate a substantial amount of time on computing the steady-state growth rate.[7] In perpetuity, no firm can grow faster than the overall economy. This means that the growth rate can never by higher than the nominal GDP growth (in the long term). Also, no firm can keep growing faster than the overall industry. Finally, the growth rate cannot exceed the cost of capital in perpetuity. In many cases, it is common to assume long-term growth rates of 1% to 2%, that is, close to the inflation rate. But in certain sectors (such as fixed line telecoms), where markets are mature and competitive pressures keep driving margins down, it is sometimes reasonable to assume negative long-term growth rates.

Cost of Capital

The cost of capital is one of the most important concepts in finance. It is the minimum acceptable rate of return that new investments must yield and it represents the long-term opportunity cost of the funds used by a company. If management decides to invest in projects with expected returns above the cost of capital, the company value goes up. Conversely, if a company invests in projects (that despite having positive profitability) with expected returns below the cost of capital, it destroys value and company value goes down. Similarly, the cost of capital is the discount rate that should be used in a DCF analysis, in capital budgeting applications, when valuing a company or a division, or an acquisition target.

[7] Market multiples can also be used to estimate the terminal value (and thus provide a robustness check of the terminal value obtained through the FCFF method). This involves estimating the terminal value using market multiples from publicly traded firms comparable to the company being valued. The triangulation of the terminal value using multiples is often used. Given the substantial importance that the terminal value has in a valuation, one must use different approaches to estimate it. Multiples are also very useful to obtain an estimate of the implied growth rate that the market is using in its valuations. It can be helpful when judging the merits of different long-term growth rates to think about this.

Importantly, the cost of capital is not fixed internally. Rather, it must be estimated, taking into account the rate of return required by the investors that finance a company. Investors who buy company bonds and stocks are looking for a return that compensates them for the risk in their investment, as well as the time value of money. Thus, the cost of capital can be interpreted, from the investors' point of view, as the opportunity cost of funds.

Also, the current cost of capital for a company, may not be the appropriate parameter to use in an expansion project. If, for instance, a company is currently involved in electricity distribution and now wants to evaluate a new business opportunity in the media business, the past cost of capital is not appropriate since the risks of the two businesses are not the same.

Under the FCFF valuation analysis, the appropriate discount rate is the Weighted Average Cost of Capital (WACC) on comparable investments. The WACC reflects not only the business risk but also the financial risk of a company to be valued. The WACC must be estimated in the same currency as the cash flows and it must incorporate the appropriate long-term target capital structure.

The formula for the WACC is a weighted average of the equity and debt investors' required return (opportunity cost of capital for them) given by:

$$WACC = \frac{debt}{debt + equity}(1-t)r_{debt} + \frac{equity}{debt + equity}r_{equity}$$

- Where r_{debt} is the cost of debt, r_{equity} is the cost of equity
- t is the corporate tax rate
- Debt is the sum of short- and long-term debt
- Equity is the total value of the equity.

The WACC is the after-tax[8] cost of funding for a company as a whole. It is computed as the weighted average of the cost of equity and after-tax cost of debt, taking into account the appropriate mix of debt and equity. Both costs of equity and debt should be forward looking and reflect the cost demanded by the different sources of capital of a company (or required return expected by investors given the risk of a company).

To compute the WACC:

1. Estimate the percentages of debt and equity financing. Importantly, these must be based on market values of equity and debt. Book value and market value of debt are

[8] Since interest payments are tax deductible, the after-tax cost of debt is lower than the before-tax cost. Thus, in the WACC formula, we includes the term (one minus the corporate tax rate) to represent the tax shield obtained through interest payments. The correct tax rate of the WACC is the rate at which taxes will be reduced by interest deductions in the future. This may be the effective tax rate, or the marginal tax rate depending on the circumstances.

not significantly different, unless a company has entered into a distress situation.[9] However, the book value of equity is, for most companies, very different from its market value.

2. Estimate the cost of equity (r_{equity}) and cost of debt (r_{debt}). Both must reflect the expectations of risk and return required by investors. These costs (of equity and debt) must also reflect the appropriate capital structure of a company.

3. Estimate WACC using the appropriate capital structure, which represents the target mix of capital (debt and equity) of a company.

Importantly, the cost of capital is not dictated by management. It is rather the rate of return demanded by the investors who finance a company, either by buying company bonds (debtholders) or stocks (equity holders). All investors seek a return on their investment that compensates them for the risk incurred. The WACC is then a market-value concept that management needs to know, in order to make good decisions for a company's owners. We will now look at how to estimate the required return for each of the sources of capital: cost of debt and cost of equity.

Estimating the Cost of Debt

To compute the WACC, the cost of debt must be forward looking, and it must reflect expectations of risk and return required by debt investors. It must also reflect the expected return on a long-term fixed-rate[10] loan (or bond), of a credit risk that is consistent with the capital structure ratios built into the WACC formula.

Companies can borrow from a bank by taking a loan. In this case, the cost of debt is the interest rate the bank charges a company.[11] Alternatively, a company can borrow directly from investors by selling bonds. In this case, the cost of debt is the current market rate (or yield-to-maturity) required by investors to invest in the company's bonds.

Since a corporate bond has a certain probability of default, investors will always ask companies for interest rates higher than the risk free rate. The cost of debt is then:

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[9] Differences between book and market value of debt arise when the company faced large changes in its ratings (and thus the cost of debt) since the debt was originally issued. In this case, the face value of the loans or bonds will be different from its market value.

[10] Rates on floating-rate bonds or loans should not be used in cost of debt calculations. These have interest payments linked to a short-term benchmark rate, such as the LIBOR or Euribor. These can give a misleading estimate of the cost of debt over the long term. Even if a company has floating-rate debt, when calculating the WACC, we should consider as cost of debt, a long-term fixed rate.

[11] The rate a company pays to the bank is the before-tax cost of debt. It will then be multiplied in the WACC formula by (1-t). That is, if a company pays $1,000 in interest costs and has a tax rate of 25%, it will reduce the amount of taxes by $250 (due to the deductibility of interest costs on the tax bill). Thus, the after-tax dollar cost of debt is $750.

$$r_{debt} = r_f + Spread$$

- Where r_{debt} is the corporate cost of debt and r_f is the risk-free rate (the yield to maturity of similar maturity government bonds).
- The common practice is to take the yield on a long-term (for instance, 10 years) government bond as the risk-free rate.
- It is important to remember that this risk-free rate must be consistent with the currency in which the cash flows are estimated.
- The Spread is the market estimate of a company's credit risk. Naturally, for riskier borrowers the Spread (and thus the cost of debt) is higher than for safer ones.

The cost of debt is then the investors' required return, which is consistent with what they demand on debt instruments of similar credit risk and maturity.

Credit ratings play an important role in helping investors make better-informed decisions and judge the risk of lending money to a given company. A credit rating is an evaluation of the creditworthiness of an issuer (or a specific bond issued by that issuer).

The main global rating agencies are Moody's Investor Services (Moody's) and Standard & Poor's (S&P). Below are the major rating categories for these rating agencies:

	Moody's	S&P
Investment Grade	Aaa	AAA
	Aa	AA
	A	A
	Baa	BBB
Junk Bonds	Ba	BB
	B	B
	Caa	CCC
	Ca	CC
	C	C

Bonds with a rating equal to or above Baa (Moody's) or BBB (S&P) are considered investment grade. Bonds with lower ratings are considered speculative grade – also called junk bonds, sub-investment grade, or high-yield bonds.

