Misvaluation: Driver of the Takeover market?

Time-Series Variation of the Misvaluation Effect

Abstract

This paper examines the time-variation of the misvaluation hypothesis – that inefficient stock market misvaluation is an important driver of the takeover market - in the U.S. takeover market during the years 1978-2017. The main focus is on the financial crisis of 2008, and its effects on the misvaluation hypothesis. Price-to-book value of equity and price-to-residual income model are used as misvaluation proxies. This paper is providing clear evidence that the misvaluation hypothesis is not as strong in the post-2000 period compared to the pre-2000 period. This challenges the misvaluation driven M&A theories (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004) since during the post-2000 years higher acquirer valuation is associated with cash as a payment method and lower valuation ratios with stock as a payment method. My results are robust for additional tests and controls.

Bachelor's Thesis

Aalto University School of Business

Department of Finance

Kalle Ahola

Fall 2019

TABLE OF CONTENTS

LIST OF TABLES

I. Introduction

In this paper, I investigate how important driver is the market misvaluation in the takeover markets. I examine the relations between the market valuation of companies and the takeover characteristics in the U.S. takeover markets. More specially, I am exploring the time-series variation of the effect misvaluation has on the method of payment and the announcement returns with the main focus being the effect the financial crisis of 2008 has on the misvaluation effect. I use market price-to-fundamental ratios as proxies to define the misvaluation of the takeover companies. I attempt to capture the misvaluation by measuring the differences in the market values around the announcement date as well as the abnormal returns.

Although misvaluation approach on takeovers has traditionally had a low profile compared to an efficient markets approach, the idea that market misvaluation has a remarkable effect on the takeover markets is not new (Shleifer and Vishny, 2003). While takeovers are common in the business world, they are remarkable investment decisions for companies. Usually, takeovers are major investments and therefore a great deal of data on characteristics and features of the transaction is available. That is the reason why the takeover market is attractive for testing the hypothesis that misvaluation is an important driver in resource allocation and strategic interaction between firms. (Dong et al., 2006)

The fundamental assumption for misvaluation is that financial markets are inefficient (Shleifer and Vishny, 2003). In other words, misvaluation denotes the valuation errors of the company. In perfect markets, valuation ratio would always indicate the true intrinsic value of the company and therefore misvaluation would not exist. Reasons for misvaluation might be the limits of arbitrage and the presence of irrational investors (De Long et al., 1990). According to Shleifer and Vishny (2003) and Rhoedes-Kropf and Viswanathan (2004) market misvaluation has considerable effects on the takeover market. Based on their results, they argue that bidders are more highly valued than their targets and more highly valued bidders are more likely to use stock as a payment method in a transaction. They argue that the effects arise from the bidders' efforts to profit by buying undervalued targets with cash at a price lower than their intrinsic value or by buying targets that are less overvalued than the bidder with stock.

The primary object of this paper is to study the time-series variation of the misvaluation effect on the takeover markets in a sample of U.S. mergers and acquisitions (hereafter M&A) announced between 1978 and 2017. Specially, I am focusing on the time between the years 2000 and 2017 and the financial crisis of 2008 and the possible effect crisis has on the misvaluation effect. Based on my results for the years 2000-2017, more highly valued acquirers are more likely to use cash as a payment method and acquirers with lower valuation ratios are expected to use stock as a payment method. This challenges the findings of previous literature. I find that the financial crisis of 2008 is a key driver behind the change in the effect misvaluation has on the method of payment in the U.S. takeover markets.

II. Literature Review and Hypotheses

In this section, I introduce the misvaluation driven M&A theories (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004) and related empirical evidence with the aim of constructing hypotheses that are related to each of the theories. Additionally, I provide information regarding the determination of the financial crisis. Eventually, the object is to provide a solid ground for constructing a comprehensive model for my analysis noting that the focus of the study is the misvaluation hypothesis.

II. A. Review of the Misvaluation Driven M&A Theories

In M&A literature exists two main theories explaining the reasons for takeover activity. The neoclassical theory sees merger waves as an efficiency-improving response to shocks occurring within the industry. For example, Mitchell and Mulherin (1996) suggest that merger waves are created due to shocks, which shape the industry from an economical, technological or regulatory viewpoint. In general, neoclassical theory sees a merger as an efficiency improvement which channels assets from inefficient companies toward more productive ones. Shleifer and Vishny (2003) accord the considerable explanatory power of neoclassical theory but they argue that the theory is incomplete. For example, the neoclassical theory does not explain the aggregate merger waves, unless several industries experience shocks at the same time since it focuses on industry-specific merger waves.

Shleifer and Vishny's theory assumes that the stock market is inefficient but managers are perfectly rational and informed. The acquirer management maximizes their personal wealth in the long-term, whereas target management is prone to short-term thinking by accepting overvalued offers and cashing out quickly after the proposed takeover is completed. Authors do not specify the source of misvaluation and presume that security prices deviate from fundamental values relying on existing theoretical and empirical literature. (Shleifer and Vishny, 2003)

Rhodes-Kropf and Viswanathan's theory assumes that managers of both the acquirer and the target have private information on stand-alone values on their respective companies. In addition to that, the managers of the acquirer have private information regarding the potential value of merging with the target firm. The misvaluation has two components – a firm-specific component and industry- or market-wide component. The target has limited information about the components of misvaluation and consequently has difficulties in determining synergies. The theory assumes that the target management is Bayesian and once it receives a high stock offer, it makes a correct adjustment for potentially overvalued stock bids but rationally considers the probability for high synergies as well. As a result, the takeover offer is more likely to be accepted since target management overestimates the synergies when the industry- or market-wide overvaluation is high. The target management reaches to the same conclusion when the acquirer's overvaluation is high since the target does not know the component of

misvaluation and they rationally underestimate the market-wide misvaluation component. However, the target management underestimates synergies when the firm-specific overvaluation is high. To summarize, the target accepts more takeover offers in overvalued markets and less in undervalued markets. The model also assumes some form of limited arbitrage that allows for the misvaluation which they otherwise take as given. (Rhodes-Kropf and Viswanathan, 2004)

In their papers, Shleifer and Vishny and Rhodes-Kropf and Viswanathan present models of M&A, based on the misvaluations of the combining firms. The key ingredients of the models are the relative valuations of the acquirer and the target and the market's perception of the synergies from the combination. Both models predict that I) stock-financed bidders are more highly valued than cash-financed bidders, II) cash-financed bidders are less overvalued than stock-financed bidders, III) overvalued bidders use stock as a payment method, IV) cash-financed targets are more undervalued than stock-financed targets. Considering the points II) and IV), Shleifer and Vishny's model assumes no synergies in combining the two firms that means cash-financing is driven by target undervaluation. On the other hand, in Rhodes-Kropf and Viswanathan's model undervaluation and high synergies drive cash-financing since the model includes synergies. (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004)

Most interestingly for my study, neither of the misvaluation driven M&A theories (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004) do not focus on the time-series variation of the misvaluation hypotheses. Therefore, the main contribution of this paper is to provide analysis on time-series variation of the misvaluation hypothesis and especially analyze the effect of the financial crisis of 2008 on the misvaluation hypothesis. To the author's knowledge, there is no study which analyzes the effect of the financial crisis of 2008 to misvaluation hypothesis.

II. B. Empirical Evidence

Based on the misvaluation driven M&A theories of Shleifer and Vishny and Rhodes-Kropf and Viswanathan, more recent papers (see e.g. Dong et al., 2006; Rhodes-Kropf et al., 2005) provide broad and supportive evidence on the predictions of the theories. Rhodes-Kropf et al. develop a decomposition of the market-to-book value into three components: firm-specific error, time-series sector error and long-run value to book. They argue that although higher market-to-book value firms indeed acquire lower market-to-book value firms, much of this is driven by short-term deviation in fundamentals at the firm and sector/market level. Therefore, the component attributable to fundamental value has no (or negative) effect on the intensity of merger activity. On the other hand, Dong et al. examine how the (mis) valuation affects several takeover features in the context of misvaluation (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004) and Q theories (Brainard and Tobin, 1968). The authors

use price-to-book value of equity and price-to-residual income as proxies for misvaluation, growth opportunities and/or quality of the management. To conclude, both papers (Dong et al., 2006; Rhodes-Kropf et al., 2005) find supporting evidence on both theories (Shleifer and Vishny, 2003; Rhoedes-Kropf and Viswanathan, 2004) and argue that the two theories act more as complementary to each other rather than substitutes.

In addition to broad and supportive evidence on the predictions of the theories, both Dong et al. and Rhodes-Kropf et al. consider the time-series variation in their analyses. The time-series sector error in the decomposition model of the Rhodes-Kropf et al. captures the possibility that the whole sector or market could be over-heated and therefore the firms in the same sector/market might share the same misvaluation component. Dong et al. found some similarities and differences between the decades 1980s (1978-1989) and 1990s (1990-2000). They argue that the misvaluation effect was stronger in the 1990s compared to 1980s due to different drivers in the takeover markets. In general, Dong et al. found that the evidence is supportive of both misvaluation driven theories during both decades.

