Factors explaining capital market reactions during corporate, sovereign, and pandemic events

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Chapter 1: Introduction

This chapter introduces the motivation of investigating information transmission in capital markets from different perspectives. We examine how information-triggering events at the corporate, sovereign, and global levels, i.e., mergers and acquisitions (M&A), adjustments in sovereign creditworthiness, and the global pandemic outbreak, affect the pricing of securities and cryptocurrencies and identify factors that explain these market reactions. Through empirical studies, we document new findings under two major trends in capital markets, namely industry integration and investment diversification.

1.1 Motivation

1.1.1 Information implications in industry integration

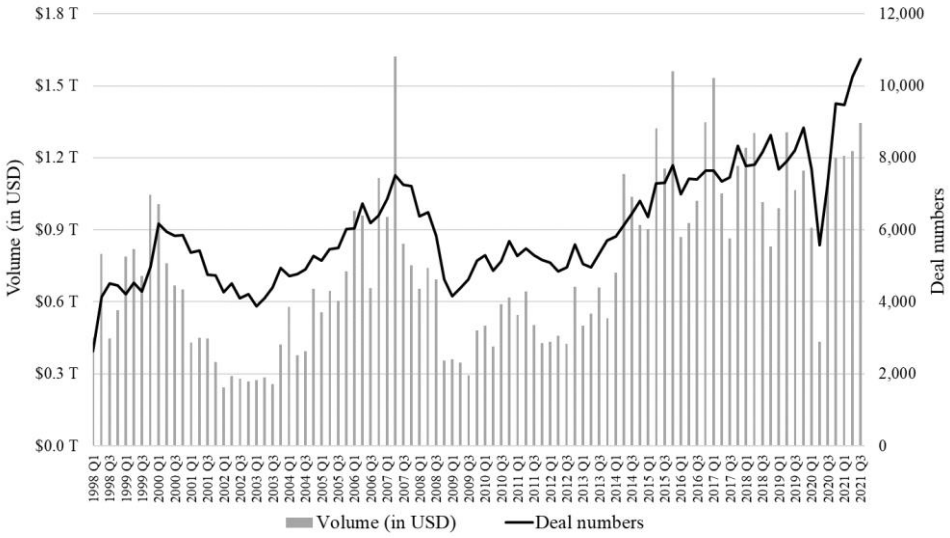
The efficient market theory outlines how capital markets react to information. Fama (1970) summarizes three forms of efficient markets. The strong form implies that markets fully price in all information, including insider and public information. The semi-strong form is restricted to public information, and the weak form captures only historical information. As evidence for the semi-strong form, Fama (1970) reviews studies investigating how stock prices are adjusted to the publication of new information, such as stock splits, annual earnings reports, and seasoned stock offerings. He concludes that consistent with the semi-strong form, prices respond significantly to public announcements of certain events that are crucial for firms' valuation.

Based on the semi-strong market efficiency, researchers dig into the implied information of firms' disclosures to examine how they exactly affect stock prices. As one of the most investigated fields, M&A are essential sources of firms' external growth and closely related to the overall market environment (e.g., Bauer & Matzler, 2014; Rhodes-Kropf & Viswanathan, 2004; Shleifer & Vishny, 2003). Harford (2005) explains that economic, regulatory, and technological developments can facilitate firms' M&A activities and lead to M&A waves when industries experience an aggregated time period of changes. Firms accommodate themselves through M&A to enlarge market shares, diversify regional risks, and acquire new technologies. Figure 1-1 shows Bloomberg's quarterly M&A data for over 23 years, where the number of M&A generally increased since 2009 but dropped significantly in 2020 Q2 due to the worldwide Covid-19 outbreak. Since 2020 Q3, there has been a strong rebound in global M&A activities

as many buyers hunted for firms that suffered liquidity problems (Galpin, 2021). In 2021, M&A deal numbers continued to reach record highs. With an increasing focus on M&A activities, especially during the economic recovery after the Covid-19 crisis, how investors read the implied information in M&A disclosures is of great interest for involved firms to capture M&A success in the short term.

Figure 1-1. Global M&A quarterly data 1998 – 2021

This figure presents global completed M&A volumes and deal numbers from 1998 Q1 to 2021 Q3. Data are obtained from the Bloomberg Terminal.[1]



Many studies reveal that acquirers suffer negative market reactions around M&A announcements (e.g., Alexandridis et al., 2017; Masulis et al., 2007; Moeller et al., 2004). The disappointment can be attributed to implied information in deal details, for example, valuation issues of acquirers and targets, unpromising synergies of combined entities, and lack of experience in integration procedures. Although the success of M&A decisions is rather a long-term strategic challenge for acquiring firms, the information is priced in based on investors' expectations in a timely manner. If market sentiments are against specific deals, it may create additional pressure on acquirers when their shareholders suffer significant losses. Conversely, M&A can be processed more smoothly if acquirers encounter less resistance based on positive perceptions from investors. With new developments in capital markets, M&A activities are subject to more

[1] The data include the acquisition or sale of control in a company or asset for strategic purposes. The minority purchase, private equity investment, venture capital financing, joint venture, buyback, and spinoff are excluded.

regulatory requirements. For example, the US dropped the accounting rule of pooling payment method for M&A in 2001, which used to allow firms to merge their financial statements when solely using common stocks to finance M&A. Since then, the number of stock swaps has decreased significantly (De Bodt et al., 2015). In 2016, the US Treasury Department published the regulation against tax inversion in cross-border M&A, which has effectively reduced the number of firms acquiring subsidiaries in tax havens. In recent years, countries around the world have been more cautious about acquisitions from foreign entities. Among others, the European Union (EU) has executed a new screening framework of foreign direct investment since 2020. The EU published an extended list of businesses that may cause concerns, including critical infrastructure, technologies, and inputs, as well as areas to sensitive information and pluralism of media. With the changing environment and increasing M&A activities, the lessons that firms and investors have learned from prior empirical studies may not apply to recent developments in capital markets. For instance, earlier studies show that acquirers prefer stock payment when their shares are overvalued and take benefits at the cost of targets' shareholders, which in turn provokes negative market reactions around M&A announcements (e.g., Di Giuli, 2013; Eckbo et al., 1990; Shleifer & Vishny, 2003). Nevertheless, with stricter regulation methods and more insights into M&A deal techniques, it is less possible for firms to exploit their counterparty's interests in M&A. Some recent studies reveal that stock-financed M&A are no longer a signal for overvalued acquirers, as targets get more aware of payment decisions (e.g., De Bodt et al., 2019; Eckbo et al., 2018). Besides valuation issues, academic findings on synergy effects and acquirers' experience also indicate some new trends in M&A practice. Different from earlier waves of conglomerate M&A, where acquirers attempt to build empires (e.g., Amihud et al., 1986; Mueller, 1985), firms focus more on positioning themselves well in the increasingly crowded market environment. Especially for some services providers with low entry barriers, they face tremendous pressures from both existing homogeneous competitors and technology-based industry entrants. As one of the traditional brokerage businesses, insurance intermediaries have experienced an integration trend over the years, especially under the emergence of insurtech companies that carry insurance products and distributions at a lower cost through digital channels. When industry consolidation is inevitable, firms with strong financial and operational efficiency are likely to become serial acquirers, who conduct M&A regularly to gain external growth and enlarge their market shares (Macias et al., 2016a). Previous academic papers document negative short-term effects for serial acquirers due to managerial hubris, showing that

managers prefer to use free cash flow for acquisitions rather than paying dividends (e.g., Billett & Qian, 2008; Guest et al., 2004). Recent studies find that serial acquirers can benefit from prior experience in valuation techniques, bidding strategies, and integration processes, and thus gain positive market reactions upon M&A announcements (e.g., Aktas et al., 2013; Macias et al., 2016a, 2016b; Morillon, 2021). With improved information availability, investors can interpret firms' decisions timely through online media based on their own knowledge and social network contributions (Hirshleifer, 2020), limiting the possibility for insiders to build managerial hubris at the cost of shareholders.

The trend of industry integration has been continuing for years, as evidenced by the increasing number of M&A activities. The Covid-19 crisis has accelerated the pace of integration as many companies suffered from liquidity shortages. In the academic field, findings are divided on many issues related to M&A. Nevertheless, more regulatory requirements and easier access to information have improved market transparency for involved parties and investors. It is necessary to update the existing knowledge and give acquirers, targets, and stock market participants more insights. In particular, we focus on general valuation issues of both sides in M&A and the learning effect in a specific sector under enormous integration pressure. We follow the call of Malmendier et al. (2016) to investigate whether acquirers and targets can exploit their overvaluation by M&A payment methods, based on the counterparty's unawareness or short-term horizon for all industries. In addition, we take a closer look into insurance intermediaries, who are facing challenges from existing competitors and insur-tech entrants, and examine if serial acquirers are extraordinary players under industry integration, as Golubov et al. (2015) suggest that some acquirers can persistently capture better M&A announcement returns regardless of any deal-specific attributions. We particularly focus on the learning effect of serial acquirers in M&A risk management.

1.1.2 Information implications in investment diversification

Macroeconomic information, unlike individual corporate events, has a much broader impact. Studies show that capital markets are highly interdependent between the US and other developed markets, as well as among European countries, reflected in co-movements of security prices under one country's economic events, such as changes in unemployment, inflation, and sovereign creditworthiness (e.g., Afonso et al., 2012; Becker et al., 1995; Ehrmann et al., 2011). Forbes and Chinn (2004) examine both developed and emerging stock markets in America, Europe, and Asia. They reveal that market movement in the largest regional economy

significantly influences nearby countries, where the US has the strongest impact on most regions. They also document that in the observed period since 1996, international trade and finance relationships have become the major bridge of spreading economic shocks. Existing studies add more evidence that the magnitude of information transmission can be influenced by geographic closeness, cultural similarity, and trade flows (e.g., Afonso et al., 2012; Ferreira & Gama, 2007; Gande & Parsley, 2005; Ismailescu & Kazemi, 2010). The transmission channels across countries can be attributed to a direct creditor-debtor relationship through international trades (Afonso et al., 2012) or indirectly sharing common lending centers, where the declined solvency of one country can make less capital available to others (Ismailescu & Kazemi, 2010). The country-level creditworthiness plays an important role and can be measured by sovereign credit ratings, which reflect the economic and political environment. Studies show that changing sovereign ratings have a large impact on domestic capital markets, particularly under the sovereign ceiling policy, which limits all local corporate credit ratings to their sovereigns (e.g., Alsakka & Ap Gwilym, 2013; Brooks et al., 2004; Williams et al., 2013). Through the direct and indirect transmission channels, sovereign rating adjustments can spread to other countries. Previous studies document co-movements in developed and emerging capital markets in reaction to sovereign rating news. For example, both sovereign rating downgrades and negative reviews trigger decreases in stock and bond prices and increases in credit default swap (CDS) spreads across various markets (e.g., Dichev & Piotroski, 2001; Finnerty et al., 2013; Followill & Martell, 1997; Hand et al., 1992; Kiesel & Kolaric, 2018; Norden & Weber, 2004). Given the evidence of common spillover effects, one would assume that international capital markets are highly integrated, which increases the difficulty of diversifying investments across markets and asset classes.

Investors look for alternatives that can offer extra diversification value. According to the World Bank, Africa had more than 1.3 billion population as of 2020, of which the young generation will account for a significant portion by 2050. Human and natural resources such as oil and metals provide Africa with large growth potential. Nevertheless, the region was heavily affected by the Covid-19 crisis, particularly in the tourism and mining industries. As summarized by the African Development Bank (2021), Africa suffered an average GDP contraction of -2.1% in 2020, where East Africa was the best performing region with 0.7% growth and Southern Africa suffered the most with -7.0%. Compared to the US, whose GDP contracted at -3.5% in 2020 according to the World Bank, Africa experienced a slower spread of coronavirus and a

lower mortality rate in 2020. Despite the long-term growth potential powered by the young population and rich natural resources, Africa faces near-term problems caused by the global pandemic. As a result in capital markets, financial inflows experienced significant drops in 2020, including foreign direct investment, portfolio investments, remittances, and official development assistance, among which portfolio investments were completely reversed from a net inflow of USD 23 billion in 2019 to a net outflow of USD 27 billion in 2020 (African Development Bank, 2021). Investors' confidence in African assets, which had developed positively in recent years, was disrupted by the pandemic as investors shifted to safer assets. To regain net inflows, it is crucial for Africa to improve capital market efficiency by creating more information transparency. As a source of information on the investment environment, African sovereign ratings are of particular importance for foreign investors who have little access to regional corporates. In 2020, many African sovereigns were downgraded by major credit rating agencies[2], including some of Africa's biggest economies, such as Nigeria and South Africa. The uncertainty of economic recovery after the Covid-19 crisis increases with the worsening creditworthiness of African countries. The knowledge about how African sovereign ratings affect domestic capital markets and whether the information transfers to other countries is very limited. It is concerned for investors how significantly the recent downgrades of African sovereigns can influence regional capital markets and whether they would trigger similar spillover effects as the European sovereign debt crisis from 2008 to 2011 (Beirne & Fratzscher, 2013; Gibson et al., 2012), leading to a large-scale economic recession in the region. By investigating the historical impact of sovereign rating adjustments in Africa, we aim to shed light for investors about the information transmission mechanism in African capital markets, preparing for the influence of ongoing credit events to serve their investment decisions.

In contrast to African countries, which had limited ability to maintain financial market stability during the Covid-19 lockdowns, central banks and governments in more developed countries have injected massive liquidity into markets through monetary and fiscal policies to help businesses and individuals overcome the crisis. For example, the Federal Reserve has cut interest rates to 0.00% – 0.25% and restarted asset purchases with no upper bound. In addition, the US government announced several economic stimulus programs, the most recent of which, the

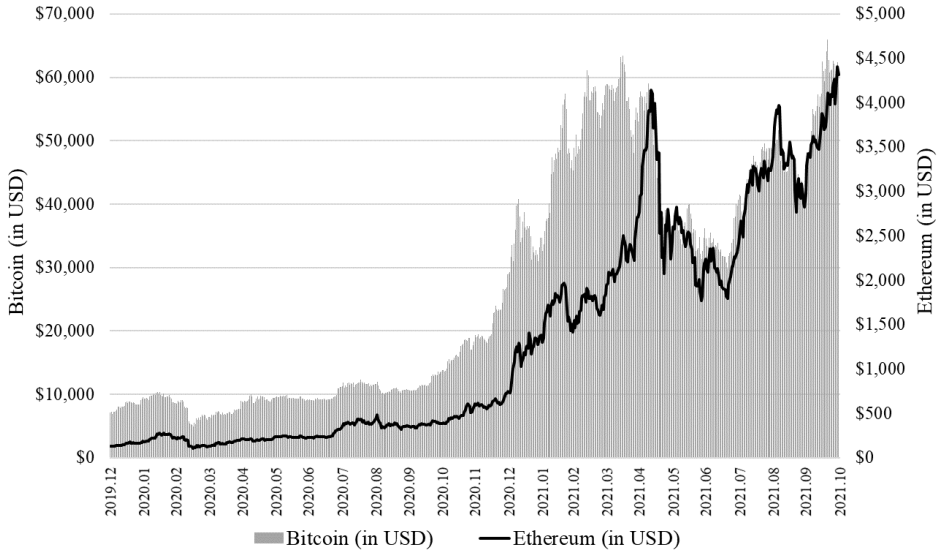
[2] For example, Angola, Botswana, Cameroon, Cape Verde, Ethiopia, Gabon, Ghana, Morocco, Namibia, Nigeria, Seychelles, Tunisia, South Africa, and Zambia were downgraded in 2020 by at least one of the major rating agencies, namely S&P, Fitch, and Moody's. The information is obtained from the rating agencies' websites.

American Rescue Plan Act of 2021, was proposed USD 1.9 trillion to support the recovery. And the European Central Bank initiated the *Pandemic Emergency Purchase Programme* amounting to EUR 1.85 trillion in 2020. Besides, the EU leaders agreed on the 2021 – 2027 joined spending plan that includes EUR 750 billion recovery package aimed at the Covid-19 crisis. These quick moves have kept major economies from large recessions due to the lockdowns but also triggered risk for high inflation. If the productivity of economic activities after the pandemic cannot keep up with the increased amount of liquidity pumped during the crisis, excess inflation may occur and last a while, causing damage to global economic developments. The latest US consumers prices index for October 2021 reached 6.2% year over year, the highest 12-month increase since November 1990. Similar inflation hikes also happened in Europe. It is uncertain if inflation pressures would be transitory as central banks expected, but investors have been eagerly searching for hedges after seeing excessive liquidity.

Different than earlier times that people purchase gold in anticipation of inflation risk, more and more investors eye on cryptocurrencies based on their decentralized feature and low correlations with other assets (Griffin & Shams, 2020). During the Covid-19 crisis, even large firms started to adopt cryptocurrencies on their balance sheets as either investment or reserve assets. For example, the software company MicroStrategy, the payment processors Square and PayPal, as well as the electric vehicle manufacturer Tesla purchased Bitcoin in 2020. In addition, investment firms have set up funds for institutional and private investors to invest in cryptocurrencies, which further accelerated the adoption process. However, the high level of attention also brings more volatility related to sentiment and regulatory risks, as the prices of cryptocurrencies can be heavily influenced by social media messages and regional policies. In the second quarter of 2021, China banned the cryptocurrency mining business due to environmental concerns, after which Tesla stopped accepting Bitcoin as a medium of payment, causing the prices of cryptocurrencies to drop sharply. As shown in Figure 1-2, the largest cryptocurrencies measured by market cap, Bitcoin and Ethereum, lost about 40% of their value in 2021 Q2, followed by an extremely fast rebound after July 2021. The phenomenon of excessively volatile prices is even more pronounced for smaller cryptocurrencies.

Figure 1-2. Price developments of Bitcoin and Ethereum 2020 – 2021

This figure presents daily price developments of Bitcoin and Ethereum from 31.12.2019 to 31.10.2021. Data are obtained from the Bloomberg Terminal.



Recent academic studies also demonstrate the high price volatility of cryptocurrencies. Liu and Tsyvinski (2021) compare daily, weekly, and monthly price data between stock and cryptocurrency indices. They find that cryptocurrency returns have a much higher mean and standard deviation, as well as positive skewness and kurtosis with a high probability of extreme gains and losses. The high volatility is also associated with active trading activities, which in turn can be reflected in price movements and cause autocorrelation of returns. Researchers document that historical returns and trading volumes have significant explanatory power in predicting cryptocurrency returns over short-term periods, increasing the possibility of speculative trades (e.g., Bianchi & Dickerson, 2019; Zhang et al., 2018). The characteristics associated with speculation increase the risk of cryptocurrencies being a diversification asset. Nevertheless, previous studies mainly focus on large-cap cryptocurrencies in the stable market environment. As more companies and institutional investors have adopted Bitcoin after the Covid-19 outbreak, it remains to be empirically investigated whether cryptocurrency markets have become more stable and efficient over time. Moreover, with more small-cap cryptocurrencies emerging, it is rarely examined whether their price movements share similar features as large caps or are more driven by speculative purposes. Dogecoin, for example, was developed in 2013 as a humorous alternative to traditional cryptocurrencies. Unlike Bitcoin, which is based on supply scarcity, Dogecoin has no quantity limit and can be created quickly with copied source codes. Driven by posts on social media, the price of Dogecoin rose from around USD 0.06 to a high of nearly

USD 0.74 (more than 1,000%) from April to May 2021, making investors concerned about possible price manipulation. To capture a more comprehensive picture, research on both large and small cryptocurrencies is desired for investors to understand whether cryptocurrency markets are homogenous and efficient in terms of price drivers.

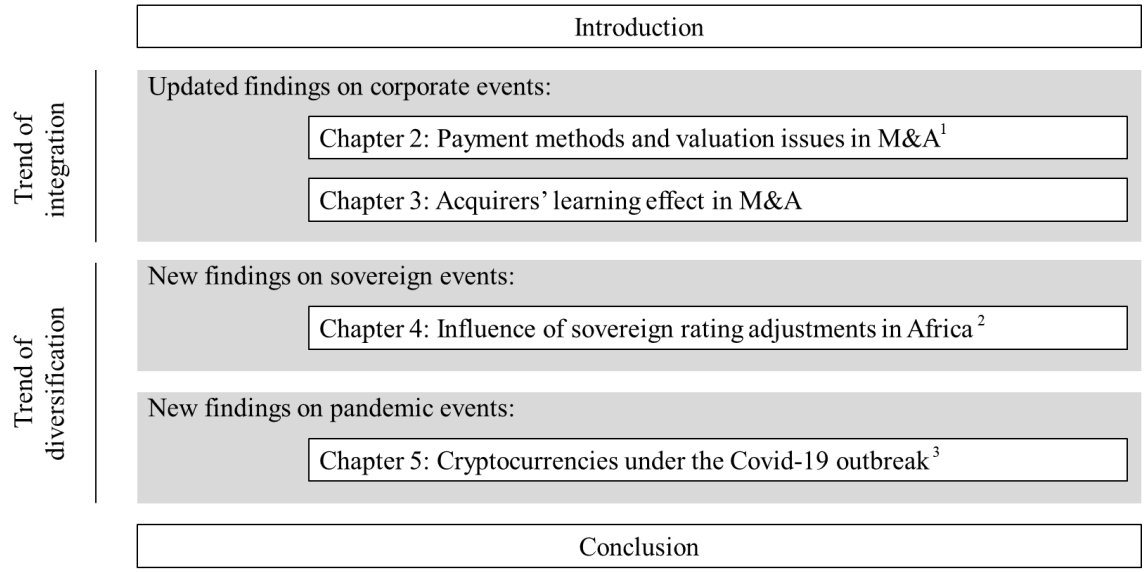
The pursuit of diversification is always on investors' agendas, especially in turbulent market times. The Covid-19 crisis has exacerbated the imbalance of geographic developments with lagging economies suffering from healthcare shortages and instability in financial systems, hampering them from economic recovery. In capital markets, although a region like Africa can provide long-term diversification value for investors, the hits by the Covid-19 have impaired investors' confidence. In addition, Africa was one of the most affected regions by sovereign rating downgrades during the pandemic, which added to the pessimistic sentiment in global capital markets toward Africa. Our objective is to examine the impact of sovereign rating adjustments using historical data and provide investors with more insights into African capital markets. On the other side of the imbalance, countries with financial strengths have pumped enormous liquidity into their economies, driving up prices for investment assets and consumer goods while economic productivity remains to catch up. Cryptocurrencies as an asset independent of central banking systems, can be beneficial in an inflationary scenario and have therefore gained more attention since the Covid-19 outbreak. Compared to traditional investment assets, cryptocurrencies are subject to excessive price volatility. In addition to the regulatory risk that can spread across cryptocurrency markets, social media sentiment can also dramatically drive their prices, especially for small caps. It is important to examine whether the risk of speculation overshadows the potential as an inflation hedge for both large and small caps of cryptocurrencies, which motivates our research.

1.2 Study design

The dissertation consists of four studies, focusing respectively on how capital markets respond to information contained in corporate, sovereign, and pandemic events. Each study has an independent structure of introduction, literature review, empirical research, and conclusion. Three of the four papers have been published in academic journals. Figure 1-3 outlines the structure of this dissertation.

Figure 1-3. Dissertation structure

This figure presents the key elements of this dissertation. [1] The paper "The rationality of M&A targets in the choice of payment methods" was published in *Review of Managerial Science*. [2] The paper "Sovereign rating announcements and the integration of African banking markets" was published in *Journal of Risk Finance*. [3] The paper "Reaktionen der Kryptowährungsmärkte auf die COVID-19-Pandemie" was published in *Corporate Finance*.



Chapter 2 analyzes M&A payment methods and valuation issues in 1,155 M&A transactions by US acquirers between 2009 and 2016. According to the efficient market theory, M&A payment methods should be irrelevant with acquirers' valuation because stock markets price in all information immediately. Nevertheless, existing studies reveal that paying with stocks is regarded as a signal for overvalued acquirers, leading to negative acquirers' abnormal returns upon M&A announcements (e.g., Eckbo et al., 1990; Hansen, 1987; Myers, 1984). The more recent literature provides different evidence as targets are not supposed to accept overvalued stocks at their disadvantage (e.g., De Bodt et al., 2019; Eckbo et al., 2018). Following these debates, this study aims to address whether acquirers' overvaluation is related to the choice of payment methods. To gain a more comprehensive understanding, we not only focus on acquirers, as has been the case in previous studies, but also extend the research to targets and investigate if their valuation issues have similar implications for M&A payment methods.

Chapter 3 focuses on a specific sector, i.e., the insurance intermediary, which has exhibited a strong integration trend over the last years. We study 197 global M&A transactions from 1995 to 2015 and identify a number of acquirers who conduct M&A quite often. Some studies observe that serial acquirers receive negative market reactions, aggravated with increasing number of transactions due to growing managerial hubris (e.g., Billett & Qian, 2008; Guest et al., 2004;

Ismail, 2008). Other research shows that serial acquirers can learn from their previous M&A experience and thus gain positive abnormal returns (e.g., Aktas et al., 2013; Macias et al., 2016a, 2016b; Morillon, 2021). For the insurance intermediary sector, where entry barriers are relatively low with respect to technological obstacles and funding requirements, this study is to examine whether acquirers' M&A experience helps them improve announcement returns and risk management, and what factors drive serial acquirers.

Chapter 4 investigates the influence of 203 African sovereign rating adjustments between 2010 and 2016 on 37 publicly listed African banks. Existing studies observe common spillover effects in developed and emerging markets, where capital markets react to one's negative sovereign rating announcements in tandem across different countries (e.g., Afonso et al., 2012; Ferreira & Gama, 2007; Ismailescu & Kazemi, 2010). However, we observe that African markets seem to be less integrated in response to sovereign rating adjustments and question whether there are differential spillover effects among African countries. As suggested by Gande and Parsley (2005), countries with significantly negatively correlated trade flows can react differently to one's sovereign downgrades. This study also examines if free trade agreements can influence spillover effects in African capital markets.

Chapter 5 examines the predictability of returns using historical data for the ten largest and ten smallest cryptocurrencies, respectively. According to previous studies, the inefficiency of cryptocurrencies, such as return autocorrelation and volume-trigged price movements, is associated with a high probability of speculation (e.g., Bianchi & Dickerson, 2019; Zhang et al., 2018). Using recent data from January 2018 to March 2020, we focus on whether the trend has changed and if there are differences in efficiency between large and small cryptocurrencies. Particularly, we also evaluate how the Covid-19 outbreak affects return patterns in cryptocurrency markets.

Chapter 6 concludes the dissertation from a general perspective, including literature contributions and practice implications. We address the importance of creating information transparency among firms, regional markets, and emerging asset classes from different groups of interests to improve the overall market efficiency.

Chapter 2: The rationality of M&A targets in the choice of payment methods[3]

This study analyzes M&A payment methods in large transactions by US acquirers between 2009 and 2016. While we find consistent with previous evidence that asymmetric information between acquirers and targets significantly influences the choice of M&A payment methods, we show that contrary to prevailing findings in the literature, acquirers cannot exploit their overvaluation through stock-financed M&A at the disadvantage of targets. In addition, when facing larger uncertainty in the counterparty's valuation, a higher percentage of cash financing is applied to reduce the associated risk. Our results document that both acquirers and targets are rational in choosing M&A payment methods.

2.1 Introduction

Prior studies provide evidence that M&A activities are closely related to the overall stock market valuation (e.g., Ang & Cheng, 2006; Rhodes-Kropf & Viswanathan, 2004; Schlingemann, 2004; Shleifer & Vishny, 2003). Under efficient information, M&A payment methods should be irrelevant as stock markets correctly price in all information to reflect firms' intrinsic value. However, many studies point out the impact of payment methods on M&A performance and interpret stock-financed M&A as a signal for overvalued acquirers, who are subsequently subject to stock price corrections (e.g., Berkovitch & Narayanan, 1990; Eckbo et al., 1990; Fishman, 1989; Hansen, 1987; Myers, 1984). In the case of stock swaps by overvalued acquirers, why would targets still accept these offers? Shleifer and Vishny (2003) explain it with market information asymmetry, where targets cannot identify acquirers' intrinsic value correctly. Besides, Rhodes-Kropf and Viswanathan (2004) observe that even rational targets would prefer stock payment when the overall stock market valuation is high. Di Giuli (2013) argues that targets' managers believe in the value creation of M&A. Therefore, they are convinced that the share price of the combined firms will develop so positively in the long term that the temporary exploitation can be accepted. However, recent literature is divided on whether acquirers' overvaluation leads to stock financing in M&A. While some studies argue in favor of the

[3] This paper was published in *Review of Managerial Science* on 20.05.2021. Authors are Michael Klitzka, Jianan He, and Dirk Schiereck. DOI: 10.1007/s11846-021-00469-6.

overvaluation hypothesis (e.g., Ben-David et al., 2015; Di Giuli, 2013; Savor & Lu, 2009; Vagenas-Nanos, 2020), De Bodt et al. (2019) and Eckbo et al. (2018) present opposed evidence. Eckbo et al. (2018) argue that targets are not likely to naively accept acquirers' overpriced shares and elaborate the rational payment design hypothesis. This hypothesis states that both firms know their own valuation but only the probability distribution over the counterparty's value. Targets have different possibilities to monitor acquirers, and the better they can assess the counterparty, the lower the dispersion of valuation estimates. Thus, better-informed targets would accept a higher percentage of stock financing in M&A, leading to fair deal terms for both parties (Eckbo et al., 2018).

