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Precision of Fairness Opinions: An Empirical Analysis

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Tobias Lippe

"[Fairness opinion] is as necessary to valuation analysis as is the appendix to the human digestive system. [...] Other than producing profits for the investment banking industry, it produces no benefit for the shareholders."

Elson, Charles M. (1992, p. 1002)

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LIST OF ABBREVIATIONS

Acc	Accuracy
AG	Aktiengesellschaft
ANOVA	analysis of variance
BDO	BDO Global Coordination B.V.
BLUE	Best Linear Unbiased Estimator
CAR	Cumulative Abnormal Return
CEO	Chief Executive Officer
CCH	Commerce Clearing House
Coef.	Coefficient
Conf.	Confidence
DCF	Discounted Cash Flow
Del.	Delaware
Del. Ch.	Delaware Chancery Court
Del. Sup.	Delaware Supreme Court
df.	Degrees of Freedom
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortisation
EM	Earnings multiple
et al.	et alia: and others
e.g.	Exempli Gratia: for example
Err.	Error
FED	Federal Reserve
Fed. Sec. L. Rep. (CCH)	Federal Securities Law Reporter Commerce Clearing House
FINRA	Financial Industry Regulatory Authority

FO	Fairness Opinion
FV	Firm Value
GLS	Generalized least squares
HC3	heteroscedasticity-consistent model 3
HCSE	Heteroscedasticity-Consistent Standard Error
IDW	Instistut der Wirtschaftsprüfer
IM	Information Matrix
Inc.	Incorporated
IPO	Initial Public Offering
IRS	Internal Revenue Service
KPMG	Klynveld Peat Marwick Goerdeler
K-S	Kolmogorov-Smirnov
LBO	Leveraged Buy-Out
Log	Logarithm
M&A	Mergers & Acquisitions
MAD	Median Absolute Deviation
NHI	Nymex Holdings Inc.
No.	Number
OBS	Observations
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
p	Probability
p.	Page
PAT	Principal-agent theory
P/E (ratio)	Price-Earnings (ratio)
prob	Probability
PWC	PriceWaterhouseCoopers
R^2	R squared
RESET	Regression Equation Specification Error Test

S&P 500	Standard & Poor's 500
SD	Standard Deviation
SDC	Securities Data Company
SEC	U.S. Securities and Exchange Commission
SEO	Seasoned Equity Offering
STATA	Statistical software named STATA
Std.	Standard
TM	Transaction Multiple
US	United States
USA	United States of America
USD	United States Dollar
VIF	Variance Inflation Factor
vs.	Versus
WLS	Weighted Least Squares

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β	regression coefficient
ε	error term
i	refers to the specific observation
MAD	median of absolut deviation
σ	standard deviation
X	value of observation
$\bar{x}$	mean
$\tilde{x}$	median
Z	Z-score
$\lvert x \rvert$	absolute value

1 INTRODUCTION AND OBJECTIVES

1.1 INTRODUCTION

The importance of mergers and acquisitions (M&A) worldwide is large and growing annually. The total deal value of mergers and acquisitions in 2015 reached 4.7 trillion USD, up by 42% compared to 2014 (OECD, 2016; ThomsonReuters, 2017). Therefore the entire M&A sector is a major economic force creating media and academic interest. The increasing volatility on financial markets and the on-going specialisation in services leads to a growing uncertainty of decisions regarding financial transactions. In many of these mergers the question of financial adequacy of the merger conditions and its “fairness” arises.

The board of directors of a target company must ensure the financial fairness of a takeover because of its fiduciary duty to its shareholders. If the board does not ensure the adequacy of the offer, legal consequences might arise. Since a court ruling in January 1985, the so-called Smith vs. van Gorkom case, fairness opinions are a common instrument in nearly every M&A transaction in the US (Cain and Denis, 2012). The Delaware Supreme Court ruled in January 1985 against the directors of Trans Union Corporation and found them guilty of a lack of due diligence when the company was taken private in a leveraged buyout. The justice concluded that management has failed to obtain enough information on the adequacy of the offer and the company’s value before agreeing to sell it (Sweeney, 1999). Jurisdiction implied that liability could have been avoided by obtaining a fairness opinion from anyone in a position to determine the corporation’s value. Since the Smith vs. Van Gorkom decision courts do generally accept fairness opinions obtained by target’s boards of directors as a primary source in the satisfaction of fiduciary duties in assessing the deal and recommending a proposed deal to the shareholders. Fairness opinions are consequently used by management as a tool to provide legal protection.

Due to the prominence of the ruling on the financial adequacy of a takeover bid for shareholders the quality of fairness opinions is of importance. Nevertheless, the inadequacy of fairness opinions has repeatedly been criticised in the last years, especially by members of the legal community (Prokop, 2013; Elson, 1992). Given the lack of standardisation and the huge creative leeway in business valuations, the verdict is proclaimed that the valuations in fairness opinions can be arbitrarily manipulated. With a false incentive structure and insufficient independence of the performing investment bank, the fairness opinion as an instrument for protection of the shareholders would therefore be useless (Davidoff, 2006; Bebchuk and Kahan, 1989).

The problems of inadequacy with regards to the pricing precision emerge mainly from asymmetric information levels between management, the advisor and the shareholders. Depending on different factors, the differences in the information levels are smaller or bigger. The management team has the advantage of insider knowledge and normally being involved in the discussion of the terms of acquisition and has superior knowledge about the financial adequacy of the deal than shareholders, who normally only receive information from periodically issued and possibly biased financial reports of the company (Schmidt, 2016). Nonetheless, the investment bank creating the FO might as well have superior knowledge compared to the management.

These asymmetric information levels lead to problems addressed in the principal-agent theory (PAT), which focuses on the relations and problems arising of a contractual agreement between persons or entities with different information levels (Schmidt, 2016; Coase, 1937).

In relation to fairness opinions (FOs) the first principal agent problem (PAP) arises between the management (principal) and the investment bank (agent). The second PAP arises between management and the shareholder. The underlying problem is that the interests of the management might not be aligned to those of the shareholders, for example in management buyouts (Hall, 2005). These problems limit the quality of fairness opinions.

Besides the prominence of FOs, research on fairness opinions is still rather limited. Bowers and Latham describe the level of research in 2004 as "the issues related to fairness opinions have only recently begun to be examined in the financial literature" (p. 4). Of course, afford is spent on researching the limitations of fairness opinions and their advantages and disadvantages since 2004, however, the field of fairness opinions offers still large potential for research. Empirical evidence in the finance literature is limited and existing results are mixed (Liu, 2015). Therefore, the research in this dissertation is of explorative nature and variables cannot always be deducted by quantitative research.

Classical M&A research offers an extensive list of variables that might potentially influence the precision of fairness opinions, but for a first empirical study a limitation on the information provided in a fairness opinion appears most promising. Based on the idea to lower information asymmetries, the reader of a fairness opinion should be able to understand the provided valuation range and draw conclusions on the valuation precision. Furthermore, the valuation models used in FOs offer still some space for tactical pricing by the advisor to manipulate the valuations (Schönefelder, 2007). Hence, understanding the factors that increase precision can help to identify possibly biased opinions, where the precision is expected to be lower and the elimination of information asymmetries likewise limited. Precision should be measured by the valuation range, under-/overvaluation of the target and the accuracy of the fairness opinion.

Additionally, overfitting of regression analysis is another argument why the variables should be derived from the functions of fairness opinions and the provided information. To avoid overfitting, 10 to 15 observations per predictor variable will allow good estimates, according to Peduzzi et al. (1995) and Green (1991). A deduction of variables from classical M&A research would lead to more than 50 variables from different aspects like planning, financial data, negotiation, due diligence, transition management structures, post-merger integration, leadership and trust, cultural integration, HR practices, control and monitoring (Weber et al., 2014). As the data sets at hand has 392 observations split into two nearly equal sub data sets of approximately 200 observations each and even only 100 observations for some valuation models, a biased selection of variables would be needed, if all variables of M&A research are considered. In contrast, focussing on the information provided in the fairness opinion, an elimination of variables due to overfitting is not needed.

Therefore, the aim of the dissertation is to derive variables that influence the precision of fairness opinions based on the information provided in the fairness opinion and find out in how far the reader of a fairness opinion can draw conclusions from these variables on the precision of fairness opinions. For that purpose, a data set comprising all US-mergers between 2003 and 2013, which make use of FOs, is collected and analysed by the help of univariate and multiple regression analysis. The US market is chosen as it is the largest stock market in the world and information is best available as fairness opinions must be made public. Additionally, the US market is best researched in the current body of literature.

1.2 OBJECTIVES OF THE PAPER

Existing literature provides limited insights to fairness opinions. The limited body of literature in relation to fairness opinions focuses so far on legal issues (e.g. Calomiris and Hitscherich, 2007; Davidoff, 2006), the aim of fairness opinions (Zimmermann, 2015), the usage rate of fairness opinions (e.g. Bowers and Latham, 2004; Kisgen et al., 2009), usage rates of employed valuation models (e.g. Aders et al., 2012; Schönefelder, 2007), deal completion rates (Kolasinski and Kothari, 2008) and cumulative abnormal returns (e.g. Cain and Denis, 2012; Kisgen et al., 2009). None of the studies so far has focused on the valuation precision of fairness opinions and, hence, this dissertation is purposed to fill this research gap by answering the main objective.

The term valuation precision comprises in this context three different dimensions of calculating the exactness of FOs. Valuation range as the first dimension is derived from the difference between the lowest and highest valuation mentioned in the fairness opinion. The second dimension, under-/overvaluation can be calculated from the paid price in relation to the average valuation stated in the fairness opinions and is of interest as previous research on cumulative abnormal returns has shown that fairness opinions of the target advisors show an undervaluation of the target, whereas the advisors of the acquirer arrive at an overvaluation of the target (Kisgen et al., 2009). The third dimension, valuation accuracy, makes use of the absolute percentage values of the under-/overvaluation as neither of them is preferable. A precise valuation is preferred by all parties involved. A higher precision can be associated, if the valuation range is small and the valuation accuracy and under-/overvaluation near to a difference of zero percent.

Fairness opinions deliver information on different variables and factors of a transaction with the aim to lower information asymmetries. Hence, a discussion of the different functions will outline the basic information that are carved out and delivered by FOs. Fulfilling the functions, FOs are supposed to lower information asymmetries and to be more precise. However, it must be kept in mind that company valuations are always to some extent subjective, as "the practice of valuation is an inexact art, not a precise science." (Yee, 2005, p. 536). Furthermore, the writers of the FOs have to make assumptions with regards to the financial development of a company in the near future, which can never be completely exact.[1]

In order to fulfil the main objective of this study, the following sub objectives are defined:

- To extract variables from the discussion of the functions fairness opinions have to fulfil and the information they provide.
- To discuss the principal-agent theory in relation to fairness opinions in order to gain associations of the variables on the precision.
- To deduct the association to precision of deal specific variables from M&A research and fairness opinion specific variables from existing FO research.
- To analyse the data for the US market between 2004-2013 with appropriate statistical models.

These sub objectives lead furthermore to the following research questions:

(1) Which information is provided by fairness opinions?
(2) Which variables can be extracted from this information?

[1] Graham (1973), p. 315 f.: „[…] the combination of precise formulas with highly imprecise assumptions can be used to establish, or rather justify, practically any value one wishes, however high, for a really outstanding issue."

(3) How are the variables expected to be associated to the precision based on the functions FOs have to fulfil?
(4) How are the variables associated to precision based on the principal-agent theory?
(5) What association does the classical M&A research indicate for these variables?
(6) What does existing research on FO indicate about the association to precision?
(7) Does the use of certain valuation models influence the precision of fairness opinions?
(8) What is the average valuation range?
(9) What is the average valuation accuracy?

Research questions 1-6 will be answered in the theoretical approach in chapters 2 and 3 and research questions 7-9 will be answered in the empirical part of this dissertation in chapter 4 and 5.

1.3 STRUCTURE OF THE THESIS

Chapter 1 gives an introduction to the topic of fairness opinions and discusses the current level of research. The links between fairness opinions and the principal-agent theory and M&A research are highlighted. It develops the relevant research questions and explains the aim of the thesis. It proceeds to describe the structure to give a roadmap for further examination and to point out why specific topics are discussed and how they fit into the overall picture to help answering the question of the factors influencing the precision of fairness opinions.

Chapter 2 is intended to provide an overview of the essential conceptual, content wise and institutional foundations of fairness opinions in the USA. The chapter explains the different functions of fairness opinions with regards to the regulatory framework. In this chapter, an institutional overall picture of the fairness opinion is drawn, on which the work can be built up in the further course of events. Furthermore, the criticism on fairness opinions highlights principal-agent conflicts in fairness opinions. The principal-agent theory is used to explain the diverging interests of managers, shareholders and investment banks fairness opinions are torn between and why FOs can sometimes not lower information asymmetries. This chapter deducts the variables for the empirical analysis.

Chapter 3 introduces the current body of literature research on M&A in relation to the deal specific variables. Research on M&A has shown that rather no wealth is created with mergers, but mostly transferred from the acquiring shareholders to the target’s shareholders. Additionally, research on fairness opinions has shown that fairness opinions specific variables influence cumulative abnormal returns. The discussion on deal specific and fairness opinion specific characteristics is used to further deduct associations of the variables with regards to the precision of fairness opinions. Afterwards the hypotheses for the empirical chapters are defined. The expected association on the precision is derived from the presumptions to fulfil its functions and lower information asymmetries.

Chapter 4 gives a short definition of the term precision of fairness opinions with regards to the different ways to measure precision. The manual collection of the data set by extracting the information and variables from the fairness opinions is explained. Furthermore, the statistical methods that are employed to prepare the data set are introduced and the descriptive values of the data set are highlighted. Univariate tests round the chapter off.

Chapter 5 introduces the preconditions for multiple regression tests. In a next step, where applicable, the results of the univariate analysis are tested by the help of ordinary least square regressions. The results are also checked for robustness by using the three most employed valuation techniques in fairness opinions.

Chapter 6 summarises the main conclusions of this paper and puts them in contrast to other research results and names future projects and research questions.

2 FUNDAMENTALS ON FAIRNESS OPINIONS

In this chapter the basics of fairness opinions are discussed. Hereby the objective is to introduce the fairness opinion in its full picture. Initially, the term fairness opinion will be introduced with regards to the conceptual, content-wise and process-related meaning. Next, the different functions of FOs in the context of mergers and acquisitions will be highlighted. The shortfalls of fairness opinions will be discussed and solutions to overcome these obstacles will be addressed. Thereafter, the principal-agent theory will be discussed. The aim of this chapter is to deduct the variables for the empirical research and gain first associations to the precision of fairness opinions.