II. D. Financial Crisis

The financial crisis of 2008 is the most recent financial crisis, and it was one of the most serious financial crises in addition to the great depression in 1930s. It started from the U.S. sub-prime housing-loan markets in the period between years 2007 and 2009. Ultimately, it inflated into a global crisis affecting the whole world. As a result, crisis transformed into the European sovereign debt crisis which peaked between 2011 and 2012.

The relevant question for this study is the separation of crisis- and non-crisis periods that is the fundamental problem in crisis research. Although there is no consistent definition for crisis in the academics, the determination methods can be divided into three groups (Moberg, 2019). The event-based method stresses events reflected in changes in macro-economic indicators (Reinhart and Rogoff, 2011). The systemic method, which has become more common after the financial crisis of 2008, concentrates on systemic effects and distress identified at the national and international market infrastructure (Laeven and Valencia, 2018). The third method concentrates on building a permanent and comprehensive distress indicators (Duprey, Klaus and Peltonen, 2017).

II. E. Hypotheses

In the previous sub-chapters, I reviewed the misvaluation driven M&A theories, the most relevant empirical evidence on those theories and the financial crisis of 2008. In short, the main prediction is that misvaluation has notable effects on takeover characteristics, for example, the method of payment.

Contrary to the misvaluation driven M&A theories (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004), I assume that the markets are inefficient and managers are rational. In the light of those theories and previous studies, I test whether the misvaluation hypothesis changes over time on average. I base my hypotheses on Shleifer and Vishny's (2003) and Rhodes-Kropf and Viswanathan's (2004) models predictions on the misvaluation hypothesis:

H1: *Stock-financed acquirers are more highly valued than cash-financed acquirers, during the entire sample.*

H2: *Cash-financed acquirers are less overvalued than stock-financed acquirers, during the entire sample.*

H3: *Overvalued acquirers use stock as a payment method, during the entire sample.*

H4: *Cash-financed targets are more undervalued than stock-financed targets, during the entire sample.*

Both models have the same predictions, despite the differences in their models. The authors find that overvaluation induces stock offers since acquirers use their inflated stock to purchase less overvalued targets and creating value in the long-term. On the other hand, the authors argue that market undervaluation induces cash offers since the acquirer benefits when not sharing the gain from target undervaluation with the target. To conclude, both theories predict that undervaluation and/or synergies drive cash financing and overvaluation drives stock financing.

III. Data

My sample of takeovers is collected from the Securities Data Company (hereafter SDC) U.S. M&A database between the years 1978 and 2017. The sample includes both successful and unsuccessful offers subject to the following selection criteria:

- The offer is announced between January 1, 1978, and December 31, 2017.
- Both the acquirer and the target are listed on the NYSE, AMEX or NASDAQ.
- The value of the deal is $10 million or more (adjusted for Customer Price Index).
- If an acquirer makes multiple attempts to acquire the same target, only the first announcement is included in the sample.

The final sample of M&As includes 7531 takeovers from which 6558 are successful. Table I presents the annual breakdown of the final sample by the value of the transaction, transaction status, hostility of the transaction, mode of acquisition and method of payment.

Table I

Descriptive statistics of US Takeover Bids in 1978-2017

The final sample includes merger bids and tender offers in which both the acquirer and target were listed on the NYSE, AMEX or NASDAQ. Takeovers were announced between 1978 and 2017 and the value of the transaction was $10 million or more. Table I presents the annual breakdown of the final sample by descriptive statistics. Deal values are reported in millions of 2015 dollars.

Year	N	Mean Value per Transaction	Successful (%)	Hostile (%)	Tender Offers (%)	Merger Bids (%)	Cash (%)	Stock (%)	Mixed (%)
1978	14	1 064.5	85.7	7.1	42.9	57.1	64.3	28.6	7.1
1979	12	1 496.3	66.7	8.3	33.3	66.7	83.3	8.3	8.3
1980	11	657.3	81.8	18.2	27.3	72.7	18.2	45.5	36.4
1981	88	119..8	69.3	12.5	20.5	79.5	19.3	34.1	46.6
1982	97	457.6	73.2	9.3	13.4	86.6	18.6	33.0	48.5
1983	142	662.9	73.9	9.2	11.3	88.7	12.0	31.7	56.3
1984	178	585.1	73.0	5.6	19.1	80.9	19.1	24.7	56.2
1985	181	959.8	79.0	10.5	30.9	69.1	56.4	33.7	9.9
1986	170	699.8	80.6	12.4	40.6	59.4	64.7	28.2	7.1
1987	175	451.3	83.4	9.1	22.9	77.1	57.7	29.7	12.6
1988	189	564.4	74.6	12.7	36.5	63.5	67.7	25.4	6.9
1989	166	996.6	77.7	9.6	26.5	73.5	47.0	44.0	9.0
1990	105	531.6	83.8	3.8	12.4	87.6	46.7	41.9	11.4
1991	119	532.5	84.9	1.7	10.1	89.9	21.8	54.6	23.5
1992	134	375.0	86.6	3.7	8.2	91.8	25.4	62.7	11.9
1993	181	917.8	86.7	1.1	9.9	90.1	26.5	50.8	22.7
1994	297	581.5	84.5	5.7	12.1	87.9	26.9	57.9	15.2
1995	329	924.3	86.6	6.7	11.9	88.1	29.5	59.0	11.6
1996	362	1 119.1	89.0	4.7	13.5	86.5	27.6	51.4	21.0
1997	464	1 241.5	90.3	2.8	13.1	86.9	21.8	56.0	22.2
1998	509	2 545.8	90.2	2.4	12.6	87.4	25.0	54.0	21.0
1999	486	2 897.2	88.3	2.3	14.8	85.2	30.5	48.4	21.2
2000	402	2 922.8	87.8	1.7	16.2	83.8	29.9	46.5	23.6
2001	294	1 555.0	89.8	1.0	16.3	83.7	31.6	38.8	29.6
2002	180	895.2	92.2	1.1	20.6	79.4	40.6	25.0	34.4
2003	189	1 023.6	94.2	2.6	15.3	84.7	36.0	25.9	38.1
2004	190	2 471.2	92.6	1.1	4.7	95.3	33.2	26.3	40.5
2005	194	2 473.6	94.8	1.5	8.2	91.8	36.6	23.2	40.2
2006	199	2 220.3	92.5	1.5	6.0	94.0	48.7	20.1	31.2
2007	215	1 287.8	87.0	0.0	11.2	88.8	40.9	19.5	39.5
2008	121	1 965.9	83.5	3.3	19.8	80.2	44.6	21.5	33.9
2009	109	2 961.2	85.3	0.0	23.9	76.1	32.1	33.9	33.9
2010	130	1 216.2	88.5	1.5	18.5	81.5	53.1	22.3	24.6
2011	93	2 677.6	82.8	4.3	12.9	87.1	41.9	24.7	33.3
2012	113	1 163.6	96.5	0.0	13.3	86.7	54.0	19.5	26.5
2013	113	1 368.3	93.8	0.0	9.7	90.3	44.2	18.6	37.2
2014	147	3 502.1	95.2	0.7	12.2	87.8	34.0	29.3	36.7
2015	155	5 522.7	92.3	1.3	12.9	87.1	31.6	20.6	47.7
2016	140	3 023.1	97.9	0.0	16.4	83.6	38.6	22.1	39.3
2017	138	2 640.5	91.3	0.7	11.6	88.4	30.4	42.0	27.5
Total	7531	1 558.7	87.1	3.8	15.6	84.4	34.7	39.1	26.2

The accounting data used in univariate and multivariate analysis is from Thomson Reuters Datastream. The SDC sample is combined to Thomson Reuters Datastream database which reduces the sample by 1,560 missing links between the SDC and Datastream. Datastream codes from SDC are used as links for matching between Datastream and SDC. I do not exclude a takeover from the sample just due to missing accounting data, to maintain the sample size.

IV. Methodology and Empirical Evidence

IV. A. Motivation for and Calculation of Mispricing Proxies

The misvaluation hypothesis suggests that market inefficiency is an important driver of the takeover market. I address the misvaluation by using the valuation measures proposed by Dong et al. (2006). The proposed valuation measures are price-to-book value of equity (hereafter P/B) and price to residual income value (hereafter P/V). In my sample, the correlation between P/B and P/V for acquirers is 0.507 and for targets 0.435. Therefore P/V offers independent information on top of P/B regarding the misvaluation hypothesis. In addition to independent information, it is more informative to include both valuation ratios to my study since neither of them is flawless.

