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DIPLOMOVÁ PRÁCE

When Two Do the Same, It Is Not the Same:

Cost of Equity Estimation Techniques Used by Valuation Experts

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Prohlášení

Prohlašuji, že jsem diplomovou práci vypracovala samostatně a použila pouze uvedené prameny a literaturu.

V Praze dne 29. 7. 2009 Petra Kolouchová

Poděkování

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Abstract

Cost of equity is crucial information that enters business valuation. Yet, even after decades of academic research, consensus has not been reached regarding the appropriate cost of equity estimation. The aim of our thesis is to investigate the cost of equity estimation in practice. In other words, we aim to provide data on the popularity of individual cost of equity models and evidence on what techniques are used for the estimation of parameters entering the models. For this purpose, we use a specifically developed program and obtain a unique dataset of cost of equity values, estimation methods and parameters used by valuation experts in the Czech Republic in the period between 1997 and 2009. Our findings suggest that the most popular model for cost of equity estimation is CAPM, which is followed by the heuristic build up model. In the case of CAPM, risk premiums for unsystematic risks are often applied. Such premiums depend to large extent on expert's own experience and as such are rather qualitative in nature. Overall, in most points of the analysis, our results are consistent with previous, survey-based research on the US and the Western European data.

Abstrakt

Stanovení nákladů vlastního kapitálu je důležitou součástí oceňování společností. I po desetiletích akademického výzkumu se odborníci nemohou shodnout na vhodnosti jednotlivých přístupů ke stanovení hodnoty nákladů vlastního kapitálu. Cílem této práce je zjistit, jaké modely stanovení nákladů vlastního kapitálu převažují v praxi a jaké metody jsou aplikovány k odhadu jednotlivých parametrů těchto modelů. Za tímto účelem je použit speciálně vytvořený program, který nám umožňuje nashromáždit jedinečný vzorek dat obsahující hodnoty nákladů vlastního kapitálu, metody odhadu a parametry modelů, tak jak byly použity českými znalci na oceňování v letech 1997 až 2009. Naše výsledky ukazují, že nejpopulárnějším modelem nákladů vlastního kapitálu je CAPM upravený o rizikové prémie za nesystematické riziko, následován je stavebnicovým modelem. Prémie za nesystematické riziko závisí ve velké míře na vlastní zkušenosti znalce a jsou tedy spíše kvalitativního charakteru. Ve většině bodů analýzy jsou naše výsledky konzistentní se zjištěními výzkumů provedených dotazníkovým šetřením v USA a západní Evropě.

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List of Abbreviations

APT	Arbitrage Pricing Theory
CAPM	Capital Asset Pricing Model
CRP	Country Risk Premium
DCF	Discounted Cash Flows
DDM	Dividend Discount Model
FCFE	Free Cash Flow to Equity
FCFF	Free Cash Flow for the Firm
IAS	International Accounting Standards
IFRS	International Financial Reporting Standards
OLS	Ordinary Least Square
US GAAP	US Generally Accepted Accounting Principles

1. Introduction

Cost of equity is crucial information that enters valuation and corporate decision-making. The cost of equity on its own or in combination with cost of debt is used as a discount factor with which expected future cash flows are discounted. By discounting future cash flows, present value of an investment is determined. In other words, the value of an investment is derived. Valuation of investments in companies, projects, securities or assets need to be performed for various purposes, e.g., investment decision-making, capital budgeting, litigation issues or regulation requirements. Given the broad range of situations in which present value computation might or needs to be employed, there is also a broad range of situations which require cost of equity application.

The cost of equity can be defined as an opportunity cost equal to a return on alternative investments with similar level of risk (Pratt, 2002). The cost of equity represents an expected return on an investment. As such, it is not directly observable and it needs to be estimated. Finance theory suggests several approaches to cost of equity estimation. Numerous models of cost of equity estimation have been developed, e.g. the asset pricing models, the build up models, and the discounted cash flow ('DCF') models (Ibbotson, 2005). All the models translate risk of the investment into the expected returns but each of the models approaches this translation differently. Asset pricing models, which are mainly represented by the Capital Asset Pricing Model ("CAPM"), derive the cost of equity directly from the market by econometric analysis. Build up models are additive heuristic models which determine cost of equity as a sum of risk-free rate and individually estimated risk premiums specific for the particular investment. The DCF models compute the cost of equity directly from the market information on prices and expected cash flows (dividends) related to the investment.

The cost of equity and the models used for its estimation have been of interest of academia for decades. Even today discussion on the theoretical limitations of individual models can turn into an academic disputation between researches representing different

branches of finance economics.[1] Just like finance economists, neither practitioners are unified in terms of cost of equity estimation (Pratt, 2008). Apart from the selection of appropriate cost of equity model, finance practitioners are concerned with how to apply the models practically. Since framework for cost of equity estimation is rather ambiguous in terms of what parameters and techniques to use, its estimation remains one of the most challenging areas of business valuation. This holds particularly for emerging markets which have generally lower availability of high-quality information (Bruner, *et al*., 2004) and which remain segmented (Bruner, *et al*., 2008). When high-quality market information is not available, capacity to estimate parameters of the models is reduced. Furthermore, when market is segmented, information obtained from other markets with higher informational efficiency can be hardly used as a reference. In other words, further level of complexity is added to the cost of equity estimation in case of emerging markets.

Given the variety of cost of equity models and techniques used to estimate their input parameters, cost of equity estimation and its resultant value can vary from one practitioner to another. Several studies have been performed both on the US and the Western European data which investigate what cost of equity estimation techniques are used by practitioners and to what extent the techniques differ across the individual practitioners. All the studies have used survey approach to analysis. Based on responses of samples of practitioners, statistics on the frequency of individual models and parameters estimation techniques were computed. Based on the statistics, the most popular model of cost of equity estimation is CAPM, both in the US (Graham and Harvey, 2001) and in the Western Europe (Brounen, Jong and Koedijk, 2004). Corporations and analysts in the US and in the Western Europe vary in terms of what approach they apply when estimating the parameters in the cost of equity calculation (Graham and Harvey, 2001) or (Petersen, Plenborg and Scholler, 2006).

In many respects, the goals of this thesis are similar to those of the studies just described: to investigate the cost of equity estimation in practice, to provide data on the popularity of individual cost of equity models and to provide evidence on what

[1] In the past few years, the branch of financial economics called the behavioral finance has gained in popularity. The behavioralists are skeptical about inherent market rationality and deny financial models which are built on it, such as Capital Asset Pricing Model (Mauldin, 2007).

techniques are used for the estimation of parameters entering the models. Our approach is, however, distinguished from the approach adopted by the other studies. Compared to surveys, which measure believes rather than actions, our approach consists in direct analysis of cost of equity estimation instead of asking valuation practitioners on what they believe they do. Since the conclusions derived by our approach are potentially less biased in this respect, a greater objectivity is achieved.

As a source on information and data for our analysis, we use expert's opinions on company value as prepared by Czech valuation experts for the Commercial Code purposes. The Commercial Code defines several situations for which expert's opinion on a value of company is required, e.g., squeeze-out, merger or mandatory public offer. Companies are obliged to disclose the expert's opinions in the Commercial Register and the expert's opinions are thus publicly available. In order to access the expert's opinions in large amount, we use a specifically developed program which generates information on the presence of expert opinions in the Commercial Register. The analysis of each of more than one thousand expert's opinions is then performed.

Empirical studies of the cost of equity estimation in practice are generally aimed at contributing to the discussion on and further development of cost of equity theory and its implications for practice. In the context of Czech expert's opinions, findings of our analysis can also be used in a discussion related to the level of independence and expertise of Czech valuation experts. In general, experts and expert institutes entitled to perform valuation tasks for Commercial Code purposes are not obliged to follow any specific guidance on valuation methods or on cost of equity estimation. As a result, experts and expert institutes can apply any approach which they consider as the most appropriate. This situation as well as methods adopted by experts and expert institutes for cost of equity estimation have been denounced by various groups.

For instance, minority shareholders forced to sell their stakes in squeeze-out processes claim a damage of several CZK billions. They claim that the damage resulted from inappropriate valuation methods applied in expert's opinions, which are used to substantiate the compensation (OSMA, 2009). Their key objection refers to cost of capital models commonly used by the experts – they claim that apart from methodology, cost of equity models and parameters used in these models differ from one expert to

another and that the resultant cost of equity is subject to experts' manipulation. However, similar claims are supported by poor empirical evidence, if any. To the author's best knowledge, there has not been any thorough empirical analysis of cost of equity practices in the Czech Republic in recent years and our analysis is first of its type performed on the data included in the expert's opinions.

Our work is structured as follows. The second chapter focuses on theoretical background of cost of equity estimation. We provide an overview of different approaches to business valuation and to cost of equity estimation and explain their theoretical underpinnings. The third chapter concerns practical issues related to cost of equity estimation. We present the current discourse on key factors entering the cost of equity estimation both in developed and in emerging markets. The fourth chapter provides a comprehensive overview of literature dealing with the issue of corporate finance practices of cost of equity estimation. In the fifth chapter we describe the institutional settings and legal framework of business valuation in the Czech Republic. Chapter six and chapter seven describe our empirical analysis of cost of equity estimation in practice: chapter six describes the research design and chapter seven presents empirical results of the analysis.

2. Theoretical Background

We should be guided by theory, not by numbers.

W. Edwards Deming

The following section provides a brief description of three general approaches to business valuation: income approach, market approach and asset based approach. The essential component of one of the key approaches to business valuation, the income approach, is the cost of equity estimation. The theory suggests several approaches to cost of equity estimation and we present a concise overview of the theoretical underpinnings of the models which are most commonly referred to in practice: namely asset pricing models, build up models and DCF model.

2.1 Business Valuation

There are generally three approaches to business valuation: income approach, market approach and asset based approach (Pratt, 2008). Within each of the approach we can distinguish between several methods of valuation as described below.

2.1.1 Income Approach

The income approach to business valuation is based on estimating the future benefits or returns of owning and operating a business and determining the present value of such returns. In general, the approach consists in identification of the future returns, usually referred to as future cash flows, which are expected to be generated by the business, and in estimation of an appropriate discount rate to convert the expected cash flows into the present value terms. The approach can be used in several variations: the DCF method, the Dividend Discount Model ("DDM"), and residual income method. European valuation literature also distinguishes income capitalization method as a separate method of valuation (Mařík, *et al*., 2007). Regardless of which valuation method is selected, the cost of equity is a key input into the valuation under the income approach.

The DCF method is the most common method of the income approach (Pratt, 2008). It is based on a prognosis of future cash flows either to all capital providers, the so

called Free Cash Flow for the Firm version of DCF ("FCFF"), or to equity capital providers only, the so called Free Cash Flow to Equity version of DCF ("FCFE"). Depending on which version of DCF method is selected, appropriate discount rate is estimated: for FCFF weighted average of cost of equity and debt is used and for FCFE cost of equity is applied. Dividend discount model is based on the same logic as DCF FCFE but instead of using free cash flow to equity it relies on forecasted dividends. The DDM model can be applied in case of dividend paying companies only. The residual income method is based on earnings that exceed the required rate of return. The income capitalization method relies mostly on past financial results which are adjusted appropriately so that a common basis is estimated, e.g. extraordinary items are excluded. This common basis is used to estimate a stabilized income which can be expected in the future. The income capitalization method is often used as a one phase method, i.e. the stabilized income is estimated based on the historical data and it is assumed to be generated perpetually. Therefore, the income capitalization method is relatively simpler compared to the DCF model where future cash flows need to be projected (Mařík, *et al*., 2007).

2.1.2 Market Approach

Compared to the income approach, the market approach relies in the first place on the market data rather than projected future benefits. Within the market approach either the comparable companies or comparable transactions method can be applied. In comparable companies method, a group of publicly traded companies comparable to the business subject to valuation needs to be identified. Since the market value of such companies is known, the market value of a business subject to valuation can be derived based on various metrics, mainly the financial multiples, e.g. price to earnings ratio. The comparable transactions method is similar to the comparable companies method but refers to transaction data for private and publicly traded companies rather than stock exchange data for publicly traded companies.

Since shareholders of publicly traded companies usually own minority stakes only, comparable companies method is preferable in case that minority stake is being valued. On contrary, when valuing a majority stake, comparable transactions method is

recommended as it is based on mergers and acquisitions data which mostly involve transactions with controlling stakes of interest[2]. As the substance of the market approach suggests, application of either the comparable companies or comparable transactions method is appropriate only in case that sufficient amount of relevant data within a relevant time frame can be collected.

2.1.3 Asset Based Approach

Asset based approach is a static approach to valuation and as such it is based on accounting values of balance sheet items adjusted to market values. In other words, the value of a business is derived as a sum of asset values less the liability values. The asset based approach can be used under the going concern assumption as well as in case that liquidation value of a business needs to be estimated.

2.2 Cost of Equity Models

There is a wide range of cost of equity models, the most commonly used models include the asset pricing models, build up models and DCF model. In the following paragraphs we will briefly describe the theory behind each of the model, with the highest focus on the asset pricing models.

2.2.1 Asset Pricing Models

The origins of asset pricing theory can be traced back to 1960's and 1970's when Sharpe (1964), Lintner (1965), and Black (1972) built on Markowitz's model of portfolio choice (Markowitz, 1959) and developed CAPM. CAPM soon became the cornerstone of modern capital market theory and with some variations has been in use by practitioners till today.

In terms of the capital market theory, risk can be divided into two components: systematic component and unsystematic component. The systematic component of risk results from the sensitivity of the subject asset's return to the return on the market as a

[2] In order to use comparable companies data for majority stake valuation and comparable transactions data for minority stake valuation, control premium / minority discount can be applied. A comprehensive guidance on the application of the discounts and premiums is provided by Pratt (2002).

whole, whereas unsystematic component of risk is a function of characteristics of the individual company, industry, and the type of investment. While the systematic component of risk cannot be diversified away, the unsystematic component of risk can be diversified away by holding a large portfolio of investments.

The CAPM assumes risk averse investors who trade-off expected return and risk. Since investors have the ability to hold large portfolios of assets, the unsystematic component of risk is assumed to be diversified away and the risk premium part of the expected return is assumed to be a function of the systematic component of risk only. The CAPM also assumes that investors are rationale and as such they hold mean-variance-efficient portfolios as defined in Markowitz's model of portfolio choice (Markowitz, 1959). Based on Markowitz's model, risk averse investors choose portfolios so that expected return of the portfolio is maximized given its variance and variance of the return is minimized given the expected return.

Furthermore, the CAPM assumes that investors agree on the joint distribution of assets' returns and they can borrow and lend at a risk-free rate which is the same for all investors and both for lending and for borrowing (the model also assumes absence of transaction costs and investment-related taxes). Therefore, investors hold the same mean-variance-efficient portfolio which happens to be the market portfolio. The investment strategy among investors differs only in terms of what the proportion of an investment into the risk-free asset compared to the investment into the market portfolio is. The CAPM's assumptions are summarized by Pratt (2008) in the following points:

1) Investors are risk averse.
2) Rationale investors seek to hold efficient portfolios.
3) All investors have identical investment time horizons.
4) All investors have identical expectation of return.
5) There are no transaction costs.
6) There are no investment-related taxes.
7) The rate received from lending money is the same as the cost of borrowing money.
8) The market has perfect divisibility and liquidity.

Given these assumptions, the CAPM leads to the conclusion that the equity risk premium, i.e. the excess rate of return of an asset above the risk-free rate, is a function of the sensitivity of the asset's return on the market return. In other words, if there are *N* risky assets, the expected excess return of any *i*th asset is expressed by a following relation:

$$E(R_i) - R_f = \beta_{iM}\left[E(R_M) - R_f\right], \text{ for } i = 1, \ldots, \text{N}, \tag{1}$$

where $E(R_i)$ is the expected return of asset *i*, R_f is a risk-free rate, $E(R_m)$ is expected return of market, and β_{iM} is the covariance of asset *i* return with the market return divided by the variance of market return:

$$\beta_{iM} = \frac{cov(R_{i,}, R_M)}{\sigma^2(R_M)}, \text{ for } i = 1, \ldots, \text{N}, \tag{2}$$

Hence, CAPM implies that expected returns of all assets are linearly dependent on their betas which measure the underlying systematic risk (the volatility of an individual asset with respect to the volatility of the whole market) and there are no other variables that would have the explanatory power.

As described above, the CAPM relies on several simplifying assumptions, including complete investors' agreement on the distribution of expected returns and unrestricted borrowing and lending at the same risk-free rate[3]. However, as Fama and French (2004) noted, interesting models are built on unrealistic assumptions and that is why these models need to be tested empirically.

[3] The unrestricted borrowing and lending assumption can be substituted with unrestricted short selling assumption, as shown by Black (1972). Compared to classical Sharpe-Lintner version, Black version of the CAPM does not assume a risk-free rate, it assumes an asset uncorrelated with the market instead, which expected returns need to be lower than the expected market return so that the premium for beta is positive. Still, the problem of unrealistic assumptions is not mitigated as unrestricted short selling is a rather simplifying assumption too.

While the early empirical tests, e.g., Black, Jensen and Scholes (1972) or Fama and MacBeth (1973), showed that the CAPM held for the sample periods up to 1960's[4], a large amount of empirical testing since the 1970's has reported average stock returns' patterns that are inconsistent with the model. In other words, empirical evidence suggested that there is cross sectional variation in the assets' expected returns which cannot be attributed to one single factor measured as beta. Several studies documented that stocks with high E/P ratios (Basu, 1977), with low market capitalization (Banz, 1981), with high book value of debt to market value of equity ratio (Bhandari, 1988), or with high book to market equity ratio (Stattman, 1980) have higher average returns than predicted by CAPM. Fama and French (1991) examined the several empirical contradictions of CAPM and confirmed that other factors, i.e., size, price-earnings ratio, debt to equity and market to book equity ratio are important determinants of average returns of stocks. As a result of the empirical findings, there was a consensus among academia that CAPM suffers from serious problems and alternative approaches and adjustments were examined.

In response to empirical findings that challenged the ability of CAPM to explain cross-sectional variation of past returns, multifactor models were developed. In case of multifactor models, unlike in case of CAPM, asset's returns are correlated with more than one factor. The Arbitrage Pricing Theory ("APT") or Fama and French three-factor model are the most quoted examples of multifactor asset pricing models.

While derivation of CAPM is based on maximization of investor's utility, APT explains the relations between expected returns by absence of arbitrage opportunities (Ross, 1976). The theory assumes a linear relationship between expected returns and sensitivity of the returns to common factors that affect returns across assets. The APT does not identify specific risk factors which enter the asset pricing model, it is rather the practitioner who needs to identify them.

Merton (1973) extended the Sharpe-Lintner CAPM by including state variables, such as labor income or relative prices of consumption goods, into the analysis. The so

[4] To be precise, it is the Black version of CAPM (Black, 1972) which seemed to hold based on the tests' results. The Sharpe-Lintner version of CAPM was rejected by these tests.

called intertemporal capital asset pricing model[5] is based on assumption that expected investors wealth is affected by state variables. In other words, the state variables are the major source of uncertainty the investor faces with respect to the future consumption. Therefore, Merton stated that what matters to investors are the covariances of portfolio returns with the state variables.

Fama and French (1993) follow this logic but instead of identifying state variables underlying investors' wealth they use market portfolio, size and book-to-market equity as proxies to common risk factors. They claim that size and book-to-market equity reflect the unobserved state variables and as such can explain cross-sectional differences in observed returns not explained by the covariance with market portfolio. Therefore, they come up with a three-factor model. If there are *N* risky assets, the expected excess return of any *i* asset is expressed by a following relation:

$$E(R_i) - R_f = \beta_{iM}\left[E(R_M) - R_f\right] + \beta_{is}E(SMB) + \beta_{ih}E(HML), \text{ for } i = 1,\ldots, \text{N}, \qquad (3)$$

where SMB is difference between returns on diversified portfolios with small and big stocks and HML is difference between returns on diversified portfolios with high and low book-to-market equity. Fama and French test the model and find that the three-factor model does better in explaining cross-sectional differences in past returns compared to the standard Sharpe-Lintner CAPM. They note, however, that three-factor model fails to explain momentum effect which was described and observed by Jegadeesh and Titman (1993)[6].

The three-factor model was created in a way so that it worked on past data and captured empirical patterns not examined by standard CAPM. Therefore, it is not

[5] The ICAPM is equivalent to a model where expected returns are linearly related to covariance of the returns and consumption. This model is referred to as consumption model. In practice, these models are used for explaining the way how expected returns are determined rather than for estimating the cost of equity capital.

[6] Momentum effect refers to short term persistence in returns. Simply, stocks which performed well relative to the market tend to do well in short term future as well and stocks which performed poorly relative to market tend to continue to perform poorly as well.

surprising that compared to CAPM it was an empirical success. However, the model is not derived from the theory and the question why size and book-to-market equity have some explanatory power needed to be answered. Fama and French (1996) argued in favor of their model stating that asset pricing is rational and it goes in line with the three-factor model. They acknowledge, however, that there are other explanations possible. It might be the case that asset pricing is not rational and the reasoning of the explanatory power of size and book-to-market equity could be provided by behavioral finance. Also, it can be argued that CAPM holds but given biases in the data, e.g., survivor bias, or data mining, it is often empirically rejected.