Within each rating category, there are sub-categories – also called notches. Moody's uses numbers (1 for the safest tier) while S&P uses plus and minus signs. For instance, there are three different tiers within the A category:

Moody's	S&P
A1	A+
A2	A
A3	A-

Given that ratings assess potential default risk, lower ratings are associated with a higher cost of debt.[12] The table below shows the average spread (above a risk-free bond with similar maturity) required by investors for different investment- and speculative-grade bonds as at 31 January 2012:

Investment Grade	
AAA	0.46%
AA	0.57%
A+	0.79%
A	0.86%
A-	1.17%
BBB+	1.44%
BBB	1.90%
BBB-	2.38%

Junk bonds	
BB+	3.77%
BB	4.32%
BB-	4.38%
B+	4.61%
B	5.60%
B-	6.08%

Source: Bloomberg, 31 January 2012

Example

Suppose the risk-free rate equals 4% (government bonds market yield). We would estimate a company's cost of debt to be:

$$r_{debt} = r_f + Spread$$

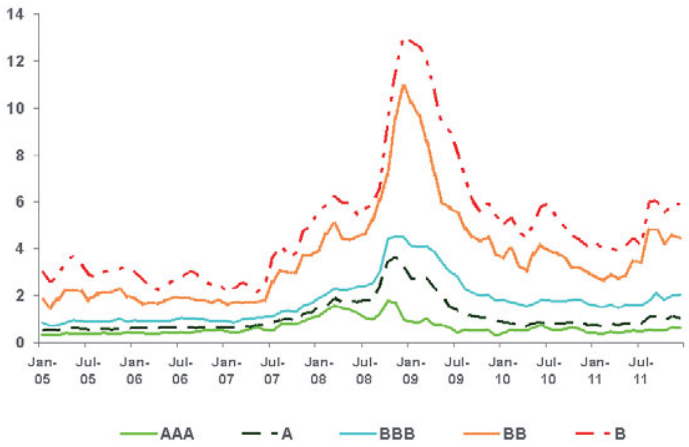
The credit spreads above indicate that an AAA borrower pays on average 4.46% (risk-free rate of 4% + spread of 0.46%) for his debt. For a BBB borrower who wants to issue debt as of 31 January 2012, the above data suggest the total borrowing costs (or YTM) are on average 5.90% (4%+1.90%).

Credit Spreads Change over Time

Credit spreads are not constant. Thus, the rate at which a certain issuer can finance itself varies over time even if its credit rating does not change. Also, from an investor's perspective, the prices of corporate bonds fluctuate as credit spreads widen or narrow. In general, corporate bond prices increase when spreads narrow.

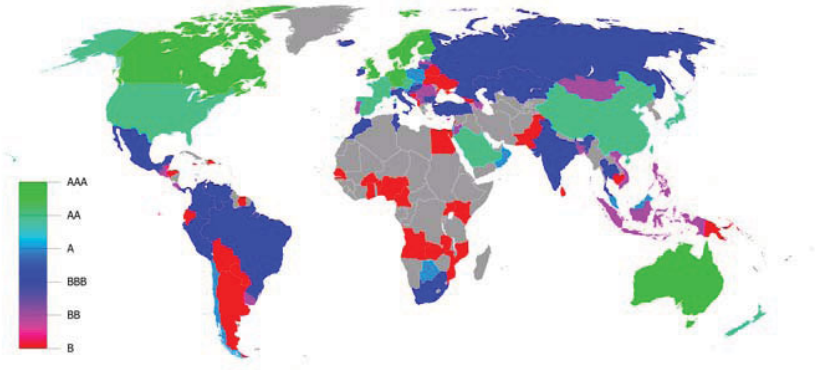
[12] As an alternative to bond ratings, we can use credit default swap (CDS) to estimate a company's credit risk (and thus the spread). CDS is a special type of insurance that protects the buyer in case of loan default. An annual premium has to be paid when a CDS is purchased. This is typically referred to as the CDS spread. In exchange for this premium, the buyer benefits from the insurance. In the particular case of the CDS market, the insurance is against default of an issuer. Thus, the CDS spread can be interpreted as the market-based metric of credit risk for a certain company.

The graph below shows the evolution of the average credit spreads for issuers of different ratings over the period 1 January 2005 to 1 January 2012:



All spreads increased significantly during the financial crisis of 2008/09. However, the graph above also shows that the increase in spreads was not constant across the different rating categories. Indeed, the spreads increased mostly for issuers of lower credit quality.

The chart below shows Standard and Poor's rating for all countries in the world, as of January 1, 2012 (grey if not rated):



Source: Bloomberg

As of January 2012, only four corporate issuers had an AAA rating worldwide: Automatic Data Processing, Exxon Mobil, Johnson & Johnson and Microsoft.

Estimating the Cost of Equity

The return required by equity investors is proportional to the risk they face. It depends on the risk of a company (or project) being valued. The capital asset pricing model (CAPM) is the traditional model used by analysts, investment banks and best-in-class world corporations to estimate the cost of equity.[13] According to the CAPM the cost of equity is equal to:

[13] The CAPM is a model developed by William Sharpe, for which he received the 1990 Nobel Prize in Economics.

$$r_{equity} = r_f + \beta \times (\text{Market Risk Premium})$$

- Where r_f is the risk-free rate (consistent with the currency of the cash flows) and β is the beta of a company, which represents the systematic risk of a company's common stock. Importantly, this beta must reflect an appropriate compensation for the business risk and also for the financial (capital structure) risk.

According to the CAPM, the main measure of risk is the beta coefficient. The beta is a measure of the systematic risk of a company's shares, which includes compensation for business and financial risk.

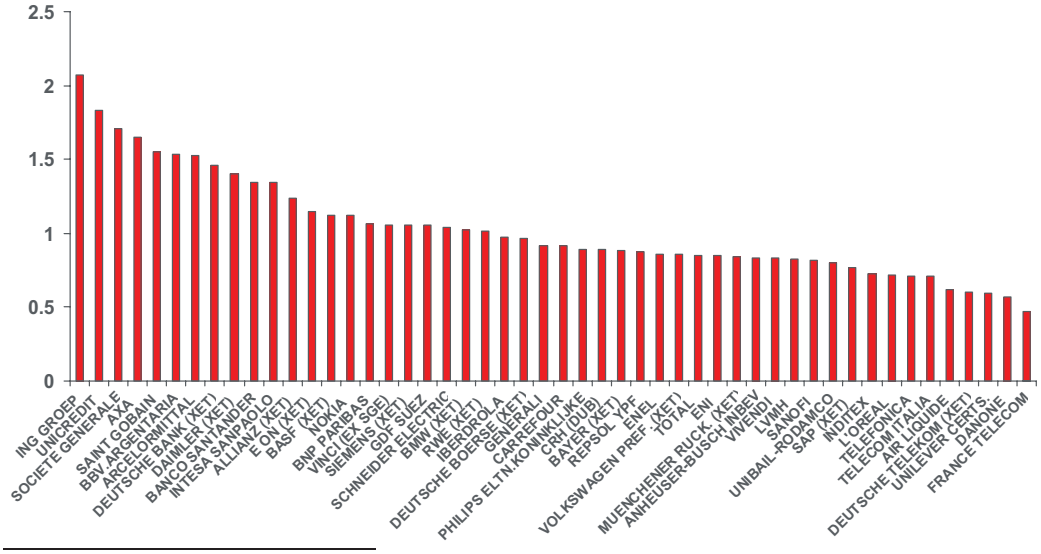
All companies and projects have their own beta coefficient.[14] The average beta is equal to one. A beta of one means that a company has an average risk, that is, a similar risk to that of the aggregate market or economy.