To evaluate misvaluation, one may also estimate future long-term stock returns. If a stock is undervalued, it should provide abnormal returns in the long-term when the misvaluation is corrected. Both the misvaluation and risk premia imply that stocks with low prices should earn high future returns (Daniel et al. 2002.). If the risk is rationally priced the price-containing variable will help to predict returns unless the risk is controlled perfectly (Ball, 1978; Keim, 1988; Berk, 1995). Prior studies have shown that the long-term performance of the acquirer is closely related to the form of payment, mode of acquisition and pre-acquisition valuation of the acquirer (Franks, Harris, and Titman, 1991; Loughran and Vijh, 1997; Rau and Vermaelen, 1998; Moeller et al., 2004).

In support of P/B, numerous prior studies have found evidence on the ability of P/B to predict cross-sectional differences in future returns (see e.g. Davis, 1994; Rouwenhorst, 1999). The market price of the firm can be viewed as a proxy for misvaluation and risk. Book value, when combined with a mispricing proxy such as market price, might be a better predictor of future returns than noisier variables such as size or price-to-earnings. Additionally, book value may provide a less noisy measure of misvaluation since it filters out the irrelevant scale differences (Daniel et al., 2002). On the other hand, P/B can pick up risk as well as mispricing (Daniel and Titman 1997).

There is also much support for P/V in prior literature. Using the Ohlson model, Frankel and Lee (1998) find that the ratio of a value index that uses analyst consensus earnings forecasts to price has incremental power to predict returns beyond P/B. The usage of analyst forecasts instead of backward-looking book

value filters growth expectations from the market price (Dong et al., 2006). Frankel and Lee (1998) argue that residual income explains much more cross-sectional variation of stock prices than book value, and that P/V can predict abnormal returns over one-, two- and three-year holding periods. Ali et al. (2003) found first that abnormal returns associated with P/V are partially consistent around future earnings announcements, consistent with misvaluation explanation. Secondly, they found that P/V continues to exhibit a significant positive association with future returns, even though they controlled risk factors. Dechow et al. (1999) found that firms with lower (higher) P/V ratios earn higher (lower) future returns in numerous different time-series models by implements the residual income model. Lee et al. (1999) computed a residual income model-based value estimate for 30 stocks in Dow Jones Industrial average. They find that an aggregate P/V ratio for the 30 Dow stocks has significant predictive power for overall market return in the U.S.

In this paper, P/B is calculated as the ratio of market capitalization to book value of equity. Book value of equity is measured the year before the announcement year, similarly as Baker and Wurgler (2002). Market capitalization is measured each day. Since a firm with negative book value and positive price should be classified as having a high valuation I assign to firms with negative P/B the maximum value of P/B in the sample similarly as Dong et al. (2006). [1]

In P/V, the residual income value includes book value of equity and the value of the firm's predicted excess income. The prediction stands for the excess income beyond what would be expected based upon the firm's book value. My estimation process for P/V is similar to that of Lee et al. (1999). I estimate the intrinsic value, denoted by V(t), for each stock at the time t. Under the assumption of clean surplus accounting, the intrinsic value of the firm stock can be calculated by adding discounted value of an infinite sum of expected residual incomes to book value (Ohlson, 1995), that is,

$$V(t) = B(t) + \sum_{t=1}^{\infty} \frac{E_t[\{ROE(t+1) - r_e(t)\}B(t+i-1)]}{[1+r_e(t)]^i} \qquad (1)$$

where B(t) is the book value of equity at time t, E_t is the expectations operator, ROE(t+1) is the return of equity at time t+1, $r_e(t)$ is the annualized cost of equity of the firm at the time t.

For practical reasons, the infinite sum of discounted expected residual incomes has to be replaced with a finite sum (series of T-1 periods) and an estimation of the terminal value (beyond period T). The terminal value beyond period T is estimated by viewing the period T as perpetuity. Lee et al. (1999) find that the choice of alternative forecast horizons (3 years to 18 years), has little effect on their results. They also argue that extending the forecast horizon beyond 3 years has little effect on the predictive power of P/V. In addition to that, the residual income valuations are less sensitive to errors in terminal

[1] The maximum value of P/B is assigned to negative P/B firms after winsorizing P/B at the 1% and 99% tails. When I exclude the negative P/B values, my findings remain unchanged. Additionally, my findings are in general robust to use the B/P instead of P/B and V/P instead of P/V.

value compared to the discounted dividend model. D'Mello and Shroff (2000) find that terminal value is on average 11% of the total value of the firm when using the residual income model and 58% when using the discounted dividend model.

I use the three-period forecast horizon

$$V(t) = B(t) + \frac{[f^{ROE}(t+1) - r_e(t)]B(t)}{1 + r_e(t)} + \frac{[f^{ROE}(t+2) - r_e(t)]B(t+1)}{[1 + r_e(t)]^2} + \frac{[f^{ROE}(t+3) - r_e(t)]B(t+2)}{[1 + r_e(t)]^2 r_e(t)}, \quad (2)$$

Where $f^{ROE}(t+1)$ is the forecasted return on equity at time t+1, the length of the period is 1 year and the last term (at time t+3) is viewed as a perpetuity, similarly as Lee et al. (1999).

Forecasted ROEs are computed as

$$f^{ROE}(t+1) = \frac{f^{EPS}(t+1)}{\bar{B}(t+i-1)}, \quad (3)$$

where

$$\bar{B}(t+i-1) = \frac{B(t+i-1) + B(t+i-2)}{2}, \quad (4)$$

and $f^{EPS}(t+1)$ is the forecasted earnings per share at time t+1. Considering the f^{ROE}s, I require that each of them is less than one.

Future book values of equity are determined by

$$B(t+i) = B(t+i-1) + (1-k)f^{EPS}(t+1), \quad (5)$$

where k is the dividend payout ratio that is computed as

$$k = \frac{D(t)}{EPS(t)}, \quad (6)$$

where EPS(t) is the earning per share at time t and D(t) is the dividend at time t. I delete the observation in which k is greater than one.

The cost of equity for the firm is calculated by using the capital asset pricing model (hereafter CAPM). The time-t beta is estimated using the 5 years of monthly return data. The market premium of the CAPM is the annual premium of the CRSP value-weighted index over the risk-free rate during the preceding 30 years. Any estimate of the cost of equity which is outside the range 3%-30%[2] is winsorized to lie at the border of the range. Prior studies show that the choice of r_e has little effect on their cross-sectional analyses (see e.g. Abarbanell and Bernard, 1995; Frankel and Lee, 1998). D'Mello and Shroff (2000) find that their results, based on a constant or a firm-specific discount rate, are substantially same

[2] Less than 3% of my estimates had a cost of equity outside of the range 3-30%.

(constant discount rate, firm-specific-CAPM rate or firm-specific rate from the three-factor model). I verify the robustness by using a constant discount rate of 12.5%, similarly as D'Mello and Shroff (2000). The results are the same as with firm-specific CAPM. Eventually, the P/V values are winsorized at the 1% and 99% tails.

I use values of P/B and P/V 2 days prior to the announcement date of the takeover, to ensure that the data used in my calculations is not affected by the announcement. Neither of the ratios, P/B or P/V, is not equal to benchmark of fair valuation for two reasons. First, P/B does not reflect growth since the book value is a historical value. Secondly, according to prior studies residual income model valuation has been found to be too low on average. Because of this, my test examines the relative valuation of the acquirers and targets. Higher values on these valuation ratios imply higher relative valuation (overvaluation) and lower values lower relative valuation (undervaluation) (Dong et al. 2006). For the robustness, I also perform all my tests by using the price-to-earnings ratio (P/E) instead of P/V. The results are in general the same as reported with P/V.

IV. B. Announcement Period Cumulative Abnormal Returns

Cumulative abnormal return (CARs) are computed for the three-day period (-1, 1) around the announcement date (t = 0), similarly as Dong et al. (2006). I compute the modified market model, similar to that of Fuller, Netter, and Stegemoller (2002),

$$CAR_t = r_i - r_m, \quad (7)$$

where the r_i is the return of firm I and r_m is CRSP value-weighted index return, during the three-day period around the announcement date. For the robustness, I calculate the CAR by using the industry index based on the industry the firm is operating instead of CRSP value-weighted index. Additionally, for the robustness, I define the CAR by alpha during the three-day period around the announcement date. The alpha is calculated by using the firm-specific CAPM-model,

$$CARt = r_t - r_f + \beta * (r_m - r_f) \quad (8)$$

where r_f is the risk-free rate and β is the firm-specific beta calculated by using the CAPM. The time-t beta is estimated using the 5 years of monthly return data. The findings are not affected by the choice how CAR is calculated.