Another argument why CAPM seems to be empirically spurious relates to market portfolio. Testability of CAPM was first questioned by Roll (1977) who argued that CAPM can hardly be tested given the market portfolio problem. Theoretically, market portfolio should be constituted of all assets available. Such an understanding of market portfolio would, however, imply that even assets such as human capital should be included. Practically, estimation of returns of such a market portfolio is limited to the extent to which relevant data are available. Therefore, researches testing the asset pricing models resorted to use of market portfolio proxies such as various equity indices instead. Roll (1977) pointed out that since the empirical tests are based on market proxies rather than true market portfolio, the validity of CAPM cannot be inferred from their results. In line with Roll's critique, the fact that CAPM is rejected by empirical tests does not necessarily mean that it is wrong.[7] The summary of the most quoted asset pricing models is presented in Table 1.

Table 1. Asset Pricing Models

Model	Measure of risk
CAPM	Covariance with market return (return on portfolio of all assets)
APT	Covariance with changes in risk factors (or with returns on assets correlated with risk factors)
Three-factor model	Covariance with three risk factors
Intertemporal CAPM	Covariance with changes in state variables (or with returns on assets correlated with state variables)

[7] The market proxy problem is extremely relevant in practical applications of cost of equity capital estimation. We will discuss this issue further below.

2.2.2 Build up Models

Build up models are additive heuristic models which are used to estimate cost of equity as a sum of risk-free rate and risk premiums. Risk premiums represent compensation which investors demand for bearing risks. There is no widely accepted list of risk premiums which should be accounted for, however, the most common ones are: equity risk premium, size premium, industry premium, etc. Build up model takes on the form of the following equation:

$$E(R_i) = R_f + RP_m + RP_s + RP_u, \tag{4}$$

where:

$E(R_i)$ = Expected return on asset i,

R_f = Risk-free rate,

RP_m = Equity risk premium

RP_s = Size premium

RP_u = Specific premiums (e.g., industry premium)

The rationale behind the above mentioned components of the build up model are fairly similar to the rationale behind the components entering the calculation of cost of equity with capital asset pricing models. Most premiums are usually widely accepted, however, there are also risk premiums which are highly controversial, such as control premium/minority discount.

Overall, despite the apparent simplicity of the model, the estimation is highly qualitative in nature. While there are quantitative methods how to calculate equity risk premium or size premium (as discussed in the following section), other premiums are often based on the professional guess of the practitioner and cannot be supported empirically. Such premiums include industry premium, leverage premium, premiums for risk related to concentration of customers or conditional liabilities, etc.

2.2.3 DCF Model

Unlike the previous models, which are explicitly based on the evaluation of risks of the subject of valuation, DCF model of cost of equity uses a different logic. It starts

from the income approach to valuation which is based on discounting expected future cash flows by appropriate cost of equity. Assuming that current market price is the present value of the expected cash flows, the implied cost of equity can be calculated from the present value formula. The simplest form of DCF model for cost of equity estimation assumes a perpetual dividend growing at a stable rate. In that case the present value of the dividends flow can be calculated based on the following formula:

$$PV = \frac{D_0(1+g)}{(k_e - g)}, \tag{5}$$

where,

PV = present value of expected dividend flow,

D_0 = dividend at time *0,*

g = dividend growth rate,

k_e = cost of equity.

Rearranging the formula, we can arrive at a formula for implied cost of equity:

$$k_e = \frac{D_0(1+g)}{PV} - g, \tag{6}$$

where the present value is directly observable as the stock price on the market, dividend at time 0 is known and dividend growth can be estimated. Statistics on implied cost of equity of publicly traded companies are provided for instance by Morningstar (2009). Average values of implied cost of equity per individual industries can be referred to when estimating cost of equity of a particular company.

3. Estimation of Model Parameters

"Measure it with a micrometer, draw it with a pencil, and cut it with an ax."

Old saying

In order to benchmark findings of our empirical analysis not only to theory but also to what the theory implies for its application, we need to understand possible approaches to the application, i.e. how various model parameters can be estimated. First, we will discuss what theory suggests for application of models in the environment of developed markets, for which it was originally developed, and then we will examine what the implications are for emerging markets such as the Czech Republic.

3.1 Cost of Equity in Developed Markets

There is a variety of parameters which enter some or all of the cost of equity models as described from the theoretical point of view in the previous section. In some cases there is a clear consensus on how the parameters should be estimated, other cases raise controversial questions and have been discussed for decades. In the following lines we will briefly outline the estimation procedures of the most important parameters.

3.1.1 Risk-Free Rate

Models like CAPM, build up models, arbitrage pricing model, or Fama-French three factor model are all built on assumption of the existence of a risk-free asset. The question is what proxy for the risk-free asset to select. Despite not necessarily risk-free, default free government bonds are perceived to be the correct choice (Ibbotson, 2005).

However, there is usually a variety of government bonds with different maturities. In theory, zero coupon government strip which maturity matches the maturity of cash flow should be used. Since business valuation usually consists of several cash flows with different maturities, using different bonds would be implied. Yet, for the sake of simplicity, yield of only one bond is preferable which maturity is in line with the maturity of the overall cash flow. Koller, Goedhart and Wessels (2005) argue in favor of

long-term bonds given the going concern assumption which is business valuation usually based on[8].

As mentioned above, a zero coupon bond is recommended because non-zero coupon bonds imply presence of reinvestment risk. Since it is not necessarily the case that yield curves are flat, some authors argue that using a single bond instead of a range of bonds with different maturities may lead to inaccuracies (Mařík and Maříková, 2007).

3.1.2 Equity Risk Premium

The equity risk premium is a critical input factor entering most of the cost of capital estimation models and as a key determinant of assets allocation it is one of the most important variables considered by finance practitioners. The equity risk premium is defined as the difference between the expected returns on stocks and on risk-free assets and in the context of cost of equity estimation it is a forward-looking concept. Equity risk premium has been of interest for both economists and practitioners for decades which resulted in abundant approaches to equity risk premium calculation. Ibbotson and Chen (2001) distinguish four categories of methods used for equity risk premium estimation:

1) **Historical method** – The equity risk premium is estimated as a difference between realized stock returns and realized returns on bonds. Historical method builds on Ibbotson and Singuefield (1976) who divided historical returns on an equity index into two components: risk-free rate and equity premium, the latter of which is assumed to be stationary.

2) **Supply-side models** – The equity risk premium is estimated using fundamental information such as earnings, dividends or economic productivity. Estimation of equity risk premium with a supply-side model is inspired by Gordon and Shapiro (1956) who proposed to estimate expected cost of equity as a sum of dividend yield and expected dividend growth. Diermeier, Ibbotson and Siegel (1984) suggested this approach for equity risk premium estimation noting that in the long run equity returns cannot be expected to be higher or lower than returns of companies in the real economy.

[8] Going concern means that a company is expected to have unlimited time-span.

3) **Demand-side models** – The equity risk premium is estimated using general equilibrium or macroeconomic models where investors want to be compensated for risk which they bear by investing into equities. Mehra and Prescott (1985) showed that based on demand-side model equity risk premium should be much lower than suggested by the historical method. This finding gave rise to the so called "equity premium puzzle".

4) **Surveys** – The equity risk premium is based on surveys of academics as well as professionals.

Depending on the method of estimation, equity risk premium can take on different values. What is more, value of equity risk premium can differ even in the context of one method as different parameters used in the estimation may lead to very different results. To document this, we will briefly discuss the value of equity risk premium derived by the individual methods.

Starting with the historical method, Siegel (2005)[9] calculated historical equity risk premium based on historical returns on stocks, bonds and bills, as shown in Appendix 1. The real return on stocks was stable over long periods with compound real return averaging 6.82% in the period 1802 to 2004, whereas over short periods of one to two decades the compound real stock return fluctuated from as low as minus 0.36% during a bear market in 1966 – 1981 to 13.62% during a bull market in 1982 – 1999. Unlike stocks, real returns on bonds, following a downward trend, deviated from the long term average not only over short periods but over long periods as well. Compared to bonds, T-bills real returns fell even more sharply from a compound real return of 5.12% in 1802 – 1870 to only 0.69% in 1926 – 2004.[10]

[9] Siegel (2005) calculates historical equity risk premium based on stocks, bonds and bills time series obtained from various sources. For the period 1926-2004 he uses data from the Center for research in Security Prices at the University of Chicago's Graduate School of Business on capitalization weighted indexes of all stocks listed on NYSE, Amex and NASDAQ. For periods preceding 1926 the data is taken from Schwert (1990) and Cowles (1937).

[10] Siegel (2005) explains the sharp drop of returns on T-bills compared to T-bonds with increased liquidity in T-bill market and increased inflation premium which the investors required when investing into long-term bonds after World War II.

As a result of relative stability of stock returns and decrease in bond and bill returns, the equity risk premium increased over time. Table 2 documents that the equity risk premium based on compound stock return over bond return averaged 2.24% in 1802-1870 and 4.53% in 1926-2004. The increase in equity risk premium based on equity return over bill return is even more remarkable. Overall, based on the evidence of 203 years preceding 2004, the real equity risk premium over bonds as measured by compound rates and arithmetic rates of returns averaged 3.31% and 4.5%, respectively.

Table 2. Historical Real Equity Risk Premium

	Equity risk premium in real terms			
	Bonds		***Bills***	
	Compound	***Arithmetic***	***Compound***	***Arithmetic***
Long periods to present				
1802–2004	3.31%	4.50%	3.98%	5.36%
1871–2004	3.86%	5.18%	5.03%	6.64%
Major subperiods				
1802–1870	2.24%	3.17%	1.90%	2.87%
1871–1925	2.89%	3.99%	3.46%	4.65%
1926–2004	4.53%	6.01%	6.09%	8.02%
Post-World War II				
1946–2004	5.39%	6.35%	6.27%	7.77%
1946–1965	11.21%	12.34%	10.86%	12.14%
1966–1981	3.81%	5.24%	–0.21%	1.51%
1982–1999	5.22%	5.03%	10.71%	11.38%
1982–2004	1.46%	1.90%	7.16%	8.32%

Source: Siegel (2005)

As shown in Table 2, equity risk premium varies depending on what time period, risk-free asset and method of estimation is selected. Furthermore, value of equity risk premium is also sensitive to what kind of benchmark is used to compute the equity returns. We comment on the individual factors effecting equity risk premium value further in the following points:

1. **Period length** – Equity risk premium is highly sensitive to the length of period over which it is estimated. Since both the equity and bond returns become volatile as the length of period shortens, there is a relative consensus among researchers

that the longest period possible is the most appropriate one; Ibbotson (2005) as well as Koller, Goedhart and Wessels (2005) advocate the full historical period documented.

2. **Risk-free asset** – Value of equity risk premium also depends on risk-free asset selection. McGrattan and Prescott (2003) note that short-term risk-free assets are used mainly for liquidity purposes and compared to long-term debt investments their volume held by investors is rather negligible. Therefore, they argue, it is the long-term bond's return which should be used in the equity risk premium calculation.

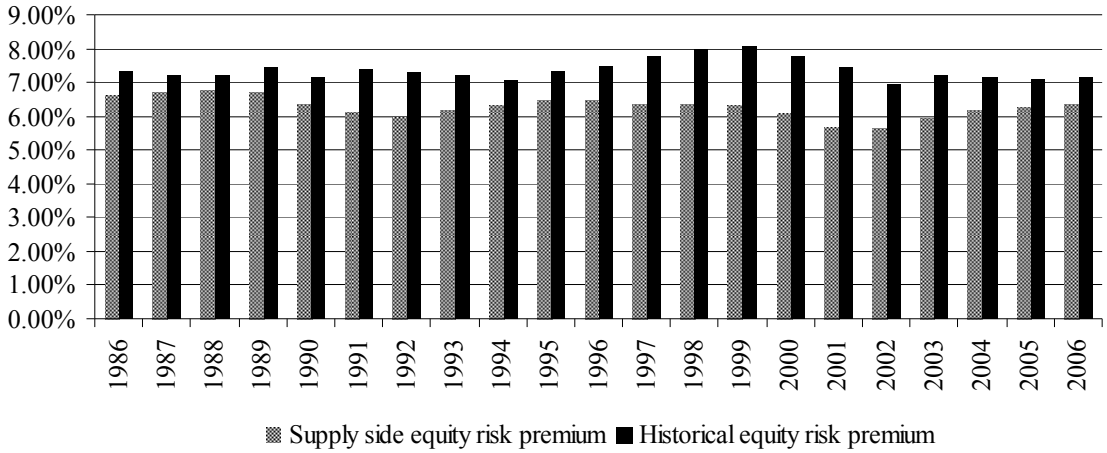
3. **Method of averaging** – The annual equity premium can be calculated either as an arithmetic mean or a geometric mean. The geometric mean is mathematically always lower than the arithmetic one unless all observations are the same. While some authors, such as Ibbotson (2005) argue that arithmetic mean equity risk premium is the best proxy of current equity risk premium, others recommend geometric average Damodaran (2008) or some prefer one of these two with some adjustments, such as Koller, Goedhart and Wessels (2005) who estimate the equity risk premium as an adjusted arithmetic mean[11].

4. **Equity benchmark** – Different values of equity risk premium could also be derived when using different proxies for equity returns. For instance, while Siegel (2005) takes capitalization-weighted indexes of all stocks listed on NYSE, Amex and NASDAQ as a source of equity returns, Ibbotson (2005) or Damodaran (2009) use S&P returns only (for detail refer to the Appendix 2)

The next approach to equity risk premium, the supply-side model, provides somewhat different estimates compared to historical equity risk premium estimates. As estimated by Ibbotson (2007), supply-side equity risk premium was lower compared to historical equity risk premium for periods beginning in 1926 and ending in different year (as shown in the Figure 1).

[11] Koller, Goedhart and Wessels (2005) argue that 5.5% seems to be reasonable approximation of historical equity risk premium, but the future equity risk premium should be lower, ranging from 3.5% to 4.5%.

Figure 1. Arithmetic Supply Side and Historical Equity Risk Premium for Periods Beginning in 1926



Source: Ibbotson (2007)

As in case of supply side models, also demand side models result in smaller estimates of equity risk premiums compared to historical equity risk premium. However, difference between the demand side model estimates and the historical estimates is substantial. Mehra and Prescott (1985) calculated equity risk premium at 0.35% which contrasts to any value derived by the historical method. In order to provide an explanation to this phenomenon, the so called equity premium puzzle, academics focused mainly on two directions of research: they either challenged the data pointing at different biases present in them or they tried to improve the theoretical model used.[12]

The last approach to equity risk premium estimation consists in surveying finance practitioners and academics. As an example we can mention a survey carried out by Welch (2000) based on which academics estimate arithmetic equity premium over short-term bonds of 7%, i.e. quite in line with the historical method results.

[12] Song (2007) provides a comprehensive list of studies dealing with both the issues: potential biases in the historical data vary from survivorship bias (survivorship bias refers to the fact that the historical equity risk premium was originally calculated based on the data of the successful US market) to transaction costs and taxes (sharp decline in taxes on dividends might have yielded higher equity premium), improvements in the model relate to habit formations (habit formation is based on assumption that an investor's utility is a function of current as well as past consumption level which makes the investor very risk averse to consumption risk, especially in short term. Once an investor gets used to certain level of consumption, it is hard to decrease it) or behavioral approach (behavioral approach for instance argues that investors are myopic and loss averse rather than risk averse).

All in all, despite being an essential parameter entering cost of equity estimation, equity risk premium is highly sensitive to methods and data used for its estimation. Therefore, cost of equity can differ considerably depending on what approach is adopted for equity risk premium calculation.

3.1.3 Beta

As follows from the discussion on CAPM, systematic risk of a security is represented by beta coefficient. In line with the CAPM theoretical background, beta is usually estimated by regressing excess returns of an asset against excess returns of the market portfolio in time. In practice, there are several questions regarding the input data for the regression which need to be answered: what proxy to use for the market portfolio, which risk-free to select, what time period to cover and what time interval to choose for computing the excess returns. Each of these factors may have a considerable impact on the estimated value of beta and thus need to be considered carefully (Pratt, 2008).

Beta estimated by the regression analysis is a historical beta. For the purpose of cost of equity estimation, however, prospective beta is needed. There are several ways how to arrive at such a beta. For illustration we can mention Blume method which is based on the assumption that betas have tendency to converge to the market beta equaled to 1 (Blume, 1971).

Another issue in beta estimation relates to the viability of regression analysis. In some cases beta cannot be estimated due to lack of data. This happens mostly in situations when a company subject to valuation is not publicly traded and thus no information on share price is provided by the market. As a result, a proxy for beta needs to be used – industry beta[13] is usually recommended (Ibbotson 2007). In order to determine industry beta, companies similar to the valued company in terms of industry sector need to be selected. Even in case a highly homogenous group of peer companies is collected, the companies do not necessarily have the same financing structure. As a result, application of average industry beta for the valued company may yield imprecise results. Therefore, unlevering and subsequent relevering of beta coefficient is

[13] Some authors recommend using peer group beta even in cases of a sufficient share prices history as beta based on regression does not have to be necessarily statistically significant.

recommended in order to reflect specific capital structure of company subject to valuation (Pratt, 2002).

3.1.4 Size Premium

As mentioned in discussion on the cost of equity theoretical background, the phenomenon of size effect, i.e. higher risk adjusted returns associated with smaller companies, was first reported by Banz (1981). Since then, abundant research has been conducted in order to provide further evidence as well as theory-based explanation of this empirically observed relationship.[14] Prevailingly, it has been argued that the empirical relationship can be explained with higher risk which investors associate with smaller companies and which they demand compensation for (Dijk, 2007). The size effect was also used to underlie the presence of serious flaws to the CAPM (Fama and French, 1991). As a matter of fact, it was shown that when estimating cost of equity, size of the underlying company needs to be taken into account.

As a result, the factor of size is usually considered in the application of cost of equity models (by definition, it is reflected in the Fama-French three factor model; it can also enter the build up method and it is usually a source of adjustment to CAPM). In case of CAPM, where the so called size premium is applied as an empirical correction of the model, the premium estimates are usually based on US market and stock data sorted in deciles depending on size. Table 3 illustrates size premiums calculated by Morningstar (2009) based on market capitalization of NYSE/AMEX/NASDAQ stocks.

Duff & Phelps (2008) document an inverse relationship between size of companies and their historical rate of returns using the universe of NYSE, AMEX and NASDAQ listed companies. However, since they argue that market capitalization is an imprecise measure of company size they sort the companies based on other measures as well, e.g., book value of equity; 5-year average net income; total assets; market value of invested capital; 5-year average earnings before interests, taxes; depreciation and amortization; sales; and number of employees. This approach turns out to be particularly helpful in case of privately held companies as company specific characteristics instead of unknown and thus guessed market value of equity can be used.

[14] A detailed review on the research is provided by Dijk (2007).

Table 3. Size Premium

Currency: USD m	**Market cap. of smallest company**	**Market cap. of largest company**	**Size premium**
Breakdown of deciles			
1-Largest	18,628	465,652	-0.36%
2	7,435	18,503	0.62%
3	4,229	7,360	0.74%
4	2,786	4,225	0.97%
5	1,850	2,786	1.54%
6	1,198	1,849	1.63%
7	754	1,197	1.62%
8	454	753	2.35%
9	219	453	2.71%
10-Smallest	2	219	5.81%

Source: Morningstar (2009)

3.1.5 Illiquidity, Control Effect

In most cases of cost of equity models, input parameters are derived from publicly traded markets. In order to estimate the control value of a company, some may argue that lower than market based cost of equity is appropriate to reflect the prerogatives which control owner can benefit from. However, as put by Pratt (2002), control owners are not willing to accept lower expected rate of return, they rather pay premiums to the company value for the potential capacity to decide on how cash flows should be generated. In other words, investors pay a premium for the option to exercise control and the discount rate is not effected (Pratt, 2002).

Furthermore, drawing data for cost of equity estimation from publicly traded companies is related to one other issue – illiquidity. Unlike in case of publicly traded companies, investors buying a stake in privately owned companies demand a discount for lack of liquidity/marketability of their shares. The percentage discount is usually applied to the value of company as if publicly traded. Even though an illiquidity premium can be applied to cost of equity, it is not recommended as determining its level is usually of spurious accuracy. While there are several empirical studies on lack of liquidity discounts applied to company value (Silber, 1991), illiquidity premium to cost of equity can be based just on subjective assessment and as such is not preferable.

3.2 Cost of Equity in Emerging Markets

Despite there is an abundant literature on cost of capital estimation, most of the methodology is based on assumptions which are hardly expected to hold in the conditions of emerging markets. Even though there has been an increase of studies focusing on cost of capital in emerging markets, an unambiguous and widely accepted framework has not been created yet. Therefore, it is not surprising that some authors recommend modifying cash flows rather than the discount rate in order to account for risks specific to emerging markets (Koller, Goedhart, and Wessels, 2005). Yet, cost of equity adjustments are commonly used by practitioners in the emerging markets (Pereiro 2002), which can be explained by cost-benefit reasons and the fact that cost of equity models, such as the capital asset pricing model, have become a standard benchmark worldwide.

