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FACULTY OF SOCIAL SCIENCES

Institute of Economic Studies

Master's thesis

The Impact of Mergers and Acquisition Activity on the Time Series Variation in the Stock Size Premium

Author: Bc. Robert Kaplan*

Supervisor: Jiří Novák M.Sc., Ph.D.

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* Address for correspondence: IES FSV UK, Opletalova 26, CZ-110 00 Praha, Czech Republic, phone: +420 222 112 314, fax: +420 222 112 304, e-mail: kaplan.robert87@gmail.com

Declaration of Authorship

1. The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

2. The author hereby declares that all the sources and literature used have been properly cited.

3. The author hereby declares that the thesis has not been used to obtain a different or the same degree.

Prague, May 9, 2018 Robert Kaplan

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Abstract

This work studies whether intertemporal variation in future takeover activity explains intertemporal changes in stock size premium. Taking into account that takeover activity involves 2-9% of firms every year and building upon existing research stating that small firms are more likely takeover targets, receive 40% higher takeover premium than large firms, we argue that small firms benefit from high takeover activity more than large firms and size premium should be more pronounced in the time of high takeover activity. We study takeover activity as well as stock size premium on aggregate level and test whether size premium can be explained by the expected takeover activity, i.e. its change compared to past. We find that change in takeover activity in the next six months versus last six months is positively correlated with size premium. Additionally, we construct a simple predictive model for estimating future takeover activity. The relation between size premium and change in takeover activity remains significant when we use forecasted values given by the predictive model instead of true future values in the model.

Abstrakt

Tato práce zkoumá, zda změna budoucí akviziční aktivity v čase vysvětluje změnu velikostní prémie veřejně obchodovaných společností v čase. Bereme-li v úvahu, že akviziční aktivita se každý rok týká 2-9% akciových společností a stavíme-li na stávajících studiích, uvádějících, že malé společnosti mají vyšší šanci stát se akvizičním cílem a získávají o 40% vyšší akviziční prémii než velké společnosti, tvrdíme, že malé společnosti mají z akviziční aktivity větší prospěch než velké společnosti, a tedy velikostní prémie by měla být výraznější v období s vyšší akviziční aktivitou. Zabýváme se akviziční aktivitou a velikostní prémií na agregátní úrovni a testujeme, zda velikostní prémie může být vysvětlena očekávanou akviziční aktivitou, resp. její změnou oproti minulosti. Zjistili jsme, že změna akviziční aktivity v následujících šesti měsících oproti minulým

šesti měsícům je pozitivně korelované s velikostní prémií. Nad to jsme sestavili jednoduchý predikční model k odhadování akviziční aktivity. Vztah mezi velikostní prémií a změnou akviziční aktivity zůstává signifikantní, když místo skutečné akviziční aktivity v budoucnosti použijeme odhad z predikčního modelu.

Keywords: asset pricing; size premium; mergers and acquisitions; merger waves; risk

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Institute of Economic Studies

Master Thesis Proposal

Author's name and surname: Robert Kaplan

E-mail: kaplan.robert87@gmail.com

Phone: +420 602 302 834

Supervisor's name: Jiří Novák, M.Sc., Ph.D.

Supervisor's email: jiri.novak@fsv.cuni.cz

Proposed Topic:
The Impact of Mergers and Acquisition Activity on the Time Series Variation in the Stock Size Premium

Preliminary scope of work:

Research question and motivation

The main goal of our research is to test whether the explanation of size premium could stem from mergers and acquisitions. This relationship has not been tested yet, or at least we have not identified any article that would test such relationship directly.

Stock size premium was observed already in 1980s (Banz 1981) and despite its common use in financial practice, it is still missing a complete and widely accepted theoretical explanation (van Dijk 2011). We have identified five major empirical findings in existing literature on merger and acquisitions, which all together establish a strong argumentation basis for explanation of size premium. We aim to test whether there is any potential link between stock size premium and takeover activity.

Contribution

We have identified five major empirical findings in existing literature on merger and acquisitions, which all together establish a strong argumentation basis for explanation of size premium.

We hypothesize that an increase in takeover activity should result in return increase in differences between small and large firms for the following reasons. Small firms receive half as much takeover premium (average of

54%) than large firms (35%) (Alexandridis et al. 2013), small firms have higher likelihood to be acquired than large firms (Palepu 1986), and takeover activity ranges from 2% to 9% in terms of deal count to total number of listed firms as well as in terms of deal value to total market capitalization. Additionally, large takeovers oftentimes destroy value for the acquirer, which results in decrease in large stock returns (Martynova & Renneboog 2008). And lastly, takeovers fit well into the explanation of January effect of size premium provided by Doran et al (2012). They succeed in explaining the January effect by the behavior of retail investors who hold 50-70% of the stock market. Retail investors incline to buy stocks with lottery-like payoffs in the beginning of a year. We claim that stocks having higher likelihood to be taken over belong to the category of lottery-like stocks due to high acquisition premiums paid to them.

Methodology

We use a dataset available at professor Kenneth French's website for size premium and several measures of takeover activity. We obtained annual dataset of realized deal count and deal value from SDC Thomson Reuters and monthly data of announced and realized deal count and deal value from Bloomberg Terminal.

To test our hypothesis, we estimate the relationship in two forms, contemporaneously and based on anticipated takeover activity. The idea behind the second form is that the takeovers are anticipated to a certain degree and information leakages lead to run-up premiums of takeover targets (Bennett & Dam 2017), therefore, the premiums are realized ahead of takeover activity. In particular, we estimate whether size premium in one month can be explained by an increase in takeover activity in the following months.

Outline

Abstract
Introduction
Literature review and hypotheses
    a. literature on evolution of size premium
    b. existing criticism of size premium
    c. theoretical explanations of size premium
    a. evidence from takeover activity
Research Design
    a. data description
    b. methodology
Results
    a. results discussion

b. consequent testing

Conclusion

List of academic literature:

Alexandridis, G., Fuller, K.P., Terhaar, L. and Travlos, N.G., 2013. Deal size, acquisition premia and shareholder gains. *Journal of Corporate Finance*, *20*, pp.1-13.

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Contents

1. Introduction

In order to make the right investment decisions, it is essential for corporate finance practitioners to understand which fundamental factors stand behind the cross-sectional variation in stock returns. This need of banks and investors strongly supported the evolution of asset pricing research, which aims to capture how various asset characteristics influence their required returns. In empirical research on determinants of stock returns, there are following commonly discussed areas: a) the ability of particular variables to capture firm's exposure to underlying risk, b) the effect of stock market microstructure on various firm measures, c) systematic stock mispricing, and due to a large amount of research targeting this problematics, there is an entire group of studies on d) issues of incorrect statistical inference, data mining, and other methodological shortcomings.

We will operate within the first discussion area and examine whether activity in takeover market has any impact on stock size premium. We base our argumentation starting from the area of research building upon capital asset pricing model (CAPM). CAPM was developed independently by Sharpe (1964), Lintner (1965) and Mossin (1966) more than half a century ago and laid a foundation for using market risk as a sole explanatory variable for asset returns. The model's predictive power was later found to be unsatisfactory and economists began testing and adding other factors, which would help to predict asset returns. The need to improve CAPM led to significant branching out of asset pricing research and several additional factors improving the explanatory power of the model were found (e.g. Basu, 1977, Banz 1981, Reinganum 1981, Fama & French 1992, Hsieh & Hodnett 2012). However, many of these studies are based on empirical evidence and still today lack sufficient theoretical explanation of why that particular variable should capture underlying risk of a firm.

In our work, we will focus on one of these factors – the size factor. The size factor should capture cross-sectional variation in stock returns of small and large companies. Specifically, empirical evidence shows that there exists a small size premium, i.e. stock returns of companies

with relatively smaller market capitalization tend to outperform stock returns of companies with relatively larger market capitalization (Banz 1981, Reinganum 1981, Fama & French 1992, van Dijk 2011). Since the discovery of this empirical relationship between firm size and its returns in 1981, there is an ongoing ardent debate about its theoretical explanation.

Some scholars contend that there are multiple risk factors behind stock's systematic risk and that firm size proxies for the exposure to state variables, which describe intertemporal change in the investment opportunity set (Fama & French 1992; Chan, Hamao & Lakonishok 1985). Second group of scholars, such as Amihud & Mendelson (1986), Brennan & Subrahmanyam (1996) or Amihud (2002), sees size premium as a compensation for higher transaction costs and/or liquidity risk. Others base their reasoning upon asset pricing models with removal of the assumption of investors' full rationality (Merton 1987; Lakonishok, Shleifer & Vishny 1994; Hou & Moskowitz 2005). The fourth and the last group of economists reject size effect as a statistical anomaly, which does not have any true theoretical explanation. In this work, we will attempt to provide an argument that could be included in the first group of the mentioned research groups. We strive to at least point to a direction where size effect explanation could be found.

The major hypothesis of our work is that size effect is influenced by fluctuations in merger activity, such that expected increase in mergers and acquisitions (takeover) activity has positive impact on stock size premium. While we have encountered only very minor research tackling the relationship between M&As and size effect, Banz (1981) himself leaves a remark pointing to this direction. At the end of his seminal paper, where he introduces size effect, he makes a following statement, which inspired our thesis: *"It might be tempting to use the size effect, e.g., as the basis for the theory of mergers – large firms are able to pay a premium for the stock of small firms since they will be able to discount the same cash flows at a smaller discount rate."*

We use several following observations from past research in the area of size premium and takeover activity to support our reasoning. Firstly, our motivation stems from the fact that stock size premium is still not a closed discussion area, but on the contrary, remains a hot topic in academic discussions even today. There is a vast and still growing research on size premium that

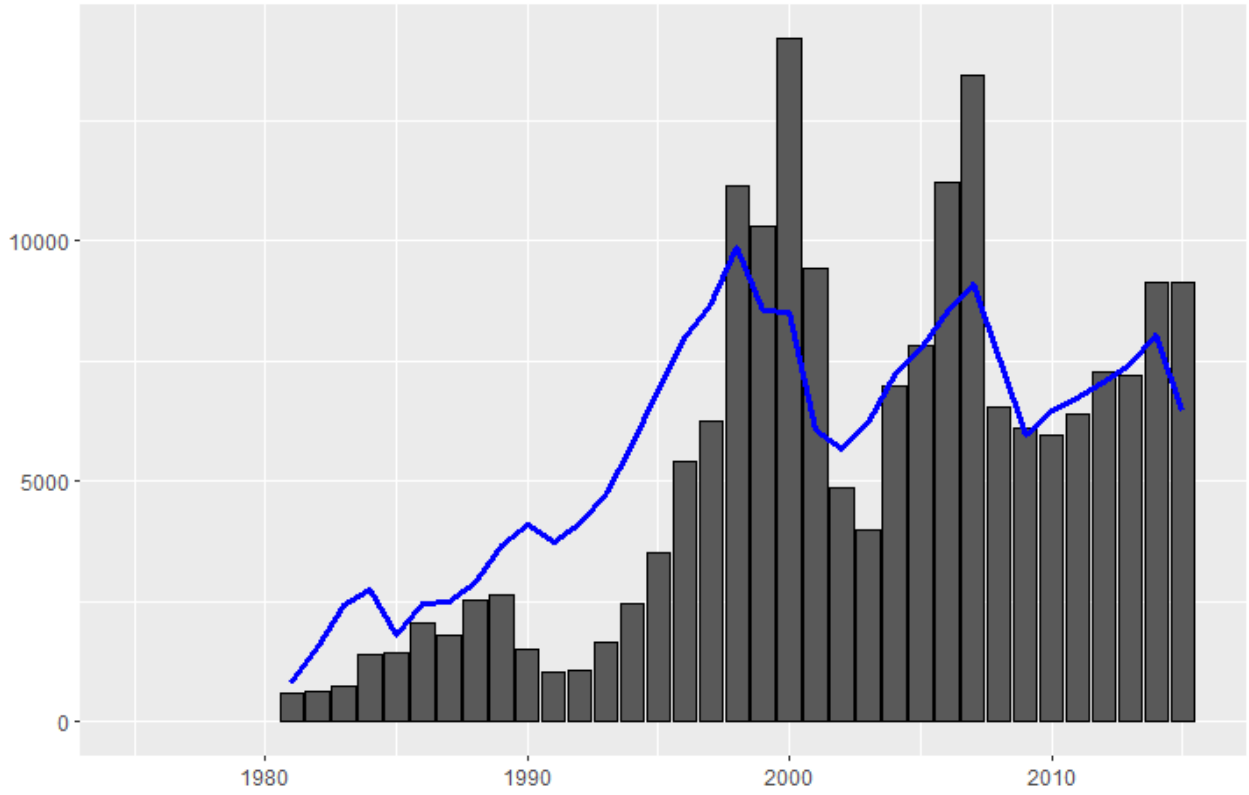
attempts to provide its theoretical explanation (e.g. Amihud & Mendelson, 1986; Chan, Chen, & Hsieh, 1985; Merton, 1987), evidence about its existence (e.g. Annaert et al., 2002; Barry et al., 2002; Lamoureux & Sanger, 1989; van Dijk, 2011) or arguments about size effect being a statistical fluke and its potential non-existence (e.g. Black, 1993; Knez & Ready, 1997; Lo & MacKinlay, 1990).