IV. C. Determination of the Crisis-Periods

In my multivariate analyses, I use crisis periods as explanatory variables for the method of payment of the acquisition and for announcement period returns. I divide the financial crisis of 2008 to two periods and as a third period, I use the European sovereign debt crisis. According to Duchin et al. (2010), based on the event-based method the three main phases of the financial crisis of 2008 are (I) from 1st August 2007 until 31st March 2009, (II) from 1st April 2019 until December 2009, and (III) from 1st April 2011 until 31st December 2012. As follows, I can examine the effect different parts of the crisis have to misvaluation effect.

IV. D. Control Variables for Multivariate Test

For multivariate analysis, I use a wide range of control variables to verify the robustness for my univariate findings. For all regression, I use the logarithm of relative and target size and industry as a control variable, similarly as Dong et al. (2006). I also include the CBOE Volatility Index (hereafter VIX) as a control variable. Regressions have the valuation ratios for acquirers and target, and crisis periods as explanatory variables.

The relative size is calculated by dividing the market value of acquirer by the market value of target that is found from Datastream. Target size is the market value of equity that is also found from Datastream. Information asymmetry is likely to increase when the size of the target increases relative to bidder since in larger transactions the risk of overpayment and dilution of the dominant shareholders' control are more significant (Faccio and Masulis, 2005). Therefore size variables are used for controlling the information asymmetry in the takeover markets for multivariate analyses. The industry control variable is the acquirer two-digit SIC, similarly as Moskowitz and Grinblatt (1999) that is found from SDC Platinum. According to Faccio and Masulis (2005) targets, in industries in which targets are not well acquainted with the industry risks and prospects of the acquirer's industry, are more likely to accept stock-financed merger bids or tender offers since acquirer's overvaluation risk. VIX is included to control the volatility effect on stock-payments. According to Bhagwat et al. (2016), during high-VIX periods the number of stock-financed decreases M&As. Authors argue that the aggregate number of monthly M&As in the U.S is inversely related to VIX. Besides, VIX adds robustness for the determination of the financial crisis since it offers another way to determine the crisis period by using a permanent and comprehensive distress indicator (Duprey, Klaus, and Peltonen, 2017) in addition to event-based method I used to determine the periods of the financial crisis.

V. Univariate Test

In this section, I report the empirical relations between valuation ratios and takeover characteristics in my sample.

As previous studies have shown, there is clear evidence of fluctuations in acquisition activity across time (Dong et al., 2006). The number of transactions peaks in the middle of the 1980s and again in the middle of the 1990s as reported in Table I. During the 2000s and 2010s, there is a clear sign that the financial crisis affected the transaction activity negatively in the late 2000s and early 2010s. From 2007 to 2008 the number of transactions decreases by 44%. After the year 2007, the average number of transactions per year is 126 and before the year 2007 in the similar period (1998-2007) the average is 286 which is 127% larger. The payment method of transactions changes along with the fluctuations in acquisition activity. During the peaks in activity, the percentage of stock payment increases substantially. Andrade et al. (2001) find also that in the acquisitions wave in the 1990s, there was overwhelming use of stock as a payment method. During the sample period, the average value per transaction[3] increases toward the year 2017. The mean value per transaction is 34% higher in the 2010s compared to mean in the 2000s and 126% larger than the mean in the 1990s. In addition to the fact that more recent transactions are more valuable, they are more likely to be successful and tend to be mergers instead of tender offers. During the 1980s is higher waves of hostile offers and tender offers. The results mentioned above considering the time between the years 1978 and 2000 are in line with Dong et al. (2006).

Table II reports how the method of payment affects the valuation ratios. Means of P/B and P/V and differences between are reported for both different time periods and the whole sample. I divide the sample to two periods: 1978-1999 and 2000-2017. The first period (1978-1999) is the same period that previous literature has mostly investigated (see e.g. Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004; Dong et al., 2006; Rhodes-Kropf et al., 2005). I include the first time period (1978-1990) to my test for the robustness since it enables me to compare the results to the previous finding (see e.g. Dong et al., 2006; Rhodes-Kropf et al., 2005; Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004) for that specific time period. The main focus for this paper is on the second period and the question whether or not there has been time-variation in misvaluation effect compared to the first period. More precisely, the focus is on the question has the financial crisis of 2008 affected the misvaluation hypothesis significantly.

[3] The value per transaction for each year is converted to 2015 dollars by using the Consumer Price Index in the U.S.

Table II

Mean Valuation Ratios by Period and Method of Payment

The valuation ratios used in the Table II are price-to-book value of equity P/B and price-to-residual income P/V. For each valuation ratio, I require that both, the acquirer and the target, have nonmissing values. The t-statistic of differences between the acquirer and target and between stock and cash are reported in the parentheses. The sample includes both successful and unsuccessful merger bids and tender offers in which both the acquirer and the target is listed on the NYSE, AMEX or NASDAQ during 1978-2017. The sample is divided into two different period of 1978-1999 and 2000-2017.

		1978-1999				2000-2017				All			
	Ratio	Acquirer	Target	Acquirer - Target (*t*-Statistic)	*N*	Acquirer	Target	Acquirer - Target (*t*-Statistic)	*N*	Acquirer	Target	Acquirer - Target (*t*-Statistic)	*N*
Cash	P/B	3.029	2.089	0.940	229	3.262	2.520	0.742	197	3.167	2.289	0.878	426
				(5.83)				(5.06)				(8.21)	
	P/V	2.159	1.822	0.337	159	2.211	2.286	-0.075	213	2.190	2.087	0.103	372
				(2.82)				(-0.84)				(1.41)	
Stock	P/B	3.621	2.394	1.227	239	3.363	2.074	1.289	225	3.516	2.239	1.277	464
				(8.68)				(7.02)				(11.38)	
	P/V	2.820	2.169	0.651	165	2.962	1.992	0.971	159	2.878	2.082	0.796	324
				(5.15)				(5.46)				(7.67)	
Mixed	P/B	2.677	2.242	0.435	149	2.565	2.121	0.444	282	2.602	2.163	0.439	431
				(2.32)				(3.33)				(4.04)	
	P/V	2.295	1.912	0.383	116	2.096	2.084	0.012	230	2.156	2.027	0.129	346
				(2.21)				(0.12)				(1.43)	
All	P/B	3.246	2.244	1.002	617	3.052	2.218	0.834	704	3.140	2.230	0.910	1321
				(10.79)				(9.54)				(14.30)	
	P/V	2.514	1.976	0.538	440	2.372	2.131	0.241	602	2.435	2.066	0.369	1042
				(6.80)				(3.47)				(7.07)	
		Acquirer	Target			Acquirer	Target			Acquirer	Target		
Stock - Cash	P/B	0.591	0.305			0.101	-0.446			0.349	-0.050		
(*t*-statistic)		(3.27)	(2.65)			(0.52)	(-3.41)			(2.73)	(-0.57)		
Stock - Cash	P/V	0.662	0.347			0.751	-0.294			0.687	-0.006		
(*t*-statistic)		(4.90)	(3.17)			(4.50)	(-2.71)			(6.91)	(-0.07)		

Result 1: On average the acquirer's valuations are higher than the target's.

During the entire period, on average the acquirer is more highly valued compared to its target. The average P/B (P/V) for the acquirer is 3.140 (2.435) and for the target 2.230 (2.066). The differential between the acquirer and the target for P/B (P/V) is 0.910 (0.369) and the difference is highly significant.

Result 2: Stock-financed acquirers are on average more highly valued than cash-financed acquirers.

On average stock-financed acquirers have significantly higher valuation ratios (P/B and P/V) during the entire sample. The mean P/B (P/V) differential between stock-financed and cash-financed acquirers is 0.349 (0.687) and the difference is highly significant. On the other hand, during the second time period (2000-2017) the difference between stock-financed and cash-financed acquirers is only significant for P/V.

Result 3: During the period of 2000-2017 cash-financed targets are on average more highly valued than stock-financed targets.

The most interesting finding for my study from this test is that during the period of 2000-2017 cash-financed targets have on average significantly higher valuation ratios compared to stock-financed targets. The average P/B (P/V) differential between cash-financed and stock-financed targets is 0.446 (0.294) and the difference is highly significant. The result in question is in contrast with my hypothesis (H4) that cash-financed targets are more undervalued than stock-financed targets during the entire sample.

On the final note, the period of 1978-1999 is in line with the misvaluation driven M&A theories. During the 1980s and 1990s, stock-financed acquirers and targets are on average more highly valued than cash-financed acquirers and targets. The mean P/B (P/V) difference between stock-financed and cash-financed acquirers is 0.591 (0.662) and between stock-financed and cash-financed targets 0.305 (0.347), and the difference is highly significant. Acquirers have also significantly higher valuation ratios compared to targets. The average P/B (P/V) for the acquirer is 3.246 (2.514) and for the target 2.244 (1.976). To summarize, my results from the time period of 1978-1999 are in line with my hypotheses and prior literature see e.g. (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004; Dong et al., 2006). Additionally, Dong et al. (2006) investigated the same period and used the same misvaluation proxies.