Betas above one indicate higher than average risk. This suggests that a company is riskier than the average company in the economy. If a company has a beta higher than one, it is also an indication that its profits are sensitive to the economic conditions and fluctuate substantially depending on the business cycle, competitive pressures and technological innovation. For example, industries that typically have betas above one include IT & electronics and automobile manufacturing. Given the higher risk, investors will demand a higher cost of equity to invest in companies with high betas.

Betas below one indicate below average risk. This is common for companies with stable profits and cash flows. It indicates that a company's profits do not vary as much as the average company in the economy. It also suggests that a company is less sensitive to the business cycle than companies with higher betas. For instance, low betas are common in utilities industries and in the food and beverage sectors.

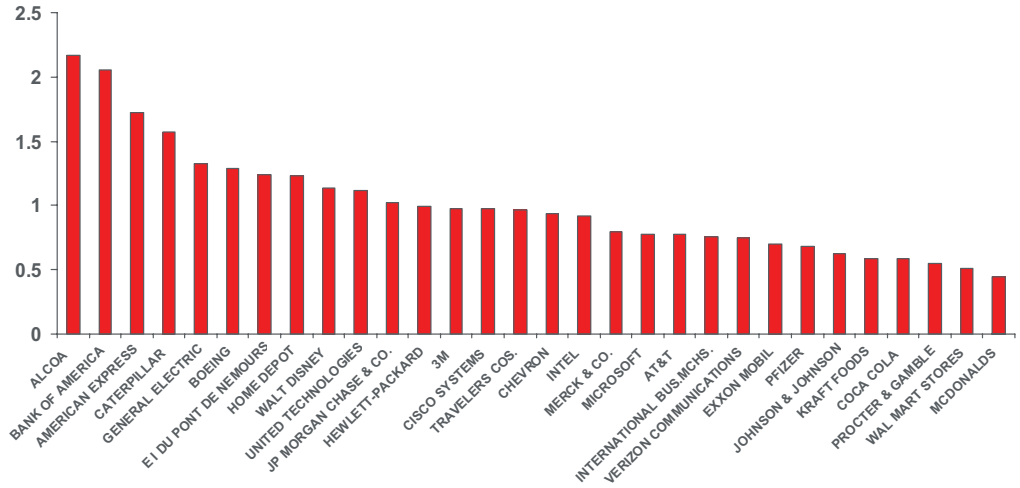
The charts below present the betas of major global companies as of February 2012.

Beta – Eurostoxx 50 Stocks

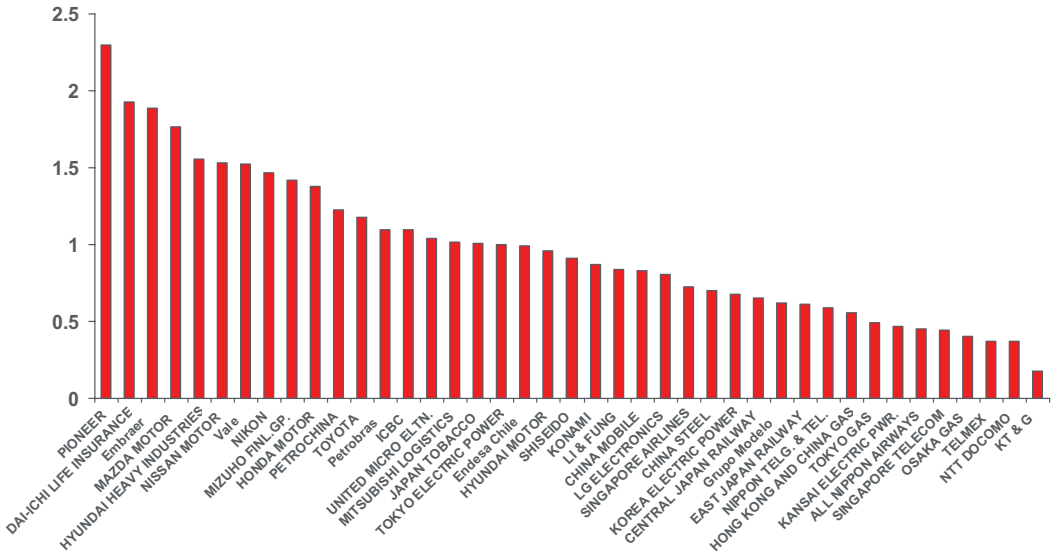


[14] For publicly traded companies, beta can be estimated as a regression of the returns on the stock against the index return. For privately held companies, or for specific projects, the beta must be estimated using comparables.

Beta – Dow Jones 30 Stocks



Beta – Asia, Japan and Latin America Stocks



Source: Computed as of February 2012, using data from Datastream. Betas are estimated using monthly data on stock prices over 5 years – 60 monthly observations.

Two parameters are needed (in addition to beta) in order to estimate the cost of equity: the risk free rate and the market risk premium. Importantly, these parameters are constant across companies. Only the beta coefficient varies and leads to changes in the cost of equity across different companies. Higher beta firms will have higher cost of equity. Conversely, the cost of equity of firms with low beta is lower than the average firm in the economy.

The risk-free rate is typically the yield to maturity on riskless government bonds. Ideally, the maturity of the bonds should match exactly the cash flows being discounted. This would imply a different risk-free rate (and thus cost of equity) for each year in the analysis. In

practice, it is common to use the yield to maturity on long-term government bonds (10 years or longer) as the measure of the risk free rate.

The table below shows the range of yield to maturity on long-term government bonds (10 years) in different countries around the world, as of February 2012:

Country	Long-term rate
US	1.92%
UK	2.07%
Germany	1.86%
France	3.07%
Japan	0.96%
Netherlands	2.37%
Switzerland	0.76%

Source: Bloomberg

Theoretically, and according to the derivation of the CAPM, the market risk premium is the expected return above the risk-free rate for the portfolio, which includes all the stocks in the market. There is no consensus among academics and practitioners on the "right" market risk premium. Estimates have been obtained from leading analysts, investment bankers, surveys of academics, surveys of CFOs, implied risk premium from aggregate data and long-term average of past realized returns around many different markets around the world. The different methods and data support a range of the market risk premium of 4% to 6%.

The table below shows the range of market risk premiums used by different investment banks as of 2011:

Investment bank	Market risk premium
Credit Suisse	6.00%
Santander	5.50%
JP Morgan	5.00%
Deutsche Bank	5.30%
Cheuvreux	4.00%

From now on, we will use a point estimate of 5%.[15] This is also (approximately) the long-term average of excess returns of equity markets over the risk-free rate for a wide range of countries since data has been available. A market risk premium of 5% can be interpreted as follows: investors demand 5% above the risk-free rate to hold a diversified portfolio of average risk (beta equals one).[16]

[15] It is good practice to conduct sensitivity analysis on the cost of capital using different numbers for its inputs.

[16] According to the CAPM, the average firm has a beta of 1. The market risk premium is the excess return (above risk free rate) that investors require, to invest in an average firm. Firms that are riskier will have higher betas, and thus investors require higher cost of equity for these firms.