Although recent literature has already examined the relationship between payment methods and valuation issues, the knowledge about "the informational implication of the medium of exchange not just on the bidder side but also on the target side" (Malmendier et al., 2016) is still limited. In this study, we follow Malmendier et al.'s (2016) call for further research and question whether acquirers can exploit their overvaluation by M&A payment methods, based on targets' unawareness or short-term horizon. We assume that both acquirers and targets are fully rational, and as a consequence, deals that involve potential equity overvaluation would be more likely paid in cash. In order to verify our assumption, we distinguish the equity overvaluation of both sides, i.e., acquirers and targets, from deal information asymmetry caused by region, industry, and public status. In addition, we control for common determinants of payment methods such as deal size and acquirers' financials. A major difference in our approach compared to prior studies is that we consider the mispricing of both acquirers and targets, whereas existing research has largely neglected the valuation capacity and bargaining power of targets in M&A payment decisions. Moreover, we examine whether the overall stock market valuation, in addition to company-specific mispricing, has an impact on the choice of payment methods. To our best knowledge, we are the first to examine Eckbo et al.'s (2018) rational payment design hypothesis and provide evidence for the irrelevance of overvaluation and M&A payment methods, and empirically prove their assumption of equal rationality between targets and acquirers.

Our results challenge prior empirical evidence that acquirers can exploit their overvaluation by paying with stocks. First, we find that acquirers' overvaluation has no significant impact on the percentage of stocks used in M&A payment. Second, we show that a higher level of acquirers' total misvaluation leads to a higher portion of cash applied to finance M&A. When

investigating targets, we find similar effects. The results show that overvaluation alone cannot influence M&A payment methods, but higher uncertainty about valuation reduces the possibility of stock payment. While targets reject overvalued acquirers' shares, acquirers do not offer stocks when they are undervalued. We explain it with equal rationality between targets and acquirers, evidenced by our finding that the probability of hiring M&A advisors is not influenced by being acquirers or targets, but rather the counterparty's action and deal features. Our findings imply that both acquirers and targets have access to counterparty's valuation and make rational decisions in choosing M&A payment methods.

We provide several implications for extant literature. First, we find new empirical evidence regarding the ongoing discussion about valuation and M&A payment methods. We find that acquirers' overvaluation has no significant impact on payment decisions. Nevertheless, acquirers' valuation can play a significant role, but not as prevailing literature suggests. We show that a higher level of total misvaluation, including under- and overvaluation, can lead to a larger percentage of cash payment to reduce the risk associated with valuation uncertainty. Second, given the assumption that targets' managers are rational, stock swaps suggest that either acquirers' market valuation correctly reflects their intrinsic value or targets may get compensated in other ways. Third, we extend our findings to targets and show that acquirers and targets follow a similar principle in choosing payment methods, i.e., a higher level of valuation uncertainty leads to a larger percentage of cash applied. We thus supplement the rational payment design hypothesis by Eckbo et al. (2018) from the counterparty's perspective.

The remainder of this paper is structured as follows. Section 2.2 reviews the two opposing hypotheses explaining M&A payment methods, namely acquirers' overvaluation and targets' rationality. Section 2.3 describes the dataset, the measures of overvaluation and misvaluation, and the empirical models applied. Section 2.4 presents and interpret the empirical findings on the determinants of payment methods and market reactions. Finally, we conclude the paper.

2.2 Literature review and hypotheses development

2.2.1 Acquirers' overvaluation and payment methods

Previous studies show evidence of highly dynamic stock prices and derive different asset pricing models to identify price-driving factors (e.g., Fama & French, 1993, 1996, 2015). Nevertheless, all these models cannot exactly capture price movements due to market under- and

overvaluation (e.g., Lin et al., 2010; Shleifer & Vishny, 1997). Following the assumption that investors are short-term oriented, firms' investment decisions should be affected by potential market overvaluation. Farhi and Panageas (2004) argue that market overvaluation often exists and has two opposing effects. On the one hand, overvaluation distorts investment decisions because of overly optimistic expectations and leads to negative outcomes. On the other hand, market overvaluation alleviates underinvestment problems by relaxing financing constraints on investment selections.

Taggart (1977) postulates that increasing economic activities are positively related to the likelihood of using stock financing. Moreover, Choe et al. (1993) find that companies increase their equity offerings, especially in expansionary periods. Similarly, Bayless and Chaplinsky (1996) show that seasoned equity offerings cluster in the period of smaller announcement discounts. Graham and Harvey (2001) extend the theory by showing that the overall market climate has an impact on firms' financing decisions. In their survey, 67% of the CFOs agree that the magnitude of equity under- or overvaluation is a crucial factor. Also, 63% of the responding CFOs agree that a higher overall stock price level can stimulate firms' equity valuation positively. This further implies that acquirers can cash out the temporary market overvaluation by offering stock-financed M&A. Shleifer and Vishny (2003) find evidence that M&A waves are associated with periods of very high stock market valuation. Based on the assumption that financial markets are inefficient, they present a theoretical model explaining M&A payment methods based on the stock misvaluation of merged firms. In their model, M&A is a form of arbitrage that rational acquirers take advantage of market inefficiency by using overvalued stocks to finance M&A. Rhodes-Kropf and Viswanathan (2004) show that even when acquirers and targets are both rational, overvalued acquirers tend to finance M&A with stocks. Rhodes-Kropf et al. (2005) report empirical evidence for the overvaluation hypothesis when isolating the misvaluation component of firms' value.

However, recent empirical research is divided on the overvaluation hypothesis. Confirming this hypothesis, Di Giuli (2013) shows that acquirers exploit short-term market overvaluation by paying with stocks. He investigates 1,187 deals between US acquirers and targets from 1990 to 2005 and uses the combined post-M&A market-to-book ratio as a proxy for overvaluation. As the result, this ratio is positively related to the use of stock payment. Moreover, Karim et al. (2016) investigate accruals-based earnings management before stock-paid M&A and find that acquirers do manage earnings to boost their valuation prior to M&A. On the contrary, they do

not find such evidence when transactions are paid in cash. Most recently, Vagenas-Nanos (2020) examines 1,456 stock-only and 896 cash-only financed M&A by US acquirers between 1985 and 2016. He shows that in a quasi-experimental design, when acquirers are more overvalued than their targets, acquirers can exploit overvaluation by financing M&A with stocks. Ben-David et al. (2015) estimate overvaluation with short interests. They find that firms with higher short interests are more likely to engage in stock swaps. Fu et al. (2013) and Akbulut (2013) find that overvalued acquirers prefer stock financing in M&A, while their shareholders suffer negative market reactions in the short term.

In contrast, Eckbo et al. (2018) find evidence against the overvaluation hypothesis. By examining 6,200 US M&A transactions from 1980 to 2014, they show a lower probability of stock-only payment in M&A when acquirers are significantly overvalued. Moreover, they find that the risk-adjusted performance of stock-paid acquirers is not significant. De Bodt et al. (2019) support their findings and argue that the overlooked change in US accounting rules is crucial for earlier interpretations of the overvaluation hypothesis. Before 2001, the "pooling of interests" method was allowed for stock swaps. Under this method, acquirers could simplify accounting procedures by fusing the accounting statements of acquirers and targets if transactions were solely paid with common stocks. De Bodt et al. (2019) investigate a sample of 4,080 M&A deals between 2001 and 2017. They find that the overvaluation measure introduced by Rhodes-Kropf et al. (2005) either loses significance or even suggests that overvalued acquirers are less likely to use stock payment in M&A.

2.2.2 Targets' rationality and payment methods

Why should targets accept stock offers if - in theory - predominantly overvalued acquirers make those offers? Shleifer and Vishny (2003) explain it as a consequence of information asymmetry, where targets cannot evaluate acquirers' intrinsic value. Moreover, they argue that targets may accept stock offers because of short-term M&A premiums and managers can liquidate stock options at a higher price. Rhodes-Kropf and Viswanathan (2004) state that "the naïve explanation that overvalued bidders wish to use stock is incomplete because targets should not be eager to accept stock". Nevertheless, they suggest that even rational targets are more likely to accept overvalued acquirers' shares if the overall market valuation is high. They argue that in overvalued stock markets, targets benefit from their high valuation while cannot fully identify acquirers' overvaluation. Based on the underestimation and the expectation of further positive market development, targets tend to accept stock payment. Di Giuli (2013) argues that targets believe

in the value creation of M&A and are therefore convinced that the long-run performance will exceed the temporary cost induced by overpriced acquirers' stocks.

In terms of rationality, Hansen (1987) draws up a theory of two-sided information asymmetry between acquirers and targets. He states that because both parties have proprietary information, acquirers will not offer stock payment when targets evaluate it too low. Targets, on the other side, use the information from offered price and payment as a signal to read acquirers' valuation. Given this, acquirers have to make offers based on targets' rationality. This theory reveals that compared to cash, stock payment pushes targets to make more efficient decisions on whether to accept M&A offers. Fishman (1989) strengthens Hansen's hypothesis and concludes that given this information asymmetry equilibrium, the probability that targets will reject stock offers is higher. Fu et al. (2013) investigate 1,319 stock-financed and 671 cash-financed M&A between 1985 and 2006 and observe that overvalued acquirers pay higher premiums and generate negative synergy effects in the short run. Their evidence implies that targets' rationality and bargaining power make acquirers less likely to take advantage of stock payment in M&A. Bi and Gregory (2011) analyze a sample of 669 M&A transactions from 1985 to 2004 and show that acquirers' overvaluation measured by price-to-value ratios increases the probability of stock payment. Nevertheless, they find that overvalued acquirers tend to buy overvalued targets with stocks, implying the rationality of both sides. Eckbo et al. (2018) provide empirical evidence based on 6,200 M&A transactions between 1980 and 2014 and find that stock financing is not significantly related to acquirers' overvaluation. Besides, the likelihood of stock offers increases only if targets are well informed about acquirers, for example, when both parties are close in terms of geography and industry. Then, the risk of getting exploited by acquirers is lower. Eckbo et al. (2018) further elaborate the rational payment design hypothesis, where both acquirers and targets know their own valuation but only the probability distribution over the counterparty's value. When targets have better information access to acquirers, they are more certain about the valuation and thus face lower risk associated with payment methods.

To strengthen their bargaining power, targets can use different strategies to fend off unattractive bids or extract higher premiums. For example, targets can apply takeover defenses such as poison pills or classified boards in hostile M&A (e.g., Bebchuk et al., 2002; Comment & Schwert, 1995; Gordon, 2002). Besides, targets can improve their market position to get more bargaining power in M&A. Ahern (2012) shows that for each dollar in pre-merger combined market equity of both firms, targets gain about 3.5 cents more than acquirers, where firms with

more unique assets gain a larger share of total M&A gains. More generally, targets can hire advisors to enhance their expertise in M&A valuation and negotiations (e.g., Ertugrul, 2015; Ismail, 2010). Ertugrul (2015) shows that targets gain 27.6% higher returns in acquirer-initiated deals with the aid of top-tier M&A advisors.

In our study, we focus on friendly M&A and assume that there is no significant difference in valuation abilities between acquirers and targets. In addition, both parties have bargaining power during the M&A process. We test this assumption with the probability of hiring M&A advisors for both parties. If this assumption holds, it implies that rational targets should accept stock payment only when the risk of getting exploited by the offered payment is low. Here, we define two sources of risk. The main risk comes from the level of acquirers' overvaluation, where larger overvaluation suggests more risk associated with stock-financed M&A, and targets would not accept overvalued stocks unless they are compensated in other ways. The second risk results from the information asymmetry between acquirers and targets. When the cost of assessing the counterparty's true value is too high, cash payment should be preferred (Fishman, 1989). Assuming targets are equally rational as acquirers and have bargaining power in friendly takeovers, we hypothesize:

H1: *In friendly M&A, acquirers cannot exploit rational targets by using overvalued stock payment. When the uncertainty of acquirers' valuation is high, a larger portion of cash payment is applied.*

On the other hand, rational acquirers should react to the uncertainty of targets' valuation in a similar way. If acquirers decide to buy possibly overvalued targets, they will prefer cash payment over stock payment. The risk of paying cash for overvalued targets is only associated with one-time financial burdens. However, with stock swaps, acquirers also bear the risk of losing corporate control, which is critical in the long term (Stulz, 1988). Among others, Faccio and Masulis (2005) show empirical evidence on 3,667 European M&A between 1997 and 2000. They find that when acquirers' voting shares are concentrated in several major shareholders, they prefer cash payment in M&A to avoid the hidden risk from targets. Thus, we hypothesize:

H2: *In friendly M&A, rational acquirers will not prefer stock payment for overvalued targets. When the uncertainty of targets' valuation is high, a larger portion of cash payment is applied.*

If the overvaluation hypothesis holds, stock markets can price in the information gained with payment methods and interpret stock financing as a sign of overvalued acquirers, which further leads to negative announcement effects for acquirers' shareholders. For example, Dong et al. (2006) find for 2,922 successful and 810 unsuccessful M&A from 1978 to 2000, acquirers' announcement returns are negatively related to stock payment but positively associated with cash payment. Moeller et al. (2004) present similar results on acquirers' abnormal returns upon M&A announcements. Interestingly, they find that acquirers who only use stock financing do not suffer negative returns, while those who apply both cash and stock financing have the largest abnormal returns.

However, following the rationality of targets, the choice of payment methods should not be viewed as a signal for overvalued acquirers, suggesting non-negative announcement effects for acquirers who only apply stock payment. Golubov et al. (2016) show that payment methods have no explanatory power in acquirers' abnormal returns and conclude that stock swaps do not destroy shareholders' value. Martynova and Renneboog (2011) investigate 2,109 European M&A between 1993 and 2001 and find that acquirers with all-cash financing get significantly positive abnormal returns (+1.03%) around M&A announcements, while acquirers paying solely with stocks receive insignificant results. Alexandridis et al. (2017) report similar results for 3,811 completed US M&A between 2010 and 2015, where acquirers who use 100% stock payment have insignificant announcement effects. Following the equal rationality of acquirers and targets, markets should not react negatively when acquirers finance M&A solely with stocks. Thus, we hypothesize:

H3: *Acquirers' abnormal returns for all-stock financed M&A are not negative upon announcements.*

2.3 Data and methods

2.3.1 Sample selection

We collect an initial sample of 12,604 completed US M&A between 2009 and 2016 from the Thomson Reuters SDC database, where all acquiring firms are publicly listed. To select the final sample, we apply the following criteria: (1) the transaction is not a hostile M&A; (2) the percentage of shares acquired after the transaction is not less than 50%; (3) the transaction volume is over USD 100 million; (4) the acquirer's stock and financial data are available for

the observation period; (5) The acquirer's market-to-book ratio is positive (Faccio & Masulis, 2005). After the screening, there are 1,155 transactions left as the final sample. Table 2-1 provides an overview of M&A payment distributions by industry and year.

Table 2-1. Sample distributions by industry and announcement year

		N	Cash	Stock	Mixed	%
Panel A: Distribution by industry SIC code						
01-09	Agriculture, forestry, and fishing	1	1	0	0	0.09
10-14	Mining	72	35	12	25	6.23
15-17	Construction	8	8	0	0	0.69
20-39	Manufacturing	499	428	14	57	43.20
40-49	Transportation and public utilities	138	88	17	33	11.95
50-51	Wholesale trade	40	32	1	7	3.46
52-59	Retail trade	33	23	5	5	2.86
60-67	Finance, insurance, and real estate	247	137	44	66	21.39
70-89	Services	117	99	3	15	10.13
91-99	Public administration	0	0	0	0	0.00
	Total	**1,155**	**851**	**96**	**208**	**100.00**
Panel B: Distribution by year						
	2009	85	48	11	26	8.29
	2010	142	103	12	27	12.56
	2011	133	101	14	18	11.18
	2012	162	128	7	27	14.75
	2013	168	122	13	33	14.06
	2014	200	153	20	27	16.01
	2015	202	141	17	44	17.40
	2016	63	55	2	6	5.76
	Total	**1,155**	**851**	**96**	**208**	**100.00**

In our sample, the manufacturing sector accounts for 43.20% of all transactions, followed by the financial sector with 21.39%. These two sectors take approximately two-thirds of the sample. The number of transactions shows a general uptrend from 2009 to 2015 but a significant decrease in 2016, partially triggered by the regulation from the US Treasury Department against tax inversion in cross-border M&A transactions. The regulation was aimed to punish firms who reduce tax burdens by acquiring overseas subsidiaries. M&A payment methods show a strong preference for cash. Of the total 1,155 transactions, 73.59% are financed solely with cash, leaving 26.41% of the sample at least partially financed with stocks. Approximately 8.31% of the transactions are stock swaps, where no cash payment is involved. This distribution is consistent with the findings of De Bodt et al. (2015). They observe that since 2001 as the *US Statements of Financial Accounting Standards*[4] were changed, where the pooling payment method for

[4] The relevant contents can be found in *No. 141 Business Combinations* and *No. 142 Goodwill and Other Intangibles*.

M&A was dropped, the number of solely stock-financed M&A declined significantly from around 62% in 2000 to approximately 10% in 2010.

2.3.2 Overvaluation and misvaluation measures

Following existing studies, we measure stock overvaluation by applying the excess value approach[5] and the industry-adjusted market-to-book ratio suggested by Lin et al. (2010). Following Berger and Ofek (1995), we calculate the first overvaluation indicator by the excess value of the firm as:

$$EXVIA_{i,t} = \ln\left(\frac{CPTL_{i,t}}{I(CPTL)_{i,t}}\right), \tag{2-1}$$

where *CPTL* is the firm's total capital, which is the market value of equity plus the book value of debt; *I(CPTL)* is the imputed value derived by the firm's size (market cap) multiplying the median capital to size ratio in its industry. A larger *EXVIA* implies that the firm is valued at a higher level compared to the industry median. In order to calculate the industry data, the initial sample of 12,604 public US acquiring firms between 2009 and 2016 is applied. We intentionally use acquiring firms but not all listed firms due to the comparability reason, which enables us to exclude the effect that firms have different possibilities to conduct M&A. We also consider the absolute term |*EXVIA*| as an indicator of misvaluation, where a higher level suggests a larger variation compared to peers.[6]

As the second overvaluation indicator, we follow Lin et al. (2010) and adjust the market-to-book ratio by the industry median:

$$MBIA_{i,t} = \ln\left(\frac{MB_{i,t}}{Med(MB)_{i,t}}\right), \tag{2-2}$$

where *MB* is the firm's market-to-book ratio and *Med (MB)* is the industry median. For the industry data, the same sample of 12,604 US acquiring firms is applied. Similar to |*EXVIA*|, we also apply the absolute term |*MBIA*| as an indicator of uncertainty in valuation, where a higher level suggests a larger variation compared to peers.

As mentioned in the literature review, several papers point out that the overall market valuation can influence corporate financing decisions (e.g., Choe et al., 1993; Taggart, 1977).

[5] After being introduced by Berger and Ofek (1995), the excess value approach is commonly used in academic studies as an indicator of overvaluation (e.g., Dos Santos et al., 2008; Jiraporn et al., 2006; Lin et al., 2010; Pantzalis & Park, 2009).

[6] As a supplement measure of misvaluation, we also apply $EXVIA^2$ to investigate both ends of *EXVIA*.

Rhodes-Kropf and Viswanathan (2004) observe that targets tend to accept stock payment when the overall market valuation is high. Following the momentum concept of Fama and French (1993), we proxy the market trend by:

$$MACRO_{i,t} = \ln\left(\frac{BUS(-1)}{BUS(-12)}\right), \tag{2-3}$$

where *BUS* refers to the market valuation, measured by the total return index of a country's leading stock index, e.g., the S&P 500 index for US firms. Besides, -1 and -12 refer to 1 and 12 months before the M&A announcement, respectively. The larger the *MACRO* indicator is, the higher the market price level compared to one year ago.

Finally, we use *MI* as an index that combines all three valuation indicators described above. *MI* is constructed as:

$$MI_{i,t} = \frac{1}{N}\frac{1}{K}\sum_{k}^{K} RANK(VAL_{i,t}), \tag{2-4}$$

where *RANK* is the rank function, which assigns a rank within each *VAL* indicator and a higher rank implies a larger level of overvaluation or misvaluation. *VAL* refers to the available valuation measures for the firm. In specific, we apply *EXVIA*, *MBIA*, and *MACRO* for the overvaluation index *MI-overvaluation*, while |*EXVIA*|, |*MBIA*|, and *MACRO* for the misvaluation index *MI-mispricing*. We also add *MACRO* to misvaluation based on the argument that if the overall market valuation is high, investors may be less cautious about detecting the true value. However, under a market downturn, investors tend to make more careful investment decisions and firms are less likely mispriced. *MI* is calculated for each firm by the average of available ranks $\frac{1}{K}\sum_{k}^{K} RANK(VAL_{i,t})$ divided by the total number of firms *N*. Lin et al. (2010) argue that the index combining several valuation measures can provide a more comprehensive picture by balancing out their shortcomings and aggregating the information.

In addition to the valuation issue, previous studies also show that the information asymmetry between acquirers and targets also influences the choice of payment methods (e.g., Choe et al., 1993; Eckbo et al., 2018; Fishman, 1989). In specific, cash payment is preferred when the effort to evaluate the counterparty's intrinsic value is too high. To predict the risk of information asymmetry, we follow Faccio and Masulis (2005) and Eckbo et al. (2018) using deal-specific features as follows. *Cross-industry* is a binary variable equal to 1 if acquirers and targets are from different industries, measured by two-digit SIC codes (Drees et al., 2013). *Cross-border* is a binary variable equal to 1 if acquirers and targets are from different countries. *Unlisted*

target is a binary variable equal to 1 if targets are privately held. We anticipate that information asymmetry is larger when acquirers and targets have more regional and industry differences and less information from public markets.

To investigate the influence of valuation on the choice of M&A payment methods, we apply the two-boundary Tobit regression model[7] on the dependent variable *cash payment (%)*, which is the percentage of cash applied to finance the deal. It equals 1 if the transaction is 100% paid by cash and 0 if it is solely financed with stocks, where the percentage of cash payment is obtained from the Thomson Reuters SDC deal synopsis when available, otherwise manually collected from the SEC filings. For regressions, a general model is of the form:

$$Cash\ payment\ (\%)_i = \hat{\alpha}_{1,i} + \hat{\alpha}_{2,i} + \sum_{j=1}^{m} \hat{\beta}_{j,i} Var_{j,i} + \varepsilon_i, \qquad (2\text{-}5)$$

where $\hat{\alpha}_{1,i}$ is the first intercept and $\hat{\alpha}_{2,i}$ is the log-standard deviation of the latent variable. As independent variables, we test the above-mentioned valuation measures while controlling for information asymmetry proxied by deal-specific characteristics. Besides, we also consider acquirers' financials and other deal-related features. *Dividend-to-assets* is the dividend payout ratio to capture cash-rich firms (e.g., Denis et al., 1994; Jensen, 1986; Martin, 1996). *Leverage* is measured by the sum of total debt and deal value divided by the sum of total assets and deal value (Faccio & Masulis, 2005). *Collateral* is calculated by the ratio of property, plant, and equipment to total assets. *Return-on-equity* presents firms' profitability, and the standalone *market-to-book* ratio predicts firms' growth potential (Martin, 1996; Smith & Watts, 1992). *Closely held shares* imply how concentrated acquirers' shares are allocated. We also apply the following deal-related variables. *Relative deal size* is the ratio of deal size divided by the sum of deal size and acquirers' market cap (Raudszus et al., 2014). *CAR [-40; -1]* is the abnormal price reaction prior to M&A announcements, implying acquirers' stock run-up. Here we use the market model (*MM*) and the Fama and French three-factor model (*FF*) that are explained in the next section. Detailed variable descriptions are provided in Appendix A1.

Table 2-2 summarizes the descriptive statistics of the sample. The differences between 100% cash-financed and 100% stock-financed M&A are tested for statistical significance, where we do not include the mixed payment and thus cannot gather the full information of payment

[7] Faccio and Masulis (2005) recommend this regression model for the choice of payment methods where the percentage of cash financing is limited to [0, 1].

methods. From the preliminary tests, we find that acquirers' and targets' overvaluation and misvaluation measures show significant differences between all-cash and all-stock deals. Nevertheless, various measures tend to capture different information. In particular, *EXVIA* and *MI-overvaluation* are lower for cash acquirers while *MBIA* shows the opposite. |*EXVIA*| and *MI-mispricing* are larger for cash acquirers while |*MBIA*| is insignificant. And the results show similar trends for targets. Here, we argue that *EXVIA* and |*EXVIA*| contain the information of both equity and debt value relative to industry peers, whereas *MBIA* and |*MBIA*| only reveal the market price of equity, which can lead to different results. Notably, through these preliminary tests, we identify significant differences between how overvaluation and misvaluation are associated with payment methods and will further investigate these issues in the following sections. Moreover, all-cash acquirers are larger by total assets and pay more dividends. The financial leverage is significantly higher for all-stock acquirers as well as the number of shares held by concentrated shareholders. As for deal value, all-cash deals are smaller in both absolute and relative terms. The proxies for asymmetric information all indicate that the level of information asymmetry between acquirers and targets is higher in all-cash deals.

Table 2-2. Summary of statistics

This table presents the summary statistics of 1,155 M&A from 2009 to 2016 for all-cash (N=851), all-stock (N=96), and mixed (N=208) financed M&A. The t-test (mean) and Wilcoxon rank-sum test (median) are applied to the differences between all-cash and all-stock M&A. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A1.

