Estimating WACC for Regulated Industries on Developing Financial Markets and in Times of Market Uncertainty

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The paper deals with the estimation of weighted average cost of capital (WACC) for regulated industries in developing financial markets from the perspective of the current financial-economic crisis. In current financial market situation some evident changes have occurred: risk-free rates in solid and developed financial markets (e. g. USA, Germany) have fallen, but due to increased market volatility, the risk premiums have increased. The latter is especially evident in transition economies where the amplitude of market volatility is extremely high. In such circumstances, there is a question of how to calculate WACC properly. WACC is an important measure in financial management decisions and in our case, business regulation. We argue in the paper that the most accurate method for calculating WACC is the estimation of the long-term WACC, which takes into consideration a long-term stable yield of capital and not the current market conditions. Following this, we propose some solutions that could be used for calculating WACC for regulated industries on the developing financial markets in times of market uncertainty. As an example, we present an estimation of the capital cost for a selected Slovenian company, which operates in the regulated industry of electric distribution.

Key Words: cost of capital; CAPM; WACC; return; risk
JEL Classification: G31; G32

Introduction

The weighted average cost of capital (WACC) is a rate of return, required by investors who invest in the company either equity capital or debt. It

resembles (amongst other factors) company's risk and market circumstances. Managers in the company usually use WACC in capital budgeting decisions, i. e. WACC is a required rate of return/discount rate for financial analysis of new projects. For Stewart (1999) the task to earn the cost of capital is not a question of company financing, which many managers think. To earn the cost of capital is the market mandate. Many authors have dealt with the important issue of capital cost estimation as Gordon (1959), Lintner (1965), Black (1972), Merton (1980), Bruner et al. (1998), Ferson and Locke (1998), Mishra and O'Brien (2005), and others. Despite a broad attention on this important issue, the literature survey indicates that a proper method for a cost of capital estimation is still not defined. In the oft-cited publication *Stocks, Bonds, Bills, and Inflation,* Ibbotson and Sinquefield wrote: 'Estimating the cost of capital is one of the most important and difficult tasks performed by financial analysts. There is no clear consensus on the best way to approach this problem' (Borgman and Strong 2006).

WACC is also important in business regulation, i. e. in regulated industries. Regulated companies are important for the economy as suppliers of basic services. They use WACC to determine the proper price for the services they supply to their clients. To estimate a proper WACC is of utmost importance.

The cost of capital estimation is especially problematic and difficult to estimate on developing markets and in times of market uncertainty. Most of the models are based on historical data. In developing financial markets (like Slovenian), there is a short time series of data.

One can calculate the WACC using the usual WACC formula, where costs of different capital components are weighted against their relative importance in the company's financing.

Based on extensive literature review (cited in the paper) we believe that the appropriate WACC has to comply with the following features:

- It has to incorporate the opportunity costs of all financial resources (i. e. debt and equity financing), because free cash flows belong to all investors, each expecting the compensation for the risk they take.
- It can be calculated either as after tax or pretax WACC (depending on the purpose of its calculation), but taken into consideration the eventual tax savings and the proper effective tax rate of the company.
- Moreover, it has to be expressed in nominal terms the same as usually are the cash flows.

A company's capital is composed of different components of capital

(equity, debt etc.). When one estimates WACC, it is important to note that WACC presents an average cost of the last obtained unit of capital and not the average cost of all the capital obtained in the past. The proportion of different capital components is usually based on the target capital structure, which is – in an ideal situation – equal to the optimal capital structure of the company. The rate of return required by the investors (new or existing) is always the marginal required rate of return. Each investor will, irrespective the time that the investment was made, require the same rate of return for all invested funds. All investors (lenders or owners) seek for a return that is comparable to returns of investments with similar risk. Further, investors require a return taking into account current market circumstances, irrespectively of the past conditions, when the investment was actually made. Therefore, the cost of capital is based on present and not historical costs of capital components. Following this, the weighted average cost of capital is actually the marginal cost of capital, which depends on the current market returns (market circumstances) and represents the cost of additional unit of capital that could be obtained by the company.

The purpose of the paper is to propose some solutions that could be used for calculating WACC for regulated industries on the developing financial markets in times of market uncertainty. As an example, we present an estimation of the capital cost for a selected Slovenian company, which operates in regulated industry of electric distribution. We use a specific company as an example. The contribution of the paper relates the proposed methods of calculating WACC that can be used for a WACC calculation in regulated industries and emerging financial markets with particular emphasis on times of market uncertainty.

Thus, the goals of the paper are as follows: a) review of relevant literature and studies in the field, b) presentation of the problems and methods of assessing WACC, c) estimate the WACC for a selected company, and d) based on our findings derive conclusions.

A research question is *How to estimate a proper WACC for a regulated industry on a developing financial market in times of market uncertainty?*

The methodology of WACC estimation is based on generally used financial definition (see Brealey and Myers 2003, Brigham and Ehrhardt 2005, Estrada 2005), where the capital consists of all financial resources investors must provide for the normal functioning of a firm. The general dilemma in calculating WACC is whether to use short- or long-term oriented WACC. In this sense, the tradeoffs are between short-term accuracy and long-term stability of WACC. Our argument is that a long-term

WACC should be taken into account for valuing investment opportunities, since short-term movements of relevant variables are irrelevant for long-term investors.