2.1.1 Definition Fairness Opinion

Fairness opinions can be defined as a written assessment of the fairness of an offer in the context of a transaction from a financial perspective by an independent expert to the attention of a decision maker (Schwetzler et al., 2005). FOs can be obtained from a qualified assessor for various legal transactions and are, hence, an opinion issued by an expert in this area (Lazopoulos, 2006). These legal transactions include, but are not necessarily limited to, M&A transactions, spin-offs, squeeze-outs, financings, transfer of assets, employee stock ownership plans, restructuring of companies, share buybacks and equity placements (Zimmermann, 2017). The focus in this paper is placed on M&A transactions, where more than 50% of the outstanding shares are intended to be sold to the acquirer. The intention is mentioned here as deals do not necessarily need to be successful in the end. For all these transactions, the offer of a potential acquirer for the potential target is the assessment object of the fairness opinion. It is also the area where the use of fairness opinions is best-known for and its largest field of application (La Mura et al., 2011).

The fairness opinion itself entails the following components:

- Opinion Letter
- Valuation Memorandum
- Factual Memorandum

The opinion letter, also called accompanying letter in the US, contains an explicit statement on the fairness from a financial point of view (Schüppen, 2012) as well as an explanation of the activities carried out by the company. Due to the limitations of the scope of the fairness opinion to a fairness from a financial point of view, fairness opinions should not be mixed up with an explicit investment advice to shareholders, because the FO does neither state that shareholders should agree to the pending transaction nor that the price offered is the best price achievable (Giuffra, 1986). Additionally, the used valuation methods and confidentially agreements are stated and the date of the opinion is provided in the opinion letter (Zimmermann, 2017).

The valuation memorandum outlines in detail the premises, theoretical methods, calculations and assumptions used in the valuation process, where the opinion letter rests upon (La Mura et al., 2011). Typically, the valuation methods used include a weighted combination of a discounted cash flow valuation, comparable companies (earnings multiple and transaction multiple valuations), premium and break-up valuations and, where applicable, a liquidation analysis. Latter one is only used in case the target could otherwise not survive and would be liquidised (Davidoff et al., 2011). Furthermore, dividend growth models are an often used valuation model in fairness opinions. Share price trends of the companies involved and the environment on the capital and transaction market are briefly mentioned as well (Zimmermann, 2017). This statement is limited to one or two sentences describing the market performance, but it is explicitly not analysing whether a market is hot and overvalued or cold; although market sentiment is known to influence M&A (Ljungqvist et al., 2006). The valuation memorandum is made publicly available to the shareholder as a summary in the relevant United States Securities and Exchange Commission (SEC) filings (S-4 statement).

The factual memorandum summarises confidential information and detailed financial numbers and calculations. It can be longer than the published two parts of the fairness opinion. Due to the confidentially the factual memorandum is mostly not created for publication. The factual memorandum is usually presented to the client's board of management verbally and handed over afterwards. Nevertheless, the existence of a factual memorandum is crucial if one of the involved parties asks for litigation (Zimmermann, 2017).

Table 1 illustrates the main content of fairness opinions in the USA on the basis of the fairness letters from Goldman Sachs to the special committee of the Nymex Holdings Inc. (NHI).

Table 1: Elements of FOs on the example of Nymex Holdings Inc.

Element of FO	Description	Example of Nymex Holdings Inc.
Summary of assignment	• Determines what should be specifically examined in the Fairness Opinion. • Depending on the structure of share capital and supply, appropriateness for several groups of shareholders is determined simultaneously or separately. • Specific contract is recorded in the contract with the client ("Engagement Letter") and varies depending on the transaction situation.[2]	• Examination of the „fairness from a financial point of view" in relation to the offer of the acquirer to the shareholders of the target. • No fairness assessment for Rollover Holders contributing shares. • No fairness testing for "affiliates" (such as management or banks) holding shares. • No examination of fairness for shares already held by the acquiring company (not part of the consideration).

[2] Gould / Ahmedani (2005), p. 27: „No federal or state laws govern the parameters of such an engagement."

Summary of the intended merger agreement	• Brief summary of the merger agreement containing the key transaction parameters. • Specifies the offer to be examined.	• Merger of NHI into buyer company, which in turn is held by holding company. • Offer of 81 USD per share in **cash** to ordinary shareholders. • Names the number of shares to be purchased **(size).** • Rollover Holders invest their shares in the merged company.
Summary of assignment	• List of information and analysis the fairness opinion rests upon. • Of particular importance is whether the management's business plans were used and discussed with the bank. • No detailed analysis of any specific analyses is carried out as these are not a part of the fairness letter.	• „Management's "financial forecasts" were used and discussed. • Considered financial stock market data and comparison with peers.[3] • "Considered financial terms of other business combinations". • "Considered search for other information, financial studies, financial and accounting analysis, financial and economic criteria".
Assumptions and qualifications	• "Disclaimers and Provisions", highlighting reservations and limitations of the FO. • Disclaimers serve, above all, to avoid liability.	• Assumption that underlying information is complete and accurate. The bank is not taking any responsible for correctness. • Assumption that projections of the management's board represent the best currently available estimate.

[3] Peers are companies comparable to the analysed company in relation to size, business sector etc.

Assumptions and qualifications		• Assumption that no adverse effects will effect from regulatory or other delays in the transaction. • „No independent appraisal of the assets and liabilities“. • Fairness Opinion is based on the situation at the time of preparation. • „Our opinion addresses only the fairness, from a financial point of view“. • „Our opinion does not address the relative merits of the Merger“.
Other services, compensation and disclaimer of warranty	• Indication of whether Bank also acts as a consultant in the transaction. • Generic statement on compensation structure, especially if performance-related component included. • Indicate whether the company has granted indemnification to protect Bank and its employees from claims for damages. • Statements on advisory activity and remuneration structure may indicate potential conflicts of interest.	• „Acted as financial advisor in connection with the merger“. • „Our aggregate fee will be increased if the Merger is consummated“ **(contingency fees).** • „The Company has agreed to indemnify us for certain liabilities and other items arising out of our engagement“.
Past and future business relations	• Statement of past and possible future business relationships with target and acquirer companies.	• Investment banking services to both buyers and sellers in the past and future **(previous relation).**

Past and future business relations	• Should indicate potential conflicts of interest.	• Bank is invested in private equity funds of the buyer. • Possibility of trading securities of the target and buyer companies.
Addressee	• Determines who is the addressee of the Fairness Opinion. • Clarifies that a fairness opinion, in particular, is not a direct recommendation to shareholders. • Should counteract liability towards non-contractual third parties.	• Special Committee of the Board of Directors is the only addressee of the FO. • „Does not constitute a recommendation to any stockholder as to how such stockholder should vote“.
Judgement on the fairness of the offer	• Summary, whether the offer from the perspective of the bank is "fair from a financial point of view".	• „Based upon and subject to the foregoing, it is our opinion that, as of the date hereof, the Merger Consideration to be received by the holders of Company Common Stock (other than holders of Company Common Stock that are affiliates of Parent and the Rollover Holders) is fair to such holders, from a financial point of view.“

Source: own production

The table has addressed four variables possibly of interest for the precision of fairness opinions. These are cash, size, contingency fees and previous relation.

Some findings of the table need to be discussed in more detail in order to gain a profound understanding of the nature and functions of fairness opinions. The summary of assignment emphasises that all analyses and criteria have been included in the assessment which the bank considered to be relevant. This implies that the issuer of the fairness opinion has some space for tactical manoeuvres in the appraisal that allow the experts to come to nearly any valuation intended (Schönefelder, 2007).

The most important limitation of a fairness opinion is the fact that it solely deals with the fairness of the offer from a financial point of view. All non-financial considerations, such as legal or even social aspects, are therefore not the object of assessment (Laird and Perrone, 2002). A procedural fairness test, which is supposed to check whether the takeover took place under fair conditions, is neither content of the fairness opinion (Schönefelder, 2007).

The final fairness judgment of the taken example clarifies an important difference to appraisals or arbitrator's awards. In these cases, the valuing party determines the fair value of the company concerned, which is then paid to the shareholder as a severance payment. By contrast, the fairness opinion does not establish a specific valuation in exact US-Dollar (USD). Instead, it is merely determined whether the offer price falls within a "range of values encompassing financial fairness" (Davidoff, 2006). For this purpose, a valuation range is determined. This range is chosen based on the experience and opinion of the advisors and their understanding of “fair”. The term fair is not further defined in the opinion (Cain and Denis, 2012). However, if the offer price falls within this band width, then the transaction is always considered to be fair (fair range).

Consequently, a fairness opinion does also not indicate or test whether the offered price by the acquirer is the best obtainable price on the market for the target shareholders.[4] The following figure 1 illustrates this. The example chosen indicates that a first offer of 50 USD can be fair as it is within the lower limit of an exemplary

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[4] Davis (2004), p. A1: „[…] because fairness is so subjective, banks aren’t insuring or guaranteeing it’s the best deal for shareholders. They’re simply saying it fits within a range of fairness”

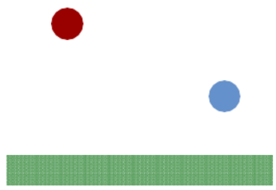
valuation range of 45-75 USD. Hence, the fairness opinion would conclude that the deal is fair.

Figure 1: Illustration fair valuation

1st offer 50 USD:

2nd, raised offer 70 USD:

valuation range 45-75 USD:



Source: own production

Subsequently a new, raised offer could be made by the acquirer and the new offer pays 70 USD per share. The offer is now at the upper limit of the valuation range, but still inside and, consequently, fair. However, the first offered price was not the best achievable price.

If the offer is not appropriate from the bank's point of view, in the previous example any valuation below 45 USD or above 75 USD, this is called an "inadequacy opinion" (Schwetzler et al., 2005). Any valuation below 45 USD would be considered inadequate for the targets' shareholders and any valuation above 75 USD would be considered inadequate for the acquirers' shareholders. The final judgment "fair" is then replaced by the term "not fair" or "inadequate", but the other contents remain essentially the same. However, it rarely happens that such an opinion is published. In contrast, if the bank does not conclude the offered price to be fair, it will inform the client before submitting the fairness opinion. Based on the valuations arrived in the FO, either further negotiation between the parties will be agreed in order to come to a price lying within the valuation range or the termination of the transaction will be announced (Davis and Berman, 2005).

2.1.2 Principal, timing and process of fairness opinions

Commercial banks have traditionally been allowed to compete with investment banks and auditors in M&A processes. Since the passage of the Sarbanes-Oxley-Act in 2002, auditors are forbidden to provide this kind of advisory services in the USA (Allen et al., 2004). However, especially for smaller transactions, specialised boutiques and valuation advisors are still commissioned. There are no formal requirement criteria in order to be allowed to issue fairness opinions, but the FO provider has to be "qualified and independent" (Bowers and Latham, 2004, p. 3).

As no exact numbers are given in current research on the market share of specialised boutiques and investment banks for the US market, a German sample is taken to illustrate the differences. Due to the strong internationalisation of capital markets similarities can be assumed to exist between the US market and the German market. Even without similarities, the numbers do still give a hint on the selection process of the advisor. In Germany, (the cheaper) consultants and auditing firms are still allowed to issue fairness opinions and had a market share, based on the number of issued fairness opinions, of 54% in 2007 (Aders and Schwetzler, 2011). Due to the high fee structure of investment banks, consultants and certified accountants are responsible for 80% of all fairness opinions for transactions valued less than 100 million euro, but only for 25% of all fairness opinions for deals of more than 1 billion euro. The lower prices for consultants and auditing firms seem to be an important aspect for smaller deals. Oppositely, investment banks have a market share of only 20% for small deals, but 75% for large deals (Aders and Schwetzler, 2011).

Fairness opinions requested by the target side are mostly commissioned by the board of directors or by an independent special committee of the board of directors. But sometimes it can also be seen that a majority shareholder requests an own, individual fairness opinion as well. However, these fairness opinions are neither published nor addressed in the S4-statements and can, thence, not be statistically analysed. The decision to ask for a fairness opinion is seen as a smart move if the majority shareholder has to defend her action against other third party investors in its own company (Landefeld et al., 2005). The principal is also the primary addressee of the fairness opinion. The fairness letter contains the explicit statement that the fairness opinion is not addressed to the shareholder. However, this creates a peculiar dichotomy as on the one hand, the fairness of an offer is judged for the shareholders who ultimately have to decide whether to accept or reject it, but at the same time they are not considered to be the addressee of the opinion (Davidoff, 2006).

In **friendly takeovers**, which are defined as takeovers that are welcomed by the target's management board, whereas hostile takeovers are against the will and objectives of the target management, fairness opinions are usually requested and written briefly before the public announcement of the transaction is made, although this might change under given situations (Bartell and Janssen, 2017). If new and material changes in the circumstances of the deal become apparent after the fairness opinion has been issued, the investment bank has no legal duty to update the fairness opinion (Fed. Sec. L. Rep. (CCH), P95, 842 (Del. Ch. 1991)). However, it is the duty of the board of management to check whether the new situation affects the validity of the FO (Fed. Sec. L. Rep. (CCH) P97, 805, at *11-12 (Del. Ch. 1993)). For hostile takeovers, the fairness opinions are issued after the announcement is made, which is logical as a prior issuance of the acquirer fairness opinion would take the surprising effect of the hostile announcement. The target, on the other hand, has no knowledge of the intended takeover and no chance to obtain the FO in advance. Due to the different timing and the risk of being outdated, the mood of the transaction (friendly or hostile) might influence the precision of FOs.

The creation of a fairness opinion is following ideally the process described in figure 2. Due to the circumstances of the deal, some minor differences to this process might be observable. Figure 2 is based on the work of Bucher and Bucher (2005) and combines concepts of Schönefelder (2007) and Bartell and Janssen (2017) as well.

Figure 2: Work flow creation fairness opinion

Source: Based on ideas of Bucher and Bucher (2005), Schönefelder (2007) and Bartell and Janssen (2017)

In a first step the assignment is declared to the advisor and as soon as the contract is signed, all relevant information such as the background of the company, the market it is active on, historical business reports and the condition of the offer itself, are collected and processed by the advisor. Above all, the advisor analyses the business plans that reflect the expected performance of the company and the forward looking statements as these are the primary source of information for the valuation purposes. This process is called information collection and processing. Often discussions will be held with management to better understand the assumptions underlying their business plans and forward looking statements. However, the business plan is not always checked for plausibility by the bank, but accepted as the current "best estimate" (Bucher and Bucher, 2005). Nonetheless, some banks develop different and individualised scenarios and estimates in order to put the business plan into perspective. This might lead to different scenarios described as “base case” and “upside case” or “downside case”.[5] Once the data basis is clarified, a business valuation will be carried out using, if possible, various valuation models in the next step (Bucher and Bucher, 2005). An internal valuation presentation is prepared, which is critically reviewed in a bank’s in-house "Fairness Committee" of experienced, and not in the fairness opinion involved bankers. The fairness committee is used to improve the independence of the FO from the management board (independence of principal and agent) and check the quality of the FO (Schönefelder, 2007). As a result, the fairness of the offer is finally assessed financially, and the fairness letter and valuation memorandum are finalised and handed over to the client. The valuation memorandum is usually presented verbally to the client allowing to ask questions or stop the publication of the FO (Bartell and Janssen, 2017).