Secondly, size of stock size premium fluctuates in time. Several studies document that in 1980s, size premium was not statistically different from zero, and therefore its former discovery is only an anomaly. Recently, when Hur, Pettengill, & Singh (2014) studied size premium in up and down markets, they argued that if stock size premium presents a compensation for risk, it indeed has to fluctuate and cannot be stable. Otherwise investors would invest in small firms' stocks, increase their values, mitigate their return premiums and size premium would diminish. This fluctuation lead us to an idea whether size premium may be influenced by some other variable, which fluctuates in time. When we realized the characteristics of merger activity and how they differ according to target firm size, we developed the idea that it could be fluctuating merger activity, which could stand behind appearance and disappearance of size premium.

There are two empirical studies, which provide main assumptions for our thesis. The first is an observation by Alexandridis et al., (2012) that market for takeovers (M&A market) pays higher relative takeover premium for small firms. In fact, Alexandridis et al. (2012) studied NYSE, AMEX and NASDAQ firms in the 1990-2007 period and show that top size tercile average takeover premium (38%) was 30% lower than in bottom size tercile (54%). Additionally, small firms are significantly more likely to become takeover targets than large firms (Hasbrouck, 1985; Palepu, 1986). The evidence on probability of being taken over is an important piece for our reasoning. Since we are studying aggregate values, one could argue that even though small companies receive higher takeover premium, their chances of being taken over may be low to a point where the premium difference for an investor does not pay off. The two observations together present the main assumptions of our thesis.

Recent study by Bennett & Dam (2017) shows that due to significance of takeover activity and high premiums paid for takeover, up to 10% of stock price may be attributed to takeover anticipation. We also note two additional supportive arguments that 1) large takeovers are often value destroying (have negative effect on large acquirers' value) and 2) takeover targets belong to the group of stocks with lottery-like payoffs, which are sought by retail investors in the beginning of a year. Therefore, takeover explanation of size premium includes explanation of January effect. All together, we suggest that in times of higher takeover activity, return differences between small and large firms, i.e. size premium, should be more pronounced than in times of low takeover activity.

Figure 1 – Merger Activity – deal count and deal value (1981 - 2015)



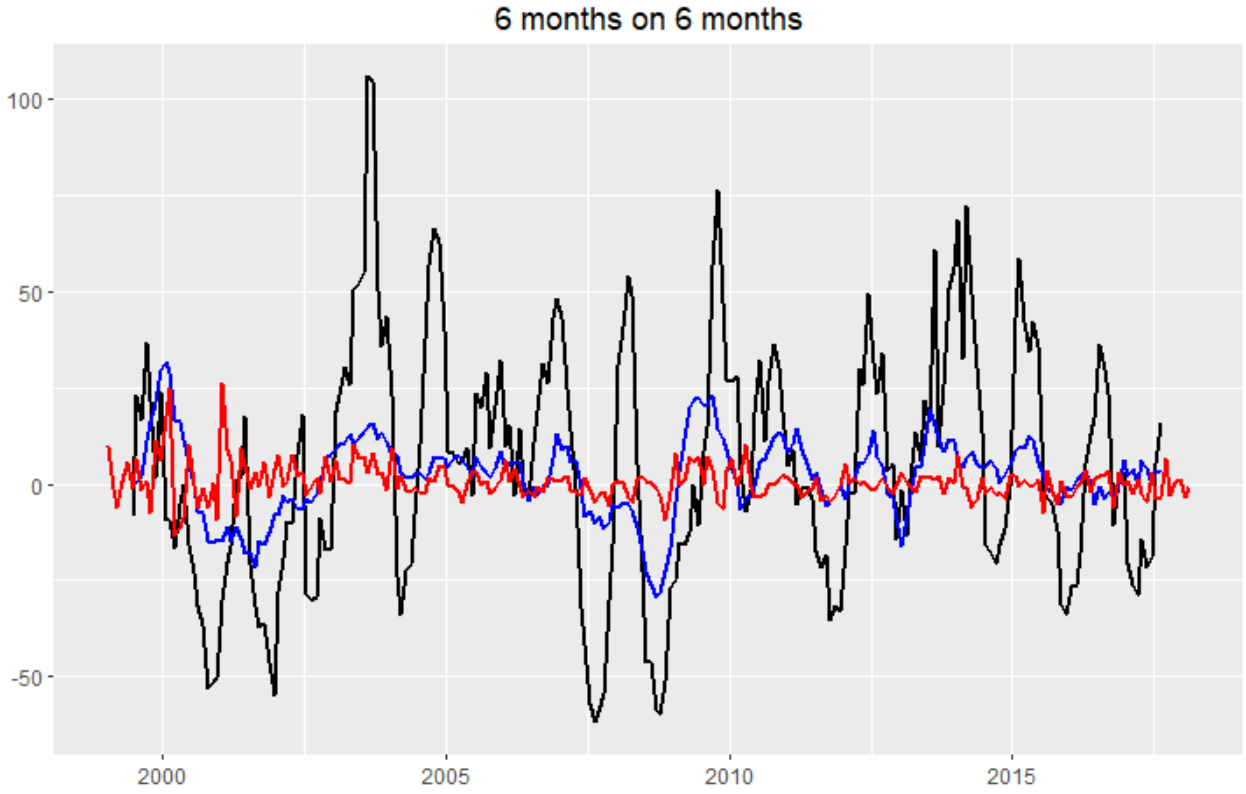
Annual merger activity in NYSE, AMEX and NASDAQ for 1981-2015 period. The bars represent 100s of millions of realized deal value and the blue line represents the number of realized deals per year.

We point out that takeover activity fluctuates in time, which is an important fact required for explanation of time-series variation in stock size premium. Visually, takeover activity in time

resembles waves, it gradually increases and then abruptly falls in a short time period to start slowly growing again. What are the determinants of merger wave pattern is another heated debate among scholars. One stream of research stands on the neoclassical view and it suggests that merger waves are a rational reallocation of assets when radical economic changes occur (Gort, 1969; Mitchell & Mulherin, 1996). The second stream, the behavioral view, argues that takeovers occur during periods of general stock market overvaluation and management thus exploits its overvalued equity to acquire real assets (Andrade, Mitchell, & Stafford, 2001a; Rhodes-Kropf & Viswanathan, 2004; Shleifer & Vishny, 2003). Further supportive evidence for our thesis lies just in Doidge, Karolyi & Stulz (2017), who report the evidence that takeover activity (measured by ratio of total market capitalization/number of firms acquired per year to total market capitalization/total number of firms in the beginning of a year) fluctuates between 2% and 9% between 1975 and 2015, which we claim to be a notable value and therefore it could be behind the explanation of variation of stock size premium.

There is also a secondary effect of takeover activity that should support our hypothesis. Large takeovers are much more likely to destroy value for acquirers (George Alexandridis et al., 2012; Martin & Loderer, 1990; Mikkelson & Ruback, 1985). Value destroying large mergers and acquisitions lead to falling prices of these companies which in comparison to small firms generate, ceteris paribus, even lower returns. Stated observations lead us to an idea whether intertemporal changes in takeover activity and its characteristics could explain time-series variation of stock size premium.

Figure 2 – Change in takeover activity and size premium – monthly (Jan-1999 - Feb-2018)



Change in takeover activity in NYSE, AMEX and NASDAQ for 1999-2018 period shown as percentage change in the next six months compared to last six months. The black line represents deal value change, while the blue line represents the deal count change. The red line represents size premium, or smb variable based on ten equally-weighted portfolios formed on size.

Let us examine the following thought experiment, which should capture our hypothesis about the relationship between the two variables. We will describe an initial state of the market in order to demonstrate the proposed dynamics. We begin with a stock market where we cannot observe any size premium. Takeover activity is at some average level, which would be measured by total acquired market capitalization to total market capitalization. Now, because of particular external factors (e.g. growing economy, beginning of market consolidation), firms start to use takeovers more frequently to grow and takeover activity is expected to increase. We are at the beginning of a merger wave.

We argue that this shift in takeover activity has two effects causing a difference in stock returns of small and large firms. The first effect is a direct impact of higher takeover premium for small firms and their higher probability of being taken over. The first reason results from size distribution of existing companies – there is a high number of small companies and only a few large ones. The market for smaller companies is therefore more competitive, there is a higher number of potential buyers, which leads to higher takeover bids with higher acquisition premiums offered for small companies in order to outbid competing investors. In other words, the smaller the target the higher share of the value difference between existing and new shareholders it receives.

Additionally, large companies on average have lower cost of capital and therefore are able to discount the target's cash flow at lower rate, which yields higher value for them than the value for the shareholders of the small firm. In other words, the larger the size difference between the target and the acquirer, the higher takeover premium the acquirer can afford to pay. And the last reason is that larger takeovers incur higher post-merger integration costs (duration and nominal amount). Given this relation, acquirers are more likely to target small companies. As a result, small firms as targets, in relative terms, benefit from acquisitions more than large firms. Additionally, as the risk of unsuccessful integration grows with size, large firms oftentimes lose value when making a large takeover, even when the relative takeover premiums paid are lower compared to small takeovers. An acquirer pays higher takeover price than the future benefits generated by the acquisition, which leads to a decrease in stock price and lower stock returns, and thus even larger difference in stock returns of small and large firms.

The second, indirect effect is a result of high takeover activity in the market. As takeovers have become more common, we argue that investors may seek firms which may become next takeover targets, invest in them, and thus increase their price. Even though Jensen & Ruback, (1983) argue that takeover prediction models do not work, many of them were introduced in 1970s and we would expect that investors and/or speculators would still attempt to "beat the market" and seek such opportunities. Moreover, we know that merger negotiations start several months before the transaction is realized (Halpern, 1973; Mandelker, 1974). Therefore, there is a high chance that

initial hints or speculations about a future merger few months before the announcement convince investors to react to these signs by accumulating shares of the target company (Bennett & Dam 2017). Naturally, as small firms have higher takeover potential and are offered higher takeover premiums, we can observe this behavior with small firm targets more likely than with large firms, which should further support size premium on aggregate level. These two effects result in growth of size premium, which, we claim, is preceded by growth in takeover activity.