In order to understand the cost of capital estimation under the circumstances of emerging markets, we need to understand the emerging markets first. Hence, we will examine how emerging markets differ from developed ones. Particularly, we will focus on efficiency and integration of the markets as these are key factors to be considered when estimating cost of capital. Consequently, we will discuss what new issues can be examined in terms of the parameters estimation compared to what has been discussed in case of developed markets.

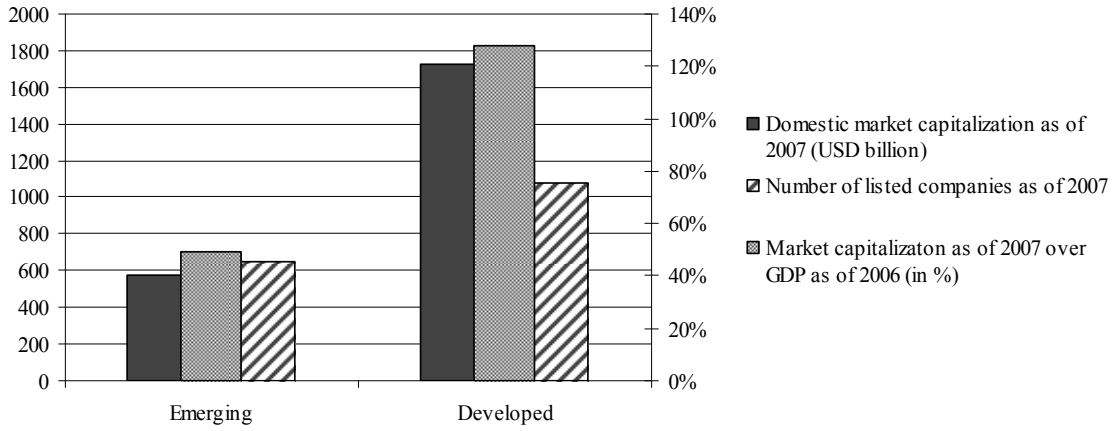
3.2.1 Emerging Market Efficiency and Integration

Given the abundance of emerging market definitions, instead of defining it we will focus on how an emerging market differs from a developed one. As shown in Figure 2 and Appendix 3, emerging market stock exchanges have on average substantially lower market capitalization, lower number of listed companies, and lower importance in the economy measured as a ratio of market capitalization to GDP.

Besides that, emerging markets have usually higher concentration as stock exchange activity comprises few stocks only. Given less stringent disclosure rules, information is less reliable and scarce. Furthermore, performance of stocks quoted on emerging markets is more volatile due to factors such as inflation risk, exchange risk, weak proprietary laws, corruption or restrictions to capital flows. For these reasons,

particularly the lower information availability, efficiency of emerging market is often called to question. Weak or even no market efficiency has been indicated in case of emerging markets (Bruner, *et al*., 2004).[15]

Figure 2. Comparison Of Emerging And Developed Markets



Source: World Federation of Stock Exchanges, ISI Emerging Markets, FTSE Emerging Markets

Furthermore, emerging markets differ from the developed ones in terms of their integration with other markets. In past few years there has been a steady increase in literature on financial market integration and its implications for asset pricing in emerging markets. Jong and Roon (2001) describe the integration as a gradual process from a segmented to an integrated market. The economic integration can be defined as a situation of decreased barriers for goods and services trade while the financial integration means that foreign investors have access to local capital markets as well as local investors have access to foreign markets.[16]

[15] We can also mention Bekaert and Harvey (2002) study which provides an evidence of lower informational efficiency of emerging markets as they find higher serial correlation of market returns in emerging countries compared to developed ones. They attribute the higher serial correlation of market returns to infrequent trading and slow adjustment to new information.

[16] Barriers discouraging foreigners to invest in a local emerging market might stem from legal measures, investor protection, information asymmetry, accounting standards, or risks such as liquidity risk, political risk, currency risk or economic policy risk (Bekaert, 1995).

Focusing on the financial integration, we can distinguish two extreme situations: a complete integration and a complete segmentation. Complete integration means that no barriers exist for foreigners to invest in a country and for local investors to invest abroad. Thus, expected returns depend on the covariance of the returns with the global market portfolio. Complete segmentation, on the contrary, means that barriers exist and the agents cannot invest freely in countries implying that the expected returns depend on the covariance of the returns with a local market portfolio.

Based on empirical evidence, emerging markets are not completely integrated (Jong and Roon, 2001) and are less integrated than the developed ones (Bruner, *et al*., 2008). Furthermore, it has been shown that the level of segmentation both in case of emerging markets and developed markets has been decreasing over time (Bekaert, Harvey and Ng, 2003), implying higher correlation of emerging market returns with the world returns and thus lower diversification benefits from investing in the emerging markets. It has also been shown that cost of capital decreased as barriers causing the market segmentation were removed (Bekaert and Harvey, 2000). We formulate the following hypothesis:

Hypothesis 1: *Cost of equity decreases over time.*

3.2.2 Market Integration Implication For Cost Of Equity

Understanding the integration process of emerging markets is essential for our analysis as the degree of integration underlies returns expected by investors from investing in emerging markets equities. In a segmented market to which foreign investors have no access, all risk lies with the local investors. Once a local market is opened to foreign investors, local investors can share risks with the foreign ones – Bekaert and Harvey (2000) estimated the cost of capital to decrease by 5 to 75 basis points as barriers causing the market segmentation were removed. As a result, if investors believe that markets are integrated and country specific unsystematic risk can be diversified away by holding a global portfolio, asset's sensitivity to the global market is relied on. On the other hand, investors rejecting the assumption of market integration believe that country

specific factors enter the pricing and the asset's return sensitivity to the local market rather than to the global one is referred to.

In case of CAPM, it has been shown that the choice between local and global market index has a substantial effect on the resultant cost of equity given the issue of market segmentation. Bruner, *et al*. (2008) also provide empirical evidence to support the assertion that the choice of proxy for a market portfolio matters. They show that for 99.5% of securities in emerging markets, the local market index is a better predictor of the excess return variation compared to global market index. In terms of the absolute differences in cost of equity capital, domestic CAPM yields on average 5.6% higher cost of equity capital than global one in case of emerging markets.

Still, there are researchers suggesting the use of a perspective of a global investor (Koller, Goedhart, and Wessels, 2005) as they do not see any better alternative and as they believe in the tendency of markets to integrate over time. Yet, the issue of market integration remains in the core of cost of capital estimation.[17] There is the global CAPM and local CAPM as variants of asset pricing model based on extreme assumptions on market integration and a variety of models between these two.

The global CAPM is based on assumption of completely integrated financial markets. Within the framework of global CAPM, an investor can invest in any market without incurring significant transaction costs. An investor holds a global market portfolio allowing him to diversify away the unsystematic risk stemming from country specifics. Practically it means that the global market index can be used as a proxy for market portfolio and risk-free rate used can be the global one. Given the characteristics of emerging markets as described above, we can hardly assume that global CAPM variant can be used without controversies. On the other hand, local CAPM uses local market index and local risk-free rate as it assumes no integration with other markets. Apart from these two, there is a variety of hybrid models based on different level of assumed integration and also availability of local market data. An overview of some of the models, as described by Pereiro (2002), is presented in Table 4.

[17] Harvey (1994) divides asset pricing models into three groups based on market integration assumption they adopt: assumption of complete segmentation (Black, Jensen and Scholes (1972), Fama and MacBeth (1973)), complete integration (Harvey (1991)) and partial segmentation.

Table 4. Cost of Equity Models in Emerging Markets

Model	Equation	Description
Global CAPM	$k_E = R_{fL} + \beta_{LL}(R_{ML} - R_{fL})$	Sum of global risk-free rate and global equity risk premium multiplied with beta of local company estimated against global market index.
Local CAPM	$k_E = R_{fL} + \beta_{LL}(R_{ML} - R_{fL})$	Sum of local risk-free rate and local equity risk premium multiplied with beta of local company estimated against local market index. Local risk-free equals global risk-free plus country risk premium.
Godfrey-Espinosa model	$k_E = R_{fL} + \beta\,(R_{MG} - R_{fG})$	Sum of local risk-free and global equity risk premium multiplied with beta coefficient estimated as a ratio of local and global market standard deviation of returns. Local risk-free equals global risk-free plus country risk premium.
Estrada model	$k_E = R_{fG} + \beta_{LG}(R_{MG} - R_{fG})$	Sum of global risk-free rate and global equity risk premium multiplied with downside risk measure estimated as a ratio of local and global semistandard deviations of returns.

Source: Pereiro (2002)

3.2.3 Risk-Free Rate

Unlike in case of the US market, government bonds in emerging markets usually suffer from insufficient liquidity. Furthermore, in case that global investor perspective is adopted, emerging market government bonds cannot be perceived as risk-free. As a result, other than local risk-free rate, usually the appropriate US one, as discussed above, is used. Risk-free rate derived from developed market needs to be adjusted for inflation differential in order to derive a risk-free rate in local currency.

Assuming that emerging markets are to some extent segmented and investor cannot diversify country specific risk away, applying the risk-free rate from developed market is just a part of the story. Country specific risk has to be reflected and country risk premium, as discussed bellow is applied.

3.2.4 Equity Risk Premium

Historical equity risk premiums cannot usually be estimated in case of the emerging markets. There is either insufficient amount of data or estimates computed on

the available data cannot be relied on due to large standard errors (Damodaran, 2003). Therefore, equity risk premium estimated for developed markets is used and in case that country specific risk is assumed to be non-diversifiable, resulting cost of equity needs to be adjusted for country risk premium.

3.2.5 Beta

Estimation of beta in the context of emerging markets includes the same issues which need to be tackled in case of the mature markets, plus some more. Choice of market portfolio proxy is even more challenging as emerging market indexes usually carry distorted information and also number of quoted companies is often insignificant. From this reason, industry betas are usually relied on and in case of publicly traded companies with sufficient liquidity, other than local market indexes are used as a reference market portfolio (Pratt, 2008). As comparable industry beta does not have to be necessarily available, in some situation, betas can be estimated based on company specific factors such as operational and financial risk. Betas derived in this way, however, do not reflect the market data and are qualitative in nature.

3.2.5 Country Risk Premium

Country risk premium can be measured in several ways. Pereiro (2002) mentions country bond default spread between the local sovereign bond denominated in the same currency as the benchmark sovereign bond issued by a developed country. Damodaran (2003) recommends using a combined approach of the bond default spread and relative equity market standard deviation as a basis for determining the country risk premium. This approach is based on assumption that country equity risk premium is larger than country default spread as volatility of equity market is larger than volatility of bond market.

Country risk premium derived with one of the above described methods can be applied to cost of equity equation in several ways. Damodaran (2003) distinguishes three ways of accounting for country risk premium depending on presumed exposure of subject to valuation to the country specific risk:

1. All companies in emerging market equally exposed to country risk – country risk premium is applied as an individual component;
2. Exposure to country risk proportional to exposure to other market risk – country risk premium is multiplied by beta as it is added to the equity risk premium;
3. Exposure to country risk specific for every company – country risk premium is added as another variable to the regression analysis resulting in a multifactor model.

3.2.6 Size Premium

Size premium data as provided in empirical studies such as that of Duff & Phelps (2008) may be used in order to determine size premium over CAPM internationally. However, it has been shown that size effect may vary depending on country (Dijk, 2007) and thus applying the size premium estimated on US data for other markets may yield imprecise estimates of cost of equity[18].

[18] That holds even in case that returns are converted so that one is consistent in terms of exchange rates used.

4. Existing Empirical Research

"The difference between theory and practice is in theory somewhat smaller than in practice."

Frank Westphal

The following section provides a detailed overview on cost of equity surveys. Even though our analysis consists in different methodology, the aim is the same: to understand what methods of cost of equity are used and how key parameters entering the cost of equity calculation are estimated. For comparison purposes, we discuss the methodology as well as findings of the studies and first then approach to perform our empirical analysis.

4.1 Cost of Equity Estimation Practices

Since William F. Sharpe wrote his doctoral thesis on what later Eugene Fama called the Capital Asset Pricing Model, there has been a vivid discussion among academia on the validity and appropriateness of the model. Meanwhile, practitioners started to apply CAPM in their day to day activities ranging from capital budgeting to M&A business valuations. A natural question followed. To what extent have professionals adopted the theoretical concepts developed by researchers? In order to investigate the behavior of finance practitioners and compare it to developments in finance theory, in other words to investigate the gap between what academic researchers tell finance practitioners to do and what practitioners really do, several surveys have been conducted. Below we present results of the key surveys on cost of capital estimation in practice. For details on surveys conducted in US and Canada, please refer to Table 5, and for details on surveys among European companies, see Table 6.

The first surveys, which were conducted in the early 80s, focused on US and Canadian firms and their corporate finance practice. Subsequently, researchers, curious whether existing insights into the finance practice hold also outside the North America, conducted surveys elsewhere as well.

4.1.1 Practices among US and Canadian Firms

The first surveys, which were conducted in the early 80s, focused on US and Canadian firms and their corporate finance practice. Based on a survey conducted among US firms in 1980 by Gitman and Mercurio (1980), CAPM with 36% was the most popular method of cost of capital estimation. Yet, a similar percentage of surveyed practitioners, i.e., 32%, used also dividend discount model. 23% of respondents applied market return adjusted for risk, and E/P ratio and cost of debt adjusted for risk premium of equity was used by 16% and 13% of respondents, respectively.

Table 5. Practices among the US and Canadian Firms

Authors	**Gitman and Mercurio (1980)**	**Gitman and Vandenberg (2000)**	**Bruner, *et al.* (1998)**	**Graham and Harvey (2001)**
Country	*US*	*US*	*US, Canada*	*US, Canada*
CAPM	36%	65%	81%	74%
CAPM including some other risk			4%	34%
APT		1%		
Market return adjusted for risk	23%	14%		
Average historical return				39%
Dividend discount model	32%	14%		16%
Investor expectations				14%
Regulatory decisions				7%
E/P ratio	16%	3%		
Cost of debt + risk premium for equity	13%	17%		
n.a.			15%	
Survey date	*1980*	*1997*	*1998*	*1999*
Sample size	*1,000*	*1,000*	*32*	*4,440*
Number of respondents	*177*	*111*	*27*	*392*
Response rate	*18%*	*11%*	*84%*	*9%*

In order to investigate developments of corporate finance practice in time, Gitman and Vandenberg (2000) replicated the survey seventeen years later and arrived at an almost twice as high percentage of practitioners relying on CAPM. In 1997, 65% of US firms applied CAPM as a method of cost of capital estimation. The increased popularity of CAPM was accompanied by a decrease in use of other techniques, namely the

dividend discount model, the E/P ratio, and the market return adjusted for risk. The cost of debt plus a risk premium for equity was, besides CAPM, the only method which increased in popularity.

Also Bruner, *et al*. (1998) showed that despite literature on asset pricing has been suggesting several drawbacks of CAPM, use of CAPM has grown substantially over time. In 1998 they conducted a telephone survey and found out that 81% of respondents used CAPM and 4% relied on CAPM including some other risk. Thus in comparison to Gitman and Mercurio (1980), the percentage of respondents relying on CAPM grew significantly. The comparison of Bruner, *et al*. (1998) findings with results of other studies may be, however, biased as only a small sample of the most financially sophisticated companies was used in their survey. Unlike Bruner, *et al*. (1998), Graham and Harvey (2001) based their analysis on a large sample of 4,440 US and Canadian firms and provided a more reliable evidence of the CAPM popularity. Based on their survey conducted in 1999, 74% of respondents relied on CAPM, 39% used average historical return and 34% used CAPM adjusted for some other risk.

The large number or responses enabled Graham and Harvey to perform a statistical analysis of the data obtained. As expected, significant differences between large and small and private and public companies were identified. Private and small companies were less likely to use CAPM compared to public and big ones. The authors explain that the disparity between private and public companies can be attributed to the fact that private companies cannot run regressions on its own stock returns but instead need to rely on beta estimates for a group of comparable companies.

4.1.2 Practices among European Firms

Subsequently, researchers, curious whether existing insights into the finance practice hold also outside the North America, conducted surveys elsewhere as well. In line with Graham and Harvey survey design, Brounen, *et al*. (2004) replicated the survey on a sample of 2,500 European companies. Out of 313 respondents, there were practitioners from UK, Netherlands, Germany and France. As in case of the US sample, the most popular approach to cost of capital estimation was CAPM. Graham and Harvey (2001) and Brounen, *et al*. (2004) results differ, however, in terms of the size of the

CAPM dominance. While in case of the US and Canadian survey 74% of respondents relied on CAPM, in case of European companies only 43% of respondents used CAPM on average. Furthermore, when comparing survey results of the individual countries, German firms preferred investor expectations to CAPM. Except for UK, it was investor expectations which the surveyed companies viewed as the second mostly used approach. In line with the US and Canadian survey results, European firms relied frequently on average historical returns and CAPM including some other risk. Overall, Brounen, *et al*. (2004) provided evidence that despite the dominance of CAPM as an approach to cost of capital estimation among European companies, the approach is relied on by a smaller percentage of respondents than in case of US and Canada.

Table 6. Practices among European Firms

Authors	**McLaney, *et al*. (2004)**	**Brounen, *et al*. (2004)**				**Truong, *et al*. (2008)**
	UK	*UK*	*Netherlands*	*Germany*	*France*	*Australia*
CAPM	47%	47%	56%	34%	45%	72%
CAPM including some other risk		27%	15%	16%	30%	1%
APT						
Market return adjusted for risk						
Average historical return		31%	31%	18%	27%	11%
Dividend discount model	28%	10%	11%	10%	10%	9%
Investor expectations		19%	45%	39%	34%	
Regulatory decisions		16%	4%	0%	16%	4%
E/P ratio	27%					15%
Cost of debt + risk premium for equity						47%
Cost of debt						34%
Survey date	*1997*	*2003*	*2003*	*2003*	*2003*	*2004*
Sample size	*1,292*				*2,500*	*356*
Number of respondents	*193*	*68*	*52*	*132*	*61*	*87*
Response rate	*15%*				*13%*	*24%*

As well as Graham and Harvey (2001), Brounen, *et al*. (2004) performed a statistical analysis and arrived at results similar to those obtained by Graham and Harvey. Also European sample documents that CAPM application tends to rise with firm size. Specifically, Brounen, *et al*. (2004) showed that use of CAPM is positively related to

firm size, CEO tenure and degree of shareholder orientation. Multivariate regression also revealed that national differences in cost of capital estimation are weak.

Another European survey was conducted on a sample of UK companies by McLaney, *et al*. (2004). The survey documented that 47% of 193 respondents relied on CAPM which is in line with results derived by Brounen, *et al*. (2004). Overall, European companies appear to prefer CAPM to other approaches to cost of capital estimation, yet to a lesser extent compared to their North American counterparts[19].

4.1.3 Practices among Financial Advisors and Investors

All the above mentioned surveys focused mostly on CEOs and CFOs of companies and their techniques to cost of capital estimation. However, there are also other practitioners who need to estimate cost of capital for other than capital budgeting purposes. These include for instance financial advisors, private equity investors or corporate financial investors.

As part of their survey of cost of capital practice, Bruner, *et al*. (1998) conducted also a survey of leading US financial advisors which indicated that CAPM is a dominating approach also among this group of practitioners. Based on the survey, 80% of 10 respondents relied on CAPM and 20% used other techniques including CAPM based ones. This result was in line with the findings based on a sample of US companies. Another survey was conducted by Block (1999) who surveyed 297 financial analysts out of which 31% viewed CAPM as very important or moderately important. Interestingly, 48% of respondents assessed CAPM as not very important and 21% viewed it as unimportant. This result contradicts the findings of Bruner, *et al.* (1998) which suggest high usage of CAPM among financial advisors. Difference between the findings of these two surveys could be explained either by different target respondents (10 most active financial advisors in case of Bruner, *et al*. (1998) versus 297 financial analysts in case of Block (1999)) or by different sets of questions ("what is used" question in case of Bruner

[19] There have been many surveys conducted outside the North America and Europe investigating the gap between practice and science in terms of cost of capital estimation. For instance, Truong et al. (2008) conducted a survey among Australian companies and found out that the most popular approach to cost of capital calculation is CAPM with 72% respondents applying it.

at al. (1998) versus "what is important" in case of Block (1999)). However, without detailed knowledge of the surveys design, we are not able to infer from the two surveys that one is more reliable than the other.

Cost of capital practice among European investors was investigated by Petersen, Plenborg and Scholler (2006). A survey of 42 respondents indicated a relative popularity of CAPM. 71% of surveyed private equity and corporate financial investors adopt CAPM and 46% of respondents rely on their experience. Some respondents argued that "common sense approach" is appropriate for smaller firms where reliable beta estimates cannot be obtained easily. Peterson, Plenborg and Scholler (2006) conclude that despite the CAPM popularity, the difference between the two techniques remains insignificant.

