



Company valuation is the core of many corporate finance courses, and it represents one of the most challenging tasks to perform in relation to the analysis of the company financials.

The standard valuation relies on a good mix of science and art, in that it involves careful measures of critical input variables, mixed with a large part of interpretation and intuition.

There are several institutions specialized in valuing companies, and none of them ever reached unanimous consensus about the value of the same company. This is an example of how complicated the task can be.

Company valuation resembles many different stages and inputs, and it relies on the appropriate estimation of key parameters, like growth potential, right cash flow discounting, and more.

The result is an educated guess on what the theoretical value of a company should be based on the available information, the balance sheet, and the robust theoretical background developed in recent years.

A good financial manager is supposed to understand the value of the company he manages, thus proper knowledge of the methodologies for corporate valuation is at the basis of a complete education in corporate finance.

After studying this chapter, you will be able to answer the following questions, among others:

- How can the CAPM be implemented in practice, for returns estimation?
- How can its parameters of CAPM be estimated?
- What are the different valuation methodologies available for corporate valuation, and how do they differ from each other?
- What is the main feature of the Facebook IPO, and how did it affect financial markets?
- What are the reasons behind the mistakes in valuing Facebook?

The first section of the chapter is about the estimation of CAPM parameters, so as to apply it in practice for cost of equity estimation. Also the market return and beta estimation are described. The second section is about the different valuation methodologies available to the analyst. The third section focuses on the real case of Facebook's IPO and its interesting features as an example of strange valuation.

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## 8.1 CAPM Parameters Estimation

### Learning Outcomes

- Learn how to estimate the risk-free rate input for the CAPM calculation
- Learn how to estimate the risk premium input for the CAPM calculation
- Learn how to estimate the beta input for the CAPM calculation

#### 8.1.1 The Risk-Free Rate

The measurement of risk-free rate should be consistent with the cash flows, meaning that if, for example, cash flows are measured in euro currency, the reference risk-free rate should be the EU reference rate or the lowest yield among all the bonds issued by sovereigns in the euro area.

One implication of that choice is that the actual location of the company does not determine the choice of the risk-free rate. The choice is driven by the currency in which the project of firm cash flows is estimated.

For example, a multinational company like Nestle can be valued using cash flows estimated in Swiss Francs, discounted back at an expected return estimated using a Swiss long-term government bond rate, or it can be valued in British pounds, with both the cash flows and the risk-free rate being British pound rates.

The purchasing power parity should assure that the same company or project, valued at different currencies, should result in consistent valuations. The only differences should be explained only by differences in expected inflation, which of course affects both the cash flows and the discount rate (Stulz 2000).

It follows that a low discount rate due to high inflation will be offset by a decline in expected nominal growth rates for cash flows, and the value will remain unchanged.

The values obtained in different currencies will differ consistently when the differences in the interest rates across different countries are not due to differences in expected inflation.

Any value will be higher when the currency with lower interest rates is used and lower when the opposite occurs. The risk, however, is that the interest rates will have to rise at some point to correct for this divergence, at which point the values will also converge.

When inflation is high and unstable, the valuation is done in terms of real values, with an estimation of cash flows directly linked to the real growth rates, excluding the part coming from inflation.

Consistency implies that the discount rates must also be expressed in real terms, starting from a real risk-free rate. While government bills and bonds offer returns that are risk free in nominal terms, they are not risk free in real terms, since expected inflation can be volatile.

Subtracting the inflation from nominal rates gives a good estimate of the real risk-free rate. This operation was hard to implement in the past, but recently the introduction of inflation-indexed treasuries has filled the gap.

The difference between a standard treasury security and an inflation-indexed treasury security is that the latter does not offer a guaranteed nominal return, but instead provides a guaranteed real return.

Thus, an inflation-indexed treasury that offers a 3% real return will yield approximately 7% in nominal terms if inflation is 4% and only 5% in nominal terms if inflation is only 2%.

Unfortunately, most countries do not offer treasury inflation-indexed securities, making it very difficult to account for the effects of inflation on the nominal rates. The real risk free rates in these markets can be estimated according to two arguments:

- Free flow of capital between countries with highest real returns would homogenize the real risk-free rate across markets. Therefore, the real risk-free rate estimated in countries where inflation-indexed treasury securities are issued can be used as the real risk-free rate in any market.
- According to another argument, frictions and constraints in capital flows across markets make the expected real return on an economy approximate the expected real growth rate (in the long term). Thus, the real risk-free rate for a mature economy like that of the United States should be much lower than the real risk-free rate for an economy with greater growth potential, such as Estonia.

The assumption that governments cannot default is not exact for all countries. Many emerging economies cannot be defined as default free; therefore, their rates cannot be assumed to be risk free (Godfrey and Espinosa 1996).

These governments are considered at risk to default on just local debt, and the fact that they also borrow not locally just amplifies the risk. Therefore, there are scenarios where obtaining a local risk-free rate, especially for the long term, becomes difficult.

The estimation of a risk-free rate for those economies must be therefore done under specific compromises.

The trick is to look at the safest companies in that market, which can be considered safer than the government itself. These companies are default free, and it is possible to estimate the risk-free rate as marginally lower than the corporate borrowing rate.

### 8.1.2 The Risk Premium

The factors that influence the equity risk premium to be inputted in the CAPM are of primary importance. In this section, we look at the role played by equity risk premiums in corporate financial analysis, valuation, and portfolio management and then consider the determinants of equity risk premiums.

The risk premium results from the expectations that investors make about how much risk can be seen in an economy and the price to be attached to that risk. This judgment is a determinant of the expected return on a risky investment and the value estimated for the investment (Booth 1999).

The natural consequence of the above is that investors allocate wealth across different asset classes in different ways. Also the choice of what specific assets or securities to invest in for each class is then affected.

The estimation of equity risk premium comes after careful analysis of the factors that determine it. After all, equity risk premiums should reflect not only the risk that investors see in equity investments but also the price they put on that risk.

The most important factor is the risk aversion of investors. More risk-averse investors in fact will ask for higher premiums, while for declining risk aversion, the asked premium will go down.

The equity risk premium is determined by the collective risk aversion of the market. The latter will result in changes in the premium, and it is opportune to focus on the factors that are more likely to change with time.

Investor age, for example, is an important factor, and studies have confirmed evidence that individuals become more risk averse as they start aging. As a consequence, the markets populated by older investors should have higher risk premiums.

Bakshi and Chen (1994), for instance, examined risk premiums in the United States and noted an increase in risk premiums as investors aged. Liu and Spiegel calculated the *M/O* ratio (middle-age investors over old-age ones). Their results show that the price/earning (*P/E*) ratios are closely and positively related to the *M/O* ratio for the US equity market from 1954 to 2010 (Chan et al. 1992).

Another important factor is the preference for current consumption, in that the expected equity risk premium should be expected to increase as preference for future consumption increases.

Markets characterized by investors that are net savers are then supposed to show lower equity risk premiums compared to markets where individuals are net consumers. Consequently, equity risk premiums should increase as savings rates decrease in an economy.

The direction of the relationship between risk aversion and risk premium is quite simple to establish. However, it is not straightforward to determine the relationship between the two.

The class of equity risk is linked to the general considerations about the predictability of the overall economy. When the inflation is easily predictable, for example, the equity risk premium should be lower. The same should apply when there is predictability of interest rates and economic growth.

A relevant branch of research examines the relationship between equity risk premium and inflation. The results are quite controversial, and some studies find high correlation, while others find little or no correlation.

Brandt and Wang (2003) argue that news about inflation dominates news about real economic growth and consumption in determining risk aversion and risk premiums.

They present evidence that equity risk premiums tend to increase if inflation is higher than anticipated and decrease when it is lower than expected.

Basically the conclusion is that the expectations on inflation determine the equity risk premium and not the level of the inflation itself.

A measure of the risk implied in the economy, when investing in equities, is given by the volatility in the earnings and cash flows of the individual firms operating in the economy.

The above changes are transferred to the markets in terms of information. In the last 20 years, the role of information available to the investors and the quality of it have changed substantially.

The relationship between information and equity risk premium is complex. The precision of the information should be inversely related to the risk premium, with more precise information corresponding to lower equity risk premiums.

Precision here must be defined in terms of what the information tells us about future earnings and cash flows. Providing more information about last period's earnings may create more uncertainty about future earnings.

The differences in information stand as the reason why, for example, larger risk premiums are demanded by investors in some emerging markets rather than others. Markets vary widely in terms of transparency and information disclosure requirements. Markets, in which companies provide little information about important aspects of the firm, should have higher risk premiums than markets where information on firms is reliable and easily accessible to investors.

There is another risk to be considered on top of the underlying real economy and the bad quality of information on the markets. There is also an additional risk related to the liquidity.

If investors have to accept large discounts on estimated value or pay high transaction costs to liquidate equity positions, they will pay less for equities today (and thus demand a large risk premium).

The general thought is that the net effect of illiquidity on equity markets should be very small given that the market is equally split in buyers and sellers. But the argument can be contrasted based on at least two main reasons.

First of all, not all the stocks in the market are widely traded, with liquidity being very variable across different stocks. Therefore, the cost of trading a widely held, large market cap stock is very small, but the cost of trading an over-the-counter stock will be much higher.

Another aspect is related to the cost of illiquidity, which can be variable over time, with significant effects given by even small changes. In particular, the cost of illiquidity seems to increase when economies slow down and during periods of crisis.