Example

If a company has:

- A beta of 1.2
- The risk-free rate equals 4%, and
- The market risk premium equals 5%,

we would estimate its cost of equity to be:

$$r_{equity} = r_f + \beta \times (\text{Market Risk Premium})$$
$$r_{equity} = 4\% + 1.2 \text{ x } 5\% = 10\%$$

In practice, and according to the data in previous charts, betas vary between 0.5 and 3.0. Like the cost of debt, the fundamental principle of high risk-high required return by investors also applies here. This means that the lowest beta firms (beta = 0.5) have a cost of equity of 6.5% (4% + 0.5 x5%). High beta firms (for instance, beta = 3) can have cost of equity of around 19% (4% + 3.0 x5%).

Putting It All Together: Estimating the WACC

Once we have estimated a company's after-tax cost of debt and the cost of equity, we can calculate the WACC.

$$WACC = \frac{debt}{debt + equity}(1-t)r_{debt} + \frac{equity}{debt + equity}r_{equity}$$

- Where r_{debt} is the cost of debt, r_{equity} is the cost of equity and t is the tax rate.

In order to estimate a company's WACC, we need to use the relative proportions of debt and equity financing. This is a very important step. The capital structure weights used to compute the WACC have to be calculated at market values.

Importantly, the WACC is a market-based concept that management needs to know. Without this knowledge, they cannot make better decisions for a company's owners – bondholders and equity holders. When investors buy stocks or bonds, they expect, or rather demand, a return. This return is the cost of equity in the case of equity holders and the cost of debt in the case of debtholders. The WACC is just the weighted average of these two components, taking into account the relative proportions of the market values of debt and equity, which represent the capital structure of the company.

Since interest payments are tax deductible, the after-tax cost of debt is lower than the before-tax cost. Thus in the WACC formula, we include the term *1-t* (one minus the corporate tax rate) to represent the tax shield obtained through interest payments. The correct tax rate of the WACC is the rate at which taxes will be reduced by interest deductions in the future. This may be the effective tax rate or the marginal tax rate depending on the circumstances.

The total value of a company is equal to the sum of the market value of debt plus the market value of equity. Importantly, we must use the market values of debt and equity. Book value

of debt and market value of debt are (in most cases) not significantly different, unless a company has entered into a distress situation. However, book value of equity is, for most companies, very different from its market value. The market value of equity is the share price multiplied by the number of shares. In the case of a privately held company, the market value of equity is obviously not observable. In this case, it is possible to use some multiple of earnings (for instance, price-earnings ratio, price-to-book value, enterprise value-to-EBITDA) as an approximation to the market value of a company's equity. Debt is all the interest bearing debt used by a company. It includes long- and short-term debt.

Example

We want to calculate the WACC for a company with:

- "A" bond rating (assuming the typical spread for bonds issued by A-rated companies equals 0.74%)
- Beta of 1.2
- Tax rate of 25%
- Risk-free rate of 4%
- 5% market risk premium
- 1,000,000 outstanding shares
- Share price of $50
- Long-term debt of $10,000,000
- Short-term debt of $3,000,000.

Step 1) Compute cost of equity and cost of debt

$$r_{debt} = 4\% + 0.74\% = 4.74\%$$

$$r_{equity} = 4\% + 1.2 \times 5\% = 10\%$$

Step 2) Compute weights that reflect the appropriate capital structure of a company at market value:

Equity = Market value of equity = 1,000,000 x $50 = $50,000,000 = $50 million

Debt = Total debt = $10,000,000 + $3,000,000 = $13,000,000 = $13 million

Step 3) Compute WACC

Example (cont.)

$$WACC = \frac{debt}{debt + equity}(1-t)r_{debt} + \frac{equity}{debt + equity}r_{equity}$$

$$WACC = \frac{13}{13+50}(1-0.25)\times 4.74\% + \frac{50}{13+50}\times 10\% \qquad = 8.67\%$$

The weights of equity and debt should be at market value and should represent the target capital structure of a company. The target capital structure translates into weights that reflect the long run mix of debt and equity that a company plans to use.

What If We Are Valuing a Privately Held Company? The Pure Play Method

We often have to estimate a beta for a firm using comparables. Beta calculations only exist for publicly traded firms. Thus, for privately held firms, for divisions of a company or for new ventures, we need to use the "pure play" method. For instance, how would you compute the cost of equity for a coffee shop that sells ice-creams by the beach?

The important thing is to consider what risks exist in the business we are interested in evaluating. Then we must find pure-players (companies that operate exclusively in the same line of business) and obtain their betas. This will give us a good indication of what is the appropriate beta for our cost of equity estimation. In the case of the beach bar, the appropriate comparison group could be restaurants or ice-cream companies. One can also envision a scenario (for instance, if the bar is in the Caribbean) where the relevant risks of the beach bar are correlated with the airline industry or the hotel business. In this case, we would obtain betas from players that are exposed to the same sorts of risks as our company or project.

What If the Capital Structure Changes? Equity Betas Vary with Leverage

The way the company finances itself between equity and debt has an impact for its cost of equity and beta – in particular, the usage of debt financing increases risks. This is obviously true for debtholders, thus the cost of debt goes up for higher levels of debt usage. But it is also true for equity holders. A firm without debt is less risky for its equity owners than a highly leveraged firm.

It is important to remember that equity is always the residual claimant on a firm's cash flows. The volatility of a firm's earnings also increases when a firm has a significant amount of leverage. Thus, cost of equity increases as the firm uses higher percentages of debt financing.

When valuing a company where the capital structure will change, that should be taken into account. If a firm is currently an all equity firm but management plans to shift the mix of debt and equity to reach a 50-50 mix, computing the WACC (and any of its components, including the cost of equity) under the assumption of no debt would not be correct.

Also, when using the pure play method, we must recognize that different companies may have different mixes of debt and equity. When we use other companies' benchmarks to obtain a beta (or cost of equity) for a specific investment valuation, it is important to remember that debt increases a firm's risk, and that can explain part of the variation in betas across companies in the same business.

The following formulas show the relation between leverage and cost of equity:

$$r_{equity}^{L} = r_{equity}^{U} + \frac{D}{E} \times (r_{equity}^{U} - r_{debt})$$

- where r_{equity}^{L} is the cost of equity of a leveraged firm, r_{equity}^{U} is the cost of equity of an all-equity firm (unlevered, no debt), r_{debt} is the corporate cost of debt, D/E is the ratio of debt-to-equity, at market-value.

This formula says that debt usage increases financial risk to shareholders. As a consequence, shareholder required return (cost of equity) will be higher when the firm uses higher levels of debt.

The same relation can be seen in terms of CAPM betas:

$$\beta_{equity}^{L} = \beta_{equity}^{U} \times \left(1 + \frac{D}{E}\right)$$

or reversing it:

$$\beta_{equity}^{U} = \frac{\beta_{equity}^{L}}{1 + \frac{D}{E}}$$

- β_{equity}^{L} is the beta of a leveraged firm, β_{equity}^{U} is the beta of an all-equity firm (unlevered beta), and D/E is the ratio of debt-to-equity, at market-value.

According to the above formulas, the cost of equity is higher for firms with higher levels of debt. Betas for stocks can be obtained from various financial services.[17] These betas are levered betas and thus reflect both the business risk and the financial risk of the firm based on the firm's debt. The formulas can be reversed to estimate an unlevered beta if the observed betas for different companies are known, as well as the amount of their outstanding debt.[18]

[17] Some free sites from which betas can be obtained include finance.yahoo.com; finance.google.com; *Financial Times* website. Reuters and Bloomberg (main databases of financial data worldwide) also provide betas for companies worldwide.

[18] In practice, we never observe unlevered betas because almost all firms have some amount of debt.