[5] Fairness opinions of Crimson Exploration Inc (target) and Contango Oil & Gas Co (acquirer), available at www.SEC.gov/Archives/Edgar

2.2 SMITH VERSUS VAN GORKOM RULING & THE FUNCTIONS OF FAIRNESS OPINIONS

2.2.1 Insurance function

The verdict spoken in the Smith vs. Van Gorkom case is nowadays seen as the de-facto starting point for the extensive use of fairness opinions in nearly every M&A activity (Smith v. Van Gorkom, 488 A.2d 858 (Del. 1985)). The Delaware Supreme Court ruled in January 1985 against the board of directors of Trans Union Corporation (target company) and found them guilty of not having acted on the basis of adequate information, as the offer was made with great haste, without studying the offer document in detail and, above all, "without the benefit of reports for valuation purposes" (Hartmann and Rogers, 1991, p. 527). The court criticises a lack of duty in the due diligence process during the leveraged buyout. The directors were unable to invoke on the Business Judgment Rule and were personally held liable due to a breach of their duty of care, which resulted in a fine of 33.5 million USD payable to the shareholders of Trans Union Corporation.

The court highlighted that especially the board of directors made a mistake in the decision-making process to not rely on an in-depth analysis on the fair value of the company. This fair value can be obtained from an investment bank in form of a fairness opinion as the verdict has clarified. In this case, a well-prepared valuation report of the company itself would also have led to a fulfilment of the conditions to comply with the Business Judgement Rule. However, internally created valuation reports of the company itself do only in rare cases fulfil the independency requirements. Thence, managers rarely rely on the reports as they often violate the Business Judgement Rule (Nielsen, 2008). Since the Smith vs. van Gorkom case fairness opinions are generally accepted by the courts as a reliable source of information in M&A activities (Davidoff, 2006).

Although the court decision made in Smith vs. Van Gorkom has emphasised that there is no legal duty to seek a fairness opinion[6], the public and managers regard FOs as an implicit necessity to appeal to the Business Judgment Rule (Davidoff, 2006; Chazen, 1981). This understanding is reflected in a sharp increase in the consumption of fairness opinions. While in 1985 only 19% of all target companies relied on fairness opinions in any kind of M&A activity, the percentage figure rose to 42% a year later. According to Bowers (2002), the percentage numbers rose to 80% between 1994 and 2002.

However, later court decisions and rulings highlight the fact that a critical appraisal of the fairness opinion by the board of directors is crucial to obtain legal protection from it. A director was denied having done the critical appraisal in 2005 as he would have otherwise realised the inadequacy of the fairness opinion due to his experience in valuations (Hall, 2005). Consequently, it is not enough for the board of directors to rely blindly on the judgment in the fairness letter or a fairness opinion at all. Rather, a thorough understanding and scrutiny of the underlying analysis in the valuation memorandum is essential (Davidoff, 2006). This finding underlines the need for a deeper analysis of factors and variables influencing the valuation precision of fairness opinions.

2.2.2 Information function for private shareholders and management

The previously discussed insurance function is derived from the information function of fairness opinions, because only the information on the value of the company allows the responsible bodies and shareholders to make a reliable decision. Some researchers believe fairness opinions to be the central decision-

[6] Smith v. Van Gorkom, 488 A.2d, 858, 873 (Del. 1985): „We do not imply that an outside valuation study is essential to support an informed business judgment; nor do we state that fairness opinions by independent investment bankers are required as a matter of law. Often insiders familiar with the business of a going concern are in a better position than are outsiders to gather relevant information; and under appropriate circumstances, such directors may be fully protected in relying in good faith upon the valuation reports of their management."

making basis for private investors and institutional investors (Zimmermann, 2015) as the fairness opinion allows not only the management, but also the shareholders, to better understand the financial attractiveness of the proposed deal. Fairness opinions do often provide management, especially of the acquiring firm, with information that have been previously unknown or not available to the management (Essler et al., 2008).

In addition, fairness opinions help reducing information asymmetries experienced by the shareholders as they are typically based on business plans and management estimates of the company's future development, which are mostly previously not publicly available (Parijs, 2005). The company valuations, thus, reflect the latest estimates of the management. Particularly, in the case of takeovers of small and medium-sized enterprises, which are often only covered to a limited extent by financial analysts and press releases in general, this reduction of information asymmetries is central to the shareholder's decision-making (Schönefelder, 2007).

The success of fairness opinions in providing information to shareholders and others engaged in the transaction is proven by lower abnormal returns in transaction where FOs are obtained (Chen, 2010). This argument implies that fairness opinions can fulfil other functions than only providing legal security for managers; they lower asymmetric information levels.

Hence, information on the transaction **size** is not only mandatory information in the fairness opinion as the example of Nymex has shown; it is also linked to the level of asymmetric information. For smaller transaction less information is previously known and the level of asymmetric information before the fairness opinion is written is higher.

2.2.3 Protection function of shareholders

Conflicts of interest do often exist for management or members of the board of directors, especially in transactions where a management buyout is planned (Nielsen, 2008). The fairness opinion fulfils here the function to protect the shareholders as the shareholders do not have to rely solely on the judgment of a possibly biased board of directors, but rather receive an expert opinion of an (independent) expert. Internal assessment or valuation reports could, in this situation, not fulfil the protection function to the same extent as an external valuation report like the fairness opinion can do (Nielsen, 2008). Especially with regards to management buyouts, the valuations of the management bear the risk to understate the value of the company as an undervaluation saves costs for the management board when acquiring the company. An external valuation of the same amount as in the management buyout would normally be considered as too low by management, but as acceptable in situations of management buy-outs (Nielsen, 2008).

Hence, the in the Smith vs. van Gorkom case explicitly mentioned internal valuation by management is not an alternative of equal objectiveness as the FO and is, consequently, not often applied by management in general (Fiflis, 1992).

2.2.4 Argumentation and signalling function towards shareholders

Fairness opinions can be used by the board of directors on both sides as an instrument to convince shareholders of the attractiveness of a transaction. An opinion issued by a reputable investment bank can deliver valuable arguments to convince shareholders of the quality and financial adequacy of a deal (Cooke, 1996). Fairness opinions on the side of the acquiring company can offer appreciated information why the merger or takeover provides economic advantages for the acquirer. Hence, the arguments given here can help to convince reluctant shareholders of the advantages of the proposed deal (Kisgen et al., 2009). By doing so, the fairness opinion helps to lower the information asymmetries between the shareholders and the management board. The argumentation function is stronger, if the advisor has a higher reputation (Cooke, 1996). Hence, **reputation** is a variable that can have an influence on the precision of fairness opinions. Critically seen fairness opinions can be used to convince shareholders, which gives reputation a negative association to the precision.

However, a fairness opinion written by an experienced and well known investment bank can send a strong signal to the shareholders of both parties that the transaction is a transaction of highest quality, at least in relation to the financial arrangements (Kisgen et al., 2009). Otherwise it is assumed that the investment bank/advisor will not issue the fairness opinion. An overly friendly fairness opinion can damage the reputation of the investment bank immediately and lead to lower earnings in the future. This quality signal can help to increase the acceptance level of the underlying offer. Thus, the fairness opinion sends a quality seal function to both the board of directors and shareholders through its competent analysis and the investment bank's standing behind it (von Dryander, 2001). Therefore, the signalling function of fairness opinions attaches a high quality of the provided information to the FO.

2.2.5 Process function for the deal

In the case of Smith vs. Van Gorkom the board of directors rushed the decision to sell the company, which helped, among other things, to act without profound information on the adequacy of the offer (Davidoff, 2006). The more or less implicit duty to obtain a fairness opinion gives the target company valuable time in the transaction process to contact further partners, search for a white knight or initiate any defensive action to protect the shareholders of the own company (Macey and Miller, 1988).

As a matter of fact fairness opinions help to structure the M&A process in all aspects, though this is neither the function nor the objective of fairness opinions. However, especially the target shareholders are put in a better position as the transaction process is slow downed and at least stretched for a couple of days, if fairness opinions are requested (Bucher and Bucher, 2005). The process function of FOs does not lead to a deduction of variables.

2.2.6 Deal completion and pricing function of fairness opinions

By signalling a qualitative deal, fairness opinions also foster a higher deal completion rate. The signalling effects help encouraging shareholders to accept the proposed deal. In cases of completely uninformed shareholders not only the reputation of the investment bank achieves this, but also the vague price indication supports this decision process (Mihanovic, 2005).

The board of directors is obliged to realise the „highest value reasonably attainable" for its shareholders in the USA (Rubenstein, 2005, p. 1739). In principle, in effective markets this objective can be accomplished through various options, e.g. auctions. If a large number of bidders in a highly competitive auction try to buy the target, it can be assumed that the price paid by the highest bidder is close to the maximum price that can be achieved (Davidoff, 2006). However, in market situations where buyers are not sufficiently interested or unbiased information are not available, e.g. bankruptcies, this pricing function can be fulfilled by a fairness opinion. The market is in extreme situations not able to deliver a fair price indication, but the FO can achieve this through the denotation of a fair price (Davidoff, 2006), although this pricing function is only fulfilled by delivering a valuation range and not a precise valuation. Furthermore, a denomination of share exchange rates in a fairness opinion is opposing the idea of a concrete valuation due to the share price fluctuations that affect the final deal price.

To better fulfil the pricing function, a cash value is preferred (Mihanovic, 2005); but only a valuation appraisal can fully fulfil the pricing function. Nonetheless, a **cash** offer does better fulfil the pricing functions of fairness opinions. Hence, the pricing function attaches a positive association of cash as the method of payment to the precision of fairness opinions.

2.3 DISCLOSURE REQUIREMENTS

2.3.1 FINRA rule 2290

Disclosure requirements for mergers & acquisitions in the US including fairness opinions are regulated by the United States Securities and Exchange Commission (SEC) in schedule 13E and Financial Industry Regulatory Authority's (FINRA) rule 2290 and FINRA rule 5190, which supersedes FINRA rule 2290. The SEC rule requires target companies to disclose whether they received a fairness opinion or not. If they received a fairness opinion, the fairness letter as well as a summary of the valuation analysis must be attached to the SEC filings (Schedule 13E-3, Item 15, Item 16 and Item 1016 (a)–(d), (f), (g)). The aim of the SEC is to enable an educated shareholder to make an appropriate decision on whether to sell the shares to the acquirer on the same basis of information as the board of directors has received.

Next to these disclosure requirements, past court decisions have led to a de-facto extension of the requirements. The following list summarises these requirements of Schedule 13E-3, Item 125, as described in Martin, 1991 and Davidoff, 2006:

- Identify the outside party (investment bank writing the FO) and/or unaffiliated representative.
- Briefly describe the qualifications of the outside party and/or unaffiliated representative.
- Describe the method of selection of the outside party and/or unaffiliated representative.
- Describe any material relationship that existed during the past two years or is mutually understood to be contemplated and any compensation received or to be received as a result of the relationship between (i) The outside party, its affiliates, and/or unaffiliated representative; and (ii) The subject company or its affiliates.
- State whether the subject company or affiliate determined the amount of consideration to be paid or whether the outside party recommended the amount of consideration to be paid.

- Furnish a summary concerning the opinion. The summary must include, but need not be limited to:
    - The procedures followed.
    - The findings and recommendations.
    - The bases for and methods of arriving at such findings and recommendations.
    - Instructions received from the subject company or affiliate.
    - Any limitation imposed by the subject company or affiliate on the scope of the investigation.

Next to these rules, the adoption of FINRA rule 2290 in the end of 2007 has led to further disclosure requirements. The superseding FINRA rule 5190 does not lead to further notable changes in the requirements. The following disclosures and procedures focus, hence, on FINRA rule 2290 (Davis, 2008). But before the focus is placed on FINRA rule 2290 it needs to be highlighted that **<u>previous relations</u>** must be indicated as they might potentially affect the objectivity of fairness opinions. Hence, the variable previous relation can a have a significant association on the precision of fairness opinions.

2.3.2 Disclosures

If at the time a fairness opinion is issued to the board of directors of a company the advisor issuing the fairness opinion knows or has reason to know that the fairness opinion will be provided or described to the company's public shareholders, the advisor must disclose in the fairness opinion the following:

(1) if the advisor has acted as a financial advisor to any party of the transaction that is the subject of the fairness opinion, and, if applicable, that it will receive compensation that is **<u>contingent</u>** upon the successful completion of the transaction, for rendering the fairness opinion and/or serving as an advisor;

(2) if the advisor will receive any other significant payment or compensation contingent upon the successful completion of the transaction;

(3) any material relationships that existed during the past two years or that are mutually understood to be contemplated in which any compensation was received or is intended to be received as a result of the relationship between the advisor and any party to the transaction that is the subject of the fairness opinion;
(4) if any information that formed a substantial basis for the fairness opinion that was supplied to the advisor by the company requesting the opinion concerning the companies that are parties to the transaction has been independently verified by the advisor, and if so, a description of the information or categories of information that were verified;
(5) whether or not the fairness opinion was approved or issued by a fairness committee; and
(6) whether or not the fairness opinion expresses an opinion about the fairness of the amount or nature of the compensation to any of the company's officers, directors or employees, or class of such persons, relative to the compensation to the public shareholders of the company.

Point (1) has highlighted that **contingency payments** must be mentioned in FOs. This leads to the assumption that contingency payments are associated to the precision of fairness opinions. Point (3) identifies the need to indicate whether any **previous relations** between the advisor and the company have existed. Hence, an association on the precision of fairness opinions can be presumed. However for both variables no positive or negative association can be gained from the disclosure requirements.

2.3.3 Procedures

Any advisor issuing a fairness opinion must have written procedures for approval of a fairness opinion by the advisor, including:

(1) the types of transactions and the circumstances in which the member will use a fairness committee to approve or issue a fairness opinion, and in those transactions in which it uses a fairness committee:
    - the process for selecting personnel to be on the fairness committee;

- the necessary qualifications of persons serving on the fairness committee;
- the process to promote a balanced review by the fairness committee, which shall include the review and approval by persons who do not serve on the deal team to the transaction; and

(2) the process to determine whether the valuation analyses used in the fairness opinion are appropriate.