Using the proposed methodology, we show an example of estimation – of the capital cost – for a Slovenian company which operates in the field of electric distribution.

The paper is structured as follows. We start with the theoretical basis and the explanation of the methodology and data followed by results and conclusion.

The Calculation of WACC

The methodology of calculating WACC is based on generally used financial definition, where the capital consists of all financial resources, i. e. common and preferred equity, and long-term debt:

$$\text{WACC} = w_d r_d(1 - T) + w_s r_s + w_{ps} r_{ps}, \tag{1}$$

where w_d, w_s, and w_{ps} are percentage of debt, and common and preferred equity financing ($w_d + w_s + w_{ps} = 1$), r_d is cost of debt, r_s is cost of common equity, r_{ps} is cost of preferred equity, and T is corporate tax rate.

The estimation of all components of WACC is explained later in details. The average cost of capital depends on several factors, of which some are not affected by an individual company, some – on the other hand – are company specific and depend on financial and investment policy of companies (Brigham and Ehrhardt 2005, 323). The company, for example, cannot control the volatility and the level of interest rates, which of course significantly affects the cost of debt (increasing interest rates influence on higher cost of debt). Moreover, the company cannot control the market risk premium, which depends on general risk aversion of investors. Further, the company has no control over some factors that affect the cost of debt (e. g. the general level of interest rates, slope of yield curve etc.), resulting in the company's WACC. Moreover, the company cannot control the corporate tax rate. The latter affects the WACC in two ways: first, the tax rate determines the after-tax cost of debt (note that after-tax cost of debt, $r_{d,at}$, is calculated as $r_d(1 - T)$); and second, it can affect the company's capital structure. In fact, the only factor that is under company's control is the risk of the company, expressed relatively to the average market risk (e. g. systematic risk, β, in the CAPM model).

In the calculation of WACC, one can note several dilemmas, which are discussed in the following sections.

Estimating WACC on Developing Equity Markets

There are some dilemmas that analysts face when they calculate WACC, especially if WACC is calculated for developing equity markets (or equity capital in transition and developing economies) and even more in times of high market volatility.

NOMINAL VS. REAL REQUIRED RATE OF RETURN FOR CAPITAL

The first question is whether WACC needs to be calculated in nominal or real terms. From the theoretical point of view, it is the same, whether one uses nominal or real rate of return, but only if revaluation of assets is consistently and adequately applied. However, this necessary condition can be met only if inflation can be estimated more or less accurately (see Independent Pricing and Regulatory Tribunal of New South Wales 2002). In fact, the following three alternatives are possible when one weights between nominal and real WACC:

- if assets are not revalorized, using nominal rate of return requires no adjustments,
- if assets are revalorized, using nominal rate of return requires that the amount of revalorization is included in revenues; or
- if assets are revalorized, using real rate of return requires no adjustments.

We believe that the most appropriate (and in fact simple) way is using nominal WACC. This is reasonable by at least two facts. First, nominal WACC incorporates the real rate of return and the compensation for (expected) inflation. Second, rates of return are usually expressed and quoted in nominal terms (e. g. yields on corporate bonds, risk-free sovereign bonds etc.). Thus, the real rate of return is not given as such and it must be estimated using nominal rates of return and expected inflation. Therefore, one might see no sense in subtracting the (expected) inflation rate from nominal rate of return and at the same time using this inflation rate in revalorization of the assets. This might be justified only in times of high (or hyper) inflation.

TAX RATE

The next dilemma relates to the following: i) should one calculate pre- or post-tax WACC and ii) should one use in calculation the legislated or effective tax rate. Although these two dilemmas can be tackled separately,

it would be more useful to address the two issues together.[1] As mentioned above, WACC presents the rate of return the investors (both creditors and owners) require if they invest in a company. Therefore, the generated cash flows of the company have to cover at least the investors' requirements. Nevertheless, from the perspective of tax legislation both types of investors are not in the same position. Namely, cash flows on interest payments are tax-deductible expenses, while the payments to owners (of equity) can be made only after the corporate taxes.

There are some advantages of post-tax WACC, such as its consistency with business practice, transparency, and a simple and accurate consideration of tax rate (i. e. simple and implicit application of effective tax rate) (Independent Pricing and Regulatory Tribunal of New South Wales 2002). On the other hand, the pre-tax WACC is generally used for regulated branches, especially because of its simplicity, while the risk of using an inadequate effective tax rate (i. e. using too high or too low tax rate) has to be addressed.

Concerning the dilemma on the use of legislated or effective tax rate, we believe that more adequate is the use of effective tax rate. The application of the legislated tax rate (which is at the same time the maximum effective tax rate) can lead to situations, where excessive cost of equity capital might be applied (because of tax reliefs).

CYCLICALLY ADJUSTED VS. LONG-TERM STABLE WACC

In times of current financial crisis and high market volatility, we are faced with a logical question, whether to calculate WACC based on current input data or data that account for long-term trends, i. e. whether to calculate 'current WACC' or a 'long-term stable WACC.' We believe that it is more accurate to take into account a long-term stable return on capital; we argue that the long-term WACC is better for the long-term perspective of investors.

The cyclical movements of relevant financial market factors (especially the risk premium and the premium for inflation expectations) are mostly consistent (i. e. are correlated) with economic/business cycles. These factors are implicitly the integral part of all WACC calculations, as they occur in the case of both capital components: equity capital and debt.