Example

Suppose we are interested in valuing a privately held company in the airline industry, which uses 40% of debt (and 60% of equity) to finance itself. The company has a rating of A, which translates into a corporate bond spread of 1.5%. The risk free rate is 4%, and the market risk premium is 5%. In addition, we observe the following data for a group of comparable companies:

Comparable companies	Observed stock beta	Equity	Debt
ABC	0.89	40,055	4,481
DSD	1.21	31,867	27,225
KLF	1.11	29,222	4,454
ZBG	1.39	19,078	9,056

For instance, ABC, a comparable company in the airline industry, has a beta of 0.89. The company has a market value of equity of 40,055 and a market value of debt of 4,481.

When trying to estimate the cost of equity for our airline based on these comparable companies, we must take into account the fact that they all have different capital structures, and thus their observed betas reflect not only their business risk in the aviation sector but also their differential financial risk. Thus, when using the "pure play" method to compute the cost of equity, we must follow the following steps:

1. Obtain cost of equity (or betas) for comparables in the sector

	Beta
ABC	0.89
DSD	1.21
KLF	1.11
ZBG	1.39

2. Obtain unlevered betas (or cost of equity) for each of the comparable firms:

$$\beta_{equity}^{U} = \frac{\beta_{equity}^{L}}{1+\frac{D}{E}}$$

What we observe for each company is its levered beta (β_{equity}^{L}). Together with its debt-to-equity ratio at market values (D/E), we can obtain the implied unlevered beta (β_{equity}^{U}).

Example (cont.)

Comparable companies	Observed stock beta	Equity	Debt	D/E ratio	% debt	Unlevered Beta
ABC	0.89	40,055	4,481	11.19%	10%	0.80
DSD	1.21	31,867	27,225	85.43%	46%	0.65
KLF	1.11	29,222	4,454	15.24%	13%	0.96
ZBG	1.39	19,078	9,056	47.47%	32%	0.94

3. Compute the average of the unlevered betas of the comparable firms.

$$\beta^{U}_{Sector} = \text{Average of the } \beta^{U}_{equity} \text{ of the different comparable firms}$$

In the above case, the average of the unlevered betas is equal to 0.84.

4. Apply the relevant capital structure of our company (D/E), using the formula below, in which the unlevered beta (or cost of equity) is the average of the unlevered betas of the comparable firms:

$$\beta^{L}_{equity} = \beta^{U}_{Sector} \times \left(1 + \frac{D}{E}\right)$$

- where D and E are the debt and equity of our firm, both at market values, and β^{U}_{Sector} is the average of the unlevered betas of the comparable firms.

If we decide to use 40% of debt and 60% of equity for our company, the levered beta will be:

$$\beta^{L}_{equity} = 0.84 \times \left(1 + \frac{0.4}{0.6}\right) = 1.40$$

5. After obtaining the beta for our company, with the appropriate capital structure, estimate cost of equity using the CAPM:

$$r^{L}_{equity} = R_f + \beta^{L} \times (\text{Market Risk Premium})$$

If risk free rate equals 4% and market risk premium equals 5%, then the cost of equity (which is consistent with our target capital structure in 4 above) is 11% (4% + 1.4 x 5%).

6. Estimate WACC using the same capital structure weights as in 4.

Target debt ratio	Target equity ratio	Corporate tax rate	Spread	Cost of debt	Cost of equity	WACC
40%	60%	30%	1.50%	5.5%	11.00%	**8.14%**

In summary, if the estimated WACC is to reflect the target capital structure of the firm, the cost of equity must reflect it as well. If we want to estimate a beta based on comparable companies, one must un-lever the observable betas from comparable companies to remove the effect of current capital structure and obtain a cleaner estimate of the true business risk of the industry. Then, we must re-lever it to reflect the target capital structure of our company. Only then can we compute the cost of equity, reflecting both the business and financial risks needed for the WACC calculation.

Company Valuation Using the FCFF Method

After computing the FCFFs, they are all situated in different times (*t).* Thus, the estimated FCFFs still need be discounted to the present, using the cost of capital as a discount rate. This is valid for any DCF analysis, including capital budgeting and investment decision analysis, valuing a company or a division, or when valuing an acquisition target.

When valuing a company by FCFF, it is important to remember that the cash flows being discounted are the free cash flows to the firm (FCFF). These are the cash flows available to all providers of capital, that is, equity and debt. Thus, when we discount the FCFF, we obtain the enterprise value, which equals the sum of debt and equity values.

$$EV = \sum_{t=1}^{\infty} \frac{FCFF_t}{(1+WACC)^t}$$

where:

- EV is the enterprise value, which equals the sum of debt plus equity
- $FCFF_t$ represents the free cash flow to the firm at time t
- $WACC$ is the weighted average cost of capital.

The enterprise value is equal to the value of equity plus the value of debt. Thus, to go from enterprise value to the value of the equity, we subtract the debt from the EV.[19]

$$EV = E + D$$

$$E = EV - D$$

Where:

- EV is enterprise value
- E is the market value of equity
- D is the market value of debt.

[19] If the firm has a deficit in its pension fund, the after-tax unfunded liability is also deducted from the enterprise value to obtain the equity value. The idea is that the buyer of the firm will have to inject cash into the pension fund to eliminate the underfunding, and of course this reduces the value of the equity of the firm.

Example

We are interested in valuing the price per share of a company that has:

- Previous year revenues = $10,000
- Estimated revenue growth = 5%, 4%, 3%, 2% and 2%over the next 5 years respectively
- Costs of goods sold (COGS) = 50% of sales
- Selling, general & administrative expenses (SG&A) = 15% of sales
- The effective tax rate = 30.0%
- Net working capital requirements = 5% of sales
- Capital expenditures are planned according to the table below:

(in $)	XXX1	XXX2	XXX3	XXX4	XXX5
CAPEX	300	294	284	270	275

- After year 5 FCFF is expected to grow into perpetuity at 2%
- Number of shares outstanding = 850
- Total debt = $10,000
- Risk free rate = 4.00%
- Credit spread = 2.00%
- Tax rate = 30%
- Beta = 1.50
- Equity market risk premium = 5.00%
- % of debt = 30%
- % of equity = 70%.

We start by computing the WACC:

WACC Calculator

Risk Free rate	4.00%
Credit Spread	2.00%
Cost of Debt (pre-tax)	6.00%
Tax rate	30%
Cost of Debt (after tax)	**4.20%**
Risk Free rate	4.00%
Beta	1.50
Equity market risk premium	5.00%
Cost of Equity	**11.50%**
% of Debt	30%
% of Equity	70%
WACC	**9.31%**

Example (cont.)

Then we estimate the FCFF for the 5-year forecast period, using the inputs above.

