METHODS FOR ESTIMATING THE COST OF CAPITAL

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Abstract

In this paper we wanted to identify the role of the cost of capital in making the decision on financing, and the main methods of determining the cost of equity and the cost of borrowed capital. It is known that when a company decides to invest, their main objective is the choice of funding sources that have the lowest cost. That`s why all the attention is focused on the cost of capital, because every business objective is to obtain enough long-term yield for the invested equity. Determining the cost of capital is an important problem in the business world for the following reasons:

- *To maximize the market value of the company. To this end, managers must act to minimize costs, including capital costs;*
- *To make the right investment decisions, which requires for managers knowledge about the cost of different sources of business financing;*
- *To decide on optimal and adequate terms regarding the funding policy and the floating capital policy.*

Keywords: *cost of capital, profitability, business, investment, financial management*

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1. Discounted Cash-Flow Methods (DCF1) of Capital Costs Estimation

After the 1929 stock market collapse, the updated cash flow analysis (DCF) has gained popularity as a method of evaluation of capital. Irving

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Fisher (Fisher 1930) and John Burr Williams's (j. Burr, 1938) spoke for the first time, officially, about DCF method in economic terms..

Cash flow analysis use updated projections of cash flow, and reduce them to reach a market value that is used to determine the potential investment. If the value at which it was ended by the DCF method is greater than the cost of the investment, earnings are obtained. DCF method is much simpler than the build-up or CAPM. The main assumption behind DCF is that current prices of the shares of a company are materialized in the expected rate of return in the market, which will be generated by the investment in that action (Pratt, 2002). In other words, the assumption is that the current price of the shares is just the sum of the present value of the expected profitability of investments (dividends).

The relationship between DCF method to estimate the cost of capital, and DCF method used for evaluating a business lies in the importance of identifying unknown and known variables. So when we use the DCF method to evaluate a company, a business, a project, the cost of capital has already been deducted and is given as a rate formula to estimate the present value. But when we use the DCF method to estimate the cost of capital, the value of this (current price action) is known and thus the cost of capital rate can be learned.

There are two types of models to use DCF technique when calculating the cost of capital: model in a single phase (the single-stage models) and the model with multiple stages (the multistage model). Although the two methods can be used to determine the weighted average cost of capital, they are most commonly used to determine the cost of capital.

Most of the methods used to estimate the cost of capital are based on market expectations concerning yields which will be generated, as well as valuable opinion on rates of return. So, this method includes that premise. As I said before, the main element behind this technique is the current price of the shares, and thus it may be concluded that there can be applied only in the case of companies listed on the stock exchange.

The values of updating the future flows which are generated by actions (dividends and selling price) help determine the cost of capital as the solution of the equation:

$$P_0 = \sum_{t=1}^{n} \frac{Dt}{1+Ke} + \frac{Pn}{(1+Ke)n}$$

DCF model in one phase has the following formula:

$$PV = NCF_0 \times \frac{1+g}{k-g}$$

where:
PV is present value
NCF_0 is the net cash-flow-ul (or available cash-flow-ul) in the period 0, immediately preceding the dassessment
k is capital cost and sustainable rate g is expected by the investor.

The companies listed at the stock-market, the net cashflow that the investor actually receives is the dividend. In this account account the dividend is virtually identical to Gordon Shapiro.

DCF1 model is used most often to estimate a rate of usefulness for the cost of the shares. In most cases, the dividend yield is assumed to be an immediate value with the first input estimation, cash flow yield (Pratt, 2002). This is a logical assumption, because the different utilities has established most often paid with dividends, such dividends represent a large percentage of all-cash flow available. But there are also companies that don't pay dividends, and in this case, theoretically sustainable component, g, is going to be bigger than at other companies that pay big dividends.

1.1. Gordon Shapiro Model

Gordon Shapiro model was developed by Gordon; and e. Shapiro in 1956 (Gordon & Shapiro, 1956). According to this model, if it admits the hypothesis of constant net profits, increase in dividends is permissible with an constant annual rate, g., Financing through the reinvestment a constant part of the net profits, will cause a situation in which the shareholders will be paid not with the entire profit but with a part of in (Stanciu L-M & Stanciu L.). It is the simplest way of estimating the cost of capital, being a simplified version of the model and the discounted value of future cash flows they generate action: dividends and the sale price.