Table III

Method of Payment and Announcement Returns by Valuation Ratio Quartiles

During 1978-1999

Acquirer and target are ranked each month on valuation ratios (P/B and P/V) into quartiles and are assigned a rank between 1 and 4. 1 is the quartile with lowest valuation ratio and 4 is the quartile with highest valuation ratio. P/B is the price-to-book value of equity and P/V is the price-to-residual income model in which the discount rate is based on firm-specific CAPM. This table reports the mean takeover characteristics for each quartile and the difference between quartiles 4 and 1. Announcement period CAR is calculated for the three day period around the announcement date of the acquisition. *N* is the total number of acquisitions in each quartile. (***), (**), (*) denote that the difference between quartiles 4 and 1 is significant at the 1%, 5% and 10% level.

			Probability of Cash Payment (%)	Probability of Stock Payment (%)	Target Announcement CAR (%)	Acquirer Announcement CAR (%)
Panel A: Acquistions Sorted Yearly by Acquirer P/B Ratio						
	N	Acquirer P/B				
1 (Undervalued)	576	1.110	38.4	34.7	14.1	-0.7
2	569	1.817	27.6	50.8	13.7	-0.9
3	572	2.739	29.5	52.2	14.6	-1.6
4 (Overvalued)	572	7.240	30.7	56.0	16.1	-1.3
Difference 4-1		6.131***	-7.7***	21.3***	2.0	-0.6*
Panel B: Acquistions Sorted Yearly by Acquirer P/V Ratio						
	N	Acquirer P/V				
1 (Undervalued)	473	1.003	38.1	42.6	15.8	-0.7
2	477	1.514	28.1	51.8	14.5	-1.1
3	476	2.167	30.9	48.7	15.4	-1.8
4 (Overvalued)	476	5.305	29.6	56.2	15.1	-1.5
Difference 4-1		4.302***	-8.5***	13.6***	-0.7	-0.8**
Panel D: Acquistions Sorted Yearly by Target P/B Ratio						
	N	Target P/B				
1 (Undervalued)	153	1.009	38.6	37.3	9.6	-0.1
2	150	1.594	40.7	38.0	9.1	-1.3
3	150	2.370	35.3	36.7	11.0	-1.9
4 (Overvalued)	150	3.876	34.1	42.7	9.6	-1.8
Difference 4-1		2.868***	-4.5***	5.4***	0.0	-1.7***
Panel E: Acquistions Sorted Yearly by Target P/V Ratio						
	N	Target P/V				
1 (Undervalued)	101	1.046	37.6	34.7	10.6	-0.2
2	117	1.463	38.4	34.2	11.5	-1.1
3	107	2.087	34.6	39.3	12.8	-1.8
4 (Overvalued)	107	3.211	33.9	41.7	11.1	-1.7
Difference 4-1		2.165***	-3.7***	7.0***	0.5	-1.5*

Table III – Continued

Method of Payment and Announcement Returns by Valuation Ratio Quartiles

During 2000-2017

			Probability of Cash Payment (%)	Probability of Stock Payment (%)	Target Announcement CAR (%)	Acquirer Announcement CAR (%)
Panel A: Acquistions Sorted Yearly by Acquirer P/B Ratio						
	N	Acquirer P/B				
1 (Undervalued)	691	1.018	29.5	29.8	21.3	-1.5
2	680	1.587	29.6	28.8	23.5	-1.5
3	686	2.486	41.5	26.4	23.0	-0.7
4 (Overvalued)	686	7.070	51.0	26.3	25.4	-0.9
Difference 4-1		6.052***	21.5***	-3.5***	4.1***	0.6*
Panel B: Acquistions Sorted Yearly by Acquirer P/V Ratio						
	N	Acquirer P/V				
1 (Undervalued)	608	0.959	29.9	28.9	23.9	-1.5
2	597	1.411	30.3	27.1	22.5	-1.5
3	598	2.099	50.0	27.1	24.2	-0.5
4 (Overvalued)	598	4.998	46.1	23.4	24.7	-1.2
Difference 4-1		4.038***	16.2***	-5.5***	0.8	0.3
Panel D: Acquistions Sorted Yearly by Target P/B Ratio						
	N	Target P/B				
1 (Undervalued)	143	0.973	21.7	32.2	16.5	-1.8
2	205	1.358	22.0	40.9	21.0	-1.5
3	174	2.372	29.3	29.3	20.7	-1.4
4 (Overvalued)	174	4.017	38.5	24.2	17.6	-1.6
Difference 4-1		3.044***	16.8***	-8.0*	1.1	0.2*
Panel E: Acquistions Sorted Yearly by Target P/V Ratio						
	N	Target P/V				
1 (Undervalued)	132	1.077	27.3	36.4	17.3	-0.6
2	171	1.463	30.4	24.0	17.0	-2.0
3	144	2.388	41.0	25.0	22.2	-1.1
4 (Overvalued)	144	3.528	42.6	21.9	18.6	-1.7
Difference 4-1		2.451***	15.3***	-14.5**	1.3	-1.1

Table III examines the relationship between a vast range of takeover characteristics and pre-announcement valuation of the acquirer and the target for the periods of 1978-1999 and 2000-2017. The table is divided into four panels from which Panel A and Panel B report the effect acquirer valuation has on the takeover characteristics and Panel C and Panel D report the effect target valuation has on the takeover characteristics. The acquirers and targets are ranked each month based on their relative valuations into quartiles. By using this monthly ranking procedure, similarly, as Dong et al. (2006), I make sure that any effects I identify are cross-sectional and not driven by time-series swings in

valuations and takeover characteristics. Quartile 4 has the highest P/V or P/B ratio and quartile 1 the lowest ratio. I report the difference between quartiles 4 and 1, to describe how do takeover characteristics differ between overvalued and undervalued firms. In addition to examining the relationship between the takeover of characteristics and pre-announcement valuations, I investigate the time-series variation in that specific relation, focusing pre- and post-2000 period.

V. A. Acquirer valuation effects

In this sub-chapter, I discuss the relation between acquirer valuation and takeover characteristics reported in Table III.

Result 4: During the period of 1978-1999 higher acquirer valuation ratios are associated with:

a) Higher use of stock as a payment method
b) Less use of cash as a payment method
c) Lower acquirer announcement CAR

More highly valued acquirers are more likely to use stock as a payment method compared to cash. The difference in probabilities between quartile 4 and 1 is 21.3% (13.6%) for P/B (P/V), and it is highly significant. Considering the cash probabilities, the difference for P/B is -7.7% and for P/V -8.5% and both are highly significant. There is also evidence that more highly valued acquirers earn lower announcement returns since the differential between the quartiles is -0.6% (-0.8%) for P/B (P/V).

Result 5: During the period of 2000-2017 higher acquirer valuation ratios are associated with:

a) Higher use of cash as a payment method
b) Less use of stock as a payment method

The more highly valued acquirer is more likely to use cash as a payment method compared to stock. The differential on the probability of cash payment between quartiles 4 and 1 is for P/B 21,5% and for P/V 16,2%, and the differences are highly significant. Besides, there is proof that acquirers with higher valuation ratios use less cash as a payment method since the highly significant difference between the quartiles is -3.5% for P/B and -5.5% for P/V. This finding is in contrast with previous findings (see e.g. Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004; Dong et al., 2006) and my hypothesis (H3) that overvalued acquirers use stock as a payment method.

Result 6: During the period of 2000-2017 higher acquirer P/B is associated with

a) Higher target announcement CAR
b) Higher acquirer announcement CAR

The target that is being acquired by a more highly valued acquirer, is expected to earn higher announcement CAR compared to target that is acquired by acquirer with lower valuation ratios. There is a 4.1% higher expected return for the target that is being acquired by a more highly valued acquirer and difference is highly significant. Additionally, more highly valued acquirer is expected to earn 0.6% higher announcement CAR compared to acquirer with lower P/B. The difference is significant but not as significant as the difference in target announcement CAR.

V. B. Target valuation effects

In this sub-chapter, I discuss the relation between target valuation and takeover characteristics reported in Table III.

Result 7: During the time period of 1978-1999 higher target valuation is associated with:

a) Higher use of stock as a payment method
b) Less use of cash as a payment method
c) Lower acquirer announcement CAR

A more highly valued target is more likely to be a target in stock-financed merger bid or tender offer rather than in cash-financed merger bid or tender offer. There is a 5.4% (7.0%) difference between quartiles 4 and 1 for P/B (P/V), and it is highly significant. Additionally, the difference in probability of cash payment is -4.5% (-3.7%) for P/B (P/V), and it is also highly significant. There is also evidence that the acquirer earns lower announcement returns when the target of the transaction is highly valued. The difference between quartiles 4 and 1 is -1.7% for P/B and -1.5% for P/V.