There is also a behavioral component, making experts believe that equity risk premiums are guided by changes in the rationality of investors. There are two main strands to this analysis, namely:

First of all, the money illusion is a phenomenon by which the equity prices in the 70s rapidly declined, followed by an increase in inflation rates. According to Modigliani and Cohn (1979), the low equity values of that period were determined by investors being inconsistent about inflation expectations.

The explanation they give is that investors used historical growth rates in earnings, reflecting past inflation, to forecast future earnings. The simultaneous use of current interest rates, which reflect the expectations on future inflation, biased the estimation of discount rates.

When inflation increases, this will lead to a mismatch, with high discount rates and low cash flows resulting in asset valuations that are too low (and risk premiums that are too high).

The second aspect is the narrow framing, which deviates from the standard Portfolio Theory. The latter in fact assumes that investors assess the risk of an investment in the context of the risk it adds to their overall portfolio and demand a premium for this risk.

Experts in behavioral economics state that when investors are offered new gambles, they isolate these gambles, separately from other risks that they face in their portfolio, leading them to overestimate the risk of the gamble.

### 8.1.3 The Beta

Recall that the beta of an investment measures the risk attached to an exposure to the market volatility and not the specific asset risk. The market portfolio of all investable assets has a beta of exactly one.

When the beta is less (more) than one, the investment has lower (higher) volatility than the market, and the asset price movements are not highly (highly) correlated to the market.

An example of the first is a treasury bill: the price does not go up or down a lot, so it has a low beta. An example of the second is gold. The price of gold does go up and down a lot but not in the same direction or at the same time as the market.

Negative betas are also observable for the investment that does not follow the market but moves to the other side. There are several types of investments like derivatives and equity put options that can show large negative betas.

The risk measured by beta is not diversifiable, and it does not measure the risk of an investment held on a stand-alone basis, but the amount of risk the investment adds to an already diversified portfolio.

The use of beta in finance is mainly divided in two parts. The first part is the ranking of assets and portfolio compared to the systematic risk of the market and is mainly performed by practitioners.

Another important field of use is the testing of CAPM, with cross-sectional regressions intended for testing the mean-variance efficiency of the market portfolio

and the linear relationship between expected returns and betas (Kandel and Stambaugh 1995).

When estimating beta, there is also a problem of separation between risk aversion, which is supposed to entail the asymmetric treatment of deviation from the regression, and the statistical loss function that is symmetric due to equal treatment of observations.

Recall that the betas measuring risk in financial models are characterized by two main features. First of all, they measure the risk added to a well-diversified portfolio, rather than the total risk associated to an asset. Therefore, there is the chance that an investment is very risky from an individual point of view while being safe in terms of idiosyncratic risk.

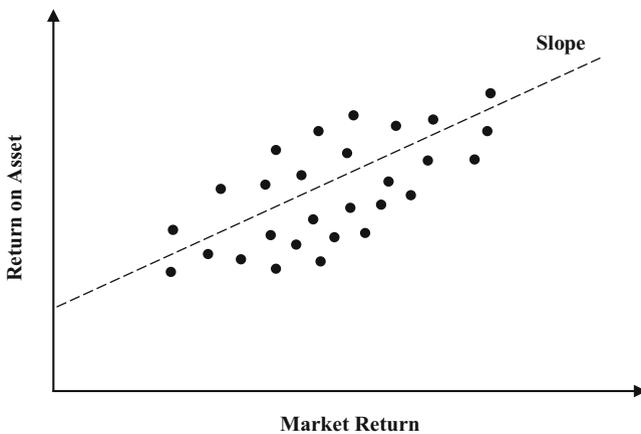
Furthermore, all betas measure the relative risk of an asset and thus are standardized around one. In the CAPM, the market capitalization-weighted average beta across all investments should be equal to one, and the property should be consistent in any multifactor model.

Diversification can be done at both equity and other asset level, plus there is a geographical dimension, regarding diversification across domestic assets or global assets.

In the CAPM, for instance, the diversified portfolio includes all asset classes and is globally diversified, when transaction costs are not considered. In case of transaction costs and barriers to global investment, some asset classes and global diversification could be excluded from market portfolio.

The beta of an asset can be estimated through a regression of the asset returns on some index that represents the market portfolio, over a reasonable time period as in Fig. 8.1.

The regression equation for a stock  $i$  is given by



**Fig. 8.1** Graph of a linear regression

$$r_i = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + \varepsilon_{i,t}$$

where:

$\alpha_i$  is the intercept parameter of the regression.

$\beta_i$  is the estimated beta (slope) of the regression.

$r_{m,t}$  is the value of the market return for the observation at time  $t$ .

$r_{f,t}$  is the value of the risk-free rate for the observation at time  $t$ .

$\varepsilon_{i,t}$  is the error term for observation at time  $t$ .

The beta is the slope of the regression, measuring the risk added on by the investment regressed to the index used as proxy of market portfolio. In addition, it also fulfills the requirement that it be standardized, since the weighted average of the slope coefficients estimated for all of the securities in the index will be one.

There are measurement issues involved in the right estimation of beta:

The choice of a market index, for example, is controversial because there are no indices that are so close to the market portfolio. There are equity market indices and fixed income market indices, which measure the returns on subsets of securities in each market.

All these indices are not complete, and they include only a subsection of the market. An example of the market is the S&P 500, which is used for estimating beta for US companies. But it includes only 500 of the thousands of equities that are traded in the US market.

The choice of the market index can make a big difference in beta estimation, given that different indices include different types of equity assets and none of these indices include other asset classes, such as fixed income or real assets.

Indices that include more securities should then provide a better estimate of the beta, especially if they are market weighted. Moreover, the index should reflect the extent to which the marginal investor in that market is diversified.

Given the weighting issue, the S&P 500 becomes the best index to use, because, even if it contains less stocks than other indices, it comes with the advantage to be market weighted, and it includes the 500 largest firms.

Another important factor in beta estimation is the choice of the time period to consider. There is not much information in risk and return models about how long the estimation time should be.

There is a trade-off involved in choosing a time period for beta estimation, given that the further one goes back in time, the more observations are available, but at the cost of including information that is probably too old, compared to the actual status of the firm.

The company in fact might have changed its characteristics, in terms of business mix and leverage, over that period. Recall that the main objective in estimating beta is not to obtain the best beta over the last period but to obtain the best beta we can for the future.

For firms that have maintained a stable business, without experiencing major innovations, going back in time is not a problem. The opposite holds for a company that experienced a change in terms of business mix and leverage.

The final factor affecting beta estimation is the choice of the return interval, used to measure returns historically. Recall that measurement can be done at daily, weekly, monthly frequencies, and so on, with intraday data representing the limit.

A shorter interval in the regression implies a richer database, for even time period. Anyway the downside is that assets do not trade continuously, and this can affect the beta estimation when an asset is not traded. In particular, non-trading on an asset during a return period can reduce the measured correlation with the market index and consequently the beta estimate.

The problem of missed trading can be reduced by choosing a longer time period, at the cost of fewer observations. In particular quarterly and annual returns result in few observations, but monthly returns seem to be the best solution in that they provide a reasonable amount of data without the problem of non-trading.

When estimating betas based on daily or weekly data, the risk is to have a bias in the measurement, with illiquid firms reporting lower betas than they should be and liquid firms reporting higher betas than is justified. Another method for beta estimation involves calculation of short-term interval returns, followed by an adjustment of the betas for the extent of non-trading.

Different choices of time period, return interval, and market index produce different estimations for the beta, so that different services often end up with different estimates of beta for the same firm.

Some services have standard adjustment methods, based on simple techniques. For example, Bloomberg estimates the adjusted beta through the formula

$$\text{Adjusted beta} = \text{regression beta} (0.67) + 1.00 (0.33)$$

This effectively pushes all regression beta estimates closer to one. The weights remain the same for all companies and are not a function of the precision of the beta estimate.

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## 8.2 Valuation of Private Firms

### Learning Outcomes

- Learn how to calculate the cost of capital of a private firm
- Learn how to estimate the beta of a private firm
- Explain the concept of terminal value

#### 8.2.1 The Cost of Capital

Recall that the valuation of a private company is a different task compared to valuing a public company. The focus is on choosing the right model and deciding whether to focus on valuing the firm or the equity.

Moreover, the valuation must take into account whether the company is at a mature stage, therefore requiring a steady state model. Alternatively, for a growing company, the choice is between a two-stage or a three-stage model.

Another challenge is the estimation of the discount rate for the cash flows, either in the form of cost of equity, cost of debt, or overall cost of capital. The choice must be consistent on what type of cash flows have to be discounted.

The estimation of the cost of equity for a private firm is challenged by the limitations of classical models, like CAPM, that rely on available market data. For private firms and divisions, the data are not available, because these firms are not traded.

It is therefore necessary to develop methods for the estimation of the model parameters, in order to overcome the limitations imposed by the lack of data.

Estimation of the beta, for example, can be done in several steps. First of all, one should collect a group of publicly traded comparable firms, preferably in the same line of business, but more generally, affected by the same economic forces that affect the firm being valued.

It is possible to test for the comparability of selected firms by estimating the correlation between the financials of the firm under valuation and the comparables. A high correlation confirms the comparable firms can be used for the analysis.