The amount of capital and reserves, where it will be determined by the size of annual dividends, as follows:

$$D_t = D_0 \times (1+g)^t \tag{1.6}$$

where D_0 represents the devident from first year

$$P_0 = \sum_{t=1}^{n} \frac{Dt}{(1+Ke)^t} \tag{1.7}$$

If it is assumed that dividends have a constant rate of increase, then the price of shares can be written:

$$P_0 = D_0 \times \frac{1+g}{ROE-g} = \frac{D_1}{ROE-g} \quad (1.8)$$

where D1 is the dividend expected to be paid in the next period, and ROE is financial profitability.

The above relation can be arranged in the form of:

$$ROE = \frac{D_1}{P_0} + g = K_e \quad (1.9)$$

Gordon and Shapiro define \"g\" as a rate of increase in the dividends that took place between the \"b\" rate constant reinvest net profit and average annual rate \"r\" of the net profitability of new investments.

$$b = g \times r \quad (1.10)$$

Gordon Shapiro model considers an unrealized growth assumption to infinity of dividends, is characterised by a market with perfect competition and full of equity financing. However the model encounters a difficulty: the estimate of g, because both the price and the dividend paid in the year 0 is considered notable (there are information for any company listed on the stock exchange). For the estimation of g can be used both historical data and forecasts future trends analysts of this indicator (Ross, Westerfield, Jordan & 1995). Another method, used to calculate g from the current rate of financial profitability and reinvest the capital ratio:

$$g = ROE \times (1-d) \quad (1.11)$$

Another problem arises when applying this model is the existence of a temporal gap between the time at which the model is applied to determine the cost of capital and the payment of the next dividend (Dragotă Camp, O'reilly, & Dragotă, 2003).

Advantages and disadvantages of the Gordon Shapiro model:

- The most important advantage is that the model is perhaps the simplest. It is very easy to use and understood at the same time.

- But the model has an obvious disadvantage, that only applies to companies that pay dividends and dividend needs to grow with a constant rate (Ross, Westerfield, Jordan & 1995). But it doesn't always happen, and this model is applied in most cases when you predict that the dividend has a constant rate of increase.

- The second problem is that estimating the cost of capital is very sensitive to the estimation of g (sustainable). For example, when given a price, a drop of just 1 p g p (percentage point) may lead to an increase in the cost of capital higher.

- Also, this model does not explain the risk, so it's difficult to say whether the estimations made by this model include the level of risk assumed (there is a default risk adjusted price value measure. In other words, the higher the risk, the greater the price; action is smaller (the higher the risk, the lower the stock price). However, the smaller the price action, the estimatation of the capital cost is the best.).

1.2. DCF models with many stages

Such models do not incorporate a number of the expected lucrativeness some years ago, but they use more growth rates for different periods of expected growth. The main advantage it brings using DCF with multiple stages is that using a larger growth rate g is closer to reality than reliance on a single rate. The main disadvantage is the difficulty imposed by iterative computation.

There is no typical pattern when it comes to models with multiple stages. They differ depending on the number of stages of growth (usually 2-3) and the length of a stage of growth (which can vary between 3 and 5 years) (Pratt, 2002).

You can take as an example here Molodowski's model (Dragotă Camp, O'reilly, & Dragotă, 2003). It is based upon assumptions of Gordon-Shapiro, but it comes with a few clarifications:

1. Stable growth for the 1st quarter year
2. Reduced T2 years growth
3. Zero growth, with net profits constant over the horizon indefinitely.

It starts with the general formula of a DCF model and is broken down in three periods, resulting in:

$$V_0 = \sum_{t=1}^{T_1} \frac{Dt}{(1+Ke)^t} + \sum_{t=T_1+1}^{T_2} \frac{Dt}{(1+Ke)^t} + \sum_{t=T_2+1}^{n} \frac{Dt}{(1+Ke)^t} \quad (1.12)$$

If V_0, g_1, g_2, T_1, T_2, are known, the value of the cost of equity by interpolation can le obtained.