4.1.4 Summary of Practices among Firms, Analysts and Investors

Based on the surveys' overview, there is abundant empirical evidence that CAPM is the most popular method of the cost of equity estimation among firms, analysts and investors in the US, Canadian as well as Western European markets. Other commonly used methods include dividend discount model, market return adjusted for risk, average historical return, etc. Our first hypothesis concerns the cost of equity estimation techniques among valuation experts.

Hypothesis 2: *Proportion of valuation experts using CAPM is higher than proportion of experts using other cost of equity estimation methods.*

As the surveys' overview reveals, several surveys have performed statistical analysis of the data obtained and examined potential factors which may effect preference for certain cost of equity estimation method, e.g. Graham and Harvey (2001) found that private and small companies were less likely to use CAPM compared to public and big ones. The preference for a certain method of cost of equity estimation can also correlate with the selection of the valuation method. As described in the section on valuation approaches, the income approach to valuation includes several methods and the DCF method is generally perceived as the most challenging one, particularly in comparison to income capitalization method. Furthermore, as discussed in the section on cost of equity

models, CAPM appears to be relatively complex in comparison to other commonly used methods of cost of equity estimation such as build up method (build up method represents a heuristic approach to cost of equity estimation and as such is not dependent on external data to such an extent as CAPM). In other words, as DCF is relatively more complex compared to other commonly used income methods of valuation, e.g., income capitalization method, CAPM is relatively more complex compared to other commonly used methods of cost of equity estimation, e.g. build up method. Since income capitalization model is technically less challenging, it is often chosen as a complementary method to some other valuation approach. In that case, build up method of cost of equity estimation appears to be preferred due to its greater presumed simplicity compared to CAPM. This leads to our second hypothesis:

Hypothesis 3: *Proportion of DCF valuation models which use CAPM for cost of equity estimation exceeds the proportion of income capitalization models which use CAPM.*

4.2 Parameters of Cost of Equity Estimation

Based on the surveys as outlined above, we can conclude that CAPM is the most popular approach to cost of capital estimation among practitioners. However, it is not clear if it is applied correctly. In order to understand the way how practitioners derive cost of capital from CAPM, researches have included specific questions on inputs to CAPM. These include risk-free rate, beta and market risk premium estimates.

4.2.1 Risk-Free Rate, Beta Factor and Equity Risk Premium

Bruner, *et al*. (1998) provided evidence that both corporations and advisors in US and Canada preferred yields of long term Treasury bonds to yields of short term Treasury bills as a proxy for risk-free rates. As shown in Table 7, in case of beta estimates both corporations and advisors relied to large extent on a published source rather than own calculations and in case of market risk premiums some fixed rate was mostly chosen. These finding are consistent with findings of a survey conducted by Truong, *et al*. (2008)

on Australian companies in 2004: Australian companies also preferred long term bond yields as a proxy for risk-free rate and used mostly public sources for beta estimates.

Table 7. Parameters of Cost of Equity Estimation

Parameters	Estimation					
Risk-free rate	*90-Treasury bill*	*10Y Treasury bond*	*20Y Treasury bonds*	*10-30Y Treasury bonds*	*30Y Treasury bonds*	*Other*
Corporations	4%	33%	4%	33%		26%
Advisors	10%			30%	40%	20%
Beta	*Published source*	*Self calculated*	*Fundamental beta*	*Advisor's estimate*	*Other*	
Corporations	52%	30%		3%	15%	
Advisors	40%	20%	30%		10%	
Risk premium	*Fixed rate*	*Arithmetic mean*	*Geometric mean*	*Arithmetic and geometric*	*Other*	
Corporations	44%	4%	4%	10%	38%	
Advisors	60%	10%			30%	

Source: Bruner, *et al*. (1998)

4.2.2 Beta Factor in Case of Privately-Held Companies

Peterson, Plenborg and Scholler (2006) focused on inputs for CAPM estimation which are used by private equity and corporate financial investors in Denmark when valuing privately-held companies. Unlike in case of publicly traded companies, betas for privately-held companies cannot be derived from the market directly. Instead, practitioners need to estimate beta based on a peer group betas or using some other methods. Peterson, Plenborg and Scholler (2006) documented that peer group betas are mostly relied on. However, 56% of respondents also mentioned own experience as a way how to estimate betas and 32% derive betas based on fundamental drivers effecting operational and financial risk of a subject company. Since betas derived from a group of comparable companies do not reflect capital structure of a company subject to valuation, they need to be adjusted appropriately. However, 29% of respondents using peer group for beta estimation do not adjust beta for specific capital structure.

4.2.3 Unsystematic Risk

Since owners of privately-held companies are often not well-diversified investors, they should be compensated for some unsystematic risk which is not taken into account by CAPM. Peterson, Plenborg and Scholler (2006) found out that most respondents consider unsystematic risks as irrelevant and only few adjust the cost of capital derived by CAPM for these risks.

This finding is in line with results of Graham and Harvey (2001) and Brounen, *et al*. (2004) who documented a tendency to omit most specific risk factors among surveyed companies in US, Canada and Europe. These specific risk factors are sources of risk other than market risk and range from Fama and French (1991) fundamental factors and Chen, Roll and Ross (1986) economic forces to Jegadeesh and Titman (1993) momentum.

Table 8. Factors in Multibeta CAPM

	Discount rate	Cash flow	Both	Neither
Interest rate risk	15.3%	8.8%	24.7%	51.3%
Foreign exchange risk	10.8%	15.3%	18.8%	55.1%
GDP or business cycle risk	6.8%	18.8%	18.8%	55.6%
Risk of unexpected inflation	11.9%	14.5%	11.9%	61.8%
Size	14.6%	6.0%	13.4%	66.0%
Commodity price risk	2.9%	18.9%	10.9%	67.4%
Term structure risk	8.6%	3.7%	12.6%	75.2%
Distress risk	7.4%	6.3%	4.8%	81.5%
"Market to book" ratio	4.0%	2.0%	7.1%	86.9%
Momentum	3.4%	2.9%	4.9%	88.9%

Source: Graham and Harvey (2001)

Both Graham and Harvey (2001) and Brounen, *et al*. (2004) found that multibeta CAPM, which takes into account also other risks than market risk, is used by many companies. In case of Graham and Harvey (2001) multibeta CAPM was always or almost always used by more than 30% companies (compared to 74% using CAPM). The survey examined risk factors considered by respondents in the mutlibeta CAPM calculation and arrived at findings which are summarized in Table 8. Interest rate risk, size, inflation risk and foreign exchange rate risk are mostly considered by companies when adjusting cost

of capital. Some companies adjust cash flows rather than cost of capital. In that case, the adjustment is often related to commodity price risk, GDP or business cycle risk and foreign exchange risk. Only few companies responded that they take market to book ratio, momentum or distress risk into account as risk factors. Findings of the survey on European companies (Brounen, *et al*. 2004) are consistent with Graham and Harvey (2001) results.

4.3 Methodological note

In the studies described above, researchers have almost exclusively relied on survey-based analysis. As noted by Graham and Harvey (2000), survey approach well complements commonly used large sample studies and less common clinical studies. Application of large sample studies as well as clinical studies has its pros and cons. In case of both the types of empirical analysis, there is a trade-off between statistical power and detail of inference which is provided. While large sample studies are statistically powerful, they do not enable analysis at such a detailed level as clinical studies do. Clinical studies, on the contrary, have very little statistical power but due to qualitative questions are capable of revealing some unique aspects which would most probably be omitted by large sample studies.

Survey-based analysis thus strikes a happy medium. Graham and Harvey (2000) argue that survey can be designed in such a way that sample is of satisfactory size and at the same time qualitative questions are viable. However, even if this is the case, surveys are vulnerable to biases which may be hard to be mitigated. Commonly mentioned biases related to survey approach include selection bias or response bias. Selection bias occurs when sample is not representative of the population and response bias is a result of flawed measurement techniques.

Non-response bias is one example of selection biases and it appears to be a serious issue in case of the surveys described. Non-response bias occurs when respondents differ in some relevant way from the non-respondents. It can result from the lack of motivation and ability to respond and it can be mitigated by response rate maximization. Response rate in some cases of the cost of equity surveys does not exceed 10 per cent, implying that non-response rate can be a potential problem. However, there

are several techniques recommended how to mitigate the non-response bias and how to investigate on its presence (for instance, Graham and Harvey (2001) argue that based on their examination, despite the low response rate their analysis does not suffer from non-response bias).

Another potential problem is related to the response bias. Questions included in the survey need to be carefully structured so that risk is minimized that they will be misunderstood. As in case of the non-response bias, response bias can be mitigated to some extent. What cannot be fully mitigated is the very essence of the survey approach: survey-based analysis measures beliefs of respondents rather than their actions. Even though the aim of the surveys on the cost of equity estimation practices is to shed light on what estimation techniques are used in practice, the surveys rather help to investigate what practitioners believe they use or they should use (which does not necessarily coincide with what they use in real).

5. Institutional Settings and Legal Framework of Business Valuation in the Czech Republic

Law cannot persuade where it cannot punish.

Old English saying

The aim of this section is to shed light on the institutional settings and legal framework of business valuation in the Czech Republic. First, we will briefly discuss situations in the Czech market which may entail business valuation. Then, we will focus on business valuation as required by the Commercial Code No. 513/1991 Coll. Since business valuation for the purposes of the Commercial Code No. 513/1991 Coll forms the basis of our empirical analysis as it follows in the next section, we will in detail examine the requirements of the code as well as other legal provisions related to the appraising profession in the Czech Republic.

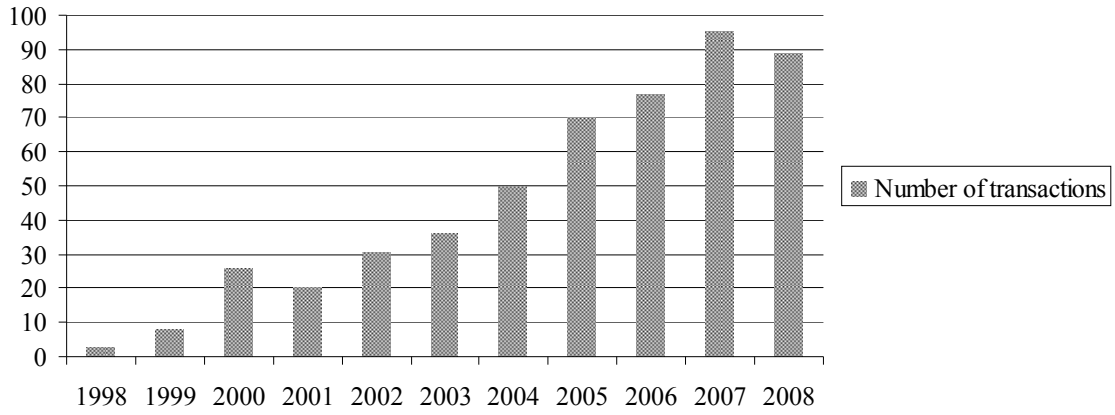
5.1 Surge in Business Valuations

Since the Velvet Revolution in 1989 triggered the transformation process of the Czech economy from a centrally planned to an open market one, expertise in business valuation has become increasingly important for many groups of economic agents. This trend can be documented by the level of M&A activity for which business valuation services are entailed. As Figure 3 shows, the activity of the Czech M&A market, as measured by the number of major M&A transactions, grew between 1998 and 2008. Except for a drop in the number of transactions in 2008, which reflects the impact of the current financial crisis on the M&A activity, the number of transactions grew continuously from 2001 onwards. As the market activity grew, so did the demand for finance practitioners performing various valuation tasks related to M&A.

However, private as well as public companies needed to be valued also for other than M&A purposes, e.g., corporate analysts have been performing valuation tasks for capital budgeting purposes, financial advisors have been asked to provide valuation services in order to assist their clients in litigation processes. Furthermore, valuation has

become an important part of financial reporting as companies reporting under IFRS or US GAAP are required to perform purchase price allocation process for every material transaction and under IAS 36 are required to test assets such as goodwill for impairment.

Figure 3. Development of M&A Activity in the Czech Republic



Source: Mergermarket

Yet, a substantial part of valuation tasks performed have been legally required, mainly by the Commercial Code No. 513/1991 Coll. [20]

5.2 Commercial Code[21] Valuation Requirements

Based on the Commercial Code No. 513/1991 Coll., the Transformation Code No. 125/2008 Coll., and the Mandatory Public Offer Code No. 104/2008 Coll., in certain situations, an expert's opinion shall be provided. Such situations include:

[20] There are also other reasons for valuation. For instance, valuation is required for the purposes of Inheritance, Donation and Real Estate Transfer Tax Code No. 173/1992 Coll. Such a valuation has, however, an administrative character and is not built on fair market value concept.

[21] In 2008 some sections of the Commercial Code Act No. 513/1991 Coll., which we will refer to, were repealed and were replaced by the Transformation Code Act No. 125/2008 Coll. and the Mandatory Public Offer Code No. 104/2008 Coll.

1. **In-kind contribution**[22] - Based on Section 59 of the Commercial Code No. 513/1991, the value of a nonmonetary contribution to a limited liability company or a joint stock company shall be based on opinion prepared by an expert. The expert shall be independent of the company and shall be appointed by a court based on the suggestion of the founder or the company. Remuneration for the preparation of expert's opinion shall be paid by the company on the basis of a contract. The expert's opinion shall consist of at least:
    - a description of the in-kind contribution;
    - methods of valuation used,[23]
    - the amount at which such nonmonetary contribution is valued.
2. **Division** – Based on Sections 253 – 256 of the Transformation Code No. 125/2008 Coll. (formerly Section 69c of the Commercial Code No. 513/1991 Coll.), in the case of division of a joint stock company or a limited liability company, the company being divided shall have the business assets valued by an expert's opinion as at the day of the closing of the financial statements. The expert's valuation shall also include valuation of business assets to be passed to the successor companies. In case of division by spin off of a joint stock company or a limited liability company, the company shall have solely the business assets being spun off into one or more companies valued by an expert's opinion.
3. **Conversion of legal form –** Based on Section 367 of the Transformation Code No. 125/2008 Coll. (formerly Section 69d of the Commercial Code No. 513/1991), in the case of conversion of legal form to limited liability company or joint stock company, the company shall have the business assets valued by an expert's opinion as at the day of the conversion preparation.
4. **Squeeze-out** – Based on Section 183i of the Commercial Code No. 513/1991 shareholder owning at least 90% of a company is entitled to ask the board to

[22] In-kind contribution is a non-monetary contribution in a company in order to acquire or increase an ownership stake.

[23] Apart from the methods used, the expert's opinion shall also contain stating whether the value of the in-kind contribution derived by use of these methods is equal to at least the total issue price of the shares to be issued or to the amount of a member's contribution to the limited liability company's registered capital.

arrange a general meeting which shall decide on transfer of the remaining shares of the company to the majority shareholder. The board decision shall be documented by a notary and the document shall include expert's opinion or other rationale regarding the level of consideration. In case of a company which is not publicly traded, the majority shareholder shall substantiate the adequacy of consideration with an expert's opinion. In case of a publicly traded company the Czech National Bank approval is required. The Czech National Bank reviews how well the level of consideration is substantiated by the majority shareholder.

5. **Mandatory public offer** – Based on Mandatory Public Offer Code No. 104/2008 Coll. and Section 183a of the Commercial Code No. 512/1991 Coll., price or exchange ratio stated in a mandatory tender offer shall be commensurate with the value of the subject shares and shall be documented by an expert's opinion. In case of a publicly traded company, the mandatory public offer shall be approved by the Czech National Bank and the expert's opinion shall be prepared only if requested by the Czech National Bank.
6. **Related party transaction** – Based on Section 196a of the Commercial Code No. 512/1991 Coll., in case of related party transaction involving property with value equal to at least one-tenth of the company's subscribed registered capital at the day of acquisition, an expert's opinion shall be prepared in order to determine the value of such property.
7. **Transfer of business assets to a sole shareholder –** Based on Sections 361 and 356 of the Transformation Code No. 125/2008 Coll. (formerly Section 69d of the Commercial Code No. 513/1991), in case of joint stock company and limited liability company 90% plus shareholder taking over business assets of a winding up company shall provide the other shareholders with adequate cash settlements and the adequacy shall be substantiated by an expert's opinion.
8. **Merger –** Based on Section 73 of the Transformation Code No. 125/2008 Coll. (formerly Section 69a of the Commercial Code No. 513/1991), an expert's opinion shall be prepared both in the case of a merger by acquisition (a merging joint stock company or limited liability company shall have the expert's report prepared if new shares will be issued by the successor company or entitlement to

new business share will be created) and in the case of acquisition by the formation of a new company. Transformation Code No. 125/2008 Coll. (formerly Section 220c of the Commercial Code No. 513/1991) may also require expert examination of the merger contract documented in an expert's opinion.

In most situations as described above, the appointment and remuneration of a valuation expert as well as the content of an expert's opinion shall be subject to similar provisions as in case of in-kind contribution. The following paragraphs briefly summarize the status of valuation experts in the Czech legislation.

5.2 Status of Valuation Experts among Valuation Professionals

5.2.1 Valuation Experts versus Appraisers

The institutional settings concerning valuation experts in the Czech Republic does not provide an easy survey. Unlike in case of legal profession where a single professional platform of the Czech Bar Association exists, the Czech valuation experts and appraisers associate in four different chambers[24]. As it happens, multiple chambers represent multiple and sometimes contradictory points of view on valuation practice and such a setting can hardly lead to improvements in the overall quality of Czech valuation professionals.

The main reason for this situation is the legislative treatment of appraising profession. On one side, there are valuation experts as regulated by the Experts and Translators No. 36/1967 Coll., on the other side there are appraising license holders as based on the Trades Licensing Act No.455/1991 Coll. Therefore, we can distinguish between experts ('znalci') and appraisers ('odhadci') who differ in terms of valuation tasks they are entitled to perform and qualifications they need to fulfill in order to become an expert or an appraiser[25]. Both experts and appraisers can provide valuation

[24] The four chambers are: The Czech Chamber of Property Appraisers, The Chamber of Expert Witnesses CR, Association of Appraisers and Experts CR, and Czech Society of Certified Appraisers.

[25] Both the terms 'experts' and 'appraisers' are used interchangeably when being translated from the Czech words 'odhadci' and 'znalci'. For the sake of transparency, we will use the term 'experts' for professionals

services to private as well as public sector, however, in some cases valuation can be performed by valuation experts only. Such cases include valuation for the purposes of the Commercial Code No. 513/1991 Coll. For the purpose of our work, when referring to the valuation professionals further in the text we will refer solely to the valuation experts in the sense of the Experts and Translators Act No. 36/1967 Coll.

5.2.2 Statistics on Valuation Experts and Valuation Institutes

Considering the size of the country, the Czech Republic has a relatively large number of valuation experts. Based on the statistics of the Ministry of Justice of the Czech Republic[26] as of June 2009 there were 10,535 valuation experts in the Czech Republic. The largest group of valuation experts specializes in property valuation (3,090 real estate valuation experts and 256 business valuation experts). Apart from the valuation experts, there are also 82 business valuation institutes and 57 real estate valuation institutes.[27]

5.2.3 Legal Regulation of Valuation Experts and Valuation Institutes

The Experts and Translators Act No. 36/1967 Coll. defines among others the appointment and suspension process or rights and responsibilities of experts, expert institutes and translators. The current legal regulation covers not only experts in the field of valuation but any other experts such as psychologists or physicians and as such it is rather general. Given the fact that it was put into effect in 1967 and since then it has been amended only marginally[28], it is also rather obsolete. Political as well as economic situation framing its conception in the 1970's is far from comparable to current situation of market economy.

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acting under the Experts and Translators Act No. 36/1967 Coll. and the term 'appraisers' when referring to professionals complying with the Trades Licensing Act No.455/1991 Coll.

[26] Statistics on experts and institutes can be gathered based on data on the web pages of Ministry of Justice www.justice.cz.

[27] Both in case of valuation experts and valuation institutes, a valuation expert or a valuation institute can have several specializations.

[28] The 2006 amendment increased the expert compensation by the valued added tax.

As a result, the current legal regulation fails to reflect the prevailing market and legal conditions and can barely contribute to the quality of expert opinions which are often the key evidence considered in a trial. Therefore, an amendment of the Experts and Translators Act No. 36/1967 Coll. has been prepared and is currently being presented to the Czech government. The amendment introduces several modifications of the current legal regulation which should lead to a higher quality of the experts' work. The modifications as described on the web pages of the Ministry of Justice www.justice.cz consist of less general regulation particularly in the area of qualification, responsibilities and quality control of the experts and the expert institutes:

1. **Qualification** - According to the current regulation, expert and expert institutes are appointed by the Minister of Justice or by chairmen of regional courts. The regulation is rather vague in terms of the qualifications and professional experience an expert needs to have in order to be eligible for the appointment. Therefore, the amendment introduces clearly defined professional qualification required (such as number of years of professional experience, university education, or graduation in specific valuation course). Furthermore, continuous education is required.