	Mean	Median	SD	Δ Mean cash – stock	Δ Median cash – stock
Panel A: All-cash financed M&A (N=851)					
Acquirers' overvaluation (N=851)					
EXVIA	-0.52	-0.60	0.41	-0.23***	-0.30***
MBIA	0.32	0.27	0.67	0.21***	0.32***
MACRO	0.09	0.11	0.14	0.01	-0.01
MI-overvaluation	0.49	0.49	0.15	-0.05***	-0.05***
Acquirers' misvaluation (N=851)					
|EXVIA|	0.61	0.63	0.29	0.24***	0.29***
|MBIA|	0.53	0.41	0.52	-0.04	-0.04
MI-mispricing	0.51	0.51	0.15	0.05***	0.05***
Targets' overvaluation (N=191)					
EXVIA	-0.84	-0.82	0.20	-0.14***	-0.12***
MBIA	0.21	0.15	1.01	-0.01	0.10
MACRO	0.08	0.09	0.15	0.00	-0.01
MI-overvaluation	0.47	0.48	0.17	0.02***	0.01***
Targets' misvaluation (N=191)					
|EXVIA|	0.87	0.83	0.19	0.17***	0.12***
|MBIA|	0.53	0.25	0.70	0.17*	0.11*
MI-mispricing	0.54	0.55	0.15	0.08***	0.09***

Continued on next page

Table 2-2. continued

	Mean	Median	SD	Δ Mean cash – stock	Δ Median cash – stock
Acquirers' financials					
Total assets ($mil)	30,818	7,645	98,925	17,321***	3,895***
Dividends ($mil)	678	116	1,537	406***	62***
Leverage	0.45	0.37	0.62	-0.28***	-0.15***
Collateral	0.26	0.15	0.26	-0.06**	-0.06
Return-on-equity	0.22	0.20	0.43	0.09	0.09
Market-to-book	3.39	2.21	7.27	1.50***	0.88***
Closely held shares	8.00	1.52	14.02	-5.84***	-4.02***
Deal-related features					
Relative deal size	0.14	0.07	0.19	-0.21***	-0.26***
Deal value ($mil)	1,030	420	1,863	-1,279**	-169**
CAR [-40; -1] (MM)	-0.01	-0.01	0.08	-0.01	0.00
CAR [-40; -1] (3F)	-0.01	-0.01	0.08	-0.01	0.00
Asymmetric information (binary)					
Cross-industry	0.59			0.25***	
Cross-border	0.23			0.14***	
Unlisted target	0.80			0.50***	
Panel B: All-stock financed M&A (N=96)					
Acquirers' overvaluation (N=96)					
EXVIA	-0.28	-0.30	0.34		
MBIA	0.11	-0.04	0.70		
MACRO	0.09	0.11	0.19		
MI-overvaluation	0.54	0.54	0.16		
Acquirers' misvaluation (N=96)					
|EXVIA|	0.37	0.34	0.24		
|MBIA|	0.57	0.45	0.43		
MI-mispricing	0.46	0.46	0.14		
Targets' overvaluation (N=64)					
EXVIA	-0.71	-0.71	0.21		
MBIA	0.22	0.05	0.61		
MACRO	0.08	0.11	0.18		
MI-overvaluation	0.45	0.47	0.19		
Targets' misvaluation (N=64)					
|EXVIA|	0.70	0.71	0.22		
|MBIA|	0.36	0.14	0.42		
MI-mispricing	0.46	0.46	0.15		
Acquirers' financials					
Total assets ($mil)	13,498	3,749	28,749		
Dividends ($mil)	272	54	856		
Leverage	0.74	0.51	0.80		
Collateral	0.33	0.22	0.33		
Return-on-equity	0.13	0.11	0.17		
Market-to-book	1.88	1.33	1.53		
Closely held shares	13.83	5.54	18.92		
Deal-related features					
Relative deal size	0.36	0.34	0.22		
Deal value ($mil)	2,309	590	5,481		
CAR [-40; -1] (MM)	-0.01	0.00	0.09		
CAR [-40; -1] (3F)	-0.01	0.00	0.09		
Asymmetric information (binary)					
Cross-industry	0.34				
Cross-border	0.10				
Unlisted target	0.29				

Continued on next page

Table 2-2. continued

	Mean	Median	SD	Δ Mean cash – stock	Δ Median cash – stock
Panel C: Mixed financed M&A (N=208)					
Acquirers' overvaluation (N=208)					
EXVIA	-0.40	-0.46	0.39		
MBIA	0.35	0.21	0.84		
MACRO	0.06	0.10	0.19		
MI-overvaluation	0.52	0.50	0.15		
Acquirers' misvaluation (N=208)					
|EXVIA|	0.49	0.48	0.29		
|MBIA|	0.62	0.43	0.66		
MI-mispricing	0.47	0.47	0.15		
Targets' overvaluation (N=87)					
EXVIA	-0.76	-0.72	0.22		
MBIA	0.22	0.15	0.57		
MACRO	0.04	0.09	0.23		
MI-overvaluation	0.51	0.51	0.15		
Targets' misvaluation (N=87)					
|EXVIA|	0.75	0.72	0.23		
|MBIA|	0.34	0.15	0.38		
MI-mispricing	0.44	0.42	0.18		
Acquirers' financials					
Total assets ($mil)	19,078	5,343	37,553		
Dividends ($mil)	437	83	1,130		
Leverage	0.78	0.58	1.14		
Collateral	0.34	0.22	0.32		
Return-on-equity	0.21	0.17	0.22		
Market-to-book	3.70	1.87	9.01		
Closely held shares	12.97	6.71	16.99		
Deal-related features					
Relative deal size	0.30	0.24	0.23		
Deal value ($mil)	3,043	900	6,569		
CAR [-40; -1] (MM)	-0.01	-0.02	0.09		
CAR [-40; -1] (3F)	0.00	-0.01	0.09		
Asymmetric information (binary)					
Cross-industry	0.53				
Cross-border	0.12				
Unlisted target	0.59				

2.3.3 Event study

To investigate whether acquirers' stock financing is viewed as a signal for overvaluation by investors, the event study following MacKinlay (1997) is applied. The expected return of firm *i* on day *t* is calculated by the market model as:

$$E(R_{i,t}) = \hat{\alpha}_i + \hat{\beta}_i * R_{m,t} + \varepsilon_{i,t}, \quad (2\text{-}6)$$

where R_m refers to the return of the S&P500 index for US acquirers. The period to estimate $\hat{\alpha}_i$ and $\hat{\beta}_i$ is [-257; -6], meaning the corresponding days prior to the M&A announcement. To test the robustness, the Fama and French (1993) three-factor model is applied:

$$E(R_{i,t}) - r_f = \hat{\alpha}_i + \hat{b_i} * (r_{m,t} - r_f) + \hat{b}_{s,i} * SMB_t + \hat{b}_{v,i} * HML_t + \varepsilon_{i,t}. \quad (2\text{-}7)$$

In this model, r_f is the risk-free rate and r_m is the return of the market portfolio. *SMB* and *HML* measure the excess returns of small caps over big caps and of value stocks over growth stocks, respectively.[8] The abnormal return is calculated as the difference between the realized return and the expected return:

$$AR_{i,t} = R_{i,t} - E(R_{i,t}). \quad (2\text{-}8)$$

The cumulative abnormal return (*CAR*) of stock *i* during the event window $[\tau_1; \tau_2]$ is calculated as:

$$CAR_{i,[\tau_1;\tau_2]} = \sum_{t=\tau_1}^{\tau_2} AR_{i,t}. \quad (2\text{-}9)$$

Finally, for a sample of *N* observations, the average cumulative abnormal return (*CAAR*) is derived by:

$$CAAR_{[\tau_1;\tau_2]} = \frac{1}{N}\sum_{i=1}^{N} CAR_{i,[\tau_1;\tau_2]}. \quad (2\text{-}10)$$

To identify the determinants of stock market reactions to M&A announcements, the ordered logit regression model is applied. Harrington and Shrider (2007) argue that it is a better way to analyze abnormal returns compared to ordinary least squares (OLS) regression due to significantly increased deviations around the event. Here, we first divide acquirers' CARs into quantiles and assign them discrete scores as follows: 1 if the CAR is lower than the first quantile; 2 if it is between the first and the second quantile; 3 if it is between the second and the third quantile; and 4 if it is higher than the third quantile. Then, we run regressions on the scores (*S*) of CARs with the independent variables explained in Section 2.3.2.

$$S(CAR_i) = \hat{\alpha}_i + \sum_{j=1}^{m} \hat{\beta}_{j,i} Var_{j,i} + \varepsilon_i. \quad (2\text{-}11)$$

2.4 Empirical results on payment methods

2.4.1 Targets' rationality and payment methods

To test the first hypothesis that overvalued acquirers cannot exploit rational targets in the choice of payment methods, we first verify the rationality of targets in terms of hiring transaction

[8] Data for the daily US Fama and French three factors are obtained from the website https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

advisors. Following Ertugrul (2015), who finds that top-tier advisors can help targets with valuation and negotiations in M&A, we investigate whether there are differences between acquirers and targets when hiring top-tier advisors. We divide M&A advisors into top-tier and others by their market shares and identify the biggest five investment banks as top-tier advisors (Ertugrul, 2015; Golubov et al., 2012). According to Bloomberg (2017), Goldman Sachs, Morgan Stanley, Bank of America Merrill Lynch, JP Morgan, and Citigroup are identified as top-tier M&A advisors. In line with Golubov et al. (2012), we classify deals, in which at least one advisor is one of these five banks, as consulted by a top-tier advisor. For the final sample of 1,155 transactions, we collect the information of advisors from the Thomson Reuters SDC deal synopsis when available, otherwise manually collected from the SEC filings. According to the available data, 930 targets have M&A advisors, out of which 361 are top-tier advisors; 736 acquirers are advised, out of which 358 are from top-tier M&A advisors. The high percentage of top-tier advisors can be attributed to our sample selection, where we only include the deal volume over USD 100 million.

Table 2-3 shows the results of logit regressions on the binary variable *top-tier advisor*, which equals 1 if the firm has a top-tier M&A advisor and 0 otherwise. Each transaction has two observations of advisors, one on the acquirer side and the other on the target side, making 2,310 total observations. The binary variable *acquirer* equals 1 if the observation refers to the acquirer side. *Opposite advisor* is a binary variable that equals 1 if the opposite party hires an advisor regardless of being the top-tier or not. The results show that hiring a top-tier advisor does not depend on being acquirer or target, supported by the insignificant coefficients of *acquirer* in all models. Nevertheless, if the counterparty is advised, it is more likely for the observed firm to hire a top-tier advisor. In addition, our results show negative coefficients for cross-industry deals, particularly under the industry-fixed effect. It implies that when firms are from different industries, both parties are less likely to hire top-tier advisors. However, when the industrial information is homogeneous, the involved parties tend to explore their bargaining power with the aid of top-tier investment banks. We also find that for larger deals, firms tend to hire top-tier advisors, partially attributed to the self-selection issue, where big banks actively pitch for large deals. Based on these results, we conclude that targets are as rational as acquirers in terms of hiring M&A advisors and should not be at a disadvantage in professional knowledge of M&A valuation and negotiations.

Table 2-3. Rationality in hiring top-tier M&A advisors

This table presents the results of logit regressions on the top-tier advisor as 1, otherwise 0. Robust z-statistics are given in parentheses. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A1.

	Model (1)	Model (2)	Model (3)	Model (4)
Acquirer	-0.164	-0.165	-0.157	-0.156
	(-1.610)	(-1.619)	(-1.562)	(-1.562)
Opposite advisor	1.115***	1.116***	1.113***	1.109***
	(7.900)	(7.935)	(7.979)	(7.982)
Cross-industry	-0.286***	-0.279***	-0.168*	-0.163*
	(2.785)	(2.736)	(1.691)	(1.650)
Cross-border	-0.101	-0.106	-0.071	-0.078
	(-0.782)	(-0.834)	(-0.565)	(-0.627)
(ln) Deal value	1.525***	1.529***	1.460***	1.468***
	(13.671)	(13.867)	(13.522)	(13.744)
Fixed year	Yes	No	Yes	No
Fixed industry	Yes	Yes	No	No
Constant	-5.847***	-5.905***	-5.723***	-5.840***
	(-14.615)	(-16.942)	(-15.306)	(-18.382)
Observations	2,310	2,310	2,310	2,310
Pseudo R^2	0.152	0.153	0.133	0.134

After verifying the assumption, we investigate the relationship between acquirers' overvaluation and the percentage of cash financing in M&A. Table 2-4 shows the results of Tobit regressions where the dependent variable *cash payment (%)* ranges from 0 to 1. The observations are reduced to 1,150 due to data availability. The results show that acquirers' overvaluation measures are insignificant in all models, indicating that acquirers' overvaluation is unrelated to M&A payment methods. We argue that when acquirers are overvalued and the overvaluation can be identified with accessible information, they have little opportunity to cash out through M&A payment methods. We support De Bodt et al. (2019) and Eckbo et al. (2018) that targets do not naively accept overvalued stock payment and further explain targets' rationality as follows: if targets are aware of acquirers' overvaluation, they would either not accept stock financing or be compensated in other ways, such as M&A premiums, leading the percentage of cash payment unrelated to acquirers' overvaluation.

Table 2-4. Payment methods and acquirers' overvaluation

This table presents the results of Tobit regressions on the percentage of cash applied to finance M&A. Robust t-statistics are given in parentheses. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A1.

	Model (1)	Model (2)	Model (3)	Model (4)
Acquirers' overvaluation				
EXVIA	-0.006			
	(-0.044)			
MBIA		0.043		
		(0.474)		
MACRO			0.141	
			(0.411)	
MI-overvaluation				-0.193
				(-0.561)
Asymmetric information				
Cross-industry	0.241***	0.241***	0.239***	0.243***
	(2.861)	(2.866)	(2.832)	(2.886)
Cross-border	0.186	0.181	0.187	0.188
	(1.577)	(1.530)	(1.580)	(1.589)
Unlisted target	0.723***	0.724***	0.722***	0.722***
	(7.571)	(7.617)	(7.610)	(7.612)
Acquirers' financials				
(ln) Total assets	0.345***	0.353***	0.343***	0.349***
	(2.947)	(3.303)	(3.290)	(3.323)
Dividend-to-assets	0.514	0.486	0.514	0.532
	(1.085)	(1.030)	(1.092)	(1.125)
Leverage	0.098	0.097	0.098	0.100
	(1.098)	(1.092)	(1.105)	(1.120)
Collateral	0.194	0.190	0.190	0.213
	(1.178)	(1.192)	(1.189)	(1.301)
Return-on-equity	-0.053	-0.063	-0.054	-0.046
	(-0.496)	(-0.577)	(-0.502)	(-0.427)
Market-to-book	0.007	0.005	0.007	0.008
	(0.960)	(0.494)	(0.959)	(1.042)
Closely held shares	-0.007***	-0.007***	-0.007***	-0.007***
	(-2.738)	(-2.744)	(-2.729)	(-2.764)
Deal-related features				
Relative deal value	-1.111***	-1.061***	-1.119***	-1.116***
	(-3.699)	(-3.659)	(-4.221)	(-4.217)
(ln) Deal value	-0.504***	-0.515***	-0.502***	-0.505***
	(-3.952)	(-4.161)	(-4.167)	(-4.181)
CAR [-40; -1] (MM)	-0.695	-0.718	-0.700	-0.677
	(-1.517)	(-1.559)	(-1.530)	(-1.474)
Fixed year	Yes	Yes	Yes	Yes
Fixed industry	Yes	Yes	Yes	Yes
Constant	-0.779	-0.860	-0.721	-0.731
	(-0.768)	(-0.950)	(-0.818)	(-0.831)
Sigma	0.945***	0.945***	0.945***	0.945***
	(16.629)	(16.628)	(16.629)	(16.629)
Observations	1,150	1,150	1,150	1,150
Pseudo R^2	0.255	0.255	0.255	0.255

In terms of deal-related information asymmetry, we find that *cross-industry* and *unlisted target* are significantly positively related to *cash payment (%)*. It implies that if acquirers and targets are from different industries, a larger portion of cash payment is applied to reduce the risk caused by industrial information asymmetry. As for targets who are not publicly listed, there is a possibility that targets' managers want to cash out from M&A, and acquirers can reduce the risk of losing control by paying with cash. According to our results, acquirers' total assets are positively related to *cash payment (%)*, while shares held by block-holders (*closely held shares*) show significant negative coefficients. We explain that for larger firms, whose shares are distributed more decentralized, cash financing is preferred in M&A. It can be attributed to the high complexity of stock payment in terms of operating costs and regulatory requirements. The negative signs of *deal value* imply that in larger deals, both absolutely and relatively, a lower percentage of cash is applied. We argue that the complexity of M&A increases with larger transactions. Therefore, acquirers would use a higher portion of stock financing to share the risk of future performance with targets. Our findings support Hansen's (1987) risk-sharing theory and are in line with Faccio and Masulis (2005) that partial stock payment is often used in large deals.

Generally, we find that overvalued acquirers cannot take advantage of payment methods based on targets' rationality. Although targets can leverage their information to evaluate acquirers' equity and make reasonable decisions in M&A, information asymmetry still affects how certain they are about valuation estimates. In this content, larger variations in acquirers' *EXVIA* and *MBIA* can imply higher risk levels. Therefore, we apply the absolute terms of *EXVIA* and *MBIA* to measure acquirers' misvaluation. Besides, *MI-mispricing* that combines |*EXVIA*|, |*MBIA*|, and *MACRO* is applied as a misvaluation index explained in Section 2.3.2. We also apply $EXVIA^2$ as a supplement indicator to test if both ends of *EXVIA* can influence payment decisions. Table 2-5 shows the results of payment methods related to uncertainty in acquirers' valuation.

Table 2-5. Payment methods and acquirers' misvaluation

This table presents the results of Tobit regressions on the percentage of cash applied to finance M&A. Robust t-statistics are given in parentheses. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A1.

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Acquirers' mispricing					
|EXVIA|	0.834***				
	(4.664)				
$EXVIA^2$		0.785***			
		(4.608)			
|MBIA|			-0.213		
			(-1.443)		
MACRO				0.146	
				(0.420)	
MI-mispricing					0.482**
					(2.205)
Asymmetric information					
Cross-industry	0.251***	0.281***	0.259***	0.266***	0.268***
	(-3.134)	(3.372)	(3.062)	(3.120)	(3.155)
Cross-border	0.151	0.177	0.216*	0.208*	0.199*
	(1.266)	(1.516)	(1.811)	(1.742)	(1.666)
Unlisted target	0.711***	0.650***	0.661***	0.660***	0.665***
	(7.713)	(7.054)	(7.060)	(7.026)	(7.080)
Acquirers' financials					
(ln) Total assets	0.392***	0.379***	0.328***	0.347***	0.373***
	(3.750)	(3.555)	(3.093)	(3.284)	(3.468)
Dividend-to-assets	0.746**	-0.098	0.650	0.468	0.472
	(2.354)	(-0.933)	(1.317)	(0.980)	(0.995)
Leverage	0.097	0.669	0.092	0.082	0.076
	(1.179)	(1.430)	(1.014)	(0.922)	(0.851)
Collateral	0.380**	0.075	0.212	0.191	0.209
	(2.382)	(0.862)	(1.310)	(1.178)	(1.293)
Return-on-equity	-0.103	0.354**	-0.036	-0.049	-0.066
	(-1.080)	(2.196)	(-0.333)	(-0.455)	(-0.608)
Market-to-book	0.010	0.009	0.020*	0.007	0.006
	(1.550)	(1.140)	(1.910)	(0.941)	(0.739)
Closely held shares	-0.008***	-0.009***	-0.008***	-0.008***	-0.008***
	(-3.166)	(-3.335)	(-2.760)	(-2.744)	(-2.853)
Deal-related features					
Relative deal value	-1.053***	-1.096***	-1.159***	-1.116***	-1.044***
	(-4.247)	(-4.083)	(-4.308)	(-4.167)	(-3.851)
(ln) Deal value	-0.524***	-0.552***	-0.526***	-0.542***	-0.563***
	(-4.724)	(-4.583)	(-4.307)	(-4.434)	(-4.565)
CAR [-40; -1] (MM)	-0.835*	-0.782*	-0.692	-0.698	-0.739
	(-1.813)	(-1.731)	(-1.494)	(-1.507)	(-1.595)
Fixed year	Yes	Yes	Yes	Yes	Yes
Fixed industry	Yes	Yes	Yes	Yes	Yes
Constant	-1.397	-1.252	-0.427	-0.660	-1.103
	(-1.540)	(-1.379)	(-0.475)	(-0.740)	(-1.184)
Sigma	0.923***	0.929***	0.954***	0.956***	0.955***
	(16.321)	(16.660)	(16.618)	(16.613)	(16.618)
Observations	1,150	1,150	1,150	1,150	1,150
Pseudo R^2	0.268	0.266	0.251	0.249	0.260

According to Table 2-5, we find that the mispricing measures |*EXVIA*|, $EXVIA^2$, and *MI-mispricing* are highly significant, and their positive signs indicate that a higher level of acquirers' misvaluation leads to a larger portion of cash financing. |*EXVIA*| contains the information of acquirers' equity and debt relative to industry peers and therefore can reveal a more comprehensive view compared to |*MBIA*|, which only reflects the market price of equity. |*MBIA*| and *MACRO* show no significant influence on payment methods, suggesting that acquirers' price multiples and the historical market development are insignificant for targets' decisions. The deal-relate proxies for information asymmetry, namely *cross-industry* and *unlisted target* are robust and positively related to *cash payment (%)*. Other controlling factors such as *total assets*, *closely held shares*, and *deal value* show consistency.

Our results support Rhodes-Kropf and Viswanathan's (2004) statement that "the naïve explanation that overvalued bidders wish to use stock is incomplete because targets should not be eager to accept stock". Based on our findings of acquirers' overvaluation and misvaluation, we supplement Eckbo et al.'s (2018) evidence that although overvaluation should not be related to the choice of payment methods, the uncertainty about acquirers' valuation makes targets prefer cash payment to stock payment. We explain it by the two-sided information asymmetry theory according to Hansen (1987) and Fishman (1989), implying that when valuation uncertainty is high, cash payment allows both sides to reduce the risk associated with non-public information and avoid the excess cost of finding out the counterparty's true value. Moreover, based on the assumption that both parties are rational, while targets decline overvalued acquirers' stocks, undervalued acquirers would not offer stock payment in the first place.

2.4.2 Acquirers' rationality and payment methods

Following the two-sided information asymmetry theory, acquirers should react to targets' overvaluation and misvaluation in a similar way when choosing payment methods. Under this assumption, we build a subsample of transactions that include publicly listed targets to address the call of Malmendier et al. (2016) for further research on targets' valuation. As shown in Table 2-2, there are 342 transactions included in the subsample. We apply the same measures for targets' overvaluation by *EXVIA*, *MBIA*, *MACRO*, and *MI-overvaluation* and misvaluation by |*EXVIA*|, |*MBIA*|, *MACRO*, and *MI-mispricing*. We also test the supplement information contained in $EXVIA^2$. Besides, we add two relative overvaluation indicators *rel. EXVIA* and *rel. MBIA*, calculated by the difference between the respective acquirers' and targets' overvaluation measures, where a larger number indicates that acquirers are more overpriced than targets. We

calculate *rel. |EXVIA|* and *rel. |MBIA|* as the sum of the respective acquirers' and targets' mispricing measures, based on the consideration that larger variations in acquirers' and targets' mispricing should increase their valuation risks but not be offset.

Table 2-6 shows the results of Tobit regressions on *cash payment (%)* and targets' overvaluation. The results are similar as in Table 2-4. Combining the results of these two tables, we conclude that neither acquirers nor targets can take advantage of payment methods based on the insignificant relationship between their overvaluation measures and the percentage of cash used to finance M&A. These findings offer a new perspective to the two-sided information asymmetry theory (Fishman, 1989; Hansen, 1987) that both parties in M&A are rational based on the information they obtain about the counterparty. We also supplement the latest findings of Eckbo et al. (2018) and De Bodt et al. (2019) where they focus more on targets' rationality and prove the insignificant relationship between payment methods and acquirers' overvaluation. Based on the fact that M&A decisions are made through a multi-stage negotiation process and both parties can leverage the information they acquire during the process (Officer, 2007), the decision of M&A payment methods should not lead to a significant advantage for one party at the other's cost. In this context, the relative measures of overvaluation, which suggest whether acquirers are more overpriced than targets, are also insignificant related to payment methods. We prove the robustness that *cross-border* transactions and acquirers' *total assets* are positively related to the percentage of cash paid, whereas larger *deal value* leads to a higher portion of stock payment. In addition, acquirers' *leverage* is significantly positively related to cash financing when we control for targets' overvaluation. We explain this finding by the implied interaction effect, i.e., acquirers' leverage is interactive with their overall valuation and thus shows no significant effect in Table 2-4. When combined with targets' overvaluation in Table 2-6, positive signs indicate that acquirers with higher leverage may have better access to debt markets. They may prefer to issue new debt to fund M&A with cash for additional leverage benefits without diluting their shares with targets' shareholders.

Table 2-6. Payment methods and targets' overvaluation

This table presents the results of Tobit regressions on the percentage of cash applied to finance M&A. Robust t-statistics are given in parentheses. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A1.

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Targets' overvaluation						
EXVIA	-0.420					
	(-0.907)					
MBIA		0.041				
		(1.171)				
MACRO			0.153			
			(0.317)			
MI-overvaluation				-0.000		
				(-0.000)		
Asymmetric information						
Rel. EXVIA					-0.384	
					(-1.672)	
Rel. MBIA						-0.044
						(-1.227)
Cross-industry	0.215	0.247*	0.219	0.183	0.212	0.245*
	(1.571)	(1.793)	(1.589)	(1.353)	(1.544)	(1.782)
Cross-border	0.582**	0.565**	0.577**	0.540**	0.533**	0.570**
	(2.533)	(2.482)	(2.478)	(2.396)	(2.323)	(2.502)
Acquirers' financials						
(ln) Total assets	0.562***	0.573***	0.565***	0.603***	0.749***	0.562***
	(2.724)	(2.754)	(2.716)	(2.918)	(3.067)	(2.713)
Dividend-to-assets	3.108	2.739	3.042	2.861	3.173	2.599
	(1.156)	(1.026)	(1.123)	(1.074)	(1.179)	(0.970)
Leverage	0.313**	0.309**	0.329**	0.327**	0.368**	0.309**
	(2.045)	(2.020)	(2.152)	(2.191)	(2.380)	(2.020)
Collateral	-0.174	-0.212	-0.233	-0.242	-0.127	-0.216
	(-0.565)	(-0.701)	(-0.765)	(-0.798)	(-0.410)	(-0.713)
Return-on-equity	0.263	0.272	0.263	0.269	0.240	0.284
	(1.495)	(1.542)	(1.487)	(1.557)	(1.360)	(1.604)
Market-to-book	-0.007	-0.008	-0.007	-0.008	-0.004	-0.005
	(-0.674)	(-0.712)	(-0.653)	(-0.726)	(-0.397)	(-0.487)
Closely held shares	-0.002	-0.003	-0.002	-0.001	-0.001	-0.003
	(-0.435)	(-0.597)	(-0.348)	(-0.185)	(-0.243)	(-0.605)
Deal information						
Relative deal value	-1.865***	-1.812***	-1.911***	-1.708***	-1.498**	-1.865***
	(-3.463)	(-3.353)	(-3.547)	(-3.187)	(-2.559)	(-3.483)
(ln) Deal value	-0.614***	-0.641***	-0.607***	-0.671***	-0.760***	-0.630***
	(-2.902)	(-2.982)	(-2.860)	(-3.155)	(-3.193)	(-2.959)
CAR [-40; -1] (MM)	-0.402	-0.482	-0.419	-0.386	-0.460	-0.458
	(-0.557)	(-0.667)	(-0.578)	(-0.545)	(-0.635)	(-0.635)
Fixed year	Yes	Yes	Yes	Yes	Yes	Yes
Fixed industry	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-2.910*	-2.728	-2.632	-2.871*	-4.085**	-2.620
	(-1.702)	(-1.612)	(-1.555)	(-1.683)	(-2.097)	(-1.553)
Sigma	0.867***	0.866***	0.870***	0.851***	0.867***	0.866***
	(10.538)	(10.544)	(10.539)	(10.566)	(10.545)	(10.545)
Observations	341	341	341	341	341	341
Pseudo R^2	0.334	0.336	0.333	0.336	0.338	0.336

Table 2-7. Payment methods and targets' misvaluation

This table presents the results of Tobit regressions on the percentage of cash applied to finance M&A. Robust t-statistics are given in parentheses. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A1.