The second step is to estimate the average beta for the publicly traded comparable firms. After that, the average market value of the debt-to-equity ratio for the comparable firms must be estimated. This leads to the calculation of the unlevered beta of the firm.

$$\beta_U = \frac{\beta_L}{1 + (1 - \tau_C)\left(\frac{D}{E}\right)}$$

where:

$\beta_U$  is the unlevered beta.

$\beta_L$  is the levered beta.

$\tau_C$  is the corporate tax rate.

$D$  is the market value of the debt of the firm.

$E$  is the market value of the equity of the firm.

The last step involves the estimation of the debt-to-equity ratio for the private firm. The main limitation is the availability of only the book values for both. In order to overcome the issue, the average debt-to-equity in the industry can be used.

Assuming that the private firm will move to the industry average debt ratio, the beta for the private firm will then also converge on the industry average beta. This might not happen immediately but over the long term.

$$\tilde{\beta}_L = \frac{\beta_U}{1 + (1 - \tau_C)\left(\frac{D_{\text{AVG}}}{E}\right)}$$

where:

$\beta_{\text{PVT}}$  is the beta of the private firm.

$D_{AVG}$  is the industry average debt.

Another approach involves estimating the theoretical optimal debt-to-equity ratio for the private firm, based on the analysis of the financial statement. The determined ratio can then be used for the beta calculation. One should consider to then use the same ratio also in the estimation of cash flows.

$$\tilde{\beta}_L = \frac{\beta_U}{1 + (1 - \tau_C)\left(\frac{D_{OPT}}{E}\right)}$$

where:

$D_{OPT}$  is the optimal debt.

The final step of this method is to use the beta obtained through the above steps to estimate the cost of equity of the private firm.

An alternative method consists of estimating an accounting beta, again with a process divided in several steps. First of all, the historical accounting earnings of the private firm must be collected for a reasonably long time.

Collecting the accounting earnings for the index of reference, as a proxy of the market, for the same time period is the following step. The changes in earnings for the private company must then be regressed against the changes in the market returns. The beta is then obtained as the slope of the regression line.

Much research has been done by researchers to relate the betas of publicly traded firms to observable business variables. Fundamental betas are the result of the efforts of authors like Beaver et al. (1970).

They examined the relationship between betas and seven different business variables, namely, the dividend payout, asset growth, leverage, liquidity, asset size, earnings variability, and the accounting beta.

Also Rosenberg and Guy (1976) have performed a similar analysis. The betas have been regressed on the variables in order to find the appropriate coefficients to relate the beta for the private firm to its own business variables.

By measuring each of these variables for a private firm, it is then possible to estimate the beta for the firm. While this approach is simple, it is only as good as the underlying regression.

Another type of beta to use for valuing the cost of equity of private firms is the bottom-up beta. It can be estimated by starting with the businesses that a firm is in and estimating the fundamental risk or beta of each of them. The weighted average of these risks is then calculated and adjusted for leverage.

The four main steps involved in the estimation of bottom-up beta are:

- Break the company down into the businesses that it operates in. The business should not be defined too narrowly in order for the process to run smoothly.
- Estimate the risk (beta) of being in each business. This beta is called an asset beta or an unlevered beta.
- Take a weighted average of the unlevered betas of the businesses, weighted by how much value the company gets from each business.
- Adjust the beta for the company's financial leverage (debt-to-equity ratio).

The adjustment of the bottom-up beta to the leverage of the firm is a controversial point since such an adjustment should be normally made on market values of equity and debt, which is only possible for public firms.

While many analysts use the book value debt-to-equity ratio to substitute for the market ratio for private firms, there are several alternatives that can be implemented.

One option is to assume that the market leverage of the private firm resembles the average leverage of the industry sector. In this case the levered beta can be defined as an industry beta.

Another method is to use the private firm's target leverage ratio, or the optimal debt ratio, to estimate the beta. The difficulties of the method are that the leverage ratio is disclosed upon discretion of the management, while the optimal debt ratio must be estimated.

The beta can then be adjusted for operating leverage, by simply considering the proportion of the fixed costs over overall costs. If this proportion is greater than is typical in the industry, the beta used for the private firm should be higher than the average for the industry.

A further adjustment can be made for diversification effects. One should recall in fact that the beta represents the risk added by an investment to a diversified portfolio. In case of the private firms, the owner is often the only investor and thus can be viewed as the marginal investor.

As a consequence, the entrepreneur is not well diversified but concentrates most of his wealth in the private firm. It can be stated as a consequence that the betas calculated for a private firm will generally underestimate the risk exposure.

As in the case of operational leverage, it is possible to make a simple adjustment in order to account for the non-diversifiable risk when calculating beta. The method is based on the standard deviation.

Define the standard deviation in the private firm's equity value by  $\sigma_i$  and the standard deviation in the market index by  $\sigma_m$ . If the correlation between the stock and the index is defined to be  $\rho_{im}$ , the market beta can be written as:

$$\beta_m = \rho_{im} \frac{\sigma_i}{\sigma_m}$$

where:

$\sigma_i$  is the volatility of the returns of stock  $i$ .

$\sigma_m$  is the volatility of the market returns.

$\rho_{im}$  is the correlation coefficient between market returns and returns of stock  $i$ .

The total risk to which the firm is exposed is given by dividing the market beta by  $\sigma_{jm}$ . This would yield the following:

$$\frac{\beta_m}{\rho_{im}} = \frac{\sigma_i}{\sigma_m} \quad (8.1)$$

Equation (8.1) represents the relative standard deviation of the firm, scaled against the standard deviation of the market. It is possible to indicate such a measure as the total beta, which accounts for non-diversifiable risk.

$$\beta_{\text{TOT}} = \frac{\beta_m}{\rho_{im}}$$

The total beta is dependent on the correlation between the market and the firm and will be higher than the market beta. In general, for lower values of the correlation, the total beta will be higher.

For a private firm, the total beta calculation may seem difficult, due to the absence of market prices, which hinder the calculation of a market beta and the correlation coefficient.

However, one should recall that it is possible to estimate the market beta of the sector by looking at publicly traded firms in the business. The correlation coefficient is obtained by looking at the same sample and using it to estimate a total beta for a private firm.

The reason for making the company valuation is another important factor in assessing whether the total beta adjustment is needed or not. In case of valuation for sale, for example, the need for adjustment depends on the potential buyer.

In case of an IPO, there should be no adjustment for non-diversification given that the market investors, who are the buyers in this case, are assumed to be potentially diversified in their investments.

If the valuation is for sale to another individual or private business, the extent of the adjustment is dependent on the diversification of the buyer. The more diversified the buyer, the higher the correlation with the market and the smaller the total beta adjustment.

The estimation of the cost of debt for a private firm presents a basic problem, similar to that encountered in estimating the cost of equity. As for equity in fact, private firms do not access public debt market, and they are therefore not rated.

The biggest part of the liabilities in the balance sheet is made of bank debt. Using the interest rate paid on the bank, loans may be misleading and not reflect the real rate at which the firm can borrow.

One possible method is to assume that the private firm can borrow funds at a rate equivalent to that paid by the comparable firms in the industry. In this case the cost of debt can be expressed as

$$\tilde{r}_D \cong r_{\text{AVG}}$$

where:

$r_{\text{AVG}}$  is the cost of debt for similar firms in the industry.

Another solution is to estimate an appropriate credit rating for the company, based upon financial ratios, and use the interest rate estimated bond rating. This leads to a formulation of the type

$$\tilde{r}_D \cong r_{\text{RAT}}$$

where:

$r_{\text{RAT}}$  is the interest rate based upon estimated bond rating for private firm.

The third method involves considering the actual long-term debt of the private firm and using the cost of that debt as a proxy of the estimated cost of debt. This is especially valid if the debt is recent, therefore reflecting the actual creditworthiness of the firm.

$$\tilde{r}_D \cong \frac{I}{D}$$

where:

$I$  is the interest expense.

Once the cost of equity and cost of debt have been somehow estimated, it is then possible to estimate the overall cost of capital. However, there are issues also at this stage.

The debt ratios for private firms are in fact stated in book value terms, rather than market value. Furthermore, the debt ratio for a private firm that plans to go public might change as a consequence of that action.

One possible solution is to assume that the firm debt ratio will converge to the industry average ratio in a reasonable term. In this case the following equality holds:

$$\frac{\tilde{D}}{\tilde{V}} \cong \frac{D_{AVG}}{V}$$

where:

$\tilde{D}$  is the debt of the private firm.

$\tilde{V}$  is the total value of the private firm.

$D_{AVG}$  is the industry average value of debt.

Otherwise it is possible to assume that the company will move toward its optimal debt ratio, so that

$$\frac{\tilde{D}}{\tilde{V}} \cong \frac{D_{OPT}}{V}$$

where:

$D_{OPT}$  is optimal value of debt.

It is very important that the debt ratio assumptions used to calculate the beta, the debt rating, and the cost of capital weights are consistent. When assuming that the firm will move to the industry average debt ratio, one must therefore calculate the beta using the industry average debt/equity ratio, estimate the bond rating by looking at similar firms in the industry, and calculate the cost of capital using the same debt ratio.

### 8.2.2 Beta Estimation

Recall that beta measures the systematic risk of a security compared to the market, and how the return on equity of a company changes, according to changes of the return of the market.