2. **Quality control** – The current legal regulation defines a supervisory board appointed by the Minister of Justice for the quality check purposes. However, the rights and responsibilities of the board are defined rather vaguely with very general definition of the suspension process. The amendment introduces qualification verification if loss of expert's qualification is indicated. In case that the expert does not pass the verification, exclusion from the register follows. Furthermore, during the verification process, the expert activity might be banned. Experts not following the enforceable act on experts and translators may be fined.

3. **Liability –** Under the current legal regulation experts and expert institutes are strictly liable for the content of the expert opinion. An obligatory insurance for liability damage is introduced by the amendment.

4. **Expert institutes –** Under the current legal regulation it is not clear who personally performs the valuation for the expert institute and the valuation can be

performed by authorized person who does not have any valuation qualification. According to the amendment, expert institutes not clearly defining the experts responsible for the valuation will be excluded from the register.

5. **Register** – Experts and expert institutes are listed in one of the 9 registers currently used (8 registers on the regional level and one register on the Ministry of Justice level). The amendment introduces one global register instead which shall be administered by the Ministry of Justice.

As the comparison of the proposed amendment to Experts and Translators Act No. 36/1967 Coll. with the current situation suggests, it is questionable whether the legal and institutional framework of the valuation profession in the Czech Republic has provided sufficient conditions for improving quality and credibility of the valuation experts' work and for ensuring their independency and professionalism. Furthermore, the analysis of the legal framework of business valuation in the Czech Republic shows that valuation experts and expert institutes differ neither in terms of professional requirements nor in terms of authorization to perform various valuation tasks for the Commercial Code purposes. We formulate the third hypothesis as:

Hypothesis 4: *Experts apply cost of equity models in the same proportion as expert institutes.*

5.3 Valuation Guidelines

As discussed above, the legal regulation has been rather vague and multiple professional chambers could barely fulfill their monitoring role. In such a situation, valuation guidelines might play an essential role. Apart from some brief instructions on what an expert's opinion shall include, i.e., a description of the subject of valuation, methods applied, and the value estimated, neither the Commercial Code No. 513/1991 Coll., nor the Transformation Code No. 125/2008 Coll. is specific about appropriate valuation methods which an expert shall use in order to derive the value correctly. Neither do they suggest any valuation guidelines to be followed. In other words, apart from some specific cases, there are no binding valuation guidelines and in order to

benchmark valuation procedures to some valuation standards, Czech experts usually rely on the following:

1. International Valuation Standards;
2. Czech National Bank Guidelines;
3. Property Valuation Code No. 151/1997 Coll.

5.3.1 Property Valuation Code and Valuation Bill

At first sight, there is the Property Valuation Code and the Valuation Bill to be followed. However, both the code and the bill apply primarily in case of valuation for purposes other than those defined by the Commercial Code No. 513/1991 Coll. and the Transformation Code No. 125/2008 Coll (e.g., Real Estate Tax Code purposes). Given the absence of widely accepted Czech valuation standards, Czech expert's opinions have been referring to international valuation standards such as the European Valuation Standards by the European Group of Valuers Associations, the International Valuation Standards by the International Valuation Standards Committee, or the Business Valuation Standards by the American Society of Appraisers.

5.3.2 International Valuation Standards

International valuation standards provide general valuation methodology framework[29]. The aim of the international valuation standards developed is to develop a guidance of valuation best practice which will result in consistent application of valuation methodologies by valuation professionals. These valuation standards are also reflected by the Czech National Bank in the valuation guidelines as prepared in 2004.

[29]For instance, the International Valuation Standards address the issue of discount rate estimation in case of income approaches to valuation in a rather general way, as it follows: "In keeping with the IVSC Code of Conduct, it is incumbent on the Valuer to identify the components of DCF analysis, including the discount rate or rates that are applied to the net cash flows and the reasoning behind and support for this selection. To derive discount and terminal capitalization rates, a Valuer makes use of various sources of data and information on real estate and capital markets. In addition to data on the income streams and resale prices of comparable properties or businesses, surveys of investor opinion and rates of return are useful in selecting discount rates provided that the market for the subject property is consistent with the market for the property acquired by the investors consulted in the survey.

The Czech National Bank guidelines consist of a methodological note for the purposes of Mandatory Public Offer Code No. 104/2008 Coll. (formerly the Commercial Code No. 512/1991 Coll.). Given unsatisfactory quality of the expert's opinion reviewed by the Czech National Bank, the Czech National Bank developed valuation guidelines in order to facilitate the approval process. Consequently, these valuation guidelines have become the best valuation practice for other valuation tasks as well.

5.3.3 Czech National Bank Guidelines

As in case of the international valuation standards, the Czech National Bank guidelines provide general framework for valuation procedures rather than addressing specific methodology issues. Furthermore, the guidelines define the required structure of expert's opinion and mention common mistakes which the Czech National Bank came across with when reviewing the expert's opinions. The general principles, which the Czech National Bank build its valuation guidelines on, are the following:

1. **Comprehensiveness** – Expert's opinion is comprehensive if expert independently and impartially reflected all known relevant information;
2. **Completeness** – Expert's opinion is complete if it contains valuation date as well as other necessary components as described by the guidelines;
3. **Internal consistency** – Expert's opinion is internally consistent if methods and inputs as selected by the expert are in line with assumptions stated and with conclusions derived;
4. **Independence** – Expert's opinion is independent if the expert is not dependent on the result of the valuation. Furthermore, expert's opinion is impartial if appraiser performed valuation without favoring any of the parties involved;
5. **Reproducibility** - Expert opinion is reproducible if methods and input data are used appropriately and the valuation can be replicated by a third party;
6. **Validity and verifiability** – Expert's opinion is valid and verifiable if all methods and information used are used with reason and this reason is stated in the expert's opinion;

7. **Internal control** – Expert's opinion fulfils the requirement of internal control in case that at least two different valuation approaches are applied and based on the same or similar input data and assumptions similar results are derived.
8. **Transparency** – Expert's opinion is transparent if information used come from a reliable source and all sources of information are listed.

Based on the Czech National Bank valuation guidelines, the expert's opinion shall among others include basic valuation information; description of the subject of valuation; valuation assumptions and limitations; macroeconomic, industry and company business analysis; financial analysis; financial plan construction; and the valuation methods applied. The valuation guidelines also briefly comment on the most commonly used valuation approaches and in case of each of the valuation approaches the steps which need to be followed are described. For instance, discount rate used in income methods shall be based either on market data or on company specific risks. The discount rate calculation shall reflect inflation, discount rate for DCF FCFF shall be distinguished from discount rate used in DCF FCFE method, appropriate risk-free rate shall be determined and references to data shall be provided.

The valuation guidelines are followed by the common errors which the Czech National Bank had found in the expert's opinions prepared for the purposes of mandatory public offer, e.g., not substantiated valuation method selection; omitted inflation effect; missing sources of data and other information; mismatch between the DCF method version (FCFF vs. FCFE) and discount rate applied (cost of capital vs. cost of equity); inappropriate estimation of capital structure for cost of capital calculation.

5.4 Expert's Opinion Disclosure Requirements

5.4.1 Commercial Register

Disclosure requirements related to expert's opinions are specified by the Commercial Code No. 513/1991 Coll. In order to provide information to market participants, the Commercial Code No. 513/1991 Coll. defines the Commercial Register as a public list to which entries are made regarding the legally required information on entrepreneurs. Commercial Register is kept by registration courts, it is in electronic form

and it is publicly available. Section 27 of the Commercial Code No. 513/1991 Coll. contains provisions on registry of documents which is an integral part of the Commercial Register. The registry of documents contains documents supporting the entries made in the Commercial Register.

The Commercial Code No. 513/1991 Coll. defines mandatory entries into the Commercial Register as well as mandatory content of the registry of documents. In line with the Section 38i of the Commercial Code No. 513/1991 Coll. the registry of documents shall among others include expert's opinion on the valuation of in-kind contribution in case of a formation or increase in registered capital of a limited liability company or a joint stock company, expert's opinion on valuation of business assets in case of transformations, and expert's opinion on valuation of assets according to the Section 169a of the Commercial Code No. 513/1991 Coll.

5.4.2 Form of Disclosure

The legally required form of disclosure of documents filed in the Commercial Register has changed substantially in recent years. The Code No. 216/2005 Coll., particularly its part amending the Commercial Code No. 513/1991 Coll., meant a turning point in the way documents can be accessed by public. Being put in effect as of 1 July 2005, the Code No. 216/2005 introduced the electronic form of filing. However, as the conversion of documents into the electronic form was performed by the registration courts only, the process was inefficient. Due to lack of capacity, registration courts were not able to convert neither the newly filed nor the historically filed documents in a timely manner and only some documents listed in the on-line version of Commercial Register, as accessible on the web pages of the Ministry of Justice (www.justice.cz), were available.

In order to facilitate the process of documents conversion, the Bill No. 562/2006 Coll., effective as of 1 January 2007, was prepared which requires delivery of electronic files rather than hard copy documents to the registration courts. Yet, at time of writing this work, the conversion process is far from complete and a substantial part of documents, particularly those with older date of filing, is available in hard copy format only.

5.4.3 Sanctions for Noncompliance

As important as understanding the rules, it is important to understand to what extent the rules can be enforced. In terms of the Commercial Code No. 513/1991 Coll., there are no sanctions defined for the noncompliance with the disclosure requirements. However, noncompliance with the disclosure requirements can be interpreted as an economic crime in accordance with Section 125 of the Criminal Law No. 140/1961 Coll. or a fine may be imposed based on Civil Procedure Code No. 99/1963 Coll.

6. Research Design

"Though this be madness, yet there is method in't."

Hamlet, Act II, Scene III

The following section presents detailed description of methodology and data collection, and is followed by a section covering the findings derived based on the analysis.

6.1 Methodology

We have designed a methodology which is distinguished from the previously applied approach. Given the limitations of survey approach, as discussed above, we develop a methodology design which better suits the needs of our analysis. The key merit of our methodology is that it addresses the practices as they were adopted rather than as they were claimed to be adopted. Instead of surveying finance practitioners and relying on what the respondents claim to do, we analyze what they really do. The population of valuation experts and expert institutes in the Czech Republic appears to be ideal for this purpose given the legal provisions regulating expert's opinions preparation. These provisions include the following:

1. Expert's opinions shall be filed with the registry of the Commercial Register;
2. Expert's opinions shall be publicly available;
3. Expert's opinions shall be filed electronically;
4. Description of valuation methods applied shall be part of an expert's opinion.

Put differently, due to disclosure requirements, electronic availability and required contents of expert's opinions, we can analyze cost of equity estimation practices of the Czech valuation experts by direct analysis of the expert's opinions.[30] Therefore, beliefs versus actions problem present in survey technique is mitigated. In order to

[30] To what detail the methodology is described obviously differs case by case and is also subject of our analysis.

collect information on publicly available expert's opinions, we use a unique software program. Based on a sample of retrieved expert's opinions, estimation practices common among valuation experts are examined by analyzing each of the expert's opinions individually. Furthermore, in order to test hypotheses, several statistical tests are applied: namely test on difference between proportions, chi-square test, and ordinary least squares test ('OLS'). The statistical computing is performed in the R software environment. A brief description of the applied statistical tests follows:

1. **Nonparametric chi-square test** – The chi-square test belongs among the so called nonparametric methods. The main advantage of nonparametric methods is that no assumption about the underlying population distributions is needed. This test is appropriate for the analysis of variables classifying observations into small number of categories – the so called categorical variables. Data set built by two categorical variables is often referred to as RxC table: R stands for number of rows of categories for one variable and C stands for number of columns of categories of the other variable. The null hypothesis of the test of independence states that the relative proportions of one variable are independent of the second variable. The test statistic is computed as:

$$TS = \sum \frac{(o_i - e_i)^2}{e_i}, \tag{7}$$

where o_i and e_i represent observed and expected frequencies for *i*th cell of the RxC table. Under the null hypothesis, the statistic has an approximate chi-square distribution with (C-1)(R-1) degrees of freedom. While the chi-square test easily tests for a difference between proportions, it cannot test for the sign of the difference. For this purpose, a different test has to be used.

2. **Tests on proportions** – Unlike chi-square test, tests on proportions can be used in order to test for the sign of the difference. Test on proportions can be used either for testing hypothesis about a population proportion or about difference between two population proportions. In the first case, the test statistic is:

$$TS = \frac{p - \pi}{\sqrt{\pi(1-\pi)/n}}, \tag{8}$$

where p stands for the sample proportion, π for the population proportion and n for the size of the sample. On condition that $n\pi$ and $n(1-\pi)$ exceed 5, the test statistic has a N(0,1) distribution. Since a hypothesis relates to whether the proportion is greater than some stated threshold, the alternative hypothesis is stated as one-sided hypothesis and the test is one-sided test. The test on a difference between two population proportions is used in order to test whether the proportion of a group with certain characteristics is bigger for one population compared to another population. The test statistic is:

$$TS = \frac{p_1 - p_2}{\sqrt{\pi(1-\pi)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}, \tag{9}$$

where ($p_1 - p_2$) represents the difference between sample proportions, n_1 and n_2 the size of the samples of the two populations and π the common population proportion estimated by:

$$p = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}. \tag{10}$$

The test statistic has a N(0,1) distribution and again, given the nature of the alternative hypothesis, the one-sided test is used.

3. **OLS regression –** The OLS method is used for the purposes of our analysis in the form of the following univariate regression: $Y_i = \alpha + \beta X_i + \varepsilon_i$, i=1,2,3,…n, which represents the linear relationship between dependent variable Y and explanatory variable X and the disturbance ε. Since OLS is based on several assumptions, the assumptions need to be verified. The commonly verified assumption relates to the homoskedasticity of disturbances. Therefore, when applying the OLS regression, Breusch-Pagan test for heteroskedasticity is employed and in case that the null hypothesis about homoskedasticity of disturbances is rejected, Generalized Least Squares estimators are used instead.

The starting point for the statistical testing of proportions is the computation of the sample proportions. Since in some cases more than one expert opinion can be

presented for one expert or expert institute, more than one characteristic can be identified for one expert or expert institute. This issue needs to be addressed appropriately in the proportion computations. Since we are interested in what methods the experts use rather than what methods occur in expert opinions, we need to reflect every expert or expert institute equally in the proportions calculation. We proceed in a following way. In case that an expert is inconsistent across his expert opinions, we take the number of observations related to each of the method employed and divide it by the total number of observations belonging to this particular expert. As a result, each expert is represented by one observation only.[31]

6.2 Data Sample

The access to the registry of the Commercial Register on the Ministry of Justice web pages is straightforward. Every single step necessary in order to retrieve a document belonging to a certain company is described in detail in the Appendix 4. Despite relative simplicity of retrieving a specific document, downloading documents regardless the companies they are filed with, based on the documents character only (e.g., annual report, financial statements, expert's opinion) is not possible. There is no list of expert's opinions filed in the Commercial Register and unless a name of a company is known, the registry is not much helpful in collecting a sample of appraisals. As a result, direct download of a sufficiently large sample of expert's opinions cannot be performed.

Instead, a specifically developed program is needed to be employed before the sample of expert's opinions is retrieved. Such a program would search the registry for entries on expert's opinions filings and would create a list of companies' identification numbers for which the filings were found. Programs of such type are today commonly used for various purposes, commercial as well as scientific ones. As an example, we can mention programs developed to collect online data on real estates prices. Such programs need to be tailored to the needs of every data search and as such are demanding in terms of time needed to be developed. For our purposes, however, we can build on a program

[31] This procedure has only a marginal effect since in our sample most experts and expert institutes are relatively consistent in terms of the methods used and only in exceptional cases one expert or expert institute uses different methods in different expert opinions.

which was originally developed for a study on disclosure discipline of companies in the Czech Republic (Tomis 2007).

6.2.1 Program Design

The program, as provided by Tomis (2007), is a software robot written in PHP scripting language.[32] The aim of the program is to search the electronic version of the Commercial Register, as available on the Ministry of Justice webste www.justice.cz, for information on documents filed in the registry. After some modifications this robot can be used for our analysis as well. In comparison with the original user, we search for information on the presence of certain filings in the Commercial register as a tool of our analysis rather than the ultimate aim of the analysis. Unlike the original user, who used the program to perform a quantitative analysis of the disclosure discipline in the Czech Republic, we are interested in cost of equity estimation methods used in the expert's opinions filed with the register. Hence, we adjust the program[33] accordingly and employ it in order to find information on which companies have filed the appraisals electronically.

6.2.2 Program Algorithm

In the following lines we briefly summarize the program algorithm. A detailed description of the individual steps of the algorithm is attached in the Appendix 5.

The program replicates steps which would need to be taken by a casual user of the website www.justice.cz in order to find documents filed with a company's entry. First, the user goes to the advanced search tool of the companies register on the website: The advanced search is based on several criteria which can be filled in the advanced search form. The only unique criterion is the identification number of a company. Once the identification number is entered, the user is redirected to the home page of the company in the registry. From this page, the user continues to the company's registry containing information about all documents filed with the Commercial Register and further links to the documents in case they are available in the electronic form.

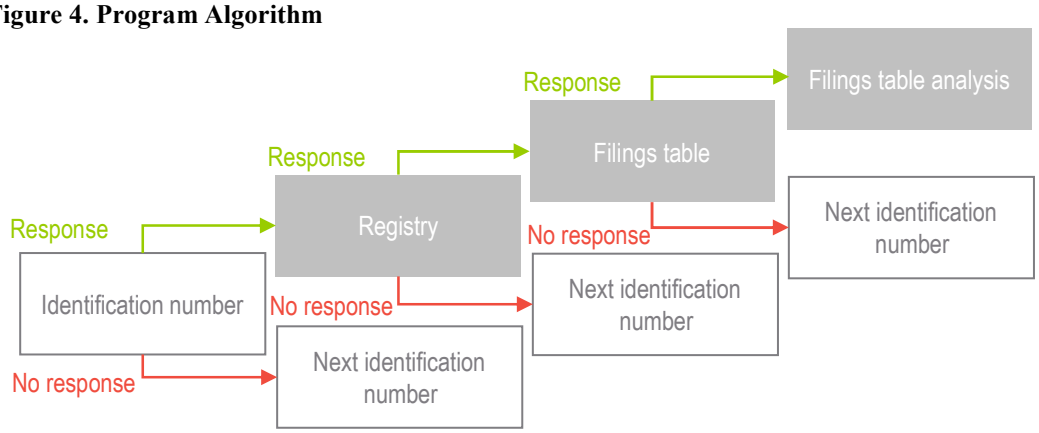
[32] Even though PHP is mainly suited for Web development, it can be used for other purposes as well.

[33] In the process of program modification we were assisted by Mr. Yann Kowalczuk.

Steps performed by the program follow in the same sequence:

1. First, the program goes to the advanced search features of the website where it enters the unique identification number. In case the program is not redirected to the homepage of the company with corresponding identification number, an error is noted and the program goes on in searching for another identification number.
2. Once being redirected to the company's homepage, the program goes to the registry section. In case the registry does not respond and the program does not proceed, an error is noted and the program goes on in searching for another identification number.
3. In the registry the program searches for html signs of filings table. In case these signs are not identified, an error is noted and the program goes on in searching for another identification number.
4. Once the program finds a table belonging to a certain identification number which includes individually filed documents, it starts to analyze the table. It goes line by line and in every line it searches for a given year and then for a given document. In our case, the program is written so that it looks for the expert's opinions and thus the text string "znal" is looked up.
5. Once the first "znal" is identified for a given year, the program finds out whether the document is filed electronically and how many pages it consists of. Then it stops searching, documents the key word allocation and starts to search for documents in the next year.
6. This process, as shown in Figure 4, repeats as long as there are identification numbers to be searched for.

Figure 4. Program Algorithm



Source: Tomis (2007), own adjustments

6.2.3 Program Inputs

The program requires its user to fill in three types of information:

1. Type 1 – company identification number;
2. Type 2 – year of registration;
3. Type 3 – key word.

In order to find the companies' identification numbers, we use Magnus dataset as a sample universe which covers both public and private companies in the Czech Republic. Magnus is a paid database of the Czech capital information agency which provides its users with financial information on companies as well as securities traded in the Czech Republic. As it covers all business entities registered in the Czech Republic, it has almost half a million entries. The database is daily updated based on information collected by commercial courts, stock exchange data, etc. Furthermore, the database is relatively user friendly and it allows for downloading large amount of data. Magnus database is currently probably the most comprehensive, accurate, reliable and up-to-date source of information about Czech companies available. Therefore, we use it as a source for the type one input information.

Type two input information defines the range of years being examined, in our case period from 1993 to 2009 is considered. Type three input information relates to the very subject of our search. The Commercial Register files expert's opinions under various names. Based on a sample of randomly selected companies we identified a text

string which is always present in expert opinion identification: “znal”. Therefore, key word in our analysis is “znal”.