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
Targets' mispricing							
|EXVIA|	0.772*						
	(1.957)						
$EXVIA^2$		0.488*					
		(1.736)					
|MBIA|			0.169				
			(1.208)				
MACRO				0.153			
				(0.317)			
MI-mispricing					0.716		
					(1.629)		
Asymmetric information							
Rel. |EXVIA|						1.185***	
						(4.541)	
Rel. |MBIA|							0.086
							(0.877)
Cross-industry	0.176	0.220	0.228*	0.219	0.176	0.229*	0.235*
	(-1.351)	(1.617)	(1.669)	(1.589)	(1.369)	(1.773)	(1.714)
Cross-border	0.576**	0.596**	0.574**	0.577**	0.603***	0.541**	0.570**
	(2.444)	(2.589)	(2.508)	(2.478)	(2.730)	(2.464)	(2.494)
Acquirers' financials							
(ln) Total assets	0.576***	0.560***	0.567***	0.565***	0.599***	0.700***	0.557***
	(2.691)	(2.726)	(2.734)	(2.716)	(3.028)	(3.387)	(2.685)
Dividend-to-assets	2.909	3.166	3.038	3.042	2.721	3.087	3.125
	(1.377)	(1.186)	(1.134)	(1.123)	(1.065)	(1.246)	(1.155)
Leverage	0.284*	0.297*	0.321**	0.329**	0.303**	0.227	0.319**
	(1.830)	(1.950)	(2.112)	(2.152)	(2.109)	(1.573)	(2.093)
Collateral	-0.143	-0.146	-0.242	-0.233	-0.244	0.182	-0.246
	(-0.418)	(-0.478)	(-0.800)	(-0.765)	(-0.846)	(0.612)	(-0.810)
Return-on-equity	0.256*	0.266	0.266	0.263	0.243	0.258	0.254
	(1.791)	(1.519)	(1.516)	(1.487)	(1.463)	(1.544)	(1.443)
Market-to-book	-0.007	-0.007	-0.007	-0.007	-0.007	-0.001	-0.010
	(-0.729)	(-0.680)	(-0.677)	(-0.653)	(-0.702)	(-0.114)	(-0.899)
Closely held shares	-0.001	-0.002	-0.001	-0.002	0.000	-0.005	-0.002
	(-0.229)	(-0.426)	(-0.297)	(-0.348)	(0.037)	(-1.179)	(-0.402)
Deal information							
Relative deal value	-1.589**	-1.827***	-1.822***	-1.911***	-1.577***	-1.353**	-1.878***
	(-2.483)	(-3.409)	(-3.373)	(-3.547)	(-3.082)	(-2.583)	(-3.489)
(ln) Deal value	-0.658***	-0.619***	-0.615***	-0.607***	-0.657***	-0.708***	-0.611***
	(-2.994)	(-2.937)	(-2.901)	(-2.860)	(-3.242)	(-3.407)	(-2.877)
CAR [-40; -1] (MM)	-0.279	-0.333	-0.455	-0.419	-0.339	-0.363	-0.411
	(-0.394)	(-0.461)	(-0.630)	(-0.578)	(-0.497)	(-0.520)	(-0.570)
Fixed year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-3.125*	-2.821*	-2.803*	-2.632	-3.259**	-5.167***	-2.724
	(-1.806)	(-1.679)	(-1.650)	(-1.555)	(-2.008)	(-2.926)	(-1.608)
Sigma	0.823***	0.863***	0.867***	0.870***	0.825***	0.814***	0.868***
	(10.979)	(10.544)	(10.543)	(10.539)	(10.858)	(10.607)	(10.541)
Observations	341	341	341	341	341	341	341
Pseudo R^2	0.337	0.337	0.336	0.333	0.337	0.368	0.334

In Table 2-7, we further investigate targets' misvaluation measures and find that targets' |*EXVIA*|, $EXVIA^2$, and *rel.* |*EXVIA*| are significantly positively related to the percentage of cash paid in M&A. We address the similar conclusion as for Table 2-5, i.e., a higher level of targets' misvaluation can also lead to a larger portion of cash payment. Our results indicate that both parties are rational and would reduce the risk associated with the counterparty's valuation by using cash financing in M&A. In addition, we find that the relationship between *cash payment (%)* and *rel.* |*EXVIA*| is positive with high statistical significance. As mentioned, *rel.* |*EXVIA*| represents the combined mispricing level of acquirers and targets. The positive sign indicates that transactions with higher total mispricing are financed with a larger portion of cash, adding more evidence to the two-sided information asymmetry theory. We do not find significant results on |*MBIA*| and *MACRO* for targets either, while demonstrating the robustness of other influencing factors, such as *cross-border*, *total assets*, *leverage*, and *deal value*.

2.4.3 Signal of payment methods for investors

Following the rationality of acquirers and targets, we investigate how investors interpret the information about payment methods through acquirers' abnormal returns. In Table 2-8, we observe significant positive abnormal returns for cash-financed M&A but insignificant results for stock swaps. Based on these results, we cannot derive that stock payment is a signal of overvalued acquirers on stock markets. The findings are in line with Martynova and Renneboog (2011) and Alexandridis et al. (2017) that acquirers who pay solely with stocks get insignificant announcement effects. In our sample, for the event window [-5; +5], acquirers with mixed payment receive the highest average abnormal returns of 2.55% according to the market model. Followed by cash acquirers, who earn about 1.22% over the same period. The results of the Fama and French three-factor model are consistent with those of the market model. Our findings agree with Betton and Eckbo (2000) that the mixed payment of cash and stock generates the highest announcement returns for acquirers' shareholders. We argue that investors read the choice of payment methods as an indicator of acquirers' financial strength combined with risk-sharing expectation. With cash payment, acquirers show that they have sufficient free cash flow, while a portion of stock payment enables acquirers to share the risk of future performance and create a long-term joint incentive with targets.

Table 2-8. Market reactions to M&A payment methods

This table shows the mean and median of acquirers' CARs. The t-test (mean) and Wilcoxon rank-sum test (median) are applied. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively, with p-values shown in secondary rows.

Event window	Cash N=851		Stock N=96		Mixed N=208		All transactions N=1,155	
	Mean p-value	Median p-value	Mean p-value	Median p-value	Mean p-value	Median p-value	Mean p-value	Median p-value
Market model								
[-5; +5]	1.219%	0.696%	1.000%	-0.137%	2.550%	1.590%	1.441%	0.763%
	0.000***	0.000***	0.228	0.719	0.001***	0.001***	0.000***	0.000***
[-1; +1]	1.198%	0.454%	0.436%	-0.628%	1.664%	0.944%	1.218%	0.480%
	0.000***	0.000***	0.546	0.412	0.002***	0.004***	0.000***	0.000***
[-1; 0]	0.637%	0.167%	-0.044%	-0.811%	0.406%	-0.006%	0.539%	0.119%
	0.000***	0.000***	0.942	0.137	0.349	0.616	0.000***	0.003***
Fama and French three-factor model								
[-5; +5]	1.139%	1.139%	1.030%	-0.181%	2.530%	1.228%	1.380%	0.529%
	0.000***	0.000***	0.189	0.623	0.001***	0.002***	0.000***	0.000***
[-1; +1]	1.168%	0.376%	0.384%	-0.402%	1.677%	0.781%	1.195%	0.380%
	0.000***	0.000***	0.582	0.425	0.002***	0.003***	0.000***	0.000***
[-1; 0]	0.609%	0.115%	-0.107%	-0.589%	0.394%	0.182%	0.511%	0.068%
	0.000***	0.000***	0.857	0.145	0.349	0.513	0.000***	0.005***

Table 2-9 shows the results of ordered logit regressions on acquirers' CARs. We observe that larger *cash payment (%)* is significantly associated with a higher quantile of acquirers' abnormal returns for the shortest event windows. However, this effect fades for the longer event window [-5; +5]. It supports the event study results that all-cash acquirers get positive CARs but does not disagree that stock payment triggers non-negative effects. Huang et al. (2016) find that cash deals are more likely to be successful, which further explains the more positive market reactions upon M&A announcements. Our results of payment methods on acquirers' CARs are consistent with Moeller et al. (2005), Martynova and Renneboog (2011), and Danbolt and Maciver (2012). Furthermore, acquiring *unlisted targets* leads to higher abnormal returns for acquirers. This finding is in line with Faccio et al. (2006) and Officer (2007), based on the fact that unlisted firms suffer an average acquisition discount of 15% to 30% to comparable publicly traded targets due to the illiquidity issue (Officer, 2007). We also find that acquirers' *total assets* are negatively related to their CARs for the event windows [-1; +1] and [-5; +5], which can be interpreted that investors see fewer synergy effects for big firms through M&A and thus react less positively. Homberg et al. (2009) report a similar result by showing that the absolute size of acquirers is negatively related to short-term M&A performance.

Table 2-9. Determinants of market reactions

This table presents the results of ordered logit regressions on acquirers' CARs of the market model. Robust t-statistics are given in parentheses. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A1.

	CAR [-1; 0]			***CAR [-1; +1]***			***CAR [-5; +5]***		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
Cash payment (%)	0.668***	0.672***	0.551**	0.513**	0.502**	0.495**	0.016	0.004	-0.045
	(3.083)	(3.054)	(2.388)	(2.527)	(2.423)	(2.216)	(0.079)	(0.020)	(-0.209)
Asymmetric information									
Cross-industry	-0.019	-0.035	-0.012	0.078	0.072	0.027	-0.067	-0.062	-0.044
	(0.168)	(0.313)	(0.105)	(-0.709)	(-0.644)	(-0.234)	(-0.621)	(-0.572)	(-0.398)
Cross-border	-0.250*	-0.234*	-0.264**	-0.060	-0.041	-0.071	0.032	0.068	0.026
	(-1.903)	(-1.772)	(-1.979)	(-0.483)	(-0.325)	(-0.557)	(0.243)	(0.501)	(0.196)
Unlisted target	0.430***	0.423***	0.442***	0.494***	0.493***	0.472***	0.633***	0.643***	0.631***
	(3.106)	(2.995)	(3.151)	(3.606)	(3.540)	(3.403)	(4.637)	(4.670)	(4.608)
Acquirers' financials									
(ln) Total assets	-0.177	-0.147	-0.117	-0.490***	-0.474***	-0.473***	-0.315***	-0.332***	-0.291**
	(-1.547)	(-1.276)	(-0.963)	(-4.196)	(-4.038)	(-3.890)	(-2.753)	(-2.864)	(-2.450)
Dividend-to-assets	0.795	0.831	0.807	-0.254	-0.210	-0.188	-0.020	-0.020	0.074
	(1.384)	(1.491)	(1.380)	(-0.285)	(-0.242)	(-0.212)	(-0.029)	(-0.029)	(0.108)
Leverage	-0.173	-0.143	-0.186	-0.237	-0.225	-0.212	-0.255*	-0.259*	-0.251*
	(-1.204)	(-1.058)	(-1.210)	(-1.585)	(-1.544)	(-1.433)	(-1.761)	(-1.801)	(-1.741)
Collateral	-0.060	-0.025	0.039	-0.054	-0.032	0.096	-0.062	-0.056	0.020
	(-0.275)	(-0.112)	(0.152)	(-0.242)	(-0.139)	(0.374)	(-0.290)	(-0.264)	(0.081)
Return-on-equity	-0.180	-0.149	-0.213	-0.027	-0.000	-0.013	-0.044	-0.044	-0.064
	(-0.799)	(-0.682)	(-0.955)	(-0.100)	(-0.000)	(-0.049)	(-0.206)	(-0.221)	(-0.312)
Market-to-book	0.020	0.018	0.021*	0.013	0.011	0.013	0.025**	0.025**	0.026***
	(1.644)	(1.441)	(1.713)	(0.866)	(0.792)	(0.916)	(2.509)	(2.512)	(2.648)
Closely held shares	0.002	0.003	0.002	0.003	0.004	0.004	0.006	0.007	0.006
	(0.433)	(0.784)	(0.370)	(0.682)	(1.033)	(0.931)	(1.355)	(1.514)	(1.397)
Deal information									
Relative deal value	0.872**	0.887**	1.077**	0.477	0.440	0.418	0.377	0.350	0.440
	(2.063)	(2.084)	(2.439)	(1.067)	(0.970)	(0.916)	(0.978)	(0.891)	(1.081)
(ln) Deal value	-0.087	-0.109	-0.181	0.209	0.211	0.189	0.217	0.242	0.175
	(-0.560)	(-0.687)	(-1.113)	(1.292)	(1.291)	(1.136)	(1.418)	(1.556)	(1.120)
Constant cut 1	-2.243**	-2.101*	-1.858	-4.671***	-4.573***	-17.859***	-3.150***	-3.269***	-2.852***
	(-2.073)	(-1.888)	(-1.637)	(-4.370)	(-4.153)	(-12.110)	(-2.990)	(-2.960)	(-2.637)
Constant cut 2	-1.099	-0.948	-0.705	-3.532***	-3.427***	-16.712***	-2.020*	-2.135*	-1.718
	(-1.017)	(-0.852)	(-0.621)	(-3.319)	(-3.126)	(-11.346)	(-1.921)	(-1.937)	(-1.591)
Constant cut 3	0.045	0.206	0.450	-2.368**	-2.254**	-15.535***	-0.875	-0.984	-0.570
	(0.042)	(0.185)	(0.396)	(-2.232)	(-2.062)	(-10.588)	(-0.832)	(-0.893)	(-0.527)
Fixed year	No	Yes	No	No	Yes	No	No	Yes	No
Fixed industry	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150	1,150
Adjusted R^2	0.017	0.021	0.021	0.022	0.026	0.027	0.017	0.019	0.018

2.5 Conclusion

We present new evidence regarding the relationship between the choice of M&A payment methods and acquirers' overvaluation. The extant literature is divided on this issue, with some studies suggesting that acquirers' overvaluation increases the percentage of stock financing in M&A (e.g., Rhodes-Kropf et al., 2005; Rhodes-Kropf & Viswanathan, 2004; Shleifer & Vishny, 2003), while others, especially recent studies such as Eckbo et al. (2018) and De Bodt et al. (2019), find that overvalued acquirers are less likely to pay solely with stocks. This debate is particularly important because the assumption that stock swaps suggesting acquirers' overvaluation can lead to immediate and long-run price corrections (Vagenas-Nanos, 2020).

Based on our sample, which includes 1,155 completed M&A transactions from public US acquirers between 2009 and 2016, we show that acquirers and targets are both rational in terms of hiring M&A advisors. Given that both sides act rationally, we examine the determinants of payment methods with a focus on their valuation. While acquirers' overvaluation shows no significant impact, the measures of misvaluation and proxies for information asymmetry are positively related to the percentage of cash used to finance M&A. Our findings are consistent with the rational payment design hypothesis by Eckbo et al.'s (2018) that acquirers' overvaluation has no effect on payment methods. Moreover, we extend our study to targets' valuation and find that for both parties, the larger the misvaluation, the higher percentage of cash is applied to reduce the risk of valuation uncertainty. Furthermore, applying the event study approach, we provide evidence that stock payment is not a signal of overvalued acquirers to market participants.

Our results imply that neither acquirers nor targets can take advantage of their valuation deviations through M&A payment methods. Based on our results, there are several practical implications for involved firms and investors. First, due to the rationality of acquirers and targets, firms can consider stock financing as a valid option in M&A and should not concern about negative market reactions. Second, reducing information asymmetry between acquirers and targets increases the likelihood of stock payment. It further implies that acquirers who intend to use their stocks to finance M&A should actively create information transparency. Third, highly qualified transaction advisors can be valuable for both parties in M&A valuation and negotiations. Finally, investors cannot easily regard stock-financed M&A as a signal of overvalued

acquirers. In practice, acquirers' overvaluation can be offset by acquisition premiums where targets are not disadvantaged.

Following existing studies, we provide new insights into the discussion of M&A payment methods and overvaluation and raise the following questions for further research. For example, to what extent can transaction advisors help avoid overvalued acquirers or targets in M&A negotiations? And if acquisition premiums are higher when overvalued acquirers choose stock payment?

Chapter 3: Are serial acquirers better risk controllers?

This study explains M&A at the firm level in the insurance intermediary sector. By analyzing global insurance intermediary M&A transactions from 1995 to 2015, we identify a large number of serial acquirers and find that they gain higher CARs than occasional acquirers regardless of M&A deal structures. Our results suggest that serial acquirers are firms with greater growth potential and lower leverage. Most importantly, these firms exhibit low pre-M&A information asymmetry as represented by stock price volatility and idiosyncratic volatility. Serial acquirers are also good at managing risk during the M&A process and show a strong learning effect.

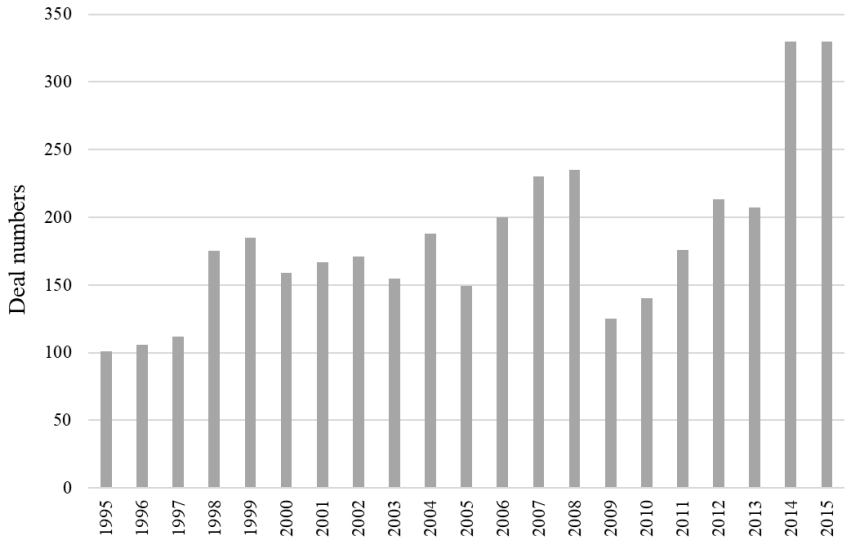
3.1 Introduction

According to the Thomson Reuters SDC database, Arthur J. Gallagher & Co., a US based international insurance broker, completed around 330 M&A worldwide from 1995 to 2015. As one of the companies that have built its own expertise in M&A, its stock price has appreciated approximately 400% during the same period. Not merely individual firms, insurance intermediaries generally show an increasing interest in M&A activities. Figure 3-1 shows the preliminary 3,864 observations of insurance intermediary M&A from 1995 to 2015, in which approximately one-third of acquirers has completed multiple transactions during this period. With a relatively small number of companies in the sector, why do some insurance intermediaries conduct M&A so frequently?

According to the report by Conning (2005), entry barriers of the insurance intermediary sector are relatively low with respect to technological obstacles and funding requirements. However, firms' intangible assets, such as customer coverages and partnerships with other financial institutions, are decisive for the success of insurance intermediaries. These resources need to be either accumulated over a long time period or integrated externally through M&A activities. Moreover, the emergence of insur-tech firms, broadly referring to technology-based firms focusing on insurance products and distributions, has a large impact on the sector (Swiss Re, 2016). Insur-tech firms can customize and distribute insurance products through online channels at a lower cost, forcing traditional brokers to defend their market shares more efficiently. Existing and emerging competition pressures among insurance intermediaries contribute to the consolidation trend in the sector.

Figure 3-1. Global insurance intermediary M&A 1995 – 2015

This figure presents 3,845 completed global insurance intermediary M&A from 01.01.1995 to 31.12.2015. Data are obtained from the Thomson Reuters SDC database with either the acquirer's or target's primary SIC code as 6411, referring to insurance agents, brokers, and services.



Macias et al. (2016a) focus on the different types of acquirers and find that a group of acquirers undertake a very large number of US M&A transactions from 1884 to 2013. They further divide these serial acquirers into sprinters and marathoners, where the first group conducts M&A intensively over a short time window and the second group participates in M&A more regularly. They explain that sprinters may take advantage of short-term valuation benefits, whereas marathoners are more likely motivated by firms' long-term strategic growth needs. Harford (2005) argues that the strong demand alone is not sufficient to trigger intensive M&A activities. There must be enough capital liquidity to support the reallocation process, making firms with large cash flow more likely to become serial acquirers. Nevertheless, previous studies show that when cash-rich firms prefer to conduct M&A rather than pay dividends, it causes negative stock market reactions due to agency problems and management hubris (e.g., Gao, 2011; Harford, 1999; Oler et al., 2008; Yang et al., 2019). Particularly for serial acquirers, many studies observe that acquirers' abnormal returns decline as the number of M&A transactions increases, which can be attributed to growing management hubris at the expense of shareholder interests (e.g., Billett & Qian, 2008; Guest et al., 2004; Ismail, 2008).

There are also different findings on serial acquirers. Fuller et al. (2002) show that when serial acquirers buy private targets, shareholders benefit from positive market reactions. Boubakri et al. (2012) add that shareholders earn higher abnormal returns when acquirers conduct five or

more M&A transactions, in which targets are domestic or privately held firms. Aktas et al. (2013) argue that knowledge gained from previous M&A helps serial acquirers improve their valuation techniques, leading to higher CARs upon M&A announcements. Macias et al. (2016a, 2016b) also find evidence for the learning hypothesis that serial acquirers improve bidding strategies and increase the acquiring speed over time.

The controversies about serial acquirers motivate us to investigate whether acquirers with more experience in M&A outperform others and what factors determine their active participation in M&A activities. Analyzing global insurance intermediary M&A from 1995 to 2015, we find that compared to occasional acquirers, serial acquirers gain significantly positive CARs around M&A announcements. Regardless of deal characteristics, such as the public status of targets and payment methods, the more experienced acquirers are associated with larger CARs. These findings show the opposite evidence of managerial hubris. We find support for Golubov et al. (2015) that M&A announcement returns can be explained at the firm level rather than deal level, where some acquirers obtain consistently better results than others without specific deal structures applied. In addition, our findings supplement Golubov et al. (2015) that serial acquirers can be the outperforming ones in the insurance intermediary sector. Our results also complement existing studies by identifying that firms with lower risk profiles, proxied by lower stock price volatility and idiosyncratic volatility, as well as larger growth potential, proxied by higher market-to-book and lower leverage ratios, are often serial acquirers. We also add evidence to Aktas et al. (2013) and Macias et al. (2016a, 2016b) that with the increasing deal order, serial acquirers can significantly shorten the acquiring procedure, proxied by the number of days between M&A announcement and execution, indicating that they learn from previous experience and improve risk management during the M&A process.

We collect a sample of global insurance intermediaries that are affected by different market conditions to examine the common characteristics in the sector. In order to differentiate specific risk from market risk, we apply the measure of idiosyncratic volatility in addition to general volatility. Many studies prove that idiosyncratic volatility is a proxy for information asymmetry between firms and investors (e.g., Ang et al., 2009; Bali & Cakici, 2008; Han & Lesmond, 2011; Herskovic et al., 2016). We verify that both risk measures are significantly negatively related to M&A decisions, indicating that firms with lower risk levels are more active acquirers. Moreover, we find that M&A transactions do not increase the firm's specific risk for serial acquirers. To our best knowledge, this study offers a new perspective of the relationship

between firms' information transparency and M&A decisions. In addition, previous studies often relate acquirers' market-to-book and leverage ratios to their announcement returns but not directly to M&A decisions (e.g., Martin, 1996; Rajan & Zingales, 1995; Rhodes-Kropf et al., 2005). Our research reveals that firms with high growth needs may use M&A more often to enlarge their market shares, especially in the services sector. In turn, utilizing external resources further expands their growth potential.

The remainder of the paper is structured as follows. Section 3.2 addresses the relevant literature and hypothesis. Section 3.3 describes the data and methodology. Section 3.4 illustrates the findings on serial acquirers. Section 3.5 concludes the paper.

3.2 Literature and hypothesis

In the literature, there is no clear definition of serial acquirers. Fuller et al. (2002) use a sample of US acquirers who complete at least five bids within three years. They find that from 1990 to 2000, serial acquirers get significantly negative CARs when buying public targets, especially if targets are paid with stocks. Nevertheless, serial acquirers get significant positive market reactions when buying private or subsidiary targets regardless of payment methods. Their findings show that serial acquirers are quite common in the US, where announcement effects are driven by deal structures but not their experience in M&A. Differently, Guest et al. (2004) focus on UK acquirers who conduct more than one M&A from 1984 to 1998. They find that the status of being serial acquirers and the number of transactions are both negatively related to acquirers' CARs. Their results show that the decline in performance is more pronounced for acquirers who conduct M&A shortly after the previous acquisition and find evidence for managerial hubris that can be attributed to, e.g., less careful with subsequent M&A or higher premiums being paid. Billett and Qian (2008) further investigate the relation between serial acquisitions and management overconfidence. Using a sample of US acquirers between 1985 and 2002, they find that each acquirer conducts approximately 1.5 deals on average. They define serial acquirers as those who acquire more than one public target within five years. The results show that the first M&A deal of serial acquirers captures no significant CARs, whereas the subsequent ones bring negative announcement effects. Their findings also reveal that acquirers who become overconfident from successful acquisitions are more likely to continuously acquire new firms, implying that managers develop their hubris with growing M&A experience. Ismail (2008) confirms that successful first-time bidders suffer from hubris behavior in following

M&A transactions, suggested by decreasing CARs as deal orders increase. Different from other studies, he also compares serial acquirers with occasional acquirers, who only conduct one acquisition in the sample of US public acquirers from 1985 to 2004. He notes that serial acquirers significantly underperform irrespective of deal characteristics, e.g., payment methods and target public status.

Recent studies find more support for the learning hypothesis, suggesting that firms gradually improve their decision-making process and performance. According to the learning hypothesis, there should be a positive learning curve to observe (Yelle, 1979). With respect to M&A, serial acquirers are expected to learn from prior experience, leading to improved announcement effects as deal orders increase. Macias et al. (2016b) observe that serial acquirers often use different payment methods from one acquisition to the other for strategic reasons, such as to exploit their market valuation or optimize the capital structure. Their results suggest that announcement effects do not depend on specific payment methods as serial acquirers improve their bidding strategies over transactions. Aktas et al. (2011) find that learning-by-doing can also make acquirers assess expected synergies more accurately in subsequent M&A and increase the probability of completing transactions. Aktas et al. (2013) investigate US acquirers who complete at least two M&A from 1992 to 2009 and confirm the learning curve for acquirers in finding proper targets. They measure the number of days between two successive M&A transactions as a proxy for acquisition speed and find that the abnormal days between transactions significantly drop over M&A sequences. Their evidence implies that increased synergy effects dominate integration costs as acquirers conduct more transactions. Moreover, the transaction speed is accelerated when the current transaction has similar deal characteristics as previous ones.

Some studies differentiate serial acquirers and observe different announcement effects. Macias et al. (2016a) categorize acquirers by the total number of transactions as well as the intensity and length of time windows to conduct M&A. They define four different types of acquirers in the sample of US publicly listed acquirers between 1984 and 2013, namely loners, occasional acquirers, sprinters, and marathoners, where the latter two groups belong to serial acquirers. They observe that approximately 11% of the acquirers complete around half of all transactions, either in a concentrated time window as sprinters or regularly over a long period as marathoners. The results show that acquirers' size and efficiency measures are positively related to the total number of transactions, implying that efficient acquirers are those who

conduct M&A more frequently, i.e., the marathoners. They also find that serial acquirers improve their growth potential and accelerate M&A speed over transaction sequences, supporting the learning hypothesis. Differently, sprinters are less motivated by external growth needs but rather market timing, particularly active during the dot-com bubble and subject to high stock price volatility. Morillon (2021) further investigates announcement effects among different types of acquirers for US acquirers between 1979 and 2016. The results show that sprinters suffer declining returns as deal numbers increase and even get negative announcement effects in their later deals. He explains that sprinters are more likely driven by overvaluation and eager to capitalize on temporary benefits. In doing so, they are inevitably subject to stock price corrections due to hasty investments. On the contrary, marathoners do not suffer decreasing returns over M&A deals. He confirms the learning effect for marathoners, who conduct M&A more frequently to gain external growth.

According to the literature, serial acquirers can have different motives to conduct M&A. For instance, managers are desired to build larger firms or take advantage of temporary overvaluation on stock markets. The empire-building motivation is often associated with managerial hubris, where managers conduct M&A without carefully selecting targets and effectively negotiating deal agreements. As for market-timing, acquirers who undertake M&A concentratedly over a short time period are also likely to exhibit similar characteristics. Evidence shows that these acquirers often generate negative abnormal returns when announcing M&A because investors expect fewer synergies but burdens for shareholders. Differently, acquirers who make strategic moves based on external growth needs are associated with positive market reactions. Following the learning hypothesis, these serial acquirers continuously improve their M&A skills in finding appropriate targets, making reasonable offerings, and controlling risks during transactions. As for the insurance intermediary sector with low entry barriers and high peer competition, firms are more likely motivated by the demand for resource integration. As mentioned earlier, intangible assets such as product and customer coverages are crucial in the sector and can be acquired externally. In addition, compared to other industries, financial services firms generally have lower valuation multiples. As of January 2021, financial services (non-bank and non-insurance) in the US stock market have a current price-to-earnings ratio of approximately 24 times, while the total market’s ratio is around 110 times on average for more

than 7,500 listed companies.[9] As part of the financial services industry, insurance intermediaries are less likely to have high valuation that opportunistic acquirers can monetize through M&A transactions. On the contrary, they are more motivated by strategic needs to defend their market shares under high competition in the sector. We thus hypothesize: *Serial acquirers in the insurance intermediary sector gain positive announcement effects and show a positive learning curve over their M&A sequences.*

3.3 Data and methods

3.3.1 Data

This paper investigates insurance intermediary M&A in different markets from 1995 to 2015. To specify our observations, we apply the following criteria in the Thomson Reuters SDC database: (1) the M&A announcement is disclosed between 01.01.1995 and 31.12.2015; (2) either the acquirer's or target's primary SIC code is 6411, referring to insurance agents, brokers, and services; (3) the transaction is completed. After the preliminary screening, there are 3,854 global transactions left. For further empirical studies, we include the restrictions as follows: (4) the acquirer is publicly listed with a current valid ISIN number; (5) the acquirer owns the target less than 50% before and more than 50% after the transaction; (6) the deal value is published and larger than one million, measured in USD. These filters ensure that the observation is a matter of ownership change and could impact the market value of acquirers, improving the comparability among global markets. There are 479 transactions left after the second screening. To clean up the sample, we exclude illiquid stocks[10] and those without enough historical stock data. The remaining 240 transactions are examined for confounding events[11] in the LexisNexis database. Eventually, we remove 25 deals because of confounding events and 18 deals due to lack of market four-factor data from the AQR database[12]. The final sample contains 197 global insurance intermediary M&A between 1995 and 2015. The steps of sample selection are presented in Table 3-1. Final observations are distributed worldwide, covering 28 countries in total,

[9] Data are obtained from http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/pedata.html.