The adoption of FINRA rule 2290 moves the responsibility to ensure that conflicts of interest of the fairness opinion writer are avoided away from the agent to the principal of the FO. The increased disclosure requirements are expected to lead to a more sophisticated selection of the advising investment bank (Gould and Ahmedani, 2005).

On the other hand, criticism against FINRA rule 2290 is focusing on the facts that contingency fees are not forbidden and, hence, the conflict of interest of the investment bank to recommend a bad deal instead of indicating and thereby stopping a poor deal is still given. Contingency fees are criticized as they amount to nearly 90% of the total advisory fees paid in M&A transactions or 1% of the final deal value. Hence, the FO provider might be tempted to alter valuation models in order to come to valuations that allow continuing with the transaction, whereas unaltered models would not consider the deal to be fair (Servaes and Zenner, 1996). Furthermore, **FINRA** rule 2290 does not essentially increase disclosure requirements above what is already a de-facto requirement based on past court decisions (Gould and Ahmedani, 2005). Nonetheless, the changes in regulations leading to tougher disclosure requirements and increase in the awareness of possible conflicts of interests lead to the assumption that a positive association to the precision of fairness opinions exist as supported by Gould and Ahmedani, 2005.

Therefore, the deal's execution date should be used to analyse whether the FO is written before or after the changes in legislation. Later FOs are associated with a higher precision as disclosure requirements are stronger.

2.4 CRITICISM TOWARDS FAIRNESS OPINIONS

Despite the wide-spread use of fairness opinions as a consequence from the Smith vs. Van Gorkom ruling, FOs are still a subject of intensive criticism. The main shortcomings of fairness opinions are already discussed, but statements like the one from Davidoff (2006, p. 1560) that FOs are “conflict-ridden, subjective, rubber-stamps, meaningless and hackneyed” ask for a more thorough investigation. The following discussion highlights the criticism and the strong connection to the principal-agent theory.

2.4.1 Conflict of interest caused by the principal of the fairness opinion

The principals of a fairness opinion might pursue their own interests during mergers and acquisitions, which might conflict with their duty to act in the interest of the shareholders. One reason for that can be the fear of managers to lose their own jobs or suffer a subsequent loss of power after the merger is completed. This might lead to the result that decision-makers are more reluctant to engage in a transaction, even if it is in the best interest of the shareholders (Roll, 1986).

In order to prevent management from acting so and to ensure an objective assessment of the transaction, so-called "golden parachutes" were introduced in the USA as a counter-incentive. These often include the immediate transfer of stocks to managers and the possibility to redeem immediately stock option plans that are otherwise not yet due and additionally high severance payments in the case of takeovers (Bress, 1987). However, golden parachutes bear the risk of being over dimensioned. Hence, if the financial compensation is too high, decision-makers might be over-inclined to accept a takeover bid, which is not necessarily in the best interest of the shareholders (Hall, 2005).

Other financial incentives for accepting an offer can be made by the buyer, for example, in form of a signing bonus or very lucrative advisory deals for the management team for the immediate future after the company is purchased (Choi, 2004; Cochran et al., 1985).

Furthermore, in M&A activities considered as management buyouts or going privates with management participation, direct incentives are given to the management team to acquire the target as cheap as possible. This contradicts the paradigm to achieve the best obtainable price for the shareholders, but lowers the costs for the manager's manoeuvre (Nielsen, 2008; Oesterle and Norberg, 1988).

All the just discussed factors are more linked to general problems of mergers and acquisitions. However, a strong link to fairness opinions is given in the way that such wrong incentives for the board of directors or management might result in the selection of a fairness opinion provider, who is not completely objective. More precisely, Oesterle and Norberg (1988, p. 211) state that "managers dress up their positions with valuations by ostensibly fair-minded experts in order to hoodwink their shareholders". This would take away the protecting role of fairness opinions for shareholders, while management is still protected from liability risks (Elson, 1992).

2.4.2 Conflict of interest caused by the agent of the fairness opinion

The agents of a fairness opinion might pursue their own interests during mergers and acquisitions as well the principals might do. The criticism on FINRA rule 2290 has briefly introduced the problem of a lack of independence. Some researchers comment the interests of the investment banks providing FOs that they either support the interests of the client or pursue their own interests, but never the interest of the shareholders (Chemmanur and Fulghieri, 1994).

In many US acquisitions, the investment bank does not only provide the fairness opinion, but also advises the companies, either target or acquirer, on all strategic and financial aspects of the transaction (Morgan Stanley, 2007; Roll, 1986). For these advisory services, the investment banks receive an advisory fee, depending on the transaction size, which can amount to a double digit million US-Dollar value. This fee is called "contingent fee." The provision of the fairness opinion, on the other hand, is often compensated separately and is ideally be independent of its outcome. However, the remuneration for the fairness opinion is usually well below the advisory fee. For example, two studies for the US market show that the fairness opinion fee accounts for less than 15% of the total compensation (Kisgen et al., 2009; Rubenstein, 2005). In monetary terms a median fee for fairness opinions of 300,000 USD is paid, whereas the median advisory fee amounts to 2,400,000 USD (Kisgen et al., 2009).

Multiple researchers have proven that fairness opinions increase the likelihood of deal completion significantly (Rubenstein, 2005), which is in line with the interests of the investment banks to maximise the obtainable profits from M&A, but might be against the interests of shareholders. However, this criticism is countered by the fact that the fees are often determined as a percentage of the transaction volume and, thus, likewise an incentive to obtain the highest possible offer price is given for the investment bank, which is aligned to the expectations of the target shareholders, but not to those of the acquiring shareholders (Mihanovic, 2005).

In addition to the monetary incentives of the bank, past, current and future relationships **(previous relation)** with the client are cited as a reason for a possible lack of objectivity. Psychological ties of the consultant from past projects make it more difficult to cross the interests of the management with an independent fairness opinion. Furthermore, an investment bank that has consistently recommended a transaction in the past and has actively helped to initiate the current transaction would lose credibility if it then discards the transaction in its fairness opinion (Morgensohn, 2005).

Especially since the beginning of the new millennium an increased number of transactions are carried out in the way of leveraged buy-out (LBO) (Cumming et al., 2007). In these transactions the target is acquired in cash by a combination of equity and debt. Here, investment banks have often the position of "dual presentation", which means that the bank represents the target company, but it also provides services, e.g. financing, to the acquiring company. More precise, the investment bank offers staple financing to the acquirer. Staple financing is a pre-arranged financing package offered to interested bidders in M&A transactions. The staple financing is arranged by the investment bank advising the acquirer company and includes all details of the lending package, including the principal, fees and loan covenants. The name is derived from the fact that the financing details are stapled to the back of the acquisition term sheet (Povel and Singh, 2010). Hence, if the transaction does not materialise, no financing is needed and the investment bank would lose this additional contract.

Contradicting these severe allegations are comments that investment banks are not willing to risk a sustainable damage in their **reputation** by issuing biased fairness opinions. In addition with liability risks arising from wrong fairness opinions, these two factors are perceived to outweigh short-term monetary benefits received through contingent fees (Kisgen et al., 2009). For this reason, the objectivity of investment banks in the context of fairness opinions should be regarded as given (Schönefelder, 2007).

These conflicts have highlighted the need to further investigate the variables previous relation, contingency fees and reputation.

2.4.3 Approaches to improve the quality of fairness opinions

Various approaches are proposed to address and solve the problems of conflicting interests caused by the agent and the principal, which are closely linked to discussions on the quality of fairness opinions.

Particularly in LBOs, but also in any other M&A transaction, a second fairness opinion **(multiple FOs)** is recommended to overcome potential conflict of interest. The second opinion can be rendered by an investment bank, which is not linked to any other advisory services in the transaction. Ideally, the bank does also not have any previous relations to the companies involved and does not receive contingency fees (Sorkin, 2005). Thence, the second FO performs the role of an objectivity test and can identify an obviously one-sided first fairness opinion (Kisgen et al., 2009). Some banks, e.g. Credit Suisse, have introduced frameworks where certain kinds of transactions are required to be double-checked by a second fairness opinion. This can be seen as a pro-active approach to lower potential conflicts of interest and, in turn, increase the quality of the fairness opinion (Schönefelder, 2007).

An alternative to multiple fairness opinions is the review of a fairness opinion by a "Valuation Advisor", who assesses the robustness and objectivity of the fairness opinion. This is typically done by small, specialised boutiques. However, it is criticised that such boutiques might be forced to grant "rubber stamps" in order to stay in business at all (Sorkin, 2005, p. 3). Furthermore, it is argued that the lack of valuation standards make second opinions relatively useless as any difference in the valuation can be easily justified by the issuer of the first fairness opinion (Roll, 1986).

As a consequence, commentators like Davis (2004) claim that investment banks performing advisory services and receiving performance-based compensation should generally be refrained from issuing fairness opinions. Legislation in France, for example, does not allow this combination of business activities; however in the US this is not forbidden (Davis, 2004). On the other hand, it is argued that the fairness opinion provider in question is best acquainted with the company and the transaction circumstances. Hence, the advisor is the most qualified and reliable addressee to compile a reliable company valuation.

Another approach to enhance the functionality of fairness opinions is a better disclosure. While the SEC's and FINRA's reforms outlined in chapter 2.3 may, at least, contribute to increasing shareholder awareness of conflicts of interest, disclosure of all material company valuation considerations and assumptions, based on critical analysis, will allow the reader of the fairness opinion to come to own judgments (Davis, 2004). Improved disclosure can also be beneficial for the investment banks itself as previous court decisions have shown that good disclosure can contribute to a mitigation of liability risks (Kisgen et al., 2009).

Others prefer the approach to standardise fairness opinions with regards to the used valuation models. Current practice is criticised for methodologically flawed valuation models that either are not following theoretical guidelines or are adapted to the needs of the fairness opinion provider (Rau, 2000; Elson, 1992). Therefore, stronger regulation is expected to limit the scope of misuse of valuation models and subjectivity. Hence, the degree of subjectivity will be lowered (Schwetzler et al., 2005). In some countries, like Germany, fairness opinions are asked to follow certain valuation standards as described in IDW (Institut der Wirtschaftsprüfer (Institute of Auditors)) standard IDW S8 "Grundsätze für die

Erstellung von Fairness Opinions"[7] (Franken and Schulte, 2014). Bingham (2005) demands that at least a second fairness opinion has to follow the guidelines for fairness opinions issued by the American Society of Appraisers, an institution similar to the IDW, in the USA.

With the introduction of a standard procedure for fairness opinions, courts would also be placed in the position to use an objective benchmark to judge the quality and work of the fairness opinion provider (Rubenstein, 2005). Otherwise, criticism on standard procedures argues that any standard would never be able to capture the complexity of fairness opinions and business valuations correctly. Experienced advisors are better able to adapt to the given circumstances of a transaction, if no standards are set and might, thus, still arrive to a fair valuation and effective assessment, where they would fail to do so with strong guidelines in place (Mihanovic, 2005). Especially the standard valuation models often fail to come to a positive company valuation, if the target is facing bankruptcy or is already illiquid (Ratner et al., 2010).

Last but not least, some researchers demand a tightening of the liability rules. This could help investment banks to avoid controversial contracts with potential conflicts of interest, which would improve the fairness opinion functionality for the shareholder (Davidoff, 2006). However, extended liability is being criticised for the fact that investment banks will increasingly make use of disclaimers which will in turn mean that the fairness opinion loses its informational content (Davidoff, 2006).

The discussion has shown that multiple fairness opinions are believed to improve the quality of FOs. Hence, a positive association to the precision can be assumed. Furthermore, the conflicts of interests between the principals and the agents of fairness opinions call for a closer analysis of the principal-agent theory, which is provided in the next chapter.

[7] IDW has issued a framework for valuation standards in fairness opinions.

2.5 PRINCIPAL-AGENT THEORY

2.5.1 Concepts of the principal-agent theory

2.5.1.1 Introduction to the principal-agent theory

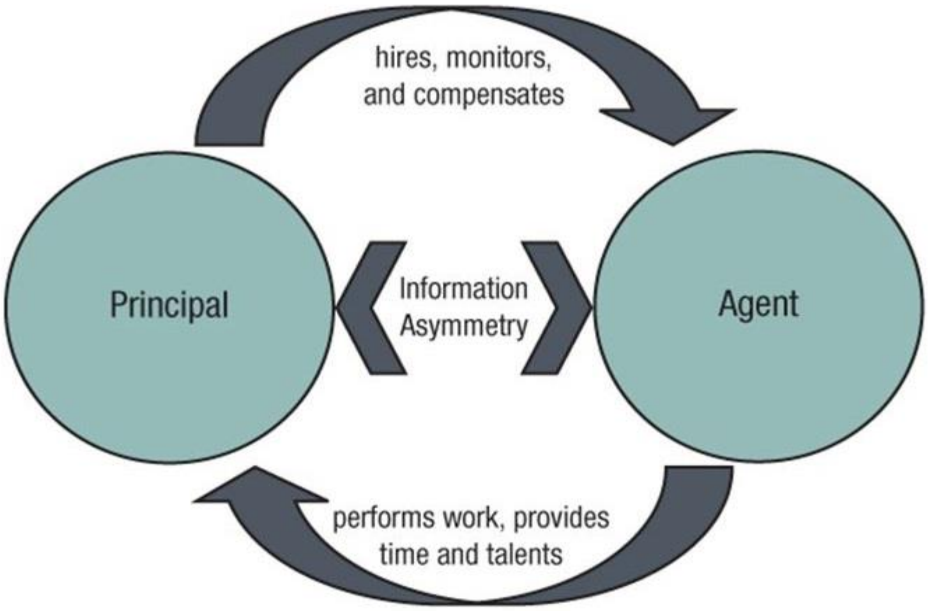
The previous discussion of the limitations of fairness opinions has highlighted that fairness opinions are influenced by principal-agent relations and the consequences of opposing interests. This is not surprising as agency theory is a fundamental building block in modern corporate finance literature (Tirole, 2009). Consequently, a more detailed look on the theory and its implications is beneficial.

The principal-agent theory describes the contractual relation between one party, the principal, who delegates work to another party, the agent. The principal-agent relationship has a hierarchic structure of super ordination and subordination (Blum et al., 2005). The contractual agreement has a strong relation to risk sharing between individuals and groups (Arrow, 1971) and can be applicable in a variety of situations, ranging from macro level issues as regulatory policy to micro level details as expression of self-interest or lying (Schwarz et al., 2002; Eisenhardt, 1989).

The main goal of the principal-agent theory is concerned with solving problems that arise due to the contractual setting between the two parties and asymmetric information between them (Hartmann-Wendels et al., 2015; Jensen and Meckling, 1976).

