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**Discount Rate Estimation Practices of Czech Valuation
Experts in Minority Shareholder Squeeze-Outs**

Master's Thesis

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Year of the defense: 2024

Declaration

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References

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Abstract

This thesis examines the environment of expert appraisals in the Czech Republic and studies the conflict of interests arising from a setting when a valuation expert is contracted to provide valuation for the purpose of a minority shareholder squeeze-out. This underlying conflict of incentives stems from the fact the expert is paid by the majority shareholder and also from possible efforts relationship building (resulting in securing future engagements) from the expert's side with the majority shareholder that would arise from discretionary adjustments to discount rate calculations and decreased squeeze-out price. This opportunistic behavior is deterred by reputational and legal consequences upon discovery of such practices which can be facilitated by institutional barriers such as a requirement for an approval of the squeeze-out by the Czech National Bank. The previous quantitative research into fields of expert appraisals, methodologies used by valuation experts, and minority squeeze-outs is limited in both Czech and international setting. We rely on previous research into litigation and reputational risks and based on its findings introduce checks for structural differences in behavior of expert groups in discount rate estimation practices. We combine data provided by a valuation team of one of the Big4 companies on minority squeeze-out appraisals and prepare an original set of expert appraisals from the business register. Based on this data we extract discount rate information and test if the practices of experts are consistent and opportunistic. The results indicate some evidence of structural differences between Big4 and non-Big4 experts in the impact their changes in discount rate estimation have on the resulting discount rate. We find no evidence of opportunistic behavior in the squeeze-out setting.

Abstrakt

Tato práce zkoumá prostředí znaleckých posudků v České republice a zaměřuje se na konflikt zájmů plynoucí ze situací, kdy jsou znalci v oboru oceňování najímáni pro potvrzení přiměřenosti nabízeného protiplnění při vytěsnění minoritních akcionářů. Tento konflikt zájmů je motivován tím, že plátcem za posudek je majoritní akcionář a zároveň možnými snahami o budování vztahů (které by mohly vyústit v budoucí zakázky) s většinovým akcionářem, kterého by bylo docíleno pomocí účelných úprav v metodologii stanovení diskontní sazby a snížení hodnoty vyplaceného protiplnění. Proti takovému oportunistickému jednání stojí potenciální reputační a právní problémy, které mohou

následovat v případě jeho odhalení. V procesu vytěsnění existují institucionální kontroly které mohou oportunistické jednání odhalit – například požadavek na schválení vytěsnění ze strany ČNB. Předchozí kvantitativní výzkum zaměřující se na znalecké posudky, metodologii používanou znalci a vytěsnění minoritních akcionářů je omezený jak v České republice, tak celosvětově. Opíráme se tedy o předchozí výzkum v oblasti dopadu litigačního a reputačního rizika a na základě jeho nálezů testujeme, zdali mezi skupinami znalců existují strukturální rozdíly v praxi stanovovan discounting míry. Využíváme souboru posudků pro stanovení přiměřeného protiplnění jednoho oceňovacího týmu ze společností tzv. Big4 a připravujeme vlastní posudků z obchodního rejstříku. Z těchto souborů posudků získáváme data o odhadech diskontních měr a testujeme, zdali je praxe znalců konzistentní a zda vykazuje známky oportunistického chování. Naše výsledku ukazují jisté rozdíly mezi praxí znalců patřící do Big4 a ostatních ve velikosti dopadu změn jejich metodologie na výsledné velikosti odhadů diskontních sazeb. Nenacházíme důkazy o oportunistickém chování znalců v případech vytěsnění minoritních akcionářů.

Keywords

Expert appraisal, squeeze-out, valuation, discount rate, reputation risk

Klíčová slova

Znalecký posudek, vytěsnění, ocenění, diskontní sazba, reputační riziko

Název práce

Odhady Diskontních Měr Praktikované Českými Soudními Znalci Při Vytěsnění Minoritních Akcionářů

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Introduction

In 2006 the then 10th largest listed company in the Czech Republic, Severočeské doly, has undergone a minority shareholder squeeze-out process. This squeeze-out has been subject to a lawsuit where the minority shareholders claim the compensation provided for shares of the company was not fair. The lawsuit is still underway today more than 15 years after the squeeze-out took place. Since the main contested point is the economic assessment of fairness of the compensation provided, expert appraisals of the company play a vital role in the case. During this litigation alone 7 different experts have provided their reports, testimonies, and assessment of the fair valuation of the company with vastly differing opinions. that are still not settled after such a long time even though lengthy discussion has already taken place.

This minority squeeze-out litigation shows just one of the many ways expert opinions can play a vital role in the justice and corporate finance environment in the Czech Republic. As we will explain later, expert opinions also enjoy a special spotlight in the eyes of courts as they assume a certain premium position as compared to other forms of evidence with courts having a limited ability to challenge their findings in practice. Moreover, there are many settings where Czech law directly requires an expert appraisal to be prepared to serve as indication of fairness outside of court setting.

Given their wide applicability it could be expected that expert appraisals and the quality of experts' work would be extensively examined by the academia, the state, or professional bodies. This does not seem to be the case in the Czech Republic as there is a very limited literature aimed at examining expert appraisals. Moreover, most of this literature is focused more on descriptions of utilized approaches (Kolouchová & Novák, 2010) or on starting a discussion about qualitative aspects of expert reports (Červený, 2016) rather than providing analysis of trends and deeper insights into environment of expert appraisals in the country. Apart from research of Kolouchová & Novák (2010) the sample sizes of all the studies focused on expert appraisals in the Czech Republic available to us do not exceed a sample size of 100 expert appraisals challenging the robustness of their findings and are often opaque in their description of how the examined appraisals were selected.

This unoccupied space in research has prompted us to create the first study that comprehensively examines the practice of experts in the Czech Republic. We focus primarily on the setting of minority shareholder squeeze-outs discussing the institutional background of the strong clash of incentives for the expert the minority squeeze-outs present in detail in the thesis. We test these incentives by examining the changes in methodology experts use to estimate the discount rate for their valuation.

The rest of the thesis is split into the following chapters: description of the squeeze-out process and its specifics in the Czech Republic; introduction into the legal environment of expert appraisals in the Czech Republic; a brief literature review on the impact of reputational and litigation risks on similar clashes of incentives as are present in the squeeze-out setting; a brief introduction into company valuation motivating consistent practice in discount rate estimation; selection of key parts of methodology of expert appraisals to be studied; chapter covering the definitions of our key metrics and construction of related hypotheses; description of the data gathering process with summary statistics of the observed variables; a section detailing the research methodology; the results of our analysis, their interpretation and implications they pose for the current minority squeeze-out regulation; and a concluding remarks summing up the thesis and suggestions for future research.

1 Minority shareholder squeeze-outs

For the purposes of this thesis, it is crucial to understand what the main economic agents in squeeze-outs of minority shareholders are, what are their main motivations and what is the basic legal and institutional framework governing the process in the Czech Republic. This chapter shall therefore serve as an introduction into the institutional background of the squeeze-out process describing the process, motivations of the stakeholders, and legal checks imposed on them.

Minority shareholder squeeze-out is a process during which a majority shareholder (or group of coordinated shareholders) that controls a significant portion of subject company's shares can unilaterally decide to buy-out the remaining minority shareholders out of the company. The level of control required for such an action depends on the legal environment the company operates in but is usually set at a significant portion of ownership.

Since minority shareholder squeeze-outs are a one-sided decision of the majority shareholder (i.e. the minority shareholders cannot decide not to sell their shares) safeguards are put in place to assure that the process, and the offered price for the shares will be fair with respect to the fundamental value of the company. If such safeguards were not in place an economically rational majority shareholder would always offer subpar compensation or rather no compensation at all.

1.1 Minority shareholder squeeze-out in the Czech Republic

In the Czech Republic, the law¹ allows for minority squeeze-out to be initiated once the majority shareholder controls shares equivalent to 90% stake in the equity of the company and also 90% of all voting shares. It is important to stress that the 90% quota gives the right to initiate the process but does not come with an obligation and is not intended to serve as an institute of protection of minority shareholders' rights as stated repeatedly by the courts.² The Czech law has another legal institute that provides minority shareholders with an opportunity to exit a company when some other market participant achieves "a significant

¹ Zákon o obchodních korporacích, §375

² For example, in Pl. ÚS 56/05

portion of ownership over the company”, however these cases will not be the focus of this thesis.

There are three safeguards put in place by the law to protect the interests of the minority shareholders in the squeeze-out process – a formal requirement of anchoring the proposed price in an expert appraisal or the company’s analysis, oversight and need of approval by the Czech national bank, and, finally, a possibility to sue in court if the minority shareholders feel the approved price was not sufficient. These safeguards are crucial to the motivation of both the majority shareholder and the experts employed by them – for detailed discussion of mainly the incentives connected to possibility of litigation see chapter 3.

The first of the abovementioned safeguards is that the proposed price must be based on either an expert appraisal prepared by a third-party expert, or an extensive analysis as provided by the majority shareholder. However, in practice over most of the squeeze-outs are supported by an expert appraisal.³

The second safeguard constitutes a legal requirement for the squeeze-out process and offered price to be reviewed by the Czech national bank that also acts as the regulator of financial market in the Czech Republic. This step is supposed to provide a check by the regulator of the financial market to assure that there was no significant infringement into rights of minority shareholders during the squeeze-out process.

Finally, following an approval by the Czech national bank and an approval on the general assembly of the company, legal transfer of rights and the payout of the proposed price, there is a three year long time window, during which the minority shareholders can decide to sue the majority shareholder if they believe the price paid for the shares was too low or that their rights were infringed upon during the process. Such challenges in court are supposed to provide an additional layer of oversight mainly concerning the question if the price paid for the shares was adequate.⁴ This challenge of the adequacy of the paid-out price is quite common in the Czech Republic and was raised in approximately 10% of all the squeeze-outs

³ As of October 2023, there have been 954 squeeze-outs in the Czech Republic while only two squeeze-outs have not been supported by an expert appraisal: those of Unipetrol a.s. and PFNonwovens a.s.