6.2.4 Program Outputs

There are two output text files. The first text file called the “Output” comprises of a table summarizing information on the presence of searched key words in the online version of the Commercial Register. The table has as many rows as is the product of the first two inputs: number of years and number of identification numbers. Number of columns corresponds to the number of key words being searched plus four. In our case, there is one column with identification numbers, one column with years, one column with 0/1 information whether expert opinion can be found in the Commercial Register for every single company and year, one column with 0/1 information whether the allocated expert opinion is filed electronically, and one column with information on the number of pages of the expert opinion. The second text file is serves for controlling purposes only.

6.2.5 Sampling Procedure

After retrieving the information related to the expert’s opinions in the registry, a sample of expert’s opinions may be created. The output of the program provides us with information regarding the documents being filed in the registry. Based on the information, e.g., the 0/1 information on the presence of the document in the registry, and given the identification number of a company with which the document is filed, we can start the downloading process. At this stage of the sample collection, information on the electronic conversion of documents facilitates the downloading process. Since we can separate the converted documents from those which have not been converted yet, we can focus on downloading solely those documents relevant for our analysis, i.e. expert’s opinions in the electronic form. Consequently, time needed for the downloading process is reduced substantially.

As described in the section on institutional settings and legal framework of business valuation in the Czech Republic, expert’s opinions are required for various purposes and not necessarily relate to company valuation. For instance, in-kind

contribution may be in form of a business unit but also in form of a set of certain tangible assets such as real estate. If that is the case, valuation methodology may differ in some aspects from the company valuation methodology subject to our analysis. Since our aim is to examine the common practice of Czech valuation experts in terms of cost of equity capital estimation in company valuation, our sample should not include expert's opinions with other than company valuation, such as real estate valuation.[34]

Neither should the sample consist of expert's opinions not using income approach to valuation. Based on the Commercial Code, as described in the preceding sections, methods of valuation shall be described in the expert opinion. According to one interpretation of this provision, plural of the word "methods" implies that more than one method of valuation shall be used for the purpose of a legally required valuation. Given the three approaches to valuation (market, income and asset-based approach) and multitude of valuation methods within each of the approaches, it can be assumed that a significant part of the expert's opinions does not contain income method of valuation in which cost of equity would be estimated.

As a result, sorting out just those expert's opinions which use cost of equity estimation can substantially reduce size of the resulting sample. Furthermore, it would be extremely time demanding. Therefore, an assumption is formulated: solely expert's opinions with more than fifty pages are included in the sample. The rationale behind the assumption is as follows. Expert's opinions shall, as discussed in the section on the Commercial Code, contain several pieces of information as well as documents, e.g., the Certification of the valuation expert. Therefore, expert's opinions are very often quite large. This holds particular in case that subject of valuation is a company as a broad variety of information needs to be included (such as assumptions of financial plan which may entail economy, industry or financial analysis).

In summary, out of the population of expert's opinions filed in the registry of the Commercial Code a sample of expert's opinions is drawn based on the following: expert's opinions included in the sample are in electronic form, have more than 50 pages and use income approach to company valuation. While the first two conditions can be

[34] The sample should include, however, valuations of subjects which may not be a legal person but which may form separate cash generating unit for which financial plan can be prepared.

assessed with help of the program output information, the third condition must be verified individually for every expert's opinion sorted out based on the first two conditions. In a next step, every expert opinion in the sample is analyzed and database containing information on the cost of equity estimation techniques as well as the valuation expert and the purpose of valuation is created. Based on the database, conclusions about the frequency of different methods of cost of equity estimation can be derived and hypotheses can be tested.

6.3 Limitations

There are primarily two potential limitations of the methodology which we apply. The first limitation relates to the conversion process of documents filed in the registry. As already discussed in the section on the Commercial Register, firms have been legally required to provide the electronic documents only since 1 January 2007. Before that, documents could have been delivered to registration courts in hard copy format and since 1 July 2005 registration courts have been obliged to convert the newly as well as historically received documents into electronic format. Given the insufficient capacity of registration courts, the conversion process has not been completed yet and there is still a significant number of documents which cannot be accessed online.

The second limitation is due to the poor disclosure discipline of companies in the Czech Republic. Despite the legally defined sanctions for companies not complying with disclosure requirements, as mentioned in the section on the Commercial Code, there is still a large percentage of companies not providing the required documents to respective registration courts.

Both the lack of disclosure discipline and the incompleteness of digitalization process can be documented by findings of a study performed by Dun & Bradstreet (2007). Dun & Bradstreet (2007) used disclosure of documents on economic results in respective years as a proxy to the overall disclosure discipline and arrived at results which are shown in Table 9.

According to the results, only less than one third of companies complied with the Commercial Code in a respective year between 2003 and 2006. Furthermore, digitalization of documents was investigated. Documents on economic results were

available in electronic form only in case of less than one fifth of the companies in each respective year of the period. In 2006, the percentage of companies with digitalized documents for the respective year fell to a level of 6% only.

Table 9. Disclosure Discipline of Companies in the Czech Republic

	2003	**2004**	**2005**	**2006**
Number of companies	298,478	311,704	321,188	322,696
Number of companies in compliance*	80,099	83,806	79,061	25,423
as a share of total number of companies	*27%*	*27%*	*25%*	*8%*
Number of electronic filings	48,175	62,861	53,734	19,314
as a share of number of companies in compliance	*60%*	*75%*	*68%*	*76%*
as a share of number of companies	***16%***	***20%***	***17%***	***6%***

*In case a company files the economic results for the respective year, it is assumed to be in compliance
Source: Dun & Bradstreet 2007

Nevertheless, Dun & Bradstreet (2007) do not provide any statistics about years preceding the period 2003 and 2006, nor do they comment on the years later on. Given the change in legislature in 2007, it can be assumed that the digitalization of documents has improved since then at least in terms of the newly filed information. In case of historically filed documents, the situation might have improved as well as registration courts were no longer obliged to digitalize the new documents and could pursue the digitalization of historical documents better. As far as disclosure of documents is concerned, most probably the situation has not improved dramatically. Despite legal sanctions for noncompliance, companies did not file the documents historically. Unless the enforcement of the disclosure requirements intensified, it is unlikely that companies have become more disciplined since 2007.

The above mentioned facts imply that the sample of digitalized documents filed in the Commercial Register registry does not represent the whole population of documents which companies are required to disclose. Despite the evidence discussed above refers to documents on economic results only, it cannot be expected that the disclosure discipline and digitalization in case of expert's opinions would differ significantly. Therefore, sample of expert's opinions used in our analysis represents only a part of the population of all expert's opinions prepared in the Czech Republic. This

potential limitation needs to be considered when interpreting results of our empirical analysis.

6.4 Descriptive Statistics

Based on the Magnus database we gathered information on all joint stock companies and limited liability companies registered in the Czech Republic. In total, our dataset includes approximately 340 thousand identification numbers and covers a period of 17 years (1993 to 2009). As a result, the program worked with more than 5.7 million entries to be checked.

Out of this amount of entries, 3,270 were evaluated as positive, meaning that expert's opinions were present in 3,270 cases. However, only 2,699 expert's opinions were in electronic form and thus only these were accessible to us. As defined above, we focused on expert's opinions with more than 50 pages only and based on this assumption we sorted out a sample of 1,031 expert's opinions. One by one, we read through the 1,031 expert's opinions and we selected 278 expert's opinions suitable for our analysis, i.e., legible expert's opinions using income approach to business valuation and containing relevant information. Table 10 gives us overview of the above described procedure.

Table 10. Sampling Procedure

Statistics	**Total**
Companies (joint stock companies, limited liability companies)	340,440
Years	17
Entries checked	5,787,480
Identified expert's opinions	3,270
Digitalized expert's opinions	2,699
Expert's opinions with number of pages greater than 50	1,031
Expert's opinions using income approach*	**278****

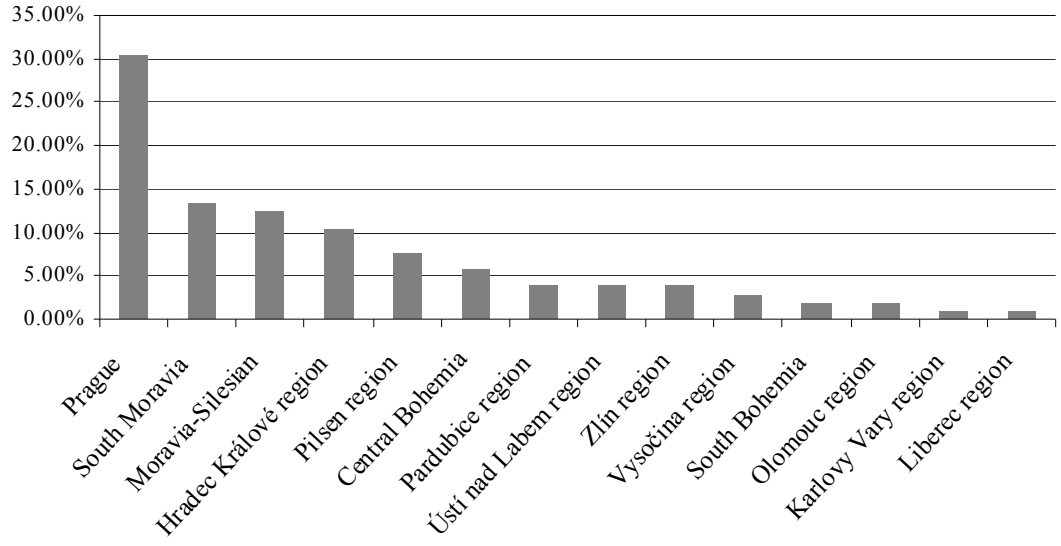
*Cost of equity is used only in case of income approach to valuation. Therefore, only expert opinions using income method are selected.
** Excluding duplicates and illegible expert's opinions.
Source: Author, Magnus

Taking into consideration number of companies and number of valuation experts and expert institutes in the Czech Republic (as discussed above), the resulting sample

seems to be rather small. This can be attributed to the poor disclosure discipline of companies registered in the Czech Republic and slow digitalization process of documents filed with the Commercial Register. On the other hand, out of total 256 business valuation experts and 82 business valuation expert institutes, our sample includes expert's opinions prepared by 105 experts and expert institutes which means, in terms of survey-based analyses, a relatively large response rate.

As illustrated by Figure 5, almost one third of experts and expert institutes in our sample are registered in Prague, followed by those registered in South Moravia and Moravia-Silesian regions. There is at least one representative of each of the 14 regions in the Czech Republic included in the sample.

Figure 5. Experts and Expert Institutes by Region

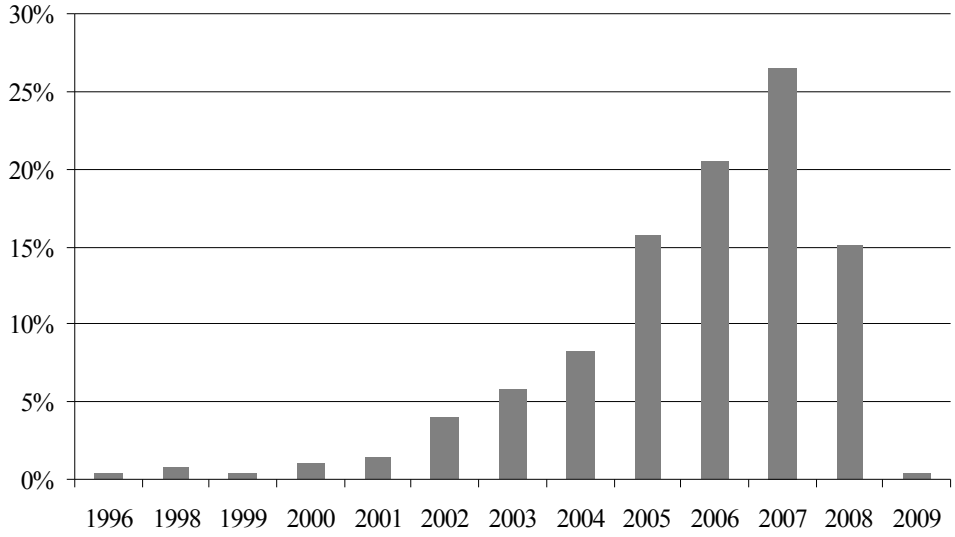


Source: Author

Most expert's opinions in our sample come from the last three years, as documented by Figure 6. The oldest expert's opinion dates back to 1996 and the most recent one to 2009. The largest proportion of the sample falls into 2007 – 74 expert's opinions from this year have been analyzed. Almost 90% of the total sample is represented by expert's opinions prepared since 2004.

The relatively low number of expert's opinions in our sample with year of origin before 2004 can be attributed to several potential factors. First, there might have been less activity in the market and less situations might have required expert's opinions. Second, disclosure discipline was lower resulting in lower percentage of expert's opinions filed with the Commercial Register. Third, digitalization process performed by registration courts is particularly slow in case of documents filed deeper in the history. Fourth, expert's opinions filed in the 1990's and early in the first decade of this century might have been in such a form which did not allow a full legibility of the digitalized files. Fifth, historically expert's opinions prevailingly applied other than income approaches. Whatever the reason might be, even though we do not have abundant data on practices applied by the Czech experts and expert institutes historically, some insights related to the changes in time may be gained.

Figure 6. Expert's Opinions by Year of Origin

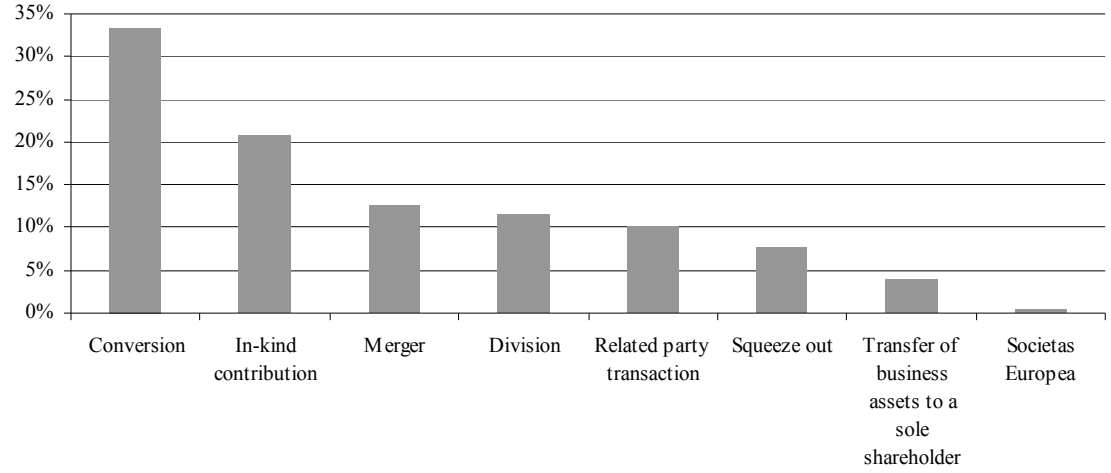


Source: Author

Expert's opinions in the sample can be divided into subsamples based on the purpose of valuation they were prepared for (see Figure 7). One third of expert's opinions in the sample were prepared for conversion of legal form and more than one fifth for in-kind contribution. Merger and division each are represented by more than 10% of the sample. Related party transaction accounts for 10% of the sample, squeeze-

out for more than 7%, and less than 5% of the sample belongs to transfer of business assets and Sociates Europea[35].

Figure 7. Expert's Opinions by Purpose of Valuation

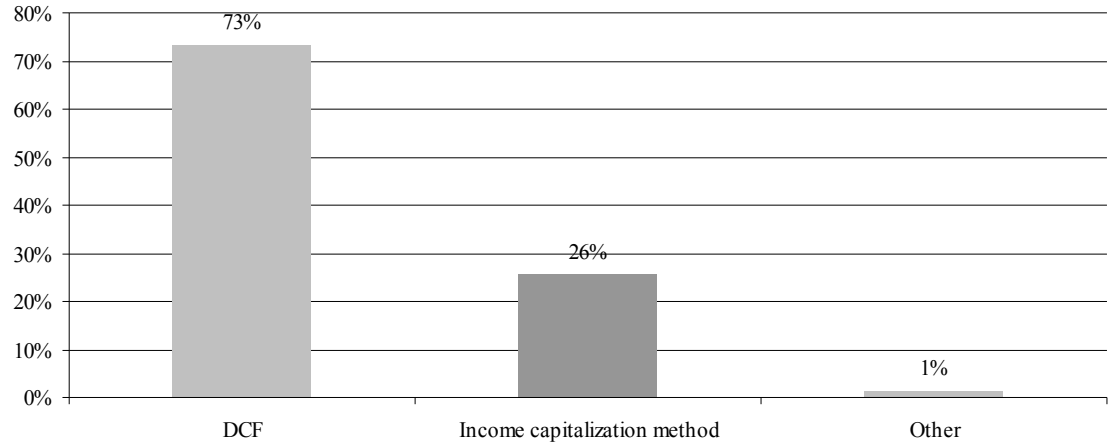


Source: Author

Experts opinions selected for the sample use income approach to company valuation. As already discussed, the income approach includes various valuation methods ranging from the DCF to income capitalization method, or residual income method. Based on the sample, Figure 8 shows what methods of valuation were mostly applied by valuation experts. Majority of experts (73%) preferred DCF, followed by income capitalization method (26%). Use of other than these two income methods of valuation was insignificant. Less than 1% of experts used residual income method or income method in a combination with some other approach to valuation, e.g., asset based approach.

[35] Societas Europea Code No. 627/2004 Coll. requires expert's opinion for some purposes as well.

Figure 8. Valuation Methods Applied by Experts



Source: Author

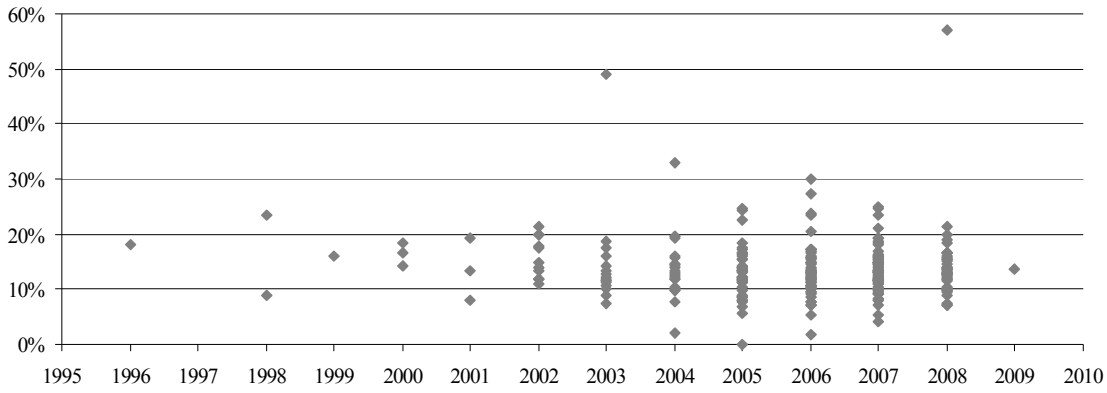
7. Empirical Results

In the following section we provide the reader with the empirical analysis results. First, we present an overview of the results with respect to cost of equity value and cost of equity models. Then, we proceed with discussion of parameters used in the cost of equity estimation.

7.1 Cost of Equity Value

The yearly average of cost of equity values estimated in the expert's opinions in the sample decreased from 18% to 14% in period 1997 to 2009. Figure 9 shows the individual values of cost of equity over time.

Figure 9. Cost of Equity in Time



Source: Author

Based on the OLS regression with time factor as explanatory variable and cost of equity as dependent variable we estimated a negative coefficient of the time variable implying a negative association between cost of equity and time. However, given the high p-value (=0.171), the coefficient is not statistically significant. In other words, the **hypothesis 1** that cost of equity decreases over time cannot be supported. For details on the statistical regression, refer to the following Table 11.

Table 11. OLS Regression - Time Factor as Explanatory and Cost of Equity as Dependent Variable

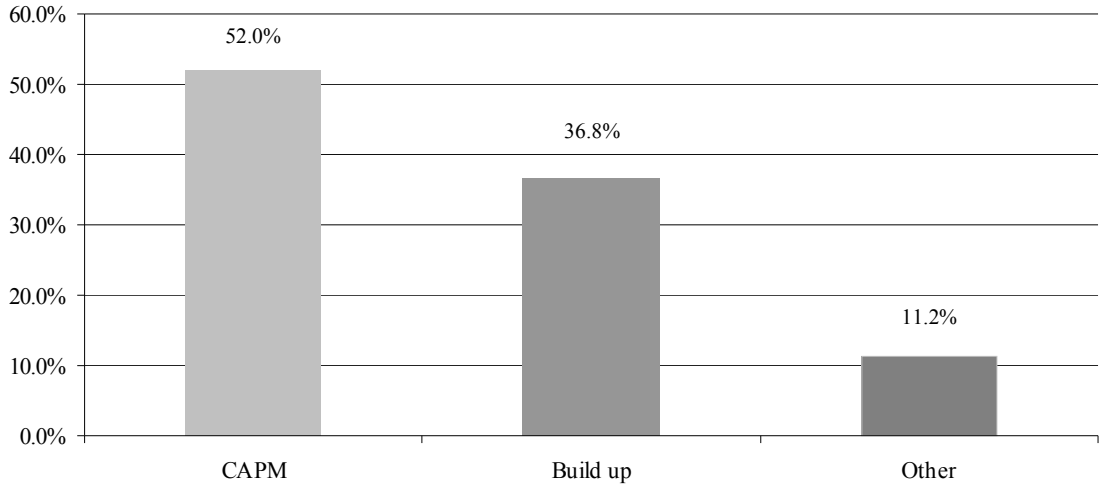
	Estimate	Std. Error	t-statistics	P-value
Intercept	4.545576	3.21292	1.415	0.158
Time variable	-0.002198	0.001602	-1.372	0.171

Source: Author

7.2 Cost of Equity Models

As presented in Figure 10, for the purpose of cost of equity estimation, CAPM (including CAPM based models adjusted for further risk premiums for unsystematic risk) was used by 52% of experts, 36.8% of experts applied build up method and only 11.2% relied on other than CAPM and build up models. These methods included the average of CAPM and build up method, own estimate, cost of debt adjusted for equity risk, interest rate on a bank deposit, or repo rate adjusted for risk.