Beta is the slope coefficient obtained through regression analysis of the stock return against the market return. The following regression equation is employed to estimate the beta of the company:

$$\Delta S_i = \alpha_i + \beta_i \Delta S_M + e_i$$

where:

$\Delta S_i$  is the change in price of stock  $i$ .

$\Delta S_M$  is the change in the value of the market.

$\alpha_i$  is the intercept value of the regression.

$\beta_i$  is the beta of the stock  $i$ .

$e_i$  is the error term.

The problem with the above regression is that it can be conducted only for public companies, which are listed on stock exchange and for which historical data about equity returns are available (Damodaran 2002).

But what about for private companies? Due to lack of market data on stock prices of private companies, it is not possible to estimate stock beta. Therefore, other methods are required to estimate beta of the private company.

One straightforward method is to derive the private company beta directly from that of comparable public companies. The objective of the method is to calculate the average beta of a group of public companies that operate in the same business as the private company.

The estimated beta from comparable firms is a proxy for the industry average levered beta. After that, the beta needs to be unlevered, by applying the average debt-to-equity ratio for these comparable companies. The final step is re-levering beta, using private company's target debt/equity ratio.

**Example 8.1** Consider estimating the beta of an illustrative company with a target debt-to-equity ratio of 0.5, by using the information about four comparable companies:

Comparable companies	Beta	Debt	Equity	D/E
Company 1	1.60	7840.00	16,267.00	0.48
Company 2	1.65	10,565.00	37,850.00	0.28
Company 3	1.71	523.23	1653.47	0.32
Company 4	1.69	1627.84	4079.74	0.40
Averages				
Weighted average beta	1.64			
Weighted average D/E	0.34			

The equity-weighted average beta of the four companies is 1.64. This is close to the arithmetic average of about 1.66. The next step is to unlever the beta by using the average debt-to-equity ratio for these companies, which is 0.34. It follows that

$$\beta_U = \frac{\beta_L}{1 + (1 - \tau) \frac{D_{AVG}}{E_{AVG}}} = \frac{1.64}{1 + (1 - 0.35)0.34} = 1.343$$

where:

$\beta_L$  is the levered beta.

$\frac{D_{AVG}}{E_{AVG}}$  is the average debt-to-equity ratio of comparable firms.

$\tau$  is the tax rate.

Thus, we get the unlevered beta of 1.343 approximately.

In the final step, we need to re-lever the equity using the target  $D/E$  ratio of the private company, which equals 0.5:

$$\beta_L = \beta_U \left[ 1 + (1 - \tau) \frac{D}{E} \right] = 1.343(1 + 1 - 0.35)0.5 = 1.78$$

The method of the average beta of comparable firms has the drawback consisting in the fact that it neglects the differences in size between companies. It happens often that the public comparable companies considered are much larger than the private firm.

Another possible method is the earnings beta approach that becomes useful in cases when it is difficult to obtain reliable comparable betas. It happens quite often in fact that public companies operate in many segments, making it difficult to identify which companies are really comparable to the private firm under valuation.

The earnings beta approach uses the company's historical earnings change and regresses them against the market returns. An appropriate market index can be used as a proxy for market.

The beta obtained as above needs to be adjusted in order to reflect the expected future performance of the firm. Recall that beta has a mean-reverting feature and tends to get to one in the long term. The adjusted beta can be expressed as

$$\beta_{Adj} = \alpha(1 - \alpha)\beta_H$$

where:

$\beta_{Adj}$  is the adjusted beta.

$\alpha$  is a smoothing factor.

$\beta_H$  is the historical beta.

The smoothing factor can be derived through complex statistical analysis based on historical data, but as a rule of thumb, the value of 0.33 or (1/3) is used as a proxy.

There are drawbacks in the earnings beta approach, depending on the fact that private companies do not exhibit longtime series of earnings, therefore making the regression analysis less reliable.

Moreover, the accounting earnings are subject to smoothing and accounting policy changes. Therefore, these may not be appropriate for statistical analysis, unless necessary adjustments have been made.

The use of CAPM for valuation of private companies can be problematic, due to the lack of a direct method to estimate the beta of a private firm. The above-presented methods represent a good compromise for implementing the model.

### 8.2.3 Growth and Terminal Value

The terminal value in the valuation of discounted cash flows represents the estimated value of the potential company's cash flow to be realized after the final discrete projection period.

Corresponding to the forecast of the future cash flows over such a terminal period, an analyst also chooses a long-term growth rate to incorporate the value of the cash flows into a perpetuity.

The calculation of the terminal value is therefore based on the strong assumption that future cash flows over a specified time horizon will grow at a constant long-term growth (LTG) rate forever.

The most commonly used method to calculate the terminal value in the standard DCF model is the Gordon growth model (GGM), which can be described by the equation

$$PV = \frac{NCF_0(1 + g)}{r_e - g} \quad (8.2)$$

where:

PV is the present value.

$NCF_0$  is the net cash flows in the final discrete projection period.

$g$  is the selected long-term growth rate.

$r_e$  is the selected cost of capital.

The first step in terminal value calculation is to use the growth model to estimate the normalized long-term series of cash flows (terminal period NCF) during the estimated projection period.

The cash flow stream should reflect the assumption of stable, normalized returns for the company. This is a very important passage in order to ensure a fair valuation of the growth potential of the business.

The following step entails the capitalization of the terminal NCF at an appropriate risk and growth-adjusted capitalization rate, which is commonly indicated as the direct capitalization rate.

The Gordon growth model assumes that the terminal value is estimated based on the assumption of an increase (or decrease) of the NCF, at a constant annual rate, in perpetuity.

The good proxy for the capitalization rate is the company's WACC, which incorporates the risk embedded in the business cash flows, net of the selected long-term growth rate (which incorporates the expected growth of the company cash flow).

The capitalization rate calculated as above is then used to discount the projected terminal period's NCF, in order to determine the terminal value, to be added to the discounted previous cash flows (Pratt and Grabowski 2010).

Because the terminal value is calculated as of the end of the discrete projection period, the last procedure in the application of the GGM is to compute the present value of the terminal value.

In that final discounting phase, the long-term growth rate is not used, but the same present value discount rate applied to the final cash flow of discrete period NCF calculation should be used instead.

The assumption of a permanent positive or negative growth rate for a business may appear too strong and unrealistic. This is particularly the case when an analyst decides to use a growth rate above the projected inflation rate in the economy.

This implies in fact that the company will grow to infinite, and it will do it on an infinite time span. However, the majority of the terminal value is generated by the cash flow that occurs within the first few periods beyond the discrete projection periods.

By selecting the LTG rate for the Gordon model, an analyst has a view of the cash flow growth of the company for a time interval of at least 10–20 years, after the terminal period.

Recall that the GGM is a collapsed version of the summation of the present value of each individual period in the terminal period discounted to the beginning of the terminal period at the direct capitalization rate.

As per the equation as stated above, the terminal value is generated (for each period successive to the last discretely discounted cash flow) based on the spread between the WACC and the LTG.

In other words, given the same WACC, a lower LTG rate causes a higher proportion of terminal value to be generated in the near term, while a higher LTG rate causes the opposite result.

A higher LTG in fact corresponds to a steep increase in the cash flow projections in the future. Following this approach, the future periods tend to correspond to higher present values.

A higher long-term growth rate corresponds then to higher proportion of value generated in later periods. This drives uncertainty such that a high LTG amplifies it through relatively increased proportion of the terminal value.

The issues related to the right choice of the LTG rate are many. First of all, there is necessity to match it with the inputs considered when measuring the related cash flows to discount.

Also important is to consider appropriate factors in the selection of the right rate, while excluding the inappropriate ones from the analysis, in a process that requires careful selection.

The purpose of this section is also to give a summary with explanation of the quantitative and qualitative factors that should be considered when selecting the appropriate LTG rate for application to the Gordon model.

Sometimes the analysis behind the choice of the LTG rate mainly relies on factors like historical and projected growth, inflation, or any other similar metric that can be directly measured.

The issue with such an approach is that other important factors are ignored, which relate to the overall business life of the company and to its overall growth perspectives. Understanding what those factors are is important because the period covered by the LTG rate variable within the GGM may start so far into the future that there could be problems.

First of all, it is very difficult to precisely project the LTG rate. Secondly it may not be practical or possible to identify and select the specific company initiatives that may contribute to the overall growth of the business.

Qualitative factors are important in determining the appropriate permanent growth factor of the company and may include items like the projected business performance, the assets of the company, and managerial strategy.

According to *Investment Valuation: Tools and Techniques for Determining the Value of Any Asset* by Aswath Damodaran, a company's LTG rate should be "determined by a number of subjective factors—the quality of management, the strength of a firm's marketing, its capacity to form partnerships with other firms, and the management's strategic vision, among many others."

The first way to measure LTG is from the company's existing assets. Such an approach focuses on both tangibles and intangibles and results in being the most commonly addressed factor when thinking about long-term growth.

Among the assets that analysts normally include in the assessment of the expected growth are:

- The overall industry growth
- The company's market share
- Inflation
- The growth of the existing assets prior to the terminal period

Industry growth is important and sometimes expected to be higher or lower in the discrete projection period rather than in the terminal period. In all cases, the latter is the one to be assumed as the factor for LTG calculation.

The company's market share is also very important, and sometimes, if the company shows a positive trend of market penetration, this factor has a positive impact on the estimation of the growth.