The first problem arises when the goals and aims of the principal and the agent conflict and when it is difficult for the principal to control what the agent does. The inherent problem for the principal is to verify that the agent is acting appropriately and in the best interest of the principal due to information asymmetries (Bebchuk and Fried, 2005). Figure 3 illustrates this. The agent, in relation to fairness opinions, the management board, hires a principal, the advisor/investment bank. The bank receives a monetary compensation for the assignment and is monitored by the principal. The agent carries out the assignment by offering time and skills. However, the agent will show a strong opportunistic behaviour as a homo oeconomicus[8] under the assumption of utility maximisation. Under this assumption the agent will minimise the expenditures to fulfil the task assigned by the principal (Hartmann-Wendels et al., 2015).

Figure 3: Principal-Agent relation



Source: Rothaermel (2015, p. 415)

The second problem is deducted from the risk sharing approach. Whenever the principal and the agent have different attitudes to risk, they will focus on different outcomes and take different actions.

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[8] In economics, homo economicus is the concept portraying humans as consistently rational and narrowly self-interested agents who usually pursue their subjectively-defined ends optimally. Homo economicus is often portrait as perfect rational (Caruso, 2012).

The focus of the principal-agent theory is emphasised on the contract governing the relationship between the two parties and the most efficient contract between them, taking into effect assumptions about the behaviour of people (e.g. self-interest, risk aversion, free lancing), organisations (e.g. conflict among members) and information (e.g. information is a commodity that can be acquired), according to Arrow, 1992 (Dionne and Harrington, 1992).

Agency theory is applied on organisational phenomena as compensation (Conlon and Parks, 1990), board relationships (Fama and Jensen, 1983), innovation (Bolton and Scharfstein, 1998; Zenger, 1988), ownership and financing structures (Agrawal et al., 1992), but also on vertical integration (Anderson, 1985; Eccles, 1985) and acquisition and diversification strategies (Amihud and Lev, 1981).

To summarise the ideas of the principal-agency theory so far, it can be said that the domain of the principal-agency theory is the relationship between the principal and the agent who have differing goals and opposing attitudes toward risks, but are engaged in cooperative behaviour due to a contractual setting.

The principal-agency theory has developed in two different streams, the positivist and the normative principal-agent theory (Blum et al., 2005; Jensen, 1983). The normative stream is more focused on cases and the general theory of the principal-agent theory, for example on employer-employee, buyer-supplier relationships or any other agency (Watts and Zimmerman, 1983). Research is based on assumptions, which are logically deducted and mathematically proven (Hartmann-Wendels et al., 2015; Harris and Raviv, 1978). This concept is also employed in this dissertation to deduct the variables and the expected associations on the precision.

However, as Eisenhardt (1989) points out, the two streams are complementary. The positivist theory identifies contract alternatives, whereas the principal-agent stream indicates which contract is the most efficient one under given situations.

The positivist agency theory focuses on identifying situations in which the principal and the agent are supposed to have conflicting interests due to different aims. It tries to find the ideal contractual solution to overcome the situation in which the agent is more focused on her self-interest. One proposition is to use outcome-based contracts as they are partly used for fairness opinions in terms of contingency fees. The conflicts of self-interests by the agents are reduced by these contracts (Hartmann-Wendels et al., 2015; Jensen and Meckling, 1976) as these contracts align the preferences of agents with those of the principals as the financial rewards for the agent depend on the same goals and actions. By aligning the preferences the underlying problems of hidden characteristics, hidden intentions and moral hazard are reduced (Hartmann-Wendels, 2015; Townsend, 1979). These three problems will now be explained in more detail.

2.5.1.2 Hidden characteristics

Problems in terms of hidden characteristics are based on information asymmetries between the principal and the agent regarding the quality of the subject matter, e.g. the sale of a company, **before** contract closing. This information asymmetry is relevant, because information is a strategic factor for all economic decisions (Blum, 2015). Thus, in the context of a purchase agreement, the seller is usually better informed about the nature of the object of sale as the buyer. The buyer can only decide on the basis of a temporary inspection of the item to be purchased. Consequently, assuming a strictly opportunistic behaviour, this leads to an adverse selection, which means that the buyer will not buy the object. Based on the fear of hidden defects, the purchaser is only willing to pay a lower than average price for the goods. However, the seller is not willing to sell the product at a lower than average price, if the product quality is above-average (Blum, 2015). Inevitable corollary, the average quality of the products offered in the market will decline and the purchaser, in turn, is again only willing to pay a below-average price for the goods. In theory, the chain would continue indefinitely and an equilibrium price would not be found. (Blum et al., 2005; Akerlof, 1970). This negative chain can be stopped by obtaining fairness opinions, if the positive mind setting is accepted that fairness opinions provide value and lower information asymmetries.

2.5.1.3 *Hidden intention*

Hidden intentions are a problem, which result from the willingness of the agent to exploit the dependence of the principal, often referred to the freelancing problem. This problem can occur **before** and **after** contract closing. With her advanced knowledge, the agent knows how to reduce the working effort or to maximise her compensation claim and is prepared to use this advantage over the principal in her own interest. After contract closing the principal faces the problem how to verify that the agent acts in the best interest of the principal and does not follow her own self-interests (Hartmann-Wendels et al., 2015; La Porta et al., 2000).

2.5.1.4 *Moral hazard*

The moral hazard effect emerges **after** contract closing and is divided into hidden action and hidden information. A hidden action is any activity in the context of actively realised or omitted action, which cannot be monitored by the principal. A lack of effort by the agent to act in the interest of the principal and to do the intended work for the principal is described by the term shirks (Hartmann-Wendels et al., 2015).

It is also possible that the agent uses the resources of the principal to pursue his own interests, described as consumption on the job. Hidden information means that the principal is capable of monitoring the agent, but due to a gap of expertise she is not able to evaluate the agent's working effort and performance capabilities. This information asymmetry allows the agent to realise fringe benefits. The agent can act for her own benefit without any benefit for the principal. One example is the investment bank employee, who works on private or other business projects on the principal's time. However, the research is so similar to the intended work or so complex that the principal cannot detect what the agent is actually doing (Hartmann-Wendels et al., 2015; Blum et al., 2005).

These situations have in common that they produce additional costs. The principal has additional monitoring costs and the agent incurs additional bonding costs as the agent cannot accept other offers while carrying out the current assignment. In addition, the principal incurs residential losses incurred from the diverging principal and agent interests despite the use of monitoring and bonding (Schmidt, 2016).

Mutual trust, e.g. due to previous relations, reduces agency costs and increases the cooperation profit for both parties as in situation with a lack of confidence in each other, monitoring costs will rise continuously. This might lead to an overinvestment in safeguards. With the ambition to achieve a cooperative solution, there has to be consensus between the parties and activities of one's accord or manipulation have to be excluded. Consensus solutions found in a regulatory system have the advantage that the interests and values of each party are respected (Schmidt, 2016).

Agency problems between the principal and the agent arise from a combination of information asymmetries and conflicting aims. The three main ideas to overcome these problems are the reduction of information asymmetries, the harmonisation of aims and confidence building.

2.5.1.5 Reducing information asymmetries

Since all agency problems are based on information asymmetries, all measures to lower information asymmetries lead to a reduction of agency problems. These improvements can be achieved by both parties. An improvement of market transparency can be initialized by the principal as well as by the agent. The principal can try to gain additional information from other sources to reduce the level of asymmetric information (Hartmann-Wendels et al., 2015).

The principal with a lack of information respective to the agent can fill up this gap by active information procurement about the qualifications of the agent. This information procurement process is commonly known as screening. The screening process is done by the principal in his own interest, to avoid risks and problems of hidden characteristics and hidden intentions (Schieg, 2008). In relation to fairness opinions, investment banks might pretend to have experience in crafting FOs or with the business segment, but do not have the necessary skills or manpower to successfully proceed with the assignment. The idea to acquire an agent, which has proven to be qualified before, is an option to overcome these obstacles. Either a previous relation can be beneficial as the qualifications are known on first-hand basis or a high reputation in the market, which signals quality.

In addition to the principal, the agent can also help limiting the information deficit. This is called signalling. An agent with high qualities or reputation intends to differentiate from agents with less favourite attributes. In order to show the own abilities, the agents can reveal their unique qualities (Schmidt, 2016). An investment bank can, for example, provide previous fairness opinions or qualifying documents to the principal, demonstrating the previous success and experience.

Screening and signalling are only relevant for problems arising **before** contract closing. **After** closing screening and signalling are superseded by monitoring and reporting. Both activities are aimed at reducing the asymmetric information distribution during the operating contractual relationship. Thereby the monitoring and reporting tools should also prevent the risk of hidden intention and moral hazard (Göbel, 2002). Table 2 summarises the shown problems related to the principal-agent theory and is based on the ideas of Hartmann-Wendels et al. (2015).

Table 2: Problems of principal-agent theory with relation to fairness opinions

	hidden characteristics	hidden information	hidden action
Date of origin	before contract is signed	after contract is signed	after contract is signed
Place of origin	ex-ante (undisclosed attitude)	unobservable information status of agent	uncontrollable activities of agent
Problem	entering into contractual agreement	Assessment of results	Behaviour- /performance evaluation
resulting risks	adverse selection	moral hazard	moral hazard, shirking
Solution	signalling, screening, self-selection	Incentive and control systems, self-selection	Incentive and control systems

Source: own production

2.5.1.6 *Harmonisation of aims*

Theory provides different solutions to mitigate hidden intentions and moral hazard. The programmability and measurability define the proposed solutions. Programmability is defined as the degree to which appropriate behaviour of the agent can be defined **upfront** by the principal. For simple tasks as cleaning jobs the outcome can be defined easily in advance, for example cleaning staff has to clean the entire building by the end of the night. The measurement of the job completion is rather simple compared to the services an investment bank offers. Consequently, different contract types are suggested. For more programmable jobs, behaviour based contracts (e.g. hourly wages) are suggested, whereas complex and less programmable jobs require an outcome-based contract (**<u>contingency fees</u>** for fairness opinions).

Measurability becomes easier and faster, if the principal and agent know each other for a long time. In long-term principal-agent contracts it is most likely that the principal will learn about the agent, according to Lambert (1983). This means that information asymmetries are larger in short-term contracts (as the creation of a fairness opinion). Hence, it is recommended for short term contracts to rely on **previous relations** as asymmetries of information are smaller and controlling becomes easier. This leads to a positive association of previous relation on the precision of fairness opinions.

If the principal and agent would not pursue different aims, the level of asymmetric information between the two parties would not be relevant. Therefore, a harmonisation of aims is in the interest of both partners. This can be achieved, as seen, by a contractual agreement that offers the lowest potential of conflicts. Two different contractual agreements are desirable, depending on the level of complexity of the activities to be carried out.

Before contract closing the principal should harmonise the agent's aims with the own aims. This should consequently leads to a contract which offers the lowest conflict potential. The instrument of designing performance-oriented contracts is well-known especially for the remuneration of managers in stock listed companies. For example, the agent's compensation claim can be linked completely or partially to the aim desired by the principal. Under certain circumstances, a material reward could reduce the motivation or even displace the motivation completely. A multi-period cooperation has a positive effect on the agency problem, because of the possibility that the agent risks losing his reputation (Schmidt, 2016).

Another approach to control the agent more thoroughly and easier is given by Gailmard (2014). According to his ideas, hiring multiple agents to carry out the same work independently will help to lower moral hazard and information asymmetries. **Multiple (FO)** agents will compete do be better than the other agents, either in time consumption and/or quality. Additionally, every agent will provide additional, incremental information to the principal and, hence, lower information asymmetries (Bovens et al., 2014).

Hence, not only previous relations and contingency payments help to moderate the effects of asymmetric information, but also multiple FOs are seen as one way to overcome these problems.

2.5.2 Information asymmetries between management and shareholder

Until now, the discussion of the principal-agency theory has entirely focused on the relation of management (principal) and the fairness opinion provider (agent). However, the relation between shareholder and management is also a principal-agent relation. The shareholder is the principal and the management the agent, who should act in the best interest of the shareholder (Jensen, 1986). The same problems arise from this principal-agent relation as they arise out of the principal-agent relationship between management and fairness opinion provider. Nonetheless, the focus is different.

Especially the financial rewards of management are in contrast to the financial rewards shareholders expect. A pay-out of excessive cash of companies in terms of dividends to its shareholders creates conflicts of interests. Pay-outs to shareholders reduce the resources under the agent’s control (management) and reduce the need for monitoring and also make monitoring easier for the shareholders (Harada and Nguyen, 2013; Easterbrook, 1984; Rozeff, 1982). Additionally, dividend payments are generally expected to be beneficial to share prices (Gordon, 1959) and, hence, dividend payments are highly appreciated by shareholders. In contrast to that, managers prefer to keep dividends streams in the company as more funds under their control increase the power of managers. Likewise, compensation of managers is often linked to company growth (Bergstrasser and Phillipon, 2006; Murphy, 1985). Additionally, the urge of firms to promote middle managers in order to keep them satisfied creates a strong need to grow in order to supply the needed managerial levels constantly (Baker et al., 1993). Due to the diverging interest of the principal and the agent, cash is expected to be associated to the precision for the statistical analysis based on the principal-agent theory.

These conflicts of interest in regards to pay-out policies grow if companies generate substantial free cash flows. Managers are interested to spend the excess free cash flows in all projects that generate positive net present values in order to grow, whereas shareholders might be able to find better projects with a better return outside the company (Jensen, 1986).

This conflict between management and shareholders has briefly introduced the problems of diverging interests and the influence of certain variables on shareholders' returns. Therefore, the links between PAT and wealth transfers in M&A transactions are strong and partly explainable by principal-agent conflicts.

2.6 MAIN FINDINGS OF CHAPTER 2

The main purpose of this chapter is to provide a systematic introduction to the essentials of fairness opinions as an integral part of public mergers and acquisitions in the USA, which will form the background for subsequent chapters.

For this purpose a general description of fairness opinions is given in chapter 2.1. Chapter 2.2 explains the relevance of fairness opinions due to the Smith vs. van Gorkom ruling. Furthermore, this subchapter is used to introduce the different functions fairness opinions can and have to fulfil in relation to the board of directors and shareholders. By delivering certain functions and information to its readers, first indications are given what variables might influence the precision of fairness opinions. These are, sorted by the order of appearance, friendly or hostile deals, size, reputation, cash, contingency fees and FINRA (year), the difference between target and acquirer valuations and lastly multiple fairness opinions and multiple valuations.

Section 2.3 dealt with the regulatory frameworks in the US, focusing on disclosure requirements. It is highlighted that there is no obligation to obtain a fairness opinion in the USA, but since the Smith vs. van Gorkom ruling nearly every merger is using FOs to limit the liability of the board of directors. Nonetheless, conflicts of interest between the principals and agents can arise. Hence, disclosure requirements were changed in 2008 with the adoption of FINRA rule 2290. The effect on the quality and, consequently, precision of fairness opinions is not yet known and this change in legislation will be a variable for the empirical research.