⁴ In Czech this adequacy is called “přiměřené protiplnění”

that have occurred on the market.⁵

2 Legal environment of expert appraisals

This chapter describes the definition of expert appraisals in the Czech Republic, description of what are the factors setting apart expert appraisals from ordinary valuation reports, and concludes with discussion of incentives of the expert in cases they work for a majority shareholder in the setting of minority squeeze-out.

2.1 Expert appraisal definition

Since this thesis concerns valuation expert opinions it is imperative to define and explain what an expert opinion is and how it differs from a normal valuation report. In the Czech Republic, expert opinions are defined as special documents that fulfil a set of formal criteria set by a decree of the ministry of justice⁶ and are prepared by an individual or a legal entity that have acquired an expert status. If a legal entity wants to have the status of an expert, it must employ an individual with the expert status in the relevant field of work. For a person to acquire the expert status in business valuation, they must have completed a master's degree in economics, have had 5-year full-time tenure in a relevant field of work, and then they can go through a specialized course covering valuation and introduction to the legal requirements imposed on experts, and finally pass an expert exam.

As there are requirements for the experts, there are formal requirements for the expert appraisals that mainly focus on the possibility to be fully reviewed that encompasses the need to present transparent computations, list all sources for the input data and possible limiting assumptions related to the expert appraisal limitations. A factor that is directly important to this thesis is the fact that preparing an expert appraisal brings along a possibility of legal consequences for the expert. Should it be proven that an expert willingly influenced the valuation or violated any other part of the relevant law they face a fine of up to CZK 500,000 and possibly risk revocation of the expert status. Keeping the expert status is

⁵ The webpage that tracks squeeze-outs in the Czech Republic <https://www.in-server.cz/vytesneni-akcionaru/> shows that there were 954 squeeze-outs in the Czech Republic while there are at least 109 companies that were or are currently being sued for adequate compensation

⁶ Vyhláška o výkonu znalecké činnosti

important for the experts since it enables them to provide services. These cases can serve as an important source of revenue for the expert companies and therefore the threat of expert title revocation is an important incentive in managing the potential conflict of interests the expert may face.

Among the services made possible by the expert title are for example appraisals of non-cash deposits into equity of companies that are legally required to be assessed by an expert, or special status of expert reports in litigation process in the Czech Republic as compared to regular valuation reports as we discuss in the following chapter.

2.2 Structural advantages of expert appraisals in court

As stated above, minority shareholder squeeze-outs are often targeted by subsequent lawsuits that inherently must claim that the price set by the initial expert report was flawed or at least incorrect. Therefore, it is also important to discuss how the expert appraisals are treated as a preferential type of evidence and

The important distinction of expert report to normal valuation reports are the legal differences between these two kinds of reports. Even though a normal valuation or economic report can be presented as evidence in court, an expert report enjoys a more prominent state as defined in § 127 and § 127a of Czech civil court code (Občanský soudní řád). Moreover, expert appraisals are commented on in court rulings which often outline the fact that matters covered in expert opinions that concern specialized areas of knowledge are not subject to review by the court and that such areas can only be reviewed by another expert report.⁷

Hand in hand with special treatment of expert appraisals in eyes of law goes more stringent consequences of wrongdoing when preparing an expert report – an expert that has knowingly prepared and handed in an untrue expert report can, additionally to civil law consequences, also face potential criminal law charges with sanctions ranging from fines to prison sentences. However, it's quite rare that experts in the area of economics would face significant repercussions in connection with their expert appraisals.

⁷ Supreme court of the Czech Republic, 30 Cdo 3450/2007

2.3 Role of expert appraisals in the squeeze-out process

As noted earlier expert appraisals play a key role during the process of the squeeze-out process because it is the one of the main sources to set the purchase price of the squeezed-out shares. The squeeze-out price can also be supported by the price the majority shareholder acquired the company's shares in 6 months preceding the squeeze-out,⁸ or past transactions with large bundles of the company's shares.⁹ However, the information quality of the pre-squeeze-out transaction prices might be limited with respect to the level of liquidity of the shares and thus the expert opinions tend to play a key role in the squeeze-out process and even in the subsequent litigations.

A common objection from the minority shareholders with respect to the reliance of the squeeze-out price on an expert appraisal is the fact that the expert is essentially working on a valuation engagement that is paid for by the majority shareholder. Therefore, there is an incentive to undervalue the company as the expert is paid by majority shareholder and for the expert to keep or establish a positive relationship with the majority shareholder as they might be a potential future client for the expert. This issue was addressed even in an attempt to outlaw the squeeze-out process at the Constitutional court of the Czech Republic where the claimants stated that *“[i]n case of squeeze-outs, the price for such a transaction is set by the majority shareholder alone while also determining the level of financial compensation for the expert. This fact, obviously, influences the question of whether the expert is impartial or not. (...) A possible objection that the expert has legal liability for faulty appraisal and that they are liable for damages is, in this case with respect to the value of the squeeze-outs out of the question.”*¹⁰ To such objection, the court responded that: *“The fact that the costs*

⁸ For example, in the case of squeeze-out of PFNonwovens a.s. the Czech national bank states that one of the supporting factors for justification of offered compensation was the average price of shares of the company on the Prague Stock Exchange. See Decision of the Czech National Bank case 2020/130962/CNB/570 S-Sp-2020/00068/CNB/572 dated October 23, 2020; available online at <https://www.pfnonwovens.cz/file/3387/rozhodnuti-cnb.pdf>

⁹ For example, in the early squeeze-outs such as in the case of Severočeské doly the price paid for a stake in the company during its privatization process is often cited as a point of contention in the court decisions.

¹⁰ In original: *“V případech vytěsnění (squeeze-out) však znalec pro tento účel určuje hlavní akcionář sám, přičemž také stanoví znalci výši jeho odměny (§ 183j odst. 6 obch. zák.). To samozřejmě musí mít a má vliv na otázku závislosti či nezávislosti znalce. (...) Případná námitka, že znalec má odpovědnost za vadný posudek a že odpovídá za způsobenou škodu, zde s ohledem na hodnoty, které jsou ve hře, neobstojí.”* Pl. ÚS 56/05, pg. 6

*of the expert appraisal are paid for by the majority shareholder cannot on its own lead to a general conclusion that such expert appraisals are faulty just due to this very fact because the same objection could be raised had the expert appraisal been paid for by a minority shareholder.”*¹¹ We understand that this discussion is focused mainly on the legal and especially constitutional circumstances of expert appraisals in squeeze-out cases, however it demonstrates that the conflict of incentives was apparent and strong enough to be put forward as one of the causes for the challenge of legality of the squeeze-out process as a whole.

Moreover, the majority shareholder can hypothetically decide if they want to continue in the squeeze-out process depending on the result of the valuation – i.e. if the valuation stemming from the expert report is too high, the majority shareholder can simply contract another expert to see if they arrive at a lower valuation. Such decision would, however, be rational only in the case when there was, first, no time pressure to perform the squeeze-out and also while the fees for the additional expert report would be spent with limited probability that the new valuation would yield significantly lower result with a real risk that the new valuation could also produce higher valuation and thus yielding the majority shareholder with two unusable expert reports and a need to contract yet another expert. Therefore, it seems rather unlikely the majority shareholder would try postponing the squeeze-out once they decided to undergo the process.

To sum up we see that there is an interesting conflict of incentives related to preparing an expert opinion for a squeeze-out in the Czech Republic. On one hand valuation experts in squeeze-out setting might be motivated to lower the valuation result to improve relationship with their clients, on the other any opportunistic behavior brings a risk of being exposed and along with it a following fine, reputational damage, and even a potential removal of expert status resulting in constraints on their ability to provide services to their clients.

¹¹ In original: “*To, že náklady na vyhotovení znaleckého posudku jsou hrazeny hlavním akcionářem, samo o sobě ještě nemůže vést k obecnému závěru, že tyto posudky jsou již tím vadné, protože stejnou námitku by bylo možno vznést v případě, že by byly hrazeny minoritním akcionářem*” Pl. ÚS 56/05, str. 25

3 Prior research into litigation risks and reputation impact on incentives

As we outline in the previous section, engaging in distortions of squeeze-out valuations poses both a litigation and reputational risk for valuation experts. Effects of both of these risks on incentives of professionals were extensively studied in the context of audit and audit quality. We believe there is a strong case to expect the effects on incentives to be similar between audit and professional valuation services as both types of the professional services are usually provided by the same companies to similar types of customers building effectively similar competitive pressures. Moreover, audit has international regulation while we see that the provision of valuation professional services is trending towards standardization of certain parts of its practices (e.g., International valuation standards that prescribe what is the expected approach to a typical valuation engagement and provide a few of the widely used bases of value are followed by almost 200 companies worldwide). A brief review of literature focusing on the impact and channels through which litigation and reputation risks impacts audit professionals follows in the remainder of this chapter.

In general, the issues of litigation risk and reputational risks are treated as two separate concepts in prior literature as stated in Skinner & Srinivasan (2012). The general idea behind litigation risk's effect on incentives is that legal liability of auditors (or valuation professionals in the case of squeeze-outs) pressures them to deliver reliable audits to avoid getting sued and having to bear the costs of litigation. The aspect of litigation risk also includes an associated insurance aspect related to selection of larger audit provider by their clients building on the argument that larger audit companies will find it easier to meet potential lawsuit claims and thus provide a financial remedy to the clients' shareholders should they fail during their audits. The reputational risk is to be associated with clients' desire to exhibit high audit quality to their shareholders. If audit quality is important to clients, recording an audit failure harms the auditor's reputation and perceived level of quality of their services in turn causing their clients to switch to another auditor. Therefore, these effects are presumed to be a barrier to engaging in opportunistic behavior such as overlooking discretionary adjustments in the clients' accounting in case of audit or, in our case, distortions of valuations in the squeeze-out setting.