However, there is a second phase of the cycle, which should explain time variation in size premium. If takeover activity would reach some high levels, prices would stabilize such that small firms would have marginally higher value ratios due to this effect. Without any dynamics in the process, such as firm migration from one size quantile to another as well as changes in takeover activity, size premium would disappear, because once investors are aware of higher risk adjusted returns of small firms, they would prefer those above large firms. However, takeover market becomes saturated at a certain point when attractive firms become acquired and market has consolidated and takeover activity must start declining, e.g. the market growth reverses, or a market crash occurs, and direct effect of takeovers disappears. Subsequently, investors cease selecting potential takeover targets, indirect effect disappears as well and size premium disappears entirely. During these changes, size premium may easily become a size discount for a short period. In other words, size premium follows takeover activity.

In this thesis, we aim to find whether there exists a relationship between aggregate takeover activity and size premium. We perform statistical analysis to first test whether change in future takeover activity impacts size premium in current period. Should we obtain significant results and should we strive to use the findings in practical application, we need to replace true future values from the model by predicted/ anticipated future values. Therefore, we will continue by leaving aside an assumption of investors' perfect foresight and attempt to find a predictive model of future takeover activity. If we are successful in predicting takeover activity sufficiently well, we will use predicted values in our original equation and thus create a two-step model for estimating size premium.

The remainder of the paper is organized as follows. Section 2 reviews prior literature and specifies the hypotheses. In section 3, we discuss the methodology and our data sample. Section 4 presents the empirical results and Section 5 concludes.

2. Literature Review

In this section, we will first present a short historical overview of size premium, discuss the criticism of the phenomenon and how it relates to our hypothesis, then we comment on existing theoretical explanations of size premium, establish a link between size premium and merger activity, and lastly we elaborate on characteristics of aggregate merger activity, which motivated our hypothesis and which together form our line of reasoning that change in merger activity should impact magnitude of size premium.

2.1. From size premium discovery to general acceptance

In the 1960s, several economists simultaneously developed the capital asset pricing model (CAPM), which defines a fairly simple relationship between an expected return of an asset and its market risk (Lintner, 1965; Mossin, 1966; Sharpe, 1964). However, its simplicity is overweighed by excessively restrictive assumptions. For this reason, researchers have been attempting to improve the model since its introduction. In fact, its shortcomings are twofold and interrelated; the simplifying restrictive assumptions distance the model far from reality and the model proved to be unable to sufficiently predict returns in practice.

One of the improvements of CAPM's predictive power was a discovery of size premium in 1981 in the two independent empirical studies (Banz, 1981; Reinganum, 1981). The first study by Banz (1981) examines the empirical relationship between firm's common stock return and its total market value during 1926-1975 period using NYSE common stocks. Banz separates the stocks into five quintiles according to their market capitalization and finds that the smallest quintile stocks earn monthly returns that are 0.40pp higher than those of the remaining stocks. He further reports that size effect is not linear, occurs only for the smallest firms and is not very stable in time. He does not provide theoretical explanation of size effect and explicitly says that size may very well be only a proxy for some other unknown parameter correlated with size.

Regarding the theoretical explanation, Banz states two conjectures. The first, which is in accordance with Klein & Bawa (1977), is that the lack of information on smaller stocks leads to uncertainty about the information available about them and repudiates investors from holding these stocks. This is related to the observation that stocks which are followed only by a small group of investors generate higher returns (Merton, 1987).

The second conjecture of Banz (1981) of is closely related to our central hypothesis and attempts to build a theory of mergers. He states that smaller stocks become acquisition targets of larger ones due to the ability of large firms to discount the cash flow of smaller ones at a lower discount rate. The difference in discount rates leads to a difference in firm values. During an acquisition, this firm value difference is distributed between the seller and buyer and results in the existence of acquisition premium.

Size premium was discovered around the same period by Reinganum (1981), who tests two factors, size factor and E/P ratio, whether they help to explain stock returns. He finds size premium significant even when controlling for E/P ratio, but when he controls E/P ratio for firm size, E/P ratio factor's significance disappeared. He studies size effect on 566 firms listed on NYSE and AMEX over the 1963-1977 period and, when separating them to deciles by market capitalization, finds monthly size premium of 1.77% in the smallest versus the largest decile.

Results of Basu (1983) indicate a slightly different conclusion when studying NYSE firms and controlling for other variables. He finds the value factor to be significant even when controlling for size, while significance of the size factor disappears when controlling for differences in E/P ratios. The author concludes that possible effects of interaction between the two factors should be further studied to arrive at definitive results.

Consequent studies are broadly supportive of Banz (1981) and Reinganum (1981). Brown, Kleidon, & Marsh (1983) use the dataset from the latter research study and in addition to the previous methodology, they adjust for differences in risk and find approximately linear relationship between the average daily returns on 10 quintiles by size and the logarithm of the average market

capitalization. Keim (1983) finds 2.5% monthly size premium during 1963-1979 period for NYSE and AMEX stocks. In addition, he shows that large firms have lower CAPM betas than small firms, which, however, cannot fully explain the return difference. Lamoureux & Sanger (1989) obtain similarly as Reinganum (1981) 1.7% monthly premium for NYSE and AMEX stocks and 2% monthly premium for NASDAQ stocks over the 1973-1985 period. Contrary to Keim (1983), they report that small firms have lower beta than large firms on NASDAQ.

The most widely cited empirical research on size premium was published in Fama & French (1992), where the authors extend CAPM and introduce, so called, three-factor model. Fama and French study NYSE, AMEX and NASDAQ data in the 1962-1989 period. Based on previous empirical studies, they cross-examine whether size, book-to-market equity, E/P, and leverage capture the cross-sectional variance in stock returns. They argue that since all of them can be regarded as different scaled versions of a stock's price, some are reasonably expected to be redundant. The three-factor model includes size and book-to-market equity factors in addition to stock's beta. The model was further developed and expanded with several versions used by financial researchers as well as practitioners even today. This is especially true for the presented Fama-French three-factor model.

Since Fama & French (1992), the use of size premium has become an industry standard. Graham & Harvey (2001) survey nearly 400 chief financial officers (CFOs) and find that CFOs consider firm size as one of the most common factors when estimating discount rate for evaluating an investment.

2.2. Criticism of size premium

Even though size premium is generally accepted by research community as well as by investment practitioners, there are several research papers where authors argue against the importance or even existence of size effect and/or size premium. Since they oftentimes pose questions for which our thesis may have answers or indicate where answers can be found, we

consider them important not only to provide full picture, but also to support our line of reasoning. We have sorted this criticism into three main categories: i) size effect is a result of data mining, ii) evidence on size premium existence is not persistent, it disappeared in 1980s and then reappeared in 2000s, iii) size premium occurs only in the month of January (so-called January effect).

Size premium is a result of data mining or statistical error

General rejections stand on the data mining argument that when many researchers are looking at the same data for a long time and they attempt to discover new relations between variables, they will eventually be successful. Size effect dismissive scholars (Black, 1993; Knez & Ready, 1997; Lo & MacKinlay, 1990) question the existence of size effect as possibly a mere anomaly, a spurious correlation, resulting from data mining. Lo & MacKinlay (1990) point out that sorting the returns to portfolios based on firm size, or any other chosen variable, may result in sizable increase in measurement error and incorrect rejection of null hypothesis that asset pricing model is true. They show that this type I error can reach even 100% when 5% significance level is used. This statistical issue does not reject existence of size premium, but highlights difficulties that portfolio sorting brings and that need to be addressed.

Comprehensive answer to the issue of data mining and high number of discovered factors is provided in Harvey, Liu, & Zhu (2016), who present a new framework for multiple tests and who derive statistical significance levels that should be used. They report and reexamine at least 316 statistically significant factors discovered until 2012. They argue that using critical value for the t-test of 2.0 in asset pricing tests is a serious mistake and propose that statistical significance level should be increasing over time as more factors and data are mined. They use four frameworks, where each employs different assumptions and where each arrives at the same conclusion. They currently recommend using the critical value for the t-test of at least 3.0. Of the 296 published significant factors, they find 132 to 156 false according to the framework used. Important conclusion for us is that size is among 13 listed factors that are the most significant throughout time.

An argument from different perspective is that it would be strange to assume a non-existence of size premium when it has been found not only in the US and the UK, but across various markets such as: Australia (Beedles, 1992), Belgium (Hawawini, Michel, & Corhay, n.d.), Canada

(Elfakhani, Lockwood, & Zahre, 1998), China (Drew, Veeraraghavan, & Naughton, 2003), France (Louvet & Taramasco, 1991), Germany (Stehle, 1997), Japan (L. K. C. Chan, Hamao, & Lakonishok, 1991), Mexico (Herrera & Lockwood, 1994), Singapore (Wong, Neoh, Lee, & Thong, 1990), Spain (Rubio, 1988), and Turkey (Aksu & Onder, 2000).

If we were to make any conclusions regarding the argument that size premium criticism is a statistical anomaly, we would say that size factor belongs among the few highly significant factors studied since the discovery of CAPM and size premium has been observed internationally. Therefore, we do not consider this argument valid anymore.

Disappearance, reappearance, and size premium intertemporal variation

Another stream of criticism against existence, importance and use of size premium, which is closely related to the previous one, stresses that size premium lost its statistical significance after the early 1980s and therefore, it may have been only a temporary spurious correlation suggesting that true stock size premium never existed and that size has never captured any additional risk.

Dimson & Marsh (1998) observe disappearance of size premium and list four potential explanations of bias in previous research – the survival of markets or asset categories (US and UK are the most studied markets, but the fact that they are the most developed and the best performing in the long term creates bias), survivorship bias in the dataset (stocks that ceased to be traded disappear from the dataset), bid-ask bounce (frequent rebalancing or equally-weighted indexing can cause dangers in the long term premium) and omission of transaction costs (managing a portfolio of small stocks is more costly). In their study, they document the reversal of stock size premium and failure of small stock focused funds in the UK introduced in 1987, when the investment public had realized the magnitude of return premium offered by small stocks (they list a premium of 6% p.a. for the smallest decile and 9.2% p.a. for the smallest 2% in 1955-1986 period). They document an underperformance of small stocks of similar magnitude in the next decade in the UK stock market.

Similarly, Horowitz, Loughran, & Savin (2000) find no size premium in the period after the study of Banz (1981). They study NYSE, AMEX and NASDAQ stocks during the subsequent 1980-1996 period. When sorting the stocks to deciles, they obtain average annual returns of the smallest size decile to be 14.99%, while the second to fifth size decile average returns ranged from 11.10% to 14.98% and sixth to the largest size decile average returns ranged between 15.95% and 16.7%. Additionally when they perform a linear regression, they do not observe any size premium.

Van Dijk (2011) in his comprehensive review of size premium accords that the size premium has disappeared in the empirical research since 1980s, but it has returned and is relatively high in the US markets since the late 2000s. When studying stock return factors globally during 1989-2011 period, Fama & French (2012) find decreasing stock returns with growing firm size in the three of the four studied regions of North America, Europe, Asia Pacific. The relationship is not observed in Japan. Even though, Zaremba & Konieczka (2014) confirm the presence of size premium in 11 CEE markets during 2000-2013 period, it becomes obliterated when accounting for transaction costs. Over the longer time period, Blanco (2012) finds Fama-French three-factor model superior to CAPM, thus prevalent significant size premium over the 1926-2006 period.