Figure 10. Major Cost of Equity Models Applied by Experts



Source: Author

In order to test whether CAPM is the preferred method of cost of equity estimation, we test whether the proportion of experts using CAPM compared to those using build up method and the proportion of experts using CAPM compared to those using other methods is higher. We employ the test on population proportion and arrive at the results presented in Table 12.

Table 12. Cost of Equity Models

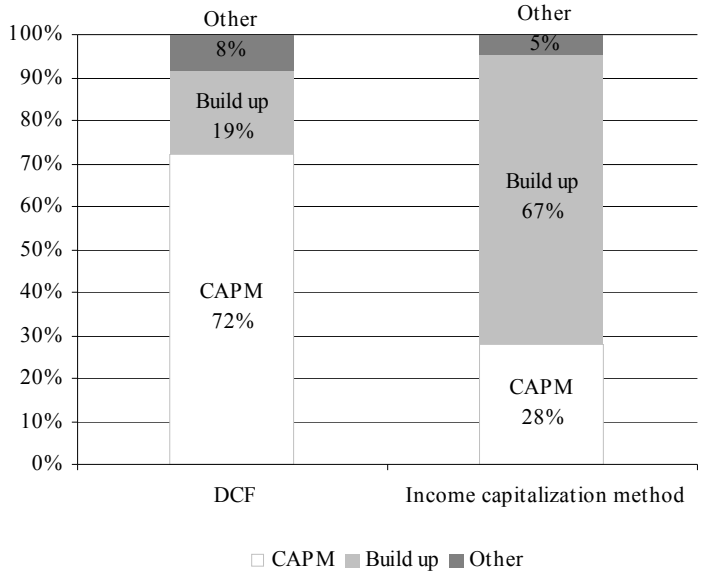
Cost of equity models	Percentage of experts	*p-value*
CAPM	52.0%	
Build up	36.8%	
Other	11.2%	
Test on population proportion (CAPM vs. build up)		*0.04*
Test on population proportion (CAPM vs. other)		*<0.001*

Source: Author

Proportion of experts using CAPM is statistically significantly higher than proportion of experts using build up method (p-value=0.04). Proportion of experts using CAPM is statistically significantly higher than proportion of experts using other than build up methods (p-value<0.001). In other words, our **hypothesis 2** that CAPM is used by higher proportion of valuation experts compared to other methods of cost of equity estimation is confirmed. These results are consistent with surveys on cost of equity estimation practices as already discussed in previous sections. Also in case of American (Graham and Harvey, 2001) as well as European companies (Brounen, *et al*., 2004) and investors (Peterson, Plenborg and Scholler, 2006), CAPM appears to be preferred method of cost of equity estimation. The same applies for surveys conducted on European investors, e.g., Peterson, Plenborg and Scholler (2006). However, unlike our results, findings of Peterson, Plenborg and Scholler (2006) do not show a significant difference between CAPM and other methods.

A closer examination of the data may reveal further interesting insights. Based on our data, the popularity of CAPM relates to which method of valuation is applied. As shown in the following Figure 11, in case of DCF, CAPM with 72% was the prevailing method of cost of equity estimation, while in case of income capitalization method, build up method with 67% was applied more frequently than CAPM. Based on chi-square test, the difference in proportions of individual cost of equity models across valuation models is significant (p-value<0,001), see Table 13. Based on test for a difference in two population proportions, the proportion of DCF valuation models which use CAPM exceeds the proportion of income capitalization models which use CAPM (p-value<0,001). In other words, **hypothesis 3**, that proportion of DCF models that use CAPM exceeds the proportion of income capitalization models which use CAPM, is confirmed.

Figure 11. Cost of Equity Models by Valuation Method



Source: Author

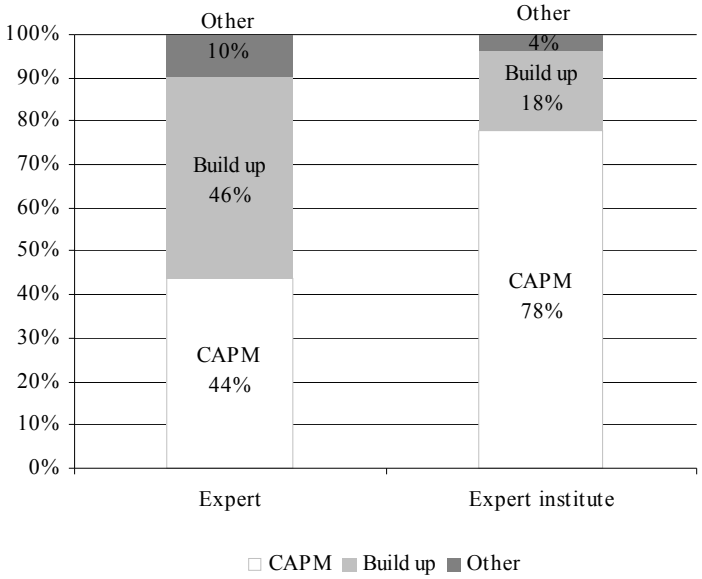
Table 13. Cost of Equity Models by Valuation Method

Method	CAPM	Build up	Other
DCF	72%	19%	8%
Income capitalization method	28%	67%	5%
Other	17%	83%	0%
			p-value
Chi-square test			*<0,001*
Test on two population proportions (DCF and income capitalization method)			*<0,001*

Source: Author

Another finding relates to the difference in cost of equity models used by expert and expert institutes. Figure 12 shows that while CAPM and build up models were used in almost the same proportion by experts, expert institutes relied more often on CAPM rather than build up method. Other methods were used only rarely by both experts and expert institutes. Based on Chi-square test, difference of proportions of models used in case of the two groups of appraisers is significant (p-value<0,001), see Table 14. In other words, **hypothesis 4** that experts apply cost of equity models in the same proportion as expert institutes is rejected.

Figure 12. Cost of Equity Models Applied by Experts and by Expert Institutes



Source: Author

Table 14. Cost of Equity Models Applied by Experts and Expert Institutes

Method	**CAPM**	**Build up**	**Other**
Expert	44%	46%	10%
Expert institute	78%	18%	4%
			p-value
Chi-square test			*<0,001*

Source: Author

This result is in line with another observation that experts used DCF valuation model in significantly different portion of cases compared to expert institutes. As it was shown, the prevailing cost of equity method in case of DCF model is CAPM and in case of income capitalization method build up model prevails. Expert institutes relied in 78% of cases on DCF and in 22% on other valuation methods, whereas experts used DCF in 68% and other methods in 39%. This difference is significant (p-value=0,004), see Table 15. The finding that CAPM is used by expert institutes more frequently than by experts is consistent with the previous finding that in case of DCF valuation, CAPM was the prevailing method.

Table 15. Valuation Methods Applied by Experts and Expert Institutes

	DCF	Income capitalization method	Other
Expert	62%	38%	1%
Expert institute	78%	18%	4%
			p-value
Chi-square test			*0.004*

Source: Author

7.3 CAPM Parameters

7.3.1 Risk-Free Rate

As presented in Table 16, in most cases, yield of a government bond with maturity longer than 10 years was used as a risk-free rate (85.2% of observations). Long term government bond with maturity shorter than 10 years was used in 8.6% observations. In some cases, also short term rate PRIBOR or historical average of government bond yields were used.

Table 16. Risk-Free Rate

Bond maturity	Proportion
Longer than 10Y	85.2%
Long term shorter than 10Y	8.6%
Short term	2.5%
Historical long term	1.9%
na	1.9%

Source: Author

As discussed in the section on model parameters estimation, life span of a company subject to valuation should be matched with the maturity/duration of a bond used for risk-free estimation. From this reason, the longest term bonds available are recommended. Findings of our analysis suggest that in most cases this recommendation is followed. Similar evidence was provided by Bruner (1998) who showed that yields of the long term Treasury bonds were favored by US and Canadian corporations and advisors, yet to a lower extent compared to what is showed by our analysis. In our analysis we also

As shown in Table 17, in case of 48.1% of observations Czech government bond yields were relied on, followed by US government bond yields with 37%. In some cases also German government bond yields or average of Czech and other government bond yields was used. In other words, almost in half of the observations, Czech risk-free rate was applied which implies that local or some kind of hybrid CAPM models were used in these cases and that Czech bonds have been viewed as liquid enough to be used as a benchmark for risk-free rate.

Table 17. Risk-Free Rate Geographically

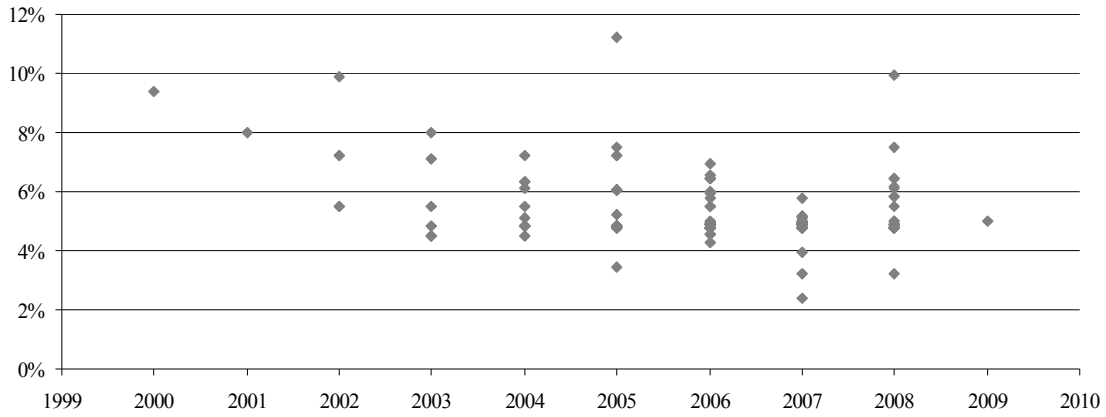
Country	Proportion
CZ	48.1%
US	37.0%
GE	11.1%
Average	1.9%
na	1.9%

Source: Author

7.3.2 Equity Risk Premium

Figure 13 gives us idea of what values equity risk premium in expert's opinions took on.

Figure 13. Equity Risk Premium in Time



Source: Author

As reported in Table 18, equity risk premium ranged from values as low as 2.4% to values as high as 11.2%. The average and median of values equaled to approximately 5%. This variation of equity risk premium is not surprising given the lack of consensus regarding the appropriate way of its calculation. As already discussed, equity risk premium is highly sensitive to inputs and methodology used in its estimation.

Table 18. Equity Risk Premium Descriptive Statistics

Equity risk premium	
Min	2.4%
Max	11.2%
Median	4.9%
Average	5.3%
Standard deviation	1.1%

Source: Author

As can be seen from Figure 13 equity risk premium decreased over time. In order to test this trend statistically, we performed the OLS regression with time factor as explanatory variable and equity risk premium as dependent variable. We estimated a statistically significant negative coefficient of the time variable implying a negative relationship between equity risk premium and time (p-value<0.001). For details on the statistical regression, refer to the following Table 19.

Table 19. OLS Regression - Time as Explanatory and Equity Risk Premium as Dependent Variable

	Estimate	**Std. Error**	**t-statistics**	**P-value**
(Intercept)	5.206247	0.999051	5.211	<0.001
x	-0.002569	0.000498	-5.158	<0.001

Source: Author

Table 20 reveals that 66% of observed equity risk premiums were computed as geometric average, and only 8% of the observed premiums were derived as arithmetic average. In 26% of observations expert's opinions did not mention the method of averaging. The prevailing application of geometric average is in contrast with findings of Bruner (1998) who reported equal or higher use of arithmetic average by US and Canadian respondents.

Table 20. Method Of Averaging Of Historical Equity Risk Premium

Method of averaging	Proportion
Arithmetic	8%
Geometric	66%
na	26%

Source: Author

Given the character of the Czech stock exchange, it is not surprising that apart from few cases when equity risk premium was estimated by an expert as a guess, most values represent historical equity risk premiums estimated on the US data. The expert's opinions quoted two sources of information on the equity risk premium: Damodaran (for details see Appendix 2) and Ibbotson. Usually, the longest period of data available was used. Only in case of 7% of observations, which included information on time period covered, shorter period was used. In few cases instead of a single number, equity risk premiums for different periods were taken and then averaged.

7.3.3 Beta

Given the character of companies subject to valuation in our sample, i.e. not publicly traded companies, it is not surprising that mostly industry beta was relied on (76% of expert opinions). In 8% of cases beta was derived from company specific factors including operational and financial risk or sensitivity to cycle and proportion of fixed assets. Average of industry betas was used in 7% and other methods such as professional guess in 8% of cases. For overview of the methods used for beta estimation, see Table 21.

Table 21. Methods of Beta Estimation

Beta	Proportion
Industry beta	76%
Risk factors based beta	8%
Average of industry betas	7%
Other	8%

Source: Author

Industry betas were taken from Damodaran, only exceptionally other sources of data occurred (these include Ibbotson and Bloomberg). Only in few cases individual

companies of the industry peer group were listed. In all cases, beta was unlevered and then relevered in order to reflect specific capital structure of a company subject to valuation. Average of industry betas included averages of different betas for different industries in case no single industry beta was deemed appropriate by the expert. Also, industry betas were taken from different markets (i.e., US, Europe, emerging markets), depending on availability of relevant data.

In order to compare our results with the findings of previous research, only the analysis of Peterson, Plenborg and Scholler (2006) can be referred to as it is the only analysis focusing on the aspects of valuation of privately-held companies. Also Peterson, Plenborg and Scholler (2006) documented the preference of industry beta rather than risk factors based beta. However, they also reported that 29% respondents did not adjust betas for specific capital structure, which is in contrast with our findings that experts always considered relevering of beta in their valuations.

7.3.4 Country Risk Premium

Results of our analysis, as reported in Table 22, show that CAPM equation was adjusted for country risk premium in 93% of CAPM applications. The adjustment was mostly (in 94% of cases) performed in line with the combined approach to country risk premium: both the bond default spread and the relative equity market standard deviation were applied and their values were taken from Damodaran (for details see Appendix 2).

Table 22. Country Risk Premium

Application of country risk premium	Proportion
CAPM without CRP	7%
CAPM with CRP	93%
CRP as individual component	*66%*
CRP multiplied with beta	*34%*

Source: Author

It is also interesting to address the question of how the country risk premium was accounted for. In 66% of observations, the country risk premium was applied as an individual component of the cost of equity equation. This implies that assumption of equal exposure to country risk across companies was adopted. On the other hand, in 34% of cases, exposure to country risk was presumed to be proportional to exposure to the

other market risk and country risk premium was multiplied by beta. The choice of whether to use country risk premium as a separate component of cost of equity or whether to multiply it with beta, can have a significant affect on the value of resultant cost of equity. This holds particularly in case that the beta takes on a value significantly different from one. Therefore, our results suggest that cost of equity for companies of comparable characteristics can vary across experts given the different approaches to CRP application in CAPM model.

7.3.5 Size Premium

Size premium was used in almost 40% of observations. As reported in Table 23, the value of size premium ranged from 0.1% to 13% with median near average equal to 3%. In 36% cases Ibbotson was quoted as a source of the size premium applied, in the rest of cases own estimate was relied on. Given the lack of data on size premiums in local market, it is not surprising that in majority of cases own estimate based on experience of the expert or some benchmark chosen by the expert was used. As a result, however, size premium applied is rather subjective in nature. In other words, applied size premiums for companies of comparable size can vary from one expert to another as majority of experts do rely on own estimate.

Table 23. Size Premium Descriptive Statistics

Size premium	
Min	0.1%
Max	13.0%
Median	3.0%
Average	3.1%
Standard deviation	2.1%

Source: Author

7.3.6 Specific Premium

Specific premium was used in case of 39% of CAPM applications. Specific premium ranged from 0.4% to 16.1% with mean equal to 3.5%, as shown in Table 24. Specific premium was in all expert's opinions estimated based on qualitative analysis including industry risk, management risk, leverage risk, etc.

Table 24. Specific Premium Descriptive Statistics

Specific premium	
Min	0.4%
Max	16.1%
Median	3.0%
Average	3.5%
Standard deviation	2.6%

Source: Author

7.3.7 Premium for Lack of Liquidity

In 22% of expert opinions applying CAPM, premium for lack of liquidity was reflected. As reported in Table 25, lack of liquidity premium ranged from minus 3% to 3.5% with median equal to 1%. Premium for lack of liquidity was in all cases based on expert's estimate and in fact it meant premium for risk related to different factors, e.g., experts applied this premium for illiquidity of shares subject to valuation or illiquidity of market. In other words, premium for lack of liquidity is highly qualitative in nature and experts apply it referring to different sources of risk. Furthermore, as it was noted in the section on the parameters entering the cost of equity, application of the premium for lack of liquidity to cost of equity is rather controversial and it is recommended to reflect illiquidity as a direct discount from the company value rather than in the cost of equity estimation.

Table 25. Lack of Liquidity Premium Descriptive Statistics

Lack of liquidity premium	
Min	-3.0%
Max	3.5%
Median	1.0%
Average	1.5%
Standard deviation	1.2%

Source: Author

7.4 Summary of Empirical Results

The empirical results of our analysis can be divided into two areas: the results of the statistical testing of hypotheses related to the cost of equity models and the results related to the application of the individual parameters of CAPM. Table 26 provides

recapitulation of the hypotheses testing results and Table 27 presents an overview of the specifics of the CAPM parameters estimation as documented by the analysis.

Table 26: Results Overview

Hypotheses:		**Results:**
Hypothesis 1:	*Cost of equity decreases over time.*	Not supported
Hypothesis 2:	*Proportion of valuation experts using CAPM is higher than proportion of experts using other cost of equity estimation methods.*	Supported
Hypothesis 3:	*Proportion of DCF valuation models which use CAPM for cost of equity estimation exceeds the proportion of income capitalization models which use CAPM.*	Supported
Hypothesis 4:	*Experts apply cost of equity models in the same proportion as expert institutes.*	Not supported

Source: Author

Table 27: Parameters CAPM estimation

Risk-free rate					
Country	*CR*	*US*	*GE*	*Average*	*na*
Percent of experts	48.1%	37.0%	11.1%	1.9%	1.9%
Bond maturity	***> 10Y***	***1Y to 10Y***	***< 1Y***	***Historical long term***	***na***
Percent of experts	85.2%	8.6%	2.5%	1.9%	1.9%
Equity risk premium					
Method of averaging	***Arithmetic***	***Geometric***	***na***		
Percent of experts	7.6%	65.9%	26.5%		
Beta					
Method of estimation	***Industry beta***	***Risk factors based beta***	***Average of industry betas***	***Other***	
Percent of experts	76.3%	8.3%	7.1%	8.3%	
Risk premiums for unsystematic risk					
Application of premiums	***Country risk premium***	***Size premium***	***Specific premium***	***Premium for lack of liquidity***	
Percent of experts	92.5%	39.8%	38.5%	22.4%	

Source: Author

7. Conclusions

The aim of this thesis is to shed light on the cost of equity estimation in practice. For this purpose, we examine the cost of equity estimation techniques used by valuation experts in the Czech Republic. By application of a specifically developed program, we obtain a unique dataset of cost of equity values, estimation methods and parameters as used by valuation experts in the Czech Republic in the period between 1997 and 2009. We test four hypotheses concerning the cost of equity models and values. Furthermore, we analyze how parameters entering the cost of equity calculation are estimated.

Our findings suggest that the most popular model used for cost of equity estimation is CAPM (including CAPM with additional risk premiums for unsystematic risk). While CAPM was used by 52% of valuation experts, the second most popular model, the build up model, was used by 36.8% of valuation experts. Other cost of equity models were used only marginally. This finding is in line with previous research which also documents the prevailing use of CAPM.

In addition, we document that the selection of cost of equity model is related to the valuation method applied. The two most common income methods used by valuation experts are the DCF and the income capitalization method. We find that while in case of DCF, the cost of equity is mostly estimated by CAPM, in case of income capitalization method the prevailing model of cost of equity estimation is the build up model. This finding can be explained by the fact that just as DCF model is a relatively more challenging method compared to income capitalization method, CAPM is more demanding compared to the build up model. Our finding implies that once income capitalization method is selected for the valuation, build up model is preferred as both require less time and information.