2. Build-up methods

2.1. General Build-up Model

Build models-up start from the idea that the cost of capital estimation consists in the separation of the two components:

- Risk-free rate
- A risk premium which includes a risk of market risk and specific risk industry specific companies.

In addressing the phenomenon of international investment, we can consider the country risk premium to cover political and economic instability of the proposed area for analysis.

The general formula is :

$$K_e = E(R_i) + R_f + RP_m + RP_s + RP_u \quad (1.13)$$

where: R_f is risk-free interest rate; RP_m is the risk prime; RP_s is the risk prime specific to the small companies; RP_u is the risk prime specific to the industry in which the company takes part (unsistematic risk)

Risk-free interest rate is the yield to maturity of government bonds or Government securities. They are used most often following their maturity: 30 days, 5 years, 30 years or 20 years. This component reflects the major subcomponents: opportunity cost caused by the allocation of resources, inflation and the risk of maturity\/investment (Pratt, 2002).

All these three economic factors are included in yield to maturity but nevertheless it is not possible to assign a percentage of each to take the weight of this yield holds. The most important factor that risk-free rate includes inflation, because when we use this rate to estimate the cost of capital and cash-flow estimate future cash flow, these sites should reflect the level of inflation. However it should be noted that it is estimated the cost of capital in nominal terms and real, not so and cash-flow in the evaluation process should be expressed in nominal terms.

Risk-free rate is chosen from the three specific components to adulthood because the build-up model incorporates a risk premium for equity based usually on a history compiled by Ibbotson Associates (Pratt, 2002). Risk related to equity reflects the cash flow generated future (dividends) and losses or gains related to the value of the investment, both expressing the uncertain values, so the need for additional risk compensation. The risk premium can be calculated by the method and the cost of capital: DCF, obtained as the solution

of the equation that equals the present value of the cash-flow estimates of future updates, it lowers the interest rate without risk.

In general, it is known that in order to accept an investment with a higher risk, the expected yield to maturity must be higher. In a similar fashion, to be adjusted and specific risk premium of the company.

Expanding on this topic, the concept of company-specific risk relates to:

- ✓ smaller companies than small ones which grant risk premium;
- ✓ risk industry;
- ✓ volatility expected profits;
- ✓ lever (indebtedness);
- ✓ other factors specific to the company.

In case of the first element, it cannot be demonstrated how it affects smaller companies, because there are no empirical studies that quantify in a purely objective vision, by adding 1-2 p. p. risk related to equity.

With regard to the risk of the industry within which the company operates, it's hard to quantify whether is greater than or less than average risk small companies, about which has been spoken. So no this can't be quantified, but is clearly a major influence on the cost of capital.

Linked to the volatility, it may be said that this is measured by the standard deviation from the average, based on historical data and of interest for high values.

Lever is a factor that can be noticed by the comparison between the level of activity of the company and its size. An adjustment in this respect, by reducing or increasing the risk premium, can intervene when the financial structure of the firm analysed differs greatly compared to that of firms in the same industry.

Other factors affecting a company specific risk can be:

- ✓ dependency on a vendor or a customer;
- ✓ an abnormal level of competition;
- ✓ very frequent changes in tax regulations and the general legal framework.

2.2. CAPM Model

CAPM (Capital Asset Princing Model) was developed independently by William Sharpe (Sharpe, 1964), Jack Treynor (Treynor, 1961), Jan Mossin

(Mossin, 1966) and John Lintner (Lintner, 1965) and is to be the most controversial and discussed pattern at the same time. For 30 years, many economists and financial theorists argued that cost of capital estimation by the CAPM is the most recommended method. And yet with time, many critics arose to address the validity of the method, but remains the most used method. The only difference between CAPM and the build-up method, shown above is the introduction of a systematic risk as a risk premium modification (Pratt, 2002). Systematic risk is measured by an indicator called beta.