Counterargument to those who refuse size premium due to its disappearance in 1980s, is presented in Hou & Van Dijk (2010), who show that small firms have suffered from large negative profitability shocks after the early 1980s, while big firms experienced large positive shocks in this period, which resulted in substantially different realized versus the expected stock returns. In 1980s the US exchanges have seen a strong increase of new stock listings and excessively large proportion of those small newly listed firms did not perform well, which was not expected by the market ex ante. Secondly, the large firms were better equipped to adjust to structural change and benefit from wide market deregulation and liberalization in the 1980s and 1990s. Chan (2003) supports this argument when he finds that good news are more likely to relate to larger firms and bad news are more likely to occur in relation with the small firms in the 1980-2000 period. Hou & Van Dijk (2010) adjust for impact of these profitability shocks to stock returns and show robust size premium of around 10% p.a. in expected returns in 1984-2005 period.

Another line of reasoning is presented in Hur et al. (2014), who point out that if size premium results from payment for risk, then intertemporal variation in the size effect is necessary. This variation can have two root causes. Firstly, as investors' risk appetite changes in time, the magnitude of size premium needs to reflect this change accordingly in a similar manner as when investors balance their portfolios between equities and fixed income. In times when the risk appetite becomes very low, size premium may even statistically disappear. Secondly, we cannot exclude the fact that risk on top of that captured by CAPM beta will be lower for small companies than for large companies and size premium becomes a size discount for some time period. Alternatively, should the size premium not result from payment for risk, we argue that size premium, or at least its intertemporal variation, results from intertemporal variation in merger activity, which we elaborate on in the following chapters.

January effect

The last issue which is often mentioned with size effect is that exceptional returns of small stocks occur mostly (or only) in the month of January. The so-called January effect of size premium might have been so far the most difficult obstacle when it comes to attempts to provide theoretical explanation of size premium. While we might not provide a fully comprehensive answer to this issue, our hypothesis perfectly fits into the explanation of Doran, Jiang, & Peterson (2012) and Kumar (2009), whose argument stands on the fact that stocks with lottery-like features (high potential payoff with high risk) are sought by investors in the beginning of the year. Similarly, we argue that small stocks have significant lottery-like features, because as we will explain further in the text, they are more likely to become takeover targets than large firms and takeover premium paid for small firms is significantly higher than that paid for large firms. We begin this section with a commentary to the work by Keim (1983), who first introduces January effect of size premium. We address his two hypotheses aiming to explain January effect and then move to the lottery features explanation.

Keim (1983) studies NYSE and AMEX stocks in 1963-1979 period on monthly basis. He finds that nearly fifty percent of the size premium magnitude occurs in January and over twenty-six percent occurs in the first trading week of the year. As he targeted the issue first, he came up with the two most straightforward potential explanations, which we consider important to elaborate on.

The first argument, which later became the backbone of January effect explanations (Reinganum, 1981; Ritter, 1988; Starks, Yong, & Zheng, 2006), is based on tax loss selling practice – firms with positive taxable income at the end of year holding shares that lost some of its value over the year may sell them at loss at the end of the year in order to reduce their taxable income. This pressures the stock price at the end of the year down and creates buying incentive in the beginning of the year and leading to extra returns in January. This effect would be more pronounced for smaller firms, because their common stock is held by larger firms, which would act as we just described. However, Keim (1983) himself states that this hypothesis is not supported by historical data. The January effect should be, other things equal, tied to the level of personal income tax rates, but as the author points out, the effect was, on average, larger in 1930s, when personal tax rates were relatively low compared to after World War II rates and smaller effect. The author stresses that other things are not always equal and as there are other variables, the hypothesis may need more testing. We point out that households' share of stock market holdings gradually decreases from around four fifths in 1970s to one half in 2013 (Ro, 2013).

The second hypothesis relates to the end of year being an ending of several important financial and informational events. Thus it is called information hypothesis. January is a month of new tax year, new accounting year for most of the firms and a time period which due to increased uncertainty and anticipation leads to stronger reactions of investors to released information. However, the issue here is that regular and recurring abnormal small firm returns are not consistent with rational expectations and market equilibrium. Therefore information hypothesis does not appear to be a sufficient explanation neither. Additionally, Keim (1983) lists several other possible non-economic explanations – concentration of listings, de-listings at year end or data base errors.

Now, we would like to elaborate on the work of Doran et al. (2012) and Kumar (2009), who seem to have developed a sound explanation of January effect. We stress again that the relationship between takeovers and returns that we test in our hypothesis would fit in this explanation well. They state that in the beginning of the year investor demand for lottery-like payoffs significantly increases and has a sizeable impact on stock prices. Kumar (2009) defines firms with lottery-like payoffs as those with highly volatile returns, high positive skewness and low price and we could enlarge this group by adding stocks that are being considered as takeover targets, because with some probability of 30-50% average takeover premium they certainly satisfy lottery-like features. He applies mentioned sampling criteria and arrives at 1553 lottery-type stocks with average market capitalization of USD 31m, 1533 non-lottery-type stocks (with opposite characteristics) with average market capitalization of USD 1,651m and 8,945 stocks that do not fall to neither group and have average market size of USD 539m. This statistics shows that it is rather small stocks that have lottery features. He then provides evidence that these are over-weighted in retail investors' portfolios (3.74%) compared to market portfolio weight (1.25%) and to institutional investors' portfolios (0.76%).

Doran et al. (2012) build upon Kumar (2009) findings, study gambling preference with relation to the New Year effect and find evidence that lottery-type stocks have abnormally high returns at the turn of the New Year. Their explanation stands on the behavioral studies showing that people tend to participate in risky activities after experiencing outcome payoffs in prior rounds of gambling (R. H. Thaler & Johnson, 1990). End of a year is a common time to evaluate one's portfolio, receive mutual fund reports, prepare for taxes and receive employee bonuses, and make New Year's resolutions (Benartzi & Thaler, 1995). While increased gambling behavior in the beginning of the year outside financial markets is well observed, Doran et al. induce that this gambling behavior phenomenon can be behind January effect and they study it in financial markets. They find an average difference in January returns between the lowest and the highest lottery-feature quintile of 11.48% in 1964-2007 period, which is robust to adjustments for bid-ask spread, delisting bias, firm size, book-to-market and momentum. They also provide evidence that these lottery-type stocks are demanded not only by retail investors, but also by institutional ones in the

beginning of the year. They further test the January effect in the US in the Chinese stock market, because Chinese New Year usually does not coincide with the western New Year. Chinese also have a gambling tradition connected to the celebrations of the Chinese New Year. The authors find that average market return is highest during Chinese New Year's month at 5.92% and lowest during January at -1.53% (excluding the January Chinese New Years). Then they examine whether Chinese investors also display higher gambling behavior around the New Year, Chinese New Year or not at all for lottery-type stocks and find January effect insignificant and Chinese New Year effect significant. Therefore Chinese data support their hypothesis that January effect explanation lies in gambling behavior.

Even though lottery-type stocks and small stocks are not identical groups, there is a strong overlap and (Doran et al., 2012) conclude that January effect can be explained by gambling behavior. To further support the gambling behavior explanation, we need to point out that January effect is also observed in relation with non-investment grade bonds, but not with investment grade bonds (Maxwell, 1998). The takeaways are that high takeover activity implies higher chance for small stock investors to receive lottery-like payoffs and it should strengthen the lottery-like classification of small stocks.

2.3. Theoretical explanations of size premium

In this section, we present theoretical explanations of size premium, which are being discussed. The first and probably the strongest group supposes that firm size is one of risk factors determining stock's systematic risk and it is a proxy for the exposure to state variables that describe intertemporal variation in the set of investment opportunities. Second group contends that size premium is a reward for liquidity risk and/or transaction costs. Third group looks at explanations in behavioural sphere by relaxing the assumption of investor rationality.

The most prolific authors from the first group are Eugene Fama and Kenneth French, who explain the existence of empirical size premium as a proxy for exposure to certain common risk

factors in stock returns. They further suggest that one of these factors should be related to financial distress (Fama & French, 1995). Using Fama-MacBeth regressions, K. C. Chan et al. (1985) find empirical evidence that size effect can be captured by change of default spread and other variables related to economic environment changes. This is on the other hand questioned by other research such as Dichev (1998) or Campbell, Hilscher, & Szilagyi (2008), who show that ex ante bankruptcy risk does not impact stock returns. In short, there is not a general academic consensus that firm size proxies for sensitivity to common risk factors. We point out that our work may be categorized in this group of reasoning.

The group of research explaining the size premium as a compensation for illiquidity and high transaction costs suffers from inability to capture the size premium completely. One representative of this explanation is the research by Amihud & Mendelson (1986) who develop a model where investors are able to require a compensation for higher trading costs. They show that investors can be sorted to long and short period holders and the first group tends to hold stocks with larger bid-ask spreads. However, when they use the model and examine larger dataset, they cannot fully explain the size premium. Very similar conclusions are made by Amihud (2002), Brennan & Subrahmanyam (1996) and Schultz (1983).

The third stream of arguments, which builds the explanations upon assumption that investors are not always rational, lacks direct evidence that mispricing may fully explain size premium. One of the arguments is that firms suffer from investor overreaction, thus those that have performed poorly are more likely low value firms whose stocks have been oversold and whose price should be corrected and returns should be improved in the future, i.e., they represent a good investment opportunity (Lakonishok, Shleifer, & Vishny, 1994). Another explanation is based on the fact that small firms suffer from low volume of information available about them. Merton (1987) shows that not well known firms with small number of investors benefit from higher expected returns. Hou & Moskowitz (2005) provide an empirical analysis of the influence of stock popularity and size effect and find that less known stocks' price reacts to information with

significant delay, which has significant impact on cross-section of stock returns and which captures a significant part of size premium.

Where is the link between size premium and merger activity?

As the wide academic consensus for the theoretical explanation of size premium is still not established, there is a need to study the phenomenon further, expand existing theories and search for the new ones. We believe that size premium may be a by-product of takeover activity. In our work, we provide another piece of research tackling only recently studied relationship between stock returns and takeover activity. While we focus particularly on differences in stock returns and takeover activity between small and large firms, we first start with the introduction of the relationship between takeover activity and stock returns.

Past literature as well as empirical evidence has shown that (i) target firm shareholders gain significant premiums from acquisitions (Andrade et al., 2001 report 35% bid premium) and that (ii) on average every twentieth public firm is acquired every year (Doidge, Karolyi, & Stulz, 2017). Combining these two observations, we need to ask whether it is not rational for investors to seek potential takeover targets and benefit from buying future takeover target firms. For example, if we were to make a one year investment in an equal-weighted portfolio of 20 firms, one of them would be acquired and provided 30% takeover premium, our entire portfolio would benefit from extra 1.5% return due to this takeover. If selection of takeover targets is not random from outsider's perspective and investors are able to anticipate (to certain degree) which firms will become next targets, they would be able to generate a non-negligible extra returns.

Before moving further, we clarify the terminology of takeover premiums here. There is unobserved, run-up and observed, or announced takeover premium. Unobserved premium is a premium to the stock price that is accumulated due to existing general takeover activity in the market. It may slowly change over longer time periods when takeover activity changes. Investment upon long term takeover anticipation without any insider information may also contribute to

unobserved premium. It is hardly measurable precisely, but we will review the research by Bennett & Dam (2017), who have made the estimation.

Run-up premium is a premium that occurs several months before the takeover announcement. Since the preparation of the takeover starts several months before the announcement, there is a high chance of information leakage upon which market participants invest in the target and which causes run-up premium. Generally, researchers do not distinguish between run-up and unobserved premium and use them interchangeably, but we will operate with them separately. Run-up premium can be roughly estimated by observing stock price growth over several months before the takeover announcement.