3.1 Litigation risk and audit quality

A theoretical model motivating the importance of litigation was introduced by Dye (1993). This paper establishes connection between auditors' willingness to comply with new higher-quality standards (a decision that is costly in effort) and links it with their wealth, level of fees they charge, and, most importantly, their propensity to issue positive ratings to companies that subsequently fail.

The theoretical model was subsequently extended by Lennox (1999), who introduced auditor size (i.e., auditor wealth) into the model and showed that larger auditors should be exposed to higher risk of litigation, charge higher fees, and issue more accurate reports. Lennox subsequently conducts an empirical study on United Kingdom audit market studying the impact of negative publicity from the press, UK department of Trade and Industry in the period of 1987-1994 and found that large auditors should face more frequent litigation supporting the existence of the insurance aspect of litigation.

Another study aimed at the effect of litigation on quality of audit by Khurana & Raman (2004) focused on the interplay between the effect of litigation and auditor size has shown that the auditor size plays a more pronounced role in higher litigation environments such as the United States.

Apart from research studying directly a set of audits and their potential litigation, another approach used to measure litigation risk's impact were studies of IPOs as they present both a very strong incentive to manage earnings upwards (i.e. inflate the reported profit figures) on behalf of the management so that the company can achieve listing at a higher price¹² while allowing such behavior as an auditor can lead to potential litigation by the company's shareholders participating in the IPO. Past research into pre-IPO earnings management and its tolerance by auditors is split in its findings. Teoh, Wong & Rao (1998) have examined return on sales of IPO companies and found that they overperform their non-issuing industry peer and that this overperformance dissipates after the year of issuance. Authors claim this dissipation of frothy return on sales is evidence of earnings management (i.e. one cannot make discretionary adjustments to their financial statements indefinitely and once a company

¹² Since valuation can be based on a market approach which constitutes of assembling a sample of comparable companies

decides to pursue opportunistic discretionary adjustments in its accounting, a reversal must be seen in the following years). However, Venkataraman, Weber, & Willenborg (2008) control for the firm specific levels of accruals and find that the level of accruals is decreasing in IPO years as compared to pre-IPO levels, which suggests that auditors exert stricter standards when the threat of litigation is higher.

3.2 Reputational risk and audit quality

The literature cited in the previous chapter outlines both the issue of separation of litigation risk from reputational risk, and shows a number of cases where the litigation effect has a more pronounced impact on auditors than reputational risk does. Moreover, Skinner & Srinivasan (2012) state that the risks of reputational and litigation risks are usually tied together illustrating that in the U.S. the biggest auditors also share the best reputations and simultaneously, there is a significant legal liability of auditors for their audit quality. Therefore, the research into reputational risk tries to find natural experiments where the effect of litigation is minimized or entirely removed to examine the impact of reputational risk alone.

One such setting is municipal bond market studied by Raman and Wilson (1994). The authors claim that there was a very limited fallout for auditors providing low quality audits to municipalities at the time of their study. At the same time, bankruptcies among municipalities are highly uncommon in the US and even when there is a bankruptcy the risk of auditors being sued is low. Thus, the municipal audit is a good setting for separation of the effect of reputation. Apart from finding that procurement process for selection of auditors is a significant variable for pricing in risk in the municipal bond market, the authors also confirm that there is a significant reduction in yield required for municipal bonds that contract auditors with better reputation (i.e., the Big Eight auditors at the time).

Skinner & Srinivasan (2012) present a study in which they were able to isolate the effect of reputation alone by examining data from Japan where there is very limited legal liability of auditors eliminating the risk of litigation altogether. The authors examine a wind-down of a Japanese affiliate of PricewaterhouseCoopers ChuoAoyama following two frauds in the accounting of their clients' broke public. As the authors point out, switching an auditor is a rather costly decision on the clients' part, they use the such decisions as a test for clients'

demand for high-quality audit. Following the first fraud becoming public, ChuoAoyama's license was only suspended for a few months and the ultimate wind down of the audit company came only after the second fraud was discovered. The frauds were discovered with sufficient time window in-between the authors use this fact to distinguish clients switching auditors due to audit quality concerns and those that were forced to leave due to the wind down. Moreover, the authors fine tune the demand for audit quality by the clients' decision by ranking the clients by their demands on a descending scale from 1) clients who switched auditor upon the discovery of the first fraud, 2) clients that introduced an interim auditor during the initial ChuoAyoama's license suspension, and 3) clients that did not introduce any interim auditor during the license suspension period.

Skinner and Srinivasan use a logit model with numerous independent variables tracking firm-specific factors such as profitability, size, leverage, involvement of owners in the management of client companies, or degree to which the companies interact with foreign investors. They find that there is both statistically and economically significant increase in demand for higher audit quality in companies that are large and fast-growing with negative effect of owners being involved in the management of the company. The authors also conduct a robustness check looking for possible pattern of companies simply following the audit partners leaving ChuoAyoama to their new employers that would erode the hypothesis built on demand for higher audit quality. This robustness check shows that the hypothesis of clients simply following their audit teams is rejected as all the clients that switched auditors outside of other Japanese PwC affiliates, maintained the same signatory of the audit reports. Authors then suggest that there might be some stock return benefit for the companies that switch auditors to maintain higher audit quality, however they state that there are significant limitations to their findings in this area.

The main takeaway from the research summarized in this chapter is that the effect of reputation alone can be strong enough to influence audit-related decisions. At the same time the competitive landscape in valuation has strong similarities to audit services – firstly, there is significant overlay between the companies that operate on the market of audit services and companies providing professional valuation services; secondly, the nature of the services is also similar with audit being a compulsory practice for most companies and independent valuation services in the Czech Republic often being required by law as is the case for

squeeze-outs or, for example, for the purposes of accounting recognition of non-cash contributions to shareholder equity. Therefore, we use reputational risk faced by experts as sufficient motivator for our thesis even if the aspect of litigation targeting experts was not to be relevant in the case of squeeze-outs in the Czech Republic.

4 The case for measuring consistency in methodology of discount rate estimation

In this chapter we provide brief overview of how valuation works and outline our rationale for selection of parameters to be used during the empirical part of this thesis that is going to test experts' propensity to engage in opportunistic behavior towards majority shareholders in minority shareholder squeeze-out settings.

In business valuation three principal approaches can be chosen to arrive at the value of the company: the income approach, the market approach, and the cost approach. In the income approach, the valuation of an asset is determined by risk-weighted streams of future income an asset can generate, the market approach tries to arrive at a value of an asset by finding transactions with comparable assets on a market, and the cost approach relates the value of an asset to the costs needed to create it. When valuing a company, we can assume that most valuations of going concern businesses are based on the income approach (i.e. all businesses have some forward-looking business plans and their risk can be estimated by some model) and thus the income method will be the main focus of the remainder of this chapter.

4.1 Valuation by income approach

As we have briefly outlined, the income approach essentially depends on risk-weighted summation of future income from an asset. When valuing a company, one of the most broadly utilized income approach models is a discounted cash flow model or a DCF model in short. When using a DCF model, the valuation expert either creates a business plan of the valued company or is provided with a business plan by the company's management adjusting the forecasted financials to arrive at a forecast of future free cash flow attributable to equity and debt providers. To convert this prediction of cash flows into a present value, the cash flows need to be discounted by a discount rate that appropriately reflects the level of risk that the company faces also called a cost of capital. The most widely applicable model to

estimate the cost of capital is the CAPM model introduced by Sharpe (1964):

$$r_e = r_f + \beta \times ERP,$$

Where r_f is the risk-free rate, β is a factor of correlation between the return on company stock and the return on market, and ERP being an equity risk premium showing the excess return of the stock market to the risk-free investment. Each of these parameters has its theoretical concept and instruments that are used in practice to estimate them.

The risk-free rate is supposed to capture a return on a security that is without any risk and reflects the expected time value of money (i.e., the return that is absolutely certain and thus does not introduce any kind of variance into the expected payoffs). As described by Koller, Goedhart, Wessels (2020) this return is, in practice, taken as a return on government bonds of developed countries as their risk of default is as low as any safe market security can provide.

The beta factor can be computed either by a regression of the company's stock on a broad market index (e.g., MSCI World) or selection of sample of companies that are as similar to the valued company as possible, estimating the beta for each of them and then taking an average or median value out of those. The second approach using the construction of peer samples is necessary in cases when the valued company is privately held and thus changes in its valuation cannot be observed on the market. The construction of the peer samples often includes a degree of expert judgement and exhibits different logic than that which would be applied in research setting where it is often the case that the peer groups are defined across industry classifications or similarly pre-defined groups.

Equity risk premium is taken as an excess return of a market index to some risk-free security. ERP is usually estimated as a difference between the returns of US listed stocks and returns of US government bonds. There are different methods to arrive to estimates of ERP which include extrapolating ERP from historical returns of various length or examining the current market valuations and other market data to arrive at an implied estimate of ERP.

Moreover, the basic specification of the CAPM model can be, in practice, expanded by additional risk premia to the discount rate calculation. These premia range from premia for

riskiness of the country a company is active in,¹³ a size premium reflecting the heavily discussed propensity of smaller companies to outperform large companies,¹⁴ or a specific risk premium attributable to some special feature the company exhibits. Pratt & Grabowski (2014) provide detailed discussion of number of such risk premia along with motivations to consider their inclusion into the discount rate estimation.