CAPM relies on all elements of the Portfolio Theory -a set of mathematical concepts that describe existing relationships on a capital market. As part of this category should be trecizate the assumptions underlying the model (Gan, 2011):

1. All investors have Morkowitz type behavior, i.e. Portfolios owned by them are effective or are on a border.
2. Build their portfolios of financial assets investors, tranzactionized on a secondary market and borrow may grant loans at an interest rate without risk.
3. All investors have homogenous expectations (identical distributions for future rentabilities).
4. The time horizon of the investment is identical for all investors.
5. Financial instruments are infinitely divisible.
6. There is no trading costs.
7. The rate of inflation is considered to be zero or perfectly anticipated.
8. Capital markets are in equilibrium and financial assets are properly evaluated.
9. is there a perfect competition between investors.

CAPM is a build-up model, starting from the idea that the yield for a risky investment should take into account the risk-free rate, market risk premium and the systematic risk. CAPM formula is:

$$K_e = E(R_i) = R_f + \beta \times [E(R_m) - R_f] \quad (1.14)$$

where: R_f is the risk-free interest rate; $[E(R_m)-R_f]$ it is the first market risk; β is a coefficient of volatility (expressed sensitivity to changes in the market action) that reflect the risk.

The beta coefficient is based on the expected profitability (yield), which are: the market price changes and dividends. Also expresses the

sensitivity of the surplus yield (relative to risk-free rate) of an individual asset or a portfolio in relation to the excess return of the market.

Because companies that are not listed on the stock exchange does not have a market price, beta here cannot be measured directly. Those who use the CAPM to estimate the cost of capital, you need to estimate the beta through a proxy for the company. This is accompanied by the use of an average of beta for that industry's through the use of specific and representative companies.

The main disadvantages stemming from the difficulty of assessing the market risk premium and beta coefficient which requires that these companies to be listed on the stock exchange.

Among the main advantages are: adjustment to cost of capital in relation to risk and that does not imply a specific dividend growth rate.

CAPM model splits risk into two categories: systematic and unsystematic risk. A fundamental assumption is that part of the risk premium is the systematic risk. Unsystematic risk encompasses some of the characteristics of the industry, the type of investment. Company-specific features include: performance of the company's management when economic conditions are very unstable, the relationship between labor and management airline staff, the success or failure of a specific marketing program. The risk depends on the total factors. It believes that investors should not be rewarded for taking unsystematic risk because they can be eliminated through portfolio diversification. In table 1, the values of the beta indicator are summarized.

Table 1. Beta indicator values

BETA INDICATOR	**SENSIBILITY OF I ASSET**
$\beta_i > 1$	The asset is more risky than the market portfolio.
$0 < \beta_i < 1$	Asset is less risky than the market portfolio.
$\beta_i < 0$	The opposite relationship between the profitability of the asset and the market portfolio.

Source: Grigore A. Class notes 2011-Stock markets

It is observed that in the case of an asset price, beta (with risk) will react more strongly than the market, i.e. the efficient asset and will have a greater variation than the return on the market portfolio. If the beta is less than one, but positive, I will respond to asset price lower than the market, and thus the profitability of assets and will have a variance of less than market portfolio

rentability (Gan, 2011). Also there may be rare cases when beta can be negative.

The classic form of the model can be modified by incorporation of a risk premium to the company's size and specific risk. In fact, one of the most interesting discoveries of corporate finance was that profitability may be linked to the firm's size: smaller companies tend to generate lower rentabilități.

The choice of method for determining the β (Dragotă pointer, Campbell, O'brien, & Dragotă 2003):

- The use of public sources that provides reports on values of β and other financial information for different companies operating on that market.
- Individual estimations, based on each investor's own calculations. Can be calculated on the basis of the ratio on the one hand, and the covariance between the profitability of individual title and profitability of the market, and on the other hand, dispersing market profitability. The second method of calculation is based on the estimation of the regression function, the profitability of the firm is the dependent variable and the explanatory variable is the market return. The slope of the regression function is even estimated value of β. indicator ; worth noting is the opinion of Pablo Fernandez (Fernandez, 2008), in the article "Are calculated betas worth for anything?" makes the difference between historical beta (historical) and beta expected (expected), historically being the beta you take of the estimation of the regression function using historical data, and the expected beta, which is included in the calculation of the cost of capital.