Observed/ announced premium is the publicly announced premium. This is the only premium that can be measured precisely compared to the other two. It is the one most commonly referred to by general and/or professional public.

In their seminal paper, Bennett & Dam (2017) study whether takeover activity has any systematic impact on stock prices and estimate that 10% of a typical firm's stock price may be attributed to investors' anticipation of takeover in 1990-2015 period. Furthermore, they estimate that these 10% of stock price (unobserved premium) is roughly one third of the observed (i.e. announced) premium. This is roughly in line with 35% announced takeover premium reported by Andrade et al. (2001) as well as with Bloomberg monthly data for 2006-2018 showing average announced takeover premium of 31%.

Bennett & Dam (2017) do not consider aggregate impact of changes in takeover activity, but on individual stock level they extend studies of Bradley, Desai, & Kim (1988) and Schwert (1996) by finding that unobserved premium occurs long before any anticipation merely as a result of rational expectations that a stockholder will benefit from sizeable acquisition premium sooner or later. They further support previous studies on run-up premium, showing that unobserved premium grows significantly couple months prior to takeover announcement.

The impact significance of takeover activity on stock prices is established and the aim of our work is to take a step further and examine the structure of takeovers in detail, in particular, we study whether and how takeovers impact returns of small firms more than returns of large firms. Our research question is whether takeover activity may directly affect size premium. The argument stands on the fact that takeover activity fluctuates in time (it arrives in waves) and two key observations – small firms receive significantly higher takeover premium than large firms and small firms are more likely to be acquired than large firms. Firstly, Alexandridis, Fuller, Terhaar, & Travlos (2013) group takeover targets into three terciles according to firm size and report that the smallest tercile received 54% average takeover versus average of 38% takeover premium paid for the largest tercile. That means that small targets get 40% higher premium than large targets. Secondly, small firms are more likely to become takeover targets than large firms (Ambrose & Megginson, 1992; Palepu, 1986). If we create the analogous terminology as used by credit risk managers (probability of default and loss given default) to demonstrate the two variables above, we have "probability of takeover" and "gain given takeover", which are both higher for small firms. Therefore, small firms benefit from takeovers more than large firms and our research question is whether intertemporal change in aggregate takeover activity impacts size premium.

Very important research paper studying similar relationship as our work is Cremers, Nair, & John (2009), who in particular study the relationship between the takeover likelihood and stock returns. They take a slightly different approach than our work by creating a takeover likelihood factor for each firm based on several firm-related variables and find that using this takeover factor helps to generate abnormal returns according to their results. The idea is the same as we state for our hypothesis above, firms that are more likely to become takeover targets generate higher returns. Firms with a strong institutional shareholder, low market to book value ratio, small size, operating in an industry with significant takeover activity in previous year, and higher leverage are more likely takeover targets and have higher takeover factor. They also stress that using only one of the variables does not suffice for takeover prediction.

The difference between our hypothesis and work of Cremers, Nair, & John (2009) is that they find takeover likelihood directly impacting stock returns, whereas we argue that takeover activity should, due to its characteristics, impact directly size premium and have an impact on stock returns indirectly.

2.4. Takeover activity evidence

In this section, we present more detailed information about takeover activity, the main findings that led to formulation of our hypotheses, and research studying similar relationship as in our work. We begin with an introduction to merger activity, merger waves, aggregate structure of mergers, and reasons for preferably using US stock market data. Then we move on to overview of empirical research testifying variation in takeover premiums by target size (small takeover targets obtain higher premiums than large ones), variation in probability of being taken over (small firms are more likely to be acquired than large firms) and that large takeovers are often value destroying.

Takeover activity

Takeover, or mergers and acquisitions, activity, as we will talk about later, refers to the number or value of takeover deals in a given year. As our hypothesis states that takeover activity has impact on time variation of stock size premium, studying the nature of takeover activity is essential for our purposes.

Important characteristic of takeover activity is that it is not stable in time, but fluctuates in time and it is well known that it occurs in waves. There have been six such waves, which were triggered for various reasons, but all of which ended by a sharp decline in stock markets and were followed by economic recessions. Since the US stock market is very well documented, the six merger waves since the 1890s have been observed only there. In the UK, stock markets have been reliably monitored only from the beginning of the 1960s, and in Continental Europe only from the early 1980s.

The first merger wave began at the end of 1890s in time of rapid technology advances, strong economic growth, industrial processes innovation, introduction of industrial stocks trading on NYSE and new US laws on incorporations. The first wave concerned primarily horizontal integration of industrial companies, which led to creation of several giant companies and monopolies (Stigler, 1950). The wave halted with the stock market crisis in 1903-1905.

The second wave started after the First World War and caused emergence of oligopolies as many small companies were merging together to achieve economies of scale and compete with monopolies formed during the first merger wave. There were usually few corporations across industries by the end of the wave (Stigler, 1950). The second wave ended with the infamous Wall Street Crash of 1929, also known as Black Tuesday.

The following two decades long third merger wave resulted from a tightening of the antitrust regime in 1950, when legislative changes to prevent anticompetitive mergers were amended. Many giant companies made acquisitions outside their main industry to diversify their business, benefit from growth prospects of other industries and bypass the new antitrust laws. The third wave came to an end with the global oil crisis in 1973 (Martynova & Renneboog, 2008).

The fourth takeover wave emerged in 1981 after the recovery from the previous economic crisis. In the US, the wave corresponds with technological progress in electronics, the deregulation of financial services (savings and loan associations) and the creation of new financial instruments and markets (introduction of high-yield bond securities). This wave is supposedly a result of inefficient operational models of conglomerates created in the previous merger wave. The fourth takeover wave is characterized by high number of divestments, leveraged or management buy-outs and hostile takeovers. The wave collapsed with the market crash in 1987 (Martynova & Renneboog, 2008).

The fifth wave began in 1993 during the time of globalization, deregulation, privatization, radical changes in technology and expansionary financial markets. The fifth takeover wave was the first one truly international – European takeover value was of a similar size to the US merger

value and the wave occurred also in Asia. As the firms were eager to participate in global markets, the fifth wave encompassed large number of international transactions. The wave ended with the market fall in 2000 (Martynova & Renneboog, 2008).

The last merger wave emerged in 2003 and ended shortly before the financial crisis in 2008. It was a continuation of the previous one resulting from abundant liquidity, technological shocks and deregulation with corporate aim to internationalize business operations. This wave was characterized by lower optimism of acquirers – they were less acquisitive and significantly lower premiums were paid than in previous waves, but on the other hand, higher portion of cash element was used in transactions (George Alexandridis et al., 2012).

It is evident from our brief introduction to each of the merger waves that there are several commonalities and unifying patterns. At the beginning of a wave, takeover activity slowly builds up over the years and then abruptly falls to start slowly growing again. The waves are preceded by technological and industrial shocks or regulatory changes and come during economic growth and stock market boom. Also all of the waves collapsed with a market crash. Gorton, Kahl, & Rosen, (2009) debate that M&As are largely driven by firms internal need to be larger in order to avoid being taken over. They show how one significant acquisition or merger may due to this behavior lead to a chain of defensive takeover transactions which are done in order for acquirers to become larger and less likely targeted by other firms. Such behavior may be considered as one of the drivers or facilitators of merger waves.

Now, we have covered the time dimension of aggregate takeover activity. In the following text, we will elaborate on takeover premium, probability of being taken over, their variation by size and implication that takeover activity should be linked to size premium. It is important to realize that merger activity measured as a total takeover deal value in a year to average total market capitalization can reach up to 3% (Andrade et al., 2001a). The fact that merger activity with its takeover premiums may have material impact on total stock market returns or stock return distribution is the first of our three key observations that motivated our hypothesis. We dedicate separate sections for the other two key observations.

Takeover premium and its variation by target size

Literature evidences that small firms receive relatively higher takeover premium than large firms. This is the second of the three key observations that motivates formulation of our hypothesis. In this subsection, we present significant literature discussing difference in takeover premiums, its causes and how it links to stock returns.

Major research study of relationship between deal size and takeover premium is done by George Alexandridis et al., (2013) who examine a sample of 3,691 US public deals during 1990-2007 period. They sort the firms in terciles and show that the smallest tercile gained on average 54% takeover premium, or 40% more than the largest tercile, which obtained 38% takeover premium. This relationship is time persistent regardless of premium measure used.

Existing literature provides several explanations for the target size difference in takeover premium: (i) as market with small companies is more competitive and counteroffers pose a risk for the initial bidder, acquirers are more likely to offer higher premium to prevent such counteroffers (G. Alexandridis, Petmezas, & Travlos, 2010; Gorton et al., 2009). Walkling & Edmister (1985) estimate that when two or more acquirers compete for the same target, bid premium averages 30 percentage points above mean, (ii) there is more information available for larger companies and therefore less information asymmetry leads to more precise valuations (Atiase, 1985; Chang, Dasgupta, & Hilary, 2006; Collins, Kothari, & Rayburn, 1987), (iii) integrating large company may be more risky and therefore an acquirer would not be willing to pay a premium as high as if it had been buying a small company. Shrivastava (1986) and Hayward (2002) provide evidence that integration of acquired firm is correlated to its organizational size. This last explanation will be further discussed in section on supportive factors. Whichever explanation plays the most important role, we repeat that takeovers provide target shareholders high compensations for holding target firm stocks, and especially high compensations to shareholders of small stocks.

This observation along with the fact that 5% of stocks are taken over in an average year lead to the conclusion that takeovers may have systematic effect on stock returns, as well as

significant effect on difference in returns of small versus large stocks, i.e. size premium . Should we follow up on the research by Bennett & Dam (2017), who estimate that around one fourth of takeover premium is embedded in the stock price and it represents around 10% of the stock price, we expect that since small stock shareholders gain even more from takeovers, this embedded part of the premium, or unobserved premium, would be higher for small stocks, such that it may contribute more than 10% to small stock price.

Important observation was made by Jarrell & Poulsen (1989) and Schwert (1996), who both find weak correlation between run-up and announced premium. It hints that announcement premium may be less (than believed) a matter of valuations and more a matter of strategic decision (to receive positive answer from target shareholders and to prevent counterproposals from other acquirers). More importantly for us, market anticipation of a takeover translates into additional costs for the acquirer and does not lower announced premium. This observation is also supportive of our hypothesis that change in takeover activity impacts size premium in a sense that when merger wave begins, potential targets do not increase their valuation levels and remain there, but retain their growth momentum throughout the merger wave even after initial increase in their valuations.

Takeover probability and its variation by target size

The third key observation motivating our hypothesis is that small firms are more likely to become takeover targets than large firms. Since we study aggregate level of takeover activity, this is an important observation. Otherwise, even if small firms received much higher takeover premium, if share of small takeovers would be only minor, we might not be able to observe any impact on size premium on aggregate level. But this is not the case as several studies show that small firms are more likely targets than large firms.

Palepu (1986) studies whether takeover targets can be predicted and finds an inverse relationship between firm size and its probability of being taken over. He hypothesizes that reason for that are growing transaction costs with the size of acquired firm and higher likelihood of large firms to initiate takeover defense. This is further seconded by Ambrose & Megginson (1992) who

look for determinants of takeover likelihood. They find the likelihood of receiving a takeover bid to be positively related to tangible assets, and negatively to firm size and to the net change in institutional holdings. The most recent and substantive study establishing takeover probability was done by Cremers, Nair, & John (2009), who find size and other two variables significant consistently across various models (the other two being market to book value and a dummy variable capturing takeover activity clustering within an industry and time). They confirm that a firm's size is negatively correlated with its probability of being taken over.