4.1.1 Discount rate consistency argument

In this section we explain how valuation of a company can change and why it is important for the method of discount rate estimation to remain stable if the valuation is to reflect changes in fundamental variables linked either to performance of the valued company or changes in the market perception of risk.

Any valuation utilizing income approach is effectively a function of the forecasted cash flows and the discount rate. Since the cash flows are reflective of the company's business plan, they reflect the idiosyncratic factors related to the valued company while the discount rate measures the riskiness of the cash flows effectively benchmarking them against a portfolio of companies facing similar types of risks as the company does.

The fundamental logic behind keeping the method of discount rate estimation consistent is that valuations of the same company at different points in time ought to reflect only the changes in fundamentals – either adjustments in the forecast of the free cash flow, or development in the perception of risk on the financial market (i.e., changes to discount rates). If, on the other hand, valuation specialists were to change the instruments used for estimation of parameters included in the discount rate, they would introduce additional source of volatility into the valuation.

To demonstrate this introduction of additional volatility let's take a hypothetical example when a company is valued in two different points in time and, for simplicity, let's assume that there is neither a change in the plan of the cash flows company will generate, nor the market perception of risk (i.e., the changes in the yields of the underlying securities that were

¹³ This country risk premium is supposed to reflect political risks associated with the country of business

¹⁴ Application of this premium often relies on research by Banz (1982) that showed that small cap companies tend to outperform large cap companies, however the magnitude and even the existence of the size premium itself has been challenged by various authors since.

chosen for calculation of the discount rate). Under such scenario, there should be no change in the value of the company. However, if the valuation expert was to change the underlying instruments used for discount rate estimation, the discount rate would change, resulting in a change in the valuation which, obviously, would not make sense in such setting. Moreover, this change in discount rate parameters is essentially at the discretion of the valuation specialist and can thus be seen as an attempt to steer the valuation result to either under- or overvaluation.

If we connect this idea of consistency to the institutional setting of expert appraisals and minority shareholder squeeze-outs we see a potential channel to influence the valuation result of minority squeeze-out valuations. Namely if the expert chooses a parameter resulting in higher discount rate, the valuation could be pressed downwards. We have shown that a profit maximizing majority shareholder in the case of minority squeeze-out would like to push the valuation as low as possible to effectively engage in valuation arbitrage paying less than the is the risk-weighted value of future cash-flows stemming from the business. We have also shown the tension valuation experts face in the case of minority squeeze-outs when the experts want to satisfy their client – the majority shareholder – to maintain their relationship (and the fees from other client-related engagements) and thus could be willing to change their methodology to do so. At the same time, valuation experts face the consequences of loss of reputation, loss of expert license along with the license-associated business should such opportunistic behavior be revealed. Therefore, discount rate data can be used as an instrument through which uncover which of these institutional incentives is stronger and if experts resort to opportunistic discretionary adjustments of discount rates to depress the valuation in squeeze-out settings.

4.1.2 Consistency nuances

We can look for various measures indicating the possible opportunistic discretionary adjustments to discount rate out of which this thesis is focusing on two. Firstly, we can simply assume that any deviation from previously pursued methodology is inherently a discretionary action by the expert trying to skew the discount rate and the valuation itself and treat all changes to the methodology as negative phenomenon. This notion has two problems: firstly, it does not allow the experts to change their methodology due to relevant factors such as development in what they perceive as the best practice effectively flagging

experts that revise and fine tune their approaches more often than other as exhibiting opportunistic behavior rather than higher level of diligence; secondly, it disregards the fact that for any opportunistic adjustments of discount rate to be meaningful for the client, the change in the discount rate and in turn in the impact on valuation of the squeezed-out business must be economically significant. If the impact on valuation were not economically significant the opportunistic behavior would lose the positive effect for the majority owner as there would be no relevant savings on their part and such changes in discount rate would then only present a risk to the valuation expert as the service to client would not be significantly bolstered but the risk of punishment would be still present. The second approach this thesis explores in relation to potentially opportunistic discretionary adjustments to discount rate is looking for the impact of the changes in discount rate estimation methodology on the discount rate values. This enables to treat the second caveat of the first approach effectively giving weight only to changes in discount in settings that have some significant impact on the resulting discount rate and the valuation itself. This second option, however, places more stringent requirements on the data that are extracted from the expert appraisals and thus may limit the number of the examined appraisals. A more in-depth discussion of the two approaches and the definition of the metrics used in the empirical part of this thesis, see chapters 6.1 and 6.2.

In the previous paragraph, we have briefly touched upon the issue of changes to methodology that may in fact exhibit a due course of action on part of the valuation experts. It is reasonable to expect valuation experts are going to be keeping up-to-date on relevant literature and worldwide best practices and making adjustments to their methodology when relevant. Research by Dye (1993) cited in chapter 3.1 has shown that there are significant differences between auditor's willingness to comply with new auditing standards and as we have motivated that the market for valuation specialists is similar to that of audit (both in the nature of the professional service provided and the companies that are active on the market) it may be reasonable to expect that similar disparities will arise among the valuation experts and their willingness to update their methodologies based on their research. The findings from the audit-related research suggest there should be a significant difference in the behavior of Big4 and non-Big4 experts. Therefore, it may be reasonable to expect Big4 companies will exhibit more frequent changes in their methodologies. At the same time, the previous literature shows that Big4 (at the time the Big8) companies are more prone to adjust

their actions based on the reputational risk they face. This would suggest that in case of minority shareholder squeeze-outs, Big4 experts should be less inclined to change their methodology in a way that would result in an economically significant reduction of the buyout price. If we combine these two implications of the previous literature, we can expect to find that Big4 experts are going to exhibit significantly more frequent variation in their methodology but these variations should result in significantly lower variation in the resulting discount rate. Next, we need to define the variables that we are going to base our empirical hypotheses on.

5 Selection of parameters to study

Since the goal of this thesis is to show whether there are signs of experts pursuing opportunistic discretionary adjustments in their squeeze-out appraisals we need to find a parameter of valuation that should be comparable across different companies and purposes of valuation.

As we have explained, the income method valuation essentially boils down to forecast of cash flows, and discount rate used. Since the forecasted cash flows are essentially tied to individual companies' business plans, we cannot test for potential opportunistic behavior across different companies by using figures from the cash flow projections as, for example, plan of capital expenditures is tied to specific projects the valued company plans to pursue and these projects in turn impact future profitability, depreciation, and other parameters of the cash-flow projection. This implies we should turn the focus of our research on the discount rate and its constituent parameters that are comparable across companies in different industries. This naturally poses the question which parameters of discount rate should we choose to examine.

Because we wish to examine the methodology behind as broad a set of expert appraisals as possible, we limit our scope of parameters to the base CAPM model as specified by Sharpe (1964). Further we cannot use the beta coefficient as it is inherently tied to the valued company's industry and thus does not fulfill our criteria. Furthermore, the exclusion of beta coefficients is supported also by findings of Kolouchová & Novák (2010), who found that beta coefficients are predominantly taken from the online database of professor Damodaran, and therefore beta coefficients would not be a good candidate for a parameter to detect

variability in discount rate methodology. Therefore, the remaining parameters we can study are the risk-free rate, and the equity risk premium that both represent quite a well-defined and universally accepted components of risk.

For the risk-free rate, we recognize three main variables: nominal amount, maturity, and country. Nominal amount denoted in percentage points is the value of the risk-free rate that was used. Maturity is associated with the maturity of the instruments used for estimation of risk-free rate. Country then refers to the country which bonds are used as the risk-free rate.

For equity risk premium we gather two main variables: nominal amount, and source. The nominal amount is the value denoted in percentage points used by the expert in their appraisal for the ERP. Source is the cited source for the ERP. The source variable is then converted to dummy variables corresponding to the individual sources listed in all of the expert appraisals.

Apart from variables concerning discount rate components, we also track the ID of the expert that prepared the appraisal, the date at which the appraisal was published, a dummy variable equal to one if the appraisal was prepared for a squeeze-out and zero otherwise, and a dummy variable equal to one if the expert is part of the Big4 and zero otherwise. The process of obtaining the data is described in chapter 7.

6 Hypothesis formulation

As we have motivated in chapter 4 there is a case for keeping the methodology behind estimation of discount rates consistent across time that relates to the tension between pressure on lower valuation in squeeze-out cases and potential reputational damage for experts. For the purpose of this thesis, we define two sets of hypotheses aimed at measuring different ideas behind deviations from previously utilized discount rate estimation. These hypotheses stand on two concepts we define in the following subchapters: consistency, and opportunism.

6.1 Definition of consistency

For examining consistency, we assume that any change in the underlying securities used for estimation of the observed discount rate parameters is a phenomenon that might hint at

potential discretionary adjustments to discount rate estimation on part of the expert and thus identifies an attempt at distorting the resulting valuation. Moreover, we treat changes to maturity or country of government bonds used to arrive at the risk-free rate and source for equity risk premium estimation as mutually equivalent and do not assign any special weights to these components of discount rate calculation.

We also label changes that constitute a single department from a previously established practice to which the expert subsequently returns only as a singular change. Therefore, a situation when an expert has been using 10-year Czech government bonds in their estimation of the risk-free rate, changes this methodology to a 5-year Czech government bond, only to return to 10-year Czech government bond in the following appraisal is labeled as one change only as it fundamentally represents only a single deviation from a previously established methodology. This is also important due to the fact that if squeeze-outs were to be the cases where experts depart from otherwise stable methodology, this approach would not penalize the subsequent return to the usual methodology and is thus able to distinguish the sought after phenomenon more effectively.