Existing assets in the company are sometimes the basis for the estimation of LTG rate. But in most cases, and for most companies, this is not enough. Some business produce new assets due to innovation. It follows that if the analyst only considers growth from existing assets in the LTG rate, he or she may understate the company's LTG rate.

It is a complicated task to identify the growth from new internally developed assets and separate it from that coming from existing assets. This is because the projection of cash flows should be then based on a product not developed yet. The

analysis also implies that the idea or product generating the increase in assets will be commercially viable.

Another important category of growth is the growth by acquisition, by which it is possible to create new company assets or grow the already existing ones, including the intangibles and goodwill.

The analysis of LTG from the perspective of growth by acquisitions involves establishing how likely the company is to make acquisitions during the terminal period and what contribution these will have on the projected growth.

Many factors affect the above considerations. First of all, it is important to consider what is the history of the company in terms of acquisitions. It is also important to understand the acquisition policy of the company.

Another important factor is the level of acquisition activity in the subject company industry. The analysis should rely on the merger and acquisition databases to analyze the number of transactions that occurred in the subject company industry in the years preceding the valuation date.

Last but not least, it is very important to assess the prospective financial ability of the company to make acquisitions. This can be done by analyzing the past financial statements as well as the financial statements projected for the discrete projection period.

One should recall that the most relevant period for the analysis is the terminal period, so that the potential of the company to make acquisitions in perspective constitutes the core of the analysis.

For example, if there is a major capital expenditure to be financed through debt, during the discrete projection period, it may be difficult for the company to complete acquisitions during the first part of the terminal period.

There are also factors that should be excluded from the LTG analysis, in that they are not meaningful to assess the growth perspective of the company. Factors like speculation, hypothetical situations, or opportunities maybe existed as of the analysis date but are not relevant in that probably not exploited.

The other big area of analysis includes quantitative factors, represented by empirical data that are useful to support the choice of the LTG rate. These data may include both company-specific information and projected economic growth, both real and nominal.

Sometimes qualitative data and quantitative data may lead to different values of the LTG. In this case it is the duty of the analyst to understand the differences and try to reconcile the different values.

The corporate financial statements are a primary source of information, both in the form of historical financial information and in the form of management-prepared projections about the financials of the business.

If the business was operating under similar business conditions, historical financial information is useful because it provides snapshots of the economic results of the business.

The projections of the management are also very important in that they reflect the point of view of someone who has generally a deep understanding of the economic

drivers of the business and give reasonable predictions of the business for a number of years into the future.

The analysis of historical financial information for the estimation of the LTG relies on the assumption that the economic factors driving a company in the near past will continue to affect the company in the near future.

The belief is that the recent trend of cash flows in one direction or the other may have a significant impact on the future direction of those, unless the trend has been determined by major shocks on operations.

One important factor to consider when analyzing the company's historical financial information is the age of the company. This is because a company in the business for a longer time may exhibit a much more stable economic condition. On the other hand, a longer series of time periods provides a higher amount of data to analyze.

The trend of the recent cash flows assumes a significant role when the company reports stable economic returns over a reasonably high number of periods. In this case in fact no major changes should be expected, and the weight of the trend in historical financial information should be considered relevant.

The analysis can be simplified by looking at a sample of three hypothetical companies. The different types illustrated below correspond to different impact of their circumstances on the usefulness of their historical financial data in the selection of the LTG rate.

- Company X has been recently founded. It shows consistent profits in the early years, and it is expected to continue like that. However, volatility of cash flows is high, and the main sources of income are two big customers not bounded by any long-term agreement.
- Company Y is young as well, with a path of increasing cash flows in time, without being dependent on any particular customers for the cash flow pattern to continue in the future.
- Company Z is a very old company that already reached its steady state and shows stable cash flows. The company grows at a rate consistent with the overall industry, with no projected major change in the business structure in the near future.

Company A does not have links to stable economic factors and has volatile cash flows, with unstable customer relationships as well. For such a company, it is clear that the historical data are less meaningful than for other companies. For such a company, it would be more useful to rely on management projections, industry projections and expectations, and other factors.

The case of company B is different, and historical data may be more useful, even if the company B is as young as company A. This is because it appears that company B's economic drivers are more predictable.

As a matter of fact, it is obvious that for a company as old as company C, historical data have the most use. With a demonstrated past growth and an actual good average reduced growth, it shows to be very interesting for the analysis.

The specific factors of the company at hand will determine what information will carry the most weight and what quantitative methods the analyst may use to provide an indication of a supportable LTG rate.

One important question is: how to estimate the growth in earnings? There are several possible approaches, and it is very important to analyze all of them in order to get a deep understanding of how growth impacts on value.

A good starting point for the analysis is generally the historical growth in earnings per share. Moreover, it is important to have knowledge of what the figures are for other businesses, as measured by other analysts.

Ultimately, all growth in earnings can be traced to two fundamentals—how much the firm is investing in new projects and what returns these projects are making for the firm.

Among the various methods of EPS growth estimation, there are arithmetic and geometric averages and simple regression models. In all cases one must put attention to the period used in estimation and the management of negative earnings, both having a serious impact on the estimation.

The work of the analysts about growth rate estimation is driven by several propositions. First of all, one must take into account that there is far less private information and far more public information in most analyst forecasts than is generally claimed.

Another proposition states that private information mostly comes from the company itself. A third proposition tells us that there is danger when all analysts barely agree with each other on estimations (lemmingitis) and when they agree to little (in which case the information that they have is so noisy as to be useless).

The inputs involved in the estimation of expected long-term growth in EPS are reinvestment rate  $R_R$  and return on equity  $ROE$  which are calculated as

$$r_R = \frac{I_R}{I_C} = R_R$$

where:

$r_R$  is the reinvestment rate.

$I_R$  are the retained earnings.

$I_C$  are the current earnings.

And the return on investment  $r_I$  is

$$r_I = ROE = \frac{I_N}{E_B}$$

where:

$I_N$  is the net income.

$E_B$  is the book value of the equity.

One must be aware that small changes in ROE translate into large changes in the expected growth rate. Moreover, the lower the current ROE, the greater the effect of changes in ROE will be.

In the long term, the company will hardly sustain growth in earnings due to increase in the ROE. After some level, the improvement in ROE will be almost meaningless to the growth in earnings (Pratt 2008).

If the change is over multiple periods, the second component should be spread out over each period.

How to value the company then? First of all, let's focus on public companies. A public company is assumed to have infinite life, so that its value  $P$  can be calculated as the present value of its cash flows over an infinite time span, as

$$P = \sum_{t=1}^{\infty} \frac{C_t}{(1 + \tilde{r})^t}$$

where:

$\tilde{r}$  is the discount rate applied to the cash flows.

Given that it is impossible to estimate cash flows forever, the common method is to estimate a series of cash flows for a limited growth period and then add up a terminal value, in order to account for the following infinite time.

$$P_0 = \sum_{t=1}^T \frac{C_t}{(1 + \tilde{r})^t} + \frac{TV}{(1 + \tilde{r})^T}$$

where:

TV is the terminal value.

The simple form of stable growth equation for estimating the terminal value represents the firm's cash flows as growing at a constant rate forever, so that the present value of those cash flows is

$$P_0 = \frac{C_1}{\tilde{r} - g}$$

where:

$g$  is the expected growth rate.

The constant growth rate as so calculated is a stable rate that can never be higher than the growth rate of the economy in which the company operates. All companies have an initial growth which can be high for some periods and will approach the stable growth at a more mature stage of their life.

The overall economy growth in some country of reference resembles the average of the growth rates of the many companies that populate it. It is therefore important to know the general state of the economy in order to guess a stable growth for the firm.

If one assumes that the economy is composed of high-growth and stable growth firms, the growth rate of the latter will probably be lower than the growth rate of the economy.

In the assumption that the company is going to disappear in the future, an implicit conclusion is that the growth rate can be negative, so that the terminal value will be lower.

The chosen growth rate should follow the nature of cash flows and discount rates, so that if those are expressed in nominal terms, also the long-term growth should be nominal and expressed in the currency in which the valuation is denominated. One simple proxy for the nominal growth rate of the economy is the risk-free rate.

It is important to underline that the terminal value is not much linked to stable growth, as it is to the excess returns in the stable growth stage. If one assumes that the ROC will equate the cost of capital in stable growth, the growth rate will not impact on the terminal value.

On the other hand, if the assumption is that the firm will earn positive (negative) excess returns in perpetuity, the terminal value will increase (decrease) as the stable growth rate increases.

The first period of discrete cash flows discounting and high growth can be characterized by several behaviors. In particular, there are four different assumptions that can be made.

The first scenario is that there is no high growth, and the firm is already in stable growth. The second scenario assumes high growth for a period, after which the growth rate will drop to stable growth.

The third scenario is similar to the second but involves high growth followed by a decline that will gradually lead to stable growth in a three-stage process. Finally, there is the case where each period will be characterized by different growth and margins.

At the same time, assumptions about excess returns must be made as well. In general, the excess returns will be large and positive in the high-growth period and decrease as you approach stable growth (the rate of decrease is often titled the fade factor).

There are several factors determining the growth pattern of a company. They range from company size to barriers to entry, passing through current growth rate. First of all, the bigger the firm, the lower the growth rate, due to reaching limits.

Secondly, past growth is not always a reliable indicator of what growth will be in the future. Long-term growth will be always lower than current growth. Barriers to entry help companies maintain large market share and therefore enhance higher returns and corresponding higher growth.