(in $)	XXX1	XXX2	XXX3	XXX4	XXX5
EBITDA	**3,675**	**3,822**	**3,937**	**4,015**	**4,096**
- Changes in NWC	(25)	(21)	(16)	(11)	(11)
- Taxes	(1,043)	(1,084)	(1,115)	(1,137)	(1,160)
- CAPEX	(300)	(294)	(284)	(270)	(275)
Free cash flow to the firm	**2,308**	**2,423**	**2,521**	**2,597**	**2,649**
Terminal value (TV)					**36,963**
Present value FCFF +TV	2,111	2,028	1,930	1,819	25,382

We then can compute the terminal value in year 5, since the firm will then grow at a constant rate of 2%.

$$TV_5 = \frac{FCFF_6}{WACC - g} = \frac{FCFF_5 \times (1+g)}{WACC - g} = \frac{2,649 \times (1.02)}{9.31\% - 2\%} = 36,963$$

With the terminal value computed, we can proceed to the enterprise value calculation, by discounting all the cash flows (FCFF) at the WACC of 9.31%. The terminal value is computed in year 5, and thus must also be discounted five years to be expressed in present value terms:

$$EV = \frac{FCFF_1}{(1+WACC)^1} + \frac{FCFF_2}{(1+WACC)^2} + \ldots + \frac{FCFF_4}{(1+WACC)^4} + \frac{FCFF_5 + TV_5}{(1+WACC)^5}$$

(in $)	XXX1	XXX2	XXX3	XXX4	XXX5
Free cash flow to the firm	**2,308**	**2,423**	**2,521**	**2,597**	**2,649**
Terminal value (TV)					**36,963**
Present value FCFF + TV	2,111	2,028	1,930	1,819	25,382

The EV (sum of the discounted FCFF plus terminal value) is estimated to be $33,270. Since the firm has debt of $10,000, then the value of equity is $13,232:

$$EV = E + D$$

$$E = EV - D$$

$$E = 33,270 - 10,000 = \$23,270$$

- where EV is enterprise value, E is the market value of equity, and D is the market value of debt.

The total market value of the firm's equity is estimated at $23,270. Since the firm has 850 shares outstanding, the value per share is:

Value per share = $23,270 / 850 = $ 27.38.

How to Deal with Cash, Marketable Securities and Unconsolidated Subsidiaries That a Firm May Have?

Up to now, we have assumed that the value of the firm comes from the future cash flows it generates. This is correct. But if a firm also has a huge amount of cash in the bank, this surely also adds to its value. Analysts often use the following formula for the enterprise value:

$$EV = E + D - Cash$$

or

$$\text{Enterprise Value} = \text{Equity} + \text{Debt} - \text{Cash}$$

This can be interpreted in terms of the value of equity:

$$\text{Equity} = \text{Enterprise Value} - \text{Debt} + \text{Cash}$$

$$\text{Equity} = \text{Enterprise Value} - \text{Net Debt}$$

- where net debt is equal to debt – cash.

This formula simply says that the value of the equity is equal to the discounted value of FCFF (enterprise value) minus the debt, plus cash that the firm has.

Suppose that in the example above, the firm had $50,000 in the bank (in addition to the cash flows estimated above). Surely this means that the value of buying the equity of that firm is much higher than previously computed. An equity holder would not only be entitled to the future cash flows but also to use the cash right now.

In that case, the value of equity would be:

$$E = 32{,}270 - 10{,}000 + 50{,}000 = \$73{,}270$$

This implies a value per share of:

$$\text{Value per share} = \$73{,}270/\ 850 = \$\ 86.20$$

The same applies to marketable securities the company may have invested in, or other non-consolidated investments in other companies. These investments (or their returns) will not show up in the FCFF calculations.

For instance, if a company A owns 20% of an unconsolidated subsidiary B, the discounted FCFF of company A will include only its operating performance, CAPEX, etc. But the value of the 20% stake in its subsidiary B is not included there. So, if we are valuing company A, we must acknowledge this and correct the equity value for it. One option is to add the value of the 20% stake in the subsidiary (which can be valued itself by DCF or by using its market value if it is a publicly traded company).

$$\text{Equity}_A = EV_A - \text{Net Debt}_A + (\text{Value of 20\% of B})$$

where:

- Equity_A is the value of the equity of company A
- EV_A is the enterprise value of company A, obtained by discounting its FCFF
- Net Debt_A equals debt – cash, for company A

An alternative method would be to include the cash flows received from the subsidiary B (dividends) in the FCFF calculation of company A and then discount them to the present.

This idea can be exemplified with a real estate example. Suppose you are valuing a company A that also has a 10% investment in an apartment building. You have two options:

1) Include the expected cash flows to be received from renting the apartments (10% of the full rental income) in your FCFF calculation going forward

2) Add the current market (selling) value of the 10% stake in the apartment building to your company A's valuation estimates.

But you can't do both! Including the cash flows from the rental income, and then adding the selling value of this stake is obviously a mistake.

Creating Value through M&As

This section describes the main methods used to value companies in a mergers and acquisitions (M&A) setting. The main analysis is based on a FCFF/DCF approach, but other methods, such as comparable deal multiples, peer multiples in the market, are also analyzed.

There are several good reasons for M&As to take place, such as:

- Increasing product range
- Increasing distribution range
- Increasing manufacturing capabilities
- Reducing unit costs.

But there are also several bad reasons:

- Ego
- Empire building
- The "need to do something"
- "Strategic Acquisitions."

M&As are a key element of many firms' strategies to maximize value and create sustainable competitive advantage. Yet more than 50% of acquisitions fail, and deals that were supposed to create great value for the firm end up destroying value. Why? Acquisitions are complex and difficult to execute and manage successfully.

Valuation plays a key part in explaining whether a merger will create value or not. In particular, when valuing a company by FCFF in an M&A setting, the potential sources of value from the combination of the two companies – synergies – is the key determinant of the valuation. The idea behind value creating M&As is:

$$\text{Value } (A+B) > V(A) + V(B)$$

Where:

- V(A+B) = Value of a firm created by combining A and B
- V(A) = Value of the independent firm A
- V(B) = Value of the independent firm B

Valuation in M&As

When an acquirer is considering buying a target company, there are a number of operating synergies that allow firms to increase their operating income, increase growth or both. In general, the synergies can be grouped in different types:

- **Cost synergies** relate to overlapping functions in the two companies. There can also be potential cost savings related to purchasing activities since the merged entity may be able to negotiate better conditions with its suppliers. The merger can also allow for better economies of scale and optimize the different functional strengths, allowing the combined firm to become more cost-efficient.
- **Revenue synergies** are related to possible cross-selling of products and services. Companies can obtain higher growth in new or existing markets, arising from the combination of the two firms, for instance by leveraging on each other's distribution network, or presenting a better end-to-end solution to their customers. It is also possible to obtain revenue synergies due to the greater pricing power from reduced competition and higher market share.
- **Financial synergies**. In M&As there are often significant financial gains to be explored related to tax optimization (for instance goodwill amortization). Tax benefits can arise by taking advantage of tax laws and through a better usage of past net operating losses. If a profitable company acquires a firm that has been accumulating losses, the acquiring company might be able to use reduce its tax burden. Also, a company can sometimes increase its amortization and depreciation charges after an acquisition, thereby saving taxes and increasing its value.

It is common to consider two scenarios:

Stand-alone Value

The stand-alone valuation involves forecasting the cash flows that the target company is able to generate on its own. These base cash flows should not include any of the benefits that might result from the merger. One must forecast the cash flows of the target company based on its business plan, the competitive analysis of the market and the overall growth of the sector and economy. Then, these cash flows should be discounted at the WACC, which then gives us the enterprise value stand alone. From here it is easy to find out the value of the equity. We obtain the value of the equity of that firm by subtracting the Net Debt value from the resulting enterprise value.

It is important to dedicate time to this stand-alone calculation. Under capital market efficiency, this stand-alone value should not differ much from the current market value of the target (when talking about publicly traded targets). Since the base-case cash flows do not include any synergies from merging the target and acquirer. Thus, the stand-alone valuation provides a floor in terms of the value that the bidder should pay in a negotiation setting.