6.1.1 Hypotheses related to consistency

We formulate three hypotheses with four related regression equations for the purpose of testing consistency. The hypotheses are as follows:

Firstly, as we have identified individual experts, we can sort them into Big4 and non-Big4 companies and measure the difference between these two groups. As the literature suggests that the Big4 companies are swifter in adopting new guidelines in their audit practice, we would expect them to also provide valuations with more frequent discount rate methodology revisions.

Hypothesis 1: Experts belonging to the Big4 are significantly more likely to change their methodology than non-Big4 experts.

Second, we focus on the aspect of minority shareholder squeeze-outs where we have motivated the structural tension in experts' motivations and therefore want to see if squeeze-outs present a case where the methodology of discount rate estimation is changed significantly more often than in case of other expert reports. Given the existing conflict of interest we expect the experts to change their methodologies significantly more often in cases

of squeeze-outs. The second hypothesis is as follows:

Hypothesis 2: Experts are more likely to change their methodology in cases valuations for minority squeeze-outs

Third, we can combine both hypotheses (i.e., testing higher consistency for Big4 companies and consistency in squeeze-outs) into a combined hypothesis. In such setting we expect the Big4 experts would change their methodology in squeeze-out appraisals more often than its non-Big4 competitors due to the more frequent revisions of their methodology overall.

Hypothesis 3: Big4 experts are more likely to change their methodology in minority squeeze-outs than their non-Big4 competitors.

6.2 Definition of opportunism

For the definition of opportunism, we consider a more nuanced approach than that used for consistency, in which we recognize that if experts were to subdue to the pressure of their clients in squeeze-out setting, they would need to distort the discount rate upwards. Upwards distortion of the discount rate would result into more conservative discounting that decreases the present values of cash-flows for most stable businesses and thus pushes the resulting valuation down. Therefore, we define a change in the underlying security for discount rate parameter as opportunistic only when the discount rate increases relative to a situation when the old instrument would have been used.

To test for opportunism, we need access to time-series data on the instruments used by the experts in their appraisals. As this is principally not possible for most equity risk premium calculations (the only publicly available source for equity risk premium estimation is the database of professor Damodaran), the testing of opportunism must be done only on the basis of instruments used in risk-free rate calculations.

6.2.1 Testing opportunism and related hypotheses formulation

As we have described at the end of chapter 4.1.2, the hypotheses derived for testing opportunism should reflect the findings of previous literature which states that Big4 companies are more sensitive to reputational risk, and should as such resort to changes that produce less variance in the values of the discount rate parameters. As is the case for testing consistency, we produce three hypotheses related to opportunism testing with four regression

specifications.

Firstly, we study the effect of whether an expert being a part of the Big4 has any impact on the direction and strength of their departures from consistent practice once they change their methodologies. In this setting, we expect the Big4 experts to produce significantly lower variation in their discount rate values than is the case for non-Big4 experts as supported by the reputational risk considerations:

Hypothesis 4: Experts belonging to the Big4 produce significantly smaller changes in their discount rates.

Second, we focus on the aspect of minority shareholder squeeze-outs where we have motivated the structural tension in experts' motivations. Therefore, want to see if squeeze-outs present a case where the changes in discount rate estimation result in opportunistic movements in discount rate estimations. As is the case for the consistency hypothesis, we expect the squeeze-outs to pose an attractive opportunity for experts to change their methodologies towards significantly higher discount rates:

Hypothesis 5: Experts produce significantly higher changes in their discount rate in squeeze-out cases

The third hypothesis combines the preceding two (i.e., testing for opportunism in Big4 experts and testing for opportunism in squeeze-outs appraisals) into a combined hypothesis. Given the reputational considerations faced by the Big4 we expect them to change their methodology of discount rate estimation in squeeze-out cases with significantly lower impact on the discount rate level than is the case for non-Big4 experts.

Hypothesis 6: Big4 experts produce significantly smaller changes in their discount rates in squeeze-out cases as compared to non-Big4 experts.

7 Data and descriptive statistics

As far as we are aware the task of tracking consistency in methodology applied by Czech valuation experts was not examined by any existing research and the research commenting on the methods employed is sparse while also concerning a limited number of expert appraisals. Thus, we firstly believe that tracking the state of the methodology in sample of our size is a factor contributing to current state of research.

As opposed to our simplified example in the chapter 4, the experts in real world face changing market environment and along with them nominal changes in individual inputs in the discount rates they apply. This will make our analysis more challenging since we cannot simply look at the nominal values of entries into CAPM because with changing market conditions the nominal values of discount rates are going to change. Thus, we need to obtain not only the nominal values of individual parameters of discount rate but also information about what they represent as defined in chapter **Error! Reference source not found.**

7.1 Data gathering process

Before we describe the design of the data gathering process, we first explain two major considerations driving certain decisions taken in it.

The first consideration relates to the fact that we aim to build a dataset where expert appraisals can be connected to their authors. This is an important requirement as we expect there might be significant differences in the levels of consistency between individual experts. By being able to identify the authors we can test for changes in methodology in squeeze-outs not only by a pooled model but also a fixed effect model that should provide a more robust inference of the experts' willingness to undergo changes in their methodologies.

The second consideration relates to the number of squeeze-out appraisals the expert must have produced to be included in our dataset. There are two principal considerations motivating this constraint. The first relates to the fact that it is possible for the experts to undergo isolated random changes in methodology and should such changes coincide with appraisals that relate to squeeze-outs, these changes could skew our results. The second consideration is related to limited motivation of experts to change methodology in squeeze-out cases if they only produce a small number of squeeze-out appraisals (i.e., it is questionable if there exists a real motivation to change expert's methodology in squeeze-out settings if the expert produced only a small number of squeeze-out appraisals). Due to these considerations, we limit the sample to include only experts that have produced at least 5 squeeze-out appraisals.

In this thesis, we operate with two main data sources – the first being the Czech business register and the second being a set of 650 expert appraisals that cover exclusively squeeze-out appraisals we obtained from the valuation and financial modelling team of one of the

Big4 companies who were open to providing us with access to their database that comprises multiple sources.

The set of data provided by the Big4 team was collected by systematically going through multiple sources of squeeze-out related appraisals – most importantly the business register and archive of the Czech national bank that is tasked with keeping all of the squeeze-out requests and related materials and other sources. This dataset is an important source of data for us, since some of these sources are not publicly available for free or a significant time investment is needed to access and gain access and electronic copies of some of the appraisals in the sample which enhances our sample size and limits possible omissions.

The data gathering process for the sample of the rest of the expert appraisals is split into the following phases: obtaining expert reports from business register, filtering the expert reports according to their authors, manual identification of patterns in the reports, utilization of these regularities by a text-recognition mechanism.

To acquire data from expert reports not related to squeeze-outs, we firstly need to obtain the expert reports themselves. For this task we scrape the Czech business register to which companies are obliged to upload relevant documents; we note that the disclosure is far from perfect. Business register is still one of the few publicly accessible sources where it is possible to acquire sufficient number of expert reports in one place as there, as of the date of publication of this thesis, is no central archive where expert appraisals from every expert could reliably be found, run either by the state or any private company. Theoretically, we could pursue a path of requesting expert appraisals from the individual experts' archives yet we believe such approach would firstly take considerably more time and, more importantly, would introduce the ability of experts to directly influence which appraisals they provide to us and thus introduce selection bias at the very root of the data gathering process. Therefore, we believe that obtaining data from the business register is the preferable option. To scrape the business register, we have obtained a list of active identification numbers of all companies in the Czech Republic from database of MagnusWeb and used this list of identification numbers as the search criterion for each company and the scraper then opened the document list (sbírka listin) and downloaded any document with label “znalecký“, or “posudek“ in the document type column. This resulted in 14,816 expert opinions for 9,407 legal entities being downloaded.

Since most of these documents were in the pdf format as scans of printed out copies, we needed to employ OCR software to make the text in the documents readable for any algorithm we would use for extraction of the data. The need to examine the data on an expert-level basis combined with the fact that reading through more than 15,000 expert appraisals simply isn't a reasonable approach with respect to the required time investment for such endeavor, motivates splitting the expert appraisals into groups by the individual experts and then trying to identify regularities within these subsamples to be subsequently exploited by a regular expression seeking algorithm.

The idea behind using regular expression algorithm lies in the fact that certain parts of expert reports (e.g., the author, the aim of the report, the report date) are made obligatory by the Expert law and, moreover, it is also economically rational on part of experts to create templates that cover section repeating in every appraisal (as would be the case for discount rate estimation for every income valuation). Therefore, we would expect experts would usually utilize a template containing the obligatory parts and most of the often repeated parts of text for their expert reports and reuse this template which enables us to gain the relevant data in an efficient timeframe.

To assign the appraisals to the individual experts we utilize the fact experts are obliged to explicitly identify themselves in the text of the expert appraisal and therefore we search the text of the appraisals for individual experts' names. To handle a possible misattribution of appraisal to an expert, we run a code checking for names of other experts in the individual expert-specific folders – as this process generated only a handful of matches, we then manually opened every such file where names of multiple experts were found and inspect to which expert this appraisal belongs to. This attribution of appraisals to their authors was done separately for the appraisals from the business register and for appraisals related to squeeze-outs so that we could identify which experts produced at least five squeeze-out reports to be included in our research – a limitation which we motivate at the beginning of this section. This approach has yielded 2,433 non-squeeze-out and 303 squeeze-out appraisals attributable to 18 experts who have published at least 5 squeeze-outs in the observed period.

To extract the data from individual experts' appraisals we utilized the same approach for each expert. Firstly, we open an appraisal and find the section where the construction of

discount rate is being discussed. In such section we identify a key phrase that preceded the desired parameter and then utilized a regular expression in python to match such phrase in all appraisals prepared by the examined expert and subsequently extract the nominal values of discount rate components and corresponding strings of text with qualitative description of those components. We note that one of the 18 experts did not provide any qualitative information with regard to their discount rate components and thus we exclude their observations from our sample.