In times of economic uncertainty, the required rate of return (of equity capital and debt) usually increases. Several reasons can be found behind this fact. The increase of the required rate of return is at least a consequence of higher risk of equity financing (because of a higher market pre-

mium), and higher liquidity and credit risk for debt financing. In times of recession, a lower inflation usually follows, but the latter still cannot neutralize the effect of increased general risk (for details see Grabowski 2009).

On the other hand, in times of expansion the risk premium lowers. Even a potential increase of inflation cannot neutralize the effect of decreased rate of return for common equity and debt financing, so the decrease of required rate of return is usually associated with economic upturn.

Is then more appropriate to use a current (i. e. cyclical) or a long-term stable WACC? We believe that more appropriate is the calculation of a stable WACC. Namely, the investments are always oriented on long run, where WACC is long-term rate of return, required by the investors. Thus, investment decisions or their financial evaluation cannot be based on short-term estimates of the relevant parameters. Financial evaluation has to be based on long-term parameters. Namely, some parameters that are used in the calculation of WACC tend to be under the influence of business cycles in short-run, but are found to be relatively stable in a long run (if we consider a period that goes beyond one or more business cycles). Therefore, we argue that an appropriate statistical estimator (for example arithmetic mean) is an acceptable approximation of the long-term 'kernel' for the relevant variable. Thus, an estimation of a long-term WACC is a manageable operation.

Using a long-term WACC means that in some periods of investment cycles the used WACC is higher than current WACC and lower in other periods. However, in the long run the effects are levelled-off. Using long-term WACC, we can most appropriately avoid estimation errors.

THE CALCULATION AND THE CHOICE OF WACC PARAMETERS

As can be noticed from equation (1), several input parameters have to be estimated before calculating WACC. We tackle these inputs in next chapters.

Capital Structure

The capital structure (the composition of debt and equity capital) plays an important role when estimating the cost of company's financial resources. In fact, the capital structure is more or less the only factor that is under direct influence of business decision. Thus, the capital structure decisions

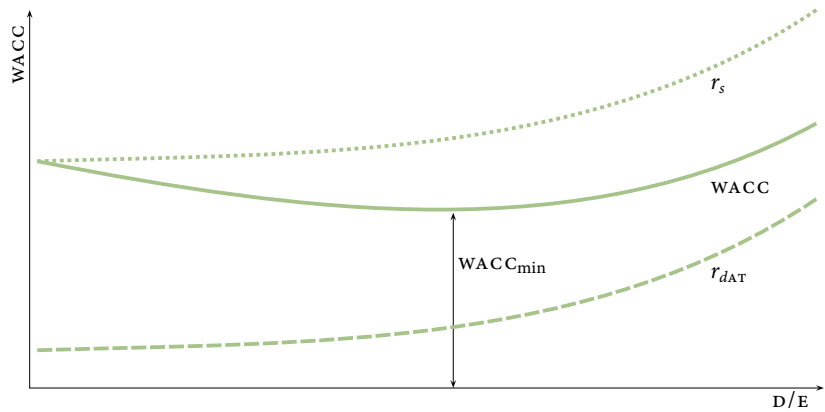

FIGURE 1 Schematic Approach in Determining the Optimal Capital Structure

are of crucial importance. Capital structure decisions include decisions on debt-to-equity ratio, dividend policy (which in turn determines debt-to-equity ratio) and investment decisions of the company.

Debt is cheaper than the equity capital (also because of tax shield) and to that end companies usually exploit the advantages of the so-called financial leverage. However, borrowing leads to a higher risk as it results in higher fixed obligations of a company (i. e. payments of interest rates and the principal of debt), which usually leads to higher required rates of return for invested capital.

From the theoretical point of view the company should try to achieve the optimal capital structure (i. e. an optimal composition of debt and equity financing, $D/E^{\star}$ in figure 1), where the WACC is at its minimum. If debt-to-equity ratio is below its optimum, the company can exploit the advantages of financial leverage, due to cheaper debt financing, while after this point, the risk premium starts to raise the price of all financial resources and consequently the WACC starts to increase.

The company's capital structure policy thus affects the cost of the capital (Brigham and Ehrhardt 2005, 265). There are several reasons behind this fact. Firstly, it has an influence on cost of equity. Namely, the systematic risk factor, β in CAPM model for estimation of required return for equity capital, is among other things, a function of financial leverage of the company. This is evident from Hamada's (1972) equation:

$$\beta = \beta_u \left[1 + (1 - T)\frac{D}{E}\right], \tag{2}$$

where β and β_u are leveraged and unleveraged beta coefficients, respectively, D/E is debt-to-equity ratio, and T tax rate.

It is evident that:

$$\frac{\partial \beta}{\partial D} > 0. \tag{3}$$

Secondly, as shown in figure 1 the cost of debt after-tax is always lower than the cost of equity capital, regardless of the capital structure. Therefore, if the unleveraged company decides to use a higher proportion of debt, this will lead to a lower average cost of capital of a company. However, this effect does not last forever. A higher proportion of debt will increase the risk of debt and equity capital, increasing the required return of both capital components, which will lead to higher WACC and will neutralize the effect of higher proportion of the cheaper debt.