Value with Synergies

Having built a stand-alone valuation, we can add to it the different synergies. Indeed, by combining the two companies, there can be increases in revenue (for instance from cross-selling and using the others' distribution network), as well as cost savings from optimizing operations, purchasing, overheads, etc. Once we incorporate all these operating synergies into the cash flows, we obtain the FCFF with synergies. By discounting the FCFF with synergies at the appropriate cost of capital, we obtain the full value of the target firm, assuming all the synergies will materialize.

The value with synergies is obtained by building upon the model previously constructed for the stand alone. The idea behind most M&As is that there will be synergies between the two companies in such a way that the cash flows that are generated by the target company will be higher after the merger takes place.

One can then incorporate the operational synergies into the DCF model by appropriately changing the revenues and costs of the company.

The main sources of synergies are usually (there are other possible sources):

- **Costs of goods sold** – by merging two entities there are often economies of scale in the purchasing of raw materials
- **SG&A** – administrative and selling expenses usually have a certain degree of overlap between the acquirer and target companies. Thus, it is reasonable to assume a reduction in SG&A for the target company in most M&As. The level of SG&A reduction depends on the degree of overlap (also geographical) of the acquirer and target companies.
- **CAPEX** – Combining companies can translate into benefits in terms of CAPEX. This is frequently the case of M&As in the pharmaceutical industry, where a combination of R&D of two companies usually allows for significant cost savings in terms of CAPEX
- **Sales** – Sales can go up as a result of the merger. This is the case if there is cross-selling, bundling possibilities, or higher pricing power, that did not exist when the companies operated independently.
- **Net working capital** - There can be an impact in the payment terms to suppliers, better use of inventory, or different trade credit terms as a result of the merger. In this case, this will also impact the value with synergies.

After obtaining the FCFF with synergies, we discount it using the WACC and obtain the enterprise value of the target, assuming the full value of the synergies[20] – Value with Synergies.

[20] Once again, from the enterprise value to equity value is a straightforward exercise.

This Value with Synergies represents the full value for the acquirer's shareholders (of the target company). Thus, it also represents the upper bound that a value-maximizing buyer should pay for that firm. Of course, most bidders do not want to pay all the benefits of the merger to the sellers of the acquired company.

How these synergies are split among the two parties – buyer and seller – is one of the major issues for negotiation. Indeed, we should aim for a situation in which the synergies are split (not necessarily equally) between the shareholders of the target and acquiring firms. This occurs when the purchase price is above the stand-alone value and is below the value with synergies.

It is precisely because the value with synergies is higher than the stand-alone value, that it is normal for bidders to pay a premium to the target shareholders. It is important to remember that the premium can be higher when there are large synergies and lower when the synergies are minimal.

However, if the bidder pays a price above the Value with Synergies, all the benefits of the merger will go to the target shareholders. In this case, the merger will be a value-destroying investment for the shareholders of the acquiring company.

Besides the buy/no buy decision, the purpose of the valuation analysis is to support negotiators. By knowing your value boundaries and conducting sensitivity analysis, you enhance your own flexibility to respond to new ideas that may appear at the negotiating table.

WACC Calculation in an M&A Setting

The basic principle of discounting is that the discount rate should compensate investors for the risk involved in the cash flow forecasts. Thus, the cost of capital of the target company is the appropriate discount rate to use.

If the target and acquirer are in the same industry, they are likely to be exposed to the same business risk. In this case, unless there are striking differences in capital structures of the two companies, it is acceptable to use the WACC from the buyer as the discount rate. However, in most situations, the target firm's WACC provides a more appropriate discount rate, since it reflects the risk premium that investors demand for bearing the risks involved in the target cash flows.

It is important to remember that capital structure matters and that more indebted firms have higher costs of equity and betas. Thus, if the target firm is substantially more levered than the acquirer, or a typical firm in the industry, its cost of equity is also likely to be higher.

If the acquired firm is privately held, we must estimate its cost of equity using comparables, following the pure play method described previously. We obtain information on the appropriate discount rate by looking at other firms in the target's industry and using them to obtain a reliable estimate of the business and financial risk of the target company.

Example

Suppose Company Buyer is looking into buying Company Target. Both Buyer and Target are in the same industry, and there are significant expected synergies from this transaction.

The cash flows of the target company on a stand-alone basis are presented below:

	XXX1	XXX2	XXX3	XXX4	XXX5
EBITDA	$3,675	$3,822	$3,937	$4,015	$4,096
- Changes in NWC	($25)	($21)	($16)	($11)	($11)
- Taxes	($1,043)	($1,084)	($1,115)	($1,137)	($1,160)
- CAPEX	($300)	($294)	($284)	($270)	($275)
Free Cash Flow to the Firm	**$2,308**	**$2,423**	**$2,521**	**$2,597**	**$2,649**
Terminal Value					**$36,963**
Present Value FCFF	$2,111	$2,028	$1,930	$1,819	$25,382

According to these FCFF, the value of Target on a stand-alone basis is:

Valuation Summary Stand-alone		
PV of Visible Period	$9,586	28.8%
PV of terminal value based on DCF	$23,685	71.2%
Enterprise Value	$33,270	100%
Net Debt	$10,000	
Unfunded Pension Plan	$0	
Value of Equity	**$23,270**	
Number of Shares	850.0	
Value per Share	$27.38	

It is important to remember that the appropriate discount rate is that of the target company, that is the risk of the CFs we are buying. When in doubt, always look at where the money is going, rather than where it came from. Suppose the appropriate WACC for Target is 9.31%. Thus, on a stand alone basis, the EV of the Target is close to $33270. Since the target has Net Debt (Debt – Cash) of $10,000 million, the value of the equity stake is value at $23,270. As Target has 850 shares outstanding, the price per share is $27.38 ($23,270/850)

But under the new management of Buyer, the operations of Target will be more efficient, and it will also improve its distribution capabilities. Suppose that the incremental sales due to improved distribution capabilities are $500 next year (and the above growth rates remain unchanged). Also, there are cost synergies involved, that allow a reduction in the costs of goods sold to 48% of sales (from 50%), and the SG&A will also be reduced by 1% (to 14% of sales, down from 15%).

The FCFF analysis allows us to place a value on these synergies. Specifically, we can model the Target firm including synergies, and then compare it to the stand-alone valuation.

Example (cont.)

According to the above synergies, the pro-forma income statement of Target with synergies is:

	XXX1	XXX2	XXX3	XXX4	XXX5
Revenues	$11,000	$11,440	$11,783	$12,019	$12,259
- COGS (without Depreciation)	$5,280	$5,491	$5,656	$5,769	$5,884
- SG&A	$1,540	$1,602	$1,650	$1,683	$1,716
EBITDA	**$4,180**	**$4,347**	**$4,478**	**$4,567**	**$4,659**
- depreciation	$200	$220	$229	$ 236	$240
EBIT	**$3,980**	**$ 4,127**	**$4,249**	**$4,332**	**$4,418**
taxes = (EBIT * Tax rate)	$1,194	$ 1,238	$1,275	$1,299	$1,325
Unlevered Net Income	**$2,786**	**$ 2,889**	**$2,974**	**$3,032**	**$3,093**

Thus, given these potential synergies, we can compute the DCF value with synergies.