To ensure that we do not drop observations due to changes in the wording of the appraisals, we keep track of the appraisals we did not find any matches in and subsequently reexamine them for the discount rate parameters and either repeat the matching for a new phrase in the remaining appraisals, or note the appraisal as without the given parameter. It is important to mention that this second option of no discount rate parameter present in the appraisal occurred primarily for appraisals that did not contain income-based business valuation (other methods included e.g., real estate valuation or business valuation using exclusively cost and/or market approach that do not use the parameters of the discount rate we were interested in). Table 1 on the following page shows the summary statistics related to our final sample.

Table 1: Summary statistics

	All Appraisals			Appraisals Containing All Parameters			
	Total	SQ	Squeeze proportion	Total	% of appraisals	SQ	% of SQ
Expert 1	76	35	46%	76	100%	35	100%
Expert 2	63	17	27%	26	41%	11	65%
Expert 3	61	9	15%	61	100%	9	100%
Expert 4	59	17	29%	18	31%	6	35%
Expert 5	44	2	5%	44	100%	2	100%
Expert 6	40	20	50%	38	95%	19	95%
Expert 7	39	34	87%	38	97%	34	100%
Expert 8	38	8	21%	38	100%	8	100%
Expert 9	34	5	15%	34	100%	5	100%
Expert 10	33	6	18%	25	76%	6	100%
Expert 11	26	13	50%	24	92%	13	100%
Expert 12	23	7	30%	19	83%	4	57%
Expert 13	21	7	33%	21	100%	7	100%
Expert 14	20	3	15%	19	95%	3	100%
Expert 15	16	6	38%	14	88%	6	100%
Expert 16	13	6	46%	12	92%	6	100%
Expert 17	13	5	38%	12	92%	4	80%
N	619	200	–	519	84%	178	–
Mean	36	12	33%	31	87%	10	90%
SD	19.03	9.97	20%	17.54	21%	9.93	19%
min	16	2	5%	14	31%	2	35%
p25	21	6	18%	19	88%	5	95%
median	34	7	30%	25	95%	6	100%
p75	44	17	46%	38	100%	11	100%
max	76	35	87%	76	100%	35	100%

Note the table contains two experts that have the number of squeeze-out appraisals below

five – this does not mean the experts did not produce at least five appraisals (i.e., they do not break the established criterion of at least five squeeze-out appraisals per expert) but rather that some of the squeeze-out appraisals either did not use income approach of valuation or did not disclose the methodology used for discount rate estimation in sufficient detail to be included in our sample. It still makes sense to include these experts in our sample as the fundamental logic of the possibility of signaling to majority shareholders that the expert is willing to make discretionary changes to their methodology remains and is structurally stronger than for experts who did not produce enough squeeze-out appraisals.

8 Methodology of hypotheses testing

This chapter describes the construction of regression model specifications for hypotheses testing. The first consideration during our analysis is the fact that we possess panel data and as such need to use methods that are able to reflect this fact. As there are structural differences in the dependent variables, we use for testing consistency and opportunism, we divide the discussion of model specification in the two following subchapters.

As we describe in chapter 4.1.2, we are aware that experts may engage in revisions in the methodologies they employ as a result of efforts to keep up to date with the best-practice or due to changes in data accessibility, or changes in the expert team. This means that there might be a number of different sets of methodologies employed over the years. Moreover, our dataset contains a different number of appraisals for each expert and therefore if all the experts should change their methodology from time to time not to concede to their clients but merely as a result of the abovementioned reasons, these changes would disproportionately show as inconsistencies for the group of experts that have the largest time gaps between their appraisals in our dataset. To avoid this potential bias, we devise variable *Avg time* that measures the average time between appraisals of each expert and is used as a control for this potential bias and we test for the significance of this variable in both settings of consistency and opportunism. For the consistency case we utilize a probit pooled regression specified as:

$$(1) \text{ any change} = \beta_0 + \beta_1 \text{ Avg time},$$

where *any change* is the dependent variable measuring any change in the underlying

methodology behind the risk-free rate or equity risk premium estimation (i.e., the maturity and country of issuance of government bonds for risk-free rate, and the source from which the equity risk premium is taken), and *Avg time* showing the average time between appraisals for each expert measured in days.

For the purpose of testing the *Avg time* effect in the setting of opportunism testing we utilize a pooled OLS regression specified as:

$$(2) r_f \text{ change} = \beta_0 + \beta_1 \text{ Avg time},$$

where *r_f change* is the dependent variable measuring the change in the yield of the associated risk-free rate, and *Avg time* stands for the average time between appraisals for each expert.

8.1 Testing consistency related hypotheses

As our hypotheses related to consistency are built on the effort to discover binary outcome (i.e., either a change in methodology either occurs, or it does not), we need to use binary variable models and choose probit model to test our hypotheses.

For testing of Hypothesis 1 we use a pooled probit regression specified as follows:

$$(3) \text{ any change} = \beta_0 + \beta_1 \text{ Avg time} + \beta_2 \text{ Big4},$$

where *any change* is the dependent variable measuring any change in the underlying methodology behind the risk-free rate or equity risk premium estimation (i.e., the maturity and country of issuance of government bonds for risk-free rate, and the source from which the equity risk premium is taken), Big4 being a dummy variable equal to one if the expert is part of the Big4 (i.e., EY, Deloitte, PwC, or KPMG), and *Avg time* showing the average time between appraisals for each expert. Hypothesis 1 is then tested by the significance of coefficient β_2 .

As we have been able to obtain data where we can identify the individual experts, we specify two regressions for testing of hypothesis 2. The first one is specified as a probit model with pooled data, and the second utilizes a probit model with fixed effects that is able to examine the consistency of methodology in squeeze-outs while controlling for inter-expert variance in the data. The regression specifications are:

$$(4) \text{ any change} = \beta_0 + \beta_1 \text{ Avg time} + \beta_2 \text{ Squeeze},$$

for the pooled model, and

$$(5) \text{ any change} = \beta_0 + \beta_1 \text{ Squeeze},$$

for the fixed effects model.

In both specifications, *Squeeze* denotes a dummy variable equal to one in case the appraisal is a squeeze-out, and zero otherwise. Both hypotheses are going to be tested by significance of the β_2 and β_1 coefficients for the pooled model and fixed effects model, respectively.

For testing hypothesis 3 we utilize a probit regression with pooled data specified as follows:

$$(6) \text{ any change} = \beta_0 + \beta_1 \text{ Avg time} + \beta_2 \text{ Big4} + \beta_3 \text{ Squeeze} + \beta_4 \text{ Big4} \times \text{ Squeeze},$$

where the interaction term *Squeeze* \times *Big4* measures if Big4 experts change their methodology significantly more often than other experts in cases of minority squeeze-outs and is used to test the hypothesis.

8.2 Testing opportunism related hypotheses

For opportunism testing we categorize different maturities of the risk-free rate into the following categories: short term (including maturities of up to 5 years), mid-term (including maturities between 6 to 10 years), long-term (including maturities between 11 to 20 years), and very long-term (including maturities higher than 20 years). Moreover, there have been seven different countries which government bond yields were used by the experts: Czech Republic, Slovakia, United States, Germany, Poland, Russia, and Hungary. We then download the government bond yields on a monthly basis for each maturity category with the longest maturity always representing the category (i.e. for the mid-term risk-free rate, a 10-year government bond is used in our dataset), with 30-year government bond for the very long-term risk-free rate.

As opposed to the case of consistency, in testing opportunism we are examining a normal continuous variable and therefore do use the probit framework for our estimation. The panel nature of the data remains and therefore we engage the pooled and fixed effect methods in testing our opportunism related hypotheses. Note that we test our models for heteroskedasticity and as they reject homoskedasticity, we result to using clustered standard errors in testing our hypotheses and interpreting the significance of our estimation.

For testing of hypothesis 4, we devise a Pooled OLS model specified as follows:

$$(7) r_f \text{ change} = \beta_0 + \beta_1 \text{ Avg time} + \beta_2 \text{ Big4},$$

where $r_f \text{ change}$ is the dependent variable measuring the change in the yield of the associated risk-free rate, Big4 is a dummy variable equal to one if the expert is part of the Big4 and zero otherwise, and Avg time stands for the average time between appraisals for each expert. Hypothesis 4 is tested by significance of coefficient β_2 .

As is the case for testing the effect of squeeze-outs in the case of consistency, we can run two regression model specification for testing of hypothesis 5 related to the effect of squeeze-outs on opportunism. The first regression is a pooled OLS model and the second is a fixed effect model utilizing the full power of our collected dataset controlling for inter-expert variance in discount rate changes. The regression specifications are as follows:

$$(8) r_f \text{ change} = \beta_0 + \beta_1 \text{ Avg time} + \beta_2 \text{ Squeeze}$$

for the pooled model and

$$(9) r_f \text{ change} = \beta_0 + \beta_1 \text{ Squeeze}$$

for the fixed effects model.

In both specifications, Squeeze denotes a dummy variable equal to one in case the appraisal is a squeeze-out, and zero otherwise. Hypothesis 5 is tested by significance of coefficients β_2 and β_1 for the pooled and fixed effect model, respectively.

To test hypothesis 6 related to the interaction between the Big4 and squeeze-out effects on opportunistic behavior we run a pooled OLS model specified as follows:

$$(10) r_f \text{ change} = \beta_0 + \beta_1 \text{ Avg time} + \beta_2 \text{ Big4} + \beta_3 \text{ Squeeze} + \beta_4 \text{ Big4} \times \text{Squeeze}$$

Where the interaction term $\text{Big4} \times \text{Squeeze}$ measures if Big4 experts change their methodology significantly more often than other experts in cases of minority squeeze-outs and is used to test the hypothesis.