Thirdly, the dividend policy also affects the weighted average cost of capital of the company. The proportion of net income that is paid out as dividends can affect the required rate of equity. If the proportion of payment is high, forcing the company to raise new equity for financing the investments and to maintain the optimal capital structure, the (additional) cost of raising new equity will occur. The latter has an influence on the weighted average cost of the capital structure.

Finally, also the investment policy affects the cost of capital if it has an impact on the capital structure. When the WACC is calculated, it is assumed that the capital structure will not change. However, if a company's capital structure changes significantly, the WACC will change as well, due to the change in financial leverage.

Cost of Debt Financing

The first step is the estimation of the required rate of return for lenders. It may seem easy, but it is often very problematic in the practice (Brigham and Ehrhardt 2005, 308). The company uses different types of debt with different effective interest rates. Even when investment plans are made, the managers do not know exactly what will be the cost of debt and how it will change due to financial market variability until the maturity of debt that needs to be refinanced. When we calculate the cost of debt, we have to consider the marginal required rate of return, i. e. the cost of the last unit of obtained capital (note that also WACC is marginal cost). Therefore, the cost of a new debt has to be considered rather than existing cost of debt; this holds at least for new investments.

How could be the actual cost of debt estimated? If the company in the past issued bonds and if these bonds are listed/quoted on financial market, we can use as a cost of debt the yield to maturity of the outstanding bonds, as it reflects the current cost of companies' debt. In developing financial markets companies rarely issue bonds to fulfil the funding needs, and even if they do, they are not liquid (thus the price does not reflect the current yield-to-maturity). In this case, yield-to-maturity of a bond issued by a similar company can be used (especially if they have a similar operating and financing risk). Given that companies rarely use bonds, there are only few or no outstanding liquid bonds on developing financial markets. Consequently, the alternative solution is to use an alternative cost of debt (either on domestic sovereign securities or on foreign corporate bonds) and an appropriate mark-up (i. e. adequate risk premium) for the company in question (comparing, say, credit rating and maturity).

However, due to tax-shield the effective cost of debt for the company is lower than the rate a company must pay to its lenders. In the calculation of the after-tax cost of debt the corporate income tax rate is applied as presented in the section on methodology.[2]

Cost of Equity Capital

The equity capital can be of two forms: common and preferred equity, which means that a company (i. e. a joint stock company) can issue common or preferred shares. The common equity capital can be raised by issuing new ordinary shares (or stocks) or on the other hand by retaining earnings (net income). When a company issues new ordinary shares, the cost of the common equity capital depends on the required rate of return, which can be derived from stock price, expected growth rate of dividends and by the floatation costs of a new issue. Note that the market price of shares is set by investors who by quoting and accepting market price implicitly determine the required rate of return. However, only few companies issue new equity. Brigham and Ehrhardt (2005, 311) point out some reasons for this fact.

On the other hand, companies can also employ retained earnings and raise equity capital in this manner. Note that the net income can be disbursed to shareholders as dividends or it can be retained in the company. The cost of retained earnings is in fact the opportunity cost of the equity capital: the owner could receive the retained earnings in the form of dividends, which could be invested in alternative investment opportunities. If the investors are to leave a part of net income in the company, then they

require an adequate rate of return, depending on the risk they take. An investor is entitled to expect a similar rate of return, i. e. rate of return that is expected for shares of a company with a similar risk. If a company was not able to assure the investors' expected rate of return for retained earnings, it would be better if the net income were paid out to investors so they can invest in more profitable alternatives (Brigham and Ehrhardt 2005, 311).

There are numerous more or less complicated methods for calculating the cost of common equity capital: Capital Asset Pricing Model (CAPM) (Black 1972; Lintner 1965; Ross 1976; Sharpe 1964), Fama and French three factor model (Koller, Goedhart and Wessels 2005; Estrada 2005, 85), Arbitrage Pricing Theory Model etc. The latter is theoretically very interesting but has a small practical value.

The commonly used method in the calculation of the cost of equity is CAPM model, in which the required rate of return is the sum of risk free rate and market risk premium, multiplied with the company's Beta (equation 4). Beta coefficient denotes the risk of the company relatively to the average market risk (average company). The CAPM supposes that all investors hold a combination of a risk-free investment and a well-diversified (market) portfolio. In such a case, they achieve the maximum return with a minimum risk. The proportion of the diversified portfolio and risk-free investment an individual holds depends on investor's risk aversion. The CAPM is based on strong assumptions. McNulty et al. (2002) found three central shortcomings of the CAPM: a) the validity of beta, b) the reliance of historical data, and c) the indifference of holding period (Zellweger 2007). Even though there are some disadvantages of CAPM, the model is the most widely used method for the calculation of the cost of common equity capital (Bruner et al. 1998; Graham and Harvey 2001; Brigham and Ehrhardt 2005, 320). It is argued in theoretical and empirical discussions that using a more complex method requires more data, which is rarely available on developing markets and leans on more estimated parameters, which requires more rule of thumb. This might lead to biased estimations.

Gunnlaugsson (2006) made a study on the validity of the CAPM on the small Icelandic stock market. The results indicate that the CAPM has worked well in the small Icelandic stock market and that CAPM (through beta coefficient) does in fact explain returns better even when compared to larger foreign stock markets. A strong relationship between the beta coefficient and stock returns was found. Furthermore, the stock returns with

high betas were higher than one would expect from the CAPM. There are two limitations of this research: i) the model was tested on a small number of shares (27), and ii) a short time series of data was used.