Furthermore, we reject the hypothesis that experts and expert institutes use the cost of equity models in the same proportion. Despite that there is no substantial difference between the valuation experts and expert institutes in terms of qualifications needed, the valuation experts apply CAPM in different proportion compared to expert institutes, just as they apply DCF valuation method in different proportion compared to expert institutes. In addition, in contrast to previous research, our results do not confirm

that cost of equity decreases over time. Even though we observe a decreasing trend, this trend is not statistically significant.

Our analysis also investigates the individual parameters entering the cost of equity estimation, particularly CAPM. Consistent with previous research, the risk-free rate used in CAPM was mostly based on long term bond, either of the domestic or foreign government. The equity risk premium was estimated by the historical method on the US data. Despite that there is no widely accepted consensus related to the averaging method used for the equity risk premium, valuation experts in the Czech Republic prevailingly preferred the geometric average. This finding is in contrast to previous research which provides evidence of the lack of consensus among practitioners with respect to which method of averaging should be used. We document a statistically significant decreasing trend of the equity risk premium in time. In terms of beta factor, valuation experts mostly relied on industry beta. This finding is consistent with results of other research focusing on valuation of privately-held companies. Risk factor based beta, which is rather qualitative in nature, was applied by substantially less valuation experts.

Subsequently, we examine the risk premiums for unsystematic risk used in the cost of equity estimation by CAPM. CAPM is generally perceived as less vulnerable to manipulation compared to the heuristic build up model, however, once risk premiums for unsystematic risks are added to the CAPM calculation, a substantial part of CAPM can become qualitative in nature rather than market based. The risk premiums, e.g. country risk premium, size premium, specific premium or premium for lack of liquidity, are the most common risk premiums used by the valuation experts.

We find evidence that there is a relative consensus whether country risk premium should be applied or not. Even though 93% of valuation experts used country risk premium, they chose different methods of how to account for it in the CAPM equation. Almost 40% of valuation experts applied size premium and specific premium, both of which were mostly based on the best guess of valuation expert. Almost quarter of valuation experts used risk premium for lack of liquidity, although valuation literature considers the application of this premium as controversial and recommends adjustments of a company value rather than cost of equity.

Overall, we document that the cost of equity estimation techniques applied by Czech valuation experts are in most points consistent with practice prevailing on the US and Western European markets as shown by previous research. As well as the US and Western European finance practitioners, the Czech valuation experts mostly rely on CAPM adjusted for unsystematic risks. Czech valuation experts often apply risk premiums for unsystematic risk which are qualitative in nature and to large extent depend on an expert's own experience.

8. Appendices

8.1 Appendix 1. Historical Real Returns of Stocks, Bonds and Bills

Table 28. Historical Real Returns of Stocks, Bonds, and Bills

	Real Return					
	Stocks		*Bonds*		*Bills*	
	Compound	*Arithmetic*	*Compound*	*Arithmetic*	*Compound*	*Arithmetic*
Long periods to present						
1802–2004	6.82%	8.38%	3.51%	3.88%	2.84%	3.02%
1871–2004	6.71%	8.43%	2.85%	3.24%	1.68%	1.79%
Major subperiods						
1802–1870	7.02%	8.28%	4.78%	5.11%	5.12%	5.40%
1871–1925	6.62%	7.92%	3.73%	3.93%	3.16%	3.27%
1926–2004	6.78%	8.78%	2.25%	2.77%	0.69%	0.75%
Post-World War II						
1946–2004	6.83%	8.38%	1.44%	2.04%	0.56%	0.62%
1946–1965	10.02%	11.39%	–1.19%	–0.95%	–0.84%	–0.75%
1966–1981	–0.36%	1.38%	–4.17%	–3.86%	–0.15%	–0.13%
1982–1999	13.62%	14.30%	8.40%	9.28%	2.91%	2.92%
1982–2004	9.47%	10.64%	8.01%	8.74%	2.31%	2.33%

Source: Siegel (2005)

Note: Siegel (2005) calculates historical equity risk premium based on stocks, bonds and bills time series obtained from various sources. For the period 1926-2004 he uses data from the Center for research in Security Prices at the University of Chicago's Graduate School of Business on capitalization weighted indexes of all stocks listed on NYSE, Amex and NASDAQ. For periods preceding 1926 the data is taken from Schwert (1990).

8.2 Appendix 2. Premiums Estimated by Damodaran

Damodaran annually updates equity risk premiums estimates based on S&P 500 and different time periods as shown in the following table.

Table 29. Equity Risk Premium

Arithmetic Average								
Start year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
1928	6.8%	6.3%	6.5%	6.5%	6.5%	6.6%	6.4%	5.6%
1959	5.0%	4.0%	4.6%	4.6%	4.6%	4.8%	4.6%	3.3%
Geometric Average								
Start year	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
1928	5.2%	4.5%	4.8%	4.8%	4.8%	4.9%	4.8%	3.9%
1959	4.3%	3.2%	3.7%	3.8%	3.7%	3.9%	3.8%	2.3%

Source: Damodaran

Damodaran also provides country risk premiums calculated based on combined approach. The data for the Czech Republic follow.

Table 30. Country Risk Premium

Year	**Adjusted Default Spread**	**Country Risk Premium**
2000	1.20%	1.20%
2001	1.20%	1.20%
2002	0.80%	1.20%
2003	0.80%	1.20%
2004	0.80%	1.20%
2005	0.60%	0.90%
2006	0.70%	1.05%
2007	0.70%	1.05%

Source: Damodaran

8.3 Appendix 3. Emerging and Developed Markets Stock Exchanges

Table 31. Emerging Markets Stock Exchanges

Exchange	Domestic market capitalization as of 2007 (USD billion)	Number of listed companies as of 2007	Market capitalizaton as of 2007 over GDP as of 2006
Colombo SE	8	235	30%
Ljubljana SE	29	87	39%
Amman SE	41	245	211%
Tehran SE	44	329	-
Budapest SE	46	41	34%
Buenos Aires SE	57	111	24%
Lima SE	69	226	42%
Colombia SE	102	90	39%
Philippine SE	103	244	55%
Cairo & Alexandria SEs	139	435	86%
Thailand SE	197	523	65%
Warsaw SE	212	375	42%
Indonesia SE	212	383	37%
Santiago SE	213	241	120%
Istanbul SE	287	319	40%
Bursa Malaysia	325	986	152%
Mexican Exchange	398	367	41%
Taiwan SE Corp.	664	703	-
Shenzhen SE	785	670	8%
Johannesburg SE	828	411	290%
Korea Exchange	1 123	1 757	92%
Sao Paulo SE	1 370	404	65%
National Stock Exchange India	1 660	1 330	83%
Bombay SE	1 819	4 887	88%
Shanghai SE	3 694	860	34%

Source: World Federation of Stock Exchanges, ISI Emerging Markets, FTSE Emerging Markets

Table 32. Developed Markets Stock Exchanges

Exchange	Domestic market capitalization as of 2007 (USD billion)	Number of listed companies as of 2007	Market capitalizaton as of 2007 over GDP as of 2006
Bermuda SE	3	53	-
Malta SE	6	16	67%
Mauritius SE	8	70	78%
Cyprus SE	29	141	85%
New Zealand Exchange	47	178	40%
Jasdaq	121	979	3%
Irish SE	144	73	70%
Luxembourg SE	166	261	182%
Osaka SE	212	477	4%
Tel Aviv SE	235	657	109%
Wiener Börse	236	119	59%
American SE	258	599	2%
Athens Exchange	265	283	81%
Oslo Børs	353	248	81%
Singapore Exchange	539	762	281%
Borsa Italiana	1 073	307	53%
OMX Nordic Exchange	1 243	851	111%
Swiss Exchange	1 271	341	312%
Australian SE	1 298	1 998	144%
BME Spanish Exchanges	1 800	3 537	103%
Deutsche Börse	2 105	866	54%
TSX Group	2 187	3 951	138%
Hong Kong Exchanges	2 654	1 241	905%
London SE	3 852	3 307	149%
Nasdaq	4 014	3 069	29%
Euronext	4 223	1 155	101%
Tokyo SE Group	4 331	2 414	108%
NYSE Group	15 651	2 297	116%

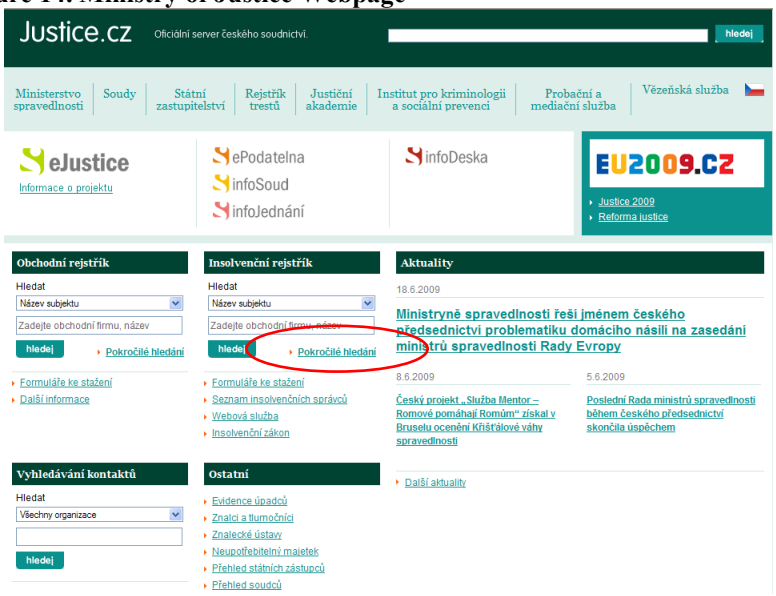
Source: World Federation of Stock Exchanges, ISI Emerging Markets, FTSE Emerging Markets

8.4 Appendix 4. Retrieval Process from the Commercial Register

In order to retrieve an expert's opinion for a specific company from the Ministry of Justice website www.justice.cz several steps need to be followed:

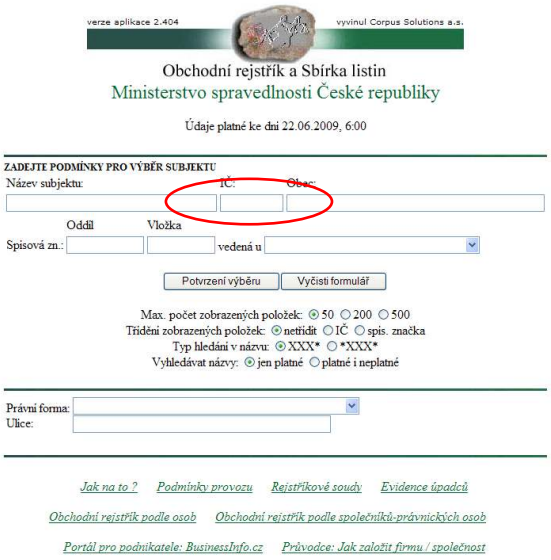
1. The user goes to the advanced search tool of the Commercial Register.

Figure 14. Ministry of Justice Webpage



2. The advanced search is based on several criteria which can be filled in the advanced search form. The only unique criterion is the identification number of a company. The identification number is entered.

Figure 15. Commercial Register Webpage

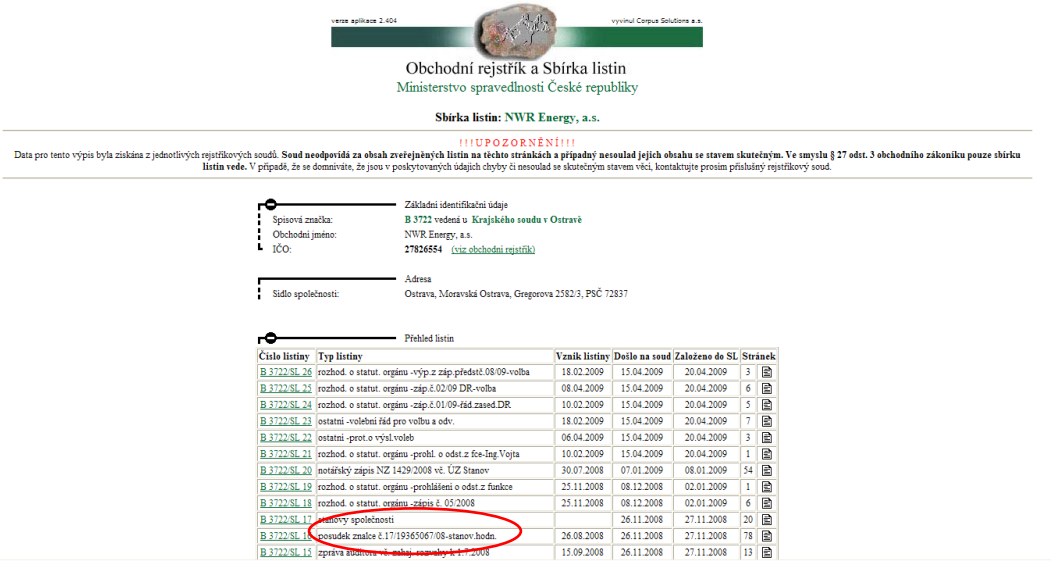


3. The user is redirected to a home page of the company in the Commercial Register. This page includes three links: a link to currently valid information on the company, a link to information on the company, and a link to the registry of the company. The registry linked is followed.

Figure 16. Commercial Register Homepage for a Specific Company

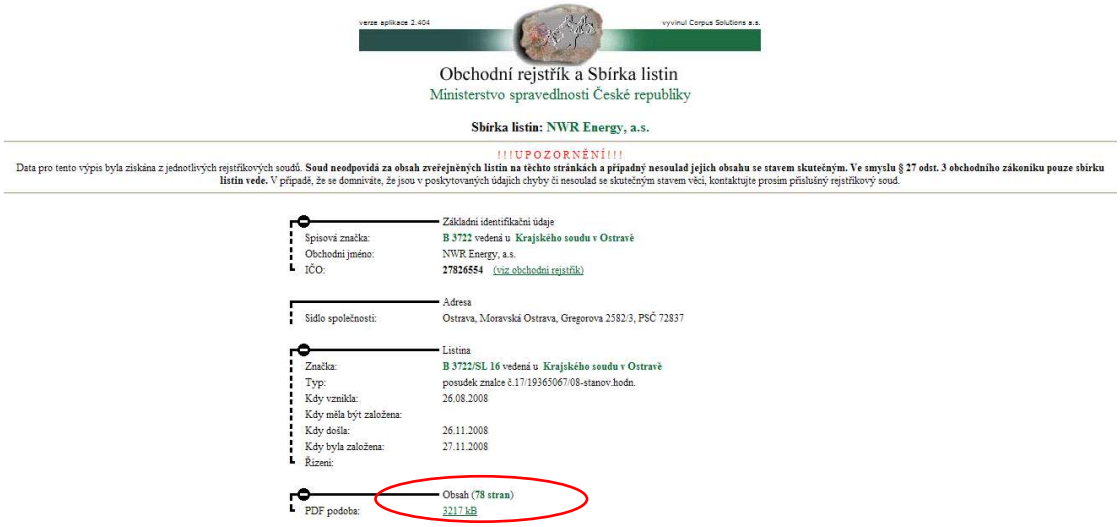
4. The user is taken to a table containing information about all documents filed with the Commercial Register for the specific company and further links are present in case of electronic documents. The expert's opinion being searched is selected.

Figure 17. Registry for a Specific Company



5. The information on the document selected is displayed. In case the document is in electronic form, link to the PDF file is included and document can be downloaded.

Figure 18. One Entry of the Registry Corresponding to a Specific Document

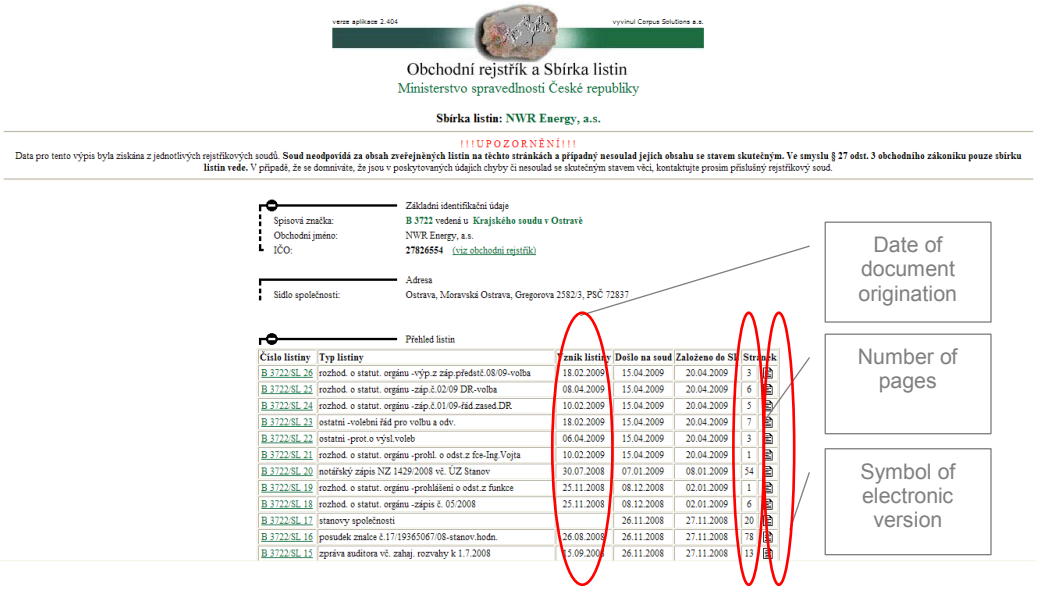


8.5 Appendix 5. Program Algorithm in Detail

Program used in this work is designed in such a way so that it replicates steps which would need to be taken by a casual user of the Ministry of Justice website in order to retrieve an expert's opinion filed for a specific company.

1. The program goes to the advanced search tool of the Companies Register on the website: http://www.justice.cz/xqw/xervlet/insl/index?sysinf.@typ=or&sysinf.@strana=searchSubject
2. The program replaces the last three signs in the following website address with an identification number as given in the inputs list: http://www.justice.cz/xqw/xervlet/insl/index?sysinf.%40typ=or&sysinf.%40strana=searchResults&hledani.%40typ=subjekt&hledani.podminka.ico=xxx
3. From the company's homepage the program continues to the registry where it searches for html signs of filings table. The filings tables contains information on documents filed in the registry, as shown in Figure x.

Figure 19. Filings Table of the Registry



4. The program analyzes the filings table in a following way: it goes line by line and in every line it searches for a given year, as specified in the inputs file, and then

for a given document. In our case, the program looks for the text string “znal”. Once the first “znal” is identified for a given year, the program finds out whether the document is filed electronically and how many pages it consists of. Then it stops searching, documents the key word allocation in the Output file, and starts to search for documents in the next year as specified in the inputs list.

In case an error occurs during the above described process and the program does not receive any response for an item being searched, error note is documented in the Log file and zeros are documented in the Output file. In other words, the Log file runs simultaneously with the Output file and in case the program does not work properly, the Log file documents an error note. The Log file also registers exact time of every identification number being searched by the program. This process repeats as long as there are identification numbers in the inputs list to be searched for.

8.6 Appendix 6. Project on Diploma Thesis

Term of master examination: September 2009
Author: Petra Kolouchová
Supervisor: Jiří Novák Ph.D.
Preliminary title: Cost of Equity in Practice

Characteristics of the theme:

The aim of the thesis is to shed light on cost of equity estimation in case of closely held companies in emerging markets. Cost of equity concept has gone through a long development and yet its estimation remains one of the most challenging areas in business valuation. Despite a clear guidance on CAPM-based DCF models in the context of developed markets, the straight application of CAPM in case of emerging markets, where the efficient markets hypotheses cannot be easily assumed to hold, raises controversies. In case of valuation of closely held companies rather than public companies, the estimation of cost of equity becomes even more complex. The informational transparency and the ability to diversify is what mainly distinguishes trading public companies in developed markets from trading closely held companies in emerging markets.

During the last two decades, the Czech Republic has been an example of an emerging market where mostly closely held companies have been traded. The transformation process followed by an increased M&A activity can be mentioned as an example of factors which created a strong demand for valuation services in the Czech Republic. Valuation of closely held companies became a crucial part of the financial analysts practice. The area of business valuation also grew given the requirements of Czech Commercial Code. Certified appraisers have been asked to perform valuation of closely held companies for the purpose of the Commercial Code but apart from some general instructions have not been obliged to follow any specific guidance on valuation methods. For estimating the cost of equity, for instance, the appraisers can apply whichever approach they consider the most appropriate.

Research Design:

In this work we will perform an empirical analysis on a sample of appraisals filed with the Czech Commercial Register.

Basic Outline:

1. Introduction
2. Theory
3. Previous Research
4. Institutional Framework
5. Empirical Analysis
6. Conclusions

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