[10] We consider stocks with more than 20% of daily returns equal to zero over the time windows [-267; -6] and [-5; +5], respectively, as illiquid stocks, where day 0 is the M&A announcement.

[11] We consider confounding events as, e.g., other M&A, a significant change in firm structure, a credit rating change, and involvement in a severe legal prosecution during the event window [-5; +5].

[12] The factor data are obtained and explained on the AQR website https://www.aqr.com/library/data-sets.

including both developed and emerging markets. US acquirers account for approximately 50% of the sample, followed by European countries with around 25%. In addition, Japan and Australia each represent about 9% of the sample. The remaining observations are scattered distributed across the globe.

Table 3-1. Sample selection

Selection criteria	Remaining number of observations (N)
Preliminary observations	3,854
Public acquirers with deal value > USD 1 million	479
Liquid stocks with enough trading history	240
No confounding events	215
Available four-factor data from AQR	197

We define serial acquirers as those who complete at least two transactions in the final sample (N=197) or five transactions in the preliminary observations (N=3,854). Occasional acquirers conduct only one transaction in the final sample and fewer than five transactions in the preliminary observations. The major difference between the final sample and the preliminary observations is due to limitations in the comparability of deal size and stock data availability. With this sorting method, we supplement existing studies by not only focusing on the final sample but drawing a broader scope to identify who has more expertise in M&A. Table 3-2 reports the summary statistics of acquiring firms grouped by M&A deal structures, financial data, and home country features. Panel A of Table 3-2 shows all 197 acquirers, where some are lack of financial and country data. Combined with Panel B, serial acquirers are significantly less engaged in *cross-industry* deals. This means serial acquirers tend to buy firms with similar business scope to generate horizontal synergy effects. Moreover, they are more active in acquiring *cross-border* and *public targets* than occasional acquirers. These characteristics suggest that serial acquirers are also more likely to enter into transactions with higher regional risk and deal with public shareholders. We observe the opposite evidence from Boubakri et al. (2012), who find that serial acquirers conduct domestic deals and buy private targets more often to achieve larger announcement returns. Moreover, our sample shows that there is no significant difference of payment methods between serial and occasional acquirers, which disproves the assumption that serial acquirers tend to cash out their overvaluation by paying with stocks.

Table 3-2. Summary statistics of acquirers

This table presents the summary statistics of 197 insurance intermediary M&A from 1995 to 2015 for all (Panel A) and serial acquirers (Panel B). The t-test (mean) and Wilcoxon rank-sum test (median) are applied to examine the difference between serial and occasional acquirers. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A2.

	N	Mean	Median	SD	Δ Mean serial – occasional	Δ Median serial – occasional
Panel A: All acquirers						
Deal structures						
Cross-industry	197	0.40	0.00	0.49		
Cross-border	197	0.31	0.00	0.46		
Cash payment	197	0.51	1.00	0.50		
Public target	197	0.10	0.00	0.30		
Deal size/ total assets	191	0.28	0.04	1.23		
Acquirers' financials						
Total assets ($mil)	191	54,091	1,981	172,370		
Total debt/ total assets	189	0.14	0.08	0.16		
Free cash flow/ total assets	187	0.19	0.11	0.26		
Return-on-assets	190	0.03	0.03	0.08		
Market-to-book	189	2.59	1.94	2.58		
Acquirers' country features						
Rule of law	194	1.60	1.61	0.20		
Political stability	194	0.72	0.88	0.47		
GDP growth	197	0.05	0.06	0.06		
Panel B: Serial acquirers						
Deal structures						
Cross-industry	107	0.27	0.00	0.45	-0.29***	-1.00***
Cross-border	107	0.37	0.00	0.49	0.15**	0.00**
Cash payment	107	0.51	1.00	0.50	-0.01	0.00
Public target	107	0.16	0.00	0.37	0.13***	0.00***
Deal size/ total assets	107	0.38	0.04	1.56	0.22	0.03**
Acquirer's financials						
Total assets ($mil)	107	43,215	1,935	155,403	-24,729	-123
Total debt/ total assets	107	0.12	0.08	0.11	-0.06**	0.01
Free cash flow/ total assets	107	0.22	0.15	0.26	0.07*	0.06**
Return-on-assets	107	0.04	0.03	0.07	0.02*	0.01**
Market-to-book	107	2.93	2.25	2.59	0.77**	0.68***
Acquirer's country features						
Rule of law	106	1.64	1.63	0.13	0.10***	0.03***
Political stability	106	0.73	0.86	0.38	0.03	-0.03
GDP growth	107	0.05	0.05	0.06	-0.01	-0.01

As Panel B of Table 3-2 shows, serial acquirers seem to engage in larger transactions, measured by *deal size/ total assets*. In addition, serial acquirers show larger growth potential given their higher *market-to-book* and lower *total debt/ total assets* ratios, indicating that they are more likely to acquire external growth and use borrowed capital. Serial acquirers have higher

profitability, measured by *return-on-assets*, and are more cash efficient than occasional acquirers, based on larger *free cash flow/ total assets*. These financial characteristics are consistent with Macias et al. (2016a), who find that serial acquirers are more efficiently in terms of profit generation. According to the World Bank, the home countries of serial acquirers have a better *rule of law*, which indicates the quality of contract enforcement, property rights, and other aspects of the legal environment. It suggests that serial acquirers may benefit from lower legal risk in M&A negotiations and settlements.

3.3.2 Event study with the four-factor model

Following MacKinlay (1997), we apply the event study method to examine the impact of M&A announcements on stock prices. Here, we use the four-factor model according to Fama and French (1993, 1996) and Carhart (1997) during the estimation window [-267; -16] to predict the expected returns of acquirers. Here we leave an interval of ten days before the main event window [-5; +5] to reduce the influence of rumors. By using 252 days of stock data, approximately one trading year, the estimates are supposed to be annualized. The expected return $E(R_{i,t})$ of stock *i* on day *t* is calculated by:

$$E(R_{i,t}) - r_f = \hat{\alpha}_i + \hat{b}_i * (r_{m,t} - r_f) + \hat{b}_{s,i} * SMB_t + \hat{b}_{v,i} * HML_t + \hat{b}_{u,i} * UMD_t + \varepsilon_i. \quad (3\text{-}1)$$

In this model, r_f is the risk-free rate and r_m is the return of the market portfolio. The size factor *SMB* shows the excess returns of small caps over large caps. The value factor *HML* captures the excess returns of value versus growth stocks. The momentum factor *UMD* presents the excess returns of stocks with high returns against low returns. The daily four-factor data for each market are obtained from the AQR database.

The difference between the realized return and the expected return is defined as the abnormal return, measured by:

$$AR_{i,t} = R_{i,t} - E(R_{i,t}). \quad (3\text{-}2)$$

The *CAR* is calculated over the period $[\tau_1;\ \tau_2]$ for firm *i* as:

$$CAR_{i,[\tau_1;\ \tau_2]} = \sum_{\tau_1}^{\tau_2} AR_{i,t}. \quad (3\text{-}3)$$

The aggregated average for *N* firms is:

$$CAAR_{[\tau_1;\tau_2]} = \frac{1}{N}\sum_{i=1}^{N} CAR_{i,[\tau_1;\tau_2]}. \quad (3\text{-}4)$$

To test whether the CAAR is statistically different from zero, we apply two parametric tests, namely the standard t-test and the test according to Boehmer et al. (1991). When the sample size is small, it is usually not clear if the sample is normally distributed. For this purpose, the non-parametric test according to Corrado (1989) and Corrado and Zivney (1992) is applied. We use two risk measures of acquirers based on the four-factor model, namely volatility and relative idiosyncratic volatility. We calculate the relative idiosyncratic volatility of acquirers following Aabo et al. (2017) by the ratio of idiosyncratic volatility to total volatility, which is equivalent to one minus R-squared of the four-factor model. For consistency, we use the same estimation window [-267; -16] to obtain annualized risk measures before M&A. As found by Macias et al. (2016a), efficient serial acquirers exhibit lower volatility compared to opportunistic acquirers. We extend their study to examining idiosyncratic volatility, avoiding the impact of systematic risks of different markets.

3.4 Empirical results and analyses

3.4.1 M&A announcement effects

The event study results show that serial acquirers get significant positive announcement effects during short event windows. Panel A of Table 3-3 presents acquirers' CARs grouped by type of acquirers. Panel A.1 demonstrates the results for all acquirers, who gain approximately 0.8% CAAR during the event window [-1; +1]. When dividing the sample into serial and occasional acquirers, Panel A.2 shows that these positive announcement effects are mainly attributed to serial acquirers with around 1.0% CAAR during the event window [-1; +1] and 0.9% at the announcement day. On the contrary, occasional acquirers have no significant results. We conclude that the experience of acquirers is a signal for market participants around M&A announcements but not necessarily lasts for longer periods. In specific, acquirers with more M&A experience trigger positive market reactions, implying that investors are more optimistic about these deals. We find no support for managerial hubris as Billett and Qian (2008), who show that serial acquirers suffer significant negative abnormal returns around M&A announcements.

Table 3-3. Announcement effects by M&A experience

This table presents the results of announcement returns (Panel A) and OLS regressions on acquirers' CARs (Panel B). Robust t-statistics are given in parentheses. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A2.

Panel A: Announcement abnormal returns						
Event window	N	CAAR	Median CAR	t-test	Boehmer test	Corrado test
Panel A.1 All acquirers						
[-5; +5]	197	0.086%	0.122%	0.162	0.369	0.656
[-1; +1]	197	0.821%	0.113%	2.218**	2.029**	2.126**
[0; +1]	197	0.547%	0.214%	1.740*	1.789*	1.813*
[+1; +5]	197	-0.113%	-0.225%	-0.289	0.079	0.634
Panel A.2 Serial acquirers						
[-5; +5]	107	0.532%	0.590%	0.814	1.035	0.726
[-1; +1]	107	1.002%	0.475%	2.096**	2.190**	2.081**
[0; +1]	107	0.864%	0.534%	2.076**	2.240**	2.193**
[+1; +5]	107	0.285%	-0.118%	0.604	0.898	1.367
Panel A.3 Occasional acquirers						
[-5; +5]	90	-0.444%	-0.450%	-0.510	-0.475	0.244
[-1; +1]	90	0.606%	-0.096 %	1.045	0.560	1.079
[0; +1]	90	0.170%	-0.161%	0.356	0.136	0.478
[+1; +5]	90	-0.586%	-0.409%	-0.905	-0.730	-0.468

Panel B: OLS regressions on acquirers' CARs [-1; +1]			
	Model (1)	Model (2)	Model (3)
M&A experience			
Serial acquirers	0.017**		
	(2.463)		
Total M&A		0.004**	
		(2.346)	
Accumulated M&A			0.005*
			(1.834)
Deal structures			
Cross-industry	0.000	-0.001	-0.002
	(0.050)	(-0.113)	(-0.221)
Cross-border	-0.008	-0.010	-0.007
	(-0.997)	(-1.231)	(-0.897)
Cash payment	0.003	0.003	0.003
	(0.431)	(0.425)	(0.412)
Public target	-0.025	-0.023	-0.021
	(-1.572)	(-1.455)	(-1.423)
Deal size/ total assets	-0.007	-0.006	-0.006
	(-1.322)	(-1.125)	(-1.141)
Constant	0.020*	0.009	0.033***
	(1.812)	(0.587)	(3.937)
Fixed year	Yes	Yes	Yes
Observations	191	191	191
Adjusted R^2	0.127	0.123	0.117

To examine whether the learning hypothesis can explain these positive announcement effects, we run regressions on acquirers' CARs [-1; +1]. Here, we use three variables to investigate the learning effect: first, the status of serial acquirers as a binary variable, to differentiate the effect between serial and occasional acquirers; second, the total number of transactions

conducted by individual acquirers during the observation period; third, the accumulated number of transactions by individual acquirers at the deal announcement, to investigate whether there is a learning curve with increasing deal orders. In addition, we also control deal structures such as *cross-industry*, *cross-border*, *cash payment*, *public target*, and *deal size/ total assets*. After applying the year-fixed effect, the general formula is:

$$CAR_i = \alpha_i + \beta_i * M\&A\ experience_i + \gamma_i * Deal\ strcutures_i + \delta_i * Year_i + \varepsilon_i. \quad (3\text{-}5)$$

Panel B of Table 3-3 shows the regression results. In Model (1), the status of being serial acquirers has a positive coefficient at the 5% significance level according to the robust t-test. It indicates that serial acquirers have higher CARs than occasional acquirers after controlling for deal structures and transaction years. In addition, all deal structures show no explanation power for acquirers' CARs. The adjusted R^2 of approximately 12.7% indicates that the status of serial acquirers alone can explain CARs to a certain extent. Model (2) confirm that the total number of M&A conducted by individual acquirers is also positively related to CARs at the 5% significant level, suggesting that more experience in M&A leads to larger announcement effects. The coefficients of all deal structures are insignificant, and the explanation power of M&A experience stays robust. Model (3) specifically investigates the learning effect. By applying the accumulated number of M&A conducted by individual acquirers at each announcement, we find a significant positive relationship between increasing deal orders and acquirers' CARs, which confirms a positive learning curve for serial acquirers and disagree with the finding of growing management hubris by Guest et al. (2004) and Ismail (2008).

Our results are in line with the learning hypothesis found by Aktas et al. (2013) and Macias et al. (2016b). We argue that for insurance intermediaries, the results indicate that serial acquirers are motivated by external growth potential but not market timing, supporting the finding of efficient acquirers by Macias et al. (2016a) and Morillon (2021). Different from Fuller et al. (2002), who show that serial acquirers' CARs are explained by acquiring private targets and paying with cash, we find no deal structures are significantly related to acquirers' CARs when considering their M&A experience. Our findings support Macias et al. (2016b), who argue that serial acquirers change their bidding strategies to best suit the situation in individual M&A, not just simply using same deal terms each time.

3.4.2 Determinants of serial acquirers

We conduct further regression analyses to examine the determinants of serial acquirers. Logit regression is used for the binary dependent variable, which equals one if it is a serial acquirer and 0 otherwise. Coxe et al. (2009) note that when the dependent variable is a count number with a low arithmetic mean, OLS regression can lead to biased results because the model assumption is not met. On the contrary, Poisson regression provides robust results for the count dependent variable, which is applied to total and accumulated M&A numbers in the following analyses.

We divide all independent variables into three groups: acquirers' pre-M&A risk levels, financial situations, and country features. First, we apply the stock volatility and relative idiosyncratic volatility of acquirers prior to M&A as risk proxies. Equity volatility is composed of systematic and idiosyncratic risks, where the systematic component is generally related to different markets. The idiosyncratic component is generally viewed as non-rewarded risk caused by information asymmetry between firms and investors (Aabo et al., 2017). Macias et al. (2016a) find that efficient serial acquirers have lower stock volatility than those who are motivated by market-timing. Since we have a global sample of observations, the measure of relative idiosyncratic volatility can reduce the influence of different markets. Moreover, several studies find that high idiosyncratic risk can increase the likelihood of failed M&A, implying that firms with more hidden information face larger uncertainty when processing M&A transactions (e.g., Officer et al., 2009; Zhu et al., 2014). In addition to information asymmetry, acquirers' financial positions can also influence M&A decisions. Following existing studies (e.g., Lang et al., 1991; Maloney et al., 1993; Moeller et al., 2004), we apply acquirers' *total assets*, *total debt/ total assets*, *free cash flow/ total assets*, *return-on-assets*, and *market-to-book* ratios to capture firm characteristics such as size, leverage level, cash availability, profit-making efficiency, and growth potential, respectively. All financial data are obtained from the Thomson Worldscope database at the year-end prior to M&A announcements. Moeller et al. (2004) find that larger firms tend to have more obstacles when conducting M&A due to the complexity of stakeholder structures. Lang et al. (1991) address that with increasing cash flow available, acquirers are subjected to a higher possibility of agency problems when choosing M&A over paying dividends. Maloney et al. (1993) investigate how capital structures affect management to make financial decisions and find a positive relationship between acquirers' leverage and M&A performance. They explain that debt markets can discipline acquirers' managers to make better

investment decisions in general. Later studies focusing on serial acquirers also confirm the importance of acquirers' financials and identify the determinants of serial acquirers. Billett and Qian (2008) find that large and cash-rich firms are more likely to acquire, whereas a higher leverage level reduces the possibility of becoming serial acquirers. Macias et al. (2016a) observe that size and operating performance, respectively measured by market cap and earnings generated per unit of assets, are positively related to the total number of M&A conducted by serial acquirers. Moreover, they find that serial acquirers focus less on organic growth, implying that their efficiency in profit generation is likely attributed to external growth. Morillon (2021) finds a positive relationship between serial acquirers' CARs and their market-to-book ratios when controlling deal orders. We assume that the aforementioned financial metrics are important for acquirers' M&A decisions, as well as the overall economic and legal environment. Moeller et al. (2005) find that M&A performance is positively associated with a more stable legal system that ensures shareholder rights and a growing economy with fewer constraints. Although the paper focuses on targets' countries, the implications for acquirers are likely to be similar. When the environment protects shareholders more efficiently, the risk of agency problems is lower, and thus managers are more prudent in making investment decisions. In addition, a booming economy supports firms to expand their businesses through M&A activities. Therefore, we collect data for acquirers' countries such as *rule of law*, *political stability*, and *GDP growth* from the World Bank at the year-end prior to M&A announcements. To investigate the determinants of serial acquirers, we run regressions after controlling for the year-fixed effect as follows:

$$P(Serial\ M\&A_i) = \alpha_i + \beta_i * Acquirers' risk_i + \gamma_i * Acquirers' financials_i + \delta_i * Acquirers' country\ features_i + \zeta_i * Year_i + \varepsilon_i. \quad (3\text{-}6)$$

Table 3-4 shows the regression results. In Model (1) – (3), the findings reveal substantial differences between serial and occasional acquirers, particularly in terms of acquirers' risk, leverage, and growth profiles as well as the legal system of their home countries. The coefficients of *volatility* and *idiosyncratic volatility* are negative at the 1% significant level and improve the predictive ability of models based on improved Pseudo R^2. It means that serial acquirers have lower volatility and idiosyncratic volatility compared to occasional acquirers, suggesting that serial acquirers may suffer less information asymmetry prior to M&A because the more transparent firms are, the less turbulence their stock prices suffer due to rumors. Model (4) and (5) confirm that the decrease in *volatility* and *idiosyncratic volatility* is associated with the increasing total number of transactions by individual acquirers. Unlike earlier studies

(Billett & Qian, 2008; Macias et al., 2016a), we find no significant impact of *total assets*, *free cash flow/ total assets*, and *return-on-assets* on acquirers' M&A experience, suggesting that size, cash efficiency, and profitability are not drivers of M&A decisions. The financial metrics that significantly differentiate serial acquirers are leverage combined with growth potential. Firms with lower *total debt/ total assets* are more likely to be serial acquirers, supported by Model (1) – (3), and there is a distinct decreasing trend in debt levels as deal orders increase, observed in Model (7) – (9). We explain this phenomenon by financial synergies of the merged entities. Because firms with low leverage have more flexibility to issue debt to finance M&A, they are more likely to become serial acquirers. As size increases after each transaction, acquirers' assets grow more than debt, suggesting that targets may bring financial synergies, thus favoring acquirers in subsequent transactions. The *market-to-book* ratio as an indicator of growth potential is highly significant and positive in all regressions. A relatively higher ratio suggests that a larger growth rate is expected for the future market value, so that investors would be willing to pay more for the stock at present. We find that serial acquirers have higher growth potential compared to occasional acquirers and there is a rising trend of firms' growth potential with increasing M&A experience. These results show that serial acquirers may utilize their growth potential through M&A transactions, supporting Macias et al. (2016a) that the success of serial acquirers is likely attributed to the fact that they are efficient at acquiring external growth but not organic growth. As for country features, we find that the indicator *rule of law* has a robust positive relationship with acquirers' M&A decisions, indicating that the country with better contract enforcement, property rights, and other aspects of the legal environment makes it easier for acquirers to conduct M&A transactions more frequently. Factors such as *political stability* and *GDP growth*, on the other hand, cannot distinguish between serial and occasional acquirers, but show a significant relationship with acquirers' increasing M&A activities. We explain that acquirers located in politically unstable areas are more likely to diversify their businesses and high GDP growth favors firms' M&A decisions to some extent.

Table 3-4. Determinants of serial acquirers

This table presents the results of logit regressions on serial acquirers and Poisson regressions on total and accumulated M&A. Robust z-statistics are given in parentheses. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A2.

	Logit regression on serial acquirers			***Poisson regression on total M&A***			***Poisson regression on accumulated M&A***		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
Acquirers' pre-M&A risk									
Volatility	-14.568***		25.089	-2.222**		-4.437	-0.380		-3.513
	(-3.362)		(1.340)	(-2.124)		(-1.052)	(-0.608)		(-0.669)
Idiosyncratic volatility		-17.516***	-44.097**		-2.193*	2.382		-0.290	3.297
		(-3.710)	(-2.051)		(-1.864)	(0.501)		(-0.422)	(0.596)
Acquirers' financials									***0.037****
(ln) Total assets	-0.071	-0.124	-0.188	0.009	0.006	0.013	0.031	0.031	(1.706)
	(-0.659)	(-1.139)	(-1.481)	(0.397)	(0.265)	(0.549)	(1.584)	(1.587)	-0.630**
Leverage	-3.998***	-4.259***	-4.544***	-0.485*	-0.495*	-0.466*	-0.656***	-0.655***	(-2.513)
	(-2.635)	(-2.669)	(-2.686)	(-1.815)	(-1.847)	(-1.729)	(-2.698)	(-2.684)	-0.120
Cash flow	1.353	1.482	1.341	-0.149	-0.168	-0.139	-0.130	-0.141	(-0.630)
	(0.854)	(0.860)	(0.740)	(-0.824)	(-0.929)	(-0.780)	(-0.682)	(-0.735)	0.591
Profitability	-3.866	-5.816	-6.808	0.659	0.666	0.727	0.474	0.530	(0.695)
	(-0.990)	(-1.378)	(-1.513)	(0.733)	(0.738)	(0.794)	(0.610)	(0.649)	0.110***
Market-to-book	0.740***	0.790***	0.810***	0.092***	0.092***	0.091***	0.111***	0.111***	(4.652)
	(4.367)	(4.475)	(4.351)	(3.190)	(3.205)	(3.166)	(4.765)	(4.723)	0.746***
Acquirers' country features									
Rule of law	4.567***	4.768***	5.350***	1.424***	1.469***	1.392***	0.791***	0.803***	-0.187*
	(2.929)	(3.065)	(3.290)	(5.259)	(5.453)	(5.009)	(4.062)	(4.177)	(-1.742)
Politic stability	-0.615	-0.693	-0.866	-0.348***	-0.356***	-0.343***	-0.198*	-0.199*	2.790***
	(-1.118)	(-1.286)	(-1.559)	(-2.871)	(-2.937)	(-2.813)	(-1.901)	(-1.900)	(3.871)
GDP growth	-2.369	-2.159	-1.753	1.063	1.088	1.034	2.861***	2.864***	-0.424
	(-0.541)	(-0.495)	(-0.404)	(1.223)	(1.253)	(1.192)	(3.950)	(3.967)	(-1.102)
Constant	-4.370*	-4.117*	-4.274*	-0.522	-0.560	-0.524	-0.430	-0.453	-3.513
	(-1.763)	(-1.659)	(-1.726)	(-1.285)	(-1.371)	(-1.299)	(-1.122)	(-1.189)	(-0.669)
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	175	175	175	180	180	180	180	180	180
Pseudo R^2	0.335	0.345	0.351	0.145	0.144	0.145	0.117	0.117	0.117

3.4.3 Risk controlling during the M&A process

We show in the previous section that serial acquirers exhibit lower volatility and idiosyncratic volatility than occasional acquirers prior to M&A transactions. To investigate if acquirers' experience also contribute to their risk controlling abilities during M&A, we use the logarithm of days between deal announcement and execution to measure how fast acquirers close individual transactions. Sherman (2010) lines out some details to be processed until the actual deal closing. He notes that acquirers must work diligently with their legal counsel, regulatory authorities, and third parties to prepare final documentation. The legal part focuses on the key elements of the deal, for example, due diligence results, terms related to payment methods, scopes of post-closing competitive and related obligations, deferred or contingent compensation components, and risk-sharing policies for specific events. In addition, acquirers must get regulatory approvals and reach agreements with third parties, such as lenders, venture investors, and vendors. The faster acquirers go through this process, the better they can manage the interim risk of M&A. We run OLS regressions on the risk controlling proxy with acquirers' M&A experience, pre-M&A risk levels, financial metrics, and country features. All variables are explained in the previous section. After controlling for the year-fixed effect, a general formula is as follows:

$$\ln(Days_i) = \alpha_i + \beta_i * M\&A\ experience_i + \gamma_i * Acquirers' risk_i + \delta_i * Acquirers' financials_i + \zeta_i * Acquirers' country\ features_i + \eta_i * Year_i + \varepsilon_i. \quad (3\text{-}7)$$

Table 3-5 demonstrates the results regarding acquirers' risk management during the M&A process. In general, M&A experience is negatively related to the days between deal announcement and execution, whereas acquirers' pre-M&A risk levels have no impact during the process. In Model (1) and (2), *serial acquirers* experience a shorter period than occasional acquirers with high statistical significance. And this effect applies to *total M&A* in Model (4) – (6), implying that acquirers with more M&A experience take less time to complete transactions. Furthermore, the learning effect persists as exhibited in Model (7) – (9), suggesting that acquirers can improve their risk management over deal sequences. Our results supplement Aktas et al. (2013) and Macias et al. (2016a), who find that the number of days between two transactions decreases over M&A sequences, implying that serial acquirers accelerate finding new targets based on their previous experience. We show that acquirers also speed up during the M&A process based on their improved risk management. The learning effect can happen in the following aspects. First, acquirers may standardize their procedures for handling M&A to meet the conditions for execution. Second, they gain more experience in finding consultants and

auditors with whom they can work effectively. Third, they have more experience negotiating with targets and other third parties involved. In addition, serial acquirers can benefit from their prior experience to screen out potential targets exposed to complex legal and contractual relationships and avoid a very costly interim period before announcing M&A transactions.

We find that acquirers' volatility and idiosyncratic volatility measures are insignificant in all models, implying that how well acquirers manage the M&A interim risk is not influenced by stock markets but rather internal efficiency and deal complexity. In particular, acquirers take less time to complete *cross-industry* transactions compared to those within the same industry, which can be associated with more negotiations regarding non-compete and employee agreements, as well as addressing regulatory concerns about monopoly risk in intra-industry transactions. Acquiring *public targets* is the other catalyst that slows down the process, as acquirers face more obstacles in dealing with targets' public investors. Acquirers' financials, especially the metrics of *total assets* and *free cash flow/ total assets*, are positively related to the length of the interim period. We reason these findings with increased agency problems in large and cash-rich firms. Due to the complexity of large organizations, it can take longer to make any decisions. And for firms with more free cash flow, management may face headwinds from shareholders by using cash for M&A rather than paying dividends. In addition, a better *rule of law* is associated with a shorter interim period, meaning that a better contract enforcement system helps acquirers manage risk during the M&A process.

Table 3-5. Acquirers' risk controlling during the M&A process

This table presents the results of OLS regressions on the (ln) days between M&A announcement and execution. Robust t-statistics are given in parentheses. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A2.