The CAPM model is defined as follows:

$$r_1 = r_f + \beta(r_m - r_f), \tag{4}$$

where r_i is expected rate of return, r_f risk-free rate, β Beta of the security (the risk measure of a stock, the measure of the systematic risk of a stock), r_m the expected market return, and $r_m - r_f$ market risk premium.

Risk-Free Rate

The first step in estimating the cost of equity capital under CAPM is the estimation of the risk-free rate of return. The question is which asset is risk-free. Every asset has its useful life in which it must earn an expected return. With the increasing probability that the return of the asset in its useful life will be different from the expected the risk increases. In finance, the risk is defined as a deviation of the actual from the expected return, so the risk free investments are those for which the actual return is equal to the expected return. The probability of default must be equal to zero and the reinvestment must be always possible.

When we estimate a cost of capital and when we determine the risk-free rate for this purpose, we must pay attention to a maturity of the asset. The equity capital invested in a firm has no maturity. So, it is recommended to use a risk-free investment with closest possible maturity as the asset in question (i. e. equity capital). A good approximation of a risk-free investment can be a long-term government bond, provided that the bond is of sufficient maturity (say 10 or better 30 years) and liquid. In this case, its yield-to-maturity would be a good approximation of a risk-free rate for current market conditions. In some cases, especially if no domestic government bonds are available or traded, one can use as a basis the government bond of a developed equity capital market. In such a case, we must calculate the difference in expected inflation rates between the countries. An even better solution would be to use the inflation-indexed bond and add the expected inflation rate on top of the real return of the bond, which would represent a risk-free rate of return.

Market Risk Premium

The next step is the estimation of the market risk premium. In their study, Ferson and Locke found that the estimation of the market risk premium is

much more important than the estimation of the beta coefficient (Ferson and Locke 1998). The majority of errors in the cost of capital estimations result from an incorrect estimation of the market premium. This means that the analysts must improve the methods of market risk premium estimation that is based on historical data. Bartholdy and Peare found that one must use the same approximation for the market portfolio for market risk premium and beta estimation. Using different approximations most likely yields a biased estimate (Bartholdy and Peare 2000).

The market risk premium is the difference between an expected market return and the risk-free rate of return. The market risk premium can also be denominated as the risk premium for the equity capital as it measures the risk aversion of investors. As the majority of investors are risk averse, they require a higher rate of return (risk premium) for their investments in stocks, compared to investments in debt securities (Brigham and Ehrhardt 2005, 313).

We can estimate the market risk premium in different ways. As every investor has its own expectation about the adequate market risk premium, we can calculate the market risk premium as a weighted average of different investors' expected premiums. This method is rarely used in practice; estimated premiums are very volatile and short-term (Damodaran 2006, 38).

In case the investors' risk aversion has not changed significantly in the past, the historical risk premium is a good proxy for the expected risk premium. We calculate the historical risk premium from a long-term time series of assets' (stocks and bonds) historical returns. The market risk premium is calculated as a difference between the average yearly return on stocks and return on risk-free bonds. For some developed markets (e. g. USA), historical data of returns exist for the period of eighty and more years.

Period for estimation of relevant parameters has to be carefully chosen. Some experts advocate shorter time as risk premium significantly changes over time and thus a more realistic estimation is obtained. On the other hand, a shorter time series has a bigger standard error. The differences in standard errors in relation of the length of time series are so evident that the use of shorter periods is not reasonable (Damodaran 2006, 47). This is proved by the research of Koller, Goedhart and Wessels (2005, 298).

The calculation of historical risk premiums is limited to financial markets with a long history of data, where the data for 50 or more years are

available. A good example of such market is the USA. In this case, the standard error of estimate could be relatively small.

In developed financial markets, the risk premium is estimated to be between 3.5% and 6% (Brigham and Ehrhardt 2005, 315). The results of Fama and French (2002) show that the expected market premium for the US market (the analysis was performed for the period 1951–2000) equals to 2.55%. Damodaran (http://pages.stern.nyu.edu/~adamodar/) argue that the expected market risk premium (implied risk premium) is more reliable because is forward looking.

For developing financial markets, the historical data on rate of returns are usually relatively short. In this case, the market risk premium can be obtained by using estimated market risk premium. Under the assumption that stocks are correctly valuated, we can apply the Gordon's growth model (Gordon 1959) for stock valuation for calculating average return on stocks.

What is the adequate risk premium for emerging markets? It is indubitably higher in comparison with a developed market, since risk on developing markets is definitely higher in comparison with developed and more liquid markets. We can estimate the equity risk premium for a developing market adding a country risk premium to the risk premium for a developed equity market.

Beta

The next step is the estimation of beta coefficient. According to CAPM, the relevant risk of an individual stock is its contribution to the risk of a well-diversified portfolio. A well-diversified portfolio can be viewed also as a smaller picture of a market portfolio. It means that it comprises all the investments in the same structure as in the whole market.

The risk contribution of an individual stock to a well-diversified portfolio is measured with the beta coefficient. For market portfolio the $\beta = 1$. The investment with $\beta = 1$ is average risky, with $\beta < 1$ less risky and with $\beta > 1$ more risky than an average risky investment.

Beta coefficient is calculated as:

$$\beta = \frac{cov_{i,m}}{\sigma_m^2}, \tag{5}$$

where $Cov_{i,m}$ is covariance between returns of the investment and a market portfolio and σ_m^2 variance of returns of market portfolio.