Findings of Alexandridis, Fuller, Terhaar, & Travlos (2013) suggest that takeover prediction strategies that overweight small firms can be more profitable because of the higher takeover probability (as well as higher takeover premium received). Putting everything together, number of takeovers relates to high portion of public firms, announced takeover premiums are around one half (third) of the small (large) target firm market capitalization and small firms are more likely to be acquired than large firms. Given the differences in takeovers between small versus large targets, we imply that takeover activity should have impact on size premium. Takeover anticipation during a merger wave should drive stock prices of small firms higher at faster pace than those of large firms, thus it should impact size premium.

Additional factors supporting the relation between takeovers and size premium

We find other two factors that may further support our hypothesis. The first is the empirical evidence that large takeovers are often value destroying (for acquirers). That is when a large company takes over another large company, transaction and post-merger integration costs are similar or higher than synergies and ultimate value is lower than it was before. This drags large stock returns lower and supports return size premium during high takeover activity (during a merger wave).

Secondly, size premium suffers from lack of sufficient explanations also due to the fact that most of the size premium is supposed to be realized in a month of January. Attempts for theoretical explanation of size premium had especially hard time explaining this temporal feature. As we

described at the end of the subsection 2.2., January effect may be explained by investor behavior in the beginning of a new year. Investors search lottery-like payoffs and we hypothesize that since the small stocks receive extraordinary takeover premiums, they may be one of the choices investors take in anticipation of their takeover. We also note an interesting observation by Mitchell & Mulherin (1996) that during the 1980s, nearly half of all major US firms received a takeover offer.

3. Research Design

3.1. Methodology

We investigate the relationship between the activity in the market for takeovers and stock size premium. This relationship will be studied on aggregate level, that is aggregate market takeover activity and total market size premium in a given time period. In general, the regression equation should have the following structure:

$$\text{SMB} = \alpha + \beta_1 * \text{takeover activity} + \varepsilon,$$

where SMB (i.e. size premium variable) is generally used small minus big variable as used in Fama French three-factor model. It is calculated as a difference in average returns of the smallest firms' decile in equally-weighted portfolio and average returns of the largest firm decile in equally weighted portfolio. The returns are calculated monthly as well as annually and deciles are re-estimated annually.

We employ the takeover activity variable by using the following approach. Takeover activity should be a measure of takeover quantity in a given period. For this purpose we use deal count and deal value, where each has its advantages and disadvantages that will be discussed in the next two paragraphs. Our annual dataset includes realized takeovers, while the monthly dataset includes announced takeovers (some of them were later discontinued). We note that for our purposes, it does not matter whether a deal was only announced and not completed, because whenever an acquirer later announces discontinuation of a takeover, target stock prices do not return back to their levels before takeover announcement, but their price remains elevated around the announced takeover price.

The first variable used is deal value, or total value of takeover target firms in a period. Deal value captures the nature of takeover activity perfectly, it also carries information about takeover

premium. Deal value, however, can be strongly influenced by one large transaction if measured for shorter time periods, such as months or few years. We will attempt to mitigate this issue by using 2, 3, 6, and 12 month moving averages in our monthly dataset.

Secondly, we use total number of deals in a period, deal count, whose advantage is that all firms are equally weighted and for our purposes small firm takeovers are perfectly represented. On the other hand, this measure carries no information about takeover premiums, but as we do not have cross-sectional data and we cannot examine takeover premiums individually, we base our assumption on Alexandridis et al. (2013) that small firms are paid significantly higher takeover premiums. We are aware of the fact that there may be a situation when more companies are being acquired, but for some reason they would receive small takeover premiums, and the effect on size premium may be opposite then we claim in our work.

We treat deal count and deal value variables in exactly the same way throughout our analysis, and therefore, from now onwards, when we mention takeover activity, we mean both variables.

Coming back to our hypothesis and regression equation, we will use following transformation of deal count and deal value variables in order to arrive at meaningful interpretation of our results. We are interested in impact of percentage change of these two variables on size premium. Takeovers are generally anticipated several months before their public announcement due to information leakage and market rumors, which should support size premium ahead of the period of announcement. This leads to realization of run-up premiums, which are target stock price increases prior to takeover announcement that can be assigned solely to the fact that investors expect high payoff on announcement. For this reason, we are employing takeover activity anticipation into our model. Taking an example of six month moving average, the change in takeover activity variable will be a sum of takeover activity in the next six months divided by the takeover activity in the past six months. Therefore, our regression equation has the following general structure:

$$SMB_{t+1} = \alpha + \beta_1 * 100 * \left(\frac{\sum_{t+1}^{t+x} takeover\ activity_t}{\sum_{t-x+1}^{t} takeover\ activity_t} - 1 \right) + \varepsilon_t,$$

where x is 2, 3, 6, or 12 months when estimating the regression with monthly dataset. For annual data, we will estimate the model for one year change in takeover activity.

While finding that the relationship above exist would suffice, we continue the analysis further. There is a minor issue in the explanatory variable above if we want the model to have an ambition to be used in practice. We have been assuming perfect foresight of the investors by including future takeover activity in the numerator of the explanatory variable. If we aim to create a model for practical application, we will be interested whether takeover activity in upcoming period can be forecasted and if that will be possible, we would include forecasted takeover activity in the numerator.

The first step would be to try to predict future takeover activity, for which we will use past takeover activity in the following specification:

$$\sum_{t+1}^{t+x} takeover\ activity = \alpha + \sum_{t-x+1}^{t} (\boldsymbol{\beta} * takeover\ activity_t) + \varepsilon_t$$

Secondly, we will add two variables as suggested in Harford (2005), who studies how merger waves can be predicted. We will add GDP growth and proxy for capital liquidity in terms of corporate bond monthly rate spread over Federal Funds rate and estimate whether predictive power of the model can be improved. Our alternative predictive model will have following specification:

$$\sum_{t+1}^{t+x} takeover\ activity =$$

$$= \alpha + \sum_{t-x+1}^{t} (\boldsymbol{\beta} * takeover\ activity_t) + \beta_{x+1} \frac{\sum_{t-x+1}^{t} gdp\ growth}{t}$$

$$+ \beta_{x+2} \frac{\sum_{t-x+1}^{t} bond\ rate\ spread}{t} + \varepsilon_t$$

Then, if we find a model that will be able to predict future takeover activity, we will take fitted values and use them in our original regression:

$$SMB_{t+1} = \alpha + \beta_1 * 100 * \left(\frac{\sum_{t+1}^{t+x} \widehat{takeover\ activity_t}}{\sum_{t-x+1}^{t} takeover\ activity_t} - 1 \right) + \varepsilon_t,$$

where the hat above the numerator stands for fitted values from previous models. This approach let us leave out the assumption of investors' perfect foresight and use instead predicted, or anticipated, takeover activity. We argue that predicted takeover activity may be, in fact, closer to what investors anticipate than true realized takeover activity. In case that we found this model to remain significant compared to the original one, the model could aspire to be applied for prediction of size premium in upcoming periods.

3.2. Data description

We have collected two datasets – one with monthly values and one with annual values. Monthly dataset with 230 observations is obtained from Bloomberg and spans from January 1999 to February 2018 and annual dataset with 35 observations spanning from 1981 to 2015, with exception of deal count share, for which we have time series with 41 observations starting 1975 and ending 2015. Since the merger waves occur since the end of 19th century, an ideal dataset would include observations for much longer time period than what we collected. We were not able to collect this long time series.

We use standard SMB (small minus big) as a size premium variable which we construct as a difference between the decile returns of equally-weighted smallest firm portfolio and equally weighted largest firm portfolio as reported at prof. Kenneth R. French's website[1]. This applies to both annual and monthly dataset. The portfolios are constructed annually for NYSE, AMEX, NASDAQ firms and returns are reported on monthly as well as annual basis for 1926-present.

For takeover activity, we compile takeover data from various sources to obtain four measures. We collect aggregate deal count and deal value on annual basis as they were listed in Hu (2017). The research by Hu (2017) cites SDC as its source and the values listed include all successfully executed takeover transactions between US acquirer and US target between 1981 and 2015, which means we have 35 observations only for deal count and deal value. For monthly basis, we collect the deal count and deal value data from Bloomberg for January 1999 – February 2018 period. Bloomberg allows us to collect realized and discontinued deals, therefore the nature of the data is slightly different and better for our purposes, because discontinuation has minor negative impact on stock price.

Finally, we collected consumer price index (CPI), GDP growth, and corporate bond spreads over federal funds rate from Federal Reserve Economic Data (FRED) database. We use CPI to adjust the deal value for inflation. The CPI index assumes a value of 100 for the year 2010. The other two time series, GDP growth and bond spreads are used in the takeover activity prediction model.

[1] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Table 1 – Annual data summary statistics

Statistic	N	Mean	St. dev.	Min	Max
Year	41	-	-	1975	2015
SMB	41	7.83	25.42	-36.1	75.7
Deal count	35	5 710	2 487	824	9 861
% yoy change in Deal count	34	8.41	22.53	-35.2	85.1
Deal value [USD bn]	35	536 332	390 182	59 680	1 420 420
% yoy change in Deal value	34	14.23	35.79	-51.4	90.4

Table 2 – Monthly data summary statistics

Statistic	N	Mean	St. dev.	Min	Max
Period	230	-	-	Jan-1999	Feb-2018
SMB	230	0.57	4.8	-13.29	26.12
Deal count	230	1 005	237	575	1 571
Deal count (6m MA)	225	6 021	1 311	3864	8641
Deal count (% change 2m-o-2m)	227	1.03	8.77	-32.92	27.21
Deal count (% change 3m-o-3m)	225	1.22	8.26	-26.14	30.30
Deal count (% change 6m-o-6m)	219	2.11	10.23	-29.54	31.95
Deal count (% change 12m-o-12m)	207	3.52	13.44	-27.71	33.07
Deal value [USD bn]	230	126.1	74.3	17.3	430.7
CPI (2010 = 100)	230	95.9	11.4	75.5	114.5
CPI adjusted deal value [USD bn]	230	130.1	72.1	17.7	394.5
CPIadj_deal value (6m MA)	225	773	336	248	1 524
CPIadj_deal value (% change 2m-o-2m)	227	8.24	42.56	-72.75	153.32
CPIadj_deal value (% change 3m-o-3m)	225	6.15	35.70	-65.33	125.20
CPIadj_deal value (% change 6m-o-6m)	219	4.81	31.62	-61.91	106.12
CPIadj_deal value (% change 12m-o-12m)	207	6.41	36.68	-55.07	99.97
GDP growth (% y-o-y)	230	2.12	1.82	-5.15	5.61
Corporate bond rate spread over Fed funds rate	230	4.36	1.68	0.95	8.82