	OLS regressions on the (ln) days between M&A announcement and execution								
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
M&A experience									
Serial acquirers	-0.461*	-0.466*	-0.438						
	(-1.811)	(-1.800)	(-1.536)						
Total M&A				-0.178**	-0.177**	-0.174**			
				(-2.516)	(-2.479)	(-2.412)			
Accumulated M&A							-0.179*	-0.178*	-0.175*
							(-1.923)	(-1.918)	(-1.887)
Acquirers' pre-M&A risk levels									
Volatility	-1.496		-4.972	-1.631		-7.510	-1.090		-8.082
	(-0.932)		(-0.479)	(-1.093)		(-0.818)	(-0.729)		(-0.861)
Idiosyncratic volatility		-1.419	3.751		-1.443	6.300		-0.845	7.477
		(-0.821)	(0.338)		(-0.904)	(0.647)		(-0.532)	(0.760)
Deal structures									
Cross-industry	-0.513**	-0.515**	-0.511**	-0.437*	-0.439*	-0.441*	-0.426*	-0.429*	-0.431*
	(-2.093)	(-2.110)	(-2.050)	(-1.913)	(-1.933)	(-1.918)	(-1.866)	(-1.886)	(-1.873)
Cross-border	0.103	0.108	0.095	0.244	0.248	0.233	0.027	0.032	0.020
	(0.399)	(0.419)	(0.369)	(0.937)	(0.956)	(0.892)	(0.108)	(0.129)	(0.079)
Cash payment	0.001	0.001	0.004	0.016	0.016	0.021	-0.005	-0.004	0.002
	(0.005)	(0.002)	(0.016)	(0.067)	(0.065)	(0.088)	(-0.018)	(-0.017)	(0.009)
Public target	0.673**	0.676**	0.662**	0.722***	0.723***	0.715***	0.645***	0.647***	0.639***
	(2.589)	(2.603)	(2.465)	(3.125)	(3.139)	(3.047)	(2.899)	(2.911)	(2.871)
Deal size/ total assets	0.046	0.046	0.054	-0.028	-0.027	-0.016	0.023	0.026	0.037
	(0.637)	(0.624)	(0.692)	(-0.405)	(-0.371)	(-0.204)	(0.363)	(0.398)	(0.544)
Acquirers' financials									
(ln) Total assets	0.125**	0.121**	0.137**	0.140**	0.137**	0.159**	0.156***	0.155***	0.179***
	(2.200)	(2.169)	(2.132)	(2.454)	(2.430)	(2.544)	(2.685)	(2.716)	(2.792)
Total debt/ total assets	0.744	0.753	0.739	0.976	0.990	0.964	0.646	0.660	0.639
	(0.927)	(0.939)	(0.912)	(1.220)	(1.234)	(1.193)	(0.799)	(0.815)	(0.782)

Continued on next page

Table 3-5. continued

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)
Free cash flow/ total assets	1.307*	1.280*	1.314*	1.680**	1.635**	1.692**	1.462**	1.418**	1.483**
	(1.984)	(1.938)	(1.972)	(2.491)	(2.413)	(2.484)	(2.224)	(2.157)	(2.219)
Return-on-assets	-0.355	-0.297	-0.109	1.075	1.216	1.448	0.840	1.040	1.293
	(-0.169)	(-0.139)	(-0.050)	(0.535)	(0.603)	(0.719)	(0.430)	(0.529)	(0.653)
Market-to-book	0.037	0.038	0.031	0.059	0.058	0.050	0.055	0.054	0.045
	(0.662)	(0.647)	(0.507)	(1.275)	(1.198)	(0.986)	(1.077)	(1.001)	(0.821)
Acquirers' country features									
Rule of law	-1.051**	-1.020**	-1.116**	-1.013**	-0.980**	-1.106**	-1.158**	-1.131**	-1.264***
	(-2.313)	(-2.240)	(-2.327)	(-2.352)	(-2.257)	(-2.528)	(-2.501)	(-2.420)	(-2.740)
Political stability	0.073	0.068	0.096	-0.010	-0.013	0.030	0.070	0.071	0.116
	(0.288)	(0.264)	(0.347)	(-0.039)	(-0.052)	(0.110)	(0.272)	(0.269)	(0.413)
GDP growth	1.991	2.006	1.966	2.439	2.453	2.403	2.770	2.784	2.724
	(1.305)	(1.315)	(1.279)	(1.555)	(1.563)	(1.527)	(1.597)	(1.606)	(1.570)
Constant	5.242***	5.235***	5.191***	5.468***	5.446***	5.375***	5.250***	5.218***	5.145***
	(4.064)	(4.063)	(3.955)	(4.714)	(4.669)	(4.482)	(4.333)	(4.289)	(4.121)
Fixed year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	116	116	116	116	116	116	116	116	116
Adjusted R^2	0.092	0.091	0.082	0.124	0.122	0.117	0.095	0.093	0.089

3.5 Conclusion

In the traditional services sector, the trend of consolidation is inevitable due to increasing competition from existing and technology-based market players. Many insurance intermediaries enlarge their competitive power through M&A transactions, where some become serial acquirers that conduct M&A more frequently than others. Different from earlier evidence that serial acquirers are motivated by managerial hubris, and their shareholders suffer negative or declining abnormal returns around M&A announcements (e.g., Billett & Qian, 2008; Fuller et al., 2002; Ismail, 2008), recent studies reveal different findings that support a positive learning curve for serial acquirers (e.g., Aktas et al., 2013; Macias et al., 2016a, 2016b; Morillon, 2021).

By investigating 197 global insurance intermediary M&A transactions from 1995 to 2015, we find strong evidence that serial acquirers create positive announcement effects. More specifically, through the event study, we find positive abnormal returns for serial acquirers while no significant results for occasional acquirers. The positive effects of serial acquirers are further evidenced by regression analyses, in which acquirers' CARs are positively related to their M&A experience. Different from earlier research (e.g., Boubakri et al., 2012; Fuller et al., 2002), we find no impact of deal structures on announcement returns. Our first finding confirms that acquirers' M&A experience contributes positively to their CARs regardless of deal structures, which contradicts the managerial hubris hypothesis. We further run logit regressions on the status of serial acquirers and Poisson regressions on the total and accumulated numbers of M&A by individual acquirers. According to the results, acquirers' pre-M&A volatility and idiosyncratic volatility are significantly negatively related to their M&A experience, implying that active acquirers are those with lower information asymmetry to investors. Other factors, such as lower leverage and larger growth potential, contribute positively to serial acquirers and increasing M&A activities. These results suggest that acquirers can improve their information transparency and specific financial metrics over deal sequences, offering evidence for the learning effect. In addition, the general market environment can also affect acquirers' M&A decisions, with better contract enforcement, property rights, and other aspects of the legal environment contributing positively. In the third part of our empirical study, we focus on the learning effect during the M&A process. We investigate the days between M&A announcement and execution as a proxy for acquirers' interim risk management and find that serial acquirers take less time to complete M&A transactions. And as acquirers get more experienced, the period of time they

need is shorter. It suggests that acquirers benefit from previous M&A, particularly in managing the interim risk. Other deal features, such as acquiring firms in the same sector or publicly listed, can increase the risk of getting approvals from regulators and public investors, leading to a longer interim period.

The implications of our study are divided into different perspectives. As investors respond positively to serial acquirers who are more likely motivated by strategic growth needs, firms should focus more on their development catalysts and less on market reactions when making M&A decisions. In addition, creating more information transparency is crucial for serial acquirers as they would counter fewer obstacles from investors to proceed M&A. During the M&A process, acquirers should leverage their experience gained from previous transactions to shorten the interim period, such as standardizing their procedures to meet execution conditions, working effectively with advisors and auditors to prepare required documents, and clarifying all post-M&A contracts with targets and other third parties. The efforts made by acquirers can also benefit investors to a great extent. As investors gain more information about firms who are active in M&A activities, they can better evaluate the intrinsic value of these firms, resulting in fewer fluctuations in stock prices due to misinformation. Besides, investors can gain valuable information from the M&A history of serial acquirers, for example, whether firms generate positive announcement effects in previous transactions and shorten the interim period over deal sequences, indicating their operating efficiency. As this study is limited to a niche of financial services with consolidation needs, further research on serial acquirers should be conducted to gain a general understanding of their learning abilities and, in particular, to assess whether these findings are applicable to other sectors and industries.

Chapter 4: Sovereign rating announcements and the integration of African banking markets[13]

This paper analyzes the impact of sovereign rating announcements on domestic and foreign banks in Africa between 2010 and 2016. In contrast to previous studies, we find that negative announcements unexpectedly lead to significant positive abnormal returns for banks, mainly due to banks in the non-reviewed African countries. For foreign banks headquartered in the Africa Free Trade Zone (AFTZ), their positive reactions are significantly decreased. Moreover, only domestic banks respond significantly positively to the sovereign good news. Nevertheless, the longer foreign banks are in the AFTZ, the stronger they react to others' positive announcements. Our findings address differential spillover effects of sovereign rating announcements in Africa and the importance of free trade agreements to improve capital market integration.

4.1 Introduction

In June 2017, Standard & Poor's (S&P) and Fitch Ratings (Fitch) lowered South Africa's credit rating to non-investment grade, resulting in dramatically increased borrowing costs for the government. Following the revised sovereign rating, several South African banks, such as Absa and FirstRand, were also heavily affected and downgraded by credit rating agencies. In the following months, its neighboring country, Botswana's sovereign rating outlook was unexpectedly improved by S&P, enabling domestic banks to obtain favorable rates in global capital markets. Such contrarian rating reactions can suggest a low integration level of African capital markets and motivate our study.

Credit ratings are dynamically updated by credit rating agencies and serve as credit quality benchmarks in financial regulating and contracting activities (e.g., Boot et al., 2006; Carneiro, 2009; Frost, 2007). Many studies document that credit rating announcements can provide capital markets with new information, particularly in the case of negative announcements. Therefore, negative credit rating announcements have a strong and immediate impact on the pricing of securities and derivatives. Previous studies show that both rating downgrades and negative reviews trigger decreases in stock and bond prices and increases in CDS spreads (e.g., Dichev

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& Piotroski, 2001; Finnerty et al., 2013; Followill & Martell, 1997; Hand et al., 1992; Kiesel & Kolaric, 2018; Norden & Weber, 2004).

In credit rating systems, sovereign ratings indicate a country's creditworthiness and have a broad impact on domestic capital markets. Although the sovereign ceiling policy is not strictly executed, sovereign ratings yet largely limit the best achievable credit ratings for domestic firms in emerging markets due to the severe information asymmetry of individual firms (Alsakka & Ap Gwilym, 2013; Williams et al., 2013). In addition, changes in sovereign ratings affect the country's cost of capital and access to global capital markets. In the European sovereign debt crisis from 2008 to 2011, Greece, Ireland, Portugal, Spain, and Italy faced extremely high interest rates as their sovereign ratings were downgraded, which further caused a widespread economic recession across European countries (Beirne & Fratzscher, 2013; Gibson et al., 2012). Previous studies document common spillover effects of sovereign ratings in developed and emerging markets, where stock, bond, and CDS markets respond to negative sovereign rating messages in tandem among different countries. And the magnitude of co-movements can be influenced by geographic closeness, cultural similarity, and trade relationships (e.g., Afonso et al., 2012; Ferreira & Gama, 2007; Gande & Parsley, 2005; Ismailescu & Kazemi, 2010). The transmission channels of common spillover effects can be a direct debtor-creditor relationship (Afonso et al., 2012) or sharing of common lending centers, where the declined solvency of one country can make less capital available to others (Ismailescu & Kazemi, 2010).

Based on the evidence of common spillover effects, one would assume that international capital markets are highly integrated. In the process of global market integration, banks play an important role through international banking services and holding diversified portfolios. Sovereign rating adjustments can heavily affect international banking services due to associated changes in interest rates. In addition, the capital allocation and market valuation of international portfolios are closely related to involved sovereigns because of the credit ceiling policy. As a result, banks are extremely sensitive to sovereign credit risk. Prior studies find that the stock prices of domestic banks decrease significantly upon negative sovereign rating announcements, but do not react significantly to positive ones, particularly in developed markets (e.g., Alsakka et al., 2014; Caselli et al., 2016; Correa et al., 2014). In regions with larger information asymmetry, even positive sovereign rating announcements can have a significant positive impact on banks' stock prices (Williams et al., 2013, 2015).

Despite a number of existing studies examining the impact of sovereign credit ratings on banks, the regional spillover effects of banks' reactions are rarely investigated. In consideration of the connective function of banks in global capital markets, we propose that banks would react to both domestic and foreign sovereign rating announcements to a certain extent. According to our observations in African markets, there can be differential spillover effects among banks, suggesting that African banking systems are less integrated. Gande and Parsley (2005) document that countries who have significantly negatively correlated trade flows with the US may experience different effects on sovereign credit spreads when one of the observed countries is downgraded. This finding motivates us to further examine whether trade relationships can influence the spillover effects of sovereign rating announcements in Africa.

According to the World Bank, African markets are among the fastest growing emerging markets, with a total market capitalization of around USD 1.5 trillion in 2017. Despite a growing interest, international investors are still confronted with limited information about African financial institutions and investment conditions. In this context, sovereign rating announcements provide investors with material information. By investigating 203 African sovereign rating announcements from Fitch, Moody's, and S&P, as well as the corresponding stock responses of 37 African banks between 2010 and 2016, we find that negative sovereign rating announcements lead to significant positive abnormal returns for banks, mainly attributed to banks in the non-reviewed African countries, suggesting strong differential spillover effects across African banks. Foreign banks benefit even more if the negative announcement is a credit watch or from Moody's. Moreover, foreign banks with higher profitability gain larger, whereas domestic banks with higher profitability suffer more from negative announcements. It further implies that better-performing foreign banks may gain larger relative competitiveness, while profitable domestic banks can be more involved in sovereign crises through government-related business. We find strong evidence that free trade agreements can reduce differential spillover effects. In particular, for foreign banks headquartered in a member country of the AFTZ, their positive abnormal returns to others' negative sovereign rating announcements decrease significantly. Upon positive announcements, only domestic banks react significantly positively. Although being in the AFTZ has no significant influence around positive announcements, the year-cumulative membership can enhance foreign bank' returns. It implies that the longer banks are in the AFTZ, the more positively they react to others' sovereign good news.

This paper contributes to existing studies in multiple ways and sheds new light on the understanding of African capital markets. First, it reveals that African banks react to sovereign rating announcements differently from developed and other emerging markets, suggesting that African markets have low integration with global markets and can provide diversification value to international investors. Second, our findings show differential spillover effects of sovereign rating announcements across African banks and add new evidence to the literature. It implies that African banking markets are not yet integrated, and the information asymmetry among countries is quite severe. Third, this paper addresses that free trade agreements can improve the integration of African capital markets to a certain extent.

The remainder of the paper is structured as follows. Section 4.2 reviews the relevant literature. Section 4.3 describes the dataset and methods. Section 4.4 presents the main empirical results, and Section 4.5 concludes the paper.

4.2 Literature review

4.2.1 Influence of credit ratings

Numerous studies address the importance of credit ratings. Boot et al. (2006) find that credit ratings have an important economic role. They address two institutional features of credit ratings, namely the monitoring function in financial markets and the influence on the decision-making process of institutional investors. By implementing these features, they prove that if a sizeable proportion of investors bases their investment on credit ratings, others would rationally follow. This can resolve the multiple market equilibria caused by different investor preferences and reduce the market fragility. Frost (2007) and Carneiro (2009) confirm the importance of credit ratings, especially given the increasing complexity of financial markets. The findings show that rating agencies make credit assessments widely available to market participants. These assessments can further serve as credit quality benchmarks and constrain risks in financial regulating and contracting activities.

In addition to the economic importance, prior studies document that credit rating announcements can provide capital markets with new information, particularly in the case of negative announcements, and thus have a strong and immediate impact on the pricing of securities and derivatives. Hand et al. (1992) investigate credit rating changes by Moody's and S&P from 1977 to 1982 and additional S&P credit watches from 1981 to 1983. They find that firms obtain

significant negative abnormal returns to downgrades and credit watches, but no significant reaction to upgrades. Their study reveals that not only rating changes but also reviews are important for adjusting security prices. In addition, a later study by Followill and Martell (1997) discovers that negative rating reviews can have even stronger effects than actual downgrades because investors would anticipate the upcoming rating changes. Norden and Weber (2004) examine how stock and CDS markets react to credit rating announcements from 2000 to 2002. They supplement the findings that both rating reviews and changes contain new information on defining the direction and magnitude of credit rating adjustments, respectively. They also confirm that only negative rating announcements can trigger significant stock and CDS reactions, suggesting that capital markets process bad news more intensively than good news, due to the information-processing bias (Dichev & Piotroski, 2001). A later study by Kiesel et al. (2016) discusses the link between stock and CDS markets in response to credit events. Their results show that stock returns can lead to changes in CDS spreads upon credit events, implying that stock markets process the credit information more quickly, although CDS spreads are directly related to the credit default risk.

4.2.2 Spillover of sovereign ratings

Sovereign ratings have a widespread impact due to the credit ceiling rule and the influence on interest rates (Alsakka & Ap Gwilym, 2013). The credit ceiling policy indicates that a country's sovereign rating limits the highest achievable credit rating for all domestic firms. Brooks et al. (2004) examine the impact of sovereign rating changes from Fitch, Moody's, S&P, and Thomson on domestic stock markets between 1973 and 2001 and confirm that sovereign rating downgrades trigger significant losses. Similar to corporate bond markets, the deterioration in sovereign credit ratings can make it more difficult to issue government bonds, leading to higher interest rates. In the European sovereign debt crisis from 2008 to 2011, several countries faced extremely high long-term interest rates due to sovereign downgrades, resulting in a widespread economic recession across European countries (Beirne & Fratzscher, 2013; Gibson et al., 2012).

The spillover effects of sovereign rating announcements are well documented in the literature. Gande and Parsley (2005) investigate the impact of sovereign rating changes on foreign sovereign credit spreads over the period 1991 – 2000. Their findings show that sovereign rating upgrades have no significant influence while downgrades lead to significant increases in sovereign spreads of reviewed and non-reviewed countries. In general, domestic and foreign

markets respond to sovereign rating events in the same direction due to economic globalization. Nevertheless, there can be differential spillover effects for countries having significantly negatively correlated trade flows with the US. They explain that when countries have a strong competitive relation in international trades, the globalization effect can be compensated.

A lot of studies reveal the determinants of common spillover effects, but fail to pay attention to differential ones. Ferreira and Gama (2007) investigate sovereign rating announcements on 18 emerging and 11 developed stock markets between 1989 and 2003. They find that the geographic closeness and being an emerging market can amplify co-movements in different stock markets to negative sovereign rating announcements. Afonso et al. (2012) focus on European markets from 1995 to 2010. They find significant increases in government bond yields and CDS spreads to negative sovereign rating announcements, and these reactions also spread to countries in the Economic and Monetary Union (EMU). Moreover, common spillover effects particularly occur from lower to higher rated countries due to the creditor-debtor relationship, which can serve as a direct transmission channel of sovereign credit risk. The other possible link is mentioned in Ismailescu and Kazemi (2010). They propose that emerging markets may share common lending centers. If one sovereign rating is lowered, it increases the burden on its lending centers, making less capital available to others.

4.2.3 Banks and market integration

Banks are one of the most important financial institutions connecting global economies by conducting international banking transactions and holding diversified foreign investment portfolios. Kim and Wu (2008) examine sovereign credit ratings by S&P from 1995 to 2003 in 51 emerging markets. They observe that positive sovereign rating adjustments trigger capital inflows from international banking and portfolios. A later study by Kim and Wu (2011) finds strong evidence that positive foreign-currency sovereign rating and outlook changes have a significant positive impact on international banking flows from developed to emerging markets. Their results also suggest that geographical proximity and legal interconnectedness are important in more risky lending decisions.

The importance of banks in global market integration also makes them vulnerable to sovereign credit risk. Williams et al. (2013, 2015) analyze the reaction of domestic banks to sovereign rating announcements in emerging markets. They report that both sovereign rating upgrades and downgrades can affect banks' stock prices and credit ratings significantly. In particular,

banks suffer significant losses surrounding domestic sovereign rating downgrades. The common negative rating changes of banks and sovereigns are mitigated for countries that have larger economic growth. They show that S&P actions trigger the strongest impact on banks, which is also confirmed by Alsakka et al. (2014) for European markets. They argue that S&P is the most active agency to announce sovereign rating adjustments. Accordingly, stock markets are most surprised by the information that arrives first. Correa et al. (2014) and Caselli et al. (2016) find similar results with respect to sovereign ratings and banks' stock prices. By investigating the reaction of banks in 37 countries to sovereign rating changes from 1995 to 2011, Correa et al. (2014) find that banks' stock prices decrease significantly upon sovereign rating downgrades but are less sensitive to upgrades. They explain that banks have a close relationship with the government by receiving direct financial support and holding sovereign debt. And banks that are closer to the government experience larger negative abnormal returns following sovereign rating downgrades. Caselli et al. (2016) supplement the findings by considering banks' performance prior to sovereign rating announcements. According to their results, European banks suffer more from domestic sovereign rating downgrades if they have higher profitability. They argue that banks with stronger financial positions are more sensitive to negative sovereign news because they may have a larger exposure to government-related projects.

4.3 Data and measures

4.3.1 Dataset

This study uses the event study methodology to investigate how banks' stock prices react to sovereign rating announcements in Africa. The long-term foreign-currency issuer rating announcements of African sovereigns in the 21-rating scale form (from AAA/Aaa to default) are obtained from rating agencies' publications between 2010 and 2016. We focus on issuer rating news, including rating changes, outlook changes, and credit watches from Fitch, Moody's, and S&P. The bank sample is gathered from the Thomson Reuters database by searching for banks who are publicly listed on an African stock exchange with enough stock data over the same period. The final sample consists of 203 sovereign rating announcements and 37 publicly listed banks in Africa.

Table 4-1. Sample of sovereign rating announcements

This table presents the distribution of 203 long-term foreign-currency issuer sovereign rating announcements between 2010 and 2016 in Africa by rating agency (Panel A) and year (Panel B). All announcements are obtained from rating agencies' publications.

	Negative announcements				***Positive announcements***		
	Credit watch	Negative outlook	Down-grade	Total	Positive outlook	Upgrade	Total
Panel A: Announcements by rating agency							
Fitch	1	26	24	51	13	11	24
Moody's	7	8	28	43	7	3	10
S&P	5	22	29	56	11	8	19
Total	13	56	81	150	31	22	53
Panel B: Announcements by year							
2010	0	2	2	4	1	3	4
2011	2	5	11	18	6	3	9
2012	1	6	6	13	3	2	5
2013	1	8	14	23	5	3	8
2014	2	5	8	15	8	3	11
2015	2	13	12	27	3	6	9
2016	5	17	28	50	5	2	7
Total	13	56	81	150	31	22	53

In Table 4-1, 203 sovereign rating announcements are divided by rating agency and year. Negative announcements represent approximately 74% of the sample, including credit watches (13), negative outlook changes (56), and rating downgrades (81). Positive sovereign rating announcements are composed of positive outlook changes (31) and rating upgrades (22). In the sample, about half of the announcements are actual rating changes, with rating downgrades accounting for the majority. Among all rating agencies, S&P is the most active agency in announcing rating downgrades, while Moody's is leading in publishing rating upgrades. A breakdown of sovereign rating announcements by year shows a general increase in the number of negative announcements and a stable trend of positive announcements. In the sample, Egypt and Tunisia suffered a number of negative announcements in 2013 due to unresolved political situations and civil violence. In 2016, Nigeria, Mozambique, and the Republic of Congo were downgraded mainly due to economic recessions, with Mozambique and the Republic of Congo suffering from severely limited abilities to service their outstanding sovereign debt. In general, the sovereign credit ratings of African countries are relatively low and sensitive to political and economic turbulences.

Of the 37 banks, more than half are from Northern Africa, including Egypt (7), Morocco (5), and Tunisia (9), as stock markets in the north have the longest history among African countries. Eastern Africa contributes 9 banks from Kenya (7), Mauritius (1), and Tanzania (1). South Africa alone accounts for 5 banks in the sample. At the bottom lies Western Africa with 2 banks from Benin (1) and Niger (1). The size of bank sample is limited because a number of African banks are either not publicly listed or have a short public history that is not sufficient for the observation period.

4.3.2 Measures

To investigate the influence of sovereign rating announcements on banks' stock prices, we use the market model of the event study method (MacKinlay, 1997). The equation applied is:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}, \tag{4-1}$$

where $R_{i,t}$ is the stock return of firm *i* on day *t*. $R_{m,t}$is the market return, with the MSCI EFM Africa Index as the benchmark. We use an estimation window of 252 days before the announcement date *t=0*, namely [-257; -6], to predict the parameters $\hat{\alpha}$ and $\hat{\beta}$ with OLS regression. Next, the abnormal return $AR_{i,t}$ is calculated by:

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) = R_{i,t} - \left(\hat{\alpha}_i + \hat{\beta}_i R_{m,t}\right), \tag{4-2}$$

where $E\left(R_{i,t}\right)$ refers to the expected return. The *CAR* of firm *i* over the event window $[\tau_1; \tau_2]$ is subsequently computed by:

$$CAR_{i,[\tau_1;\tau_2]} = \sum_{\tau_1}^{\tau_2} AR_{i,t}. \tag{4-3}$$

And the average effect for *N* firms is calculated by:

$$CAAR_{[\tau_1;\tau_2]} = \frac{1}{N}\sum_{i=1}^{N} CAR_{i,[\tau_1;\tau_2]}. \tag{4-4}$$

To check if the CAAR is statistically different from zero, two parametric tests are applied, namely the student t-test and the test according to Boehmer et al. (1991). Brown and Warner (1985) show that the t-test is prone to event-induced volatility, while the Boehmer-test controls for this problem by using a test statistic to reflect variance increases over the event window. However, when the sample size is small, it is usually not clear whether it is normally distributed. For this reason, two non-parametric tests are applied in this study, namely the test according to Corrado and Zivney (1992) and the generalized sign-test (Cowan, 1992).

4.4 Empirical results

4.4.1 Differential spillover effects of banks' reactions

Our observations are composed of the responses of 37 banks' stock prices to 150 negative and 53 positive sovereign rating announcements in Africa. In total, there are 4,184 observations for negative announcements and 1,485 for positive ones after eliminating illiquid stocks[14] and confounding events[15].

Table 4-2 presents the results for negative sovereign rating announcements. Panel A shows that African banks gain significant positive CAARs upon negative sovereign rating announcements for all event windows. Over the main event window [-5; +5], banks generate a CAAR of 2.27% at the highest significance level, showing the most significant reaction to negative announcements. When further analyzing the results, we find that banks get positive abnormal returns on each day surrounding the announcements, with a CAAR of 0.58% on the event day. According to earlier studies, one would expect negative reactions to sovereign bad news (e.g., Followill & Martell, 1997; Hand et al., 1992; Kiesel et al., 2016; Norden & Weber, 2004). However, our results show an inverted conclusion. To better understand the positive effects of negative sovereign rating announcements, we divide the sample into domestic and foreign banks. Panel B of Table 4-2 shows that domestic banks suffer losses but without statistical significance over the main event window [-5; +5]. Even so, they tend to react slightly positively right upon negative announcements, with a CAAR of 0.31% at the 5% significance level. We interpret that even bad news may indicate a better-than-expected result, easing excessive panic in domestic markets. According to Panel C of Table 4-2, the significant positive CAARs of banks are mainly driven by banks in the non-reviewed African countries, generating a CAAR of 2.45% at the highest significance level over the main event window [-5; +5]. On the announcement day, foreign banks get a highly significant CAAR of 0.59%. These results suggest that negative sovereign rating announcements have a significant positive impact on foreign banks.

[14] We consider a stock with more than 50% of returns equal to zero over the estimation window [-275; -6] and the event window [-5; +5], respectively, as illiquid.

[15] We use the LexisNexis database and rating agencies' publications to check for confounding events. A radical change in the corporate structure and legal investigation of banks and another sovereign rating announcement in Africa within the main event window [-5; +5] are considered as confounding events.

Table 4-2. African banks' reactions to negative sovereign rating announcements

This table presents the event study results for 4,181 negative observations. Panel A shows the results for all banks. Panel B shows the results for domestic banks in the reviewed countries. Panel C shows the results for foreign banks in the non-reviewed countries. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. The proportions of positive to negative CARs are shown in parentheses.