	XXX1	XXX2	XXX3	XXX4	XXX5
EBITDA	$4,180	$4,347	$4,478	$4,567	$4,659
- Changes in NWC	($50)	($22)	($17)	($12)	($12)
- Taxes	($1,194)	($1,241)	($1,278)	($1,303)	($1,329)
- CAPEX	($300)	($294)	($284)	($270)	($275)
Free Cash Flow to the Firm	**$2,636**	**$2,790**	**$2,899**	**$2,983**	**$3,042**
Terminal Value					**$42,453**
Present Value FCFF	$2,411	$2,335	$2,219	$2,089	$29,152

Thus, the value of Target with synergies can be computed as:

Valuation Summary with Synergies		
PV of Visible Period	$11,005	28.8%
PV of terminal value based on DCF	$27,202	71.2%
Enterprise Value	$38,207	
Net Debt	$10,000	
Unfunded Pension Plan	$-	
Value of Equity	**$28,207**	
Number of Shares (millions)	850.0	
Value per Share	$ 33.18	

Using the same WACC as before (9.31%), we obtain an enterprise value close to $38,207. This compares with the previously value of $33270. The difference between them is attributable to the synergies that have been generated by a more efficient and productive Target company post-acquisition. This EV can be converted into a price per share of $33.18.

Example (cont.)

In this case, the total value of the synergies, in present value terms, is given by the difference in EV with and without synergies:

EV with Synergies	$38,207
EV stand-alone	$33,270
Value of synergies	$4,936

Obviously, the Buyer would not want to offer the Target 100% of the synergies (thus paying 33.18 per share). At that price, the NPV of the synergies is all paid to the Target shareholders (who sell their shares), and no value creation exists for the Buyer, even if all the projected synergies are achieved.

For instance, if the Buyer is willing to split the synergies 30-70 (thus paying Target shareholders 70% of the synergies), it will offer a price between the two values (the stand-alone value and the value with synergies): $ 27.38 and $33.18:

Premium Analysis	
PV of 100% of Synergies	$4,936
100% synergies per share	$ 5.81
Stand-alone value per share	$27
% of synergies for Buyer	30%
% of synergies for Target	70%
Offer per share	$31.44
Premium	15%

And thus, a 31.44 price per share, represents a 15% premium over the value without synergies.

Other Valuation Approaches

Market multiples: When valuing a company, it is common to analyze comparable companies trading multiples as a benchmark. This involves analyzing the multiples (PER, EV/EBITDA, etc.) that companies in the same industry are trading. The logic behind a multiple analysis is to see how much the market is currently paying for an asset with similar characteristics than the one we are interested in valuing. Many different multiples are commonly used:

- Price Earnings Ratio (PER) = P / EPS (or Value of Equity[21] / Net Income)
- Enterprise Value to EBITDA = EV / EBITDA

[21] Market Capitalization in the case of publicly traded companies. Market capitalization is obtained by multiplying the price per share by the number of shares outstanding.

- Price to Book Ratio = P / (Book Equity per share)
- Dividend yield = DIV / P

Price to Sales Ratio = P / Sales

Example

You want to value a company that has:

EBITDA = $40 million

Net Income = $20 million

Net Debt = $80 million

Shares outstanding= 100 million

And you have identified a peer group of comparables, that currently are trading at a multiple of EV/EBITDA of 8.0x, and at a multiple of PER of 14.5x.

EV/EBITDA analysis

Taken 8.0x as a benchmark, our company's EV should be:

EV = $40m x 8 = $320 million

Since the debt equals $80 million, that means that the equity value, based on comparables, should be close to $240 million ($320 million – $80 million). Thus, the EV/EBITDA analysis suggests a value per share of $2.4 ($240 million / 100 million shares).

PER analysis

Taken 14.5x as a benchmark for the PER, our company's equity value should be:

Value of Equity = $20 million x 14.5 = $290 million

Thus, the PER analysis suggests a value per share of $2.9 ($290 million / 100 million shares).

Market multiples can also be used to estimate the terminal value (and thus provide a robustness check of the terminal value obtained through the FCFF method). This involves estimating the terminal value using market multiples from publicly traded firms comparable to the company being valued. Specifically, instead of computing the terminal value as:

$$TV_t = \frac{FCFF_{t+1}}{WACC - g}$$

…one can compute the terminal value using the EV/EBITDA multiple of comparable companies. Suppose comparable companies have an EV/EBITDA multiple of 7. This means that the enterprise value of those companies is seven times its EBITDA (on average). Thus, we can apply this multiple to the company being valued:

$$TV_t = 7 \times EBITDA_t$$

- where $EBITDA_t$ is the EBITDA of the company being valued in year *t*.

This triangulation of the terminal value using multiples is very often used. Given the substantial importance that the terminal value has in a valuation, one must use different approaches to estimate it. Multiples are also very useful to obtain an estimate of the implied growth rate that the market is using in its valuations. It can then be helpful when judging the merits of different long-term growth rates to think about this.

One needs to be very careful in identifying a group of comparable companies before being able to use a multiple as a benchmark for valuation. It is important to consider the details of each of these companies. In principle, higher multiples exist for companies that are more profitable, grow more and have lower risk. This suggests that, depending on the specific company, a different multiple may be appropriate. Therefore, it is not fair to say that a company is over-valued just because its value reflects a higher multiple than the average in the market for companies in the same industry.

It is common to obtain multiples from a list of comparable companies and then average them. In doing this, it is important to watch out for outliers. Also, the selection of comparable companies is not trivial. Indeed, multiples are often higher for firms with:

- Higher growth
- Higher margins
- Lower risk

which can be seen from the following decomposition of the PER for a stable growth company (where we can value it as a perpetuity):

$$PER = \frac{P_0}{EPS_1} = \frac{\frac{EPS_1\left(1 - \frac{RE}{Earnings}\right)}{r - g}}{EPS_1} = \frac{1 - \frac{RE}{Earnings}}{r - g} = \frac{1 - \frac{RE}{Earnings}}{r - ROE \times \frac{RE}{Earnings}}$$

Thus, a high-growth company may have a very high PER, and this is justifiable based on its fundamentals. It is therefore common to find, even in the same industry, very different multiples for firms with different business risk, costs and growth.

Transaction multiples: In an M&A situation, it is common to analyze comparable transactions as a benchmark. This involves analyzing the multiples (PER, EV/EBITDA, etc.) paid by acquirers in previous transactions. This is commonly referred to as "what the market is paying."

It is important to consider the details of each of these transactions. In principle, higher multiples occur when there are significant gains from combining two companies. This suggests that, depending on the synergies involved,[22] the multiples may differ across deals.

Previous premiums paid: In an M&A situation, it is common to analyze premiums paid in previous transactions. The premium is typically defined as the offer price (how much the buyer is offering for each share of the target company), divided by the pre-announcement stock price of the target company. It is important to adjust for possible "run-ups" that may have occurred in the pre-announcement days due to leakages of information.

As with the transaction multiples, it is important to consider the details of each of these transactions. In principle, higher premiums will be paid when there are significant gains from combining two companies. This suggests that, depending on the synergies involved, the premiums may differ across deals.

Summary

The DCF method of valuation is the recommended method for company valuation in an M&A setting. It has the advantage of being a forward-looking metric that focuses on cash flow, but recognizes the time value of money.

Importantly, the DCF method allows for the information or special insights to be incorporated explicitly into the valuation. For instance, we can easily incorporate expected operating synergies in the valuation, thereby allowing an evaluation of the merits of the acquisition.

Finally, as soon as any valuation is complete, sensitivity analysis is the next step. No valuation is right in an absolute sense, but there are countless wrong ones. There are many assumptions behind any valuation. Importantly, knowing their impact and what really are the drivers of value in a company is a key tool for managerial decision making.

[22] These, in turn, depend on the relative efficiency of the two companies, the geographical overlap, potential for cost optimization, etc.