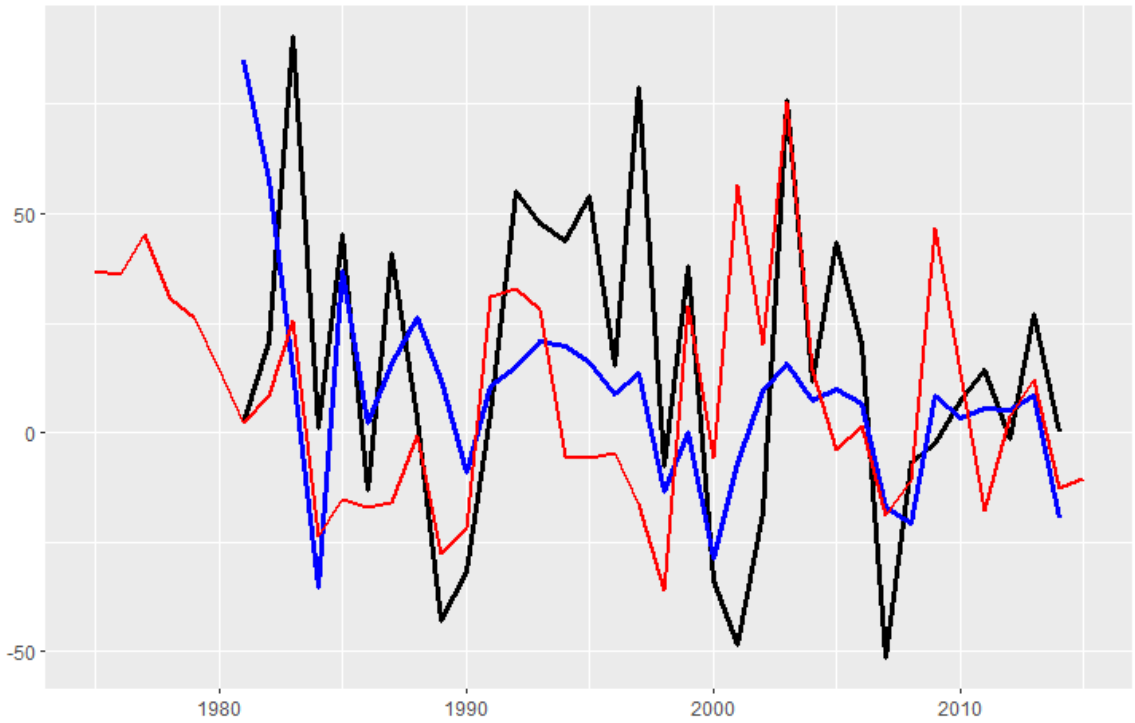
4. Empirical Results

As described in the previous sections, we examined whether merger activity and its intertemporal change impacts size premium. We employ several intertemporal measures of change in takeover activity, for which we have data on annual basis and monthly basis. In particular, we analysed expected change in takeover activity in the next year using the annual dataset and then, as we assume investors to be anticipating takeovers within several months, we analysed expected change in takeover activity in the next 2, 3, 6, and 12 months compared to past 2, 3, 6, 12 months respectively.

4.1. Exploratory graphs

Before we get to the hypothesis testing, we present exploratory graphic visualization of the relationship between the variables used. Figure 3 shows the relationship between takeover activity (deal count and deal value) and size premium from the annual dataset. We would be expecting the movement of the variables to be in the same direction and ideally with constant ratio of change in time (i.e. increase in deal count by 10pp would correspond to the increase in size premium by 3pp throughout the time period).

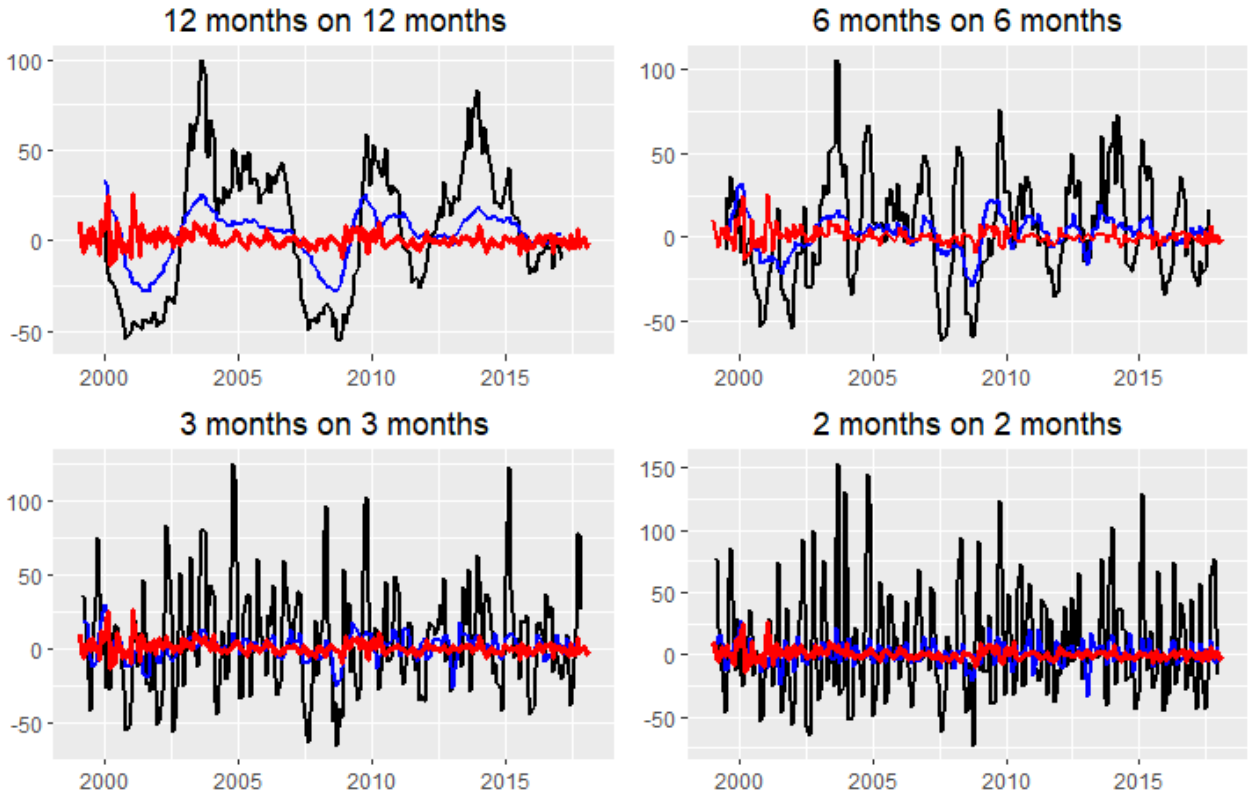
Figure 3 – Relation between takeover activity change and size premium – annual data



Blue line represents % y-o-y change in deal count and black line represents % y-o-y change in CPI adjusted deal value variables. Red line represents SMB, size premium, variable in percentages. Our expectation would be to observe the movements in the variables to be similar.

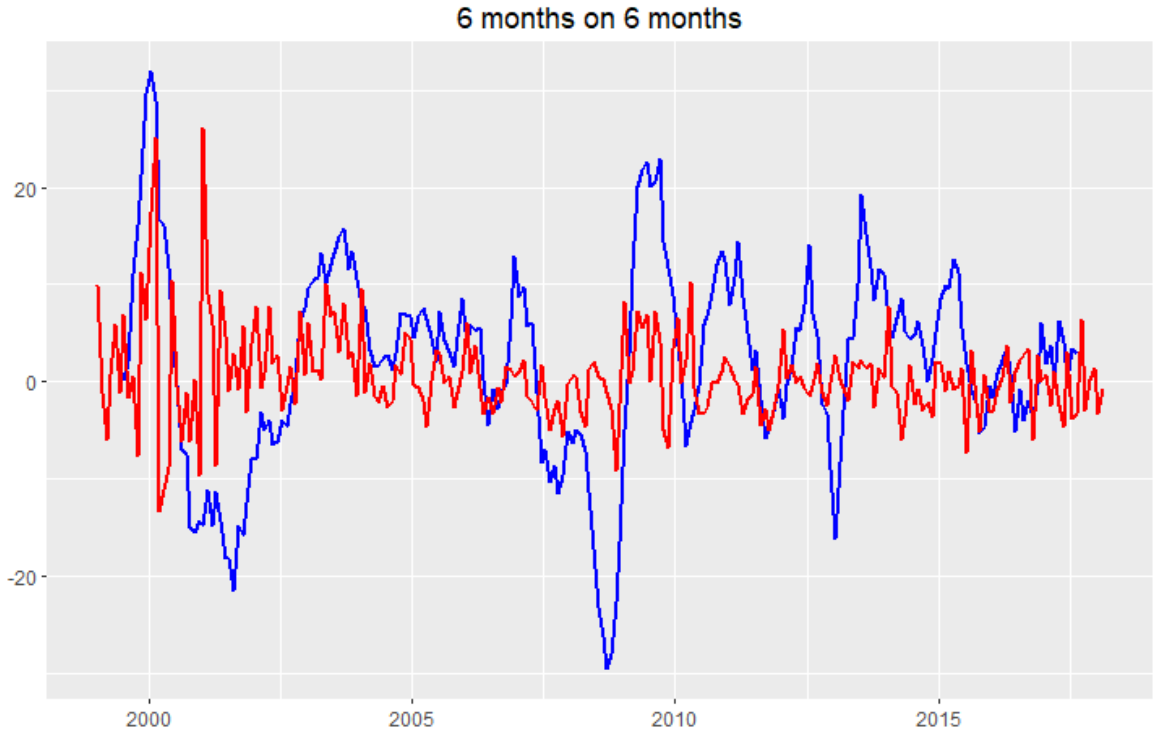
We further explore the relationship of our monthly dataset in Figure 4 by plotting the change in takeover activity and size premium similarly as for annual data. In Figure 4, we examine changes of 2, 3, 6, and 12 months on respective number of months in previous period. As six month period will be shown to be the best in explaining size premium, we provide the relation between deal count and size premium in larger graph again in Figure 5, where it is more apparent that the variables may be related.

Figure 4 – Relation between takeover activity change and size premium – monthly data



Blue line represents % Xm-o-Xm change in deal count and black line represents % Xm-o-Xm change in CPI adjusted deal value variables. Red line represents SMB, size premium, variable in percentages. Our expectation would be to observe the movements in the variables to be in the same direction and with constant ratio of change.

Figure 5 – Relation between deal count and Size premium – monthly data



Blue line represents % 6m-o-6m change in deal count and red line represents SMB, size premium, variable in percentages. Our expectation would be to observe the movements in the variables to be similar.

Again, we expect to observe in Figure 5 that the two variables move at the same time in the same direction. While size premium is more volatile, the expected pattern can be seen from the graph. We believe that Figure 5 already suggests that interrelation between size premium and change in takeover activity may exist.

4.2. Change in future takeovers and size premium

Now, we will move to statistical testing. We begin our work with annual data and then move on to monthly data. In Table 3, we report the results of two regressions, one using deal count and the other using deal value in explanatory variables. When using % change in deal count, we do not obtain significant results, which is true even when using robust standard errors in the

analysis. With regards to deal value, we observe statistical significance at 90% significance level, but these results disappear when using regression with robust standard errors. We do not observe presence of heteroscedasticity, nor unit root in residuals. Finally, we infer that change in future takeover activity is not related to the magnitude of size premium.

Table 3 – Annual data regression summary

	Annual SMB	
	(1)	(2)
Intercept	2.3567	7.3420
	(4.6201)	(4.4679)
% y-o-y change in deal count	0.2164	
	(0.1946)	
% y-o-y change in deal value		-0.2495 **
		(0.1175)
Number of observations	34	34
Adjusted R-squared	0.007126	0.09606
Residual standard error	25.19	24.76

*Note: Standard errors in parentheses, *p<0.1; **p<0.05; ***p<0.01*

We perform the analysis with our monthly dataset and we estimate four regression equations in Table 4. Each regression contains one explanatory variable of change in takeover activity, where the difference between them is the use of different period in which the change is measured. We estimate the changes over 2, 3, 6, and 12 months. We already suggested above that we believe that six month change in takeover activity appears to capture just enough volatility to observe the correlation with size premium.

Table 4 reports regression results for 2, 3, 6, and 12 month changes in deal count and 6 month change in deal value as well. When applying robust standard errors in regressions, where significant results were obtained, the outcome does not change, robust standard error of the explanatory variable in regression (2) is 0.0485, which decreases significance level from 99% to

90% and in regression (3), robust standard error is even lower at 0.0096. We have not identified any obstacles for correct statistical inference (no heteroscedasticity nor unit root in residuals). We consider these results worth attention as they should contribute to what we already know from prior research.