Event window	CAAR	t-test	Boehmer test	Corrado test	sign-test	N (pos: neg)
Panel A: All banks to negative announcements						
[-5; +5]	2.27%	7.06***	2.20**	0.99	5.75***	4,181 (2,151: 2,030)
[-2; +2]	1.74%	8.02***	1.87*	1.02	3.33***	4,181 (2,073: 2,108)
{0}	0.58%	5.95***	1.00	0.29	1.69*	4,181 (2,020: 2,161)
Panel B: Domestic banks to negative announcements						
[-5; +5]	-0.41%	-0.22	-1.42	-0.73	-0.62	262 (123: 139)
[-2; +2]	0.26%	0.20	1.14	0.49	0.98	262 (136: 126)
{0}	0.31%	0.54	2.19**	1.94*	2.34**	262 (147: 115)
Panel C: Foreign banks to negative announcements						
[-5; +5]	2.45%	7.69***	2.22**	1.20	6.10***	3,919 (2,028: 1,891)
[-2; +2]	1.83%	8.56***	1.86*	0.96	3.19***	3,919 (1,937: 1,982)
{0}	0.59%	6.19***	0.99	-0.14	1.14	3,919 (1,861: 2,058)

Table 4-3 demonstrates the results for positive sovereign rating announcements. In general, African banks do not react significantly to positive announcements, largely due to the insignificant results of foreign banks (Panel C). Nevertheless, domestic banks gain significant positive CAARs for all event windows. Panel B shows that domestic banks get a CAAR of 1.62% over the main event window [-5; +5] at the 5% significance level. On the announcement day, domestic banks gain a CAAR of 0.76% at the highest significance level. Compared to previous studies (e.g., Alsakka et al., 2014; Caselli et al., 2016; Correa et al., 2014), domestic banks in Africa react much more intensively to positive sovereign rating announcements.

Overall, we find distinctly different responses between domestic and foreign banks to sovereign rating announcements in Africa. For both negative and positive announcements, the overall results present similar trends with foreign banks' reactions, as foreign observations account for the majority of our sample. In Figure 4-1, foreign banks respond exceptionally positively to others' negative sovereign rating announcements, and this trend tends to persist over longer periods. On the contrary, surrounding positive sovereign rating announcements, domestic banks react positively, and the uptrend slowly increases over time. Our findings are in contrast to the literature that documents common spillover effects upon negative sovereign rating announcements (e.g., Afonso et al., 2012; Ferreira & Gama, 2007; Ismailescu & Kazemi, 2010).

Table 4-3. African banks' reactions to positive sovereign rating announcements

This table presents the event study results of 1,485 positive observations. Panel A shows the results for all banks. Panel B shows the results for domestic banks in the reviewed countries. Panel C shows the results for foreign banks in the non-reviewed countries. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. The proportions of positive to negative CARs are shown in parentheses.

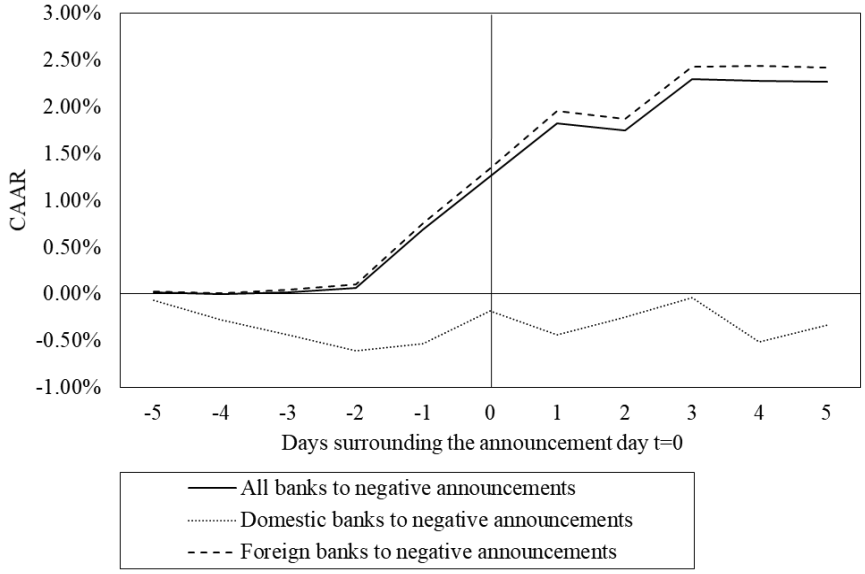
Event window	CAAR	t-test	Boehmer test	Corrado test	sign-test	N (pos: neg)
Panel A: All banks to positive announcements						
[-5; +5]	-0.26%	-0.31	0.88	-0.97	1.33	1,485 (709: 776)
[-2; +2]	-0.19%	-0.34	0.12	-0.80	0.81	1,485 (699: 786)
{0}	-0.04%	-0.16	-0.53	-0.32	0.86	1,485 (700: 785)
Panel B: Domestic banks to positive announcements						
[-5; +5]	1.62%	2.58**	1.84**	1.48	2.01**	81 (45: 36)
[-2; +2]	0.99%	2.34**	1.91**	1.26	0.90	81 (40: 41)
{0}	0.76%	3.99***	2.85***	2.55**	3.13***	81 (50: 31)
Panel C: Foreign banks to positive announcements						
[-5; +5]	-0.37%	-0.42	0.33	-1.32	0.89	1,404 (664: 740)
[-2; +2]	-0.26%	-0.44	-0.31	-1.10	0.62	1,404 (659: 745)
{0}	-0.09%	-0.33	-1.22	-0.88	0.14	1,404 (650: 754)

The differential spillover effects of sovereign ratings on banks' stock prices, particularly in the case of negative sovereign rating announcements, imply strong competitive relationships and low integration in African banking markets. This can be attributed to the following factors. First, given that the general sovereign ratings of African countries are quite low, banks are not motivated to hold each other's financial products, resulting in low interdependence among African banks. Second, the heavy information asymmetry in African capital markets can make banks react to new external information quite intensively and only to their own benefit. For example, the lower attractiveness of a negatively reviewed African sovereign can increase others' relative competitiveness with respect to foreign funds and global cooperation. Third, different from Ismailescu and Kazemi (2010), African markets share fewer common capital resources than more advanced emerging markets, which are generally associated with more international investments. Therefore, the changing solvency risk of one African country can only have a limited impact on the capital available to others, preventing co-moments in overall African capital markets.

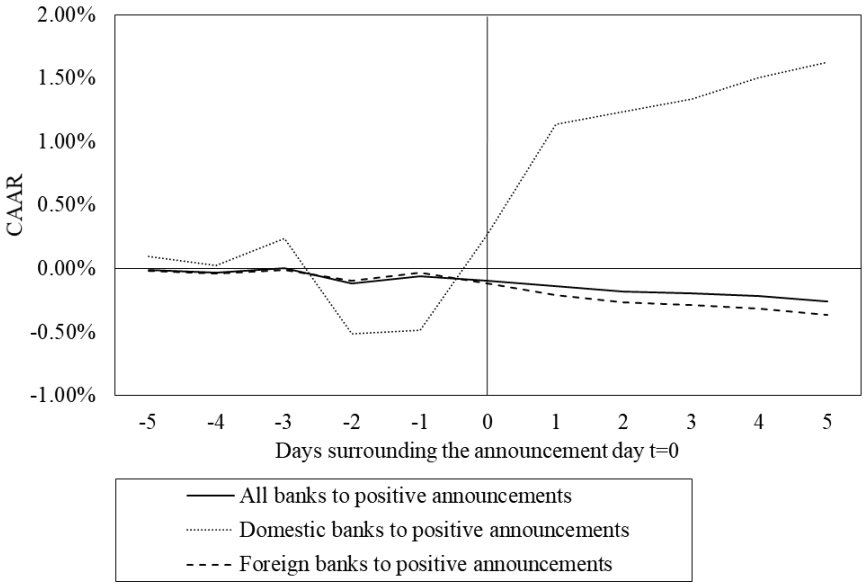
Figure 4-1. African banks' CAARs to sovereign rating announcements

This figure shows African banks' CAARs to 150 negative sovereign rating announcements (Panel A) and 53 positive rating announcements (Panel B) over the main event window [-5; +5]. The reactions of banks are divided into all, domestic, and foreign banks.

Panel A: Banks' reactions to negative sovereign announcements



Panel B: Banks' reactions to positive sovereign announcements



4.4.2 Influence of free trade agreements

According to Gande and Parsley (2005), trade flows can significantly affect the reactions to sovereign ratings across different countries. Based on this finding, we propose that if African countries have more frequent cross-border trade relationships, proxied by the membership in

the AFTZ, the differential spillover effects of banks' reactions can be decreased based on improved economic integration. Baier and Bergstrand (2007) find that free trade agreements can significantly increase the international trade flows of member countries. Market opening provides more opportunities for members to benefit from comparative advantages and improves overall market integration and economic growth (Hur & Park, 2012). To investigate the impact of free trade agreements in Africa, we run OLS regressions based on the following form:

$$CAR_i = \alpha_i + \beta_1 * Free\ trade\ zone_i + \beta_2 * Free\ trade\ zone\ (year\ cumulative)_i + \beta_3 * Foreign_i + \beta_4 * Downgrade_i + \beta_5 * Credit\ watch_i + \beta_6 * Upgrade_i + \beta_7 * S\&P_i + \beta_8 * Moody's_i + \beta_9 * ROA_i + \beta_{10} * M/B_i + \beta_{11} * Equity/assets_i + \varepsilon_i. \quad (4\text{-}5)$$

The dependent variable is banks' CARs during the main event window [-5; +5], as they provide the largest and most significant results. Moreover, we focus on the short-term spillover effects of sovereign rating announcements, making an 11-day interval more appropriate than the announcement day. *Free trade zone* is a binary variable equal to 1 if the bank is publicly listed in a member country of the AFTZ. *Free trade zone (year-cumulative)* shows the cumulative effect equal to the member status multiplying the year of being in the AFTZ, aiming to examine the influence of trade relationships over the years. *Foreign* is a binary variable equal to 1 if the bank is a foreign bank. *Downgrade* is a binary variable equal to 1 if the sovereign rating announcement is a rating downgrade. According to Followill and Martell (1997), the announcement of a credit watch can trigger a stronger impact than actual downgrade because investors would anticipate the upcoming rating change. Therefore, we use the binary variable *credit watch* to examine this effect. For positive announcements, we apply the binary variable *upgrade*. Since there are only upgrades and positive outlooks in the sample, we can clearly identify the effect of both. *S&P* and *Moody's* are binary variables equal to 1 if the announcement is from S&P or Moody's, respectively. Williams et al. (2013, 2015) and Alsakka et al. (2014) show that S&P announcements trigger the strongest impact on banks' stock prices among the major credit rating agencies because S&P tends to be the first to announce rating adjustments. In our sample, however, S&P is the most active agency for negative rating adjustments, whereas Moody's is leading positive ones. In addition, Caselli et al. (2016) observe that domestic banks with better financial performance suffer more from sovereign rating downgrades because they are more likely to participate in government-related projects. Therefore, we use three control variables of banks' financials at the year-end prior to sovereign rating announcements, obtained from the Thomson Reuters Worldscope database, namely *return-on-assets* for profitability, *market-to-book* for valuation, and *equity/ assets* for capital structure.

Table 4-4. Free trade zone and negative sovereign rating announcements

This table shows the regression results of banks' CARs [-5; +5] to negative sovereign rating announcements. Robust t-statistics are given in parentheses. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A3.

	All banks		***Domestic banks***		***Foreign banks***	
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Free trade zone	-0.004**		-0.002		-0.007***	
	(-2.212)		(-0.242)		(-3.135)	
Free trade zone (year-cumulative)		-0.000		-0.002		-0.000
		(-0.519)		(-0.981)		(-0.747)
Foreign	0.004	0.005				
	(0.966)	(1.188)				
Downgrade	0.003*	0.003*	0.013	0.011	0.002	0.002
	(1.931)	(1.931)	(1.548)	(1.254)	(1.016)	(1.063)
Credit watch	0.006*	0.006*	-0.024	-0.023	0.006**	0.007**
	(1.766)	(1.772)	(-1.214)	(-1.165)	(2.130)	(2.145)
S&P	0.001	0.001	0.006	0.007	0.001	0.001
	(0.478)	(0.496)	(0.530)	(0.612)	(0.370)	(0.438)
Moody's	0.004*	0.004*	-0.009	-0.010	0.005**	0.005**
	(1.931)	(1.947)	(-0.961)	(-0.988)	(2.239)	(2.269)
Return-on-assets	0.195*	0.155	-0.773**	-0.721**	0.363***	0.295**
	(1.687)	(1.340)	(-2.324)	(-2.146)	(2.985)	(2.455)
Market-to-book	-0.006***	-0.006***	-0.011**	-0.011**	-0.007***	-0.006***
	(-5.752)	(-5.536)	(-2.353)	(-2.332)	(-5.824)	(-5.538)
Equity/ assets	-0.034	-0.033	-0.132	-0.142	-0.048*	-0.045
	(-1.221)	(-1.173)	(-1.114)	(-1.197)	(-1.653)	(-1.552)
Constant	0.007	0.005	0.032**	0.038**	0.013***	0.010***
	(1.383)	(0.898)	(2.042)	(2.461)	(3.647)	(2.930)
Observations	3,623	3,623	214	214	3,409	3,409
Adjusted R^2	0.014	0.012	0.125	0.129	0.017	0.014
F-test	5.474***	5.248***	4.800***	5.114***	6.271***	5.808***

Table 4-4 shows the regression results for negative sovereign rating announcements. Model (1) and (2) are applied to all banks, Model (3) and (4) only to domestic banks, and Model (5) and (6) only to foreign banks. All models are examined for multicollinearity. We aim to compare the influence of free trade agreements with the year-cumulative effect and to investigate the differences between domestic and foreign banks in terms of their contrasting responses to sovereign rating announcements. The number of negative observations is reduced to 3,623 due to the absence of banks' financial data. According to Table 4-4, the variable *free trade zone* is negative and highly significant in Model (1) and (5), showing the most pronounced negative effect on foreign banks' abnormal returns based on the largest negative coefficient at the 1%

significance level. In the event study, we observe that foreign banks get significant positive abnormal returns upon others' sovereign bad news. The negative coefficient suggests that this unusual positive reaction can be reduced when banks have current exposure to free trade relationships with other African countries. We confirm our conjecture based on the finding of Gande and Parsley (2005) that free trade agreements can facilitate the integration of capital markets. However, we do not observe a significant cumulative effect, meaning that the status rather than the history of being in the AFTZ matters for foreign banks upon negative sovereign rating announcements. We interpret that banks are less surprised when they have longer free trade experience since negative sovereign announcements are quite often in Africa. In line with Followill and Martell (1997), we find that *credit watch* can strengthen foreign banks' abnormal returns. It implies that foreign banks are more surprised by new information and can anticipate others' rating downgrades to some extent. Compared to other studies, we observe that *Moody's* instead of *S&P* has a stronger impact on foreign banks (Alsakka et al., 2014; Williams et al., 2013, 2015). In our sample, *Moody's* is the least active agency in announcing negative rating adjustments in Africa, which may be interpreted as the most cautious agency by investors, leading to a greater impact. Nevertheless, factors such as free trade relationships and rating characteristics do not show any significant influence on domestic banks. In contrary to foreign banks, the variable *return-on-assets* has significant negative coefficients with domestic banks' CARs. In line with Caselli et al. (2016), we find that domestic banks with higher profitability suffer more from negative announcements based on their involvement in government-related projects. A new finding from our study is that foreign banks with higher profitability can benefit more from others' sovereign bad news. We interpret that these banks are more likely to win foreign investment than less profitable banks, and thus gain stronger relative competitiveness in African capital markets. In addition, the variable *market-to-book* has overall significant negative coefficients, suggesting that higher stock valuation may lead to lower abnormal returns upon negative sovereign rating announcements.

Table 4-5. Free trade zone and positive sovereign rating announcements

This table shows the regression results of banks' CARs [-5; +5] to positive sovereign rating announcements. Robust t-statistics are given in parentheses. Statistical significance at the 1%, 5%, and 10% levels are indicated by ***, **, and *, respectively. Variable descriptions are shown in Appendix A3.

	All banks		***Domestic banks***		***Foreign banks***	
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Free trade zone	0.001		0.007		-0.000	
	(0.178)		(0.415)		(-0.034)	
Free trade zone (year-cumulative)		0.002***		0.008		0.002**
		(3.065)		(1.618)		(2.572)
Foreign	-0.016	-0.015				
	(-1.524)	(-1.444)				
Upgrade	-0.001	-0.000	-0.036*	-0.037**	0.002	0.002
	(-0.196)	(-0.057)	(-1.940)	(-2.085)	(0.515)	(0.627)
S&P	0.001	0.001	0.051*	0.046*	-0.001	-0.001
	(0.361)	(0.403)	(1.908)	(1.916)	(-0.279)	(-0.233)
Moody's	-0.004	-0.006	0.007	0.012	-0.002	-0.003
	(-0.908)	(-1.288)	(0.384)	(0.617)	(-0.412)	(-0.797)
Return-on-assets	0.149	0.050	0.440	0.609	0.092	0.001
	(0.866)	(0.303)	(0.606)	(0.800)	(0.514)	(0.004)
Market-to-book	-0.004**	-0.003*	-0.012	-0.005	-0.003	-0.002
	(-2.061)	(-1.679)	(-0.812)	(-0.396)	(-1.645)	(-1.306)
Equity/ assets	0.004	0.005	-0.362	-0.425	0.022	0.023
	(0.083)	(0.099)	(-0.957)	(-1.057)	(0.431)	(0.461)
Constant	0.021	0.014	0.045	0.021	0.002	-0.002
	(1.627)	(1.173)	(1.141)	(0.672)	(0.385)	(-0.426)
Observations	1,306	1,306	69	69	1,237	1,237
Adjusted R^2	0.003	0.012	0.060	0.108	-0.002	0.004
F-test	0.882	2.016**	1.059	1.024	0.607	1.755*

Table 4-5 shows the regression results for positive sovereign rating announcements. The number of positive observations is reduced to 1,306 due to the lack of banks' financial data. Different from the results for negative announcements, the year-cumulative effect of the AFTZ has a significant positive effect on banks' abnormal returns, largely due to foreign banks. This surprising finding shows that the longer foreign banks are in the AFTZ, the more positive they react to others' positive announcements. Combined with Table 4-4, we interpret that positive sovereign rating announcements are less often in Africa. Banks who have a longer history in the free trade area may benefit more from cooperation with others over the years. Moreover, we identify negative coefficients of *upgrade* for domestic banks, implying that banks react less positively to rating upgrades than positive outlooks due to the anticipation of rating changes.

4.5 Conclusion

We analyze the influence of sovereign rating announcements on banks' stock prices in Africa between 2010 and 2016. The sample is composed of 150 negative and 53 positive sovereign rating announcements from Fitch, Moody's, and S&P, as well as the corresponding stock price reactions of 37 African banks. We observe strong differential spillover effects in banks' responses to negative sovereign rating announcements, indicating a low level of integration in African banking markets.

For negative sovereign rating announcements, African banks generate a CAAR of approximately 2.27% at the 1% significance level over the main event window [-5; +5], with foreign banks generating a highly significant CAAR of 2.45%. Domestic banks, in contrast, react insignificantly in the same period. For positive sovereign rating announcements, only domestic banks get a significant CAAR of around 1.62% over the main event window [-5; +5]. There is no evidence that positive rating announcements have spillover effects on foreign banks.

We further find evidence that free trade agreements can decrease the differential spillover effects upon negative sovereign rating announcements. The unusual positive reaction of foreign banks can be reduced when banks have more current exposure to international trade flows within Africa, suggesting improved capital market integration. On the contrary, foreign banks benefit more when negative announcements are credit watches or from Moody's. It can be attributed to the fact that investors may anticipate rating downgrades and interpret Moody's actions as the most cautious in Africa. In addition, foreign banks with higher profitability gain larger abnormal returns because they are more competitive to get international investment, while more profitable domestic banks suffer more, likely due to their involvement in government-related projects. For positive sovereign announcements, the year-cumulative effect of free trade relationships has a significant positive effect on foreign banks' abnormal returns, suggesting that the longer banks are in the AFTZ, the more positively they respond to others' positive announcements. Moreover, domestic banks react less positively to rating upgrades than positive outlooks because of the anticipation of rating changes.

Chapter 5: Reaktionen der Kryptowährungsmärkte auf die Covid-19-Pandemie[16]

Mit dem Aufkommen von Kryptowährungen war auch die Hoffnung verbunden, eine neue Anlageklasse zu etablieren, die gerade in Krisenzeiten durch eine geringe Renditekorrelation mit anderen Wertpapieren Diversifikationspotentiale bietet und als „sicherer Hafen“ fungieren kann. Der rasante Ausbruch der Covid-19-Pandemie zeigt jedoch, dass in Krisenzeiten sowohl die globalen Aktienmärkte als auch viele bedeutsame Kryptowährungen unter der geschwächten Wirtschaft leiden. Unsere Analyse zeigt, dass nicht alle Kryptowährungen ähnlich betroffen waren und dass eine differenziertere Selektion unter Einbeziehung der Marktvolumina durchaus Diversifikationseffekte ermöglicht.

5.1 Einleitung und Motivation

Einhergehend mit dem sich abzeichnenden gesamtwirtschaftlichen Schaden durch den globalen Ausbruch der Covid-19-Pandemie sind neben klassischen Anlageklassen auch Kryptowährungen betroffen. Seit Italien am 21.02.2020 den ersten „Lockdown” in eingegrenzten nördlichen Gebieten verkündet hat, ist der Preis von Bitcoin[17] bis zum 16. März um ca. 50% gefallen. Dabei gilt es zu beachten, dass immer mehr Unternehmen auch Bestände an Kryptowährungen halten, weil sie ihren Kunden und Lieferanten innovative digitale Zahlungsmittel bieten wollen (Foley et al., 2019). Für diese Unternehmen gewinnen mit größer werdenden Kryptowährungsvolumina Preisvorhersagemodelle an Bedeutung, die bei Anpassungen der vorgehaltenen Bestände gewinnsteigernd eingesetzt werden können. Jedoch stellen insbesondere die kleineren Kryptowährungen aufgrund ihrer geringen Marktkapitalisierung heute noch eine schwierige Anlageklasse dar. Auch die technologische Komplexität, Risiken durch Hackerangriffe und rechtliche Unklarheiten sind aktuelle Herausforderungen, die einer breiteren Akzeptanz im Wege stehen. Während die Europäische Bankenaufsicht (EBA) die institutionellen Aktivitäten im Kryptowährungsbereich aktuell noch als limitiert einstuft (EBA, 2019), werden auf nationaler Ebene bereits die Weichen für einen transparenteren Umgang mit Kryptowährungen

[16] Das Paper wurde am 29.05.2020 in *Corporate Finance* veröffentlicht. Die Autoren sind David Häfner, Jianan He und Dirk Schiereck.

[17] Der Preis aller Kryptowährungen wird in dieser Studie einheitlich in USD angegeben.

gestellt. In Deutschland wurde das Krypto-Verwahrgeschäft mittlerweile als neue Finanzdienstleistung in das Kreditwesengesetz aufgenommen, wodurch Unternehmen für Aktivitäten im Bereich Kryptowährungen ab 2020 eine Erlaubnis der BaFin benötigen. Schritte wie dieser, hin zu mehr Rechtssicherheit, machen Kryptowährungen auch zunehmend für Unternehmen und institutionelle Investoren attraktiver.

Zuletzt hat auch die hohe Preisvolatilität von Kryptowährungen Investoren und Nutzer aufgeschreckt und eine hohe Handelsaktivität auf Kryptowährungsmärkten ausgelöst. Handelsaktivität schlägt sich im Handelsvolumen nieder. Die Beziehung zwischen Handelsvolumen und zukünftigen Renditen ist für Aktienmärkte bereits gut dokumentiert (e.g., Campbell et al., 1993; LeBaron, 1992; Lee & Swaminathan, 2000; Stickel & Verrecchia, 1994), hingegen gibt es – seiner jungen Historie geschuldet – bisher nur wenige Erkenntnisse zu diesem komplexen Zusammenspiel für Kryptowährungen. Zhang et al. (2018) untersuchen eine Stichprobe führender Kryptowährungen und zeigen, dass die täglichen Preisveränderungen von Kryptowährungen einige Gemeinsamkeiten mit Aktien aufweisen. So besitzen die Renditeverteilungen sog. „heavy tails“, und die Autokorrelation der Renditen nimmt schnell ab. Zudem existiert bei Kryptowährungen anscheinend eine Verbindung zwischen Preis und Handelsvolumen in Form eines Potenzgesetzes. Bianchi und Dickerson (2019) berichten, dass der Interaktionsterm zwischen historischen Renditen und Handelsvolumen einen signifikanten Effekt auf die Preisvorhersagbarkeit der zwanzig größten Kryptowährungen hat. Dieses Ergebnis impliziert auch, dass der Markt für Kryptowährungen nicht vollkommen effizient ist.

All diesen Studien ist gemein, dass die erhobenen Daten aus einer Zeit mit einem relativ ruhigen makroökonomischen Umfeld stammen. Fraglich ist nun, ob sich ähnliche Ergebnisse auch in globalen Krisenzeiten, wie die der Covid-19-Pandemie, bestätigen lassen und ob Kryptowährungen einen sicheren Hafen für Investoren bieten können, mit denen sich Aktienbestände diversifizieren und Kryptowährungsbestände wertbeständig halten lassen. So finden Corbet et al. (2020) Hinweise dafür, dass die Kryptowährung Bitcoin bei den initialen Auswirkungen der Covid-19-Pandemie auf die chinesischen Aktienmärkte allein als sicherer Hafen eher ungeeignet gewesen wäre. U. a. argumentieren Chordia et al. (2002), dass das Verständnis für das Zusammenspiel zwischen Liquidität, Handelsvolumen, Volatilität und Preis – das auf Aktienmärkten durch makroökonomische Begebenheiten oder auch Marktpsychologie hervorgerufen wird – noch verbessert werden muss. Die nachfolgende Analyse erweitert den Kenntnisstand, indem die intertemporale Beziehung zwischen Rendite und Handelsvolumen und dem Einfluss

von Covid-19 auf Kryptowährungen mit geringer und hoher Marktkapitalisierung zwischen Januar 2018 und März 2020 dokumentiert wird.

Die weitere Analyse ist folgendermaßen strukturiert: Kapitel 5.2 beschreibt den verwendeten Datensatz, erläutert die im Regressionsmodell enthaltenen Variablen und präsentiert anschließend die empirischen Ergebnisse. Kapitel 5.3 schließt die Studie ab und fasst die Befunde zusammen.

5.2 Daten und empirische Ergebnisse

Für die empirische Analyse werden öffentlich verfügbare Daten von Coinmarketcap mit täglichen Preisen und Handelsvolumina über einen Zeitraum vom 01.01.2018 bis zum 15.03.2020 verwendet. Tabelle 5-1 fasst deskriptive Statistiken des Datensatzes zusammen. Es wird deutlich, wie ungleich die Marktkapitalisierung verteilt ist und dass die Top 10 Kryptowährungen[18] inzwischen ca. 89% der Gesamtmarktkapitalisierung ausmachen (Panel A)[19].

Für die 20 Kryptowährungen werden tägliche Renditen für jede Kryptowährung *i* anhand folgender Formel berechnet[20]:

$$r_{i,t} = \frac{Schlusskurs_{i,t}}{Eröffnungskurs_{i,t}} - 1. \qquad (5\text{-}1)$$

Mit Blick auf die Covid-19-Pandemie zeigt Abbildung 5-1 die Wertentwicklung respektive die Renditen seit dem 01.01.2020 von zwei „Buy and Hold"-Portfolios, die gleichgewichtet in die zehn führenden (Large Caps) und zehn Kryptowährungen mit geringer Marktkapitalisierung (Small Caps) investieren.

[18] Die Top 10 Kryptowährungen, basierend auf Marktkapitalisierung, sind: Bitcoin, Ethereum, XRP, Tether, Bitcoin Cash, Bitcoin SV, Litecoin, EOS, Binance Coin und Tezos (Stand 12.03.2020).

[19] Wir schließen Tether (USDT) aus der Stichprobe aus, da es ein „stable coin" ist. Anstelle von Tether nehmen wir die Kryptowährung Stellar (XLM) auf.

[20] Kryptowährungsbörsen ermöglichen ununterbrochenen Handel, $Eröffnungskurs_{i,t} \approx Schlusskurs_{i,t-1}$.