We usually calculate beta coefficient with the use of linear regression. Beta is the slope in the linear regression function where the dependent

variable comprises past returns of an individual investment and the independent variable comprises the past returns (a proxy) of a market portfolio. Several financial institutions, e. g. Thomson Financial, Bloomberg and Yahoo calculate betas with slightly different methods and their betas for the same shares could be different. Analysts usually use monthly data for the period of 4 to 5 years, and some others prefer weekly returns for the period of 52 weeks (Brigham and Ehrhardt 2005, 316). Robert Merton (1980) proved that the use of shorter periods of returns improves the results. According to Koller, Goedhart and Wessels (2005, 309) the Merton theory is illusive. The use of daily or weekly returns is problematic when the trading with the share in not frequent. In the period of not trading the illiquid share will have the return equal to zero. However, this does not mean that the price of the share is stable. If there are many days, when the share is not traded, then the value of beta is downward biased. In this case, it is recommended to use monthly returns (Koller, Goedhart and Wessels 2005, 309). If historical betas is used in the CAPM it is implicitly assumed that future relative volatility of the share will not change.

If the company's stocks are not traded on a financial market, we can also estimate the relevant beta coefficient by using data that are available for other markets, say US markets (for example data that are available on Morningstar, Damodaran online etc.). Here we use the unleveraged beta coefficient and adjust it for the financial leverage of the estimated company (Hamada equation can be used, see equation 2).

Other methods for beta evaluation are fundamental betas, accountant betas, industrial betas and the valuation with the combination of these models (for the explanation of these models see Damodaran (2006, 51)). Because of the short time series and a small number of comparable companies, these methods are rarely possible or difficult to use in developing equity markets.

Market Facts

The financial crises complicated the cost of capital estimation for regulated industries. Parameters used for the calculation, such as bond yields, credit risk and interest rates, changed evidently in recent years and become more volatile and unpredictable.

The real yield to maturity of a 30-years inflation indexed Treasury bond, which is usually used as a measure of the real risk free rate has fallen substantially (see figure 2). The reason behind is partly to the fact that American treasury bonds represent a 'safety heaven' for investors in

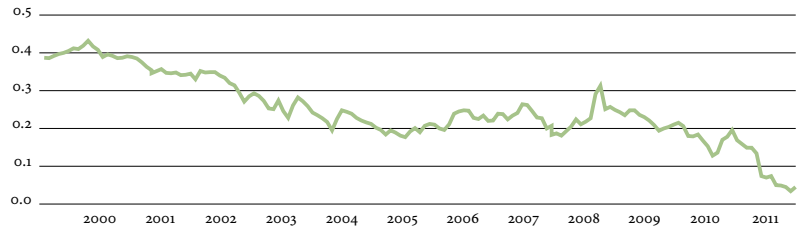

FIGURE 2 Yield to maturity of 30-Year 3-7/8% US Treasury Inflation-Indexed Bond, due 15 April 2029 (based on data from www.stlouisfed.org)

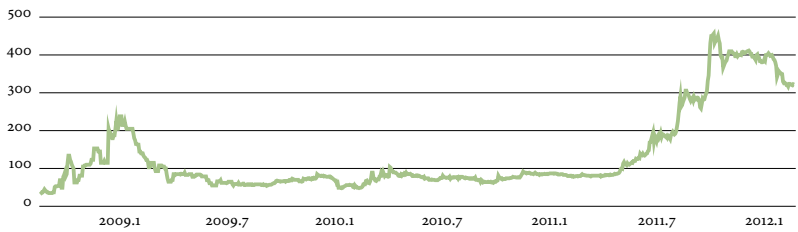

FIGURE 3 Credit Default Swap for Slovenia to US (based on data from www.reuters.com)

times of global financial turmoil's. An increased demand for such financial instrument drives the yields to maturity to historical low levels. Our opinion is that present levels are not long run equilibrium returns.

In Slovenia, interest rates drastically increased, as it is presented in figure 3 that shows the Credit Default Swap for Slovenia for the period from September 2008 to March 2012.

As could be seen from figure 3 the increased credit risk for Slovenia increased the cost of the 'relative insurance' for almost 200 basis points. Our opinion is that such an increase is a consequence of excess reaction of financial markets to a drop of credit rate for Slovenia. We estimate that this extreme increase of CDS in the second half of 2012 is not reflecting only the credit rating change but also the general mistrust, worsening liquidity on the market, the fear for the future of Euro, and other factors. According to Damodaran (http://pages.stern.nyu.edu/~adamodar/), the increased required rate of return due to the change in credit rating in Slovenia should be around 50 basis points.