Furthermore, general criticisms against fairness opinions are mentioned and solutions and ideas offered by researchers and practitioners are presented. In particular, FOs are criticised for their arbitrary in valuation and missing standards in valuation models. Solutions include the use of at least a second fairness opinion to overcome problems caused by conflicts of interests. Other solutions recommend the use of an investment bank with a high reputation and/or an independent bank.

Lastly, chapter 2 discusses the principal-agent theory as the criticism on fairness opinions has highlighted the possibly opposing interests of the involved parties. The discussion shows the mechanisms that might influence the triangle of power, control and free-lancing in the relation between the board of management, investment bank and shareholders which bias the quality of fairness opinions. In doing so, the discussion offers solutions how to avoid conflict ridden fairness opinions.

The variables derived from the functions of fairness opinions and the principal-agent theory are summarised in the following table and incorporate an indication what influence they are predicted to have on the valuation precision based on the previous discussion.

Table 3: Summary of variables based on the functions and principal-agent theory and the expected influence on the precision of fairness opinions

Variable	Functions of FO	Principal-agent theory
Friendly deal	+	
Size	+	
Reputation	o	+
Cash	+	o
Contingency fees	o	+
FINRA	+	
Multiple FOs	+	+
Related mergers	+	+
Previous relation	+	+
Multiple valuations	+	+
Acquirer	+	

Source: own production

where a + indicates a positive association to the precision and an o a neutral effect.

Therefore, in chapter 3 the so far identified variables will be discussed with regards to their influence on wealth transfers in M&A deals. Chapter 3 will focus on deal characteristics variables influencing fairness opinions with regards to mergers and acquisitions. Also fairness opinions cannot be directly compared with results from M&A research, it can be expected that some variables that improve the quality (in terms of lower wealth transfers or improved cumulative abnormal returns) of M&A deals will also improve the quality of fairness opinions. Lastly, the current status of research in FOs will be discussed under consideration of deal specific and fairness opinion specific variables and the hypotheses formulated.

3 WEALTH TRANSFERS IN MERGERS & ACQUISITIONS AND ITS RELATION TO FAIRNESS OPINIONS

Chapter two has provided variables expected to be associated to the precision of fairness opinions. These variables are now discussed with regards to the association on M&A. The aim is to deduct from the existing body of literature whether the association is positive or negative. The research on M&A is mutually limited on deal characteristic variables. Lastly, the current available body of literature with regards to the performance of transactions using fairness opinions is presented and the hypotheses are formulated. The discussion of fairness opinion research results allows analysing deal and fairness opinion specific characteristics. Special attention is paid on the level of asymmetric information related to these variables and the functions they fulfil.

3.1 WEALTH TRANSFERS IN MERGERS & ACQUISITIONS

3.1.1 Target and acquirer in mergers & acquisitions

A general wealth gain arising from mergers and acquisitions is still highly debated among researchers. Many researchers agree that mergers and takeovers do not create wealth, but merely transfer ownership of assets (Martynova and Renneborg, 2008; Peacock and Bannock, 1991). A full explanation why merger-active companies and economies underperform the market cannot be answered within a couple of pages as it involves a complex interplay of economic, social and political factors (Ismail and Krause, 2010; Porter, 1998). As the focus of this dissertation is based on the precision of fairness opinions, the following notations try to summarise the main findings.

The bulk of empirical evidence suggests that positive gains from takeovers accrue almost entirely to shareholders of target firms (Moeller et al., 2004a; Jensen and Ruback, 1983). While the average abnormal return recorded in these studies is invariably positive and statistically significant, returns to the shareholder of bidding firms are negative for mergers and not significantly different from zero for takeovers. Consequently, a separation between targets and acquirers is beneficial when analysing returns for M&A and the precision of fairness opinions (Cain and Denis, 2012). Finally, acquisitions and mergers are on average not wealth-creating, but the takeover process transfers wealth from the shareholders of the bidder to those of the target (Moeller et al., 2004a; Houston et al., 2001; Agrawal et al., 1992; Healy et al., 1992; Kaplan and Weisbach, 1992; Servaes, 1991; Jensen and Ruback, 1983).

However, the transfer of shareholder wealth cannot be observed in every period of time. In a research using only UK data from 1977-1986, the results suggest that the gains experienced by target's shareholders occurred at the expense of the acquiring shareholders' account, but the wealth decrease of the bidding shareholders was especially observed in the period from 1977 to 1980. The last six years of this study showed no significant abnormal wealth destruction on the bidding side or wealth redistributions between target and acquirer (Limmack, 1991).

Nonetheless, the general negative results for acquirers are not shared by other researchers. Based on an empirical study covering 30 years from 1955 to 1985 and over 3,400 mergers in the US and UK, significant wealth gains for both sides are observed (Franks et al., 1991). The observed wealth increase on the acquirer's side amounts to +8% in the UK and +4% in the USA. The wealth gains for the target side's shareholders are significantly higher with +31% in the UK and +24% in the US. Nonetheless, none of the cited studies can be compared one by one to another study as the time spans to measure the cumulative abnormal returns (CARs) are differently chosen. Some studies focus on a time period of only a couple of hours after the announcement is made to measure CARs, whereas other studies observe CARs over many years. Another study agrees to the fact that the observed wealth destructions on the acquirer side cannot be explained by wealth transfers from the acquirer side to the target side. This study highlights some big wealth destructions in large M&A activities as the driving force behind the partly observed wealth losses on the acquirer side (Moeller et al., 2003; Gregory, 1997).

To round up the previous discussion it can be said that wealth gains or losses resulting from M&A are still heavily debated, but some M&A transactions are more successful than others. However, the discussion is able to demonstrate that wealth gains are larger for targets and lower for acquirers and these differences are neither depending on timing nor on markets. Hence, a separation between targets and acquirers is needed for the empirical analysis.

3.1.2 Cash versus stock payment in mergers & acquisitions

3.1.2.1 Introduction to the role of cash

The review on cash or stock as a method of payment in M&A deals is needed as managers have different reasons why they choose one of the two payment options or a combination of the two (Martynova and Renneboog, 2006). The body of literature can be divided in two different groups. The first group is the means of payment groups (cash versus stock) and the other one the source of financing (internal cash reserves or cash flow versus debt financing). As the second group becomes only relevant if cash is chosen to pay for the deal, the following discussion will be divided in cash and stock. The difference in the source of financing will be explained in the cash part.

3.1.2.2 Cash payment

The empirical literature provides substantial evidence that suggests that announcements of all-equity M&As results in significantly negative cumulative abnormal returns to acquiring shareholders. Deals fully financed by cash, on the other hand, outperform fully stock financed deals (Martynova and Renneboog, 2006; Andrade et al., 2001; Travlos, 1987). The diverging performances are explained by signalling effects as they are also observed in the functions of fairness opinions. The signalling effects of cash are positively loaded, whereas stock payments are negatively connoted according to the signalling hypothesis by Travlos, 1987. The negative connotation of stock deals is explained by overvalued stocks that are used to buy the targets (Fu et al., 2013; Myers and Majluf, 1984).

Cash financed deals can have three different sources where the money is obtained from. These three sources are internally generated cash-flows, cash from borrowings (debt financing) and cash from new equity issues.

Debt financed deals might be initiated by the acquiring management board to make use of possible tax savings that are associated with debt financed deals (Trinchera, 2012; Graham, 2000). Unused debt facilities lower the market valuation of companies by up to 9.7% (Graham, 2000) and companies operating below their optimal debt level are foregoing potential benefits of debt financing (van Bingsbergen et al., 2010). An increased level of debt financing can also be used by management to protect the own company of becoming a potential target as buyers might be interested in the unused debt potential (Lewellen et al., 1985). This risk is especially given when a large number of firms are cut off from the mechanisms of capital-raising. Well-managed companies with low debt levels and wide debt capacities are in these situations first candidates to be taken over under conditions of high uncertainty (van Bingsbergen et al., 2010). The overall positive CARs of debt financed transactions is proven in multiple researches (Martynova and Renneborg, 2011; Ghosh and Jain, 2000).

The results for deals financed by new equity issues are mixed, whereas deals financed by internally generated free cash-flows deliver negative results. New equity financed deals are on the one hand expected to be value-destroying for the shareholders as costs are high for new share issues compared to free cash or debt. On the other hand, Schlingemann (2004) finds especially positive returns, even for the acquirers, if the Tobin-Q ratio is high[9] and stocks are overvalued in comparison to the average P/E ratio. Hence, the use of overvalued shares over compensates the high costs of issuing new shares.

Acquiring firms with excess cash destroy value due to overbidding or a misuse of the excess cash. Jensen (1986) posits that managers assign low

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[9] Tobin's Q ratio assumes that all companies on the stock market are valued equally to their replacement costs as measured by the firm's assets. The Q ratio is calculated by dividing the total market value of the firm by the total asset value. Companies with a Q below 1 are undervalued and Qs greater than indicate an overvaluation (Tobin and Brainard, 1976).

opportunity costs to their internal free excess cash flows that are not needed for reinvestments or normal business activities. Due to the low internal costs, managers are more likely to invest in low return projects or deals where a negative net present value is given. Hence, managers are more likely to engage in value destroying acquisitions (Stulz, 1990). Financing policies limiting the cash resources under management's control, like dividend payments, can mitigate or prevent this misuse. Another issue with free cash flows is that free cash flow is frequently used for managerial empire building (see e.g. Gorton et al., 2009, Servaes 1991). Empire building has the advantage that the company becomes harder to be overtaken by competitors, but also leads to build spheres of influence, which lower the chance to control management strictly (Masulis et al., 2007). Monitoring becomes more complex for shareholders.

3.1.2.3 Stock payment

In general, managers have superior knowledge and information about their own companies than any other person (Ataullah et al., 2014). These advantages in information levels can be used by rational managers to achieve gains for their companies and shareholders from timing anomalies resulting from irrationality in capital markets (Huang and Ritter, 2009; Baker and Wurgler, 2002).

If managers perceive their shares to be overvalued by the market, they are motivated to use the potentially overvalued shares to acquire firms that are undervalued by the market. The overvaluation can be measured in two ways, either the price/earnings ratio (P/E ratio) or the Tobin's Q ratio. If any of the two ratios is high, the likelihood for stock payments increases significantly (Shleifer and Vishny, 2003). It is expected that smart management teams of overvalued acquiring firms try to make use of their supposedly overvalued shares by buying undervalued or less overvalued companies. The overvalued shares are used to pay for the acquisition (van Bekkum et al., 2011). Since market errors like over- and undervaluation get corrected in the long-term, overvalued firms undertaking stock acquisitions seek to protect themselves against future share price corrections by selecting relatively undervalued targets (Shleifer and Vishny, 2003). A return to the average long-term P/E ratio leads to a lower market capitalisation and, hence, a negative return associated with the merger (Dong et al., 2006).

This assumption is supported by different separate, internationally oriented long-term studies. The results do clearly suggest that stock deals underperform cash deals significantly in relation to cumulative abnormal returns (Dong et al., 2006). The overvaluation of shares as well as the higher risk of owning shares leading to higher risk premiums are among the discussed explanations for that (Dong et al., 2006; Asquith, 1983; Langetieg, 1978).

A commonly used method to analyse the success of mergers is a comparison between a group including mergers and another group, where the performance of shares is measured, which are not engaged in M&A activities in the given time period. Cumulative abnormal returns are used for this purpose.

A study consisting of 534 deals has yielded a significant underperformance of stock mergers by -23.6% and -36.1%, depending whether the deal is a merger (-23.6%) or a takeover (-36.1%), whereas cash deals outperformed the comparison group by +5.1% in mergers and +69.8% in tender offers (Loughran and Vijh, 1997).

Furthermore, differences in bidder-target valuations are greater among stock offers than among cash offers (Dong et al., 2006) as a larger premium on the share price of the target is needed to convince the market to agree to the suggested takeover. Additionally, a takeover process is a time-consuming process. This means that a takeover financed with shares must include a premium to include a risk buffer for share price fluctuations during negotiations and final settlement of the merger (Shleifer and Vishny, 2003). These larger valuation differences and premiums are believed to be incorporated in the valuation ranges of fairness opinions, leading to a negative association of stock payments to the precision.

Consequently, cash deals are expected to yield better cumulative abnormal returns and contribute positively to the performance of transactions compared to share financed transactions, albeit cash does also offer serious drawbacks. However, the level of asymmetric information in cash deals is lower compared to stock financed deals.

Due to the last two arguments, a positive association on the precision of fairness opinions can be derived from the previous discussion for cash deals.

3.1.3 Size of the deal in mergers and acquisitions

3.1.3.1 Absolute size in terms of transaction size

The effects of the transaction size in terms of the paid price by the acquirer for a target on M&A performance are still debated and no clear indication is given whether larger deals are easier to value or yield better results than smaller deals.

The hubris of management thesis by Roll (1986) is mostly used for a negative argumentation towards size. Hubris of management leads to empire-building. The hubris of management causes a risk of overpayment and, hence, worse results for the acquiring shareholders. A mixture of overconfidence and empire-building is believed to lead to non-value maximising deals of larger corporations (Malmendier and Tate, 2008). In contrast to that, smaller firms tend to make acquisitions where they know the market and products well, which increases the returns from acquisitions (DePamphilis, 2010). With a large data set at hand Moeller, Schlingemann and Stulz (2004b) have analysed cumulative abnormal returns of mergers and find better cumulative abnormal returns for smaller deals.

In the same vein, another research proxies the complexity of a deal by the size and concludes that larger companies consist of more business units, which makes the valuation process more difficult and, hence, less precise (Servaes and Zenner, 1996). However, this negative impact can be overcompensated by the preference to choose a highly competitive investment bank, which will improve the precision. Furthermore, large companies are expected to have lower levels of asymmetric information in comparison to smaller companies against the creator of the fairness opinion as they are more likely to use in-house investment banking services or at least advices from their own M&A team to inform themselves on the quality, integrity and honesty of a proposed transaction. These services are normally fully controlled by an investment bank. Therefore, having the ability to use in-house services reduces the contractual agreed work of the investment bank and makes it additionally easier to control the actions of the bank, according to the PAT (Servaes and Zenner, 1996).

Besides that, larger companies are assumed to be better informed about market trends and competitors and can thereby contribute positively to the work of the investment banks. This cooperation helps to increase the valuation precision of investment banks and is a strong argument for advantages of larger deals in M&A (Servaes and Zenner, 1996). Though, although Servaes and Zenner see an increased complexity, the advantages of lower asymmetric information in knowledge and experience over compensate the increased complexity. Overall they assume that larger deals are superior to smaller deals.