Result 9: During the period of 2000-2017 higher target valuation is associated with:

a) Higher use of cash as a payment method
b) Less us of stock as a payment method

The difference between quartiles 4 and 1 on probability of cash (stock) payment is 16.8% (-8.0%) for P/B and 15.3% (-14.5%) for P/V. The difference on the probability of cash payment is highly significant for P/B and P/V and the difference on the probability of stock payment is highly significant for P/V and significant for P/B. This result is in line with *Result 5* and together they predict that overvalued acquirers use cash instead of stock and stock financed targets are more undervalued than cash-financed targets. As *Result 5,* this finding also challenges the findings of prior literature.

To conclude, the two periods are in contrast with each other. The relation between valuation ratios and takeover characteristics has changed substantially between the two decades. During 1978-1999, (I) stock-financed acquirers and targets are more highly valued than cash-financed, (II) overvalued

acquirers are more likely to use stock as a payment method, (III) more highly valued targets are more likely to be in stock-financed transactions, (IV) overvalued acquirers earn lower announcement returns, and (V) acquirers that acquire highly valued targets earn lower announcement returns. On the other hand, during 2000-2017, (I) cash-financed targets are more highly valued than stock-financed, (II) overvalued acquirers are more likely to use cash as a payment method, (III) targets with higher valuation ratios are more likely to be in cash-financed transactions, (IV) overvalued acquirers earn higher announcement returns, and (V) targets that are involved in a transaction with overvalued acquirer earn higher announcement returns.

VI. Multivariate Test

In this section, I test the robustness of findings on the empirical relations between the valuation ratios and takeover characteristics by using a multivariate test with a wide range of control variables. Further, I focus on the differences between the two periods with the aim of identifying the reasons behind the differences between the two periods. Therefore, I will only focus on the period of 2000-2017, and the factors behind the identified change between the two time periods.

There are two reasons why misvaluation proxies may be correlated with growth potential. Firstly, investors' misvaluation might be associated with growth potential for psychological reasons. According to Lakonishok, Shleifer and Vishny (1994), investors might overvalue, for example, so-called *glamour* stocks[4] which have performed well in the past. Secondly, misvaluation proxies may have measurement errors that are associated with growth potential. (Dong et al., 2006)

Considering the misvaluation proxies (P/B and P/V) used in this study, P/V has one vital advantage since it addresses the measurement error which is associated with growth potential. In addition to addressing the measurement error, P/V may also address the investors' misvaluation while controlling for P/B since the analyst forecast filter the misvaluation associated with growth potential. On the other hand, P/B also includes independent information regarding the misvaluation so it is crucial to investigate tests that use the valuation ratios separately as well as jointly. By including both P/B and P/V, I may test the independent explanatory power P/V as a misvaluation proxy. Thus, I can determine is the identified effect consequence of misvaluation rather than other economic factors, for example, growth potential or risk premia.

[4] Lakonishok, Shleifer and Vishny (1994) determine *glamour* stocks as stock that have performed well in the past and are expected to perform well in the future.

Therefore, I perform a multivariate test with a wide range of control variables which are described in *Control Variables for Multivariate Analysis* sub-chapter (Chapter IV.D.). All of my regressions include logarithm of relative and target size, industry and VIX as control variables. Due to data limitations considering the target valuation ratios[5], firstly I regress on acquirer valuation ratios to maintain sample size, and secondly on both acquirer and target valuation ratios. The results considering the regressions with target valuation ratios have to be investigated with caution since the sample size diminishes.

Table IV reports the logistic regressions considering the valuation ratios and method of payment. The dependent variables are cash payment and stock payment. Table V reports the least squares regressions considering the valuation ratios and announcement period CARs. Acquirer announcement CAR and target announcement CAR are the dependent variables in Table V. In Table IV and Table V, first I regress the dependent variable for crisis periods[6], valuation ratios, as well as for earlier mentioned control variables. Secondly, I perform the same regression without crisis periods and include year dummies.

The findings from Table IV are partly in line with univariate tests. As in the univariate test, higher acquirer valuation is associated with cash payment and lower valuation with stock payment (*Result 5a*). In addition to that, lower acquirer valuation is associated with stock payment (*Result 5b)*. On the other hand, multivariate and univariate tests are not in line with all the results. Based on the multivariate test there is no significant evidence that more highly valued targets are more likely to be involved in the cash-financed transaction (*Result 9a*). Additionally, target with lower valuation ratios is not significantly more likely to be in a stock-financed transaction (*Result 9b*). However, due to the small sample size, I examine the results considering target valuations with caution. Table IV also provides evidence that the financial crisis of 2008 has a significant effect on the method of payment. The first period of the financial crisis and European sovereign debt crisis are associated with a significant increase in the probability of cash payment and decrease in the probability of stock payment

The results from Table V are in contrast compared to findings from the univariate tests. There is no evidence that higher acquirer P/B would be associated with the higher target and acquirer announcement period CARs. Based on the multivariate test higher target P/V ratio is associated with the lower target announcement return. According to regressions with only acquirer valuation ratios, higher acquirer valuation is associated with lower acquirer announcement period CAR. In addition to valuation ratios, the European sovereign debt crisis affects the announcement period CARs for acquirer and target positively, according to regression with only acquirer valuation ratios.

[5] The sample size decreases approximately by 82% when I include target valuation ratios to the regression.
[6] Crisis periods are determined in *Determination of the Crisis Periods* sub-chapter (Chapter IV. C.). Since the dot.com bubble is not considered in this study in more detail, I exclude the acquisitions announced in the year 2000 in order to isolate the potential effects of the dot.com bubble in the early 2000s, similarly as Moberg (2019).

Table IV

Logistic Regressions

The sample includes U.S. takeovers in which both the acquirer and the target are publicly traded during 2001-2017. P/B is the price-to-book value of equity and P/V is the price-to-residual income model in which the discount rate is based on firm-specific CAPM. Crisis 1, Crisis 2 and Crisis 3 are dummy variables equaling 1 if the acquisition is announced between (I) 1st August 2007 and 31st March 2009, (II) 1st April 2009 and December 2009, or (III) 1st April 2011 and 31st December 2012. Diversifying = 1 if the acquirer and the target have the same three-digit COMPUSTAT SIC codes; otherwise zero. Relative size = market value of the acquirer / market value of the target. Target size = target's market value of equity. All regressions include two-digit SIC as a major dummy. The second row reports the p-value for each coefficient.

Dependent Variable (= 1 if Yes, Otherwise 0)								
	Cash				Stock			
Crisis 1	0.133	0.152			-0.170	-0.022		
(*August 2007- March 2009*)	*0.001*	*0.065*			*0.000*	*0.789*		
Crisis 2	-0.032	-0.172			0.006	0.100		
(*April 2009 - Decemeber 2009*)	*0.574*	*0.150*			*0.916*	*0.407*		
Crisis 3	0.158	0.170			-0.097	-0.059		
(*April 2011 - December 2012*)	*0.001*	*0.019*			*0.010*	*0.418*		
Acquirer P/B	0.046	0.291	0.044	0.024	-0.040	-0.032	-0.038	-0.029
	0.002	*0.430*	*0.003*	*0.528*	*0.006*	*0.396*	*0.009*	*0.450*
Acquirer P/V	0.046	0.069	0.114	0.060	-0.101	-0.129	-0.108	-0.113
	0.036	*0.207*	*0.000*	*0.284*	*0.000*	*0.020*	*0.000*	*0.045*
Target P/B		0.030		0.038		-0.025		-0.030
		0.381		*0.270*		*0.473*		*0.383*
Target P/V		0.012		0.016		-0.017		-0.017
		0.774		*0.712*		*0.689*		*0.699*
VIX	-0.030	-0.002	0.000	-0.023	0.006	0.001	0.002	-0.001
	0.058	*0.336*	*0.967*	*0.604*	*0.000*	*0.645*	*0.300*	*0.808*
Diversifying	-0.055	-0.021	-0.012	-0.023	0.019	0.061	0.002	0.061
	0.005	*0.636*	*0.516*	*0.604*	*0.301*	*0.177*	*0.907*	*0.176*
Log of relative size	0.233	0.300	0.219	0.308	-0.121	-0.158	-0.113	-0.165
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Log of target size	0.096	0.055	0.069	0.058	-0.061	-0.110	-0.045	-0.113
	0.000	*0.085*	*0.000*	*0.074*	*0.000*	*0.000*	*0.001*	*0.001*
Intercept	-0.040	-0.019	0.177	-0.129	0.329	0.560	0.470	0.736
	0.457	*0.882*	*0.683*	*0.453*	*0.000*	*0.000*	*0.266*	*0.000*
Year dummy			Yes	Yes			Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2220	403	2220	403	2220	403	2220	403
Pseudo-R^2	0.283	0.886	0.385	0.890	0.311	0.876	0.349	0.875

Table V

Least Squares Regressions

The sample includes U.S. takeovers in which both the acquirer and the target are publicly traded during 2001-2017. P/B is the price-to-book value of equity and P/V is the price-to-residual income model in which the discount rate is based on firm-specific CAPM. Announcement period CAR is computed for the three day period (-1, 1) around the announcement date (day 0) of the acquisition. Crisis 1, Crisis 2 and Crisis 3 are dummy variable equaling 1 if the acquisition is announced between (I) 1st August 2007 and 31st March 2009, (II) 1st April 2009 and December 2009, or (III) 1st April 2011 and 31st December 2012. Relative size = market value of acquirer / market value of target. Target size = target's market value of equity. All regressions include two-digit SIC as a major dummy. The second row reports the p-value for each coefficient.