He also says that estimations based on historical data are used for many purposes:

- to calculate the cost of equity of companies
- to classify assets and portfolios on the systematic risk
- to test the CAPM and the efficiency variance-covariance

In general, it is a great error to use a historical beta as a proxy for expected beta (Fernandez, 2008). Firstly because it is almost impossible to calculate a beta significantly, since historical data changes greatly from day to day. Secondly, because very often we are unable to have a great faith in

statistics, so we can't say exactly that a particular company's beta is less than or greater than the beta to another company. Thirdly, because the historical beta does not make sense in many cases: very risky companies have more often than not a beta coefficient of historically much lower than less risky companies. Fourthly, because historical beta depends very much on the index we're using when we compute.

2.3. APT Model (Arbitrage Pricing Theory)

Stephen Ross (Ross, 1976) proposes as an alternative to the CAPM model, a model in which the profitability of a multifactor asset is explained by several factors starting from reasoning based on the concept of arbitration. Define arbitration as the operation that involves getting a win without taking risks and without investing their own capital (equity).

It is a single-period model, in which each investor considers the stochastic properties of fixed funds ' yields are consistent with a structural factor. Ross argues that, if prices steady does not offer opportunities for arbitrage in the static portfolios of assets, then the return on assets is influenced by certain factors or indicators, such as beta.

In other words, APT is a substitute for the CAPM model in which both a linear relationship between stated yields estimates of the assets and their covariance with other random variables (in the CAPM covariance is done with the profitability of the market portfolio). Covariance is interpreted as a measure of the risk assumed by investors and that they can't avoid through diversification.

APT model assumptions are:

- ✓ capital markets are perfectly competitive, hence there is no arbitrage opportunities.
- ✓ the main objective is to maximise the investors ' wealth.
- ✓ the profitability of a financial asset is a linear function of k factors, as evidenced by the following relationship:

$$E(R_i) = b_{1,i}\delta_1 + b_{2,i}\delta_2 + ...+ b_{k,i}\,\delta_k + \varepsilon_i \quad (1.15)$$

where: Ri - is the return on the asset i at some point of time, i = 1 ... n (n represents the number of assets); $E(R_i)$ - is the expected profitability of the asset; $b_{k,i}$ - represents the sensitivity of the asset profitability in the following risk factor modification k; δ_k - it is a common set of factors that influence the profitability of all the assets; ε_i - is a random variable and represent the risk of assets i.

It is essential to understand that in the case of the model, FIT is not systematic risk reflected in the evolution of a single factor such as return on a market portfolio, but rather, market risk is embedded in many macroeconomic factors. This set of factors may be represented by (Gan, 2011):

- The development of a stock market index;
- Economic Cycles;
- The price of oil;
- The rate of inflation;
- The rate of interest;
- Exchange rate.

As with the CAPM, APT model and diversification through systematic risk is removed, so investors won't be compensated with the related risk premium specific firms. Taking into account the fact that markets are in equilibrium, so there are no arbitrage opportunities, then return on any asset that i haven't invested capital should be 0, and the equation above becomes APT:

$$E(R_i) = \lambda_0 + \lambda_1 b_{1,I} + \lambda_2 b_{2,I} + ... + \lambda_k b_{k,I} \quad (1.16)$$

where : λ_0 - is the expected return of an asset that has zero systematic risk (risk-free assets has assigned a beta equal to zero or its risk is zero, so $\lambda 0 = rf$); λ_k - is the first risk factor k (k = 1 ... n).

Why do we need so many assumptions of CAPM theory when APT model comes in and establishes a relationship coefficient β-yield expected with far fewer questionable assumptions ? The answer is that APT only applies in the case of diversified portfolios. The absence of arbitrage opportunities do not guarantee that, at equilibrium, the risk-return relationship will be maintained for all assets (Pascu-Nedelcu, 2011).

According to Ross, there is no guarantee that all individual assets will be in the SML. On the other hand the model FIT seems to emphasize better the difference between undiversifiable risk (systemic or factorial) requiring reward in the form of a premium for the risk and the diversificable risk that does not require this.

3. Conclusions

The bottom line is that none of these theories outperforms the other. APT model is more general and it provides with a relationship between risk and return with fewer unrealistic assumptions than the CAPM model, model

that is based on the existence of the market portfolio. But the CAPM model applies to all assets without exception.

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