9 Results

This chapter provides discussion of results of regression tests of our hypotheses. Firstly, we discuss the findings related to consistency testing followed by discussion of testing of

hypotheses related to opportunism. Subsequently, we motivate and provide a robustness check for opportunism testing examining only absolute values of the changes in discount rate values. The chapter concludes with contextualization of our results in the previous research and the institutional conflicts of interest, discussion of limitations of our research, and, finally, suggestions for future research.

9.1 Consistency

The following table summarizes results of test for consistency specified in chapter 8.1

Dependent Model	<i>Any_change</i>				
	(1)	(3)	(4)	(5)	(6)
<i>Intercept</i>	-1.46*** (0.137)	-1.38*** (0.143)	-1.43*** (0.139)		-1.35*** (0.146)
<i>Avg time</i>	0.0022** (0.00077)	0.383. (0.0003)	0.0023** (0.0007)		0.0017. (0.0009)
<i>Big4</i>		0.0015. (0.0009)			0.31 (0.28)
<i>Squeeze</i>			-0.15 (0.14)	-0.21 (0.16)	-0.03 (0.03)
<i>Big4 × Squeeze</i>					0.17 (0.42)
Fixed Effects	NO	NO	NO	YES	NO
N	619	619	619	619	619
Pseudo R2	0.02	0.02	0.01	0.09	0.03

The marks . , * , ** , *** designate significance at 10%, 5%, 1%, and 0.1% levels respectively

The table shows the regressions provided significant coefficients only for the effect of average time across different model specifications. Equation (1) testing the sole effect of average time has shown positive effect of the variable significant at the 1% level on the likelihood that expert is going to change their methodology. The effect of average time is of

the same level of significance and direction in model (3) that controls for the effect of squeeze-outs. Even though the effect of average time is not significant at the 5% level in equations testing for the effect of Big4, it still retains its direction and at least weak significance at the 10% level in such model specifications. This suggests that there is an increasing likelihood that experts will change their methodology with increasing time between appraisals hinting that experts revisit their methodologies of discount rate estimation regularly and make adjustments to it. When we compute the average partial effect of the *Avg time* variable, we arrive at a result 0.00048 that means that with one day increase in average time between appraisals, the probability of expert changing their methodology increases the probability of change in methodology by 0.048%.

In equation (3) we find no coefficient that would be significant at the conventional 5% level with both *Avg time* and *Big4* variables producing only weakly significant positive effects at the 10% level. As the coefficient related to the *Big4* variable is key for testing our Hypothesis 1 and the coefficient is insignificant, we do not find sufficient evidence to claim there is a significant difference between the likelihood of updates in methodology Big4 experts and experts that do not belong to the Big4 apply in their discount rate estimation and we fail to reject the null hypothesis that the frequency of updates is the same for both Big4 and non-Big4 experts.

In equation (4) we see the only significant coefficient is associated with the average time between experts' appraisals. This hints that there might be some structural shifts in methodology utilized by experts over time that are however not associated with squeeze-out valuations as the coefficient associated with the *Squeeze* variable is insignificant. Moreover, the effect of average time between appraisals seems not to be robust to changes in the regression specification as it is not significant in equations (3) and (6). The coefficient related to the *Squeeze* variable is key for testing of Hypothesis 2 and since it is insignificant, we do not find sufficient evidence to claim that experts change their methodology of discount rate estimation more often in cases of minority shareholder squeeze-outs than when preparing appraisals for other purposes.

Equation (5) shows the insignificance of *Squeeze* parameter remains even in the case when we use the Fixed effects methodology adjusting for the inter-expert variance of Equation (4). This has analogical conclusions for Hypothesis 2 as the results of Equation (4) meaning we

fail to reject the null hypothesis that there is no significant difference between the likelihood of experts changing their methodology of discount rate estimation for squeeze-out appraisals as compared to non-squeeze-out appraisals.

Equation (6) does not produce any coefficient that would be significant at the conventional 5% level and the only coefficient with weak significance at the 10% level is the effect of *Avg time* variable that shares its direction of effect with the previous model specifications. The coefficients related to the *Big4* is insignificant meaning that there is no significant difference between the likelihood of discount rate estimation methodology changes in non-Squeeze-out appraisals between Big4 and non-Big4 experts. Moreover, as the coefficient related to the interaction term between *Big4* and *Squeeze* variables is insignificant as well and is associated with testing hypothesis 3, we do not find sufficient evidence to claim there is a structural difference between the likelihood of changes in discount rate estimation methodology between the Big4 and non-Big4 experts in cases of squeeze-out valuations (i.e., we fail to reject the null hypothesis associated with hypothesis 3). The effect of the *Squeeze* variable is insignificant as well and means that there is not a significant difference in likelihood of changes in discount rate estimation methodology for non-Big4 experts in appraisals prepared for squeeze-outs.

9.2 Opportunism

The following table summarizes results of testing for opportunism specified in chapter 8.2.

Dependent Model	<i>r_f change</i>				
	(2)	(7)	(8)	(9)	(10)
<i>Intercept</i>	0.0001 (0.00014)	0.0002 (0.0001)	0.0002 (0.0002)		-0.00005 (0.0002)
<i>Avg time</i>	0.0000004 (0.0000011)	0.000002** (0.000001)	0.0007 (0.000001)		0.0000028* (0.000001)
<i>Big4</i>		-0.002** (0.0004)			-0.002** (0.0007)
<i>Squeeze</i>			-0.0007 (0.0006)	-0.0008 (0.0006)	0.0009 (0.0007)
<i>Big4 × Squeeze</i>					0.002 (0.0012)
Fixed Effects	NO	NO	NO	YES	NO
N	521	521	521	521	521
Adjusted R2	0.00	0.00	0.00	-0.03	0.00

The marks *, **, *** designate significance at 5%, 1%, and 0.1% levels respectively

The table shows the regressions provided significant coefficients only for equations (7) – the pooled OLS model for effect of Big4, and (10) – the pooled OLS model for testing of interaction between the effect squeeze-outs and Big4.

In equation (7) we see significant effect of both the *Big4* variable and the *Avg time* variable. The *Big4* variable has coefficient of -0.002. This shows that the experts belonging to the Big4 are less prone to change their risk-free rate estimation practices in a way that would lead to increase of the discount rate. It is important to note that unlike for the consistency testing, this relationship is robust to controls in equation (8) in both its direction and magnitude. As for the interpretation the -0.002 coefficient translates to Big4's changes to discount rate estimation methodology resulting in 0.2 percentage points lower discount rate

than for the non-Big4 experts and thus more probable higher valuation than in cases when the methodology was to be left constant. This means we do find sufficient evidence to reject the null hypothesis associated with hypothesis 4. The significant coefficient for the *Avg time* shows that discount rates for all experts tend to increase very slightly with more time between appraisals. The effect of average time is, however, not significant on its own in equation (2) and also lacks significance in equation (8) when controlled for the effect of squeeze-outs. Moreover, the effect of *Avg time* seems to be extremely small resulting in 0.0002 percentage points higher discount rate per day (or 0.07 percentage points per year) – such change cannot be expected to have any significant on valuation of stable businesses in practice.

In equation (8) we see that the coefficient related to the *Squeeze* variable is insignificant which means that we do not find sufficient evidence that changes in methodology during squeeze-out valuations would result in significantly different discount rates than in case of non-squeeze-out valuations. Therefore, we cannot reject the null hypothesis related to hypothesis 5. The *Avg time* variable is insignificant in this model as well which erodes possible claims that there is a robust significant effect of time between appraisals on the impact changes in methodology of discount rate estimation have on the its resulting value.

Equation (9) shows the effect of the *Squeeze* variable is insignificant even when controlling for inter-expert variance using the fixed effect model which underlines the conclusions from equation (8) that we cannot reject the null hypothesis associated with hypothesis 5 that there when experts change their methodology of discount rate estimation in squeeze-out valuations it would result in significant changes in the resulting discount rate.

Equation (10) provides the most interesting results. Firstly, it supports the significance of the *Big4* variable even when controlling for the effect of squeeze-outs with a similar strength of its effect showing the Big4 produces smaller changes in their risk-free rate when changing methodology than their non-Big4 peers in non-squeeze-out setting. Second, it supports the significance of *Avg time* showing small upwards movement in discount rate for appraisals with larger gaps between each other, however as was the case for Equation (6) the effect is so small it can be hardly assumed to have any relevant impact on the resulting valuations. Third, the *Squeeze* variable is insignificant as was the case in Equation (8) and Equation (9) showing no indication of squeeze-outs being more prone to increases in discount rates upon

changing methodology in practices of non-Big4 experts than other types of expert appraisals. Lastly, the interaction term between *Squeeze* and *Big4* variables is also insignificant showing that Big4 is not significantly different in changing their discount rate with respect to the magnitude and direction of the impacts from other experts and therefore we cannot reject the null hypothesis associated with hypothesis 6.

9.2.1 Robustness check for opportunism

We see the significant results for *Big4* and *Avg time* hold for various regression specifications during the opportunism testing. However, as the results are related to changes in risk-free rates in appraisals that step out of established methodology, there can be an alternative explanation to the findings reported in Table 3. The alternative explanation would be that Big4 experts are opportunistically overvaluing companies and that the significantly negative changes in discount rates identified in the regressions testing opportunism are actually not the result of lower absolute variance in discount rates but rather that discretionary choices of lower-than-normal discount rates pursued by Big4 experts. To make sure our analysis does not suffer from such misinterpretation, we run a robustness check where we do not take the changes of the risk-free rates alone but instead, we take their absolute values. If the coefficients related to Big4 experts in these cases turn out to be negative, it confirms our finding that Big4 experts are in fact producing more stable estimates of discount rates.