There are peculiar characteristics that a firm in stable growth should have. In particular, the risk of the company should be comparable to a stable growth firm in terms of beta and rating.

The beta should be around one, with a rating of BBB or higher on the debt issue by the firm. Also the debt ratio of the firm might increase to reflect the larger and more stable earnings of these firms. Also, the reinvestment rate of the firm should reflect the expected growth rate and the firm's ROC.

Concluding, always be aware that the terminal value will always be a large proportion of the total value. The point reflects the reality that the majority of the returns from holding a stock for a finite period comes from price appreciation.

The proportion of terminal value on the overall value increases as the growth increases. In some cases, the present value of the terminal value is greater than 100% of the current value of the stock.

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## **8.3 A Real Case: The IPO of Facebook™**

### **Learning Outcomes**

- Define the road to the firm's IPO
- Understand the firm's fundamentals
- Comment on subsequent developments toward a fair valuation

### **8.3.1 The Road to the IPO**

The history of Facebook is as interesting as controversial, in terms of its relationship with the markets. For many years in fact, the company resisted several attempts to be acquired and also rejected going public for years.

Starting from early 2006, Mark Zuckerberg turned down several acquisition offers, from the \$75,000,000 offer from Viacom in 2006 to the valuation given by independent advisors in 2011 at \$50 billion.

Facebook's valuation steadily increased in the days leading up to the IPO price. Zuckerberg wanted to wait to conduct an initial public offering, saying in 2010 that the managers were definitely in no rush.

The official path to the IPO began in February of 2012 when the company filed the documents to the SEC, as per guidelines and regulation of IPOs. The preliminary prospectus announced that the company had 845 million active monthly users and that its website featured 2.7 billion daily likes and comments.

The report to the SEC clearly showed that the impressive figures about memberships and income-related assets were slowing down, with deceleration projected to continue in the following years.

As for other companies before, the management of Facebook wanted to protect the ownership and control rights of the early investors, by instituting a dual-class stock structure, in 2009.

When the decision about going public was made, Facebook's founder Zuckerberg was puzzled about the IPO and the consequences of it. The fear of the founder was that the mission of the company would have to be compromised in the name of profit. Moreover, one should not forget about the burden of releasing a company's financial details to the public.

However, the company was at such a growth stage that involved the need for a consistent injection of capitals. Facebook needed money, and private companies face restrictions on how much stock they can issue for cash.

An attempt had been made in 2011, with the help of Goldman Sachs, to raise equity capital by creating a special investment product to sell the private shares of the company to selected Goldman Sachs's customers.

However, the SEC started investigating the plan immediately, putting pressure on the management of Facebook. The founder then decided that going public was the only solution to the capital need.

In late 2011, The Wall Street Journal reported that Facebook was anticipating an IPO valuation of \$100 billion, nearly four times more than Google's market cap when it went public in 2004.

The company filed the forms to the SEC for starting the IPO process in early February 2012. The form contained everything an investor needs to know before buying shares at an IPO, including basic financial information and the business model.

The S-1 form filed to the SEC contained information regarding the core business of the company, which at the time was primarily focused in the display advertising business. Net profits were reported at \$1 billion in 2011 from total revenue of \$3.7 billion.

The company also listed the investment banks involved in the underwriting of the IPO. The pool of banks involved in the operation, being led by Morgan Stanley, JPMorgan Chase & Co., and Goldman Sachs Group Inc., included 33 investment banks.

The next step in the path to the IPO was, like for many other companies going public, the road show, the promotional tour where executives drum up support for their IPO before large investors.

The first meeting with investors took place in May 2012, just 11 days before the IPO day. The top management of Facebook met the investor at the Sheraton Hotel in midtown Manhattan.

There was a massive presence of journalists, as expected, and a long line of potential investors eager to understand the potential of the IPO. Inside the meeting, Facebook played a video introducing the business model to special clients of its underwriting banks.

That was the time when the road to IPO started being hindered by unwanted news. While the road show was taking place, Morgan Stanley found out Facebook had cut revenue projections, resulting in a nearly unprecedented last-minute correction.

The new internal forecasts affected the road show, which is usually functioning as a way to boost the expectations on the IPO. In the case of Facebook, that stage was heavily affected by the bad news.

Bad news about the company's new internal forecasts focused on revenue growing slower than expected, due to high-tech users flocking to smartphones faster than the company could serve mobile ads.

The last-minute cut in revenues by Facebook resulted in an unprecedented downward revision, characterized by poor timing. As a matter of fact, the public disclosure of such information would have turned the IPO down.

For an IPO of that magnitude in fact, even if corrections in the revenue were quite small, statistically, in IPO showbiz statistics run second to momentum, and nothing kills momentum like a poorly timed downward revision.

Obviously something had to be disclosed, but the issue was about what to disclose. The law requires companies to share all information that would likely influence an investor's decision to buy stock, and some of the underwriters were still advising clients based on figures that Facebook later reported to be wrong.

With only a few days left before the IPO, Morgan Stanley and the other banks decided to save the company from being ashamed of their figures, through a procedure that turned out to be quite controversial and harmful to the banks afterward.

First of all, Facebook would amend its public birth certificate filed to the SEC, the S-1 form, to include information about mobile usage cutting into revenue. Second, the company would disclose more specific information about the downgraded projections.

This amendment of the official form to the SEC resulted in just changing 3 pages out of the 170 pages included in the form. The only way to gather information about the ongoing challenge, to serve ads to mobile users, was to have knowledge of those three pages.

On page 14 and 17, the company said that its users were growing faster than ads due to the increased use of mobile phones and product decisions that allowed fewer ads per page.

Another amendment appeared on page 57, stating that the mobile trend discussed elsewhere in the document had continued in the second quarter, due to users shifting from computers to phones. But no financial consequences of such a persistent trend was ever mentioned anywhere in the updated pages.

That was all the information that was given out, and no mention was made about the projected lower revenue estimates. Even the most sophisticated retail investors, with specialized software to read the forms deposited at the SEC, had no clue about the consequences on revenue of the issues reported in the amendment.

Facebook was already projecting to trade at high multiples given its earning figures was slashing its annual projections. The underwriters were not involved into any type of information disclosure themselves.

There is a rule in information disclosure by analysts, which hinders them from publishing or emailing any type of information about a new public company in the first 40 days after the IPO.

Such a rule protects investors from being hit by the findings of analysts, which may bias their personal judgment about the investment to undertake. On the other hand, this information may then flow privately to institutional clients without a paper trail.

It is clear how such a game of telephone calls and private disclosure became so important in the peculiar situation of Facebook. Analysts had the chance to inform only selected investors about the last-minute change in the revenue projections.

After the company's surprising 11th-hour amendment, the unenviable job of explaining Facebook's revisions to the research analysts fell to Cipora Herman, Facebook's vice president of finance.

Bloomberg information system reports on May 11 that the interest of the institutional investors on the IPO was not as strong as expected. Another report from Reuters on the other hand stated that demand was much higher than the planned offer of stocks, with one large unnamed institutional investor was calling around syndicate desks trying to get more shares.

The market in those days was therefore characterized by large institutional investors being fully informed about Facebook's last-minute troubles and retail investors being unaware of them.

This is why the retail investors clamored for Facebook shares, while some large investors were planning a massive short selling, therefore essentially betting against the stock's buyers.

Telephone calls reached the managers of top analysts, from hedge funds and other big investors declaring they would have short sold the stocks of Facebook, due to the revelations.

But despite the growing consensus among some large investors that Facebook was overpriced, on May 15, 3 days before Facebook's market debut, the underwriting banks increased the IPO range from \$28–\$35 to \$35–\$38, citing heavy demand. A day later, they increased supply to more than 420 million shares.

The new share and price allocation placed Facebook's valuation at the iconic \$100 billion mark.

### 8.3.2 The Firm's Fundamentals

This section summarizes the findings of the case study about Facebook given to students during the Corporate Finance course given in the years 2013 and 2014. It is based on the financials of the company at the end of 2011.

Students were given the chance to play with the financial statement of Facebook and analyze the balance sheet (see Table 8.1), income statement (see Table 8.2), statement of cash flows (see Table 8.3), and major ratios (see Table 8.4). The following paragraphs summarize the results obtained in terms of fair pricing.

Based on the financials of the company, it is possible to calculate what the fair price of an IPO of Facebook should have been. In particular, it is also possible to grasp the idea of what went wrong in the actual process of the firm going public.

Several valuation methods are available for company valuation, as summarized in Table 8.5:

Students were asked to use free cash flow to firm (FCFF) valuation method. FCF valuation is most suitable when:

- The company is not dividend paying.
- The company is dividend paying but dividends significantly differ from FCFE.