This latter is in line with figure 4 that shows the yield to maturity of Slovenian government bonds from September 2009 to March 2012, which increased in this period for 70 basis points. We do not expect the rise of the credit rate in short nor do we expect the drop of the credit rate, espe-

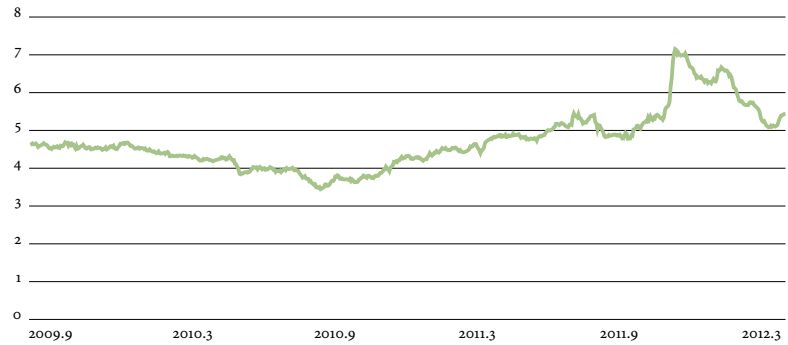

FIGURE 4 Yield to Maturity of Slovenian Government Bond SLOREP 4.625 9 September 2024 Govt, Due in Year 2024 (based on data from www.reuters.com)

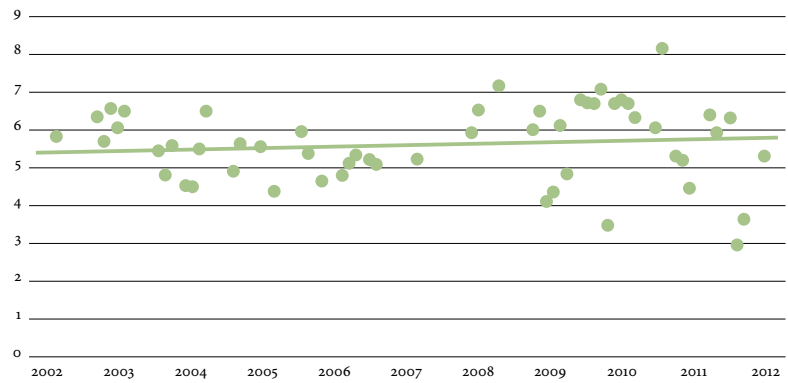

FIGURE 5 Interest Rates for New Credit Contracts with Maturity of 5 Years and Longer for Firms in Slovenia (based on data from www.bsi.si)

cially in light with the stabilization measures the Slovenian government is currently adopting.

Due to financial market pressures, the cost of debt for Slovenia on international market has increased, but – as showed by the data of Bank of Slovenia – this has not affected in the same extent the cost of debt for firms (figure 5).

The effective cost of new long-term debt financing for firms in Slovenia increased in average for 25 basis points (figure 5), but the financing activity stagnated from the year 2009 onwards. The growth of credits to nonfinancial sector (figure 6) decreased from 3% growth before the financial crisis to about 0% or almost a negative growth in 2011. The reasons are the lower demand for credit from firms and individuals,

FIGURE 6 Credit to Non-Financial Sector in Millions of EUR (based on data from www.bsi.si)

increased severity in approval of credits, and the rise in credit costs.

Based on these facts we propose some directions for the estimation of the cost of capital. We note that in recent years there is an extremely unstable period for the financial markets. It will be a result of this crisis, too, that the levels will drastically change in the future. However, the real assessment of these conditions is impossible to make, however, the calculations should be based on objective assessments and historical and long-term data, beyond the period of one economic cycle.

THE EXAMPLE OF CALCULATION

We present the estimation of a long-term pre-tax capital cost for a regulated Slovenian company that is operating in the field of electric distribution. The cost of equity is calculated based on the CAPM model. Calculation is made based on data from a mature and developed US market that has a long history, which allows estimation based on historical data. Based on the data of a mature market (risk-free rate, beta, market risk premium), and by taking into account the characteristics and differences between the US capital market and Slovenia (in particular, the risks and inflation), by applying Damodaran's methodology, we estimated the cost of equity capital. A reliable estimation based on Slovenian capital market data is not possible; combining data from different markets (the EU) in the CAPM would reduce the consistency of the model and the reliability of the estimation. We used and calculated the variables as follows:

- For the expected real risk-free rate we used the average yield to maturity of 'WTP30A29, 30-Year 3–7/8% Treasury Inflation-Indexed Bond, Due 4/15/2029,' which was 0.45% on March 30. 2012 (monthly average). The average yield, calculated from a series of average monthly yields in the period from April 1999 to March 2012, is 2.51%. We obtained the data from the Federal Reserve Bank of St. Luis web page (www.stlouisfed.org).

- For the expected inflation we used 2%, which is in line with the target inflation of the European Central Bank (2009) (official goal is 'slightly below 2%'). We believe that in times of market uncertainty this is the best possible estimate of the future inflation because long-term goal of the economic policy is to reach the announced inflation target.

We calculated the nominal risk free rate with the Fisher's equation as follows:

$$r_f = (1 + r_r) \cdot (1 + \pi) - 1 = (1 + 2.46\%) \cdot (1 + 2\%) - 1 = 4.56. \qquad (6)$$

If we compare this estimate with a current yield to maturity of the long-term Slovenian government bond, it can be noticed that this estimate is slightly lower. A long-term Slovenian government bond yield was 5.82% in April 2012. It needs to be taken into account that current market conditions are not representative so the use of current data needs to be avoided.