We define a robustness check regression for each of the hypotheses related to testing opportunism:

Robustness check for equation (7)

$$(11) \quad |r_f \text{ change}| = \beta_0 + \beta_1 \text{Avg time} + \beta_2 \text{Big4}$$

Where the $|r_f \text{ change}|$ is the dependent variable measuring the absolute change in the yield of the associated risk-free rate, *Big4* is a dummy variable equal to one if the expert is part of the Big4 and zero otherwise, and *Avg time* stands for the average time between appraisals for each expert.

Robustness check for equation (8)

$$(12) \quad |r_f \text{ change}| = \beta_0 + \beta_1 \text{Avg time} + \beta_2 \text{Squeeze}$$

where *Squeeze* denotes a dummy variable equal to one in case the appraisal is a squeeze-out, and zero otherwise.

Robustness check for equation (9)

$$(13) |r_f \text{ change}| = \beta_0 + \beta_1 \text{Squeeze}$$

where *Squeeze* denotes a dummy variable equal to one in case the appraisal is a squeeze-out, and zero otherwise.

Robustness check for equation (10)

$$(14) |r_f \text{ change}| = \beta_0 + \beta_1 \text{Avg time} + \beta_2 \text{Big4} + \beta_3 \text{Squeeze} + \beta_4 \text{Squeeze} \times \text{Big4}$$

where the interaction term *Squeeze* × *Big4* measures if Big4 experts change their methodology significantly more often than other experts in cases of minority squeeze-outs.

Table 4 below summarizes the results of the robustness checks.

Table 4: Robustness check results				
Dependent	$ r_f \text{ change} $			
Model	(11)	(12)	(13)	(14)
<i>Intercept</i>	0.0001 (0.0005)	0.0008 (0.0004)		0.0001 (0.0006)
<i>Avg time</i>	0.00001* (0.000005)	0.000006. (0.000003)		0.00001* (0.000005)
<i>Big4</i>	-0.003* (0.0014)			-0.003. (0.0016)
<i>SQ</i>		-0.0004 (0.0004)	-0.0005 (0.0005)	-0.0004 (0.0003)
<i>Big4</i> × <i>SQ</i>				-0.003 (0.0012)
Fixed Effects	NO	NO	YES	NO
N	521	521	521	521
Adjusted R2	0.02	0.01	-0.03	0.01

The marks . , * , ** , *** designate significance at 10%, 5%, 1%, and 0.1% levels respectively

The key finding is that both the volume of impact on the dependent variable and its direction hold for all of the variables. The significance of the effects is slightly diminished with *Avg time* variable in equation (10), and the Big4 variable in equation (12) not being significant at the level of 5%, however they retain weak significance at the 10% level.

The interpretation of the results is analogous to the interpretation of opportunism testing. Most importantly, we find no evidence that experts (should they belong to the Big4 or not) do not pursue changes to their methodology in discount rate estimation in a way that would increase the discount rate and, therefore, decrease the estimated buyout price. Moreover, we find sufficient evidence that the experts belonging to the Big4 exhibit lower variation in their estimates of discount rate even when they change their methodology for its estimation, and that there is a very slight upwards trend in the discount rate if the methodology of discount rate estimation changes based on the average time between experts' appraisals yet the effect is of negligible economic significance.

9.3 Implications of our results for institutional environment of expert appraisals and squeeze-out cases in the Czech Republic

In chapters 1 and 2, we have outlined the underlying clash of incentives valuation experts face in the case of minority squeeze-out valuation as the conflict between building a business relationship with majority shareholders and benefiting from fees from their engagements by producing systematically lower valuations for the squeezed-out businesses and the threat of revocation of expert title and loss of business associated with the title in case of such opportunistic behavior being uncovered. Moreover, the prior literature suggests that there is an important role of reputational issues arising from negative publicity in audit practice and given the similarities between the audit and valuation professional service provision, the effects can be expected to be similar for both professions. Our results related to the impact of squeeze-outs on consistency or opportunism of the methodology experts employ are insignificant both statistically and economically.¹⁵

¹⁵ Note that even if the results of our regression analysis were statistically significant, they would still need to amount to economic significant levels for the hypothesis to be realistic as even a statistically significant and economically insignificant deviations in discount

Our results suggest that the current institutional setting of squeeze-outs entailing expert licenses that can be revoked upon finding misconduct, the supervision of the squeeze-out process by the Czech National Bank, and the subsequent possibility of litigation if minority shareholders do not find the squeeze-out valuation satisfactory, creates an environment where the perceived litigation and / or reputational costs of significant diversion from discount rate methodology and possible resulting decrease in the squeeze-out valuation are high enough to deter valuation experts from opportunistic behavior that would pursuing relationships with majority shareholders by discretionary changes in their discount rate estimation methodologies. We find no evidence of such opportunistic behavior in our data when measuring either the frequency of methodology changes, or the impact of changes in instruments used as risk-free rate estimates on the overall discount rates in squeeze-outs.

Given that the previous research suggests there are structural differences between Big4 and non-Big4 companies in their practice, we test presence of such differences in our dataset for both consistency and opportunism with the expectation that, analogously with findings by Dye (1993) for adoption of new standards by auditors, the Big4 experts are going to exert more effort in keeping their practice up-to-date and thus are going to be fine tune their methodology more often. However, we expect the Big4 experts to produce lower variation in the absolute levels of the resulting discount rates as the Big4 could be expected to provide a more stable and predictable valuation results than its competitors. We do not find sufficient evidence to support our hypothesis in relation to the likelihood that Big4 experts would change their methodology more often than non-Big4 experts. The results are, however, consistent for testing of opportunism, where we see statistically significant results in the predicted direction for all regression specifications which retain, with one exception of weak significance, statistical significance also in for our robustness checks. The results of opportunism support our hypothesis that when Big4 engage in changes to their methodology the resulting impact on the discount rate is lower than for non-Big4 experts. This means that Big4 experts produce valuations with a more predictable level of discount rates and even if they change their methodology, the impact such changes have on the resulting value of the

rate still result in negligible benefit for the majority shareholders and thus would likely not have a significant impact on the relationship between the experts and the majority shareholders.

valued company is likely to be lower.

The most interesting venue for future research in terms of the degree of conflicts of interest on parts of both majority and minority shareholders would be a study into not only the initial valuations that are used to support the compensation for the squeeze-out compensations but also into the subsequent valuations that are produced in cases when minority shareholders sue the majority shareholders for inadequate compensation. Valuation experts in such court cases are hired by both the minority and majority shareholders and sometimes even contracted by the court itself and the resulting mix of incentives and both the payoffs and risks in such cases are even more pronounced. However, it is highly uncertain if the data for such research can be obtained reliably as appraisals used in court cases are not part of any public database and we are unaware of any private database that would systematically collect such appraisals. Moreover, at least some of the involved parties ranging from any of the shareholders, legal counsels or the experts preparing the appraisals, are likely to oppose researchers gaining access to court documents such as the appraisals precisely in cases when they would be aware of opportunistic behavior due to reputational risks and concerns about revealing their business practices.

Another direction possible future research could take is to examine other parts of the discount rate calculations be it the use of certain premia and discounts such as liquidity effect, size effect, or specific risk discount rate adjustments.

Conclusion

In this thesis we examine the conflict of interest valuation experts face when they provide expert appraisals to majority shareholders in cases of minority squeeze-outs in the Czech Republic. We outline the institutional motivation for opportunistic behavior by experts and the institutional barriers that discourage it. We also motivate the case for existence of significant differences between experts' can be expected and, based on previous research, motivate hypotheses predicting higher likelihood of Big4 experts to engage in revisions of their methodology. Finally, in a combination of the conflict of interest and structural differences between Big4 and non-Big4 experts, we motivate combined hypotheses testing if Big4 experts are significantly different in their practice in squeeze-out setting. We devise two metrics we test the hypotheses for – consistency, and opportunism – with consistency

focusing on whether experts make any changes in their discount rate estimation methodology, and opportunism testing if the changes have significant impact on the resulting discount rate. We start with a dataset of over 15,000 expert appraisals from the Czech Republic from which we are able to extract the methodology used for discount rate estimation and the instruments serving as risk-free rates for 619 and 521 appraisals, respectively, that were prepared by 17 experts regularly engaging in squeeze-out valuations. Our results indicate there is not enough evidence to support the hypotheses that Big4 experts are more likely to make adjustments to their discount rate estimation methodology than non-Big4 experts. However, we find evidence that once Big4 experts change their methodology, the impact such change has on the discount rate is significantly lower than is the case in non-Big4 experts. As for the squeeze-out related hypotheses, we find there is no significant difference in both the likelihood of methodology changes and the direction and impact of such changes between squeeze-out appraisals and non-squeeze-out appraisals. This suggests the current institutional setting of the squeeze-out regulation is sufficient in deterring opportunistic behavior on part of the experts at least in the form of discretionary adjustments to discount rate estimation methodology.

The contribution of our research lies in various channels. Firstly, it contributes to globally limited literature on discount rate estimation practices and provides quantitative analysis of experts' approaches in various settings. Secondly, it contributes to literature on minority shareholder squeeze-outs that is traditionally focused on issues of corporate governance or discussions related to legal theory such as constitutionality of the squeeze-out process in various jurisdictions. Finally, to the best of our knowledge, it is the first comprehensive quantitative research into experts reports for squeeze-out purposes in the Czech republic with previous research into expert appraisals in the Czech republic limited on qualitative discussions (e.g., Červený (2016)) or descriptions of practices pursued by the experts (e.g., Kolouchová & Novák (2010)).

We suggest several ways future research could take from detailed examination of appraisals that are used in litigation which present another analogous conflict of interest on part of the valuation experts but where we expect data availability issues, or expansion of our research by focus on discount rate premia.

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