**Table 8.1** The balance sheet of Facebook™ as of year 2011

Balance sheet (\$M)	2011	2010	2009	2008	2007
<b>Assets</b>					
Cash	1512	1785	633	297	305
Short-term investments	2396	0	–	–	–
Receivables	547	373	–	–	–
Inventories	0	0	–	–	–
Other current assets	149	88	–	–	–
<i>Total current assets</i>	<i>4604</i>	<i>2246</i>	<i>633</i>	<i>297</i>	<i>305</i>
Net property, plant, equipment	1475	574	–	–	–
Intangibles	162	96	–	–	–
Other long-term assets	90	74	477	208	143
<i>Total long-term assets</i>	<i>1727</i>	<i>744</i>	<i>477</i>	<i>208</i>	<i>143</i>
<i>Total assets</i>	<i>6331</i>	<i>2990</i>	<i>1110</i>	<i>505</i>	<i>448</i>
<b>Liabilities and equity</b>					
Accounts payable	63	29	–	–	–
Short-term borrowing	279	106	–	–	–
Other short-term liabilities	557	254	–	–	–
<i>Total current liabilities</i>	<i>899</i>	<i>389</i>	<i>0</i>	<i>0</i>	<i>0</i>
Long-term borrowings	398	367	–	–	–
Other long-term liabilities	135	72	241	170	174
<i>Total long-term liabilities</i>	<i>533</i>	<i>439</i>	<i>241</i>	<i>170</i>	<i>174</i>
<i>Total liabilities</i>	<i>1432</i>	<i>828</i>	<i>241</i>	<i>170</i>	<i>174</i>
Preferred stocks	615	615	–	–	–
Share capital	2684	947	868	335	273
Retained earnings	1600	600	0	0	0
<i>Total equity</i>	<i>4899</i>	<i>2162</i>	<i>868</i>	<i>335</i>	<i>273</i>
<i>Total liabilities and equity</i>	<i>6331</i>	<i>2990</i>	<i>1109</i>	<i>505</i>	<i>447</i>

- The company's FCF's align with company's profitability within a reasonable time horizon.
- The investor has a control perspective.

FCF valuation is very popular with analysts.

A firm potentially has an infinite life. Therefore, valuation must be based on a two-stage procedure where there are  $N$  future years (usually 5–10) of growth forecast of cash flows, followed by the final (discounted) terminal value.

$$V_0 = \sum_{i=1}^N \frac{FCF_i}{(1 + r_{WACC})^i} + \frac{TV}{(1 + r_{WACC})^N}$$

The stable growth rate cannot exceed the growth rate of the economy, but it can be set lower. If the economy is assumed to be composed by high-growth and stable growth firms, the latter group will normally grow slower than the economy.

**Table 8.2** The income statement of Facebook™ as of year 2011

Income statement (\$M)	2011	2010	2009	2008	2007
Operating revenue	3711	1974	777	272	153
Cost of revenue	(537)	(354)	(145)	(124)	(41)
<i>Gross profit</i>	<i>3174</i>	<i>1620</i>	<i>632</i>	<i>148</i>	<i>112</i>
Selling/general/admin expense	(707)	(305)	(205)	(47)	(113)
Research and development	(388)	(144)	(87)	(156)	(113)
<i>EBITDA</i>	<i>2079</i>	<i>1171</i>	<i>340</i>	<i>-55</i>	<i>-114</i>
Depreciation and amortization	(323)	(139)	(78)	0	0
Other income, net	19	2	(2)	0	(10)
<i>Operating income</i>	<i>1775</i>	<i>1034</i>	<i>260</i>	<i>(55)</i>	<i>(124)</i>
Share of results of associated companies	0	0	0	0	0
<i>EBIT</i>	<i>1775</i>	<i>1034</i>	<i>260</i>	<i>(55)</i>	<i>(124)</i>
Interest income (expense)	(42)	(22)	(10)	(1)	(11)
<i>Pretax income</i>	<i>1733</i>	<i>1012</i>	<i>250</i>	<i>-56</i>	<i>-135</i>
Taxes	(695)	(402)	(25)	0	(3)
<i>Net income</i>	<i>1038</i>	<i>610</i>	<i>225</i>	<i>(56)</i>	<i>(138)</i>
<i>ROE</i>	<i>24.23%</i>	<i>39.43%</i>	<i>25.92%</i>	<i>0.00%</i>	<i>0.00%</i>

**Table 8.3** The statement of cash flows of Facebook™ as of year 2011

Cash flows (\$M)	2011	2010	2009
Net income	1038	610	225
Depreciation and amortization	323	139	78
Accounts receivable	(174)	(209)	(112)
Accounts payable	102	120	(7)
Inventory	5	0	0
Other adjustments	221	23	(60)
<i>Cash from operating activities</i>	<i>1515</i>	<i>683</i>	<i>124</i>
Capital expenditures	(606)	(293)	(33)
Acquisitions and other investing activity	(2400)	(22)	(32)
<i>Cash from investing activities</i>	<i>(3006)</i>	<i>(315)</i>	<i>(65)</i>
Dividend paid	0	0	0
Sale or purchase of shares	1030	506	209
Increase in short-term borrowing	603	115	82
Increase in long-term borrowing	(431)	160	(48)
<i>Cash from financing activities</i>	<i>1202</i>	<i>781</i>	<i>243</i>
Foreign exchange adjustment	3	(3)	0
<i>Change in cash and cash equivalents</i>	<i>(289)</i>	<i>1149</i>	<i>302</i>
Changes in working capital	5	(70)	(179)
<i>Free cash flows</i>	<i>802</i>	<i>408</i>	<i>101</i>

When nominal cash flows and discount rates are used, the growth rate should be nominal in the currency in which the valuation is denominated. One simple proxy for the nominal growth rate of the economy is the risk-free rate.

**Table 8.4** Major ratios of Facebook™ as of year 2011

Indices	2011	2010	2009	2008	2007
<i>Debt/equity</i>	0.29	0.38	0.28	0.51	0.64
<i>Debt/assets</i>	0.23	0.28	0.22	0.34	0.39
<i>Equity/assets</i>	0.77	0.72	0.78	0.66	0.61

**Table 8.5** Valuation methods for the firm and equity

Valuation method			
	<i>Dividend discount</i>	<i>FCF to equity</i>	<i>FCF to firm</i>
<i>Cash flow</i>	Dividend	FCFE	FCFF
<i>Expected growth</i>	In dividends	In FCFE and equity income	In FCFF and operating income
<i>Discount rate</i>	Cost of equity	Cost of equity	Cost of capital
<i>Steady state</i>	Constant <i>g</i> for dividends	Constant <i>g</i> for FCFE	Constant <i>g</i> for FCFF

The historical growth in earnings per share is usually a good starting point for growth estimation. Analysts estimate growth in earnings per share for many firms. It is useful to know what their estimates are. Ultimately, all growth in earnings can be traced to how much the firm is investing in new projects and what returns these projects are making for the firm.

Growth estimation can be performed by analyzing the EPS of the firm. There are two possible methods for it. The first method assumes that the ROE is expected to stay constant and defines the growth rate as

$$g_{\text{EPS}} = r_R \times \text{ROE}$$

The expected growth rate in earnings for a company cannot exceed its return on equity in the long term. When the ROE is expected to change, equation becomes

$$g_{\text{EPS}} = (r_R \times \text{ROE}_{t+1}) + \frac{(\text{ROE}_{t+1} - \text{ROE}_t)}{\text{ROE}_t}$$

Please recall that small changes in ROE translate into large changes in the expected growth rate and that the lower the current ROE, the greater the effect on growth of changes in the ROE.

The stable growth can be estimated by taking into account simple rules. First of all no firm can, in the long term, sustain growth in earnings per share from improvement in ROE.

In stable growth, firms should have the characteristics of other stable growth firms. In particular, the risk of the firm, as measured by beta and ratings, should reflect that of a stable growth firm.

The reinvestment rate of the firm should reflect the expected growth rate and the firm's return on capital

$$r_R = \frac{g_{OC}}{ROC}$$

When a firm's cash flows grow at a "constant" rate forever, the present value of those cash flows can be defined as a growing perpetuity, as seen in previous chapters.

The stable growth rate cannot exceed the growth rate of the economy but can be negative. The terminal value will be lower, and you are assuming that your firm will disappear over time. One simple proxy for the nominal growth rate of the economy is the risk-free rate.

While analysts routinely assume very long high-growth periods (with substantial excess returns during the periods), the evidence suggests that they are much too optimistic. A study of revenue growth at firms that make IPOs in the years after the IPO shows that typically the revenue growth rate of a new public company outpaces its industry average for only about 5 years.

In the case study, the students were recommended to use an approach of the log-descend type, where the revenues for each comparable company have to be logged, and after that the trend of increase of the log price from 1 year to each other should be recorded (see Table 8.6).

The last trend represents a fair proxy of the beginning of the stable growth period for all companies, and it is then wise to take an average of them, so to obtain a risk-free type of rate.

### 8.3.3 After the IPO

The trading of Facebook stocks on the regulated exchange became on May 18, 2012, as planned. However, technical problems delayed the start of trading from 11.00 am to half hour later.

In general, during the first day of trading, many technical problems were experienced, and some orders did not go through due to glitches of various kind. Moreover, investors got confused as to whether or not their orders were successful.

During the first hours of trading, the stock price rose to a maximum of \$45, but the initial rally of trade was quite unstable. Due to the tendency of the stock price to stay below the IPO price for most of the day, many underwriters bought back shares to support the price.

If it were not for the technical problems mentioned above, the market price would have fallen below the IPO level already on the first trading day. The closing price of the first day ended up being \$38.23, only 23 cents above the IPO price and down \$3.82 from the opening bell value.

After a disappointing first day, the trading went on and, it was supported by a huge figure in terms of volume, standing at 460 million shares exchanged in the first day of trading.



The IPO ended up raising \$16 billion, making it the third largest operation of that kind in US history, behind only General Motors and Visa Inc. The stock price corresponded to a market capitalization higher than most US corporations.