- For the market risk premium, we use the average of the equity risk premium for the American market calculated by Damodaran (http://pages.stern.nyu.edu/~adamodar/). This equity risk premium is 3.99% and can be considered as a long-term equilibrium market risk premium. It is calculated as an average from the forecasted premiums time series (1960–2011) calculated with the expected dividend growth model. We added the country risk premium for Slovenia, which was 1 percentage point. According to Damodaran (http://pages.stern.nyu.edu/~adamodar/) the Slovenian credit rating A2 (www.moodys.com) reflects a 1% point of additional premium for default risk, which needs to be multiplied with the global average of equity to bond market volatility (1.5). This results in 1.5% of country risk premium for Slovenia. The calculated market risk premium for the Slovenian market is thus 5.49% (3.99% + 1.5% = 5.49%). We obtained all the data from the Damodaran (http://pages.stern.nyu.edu/~adamodar/).
- For the estimation of individual risk, we use the estimated unleveraged betas from Damodaran. The industry betas are calculated with a linear regression function, using the returns of stocks in the industry as the dependent variable and the returns of the NYSE composite index as independent variable (the relevant time series covered last five years). The calculated industry beta is the average of all calculated betas in the industry. The unleveraged betas are calculated

with the Hamada's equation taking into account the average debt to equity ratio in the industry. The data for the companies are from the Value Line database. The beta for the Electric Utility (central) is calculated from the 21 companies in the industry. The beta for the Electric Utility (central) was 0.47.

- We calculated the leveraged beta with the Hamada's equation. The company was financed as 40% of debt and 60% with equity capital and we presume that the company will not change its capital structure in the future. The company has a 20% effective tax. The calculated levered beta was:

$$\beta_1 = \beta_u \left[1 + (1 - T)\frac{w_d}{w_s}\right] = 0.47 \left[1 + (1 - 0.2)\frac{0.4}{0.6}\right] = 0.72. \quad (7)$$

- We calculated the cost of equity capital with the CAPM as follows:

$$r_i = r_f + \beta(r_m - r_f) = 4.56\% + 0.72 \cdot 5.49\% = 8.51\% \quad (8)$$

- For the cost of debt, we used the estimated risk free rate plus the premium for the long-term debt for the AAA rated company, which is 1.75 percentage points. The resulting cost of debt was 6.31%.
- The estimated pre-tax WACC for the selected Slovenian company which operates in the field of electric distribution is estimated as follows:

$$\begin{aligned} \text{WACC} &= w_d r_s + \frac{w_d r_s}{(1 - T)} = 0.4 + 6.31\% + \frac{0.6 \cdot 8.51\%}{1 - 0.2} \\ &= 8.91\%. \end{aligned} \quad (9)$$

Conclusion

The paper tackles the estimation of weighted average cost of capital (WACC) for developing financial markets for regulated industries from the perspective of the current financial crisis. The cost of capital is crucial in capital budgeting decisions, performance evaluation and in our case, business regulation. It is the yield that investors require for their investments and it is used as a discount rate to calculate the present value of the expected free cash flows of the company. In times of financial crisis an obvious question arises, i. e. how to estimate an appropriate WACC.

In the paper, we argue that the most accurate for this purpose is a long-term WACC, which takes into consideration a long-term stable yield of capital. We argue that since an investment is a long-term decision of the company and its cash flows are estimated on long run, also the adequate WACC has to be considered from a long-term perspective. Thus, it has

to be calculated free of short-term cyclical movements of the economy (e. g. the risk premium and inflation premium), or – similarly – these movements have to be properly taken into account. Following this belief, we propose in the paper some solutions that could be used for calculating WACC for a regulated industry on the developing financial markets in times of market uncertainty and financial crisis.

In a dilemma, whether to use nominal or real WACC, we opt for nominal WACC. We argue that this is the most appropriate and in fact simple, given that we can avoid estimation of inflation expectations and (most importantly) revalorization of assets.

When deciding on pre- vs. post-tax WACC, the final answer depends upon the purpose of the calculation and the background of calculating WACC. Pre-tax WACC provides an adequate cash flow to the company's owners, but it can be obtained only after the payment of corporate taxes. From this point of view, the interpretation and application of the estimated WACC are relatively simple. In the case of post-tax WACC, some adjustments should be made. An advantage of post-tax WACC is its consistency with the business practice, transparency, and a simple and accurate clearance of tax rate (i. e. simple and implicit application of effective tax rate) (Independent Pricing and Regulatory Tribunal of New South Wales 2002). On the other hand, the pre-tax WACC is generally used for regulated branches, especially because of its simplicity, while the risk of an inadequate effective tax rate use (i. e. too high or too low tax rate) has to be taken into consideration.

The general dilemma in calculating WACC is whether to use short- or long-term oriented WACC. The tradeoff is between short-run accuracy and long-run stability of WACC. Our argument is that long-run WACC should be taken into account for valuing investment opportunities, as short-term movements in the relevant variables are irrelevant for long-term investors. Following this belief, the calculation of WACC is simplified to estimation of debt cost (e. g. risk-free rate plus debt risk premium) and the cost of equity (which can be simply calculated using CAPM model employing among others long run and stationary market risk premium).

We have presented an example of capital cost estimation for a Slovenian company, which operates in the field of electric distribution using our proposed methodology. The presented methods could be used for other companies in Slovenian regulated industries and other developing financial markets taking into account the specific properties of financial

markets and companies. The result of the case study is limited to the presented company.

Notes

1 This holds for final calculation of WACC (according to equation 1) as well as for estimating input variables for WACC calculation, e. g. beta coefficient if we use CAPM methodology for the calculation of the cost of equity capital.

2 If a company utilizes the tax relief, we can take as a tax rate the expected effective tax rate (that represents the tax rate that will be actually applied).

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