The positive signalling effects of cash are more likely to be achieved by larger deals as the likelihood to use a higher ratio of cash or only use cash to finance a deal is higher for larger deals than for smaller deals (Fich et al., 2018), which is associated to better outcomes as the discussion of cash has shown.

Contradicting the positive link between size and cash are the results of another research, where larger targets significantly yield better returns in M&A, but stock payments are preferred. The explanation given in the study is larger deals are more successful than smaller ones as market control factors leading to a market domination are relevant (Fuller et al., 2002). Therefore, market domination can be added to the positive argumentation of the superiority of larger deals.

Lower levels of asymmetric information are linked to other positive size-related effects which are noted in other researches of Trimbath et al. in 2001, Hunter and Jagtiani in 2003 and Moeller et al. in 2004b, just to mention a few. Due to the increased amount of publicly available data, larger deals deliver better CARs. Another advantage of official and public data is that public data is less likely to be biased by management as quarterly reports must follow a standard layout. Additionally, manipulating regular financial statements is more difficult than manipulating a single statement issued for a one-time special event (Hunter and Jagtiani in 2003 and Moeller et al. in 2004b).

Another argument for lower levels of asymmetric information of larger deals is related to the number of independent analysts following a company to give investment recommendations. By providing recurring recommendations, analysts lower information asymmetries in the markets in M&A and coverage is higher for larger companies (Chang et al., 2006).Therefore, larger companies have more publicly available data and a higher analyst coverage.

Competition for large targets is less intense than for smaller targets as fewer potential buyers are available and able to provide the needed financing. Due to the lower competition, the risk of tender offers is lowered and premiums can be chosen on a lower level, reducing the losses for acquiring shareholders (Gorton et al., 2009). Additionally, in larger companies managers are less likely to hold a high percentage of ownership. To boost own profits resulting from the transaction, managers owning a large percentage of shares might ask for higher premiums. This leads to higher wealth transfers of the acquiring to target shareholders, leading to higher losses (Demsetz and Lehn, 1985). Overall, strong positive associations of larger deals are presented by the current body of M&A literature.

3.1.3.2 Relative size

Besides the absolute size of a target, the relative size can be of interest as well. Relative size indicates the market capitalisation of the target in contrast to the market capitalisation of the acquirer.

Fich et al. (2018) find strongly significant results supporting the view that the relative size is more important than the absolute size of the target, but do not provide further indications why they believe so. Large differences in size are necessary to realise planned synergies according to Homberg et al. (2009). Negative relative size effects are observed by Golubov et al. (2012). Golubov et al. argue that the increased complexity of relatively large deals make the results less positive. However, Song et al. (2013) find opposing results and see a faster deal completion of relatively large targets and increased precision.

Summarising the discussions on size it can be concluded that absolute size provides positive associations as information asymmetries are lower before the transaction takes place the larger the deal. However, relative size does not indicate a clear answer what targets should be preferred. On the one hand, smaller deals are seen to be easier to be integrated. On the other hand, larger deals provide more information and financial data that are less biased. With regards to fairness opinions, larger deals are expected to yield better results as information asymmetries shall be lowered by FOs. This is only possible for the advising bank, if data is freely accessible and reliable and larger companies offer more public data. Due to the fact that fairness opinions only provide a valuation of the target, only absolute size effects will be considered in the empirical research.

3.1.4 Reputation of banks in mergers and acquisitions

3.1.4.1 Introduction to the role of banks

Most market participants agree that financial advisors play a key role for the success of a transaction, mostly summarised in the superior deal hypothesis, stating that high reputation advisors suggest deals with higher overall transaction gains (Schiereck et al., 2009). The superior deal hypothesis is derived from theory describing the relationship between high reputation and high quality (Angwin, 2001; Allen, 1984; Shapiro, 1983). In case of mergers and acquisitions, the investment banks mostly fulfil the following three core activities for their clients. Firstly, the investment bank identifies potential bidders or targets. Secondly, the banks are engaged to complete offers, seek for higher bids, defend against hostile offers, and finally negotiate the deal. Thirdly, investment banks advise on the bidding strategy, on the offer price, whether to accept or reject the offer, and evaluate the potential for competitive bids. In addition, practitioners emphasise the role of investment banks in providing liquidity and, therefore, an increase in efficiency on the market for corporate control (McLaughlin, 1990).

But as shown by Ismail (2010), just a few prestigious investment banks dominate the M&A market. Recent empirical studies provide mixed evidence for the superior deals hypothesis, but indicate that the selection of financial advisors affects the performance of the associated transaction.

Nonetheless, the reputation of investment banks cannot only be scrutinised with regards to different M&A performances, but the reputation is also determined to play an important role with regards to initial public offerings (IPOs). Hence, both areas will be considered in more detail to gain an independent understanding of the importance of reputation for FOs.

3.1.4.2 Mergers and acquisitions performance

Financial advisors in transactions do generally increase shareholder returns due to their expertise in the market, which enables them to find suitable targets and identify financial and operational synergies in form of increased economies of scale and scope (Bowers and Miller, 1990). Building on this argumentation, many researchers argue in favour of the postulated superior deal hypothesis of banks with higher reputation (Fang, 2005). The high reputation is based on the expertise gained from previous experience and knowledge by advising other deals. Golubov et al. (2012) emphasise that advisors with a high reputation are willing to put more effort in providing their services as they fear a loss of reputation and market share, if their services are of low quality. With a loss of reputation, future businesses will diminish.

Focussing on empirical results, Bowers and Miller (1990) find higher returns in M&A transactions advised by top-tier advisors due to their knowledge and experience. These higher returns are found for targets and acquirers. Concentrating on publicly traded targets, Kale et al. (2003) find that cumulative abnormal returns are lower if only the target firm chooses external M&A-advice. In contrast, shareholders benefit in form of higher CARs if either the bidder or the target firm is advised by a first-tier rather than a lower-tier investment bank. The results indicate additionally that top-tier investment banks are more likely to back out from transactions, if the risk of value-destroying deals is high. This underlines the argument that investment banks care for their reputation and a higher reputation leads to better FOs.

A positive relation of the reputation of investment banks and the return of the acquirers' shareholders is presented by Bao and Edmans (2011) and Golubov et al. (2012). Both researches argument with better skills of banks that have a higher reputation to identify synergy effects. The acquiring shareholders will benefit more than the target shareholders from these skills. Therefore, both results support the superior deal hypothesis.

Larger companies prefer larger investment banks, according to Titman and Trueman (1986). With the superior deal hypothesis in mind, both researchers are able to support the hypothesis by finding better cumulative abnormal returns for mergers with investment banks that have a higher reputation (Titman and Trueman, 1986).

Chahine and Ismail (2009) find no significant differences between top-tier and low-tier advisors and Hunter and Jagtiani (2003) even find lower returns associated with top-tier advisors due to lower synergy gains than in deals counselled by low-tier investment banks.

Top-tier investment banks are more likely to be engaged in more complex transactions, where higher premiums need to be paid, which lower the returns to the acquirer (Michel et al., 1991). Therefore, the results of Michel et al. indicate higher cumulative abnormal returns for deals advised by low-tier advisors compared to those advised by top-tier banks, which contradicts previous results. The higher complexity of deals advised by top-tier banks is supported by Servaes and Zenner (1996), who find lower returns for acquirers, if top-tier investment banks are used compared to in-house consulting. However, after controlling for factors increasing the complexity like the type of transaction, diversification and M&A experience of the acquirer, the results are not significantly different from each other anymore.

Strongly negative reputation results are presented by McLaughlin (1990) and Rau (2000). They contradict the positive results in favour of a higher reputation. They discover a strong evidence for higher premiums paid by acquirers using a first-tier investment bank (average of 58%) to those using a third-tier investment bank (38%). If higher premiums paid in a transaction are expected to be negative on wealth effects of buyer's shareholders, M&A performance is believed to be better if lower tier investment banks are used. These results are partly explainable as analysts and investments banks are not trying to be absolutely precise with their valuations, but only better than the peer group (Mikhail et al., 1999).

The results so far have focused on the US market. Studies performed on the Australian market (Da Silva Rosa et al., 2004), the European market (Schiereck et al., 2009) and the Asian-Pacific market (Chuang, 2017) have found no significant differences between top-tier and low-tier advisors, but support the arguments that top-tier banks are more likely to be used in larger deals and more complex transactions. For the Scandinavian market (Esbjörnsson and Lövstrand, 2016), top-tier advisors deliver better results in form of higher returns for shareholders. The deal completion time is higher for top-tier advised deals and, hence, Esbjörnsson and Lövstrand argument that the top-tier banks take more time to ensure value creation and precise analysis. The European results do, therefore, support the superior deal hypothesis.

One possible explanation why top-tier advisors deliver mixed results is that companies may choose their advisor according to advisors prestige and popularity as a self-protective measure, according to Ismail (2010).

Summarising the previous discussion, the arguments given for a higher precision of fairness opinions using top-tier advisors outweigh contradicting results as they are mostly moderated, if the complexity of the deal is considered as well. Especially the argument of Mikhail et al. (1999) that banks are aiming to be more precise then the peer group and the superior deal hypothesis are strongly in favour of a positive association of reputation on the precision of fairness opinions.

3.1.4.3 Initial public offering performance

Multiple similarities exist between IPOs and fairness opinions. First of all, both processes are supported by an advisor, who, secondly, creates valuation models to come to a price range for shares. These similarities make IPO research interesting to predict the importance and impact of variables on fairness opinions. The second main similarity is the under-pricing of the IPO candidate, who is willing to sell new shares (Loughran and Ritter, 2004). With regards to fairness opinions, the same undervaluation is expected to be found in the target's fairness opinions (Cain and Denis, 2012), where the target is also selling shares.

Several reasons are proposed to explain why a firm would willingly under-price its securities and limit the funds received in IPOs. Many of these reasons rely either on contractual problems between the parties involved (Baron, 1982) or on asymmetric information (Chen and Mohan, 2002; Allen and Faulhaber, 1989). A common feature in these explanations is that lower uncertainty, in other words lower information asymmetries, reduces the need for under-pricing. The presence of a prestigious bank may serve as an effective vehicle to reduce uncertainty about future cash flows of the newly traded firm (Wang and Yung, 2011) and, consequently, under-pricing. Furthermore, better long term performance (Dong et al., 2011; Carter et al., 1998), an increase in analyst coverage (Loughran and Ritter, 2004) and active information aggregation (Wang and Yung, 2011) is seen in IPOs advised by banks with a higher reputation, leading to a positive association of reputation on the precision. Therefore, the signalling theory of reputation is also applicable for IPOs.

The ability of a firm to convey quality through the selection of the advisor is similar to that of the selection of the firm's underwriter. For example, Beatty and Ritter (1986) suggest that the underwriter can, through repeated business in the IPO market, develop a reputation. Comparable to the M&A market, the desire to protect their reputation leads higher-quality underwriters to market low-risk IPOs (Carter and Manaster, 1990). High-risk IPOs have a higher under-pricing, lower quality and, hence, less precision than low-risk IPOs (Chen and Mohan, 2002). Lower quality firms are generally associated with smaller and less experienced (reputated) banks (Beatty and Welch, 1996).

The desire to uphold a high reputation level by banks can be observed by the strategies that are employed to identify IPOs where banks want to be associated with and how banks refuse those contracts they do not want to be connected to. Banks consider the acceptance of an IPO prospectus contract as one of the most important business decisions and do, consequently, screen the market carefully in advance (DuCharme et al., 2001; Titman and Trueman, 1986).

Besides the negative effects on the reputation being associated with poorly performing IPOs, banks and advisors connected to poorly performing IPOs are more likely to be subject of lawsuits by disappointed shareholders (Lin et al., 2013). Larger and more prestigious advisors are more vulnerable to these lawsuits because of their "deeper pockets", which means that severance payments are higher than for smaller banks. Additionally, more severe consequences of damaged reputations occur for prestigious auditors (Dye, 1993).

The likelihood of a lawsuit is not only a result of the IPOs' immediate performance, but also of how they perform in the long run after they begin trading. Hence, reputable auditors have an incentive to associate themselves with IPOs that are less likely to perform insufficiently in the long run. More reputable banks are better able to achieve this and they assist IPOs with a better long-run performance than less known advisors (Carter et al., 1998). Being connected to well-performing IPOs does further increase the reputation, making the decision process more important for reputable banks and advisors (Dong et al., 2011).

The theoretical considerations are also supported by empirical research. Consistent with previous results of Beatty and Welch (1996), significantly lower underpricing's for IPOs are found in IPOs that use prestigious auditors (Neupane and Thapa, 2013). The empirical significances are given for different markets as well. Results from China by Wang et al., 2003, fully support the US results presented before (Carter et al., 1998). Furthermore, evidence shows that IPOs advised by lower reputation advisors are more likely to be delisted (Beatty and Welch, 1996).

Summarising the discussion on reputation in relation to IPOs, the arguments given support the assumed association that a higher reputation of the advisor is positive for the precision of IPOs by reducing the undervaluation of the IPO candidate. The results are more consensus-driven than for the M&A performance. Hence, it can be concluded that the effects of a higher reputation on fairness opinions should be positive, leading to lower valuation ranges and higher valuation accuracy, mainly due to lower levels of asymmetric information and the superior deal hypothesis.

3.1.5 Focused versus diversified mergers in mergers and acquisitions

3.1.5.1 Introduction to the role of focused and diversified mergers

In financial research, the discussion on the usefulness of focused or diversified company transactions can be divided in M&A transactions (purchases) and divestures. Both share the same characteristics and can be used to discuss the advantages of any of the two concepts. Divestures and M&A transactions are both driven by the concepts of risk diversification and the power to dominate the market.

3.1.5.2 Mergers and acquisitions

The portfolio theory of Markowitz (1952) describes that risk diversification is generally leading to the same level of returns at a lower risk level. However, other research, e.g. Fama and Miller (1972) have shown that investors can better and for lower costs diversify risks than companies can do. Consequently, not surprisingly, the results of current research on merger success are supporting this statement. Diversification is mostly seen as less promising than focused acquisitions as the diversification should be carried out by the investor and not the company.

Mergers are defined as horizontal, vertical or conglomerate. Mergers are considered as horizontal when the two companies are in direct competition and share the same product lines and markets. They are considered as vertical when the two companies have a downstream-upstream structure in which one company buys inputs from the latter to produce the final output and, hence, one company is the customer of the other. Finally, mergers are considered as conglomerate when firms are in different markets and/or do not have business lines in common (McCarthy, 2012). Conglomerate mergers are generally considered as diversified mergers (Motta, 2009).