	Dependent Variable							
	Target Announcement Period CAR				Acquirer Announcement Period CAR			
Crisis 1	0.048	-0.006			-0.007	0.003		
(*August 2007- March 2009*)	*0.046*	*0.874*			*0.221*	*0.850*		
Crisis 2	0.049	0.066			0.003	0.048		
(*April 2009 - Decemeber 2009*)	*0.156*	*0.231*			*0.760*	*0.022*		
Crisis 3	0.114	0.045			0.012	0.009		
(*April 2011 - December 2012*)	*0.000*	*0.176*			*0.037*	*0.461*		
Acquirer P/B	0.001	0.034	0.005	0.021	0.004	0.002	0.004	0.006
	0.886	*0.044*	*0.579*	*0.270*	*0.063*	*0.736*	*0.060*	*0.382*
Acquirer P/V	0.003	0.021	0.001	0.001	-0.010	0.000	-0.006	0.004
	0.806	*0.402*	*0.926*	*0.978*	*0.001*	*0.991*	*0.056*	*0.715*
Target P/B		0.000		-0.004		0.008		0.011
		0.980		*0.798*		*0.177*		*0.061*
Target P/V		-0.033		-0.043		-0.012		-0.010
		0.099		*0.041*		*0.123*		*0.178*
VIX	0.003	0.004	0.004	0.004	0.000	-0.001	0.000	0.000
	0.000	*0.002*	*0.000*	*0.042*	*0.018*	*0.091*	*0.802*	*0.712*
Log of relative size	0.045	0.046	0.044	0.042	0.013	0.026	0.014	0.028
	0.000	*0.010*	*0.000*	*0.032*	*0.000*	*0.000*	*0.000*	*0.000*
Log of target size	-0.034	-0.055	-0.037	-0.053	0.003	-0.002	0.002	-0.010
	0.000	*0.000*	*0.000*	*0.002*	*0.059*	*0.728*	*0.244*	*0.104*
Intercept	0.209	0.246	-0.375	0.454	-0.017	-0.014	-0.047	0.004
	0.000	*0.000*	*0.170*	*0.032*	*0.024*	*0.525*	*0.466*	*0.959*
Yeardummy			Yes	Yes			Yes	Yes
N	2214	402	2214	402	2214	402	2214	402
Adjusted-R^2	0.064	0.142	0.051	0.164	0.028	0.053	0.051	0.107

To conclude, consistent with univariate and multivariate tests, higher acquirer valuation is associated with cash payment and lower acquirer valuation is associated with stock payment. These results challenge the findings of prior literature (see e.g. Dong et al., 2006) and my hypotheses (H1, H2, and H3). Both Table IV and Table V provide evidence that the financial crisis has a significant effect on the method of payment.

VII. Discussion and Empirical Implications

In this chapter, I discuss my results from my analyses examining the time-series variation of the effect misvaluation has on the method of payment and announcement period returns. More precisely, I compare my results with previous literature and discuss the effect the financial crisis has on the misvaluation effect. Ultimately, I discuss on the limitations this paper has and implications on further research.

VII. A. Time Variation of Misvaluation Effect in the U.S. Takeover Markets

Based on my results, I identify clear evidence that the effect misvaluation has on the method of payment has changed significantly across time. During the time between years 1978 and 1999, stock-financed acquirers and targets are more highly valued than cash-financed acquirers and targets. Overvalued acquirers are more likely to use stock as a payment method and more highly valued targets are more likely to be in stock-financed transactions. These results are in line with my hypotheses and misvaluation driven M&A theories (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004).

The period between the years 2000 and 2017 is mostly in contrast with the earlier period and my hypotheses. Cash-financed acquirers are more highly valued than stock-financed acquirers and higher target valuation is associated with cash-financing. One of the key drivers of this difference is the financial crisis based on the multivariate analysis. During the financial crisis volatility of the stock market (VIX) increases which decreases the number of stock-financed M&As. Bhagwat et al. (2016) argue that the aggregate number of monthly M&As in the U.S. is inversely related to VIX. Prior literature finds that as the uncertainty in the market decreases the value of target and acquirer's stock and drives cash-financed M&As (see e.g. Pástor and Veronesi, 2012 and 2013; Hansen 1978).

In addition to the financial crisis, there might be other factors driving the change in the misvaluation effect. Taxation might also affect the change in method of payment in the U.S. takeover market in the period of 2000-2017. After the year 2001 pooling and goodwill amortization were abolished by Financial Accounting Standards Board (Eric de Bodt and Jean-Gabriel Cousin, 2016). Due to this, target shareholder is often liable to taxation on their profits and since require a higher premium. For acquirer, it means higher goodwill which can be amortized from future profits and thus reduced from tax burdens. (Ismail and Krause, 2010). Besides taxation, after the year 2001 the number of stock-financed M&A transsactions decreased drastically compared to cash- and mixed-financed transactions, as the Table I reports.

Other possible reasons for the change in the effect misvaluation has on the payment method of the acquisition include low-interest rates during the period between years 2000 and 2017, credit boom and

competition. The cost of debt financing influences the ability and attractiveness of cash-financed transactions. Therefore in periods of high-interest rates, acquirers prefer stock-financed transactions and in periods of low-interest rates, acquirers prefer cash-financed transactions. During the period between the years 2000 and 2017 and especially after the financial crisis of 2008 the reason why acquirers prefer cash-financed transactions is that corporate lending interest rate has been remarkable lower (Bugeja, Martin and Rosa, 2008). Additionally, to lower interest rates, before the financial crisis during the credit boom that peaked in mid-2007, corporate lending increased that boosted cash-financed M&As (Ivashina and Scharfstein, 2010). Increased competition is also a crucial driver of the cash-financed transaction since by paying with cash acquirer blocks competitive bids (Martin, 1996).

Considering the announcement date returns, higher target P/V is associated with a lower target announcement period returns that is in line with Dong et al. (2006). The Q hypothesis predicts greater returns when acquisition involves quality acquirer and bad target compared to bad acquirer and quality target. Therefore, higher acquirer valuation and lower target valuation are associated with higher announcement returns for both the acquirer and the target. (Lang et al., 1989)

Overall, the valuation ratios do not have as strong explanatory power as the findings of the previous literature suggests. This means that the misvaluation effect is not as strong in the takeover markets during the post-2000 period that implies that the market efficiency has increased during the more recent period. According to prior studies (see e.g. Gilson and Kraakman, 2014; Lim et al., 2008), crisis periods markets have recovered in the post-crisis period in terms of improved market efficiency. The fundamental assumption of the misvaluation driven M&A theories is the market inefficiency. Therefore, by improving the market efficiency the misvaluation effect on the takeover characteristics weakens.

VII. B. Limitations of the Study and Implication on Further Research

This study aims is to examine the time-series variation of the effect misvaluation has on the method of payment and announcement period returns. In doing so, it is also important to identify the biggest weaknesses of my empirical methods.

One of the challenges in this paper is data limitation considering the valuation ratios of the target. Due to this, my sample size decreases that might affect the robustness of my findings. Therefore, I performed my tests with target valuation ratios and without them to determine if the smaller sample size affect the robustness of my findings. In addition to data limitation, the announcement return is computed in a three-day period that assumes that the market reaction for the new information is immediate and correct. In perfect markets, the market reaction is immediate to new information. However, in the real capital markets with activate secondary trading, the market reaction is rapid.

The time-variation is examined by using two different time-periods and the effect of the financial crisis by using crisis dummies. The financial crisis definition comes from the previous literature and there is no consistent definition for crisis in the academics. The misvaluation effect is only examined with time-series variation scope which leaves the cross-sectional variation untouched. By no means is this approach comprehensive and a large phenomenon as the financial crisis would require more thorough investigation. Therefore, considering future research there is a fertile ground for more thorough and industry-level analysis, although such analysis was not feasible within the scope and objectives of this study.