Table 4 – Monthly data regression summary

	Monthly SMB				
	(1)	(2)	(3)	(4)	(5)
Intercept	0.5191	0.3589	0.4492	0.4836	0.5148
	(0.3384)	(0.3269)	(0.3268)	(0.3246)	(0.3239)
% 12m-o-12m change in deal count	0.0104				
	(0.0091)				
% 6m-o-6m change in deal count		0.0887***			
		(0.0314)			
% 6m-o-6m change in deal value			0.0202**		
			(0.0102)		
% 3m-o-3m change in deal count				0.0110	
				(0.0090)	
% 2m-o-2m change in deal count					0.0039
					(0.0075)
Number of observations	207	219	219	225	227
Adjusted R-squared	0.0015	0.0311	0.0131	0.0022	-0.0032
Residual standard error	4.795	4.737	4.781	4.798	4.791

*Note: Standard errors in parentheses, *p<0.1; **p<0.05; ***p<0.01*

4.3. Predicted takeovers and size premium

We continue by constructing a predictive model for future takeover activity as we described in the methodology section. So far, we assumed that investors are able to perfectly forecast future

takeover activity, which is unrealistic. In order for our results to aspire for any type of application, we need to dispose of using values from the future. If we restrict ourselves, from now, to 6 months on 6 months results, we are currently using next six months of realized/announced takeover activity. Therefore, our task is to find whether we could predict next six months of takeover activity. Natural predictor of future takeovers is past takeover activity, which we use. Additionally, as suggested in Harford (2005), we will estimate a second model, where we include past takeover activity as well as GDP growth and corporate bond rate spread over Federal Funds rate. He finds that higher GDP growth should be related to higher takeover activity and high corporate bond rate spread should be related to lower takeover activity as it proxies for capital liquidity. There is one limitation stemming from our dataset, which is the fact that we have year on year GDP growth on monthly basis, not month on month growth. We used arithmetic average of past six months of GDP growth as a proxy for true GDP growth.

Table 5 – Takeover activity - predictive models

	Next 6 months of deal count		**Next 6 months of deal value**	
	(1)	(2)	(3)	(4)
Intercept	569.84***	-176.79	273.16***	395.15***
	(178.55)	(259.87)	(38.51)	(94.42)
Deal count /(value) – lag 0	2.619***	2.556***	1.6594***	1.369***
	(0.366)	(0.357)	(0.288)	(0.287)
Deal count /(value) – lag 1	1.721***	1.768***	1.2475***	0.992***
	(0.382)	(0.373)	(0.288)	(0.288)
Deal count /(value) – lag 2	1.177***	1.322***	0.9443***	0.738**
	(0.367)	(0.360)	(0.288)	(0.288)
Past 6 months of GDP growth (avg)		79.371***		34.408***
		(25.411)		(10.926)
Corporate bond rate spread (in %)		102.23***		-22.309*
		(27.13)		(12.916)

Number of observations	221	219	221	219
Adjusted R-squared	0.8177	0.8279	0.4768	0.5153
Residual standard error	560.5	544.8	243	233.8

*Note: Standard errors in parentheses, *p<0.1; **p<0.05; ***p<0.01*

Table 5 shows the results of the takeover activity predictive models. Using only past takeover activity (regressions 1 and 3) seems to provide strong predictive power with deal count variable being better predicted than deal value (adjusted R-squared of 0.82 versus 0.48). As we are interested how well we can predict future value by using past values, we are interested in R-squared, or more specifically in adjusted R-squared. All results remain resilient when applying robust standard errors, heteroscedasticity is not present according to Breusch-Pagan test and augmented Dickey-Fuller test does not detect unit root of residuals. Strange result is obtained due to corporate bond rate spread when predicting future deal count, because higher corporate bond rate spread implies low capital liquidity, which should also mean lower takeover activity (Harford 2005). The future deal value appears to be well captured by the five components in the fourth regression model.

Now, we need to take the final step and include fitted values from the predictive models into our original regression equation. Only then, we will be explaining size premium by past observations and we will leave out the assumption that investors are able to perfectly forecast the future. As we have expected that the significance of our original models would decrease once we replaced true future values of deal count and deal value by the fitted values from the presented predictive models, we use all four of them for comparison.

Table 6 – Monthly data regression summary using predicted takeover activity

	Monthly SMB			
	3-factor predictive model	5-factor predictive model	3-factor predictive model	5-factor predictive model
Intercept	0.3792	0.4422	0.1954	0.3071
	(0.3691)	(0.3537)	(0.3370)	(0.3332)
% 6m-o-6m change in deal count	0.0779	0.0485		
	(0.0813)	(0.0644)		
% 6m-o-6m change in deal value			0.0429***	0.0343***
			(0.0134)	(0.0129)
Number of observations	219	219	219	219
Adjusted R-squared	-0.0003762	-0.001989	0.04041	0.02693
Residual standard error	4.813	4.817	4.714	4.747

*Note: Standard errors in parentheses, *p<0.1; **p<0.05; ***p<0.01*

Table 6 summarizes the results of our original model with replaced takeover activity in the next 6 months by the predicted takeover activity in the next 6 months, for which we developed a model in previous steps. In summary, the regression in the third column appears to be the most interesting for us, it is simpler than the fourth one and R-squared is slightly higher. The explanatory variable is significant even with robust standard errors (0.01291), we did not detect heteroscedasticity (Breusch-Pagan test's p-value of 0.08) and we have stationary time series (augmented Dickey-Fuller test's p-value is 0.01).

Here, we provide the final specification of our two-step model. First, we need to forecast takeover activity and then use the forecast to estimate size premium:

$$\widehat{\sum_{t+1}^{t+6} takeover\ value} =$$

$$= 273.16 + 1.659 * takeover\ value_t + 1.248 * takeover\ value_{t-1}$$

$$+ 0.944 * takeover\ value_{t-2}$$

$$SMB_{t+1} = 4.29 * \left(\frac{\sum_{t+1}^{t+6} \widehat{takeover}\ activity_t}{\sum_{t-5}^{t} takeover\ activity_t} - 1 \right)$$

We can interpret our results such that 1 percentage point increase in six month expected deal value compared to past six months leads to increase in monthly size premium of 0.04 percentage points. Given high volatility of deal value, these results should not be disregarded as negligible. We can conclude that our initial hypothesis that takeover activity is related to size premium is supported by analyses performed in this thesis. We note that we are aware that we have not performed any out-of-sample testing of the model.

5. Conclusion

The objective of our thesis was to shift the debate on size premium a little forward by adding our small research piece into the puzzle. We aimed to slightly redirect ongoing debate on size premium and point to a direction of merger theory, where we thought that theoretical explanation could be found. Due to several independent empirical findings of scholars, who study mergers and acquisitions, we constructed a solid argumentation basis suggesting that increase in future takeover activity should result in higher stock size premium.

Size premium remains a disputed topic since its discovery in 1980s. As it has been first observed in empirical studies by (Banz, 1981; Reinganum, 1981), researchers have not been able to develop a solid and complete theoretical explanation of size premium that would satisfy broad academic community. Size premium was found to be observed mostly in January and not in other months of a year, it disappeared to a large extent in the 1980s and certain researchers have argued that it was only an anomaly that has no theoretical grounding. Then it reappeared in 1990s and 2000s and has been observed again. Size premium was observed in numerous markets around the world and various studies accord that its average size is around 0.5-1.0% per month. Size premium is one of the essential topics of asset pricing theory and still, there is not a wide consensus why should size premium exist and where it stems from. This together ignited our motivation to study the phenomenon further.

Recent research showed that merger activity is related to stock returns and valuation. A study by Cremers, Nair, & John (2009) developed a takeover factor, whose addition to CAPM improves predictive power of the model. The takeover factor includes, among others, a size variable, with smaller firm size strengthening the takeover factor. Another new research paper by Bennett & Dam (2017) studied whether takeovers impact stock valuations. They showed that up to 10% of stock price can be attributed to the anticipation of a takeover. So, the relation between stock returns and/or valuation has been recently studied by other authors with positive results. Given several other empirical findings in literature on mergers and acquisitions that suggest that takeover

activity may be related directly to size premium, we decided to approach the issue from a different perspective. We compiled several empirical studies and supporting observations suggesting that higher size premium may be a result of higher takeover activity and tested this relationship.

Firstly, we note that observed takeover premiums average around 30% to 40% of preannouncement price and takeover activity in terms of value (as well as in terms of number of firms acquired) ranges from 2% up to 9% per year when compared to total market capitalization (or number of listed firms) in the beginning of a year. This means that the impact of takeovers on aggregate stock market returns cannot be disregarded.

Secondly, small firms receive 40% higher takeover premiums than large firms. (George Alexandridis et al., 2013) sorted firms into terciles and found that smallest tercile received 54% average takeover premium while the largest tercile received "only" 38% takeover premium. We assumed this difference to be an important factor supporting our hypothesis.

Thirdly, small firms benefit from higher probability of being taken over. This means that while there is a higher number of small firms than large firms, takeovers of small firms are even more frequent. One could think of the two similarly as probability of default and loss given default. Small firms have higher probability of being taken over as well as higher gain given takeover. The product of the two variables is therefore higher for small firms than for large firms, which suggests that during high takeover activity small firms' valuation should increase. Subsequently, as the probability of being taken over and takeover premiums do not decrease during the merger wave, the valuation increase does not occur once, but raises over time. This leads us to formulation of our hypothesis that takeover activity should, ceteris paribus, impact size premium.

There are another two supporting arguments in favor of our hypothesis. There is a vast amount of empirical research showing that large takeovers do not create any value and are often value destroying. That is, during high takeover activity, when large firms merger and acquire each other, the acquirer's valuation tends to decrease over time, i.e., on aggregate level large firms' returns are dragged down due to large takeovers. Second supporting argument is that January effect

of size premium, the greatest obstacle in explaining the size premium existence, is found to be related to retail investors' behavior in the beginning of the year. Retail investors, who hold significant share of stock market (50-70%) seek stocks with lottery-like payoffs in the beginning of a year. We claim that high takeover premium paid to small stocks is one of the critical reasons that small stocks fit into the category of stocks with lottery-like payoffs. These two supporting arguments would nicely complete the missing piece of puzzle.

We estimated the relationship between size premium and change in future takeover activity on annual, 12-month, 6-month, 3-month and 2-month basis and according to our expectations, we found that 6-month change in deal count and deal value appeared to be significant in explaining monthly size premium. Increase in takeover activity in upcoming months is related to higher size premium. However, since this model assumes that investors possess perfect information about future takeover activity, we wanted to leave this assumption aside and seek potential application of the relationship.

Therefore, we created a predictive model that uses past takeover activity to forecast in-sample future takeover activity. In addition, we employed two additional variables, GDP growth and corporate bond rate spread over Federal Funds rate, which were shown in Hardorf (2005) to be good predictors of takeover waves. While both of these additional factors showed to be significant, the explained variation was increased only slightly and we concluded that using purely past takeover activity provides sufficiently good estimates of future takeover activity.

Using the forecasted takeover activity from the predictive model that we created to compute its forecasted future change in the original model yielded significant results for deal value variable. Therefore, we can say that the model can predict future takeover activity to a degree when it explains size premium. We note that our analyses included only in-sample forecasting and further testing would need to be done in order to make strong conclusive remarks about the relationship between takeover activity and size premium. The practical message we want to deliver is that it may be so that sizeable increase in expected upcoming takeover activity may translate into higher returns of small stocks compared to large stocks. We believe to have achieved our objective in

hinting that the relationship between the two variables exist and that it should certainly be further studied.

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