Tabelle 5-1. Deskriptive Statistik[21]

Diese Tabelle zeigt die Stichprobencharakteristika von 20 Kryptowährungen. Panel A beinhaltet die größten Kryptowährungen (Large Caps), wohingegen Panel B aus kleineren Kryptowährungen besteht (Small Caps), basierend auf der durchschnittliche Marktkapitalisierung in USD zwischen 01.01.2018 und 15.03.2020.

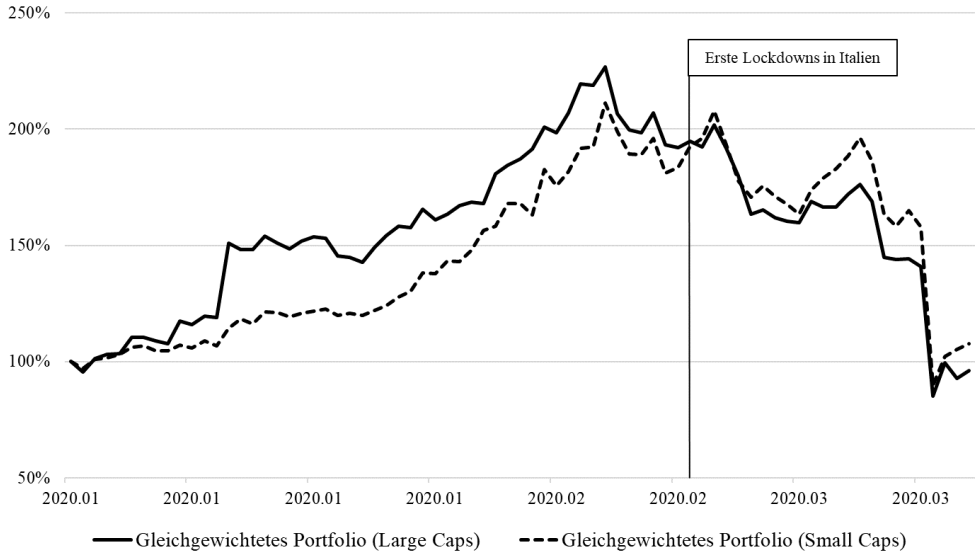
	Panel A: Large Caps			***Panel B: Small Caps***		
	Marktkapitalisierung (Mio.)	Preis	24h Handelsvolumen (Mio.)	Marktkapitalisierung (Mio.)	Preis	24h Handelsvolumen (Mio.)
	Bitcoin (BTC)			***Status (SNT)***		
Mittelwert	133,000	7,610.22	13,600	200	0.06	48
Std.-Abw.	43,400	2,486.68	10,600	282	0.08	120
	Ethereum (ETH)			***Loopring (LRC)***		
Mittelwert	32,600	320.76	5,670	123	0.20	7
Std.-Abw.	24,300	254.15	4,790	161	0.29	11
	XRP (XRP)			***Aion (AION)***		
Mittelwert	18,800	0.47	1,180	118	0.92	5
Std.-Abw.	13,900	0.37	1,090	131	1.58	5
	Bitcoin Cash (BCH)			***Aelf (ELF)***		
Mittelwert	9,410	545.11	1,350	113	0.41	23
Std.-Abw.	8,060	483.68	1,750	114	0.48	35
	Litecoin (LTC)			***WAX (WAXP)***		
Mittelwert	5,030	85.43	1,900	88	0.13	2
Std.-Abw.	2,690	49.80	1,690	112	0.23	7
	EOS (EOS)			***Zcoin (XZC)***		
Mittelwert	4,920	5.76	1,620	86	16.56	4
Std.-Abw.	2,640	3.41	1,200	76	20.52	5
	Stellar (XLM)			***Energi (NRG)***		
Mittelwert	3,270	0.17	194	42	2.23	0.3
Std.-Abw.	2,370	0.13	167	37	1.87	0.3
	Bitcoin SV (BSV)			***Aragon (ANT)***		
Mittelwert	2,240	128.21	618	41	1.45	0.4
Std.-Abw.	1,370	71.68	907	41	1.49	1
	Binance Coin (BNB)			***Blockstack (STX)***		
Mittelwert	2,160	15.91	164	17	0.13	1
Std.-Abw.	1,220	7.51	142	19	0.04	2
	Tezos (XTZ)			***Molecular Future (MOF)***		
Mittelwert	618	1.84	20	14	0.37	7
Std.-Abw.	501	1.30	48	29	0.47	11

Aus Abbildung 5-1 geht hervor, dass das Portfolio aus großen Kryptowährungen zu Beginn des Jahres eine bessere Wertentwicklung erfahren hat. Seit dem Ausbruch des Coronavirus und den ersten „Lockdowns“ in Italien – zu dem Zeitpunkt ein deutliches Signal, dass das Virus auch in Europa angekommen ist – hat sich dies jedoch geändert. Kleinere Kryptowährungen

[21] Dezimaltrennzeichen und Tausendertrennzeichen entsprechen der englischen Schreibweise, um die Konsistenz in dieser Dissertation zu gewährleisten.

reagieren deutlich weniger stark auf die Pandemie und die Wertentwicklung des Portfolios übertrifft seither das der führenden Kryptowährungen. Bei beiden Portfolios ist zwar zuletzt ein hoher Wertverlust zu verzeichnen, aber das Portfolio der kleineren Kryptowährungen weist seit Jahresbeginn eine positive (!) Rendite aus, und auch die Wertverluste der großen Kryptowährungen erscheinen im Vergleich zum US-amerikanischen oder deutschen Aktienmarkt überschaubar.

Abbildung 5-1. Renditeentwicklung großer und kleiner Kryptowährungen



Es wird aber auch die hohe Volatilität sichtbar, die mit einer regen Handelsaktivität einherging. Zur weiteren Analyse dieser Größen wird nachfolgend die Differenz zwischen dem höchsten und dem niedrigsten Intraday-Preis pro Tag und Kryptowährung ermittelt:

$$IntraDiff_{i,t} = \frac{Höchster\ Kurs_{i,t}}{Niedrigster\ Kurs_{i,t}} - 1. \tag{5-2}$$

$IntraDiff_{i,t}$ kann als Schätzwert für die tägliche kryptowährungsspezifische Volatilität betrachtet werden. Um in der empirischen Analyse die kryptowährungsspezifische Liquidität zu berücksichtigen, orientieren wir uns an dem von Amihud (2002) vorgeschlagenen Illiquiditätsmaß auf täglicher Basis:

$$ILLIQ_{i,t} = \frac{|r_{i,t}|}{Handelsvolumen_{i,t}}. \tag{5-3}$$

Die Querschnittskorrelation zwischen der Rendite und dem Handelsvolumen variiert zwischen den Kryptowährungen im Datensatz von 3% bis 34%, wodurch die Frage nach Kausalität zusätzlich motiviert wird. Gerade in volatilen Märkten werden Unternehmen, die

Kryptowährungsbestände halten, versuchen, durch Preisprognosen in der Bestandsoptimierung zusätzliche Gewinne zu erwirtschaften.

Um die Persistenz und Vorhersagekraft des Handelsvolumens und der Volatilität in Kryptowährungsmärkten statistisch zu überprüfen, verwenden wir ein Feste-Effekte-Regressionsmodell. Die folgende Gleichung zeigt unser Basisregressionsmodell:

$$r_{i,t} = \beta_0 + \beta_1 * r_{i,t-1} + \beta_2 * \log(Volumen)_{i,t-1} + \gamma * r_{i,t-1} * \log(Volumen)_{i,t-1} + \lambda' * x_{i,t} + c_i + u_{i,t} \; . \quad (5\text{-}4)$$

Dem Vorgehen von Bianchi und Dickerson (2019) folgend inkludieren wir einen Interaktionsterm zwischen Handelsvolumen und Rendite. Bianchi und Dickerson (2019) dokumentieren einen signifikant positiven intertemporalen Zusammenhang zwischen dem Interaktionsterm und Kryptowährungsrenditen. Abhängig von der gewählten Modellspezifikation enthält der Vektor $\boldsymbol{x_{i,t}}$ zusätzlich die Variablen $IntraDiff_{i,t}$, und/ oder $ILLIQ_{i,t}$.

Um explizit den Einfluss des Handelsvolumens auf Renditen während des Ausbruchs der Covid-19-Pandemie zu testen, beinhaltet der Beobachtungszeitraum auch Handelstage seit dem Ausbruch. Und das Modell enthält eine entsprechende Covid-19-Indikatorvariable in $\boldsymbol{x_{i,t}}$.[22] Darüber hinaus wird ein Interaktionsterm zwischen der Covid-19-Indikatorvariablen und dem Handelsvolumen genutzt, da erwartet wird, dass der Pandemieausbruch zum einen Renditen und Handelsvolumen und zum anderen den Effekt des Handelsvolumens auf Renditen beeinflusst.

Wir schätzen die Parameter des Regressionsmodells für große Kryptowährungen (Panel A) und kleinere Kryptowährungen (Panel B) mittels der Kleinste-Quadrate-Methode. Die Ergebnisse sind in Tabelle 5-2 dargestellt. Es zeigt sich insgesamt kein statistisch signifikanter Zusammenhang zwischen vorangegangenem Handelsvolumen ($log\ (Volumen)_{t-1}$) und Renditen großer Kryptowährungen. Dies kann als Indiz dafür verstanden werden, dass Informationen effizient durch Handelsaktivitäten verbreitet werden und demzufolge im Marktpreis reflektiert sind. Dies trifft allerdings nicht auf kleinere Kryptowährungen zu. Die Modelle (4) bis (8) zeigen konsistent, dass ein hohes Handelsvolumen zukünftige Renditen negativ beeinflusst. Renditen großer Kryptowährungen scheinen darüber hinaus eine Autokorrelation erster Ordnung aufzuweisen. Dies ist ein Indiz für die Existenz von Momentum in Kryptowährungsmärkten. Interessanterweise ist diese Eigenschaft nicht bei kleineren Kryptowährungen beobachtbar.

[22] Die Variable nimmt den Wert 1 an, wenn die Beobachtung nach dem 14.02.2020 stattfand.

Tabelle 5-2. Regressionsergebnisse

Diese Tabelle zeigt die Regressionsergebnisse. Die abhängige Variable ist Rendite ($r_{i,t}$). Wir kontrollieren für Tages- und Währungs-Fixe Effekte und verwenden robuste Standardfehler für die Schätzung. Wir verwenden tägliche Daten vom 01.01.2018 bis zum 15.03.2020 von Coinmarketcap. Robuste t-Statistiken sind in Klammern angegeben. Die statistische Signifikanz auf dem 1 %-, 5 %- und 10 %-Level ist durch ***, ** bzw. * gekennzeichnet.

	Panel A: Large Caps				***Panel B: Small Caps***			
	Modell (1)	Modell (2)	Modell (3)	Modell (4)	Modell (5)	Modell (6)	Modell (7)	Modell (8)
log (Volumen)$_{t-1}$	-0.000	-0.000	-0.001	0.002**	-0.003***	-0.003***	-0.003***	-0.002***
	(-0.814)	(-0.742)	(-0.932)	(-2.830)	(-5.829)	(-5.747)	(-5.840)	(-4.257)
r_{t-1}	-0.025	0.317***	0.330***	0.364***	-0.012	0.032	0.032	0.04
	(-1.612)	(-4.051)	(-3.903)	(-3.970)	(-0.628)	(-0.151)	(-0.148)	(-0.181)
log (Volumen)$_{t-1}$ * r_{t-1}		-0.017***	-0.018***	-0.020***		-0.003	-0.003	-0.004
		(-4.581)	(-4.460)	(-4.609)		(-0.224)	(-0.221)	(-0.273)
IntraDiff$_{t-1}$	0.046***	0.047***	0.048***	0.052***	0.065***	0.066***	0.067***	0.071***
	(-6.485)	(-7.049)	(-6.903)	(-7.898)	(-4.088)	(-3.575)	(-3.620)	(-3.892)
ILLIQ$_{t-1}$			-5,085.150**	-3,549.263			-85.914	-57.702
			(-2,958)	(-1,590)			(-1.015)	(-0.696)
Covid-19$_{t-1}$				-0.064***				0.074**
				(-3.839)				(-2.437)
Covid-19$_{t-1}$ * log (Volumen)$_{t-1}$				0.001*				-0.006**
				(-2.073)				(-2.961)
Konstante	0.006	0.005	0.008	-0.034**	0.029***	0.029***	0.030***	0.024**
	(-0.512)	(-0.436)	(-0.637)	(-3.079)	(-4.009)	(-4.018)	(-4.063)	(-2.861)
Fixe Zeit	Ja	Ja	Ja	Ja	Ja	Ja	Ja	Ja
Fixe Kryptowährung	Ja	Ja	Ja	Ja	Ja	Ja	Ja	Ja
Beobachtungen	7,728	7,728	7,728	7,728	7,119	7,119	7,119	7,119
Adjustiertes R^2	0.32%	0.48%	0.48%	1.22%	0.67%	0.66%	0.65%	0.91%

Der Interaktionsterm zwischen Rendite und Handelsvolumen ($log\ (Volumen)_{t-1} * r_{t-1}$) ist hoch signifikant negativ bei großen Kryptowährungen. Der Argumentation von Llorente et al. (2002) folgend[23] sind gegenwärtige Renditen, gemeinsam mit hohem Handelsvolumen, ein starker Indikator für den Vorzeichenwechsel bei zukünftigen Renditen, wenn der Handel vorwiegend zur Portfolioabsicherung (Hedging) anstelle des Ausnutzens privater Informationen stattfindet. Genau dieses Verhalten lässt sich in den Modellen (2) bis (4) beobachten. Wir interpretieren das negative Vorzeichen des Interaktionsterms zwischen Rendite und Handelsvolumen bei großen Kryptowährungen als empirische Evidenz dafür, dass diese Beziehung auch in Kryptowährungsmärkten gilt und große Kryptowährungen tatsächlich inzwischen eine Relevanz als Zahlungsmittel besitzen. Bemerkenswerterweise zeigt sich dieser Zusammenhang nicht in Panel B. Bei kleineren Kryptowährungen scheint somit der spekulative Handel mit privater Information eine dominante Rolle zu spielen und die Zahlungsmittelfunktion vernachlässigbar zu sein. Dies ist konsistent mit Llorente et al. (2002), die argumentieren, dass es nur schwache oder sogar keine Umkehreffekte gibt, wenn der Aktienhandel vorwiegend spekulativ ist. Darüber hinaus zeigen die Ergebnisse, dass eine hohe Volatilität ($IntraDiff_{t-1}$) einen positiven Einfluss auf zukünftige Renditen hat. Dieses Ergebnis ist hochsignifikant und kann für kleine und große Kryptowährungen in allen acht Modellspezifikationen beobachtet werden. Außerdem scheint Illiquidität ($ILLIQ_{t-1}$) keinerlei Vorhersagekraft in Kryptowährungsmärkten zu besitzen.

Zuletzt betrachten wir Effekte bezüglich des Einflusses der Covid-19-Pandemie auf die Renditen von Kryptowährungen. Während der Ausbruch des Coronavirus die Renditen großer Kryptowährungen signifikant negativ beeinflusst hat, sind die durchschnittlichen Renditen für kleinere Kryptowährungen gestiegen. Der Interaktionsterm zwischen Covid-19 und dem Handelsvolumen ist für große Kryptowährungen signifikant positiv, während er signifikant negativ für kleine Kryptowährungen ist. Darüber hinaus ist der Einfluss des Handelsvolumens auf zukünftige Renditen seit dem Ausbruch von Covid-19 generell stärker geworden. Auch dieses Ergebnis ist konsistent mit dem Modell von Llorente et al. (2002).

[23] Llorente et al. (2002) betrachten Aktienmärkte. Die Schlussfolgerungen lassen sich auf Kryptowährungsmärkte übertragen.

5.3 Fazit

In dieser Analyse konnte gezeigt werden, dass die Einschätzung von Kryptowährungen als sicherer Anlagehafen nicht unberechtigt ist, allerdings scheint dies insbesondere für kleinere Kryptowährungen zu gelten. Zudem gibt es Prognosemöglichkeiten in den Renditeentwicklungen von Kryptowährungen. Die Beziehung zwischen Handelsvolumen und zukünftigen Renditen, welche für Aktienmärkte umfassend dokumentiert ist, existiert auch auf Kryptowährungsmärkten, allerdings vorrangig bei Kryptowährungen mit geringerer Marktkapitalisierung. Darüber hinaus wirkt sich die Interaktion zwischen Handelsvolumen und Renditen signifikant negativ auf zukünftige Renditen von Kryptowährungen mit hoher Marktkapitalisierung aus, wohingegen dieser Effekt bei kleineren Kryptowährungen nicht zu existieren scheint.

Auf den Ausbruch der Covid-19-Pandemie zeigen auch Kryptowährungsmärkte deutliche Reaktionen. So hat der Einfluss des Handelsvolumens auf zukünftige Renditen seit der Pandemie bei kleineren Kryptowährungen signifikant zugenommen. Die Dimension der Covid-19-Pandemie ist aktuell noch nicht absehbar, doch es werden bereits Parallelen zur Finanzkrise 2008 – 2009 gezogen. Weitere Forschung ist zwingend notwendig, denn ein Verständnis für das komplexe Zusammenspiel zwischen Renditen und Handelsvolumen – vor allem in Zeiten makroökonomischer Unsicherheit – ist wichtig, um das Diversifikationspotential und die Beständigkeit von Kryptowährungen als sicherer Anlagehafen festzustellen.

Chapter 6: Concluding remarks

The presented studies show evidence of the semi-strong market efficiency, where security prices react significantly to public announcements of the events that are crucial to firms' valuation. We focus on two trends in capital markets. One is industry integration, where companies improve their efficiency to adapt to the changing environment. In this context, many firms choose M&A to achieve external growth and strengthen their competitiveness. The other is investment diversification, where investors actively search for low correlated markets and assets with global portfolios to reduce their investment risk. These two trends have been well explored in previous studies, where researchers provide deep insights to market participants. Nevertheless, the recent changes in regulation and market environment have put many findings in question, and some emerging markets and assets are still unfamiliar to investors. These unknowns gain more importance during the Covid-19 crisis. On the one side, the pandemic has accelerated the industry integration as many inefficient firms suffered liquidity shortages and were acquired by better-positioned firms; on the other side, investors have been searching for alternatives to diversify investment risk as central banks have injected massive liquidity into capital markets, leading to soaring inflation risk. This dissertation addresses new findings on the aforementioned trends and important implications for different groups of interests.

Chapter 2 updates the findings on the relationship between M&A payment methods and the valuation issues of involved parties. We empirically prove the rational payment design hypothesis according to Eckbo et al. (2018) and show that both acquirers and targets cannot take advantage of their overvaluation by using stock payment. In addition, higher uncertainty about the other's intrinsic value increases the percentage of cash financing in M&A, as both parties would reduce the risk introduced by mispriced stocks. Our findings imply that if acquirers would like to use stock financing in M&A to share future operational risk with targets, they should create more information transparency in capital markets, which ultimately also benefits investors and improves overall market efficiency.

Chapter 3 focuses on a specific financial services sector. As a representative of the traditional services business, insurance brokerages face tremendous pressure to defend their market shares against homogenous existing competitors and technology-based new entrants. In the inevitable trend of industry consolidation, we observe that some firms have become serial acquirers that conduct M&A quite often and continually improve their M&A performance, measured by

higher announcement returns and shorter time between M&A announcement and execution. Regardless of deal structures, acquirers with more M&A experience consistently outperform. We identify serial acquirers are those with lower information asymmetry to investors and higher growth potential, enabling them to participate in M&A sustainably. Our evidence shows the efficiency of serial acquirers and sheds light for investors on how they can utilize the information in firms' M&A history.

Chapter 4 offers a new perspective on the uniqueness of African capital markets. We show that African banks react to sovereign rating announcements differently compared to developed and other emerging markets, where negative announcements trigger significant positive stock reactions of foreign banks. Our findings reveal that African financial systems are not yet integrated and the information asymmetry among countries is quite severe. Nevertheless, banks in the AFTZ member countries show milder differential spillover effects to others' negative announcements, implying that free trade agreements can reduce market segmentation to some extent and enhance regional market efficiency.

Chapter 5 identifies that the well-documented relationship between trading volume and future returns for stocks can be extended to cryptocurrencies. Nevertheless, there are substantial differences between big caps and small caps of cryptocurrencies. While trading volume alone can forecast small caps' returns, only the interaction of trading volume and historical returns can predict some price reversals for big caps. Under extreme events, such as the global Covid-19 outbreak, large caps suffer significant losses while small caps show some diversification value. However, the inefficiency of small caps is profound, as the impact of trading volume on future returns increases significantly during the pandemic, heightening the risk of informed trading.

Overall, we show how information-triggering events at the firm, country, and global levels, i.e., M&A, sovereign rating announcements, and the global pandemic, affect the pricing of securities and cryptocurrencies, and identify factors that explain these market reactions. Our results highlight the importance of information transparency for firms involved in M&A. We also find evidence of information asymmetry in African banking systems and cryptocurrency markets. As the trends of industry integration and investment diversification continue, a better understanding of how to improve market efficiency at the industry, regional, and global dimensions is desired.

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Appendix

A1. Appendix to Chapter 2

Table A-1. Summary of variables to Chapter 2

Firms' Financial data are at the end of the year prior to M&A announcements if not otherwise stated. Data sources are the Thomson Reuters SDC and Worldscope databases, SEC 10-K filings, and the website of Fama and French.

Variable	Definition
Acquirer	A binary variable that equals 1 if the firm is an acquirer and 0 if it's a target
CAR [-40; -1] (MM)	Cumulative abnormal returns during the event window [-40; -1] by the market model
CAR [-40; -1] (3F)	Cumulative abnormal returns during the event window [-40; -1] by the three-factor model
Cash payment (%)	The percentage of cash applied to finance M&A
Closely held shares	The number of closely held shares divided by common shares outstanding
Collateral	The ratio of property, plant, and equipment to total assets
Cross-border	A binary variable that equals 1 if the acquirer and target are from different countries and 0 otherwise
Cross-industry	A binary variable that equals 1 if the acquirer and target are from different industries and 0 otherwise.
Deal value ($mil)	Deal value in million USD
Debt	Total debt outstanding
Dividends	Total common and preferred dividends paid to shareholders
EXVIA	$\text{EXVIA}_{i,t} = \ln\left(\frac{\text{CPTL}_{i,t}}{\text{I(CPTL)}_{i,t}}\right)$, where CPTL is total capital, which is the market value of equity plus the book value of debt; I(CPTL) is the imputed value derived by the firm's size (market cap) multiplying the median capital to size ratio in the firm's industry
|EXVIA|	The absolute term of EXVIA
EXVIA^2	The squared term of EXVIA
Leverage	The sum of total debt and deal value divided by the sum of total assets and deal value
MACRO	$\text{MACRO}_i = \ln\left(\frac{\text{BUS}(-1)}{\text{BUS}(-12)}\right)$, where BUS is the market valuation, measured by the total return index of a country's leading stock index, e.g., the S&P 500 index for US firms; -1 and -12 refer to 1 and 12 months before the M&A announcement, respectively
Market-to-book	The market-to-book ratio
MBIA	$MBIA_{i,t} = \ln\left(\frac{MB_{i,t}}{Med(MB)_{i,t}}\right)$, where MB is the firm's market-to-book ratio and Med (MB) is the industry's median market-to-book ratio
|MBIA|	The absolute term of MBIA.
MI-mispricing	$\text{MI}_i = \frac{1}{N}\frac{1}{K}\sum_k^K \text{RANK}(\text{VAL}_{i,t})$, where RANK is the rank function; VAL is the available valuation measures of EXVIA, MBIA, and MACRO
MI-overvaluation	$\text{MI}_i = \frac{1}{N}\frac{1}{K}\sum_k^K \text{RANK}(\text{VAL}_{i,t})$, where RANK is the rank function; VAL is the available valuation measures of |EXVIA|, |MBIA|, and MACRO
Opposite advisor	A binary variable that equals 1 if the counterparty in M&A hires an advisor and 0 otherwise
Relative deal value	The ratio of deal value divided by the sum of deal value and acquirer's pre-offer market cap
Rel. EXVIA	The difference between the respective acquirer and target's EXVIA

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Table A-1. continued

Variable	Definition
Rel. |EXVIA|	The sum of the respective acquirer and target's |EXVIA|
Rel. MBIA	The difference between the respective acquirer and target's MBIA
Rel. |MBIA|	The sum of the respective acquirer and target's |MBIA|
Return-on-equity	The return-on-equity ratio
Top-tier advisor	A binary variable that equals 1 if the firm hires a top-tier advisor and 0 otherwise
Total assets ($mil)	Total assets in million USD
Unlisted Target	A binary variable that equals 1 if the target is not publicly listed and 0 otherwise

Robustness tests

Robustness tests are applied when (1) replacing Tobit regression with logit regression on all-cash payment; (2) excluding the financial sector from the overall sample; (3) investigating the financial constraints hypothesis by using acquirers' free cash flow in the previous year divided by property, plant, and equipment in the transaction year as a proxy; (4) investigating the idiosyncratic risk of both parties as a proxy for the difficulty to identify the counterparty's true value. Our findings stay robust, and we offer all tests in *Supplementary Material* on https://www.springerprofessional.de/en/the-rationality-of-m-a-targets-in-the-choice-of-payment-methods/19182780.

A2. Appendix to Chapter 3

Table A-2. Summary of variables to Chapter 3

Firms' financial and country data are at the end of the year prior to M&A announcements if not otherwise stated. Data sources are the Thomson Reuters SDC and Worldscope databases, the World Bank, and the AQR website.

Variable	Definition
Accumulated M&A	The accumulated number of transactions by individual acquirer at the deal announcement
Cash payment	A binary variable that equals 1 if the transaction is paid solely with cash and 0 otherwise
Cross-border	A binary variable that equals 1 if the acquirer and target are from different countries and 0 otherwise
Cross-industry	A binary variable that equals 1 if the acquirer and target are from different industries and 0 otherwise
Deal size/ total assets	The ratio of deal value to total assets
Free cash flow/ total assets	The ratio of free cash flow to total assets
GDP growth	The annual GDP growth
Idiosyncratic volatility	The ratio of idiosyncratic volatility to volatility, which is equivalent to one minus R-squared of the four-factor model over the estimation window [-267; -16]
Market-to-book	The market-to-book ratio
Political stability	An indicator from the World Bank to predict the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means
Public target	A binary variable that equals 1 if the target is publicly listed
Return-on-assets	The return-on-assets ratio

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Table A-2. continued

Variable	Definition
Rule of law	An indicator from the World Bank to present the quality of contract enforcement, property rights, and other aspects of the legal environment
Serial acquirers	A binary variable that equals 1 if the acquirer completes at least two transactions in the final sample (N=197) or five transactions in the preliminary observations (N=3,854) and 0 otherwise
Total assets ($mil)	Total assets in million USD
Total debt/total assets	The ratio of total debt to total assets
Total M&A	The total number of transactions conducted by individual acquirers during the observation period
Volatility	The stock volatility over the estimation window [-267; -16]

A3. Appendix to Chapter 4

Table A-3. Summary of variables to Chapter 4

Firms' financial data are at the end of the year prior to M&A announcements if not otherwise stated. Data sources are the Thomson Reuters Worldscope database and rating agencies' publications.

Variable	Definition
Credit watch	A binary variable that equals 1 if the announcement is a credit watch and 0 otherwise
Downgrade	A binary variable that equals 1 if the announcement is a downgrade and 0 otherwise
Equity/ assets	The ratio of total equity to total assets
Foreign	A binary variable that equals 1 if the bank is located in foreign countries to the reviewed sovereign and 0 otherwise
Free trade zone	A binary variable that equals 1 if the bank is publicly listed in a member country of the African Free Trade Zone (AFTZ) and 0 otherwise
Free trade zone (year-cumulative)	A cumulative effect equals the member status (1 if the bank is in the AFTZ and 0 otherwise) multiplying the year of being in the AFTZ
Market-to-book	The annual GDP growth
Moody's	A binary variable that equals 1 if the announcement is from Moody's and 0 otherwise
Negative announcements	Credit watch, negative outlook change, and rating downgrade
Positive announcements	Positive outlook change and rating upgrade
Return-on-assets	The return-on-assets ratio
S&P	A binary variable that equals 1 if the announcement is from S&P and 0 otherwise
Upgrade	A binary variable that equals 1 if the announcement is an upgrade and 0 otherwise