VIII. Conclusion

This study investigates the time-series variation of the effect misvaluation has on the method of payment and announcement period returns in the U.S. takeover markets in the time between the years 1978 and 2017. Especially, I test the predictions of the misvaluation driven M&A theories (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004) in the time between the years 2000 and 2017 by using price-to-book (P/B) and price-to-residual income model (P/V) as misvaluation proxies. My sample consists of 7531 takeovers where both the acquirer and the target are listed on the NYSE, AMEX or NASDAQ.

Based on my findings, the misvaluation effect on the method of payment differs significantly between post- and pre-2000 years in my sample. During the 2000s and 2010s higher acquirer valuation ratios are associated with cash as a payment method and acquirers with lower valuation ratios are associated with stock as a payment method that challenges the misvaluation driven M&A theories. In general, the misvaluation effect is not as strong as in the pre-2000 period that implies that market efficiency has improved in the more recent period. The financial crisis of 2008 is identified as one of the key drivers behind the change. In addition to the financial crisis, taxation and thus tax-benefits, increased competition and credit boom are also one of the possible drivers behind the change. My findings are robust for additional tests and controls.

Overall, this paper contributes to misvaluation driven M&A literature by offering financial crisis as a driver for time-series variation of the effect misvaluation has on the method of payment and announcement period returns. Further, this paper provides clear evidence that the misvaluation effect has changed between pre- and post-2000 years. However, the results of this paper consider only publicly traded U.S. companies that highlight the need for more for further research with more comprehensive data. For further investigations, this paper provides evidence for time-series variation of the misvaluation hypothesis.

References

Ali, A., Hwang, L. S., & Trombley, M. A. (2003). Residual-income-based valuation predicts future stock returns: Evidence on mispricing vs. risk explanations. *The Accounting Review*, 78(2), 377-396.

Baker, M., & Wurgler, J. (2002). Market timing and capital structure. *The journal of finance*, 57(1), 1-32.

Ball, R. (1978). Anomalies in relationships between securities' yields and yield-surrogates. *Journal of financial economics*, 6(2-3), 103-126.

Berk, J. B. (1995). A critique of size-related anomalies. *The Review of Financial Studies*, 8(2), 275-286.

Bhagwat, V., Dam, R., & Harford, J. (2016). The real effects of uncertainty on merger activity. *The Review of Financial Studies*, 29(11), 3000-3034.

Brainard, W. C., & Tobin, J. (1968). Pitfalls in financial model building. *The American Economic Review*, 58(2), 99-122.

Bugeja, M., & da Silva Rosa, R. (2008). Taxation of shareholder capital gains and the choice of payment method in takeovers. *Accounting and Business Research*, 38(4), 331-350.

D'mello, R., & Shroff, P. K. (2000). Equity undervaluation and decisions related to repurchase tender offers: An empirical investigation. *The Journal of Finance*, 55(5), 2399-2424.

Daniel, K., & Titman, S. (1997). Evidence on the characteristics of cross-sectional variation in stock returns. *The Journal of Finance*, 52(1), 1-33.

Daniel, K., Hirshleifer, D., & Teoh, S. H. (2002). Investor psychology in capital markets: Evidence and policy implications. *Journal of monetary economics*, 49(1), 139-209.

Davis, J. L. (1994). The cross-section of realized stock returns: The pre-COMPUSTAT evidence. *The Journal of Finance*, 49(5), 1579-1593.

De Long, J. B., Shleifer, A., Summers, L. H., & Waldmann, R. J. (1990). Noise trader risk in financial markets. *Journal of political Economy*, 98(4), 703-738.

Dechow, P. M., Hutton, A. P., & Sloan, R. G. (1999). An empirical assessment of the residual income valuation model. *Journal of accounting and economics*, 26(1-3), 1-34.

Dong, M., Hirshleifer, D., Richardson, S., & Teoh, S. H. (2006). Does investor misvaluation drive the takeover market?. *The Journal of Finance*, 61(2), 725-762.

Duchin, R., Ozbas, O., & Sensoy, B. A. (2010). Costly external finance, corporate investment, and the subprime mortage credit crisis. *Journal of Financial Economics*, 97(3) , 418-435.

Duprey, T., Klaus, B., & Peltonen, T. A. (2015). *Dating systemic financial stress episodes in the EU countries*. ECB Working Paper series, No. 1873. European Central Bank. Available at: https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1873.en.PDF.

De Bodt, E., Cousin, J. G., & Roll, R. (2016). Improved Method for Detecting Acquirer Skills. *Available at SSRN 2756391*.

Faccio, M., & Masulis, R. W. (2005). The choice of payment method in European mergers and acquisitions. *The Journal of Finance*, 60(3), 1345-1388.

Frankel, R. M., & Lee, C. (1998). Accounting valuation, market expectation, and the book-to-market effect. *Market Expectation, and the Book-to-Market Effect.*

Franks, J., Harris, R., & Titman, S. (1991). The postmerger share-price performance of acquiring firms. *Journal of Financial economics*, 29(1), 81-96.

Fuller, K., Netter, J., & Stegemoller, M. (2002). What do returns to acquiring firms tell us? Evidence from firms that make many acquisitions. *The Journal of Finance*, 57(4), 1763-1793.

Gilson, R. J., & Kraakman, R. (2014). Market efficiency after the financial crisis: It's still a matter of information costs. *Va. L. Rev.*, 100, 313.

Hansen, R. G. (1987). A theory for the choice of exchange medium in mergers and acquisitions. *Journal of business*, 75-95.

Ivashina, V., & Scharfstein, D. (2010). Determinants of the method of payment in mergers and acquisitions. *The Quarterly Review of Economics and Finance*, 50(4), 471-484

Keim, D. B. (1988). Stock market regularities: A synthesis of the evidence and explanations. Stock market anomalies, 16-39.

Laeven, M. L., & Valencia, M. F. (2018). *Systemic banking crises revisited*. IMF Working paper series, No. 18/206. International Monetary Fund. Available at: https://www.imf.org/en/Publications/WP/Issues/2018/09/14/Systemic-Banking-Crises-Revisited-46232.

Lakonishok, J., Shleifer, A., & Vishny, R. W. (1994). Contrarian investment, extrapolation, and risk. *The journal of finance*, 49(5), 1541-1578.

Lang, L. H., Stulz, R., & Walkling, R. A. (1989). Managerial performance, Tobin's Q, and the gains from successful tender offers. *Journal of financial Economics*, 24(1), 137-154.

Lee, C. M., Myers, J., & Swaminathan, B. (1999). What is the Intrinsic Value of the Dow?. *The Journal of Finance*, 54(5), 1693-1741.

Lim, K. P., Brooks, R. D., & Kim, J. H. (2008). Financial crisis and stock market efficiency: Empirical evidence from Asian countries. *International Review of Financial Analysis*, 17(3), 571-591.

Loughran, T., & Vijh, A. M. (1997). Do long-term shareholders benefit from corporate acquisitions?. *The Journal of Finance*, 52(5), 1765-1790.

Martin, K. J. (1996). The method of payment in corporate acquisitions, investment opportunities, and management ownership. *The Journal of finance*, 51(4), 1227-1246.

Mitchell, M. L., & Mulherin, J. H. (1996). The impact of industry shocks on takeover and restructuring activity. *Journal of financial economics*, 41(2), 193-229.

Moberg, M. (2019). Bidder size and acquisition announcement returns in European M&A markets. *Unpublished Master's Thesis*, *Aalto University School of Business,*

Moeller, S. B., Schlingemann, F. P., & Stulz, R. M. (2004). Firm size and the gains from acquisitions. *Journal of financial economics*, 73(2), 201-228.

Moskowitz, T. J., & Grinblatt, M. (1999). Do industries explain momentum?. *The Journal of finance*, 54(4), 1249-1290.

Pastor, L., & Veronesi, P. (2012). Uncertainty about government policy and stock prices. *The journal of Finance*, 67(4), 1219-1264.

Rau, P. R., & Vermaelen, T. (1998). Glamour, value and the post-acquisition performance of acquiring firms. *Journal of financial economics*, 49(2), 223-253.

Reinhart, C. M., & Rogoff, K. S. (2011a). A Decade of Debt. *Economics.*

Rhodes-Kropf, M., & Viswanathan, S. (2004). Market valuation and merger waves. *The Journal of Finance*, 59(6), 2685-2718.

Rhodes–Kropf, M., Robinson, D. T., & Viswanathan, S. (2005). Valuation waves and merger activity: The empirical evidence. *Journal of Financial Economics*, 77(3), 561-603.

Rouwenhorst, K. G. (1999). European equity markets and the EMU. *Financial Analysts Journal*, 55(3), 57-64.

Shleifer, A., & Vishny, R. W. (2003). Stock market driven acquisitions. *Journal of financial Economics*, 70(3), 295-311.