At the time, giants like Amazon and Disney ended up being worth less than the freshly public company. Also the wealth of the founder got considerably high, with Zuckerberg's stocks worth \$19 billion.

In the subsequent days, Facebook's share turned out to be bullish on 9 of the 19 days after the IPO, with only 4 bearish days. On May 21 the closing price was as low as \$34, and the price dropped to \$31 the day after that.

The stock increased modestly in coming days, and Facebook closed its first full week of trading at \$31.91. The stock returned to losses for most of its second full week and had lost over a quarter of its starting value by the end of May.

By June 6 investors had lost \$40 billion in capitalization. The third trading week of Facebook ended up in a low \$27.10 even worse than a week previous. The company finished its fourth full week with a modest gain, reaching a closing price of \$30.01.

The volatility was so high that analysts started delivering controversial predictions of stock price range. Some of them in fact recommended buying in early June, while others recommended selling, in the same period.

The difficult path of Facebook's shares right after the IPO impacted on the stock market as a whole. The high-tech sector suffered from a decrease in prices and the exchanges as a whole suffered from the bearish trend.

The impact of the Facebook IPO was immediate on the market, affecting other technology companies as well. Investment firms faced considerable losses, as a consequence of the technical troubles.

Bloomberg estimated that retail investors may have lost approximately \$630 million on Facebook stock since its debut. UBS alone may have lost as much as \$350 million.

The Nasdaq stock exchange offered \$40 million to investment firms plagued by offering-day computer glitches.

But the investors' losses were too high to be compensated by such an amount, and the other NY exchange, the NYSE, commented severely on the decision of increasing the \$3 million reimbursement limit usually observed in these cases.

IBM was hired by Nasdaq to take care of the technical issues and overcome them. The IPO impacted both Facebook investors and the company itself. It was said to provide healthy rewards for venture capitalists who finally saw the fruits of their labor.

The wrong IPO definitely lowered the interest of the investors toward Facebook. It was also the case of all the stakeholders, including employee, who changed their view of the investment.

The situation was very risky for the company, also in view of raising further capital for future investments and expenditures. On top of that, the IPO could jeopardize profits for underwriters who face investors skeptical of the technology industry.

From a legal point of view, more than 40 lawsuits were filed regarding the Facebook IPO in the month that followed the actual operation, making the situation even worse for the shareholders and the underwriters.

The latter ones, namely, Morgan Stanley (MS), JP Morgan (JPM), and Goldman Sachs, (GS) all cut their earning forecasts for the company in the middle of the IPO road show.

It is believed that adjustments to earning estimates were communicated to the underwriters by a Facebook financial officer, who in turn used the information to cash out on their positions while leaving the general public with overpriced shares.

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## 8.4 Summary

Company valuation is a very important field of specialization involving companies and investment banks. Based on the financials of a firm, it is possible to give an estimate of the market value of the equity.

The task can be accomplished systematically for publicly traded firms. The estimation of parameters like risk-free rate premium and beta that serve as input for CAPM valuation can in fact be estimated through historical data.

The valuation of private firms is different, in that no historical data are available, and it is usually performed at the time of initial public offering to assess the right asking price of the operation.

The cost of capital is normally based on book values rather than market values, and the same goes for the other financial aspects of the firm. Beta estimation is not possible through regression as for the public firm, and it involves an analysis of comparable firms.

Another major aspect to be careful about when dealing with a private firm is the growth rates and the terminal value. Making the right assumptions about both the discrete cash flow period growth and the terminal (permanent) growth is important to not overestimate or underestimate the firm.

The chapter presents a case study regarding the IPO of Facebook, one of the most controversial financial operations of the last years. The firm in fact went public after a publicized escalation to the level of big corporation.

There were many expectations about the company going public, and the analysts were speculating for months about the value the shares would have recorded at the beginning of the trading.

Facebook still remains as an example of an overrated IPO, and the days following the first trading hours confirmed that. By studying such a case, it is possible to understand how sometimes the bias in the information can generate disasters on the market.

## Problems

1. Assuming we are valuing a going concern, which of the following types of income streams would be most appropriate for valuing the company?
  - (a) Earnings before interest and taxes
  - (b) Free cash flows
  - (c) Operating income after taxes
  - (d) Price to earnings ratio
2. The following estimates have been made for the year 2006:  
Operating income (EBIT): €6000  
Depreciation: €500  
Cash taxes to be paid: €950  
Income from nonoperating assets: €60  
No capital investments or changes to working capital are expected. Based on this information, the projected free cash flows for 2006 are:
  - (a) €5610
  - (b) €4550
  - (c) €4490
  - (d) €6550
3. Marshall Company is considering acquiring Lincoln associates for €600,000. Lincoln has total outstanding liabilities valued at €200,000. The total purchase price for Marshall to acquire Lincoln is:
  - (a) €200,000
  - (b) €400,000
  - (c) €600,000
  - (d) €800,000
4. The valuation process will often analyze several value drivers in order to understand where value comes from. Which of the following value drivers would be least important to the valuation?
  - (a) Return on invested capital
  - (b) Earnings per share
  - (c) Cash flow return on investment
  - (d) Economic value added
5. You have been asked to calculate a terminal value for a valuation forecast. The normalized free cash flow within the forecast is €11,400. A nominal growth rate of 3% will be applied along with a weighted average cost of capital of 15%. Using the dividend growth model, the terminal value that should be added to the forecast is:
  - (a) €78,280
  - (b) €86,200
  - (c) 95,000
  - (d) 97,850
6. Information from a valuation model for Gemini Corporation is summarized below:  
Total present value of forecasted free cash flows: €150,000

Terminal value added: €450,000

Total present value of nonoperating assets: €20,000

Total present value of outstanding debts: €120,000

If Gemini has 20,000 shares of outstanding stock, the value per share of Gemini is:

- (a) €15.00
- (b) €25.00
- (c) €30.00
- (d) €35.00

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## Case Study: Company Valuation

### Cashgrow Ltd

#### The Case

Cashgrow Ltd is a well-established company operating in the field of renewable energies. They recently topped up to a record \$1.85bn in sales, after launching a new power generator with increased efficiency and environmental friendly.

The generator has been the last of a series of successful projects undertaken by the company, which comes from 5 years of continuous growth in sales, gross income, and net income.

For this reason, and given the need for the company to step up and increase the scale of its operations, the management of Cashgrow decided that the company will go public in the coming year.

Going public means the company will go through an IPO, with related consequences in terms of market capitalization, share appreciation, and cash inflows. The IPO will coincide with the most important capital restructuring for the company since its birth.

Jihad is one of the senior financial analysts working in the team of the CFO office. He has been selected to lead a team of analysts who will carry on a preliminary valuation of the company Equity, so to have an idea of what to expect from the IPO.

After consulting his team, Jihad tells the management that they are going to apply a discounted cash flow (DCF) approach to the valuation of Cashgrow. That should give a good estimation of the market value of the company.

The valuation team gathers the most important financial statement items, as well as the main variables involved in the analysis. The entries from both the balance sheet and the income statement are summarized in Table 8.7 below.

Since Cashgrow is not public yet, the valuation must be run by using comparable firms and the sector as a source of financial information. In particular, there are three companies that are comparable to Cashgrow. The financial variables of those companies, and the market, that are pertinent to the analysis are summarized in Table 8.8.

**Table 8.7** Accounting items of Cashgrow in the last 5 years

Item	2017	2016	2015	2014	2013
Total assets	5,575,000	5,050,000	4,350,000	3,975,000	3,560,000
Total debt	2,075,000	2,050,000	1,650,000	1,450,000	1,260,000
Total equity	3,500,000	3,000,000	2,700,000	2,525,000	2,300,000
Sales	1,850,000	1,550,000	1,300,000	1,150,000	1,000,000
Cost of goods sold	820,000	725,000	675,000	620,000	550,000
Depreciation	105,000	115,000	121,000	90,000	85,000
Other expenses	90,000	82,000	67,000	79,000	42,000
Taxes	230,000	190,000	157,000	95,000	82,000
Changes in NWC	(5500)	6200	(3500)	4500	5200
Capital expenditure	12,000	15,300	13,100	18,150	9500

**Table 8.8** Financial variables of the companies and the market

Variable	Company A	Company B	Company C	Market
Volatility of stock returns	14.35%	16.25%	12.76%	11.45%
Correlation with the market	35.43%	42.25%	37.12%	100%
Long-term risk-free rate	3.25%	3.25%	3.25%	3.25%
Cost of debt	5.35%	5.55%	5.15%	
Average tax rate	33.25%	33.75%	32.75%	
Average (market) debt-to-equity ratio	31.75%	32.50%	30.55%	

Given that the company has substantial debt in the book, Jihad specifies to the managers that the team will be valuing the company based on a two-stage free cash flow to firm (FCFF) variant of the DCF model.

## Questions

1. If you were Jihad, how would you proceed for the calculation of the company's value? What are the main steps in the two-stage FCFF valuation model?
2. How can the variables in Tables 17.1 and 17.2 be used to calculate the parameters needed in the analysis?
3. What choices would you make for the growth of the cash flows over time? How can you justify these choices?
4. What model would you use to calculate the cost of equity of the firm?
5. What discount rate would you apply to the projected cash flows, to run the valuation? What model would you use to calculate it?

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