In practice, for most empirical studies, the type of the merger is determined by matching their SIC (standard industrial classification) digits. For instance, if the 4-digits of the two firms coincide, the merger is considered as horizontal, if the first 2-digits coincide, the merger is considered as vertical, and when none of the 4-digits coincide, the merger is said to be conglomerate (Motta, 2009). Another way to differentiate the kind of transaction is offered by SDC Platinum, where deals are grouped in eight different branches. A merger in the same branch is considered as focused, if both companies have the same branch and otherwise it is diversified.

The different types of mergers occur mostly in waves, where for a certain period of time one of the three kinds of mergers is the preferred one. The first wave covered the years from 1900 to 1920 and horizontal mergers were favorited to build monopolistic companies like Standard Oil (Lipton, 2006). The second wave in the 1920s has seen vertical mergers like Ford that acquired steel suppliers to strengthen the upstream structure. The third wave lasted from the middle 1950s to the 1970s. During the third wave many companies diversified, giving this third wave the name mergers of conglomerates (Lipton, 2006). The fourth wave in the 1980s was a period of hostile takeovers (Holmstrom and Kaplan, 2001). The fifth wave in the 1990s and first decade of the new millennium has seen a mixed kind of mergers, neither purely horizontal nor purely conglomerate. Especially deregulation and privatisations (Mitchell and Mulherin, 1996) as well as the raise of internet companies has led to large mergers in the telecommunications, entertainment, media and technology branches (Andrade et al, 2001), which lead to monopolisation and multi-national corporations (McCarthy, 2012). Mergers since the middle of 2000 are commonly seen as the sixth wave (Fich et al., 2018), still focussing on monopolisation to gain advantages by a higher market penetration.

Focused acquisitions allow the company to discover and explain synergies more easily and in a shorter period of time. The exploration of synergies allows management to create economies of scale, where redundant use of assets, resources and staff can be reduced (Lambrecht, 2004). According to Fich et al. (2018), high synergies are the main value driver in acquisitions for the acquiring shareholders. Due to the reduction in waste usage of assets and resources, cost savings leading to a higher profitability are more likely to occur in focused mergers (Pike et al., 2012; Rumelt, 1974). Additionally advantages in the knowledge transfer are observed for related mergers. Financing costs by the banks are lower as well as the critical mass and bargaining power are larger in the specific business segment than conglomerate companies of the same size can offer, where independent business units are smaller (Halkos et al., 2016). The chance to exploit value drivers delivering efficiency gains more thoroughly is higher as well (Salter and Weinhold, 1979).

Whereas nowadays horizontal and vertical, hence, focussed mergers are mostly seen as more promising with regards to the exploitation of advantages than conglomerate mergers can offer, disagreement is often raised for large mergers and takeovers by antitrust agencies, if focussed mergers are considered (Motta, 2009). As horizontal and vertical mergers increase market power by lowering the number of firms in the merging industry (Stigler, 1964), the risk of a binding veto by antitrust authorities is higher, which can increase the costs for these mergers significantly by forcing the companies to sell certain business segments as a precondition to allow the merger (Gao, 2011, p.799). Besides the mentioned advantages in market power and profitability, focussed mergers are nowadays also preferred as monitoring costs (Chen et al., 2007) are lower for managers and shareholders; a reason that connects seamless to the arguments of the PAT.

A comparison of the costs to diversify risks among companies and individual shareholders in 1972 finds not only lower costs for individual shareholders when diversifying risks, but also shorter response times. Companies need many years to adjust to rapid market changes by spin-offs or other actions, whereas shareholders can rearrange their investments within a couple of hours. Costs are also lower as no expensive investment bank is needed, whereas a spin-off is very pricey as advisory services of investments banks are needed and hefty fees are paid for the execution (Fama and Miller, 1972).

The Herfindahl-Hirschman index (also known as Herfindahl index) is a measure of the size of a firm in relation to the industry. It is used as a proxy or indicator of the amount of competition among them. The index is an economic concept widely applied in competition law and antitrust considerations. It is calculated as the sum of the squares of the market shares of the top 50 firms within a specified industry and market shares are expressed as fractions. The result is proportional to the average market share. Therefore, it can range from 0 to 1.0, moving from a huge number of very small firms to a single monopolistic producer. Increases in the Herfindahl index generally indicate a decrease in competition and an increase of market power. A company with an index of 1.0 is the only actor in a market and, hence, a monopolist, who can set prices according to its own ideas and generate the maximum achievable profit (Hirschman, 1964). Huyghebaert and Luypaert (2013) find better results for mergers that have a high Herfindahl-Hirschman index, supporting the view that focused M&A is more successful.

From a financial market perspective, related mergers are expected to yield better results as conglomerate companies are traded, on average, with a discount of 8% to 15% compared to focused companies (Berger and Ofek, 1995). In a research focussing on the banking sector better results are observed for banks specialised on one segment rather than being an all-round bank offering different business streams (Houston et al., 2001).

However, conglomerate mergers see advantages in shareholder wealth by offering coinsurance effects for debts, which lower credit costs and raise the maximum debt levels (Hann et al., 2013).

Only one research finds negative CARs for focused mergers in comparison to conglomerate acquisitions. However, the study focuses only on CARs on the announcement date of the merger, so the time period is very short (Schipper and Thompson, 1983). Any other research carried out on CARs and longer observation periods contradicts these results and are support the previously discussed outcomes. Therefore, based on M&A observations, a positive association of focussed mergers on the precision of fairness opinions can be assumed due to higher market domination power and reduced monitoring costs.

3.1.5.3 Spin-Offs and divestures

The expected wealth transfers and effects of focused mergers can also be observed for spin-offs or divestures, hence, the exact opposite to mergers and acquisitions.

The discounts conglomerate enterprises are experiencing (Berger and Ofek, 1995) on the stock markets diminish after spin-offs are carried out. Once the companies start trading at a stock market, short, medium and long-term studies find positive effects on the company values. McConnell and Ovchinnikov (2004) find firstly a reduced amount of misallocated resources and, secondly, the discount rates applied to valuation models are lower afterwards. Furthermore, investor psychology and an increase in management's efficiency create value after divestures, if the overall focus of the company has increased afterwards (Wheatley et al., 2005).

Further advantages of focus increasing spin-offs are related to asymmetric information that arises to shareholders. The level of information asymmetry is lower for focused companies and these advantages outweigh the increased trading costs for the companies, according to Huson and MacKinnon, 2003. Trading costs are higher as the old company was listed once, whereas after the divesture in form of an IPO, both companies are listed and double fees have to be paid (Huson and MacKinnon, 2003).

Additionally, companies that have undertaken focus increasing divestures and spin-offs show a better investment efficiency than diversified companies (Ahn and Denis, 2004).

All these results of spin-offs and divestures hold true for different observation periods, markets and decades (Wheatley et al., 2005). All mentioned researches have used cumulative abnormal returns to measure the performances and, hence, the results allow coming to similar conclusions than for the M&A analysis that focused companies outperform diversified companies. Focused acquisitions offer additionally a lower level of asymmetric information. Therefore, a positive association on the precision of fairness opinions for focussed transactions can be assumed.

3.1.6 Friendly versus hostile mergers in mergers and acquisitions

3.1.6.1 Introduction to the transaction type

An acquisition or takeover is defined as acquiring the control of another company, the target, by a stock purchase or exchange, and can either be friendly or hostile (Pike et al., 2012).

Whether a takeover attempt is perceived hostile depends on the communication to the target's shareholders, board of directors and employees and the understanding of the message by the recipients. If the board of directors believe that the proposed bid is in-line with the interest of the firm´s shareholders, they will open up for a further dialog of a possible takeover and create a friendly environment (Morck et al., 1988). If the bid is considered hostile, it is, however, not unusual, that hostile takeovers turn out friendly at the end, as the bidder secures endorsement for the transaction from the target's board of directors by altering the transaction details in favour of the target's management or shareholders by offering more money or other incentives (Pike et al., 2012).

An acquiring company needs to offer a purchase premium to succeed with an acquisition; this is the difference between the purchase price and the target´s pre-acquisition stock price (Haleblian et al., 2009). The size of the purchasing premium includes all potential synergy effects minus the costs for the acquisition (DePamphilis, 2010; Morck et al., 1988).

Three different ways are normally used to acquire a company, whereas the tender offer is the most common procedure and mostly welcomed as a friendly transaction, whereas the last two options are normally seen as hostile.

3.1.6.2 Tender offer

A tender offer is a public bid made directly to the firm's shareholders to purchase their shares and, consequently, capture their voting rights. The prospective acquirer thereby invites all stockholders to tender their stock at a specified price in a specified time period. To persuade the majority of the stockholders to tender their shares, the offered price usually includes a substantial premium (Gaughan, 2011). A tender offer is perceived by management either as friendly or as unfriendly. In a friendly tender offer, target's management is (usually) approached prior to the public offer to express the intentions of the bidder. The goal of the acquirer is to attain the board of directors' recommendation to the offer. It may also occur that a prospective buyer chooses to present the tender offer directly to the shareholders (Gaughan, 2011). This is referred to as an unsolicited tender offer. By circumventing management's approval, the offer is normally perceived as hostile. Unsolicited bids typically occur when a bidder has the intention to replace management. In case the bid is received unfavourably (contested), the bidder has to decide whether to continue or abort its mission. Despite the likely chance of facing takeover defences, a bidder often pursues the contested tender offer, ending up in a hostile process (Ireland et al., 2009).

3.1.6.3 Toehold

An initial step that is often taken before entering a bid procedure is the purchase of target's shares in the open market up to a specific threshold set by law. In doing so, an acquirer can establish a toehold position from which it could launch an offer. An advantage of a toehold is that the market is normally unaware of the purchase, which enables the bidder to buy shares without having to pay a premium to the market price. Toehold purchases are used as a means to lower overall costs of an acquisition (Bulow et al., 1999). In addition, having a minority interest in the target enables investors to influence the board in certain decisions (Gaughan, 2011; Choi, 1991). If a certain threshold is reached, the acquirer has the right to place favourable managers in the board of directors of the target company, which can lead to increased information about the target and lower information asymmetries (Gaughan, 2011).

A toehold position in a potential target company places the bidder in a different, favourable position. The company has a dual role as both bidder and minority target shareholder. Consequently, a toehold position has a valuable function in an auction process, for both the voting power associated with the shares owned as well as the ability to boost the price for the minority stake. Toeholds are also acquired by hedge funds and other activist shareholder to force management into a sale's process (Ireland et al., 2009).

An acquirer can anonymously buy shares until a threshold of 5% in the USA. According to SEC regulations, an acquirer that exceeds a 5% equity stake must file with the SEC explaining the reason for the purchase and its intention with the target within 10 calendar days. The target must be informed simultaneously according to Rule 13D of the Securities Exchange Act 1934 (Cornell Law School, 2018).

3.1.6.4 Proxy fight

A proxy fight, or proxy contest, is an attempt by corporate activists to persuade shareholders to use their proxy votes on contested issues and board positions. Proxy contests are political processes in which incumbent management and insurgents compete for shareholder votes. The objective of an acquirer is to get the shareholders to vote in favour of a takeover or for replacement of management, in order to obtain takeover approval (Gaughan, 2011). A proxy contest can be an effective tactic to take over a company, especially in combination with a toehold position.

Now that the different options how to gain the majority of shares in a company are introduced, the focus can be moved to the differences between friendly and hostile transactions.

3.1.6.5 Hostile deals

There are several situations in which takeover bids may turn out hostile. When an acquirer chooses to withhold from informing target management of its intentions, the unsolicited offer will very likely be considered hostile. But management may also reject a bid that imposes a threat to their position. A second reason might be that the board legitimately believes the bid is too low. And third, the board may also reject a bid because it does not support the strategic changes suggested by the bidding company. Finally, a rejection of a bid might be part of tactics to maximise shareholder value, either to boost purchase price or to create a window for competing bidders to enter (Schoenberg and Thornton, 2006). By raising the offer to a proposed price of the target, the offer might be considered friendly in the end.

A hostile bid can be done either directly through a hostile tender offer or by open market through the public stock exchange. In order for a hostile acquisition to be accepted by the target firm shareholder's, the premium is usually higher for hostile acquisitions than for friendly acquisitions (DePamphilis, 2010).

A company has several tools to defend itself from hostile raiders. These defence mechanisms are categorised as preventive, when they are installed prior to the threat, or reactive, when they are deployed after the hostile bid (Schoenberg and Thornton, 2006). If the preventive mechanisms are strong enough, the companies will not be engaged in M&A. Therefore, for the discussion of the precision of deals in M&A and with a focus on fairness opinions, only reactive actions are of interest.

These reactive, defensive tools can make a hostile takeover attempt costly or lead to a cancellation of the proposed transaction. Poison pills can be employed by the target's management to make the own company less attractive by lowering its value (Dong et al., 2006). Some of the most used takeover defence tactics or poison pills include the following (Pike et al., 2012):

- Crown jewel defence, where the company sells-off its most attractive assets. Selling the cash cow of a company and remaining with a small, sometimes loss-carrying remaining company makes the company unattractive.
- Capital structure changes, where a company restructures its capital. It involves paying shareholders a high dividend, which is primarily financed with considerable amounts of debt. After a recapitalisation, a company's financial position is dramatically different than it was before, and the company is therefore a less attractive target. The attractiveness of unused debt capabilities has been highlighted in the discussion of cash in M&A.
- White knight, where another company is sought to purchase the target. The other company might agree to leave the management in place or not to sell parts of the company. Hence, even with a lower bid, the company might be preferred by management (and shareholders). A variant of the white knight is the white squires defence. A white squire refers to a company that purchases a strategic stake to frustrate the hostile bidder, but without the intention of making a full takeover offer.
- Acquiring another company to rise the own valuation or burn excess cash and becoming, thence, too expensive for the hostile acquirer. It is comparable to the capital structure change, but more future oriented as values are acquired instead of being distributed to the shareholders.

Although offers in hostile deals are directly addressed to the target's shareholders, hostile deals are more complex (Hunter and Jagtiani, 2003), which influences the time to deal completion negatively (Walter et al., 2008). Due to the resistance of management, no direct negotiations are taking place and the resistance of the management team of the target leads to the need to offer a higher premium (Song et al., 2013). Due to the lack of direct communication between management, information asymmetries are higher and a potential risk for misevaluations. The higher premium in hostile transactions leads to higher costs for the acquirer and lower cumulative abnormal returns, hence, the precision is lower (Golubov et al., 2012). All the previous considerations lead to a negative association of hostile deals on the precision of fairness opinions, especially due to the higher levels of asymmetric information.

3.1.6.6 Friendly deals

In friendly acquisitions the details of the merger are negotiated on equal footing and as a consequence friendly transactions offer a lower risk of misevaluations by the acquirer due to an increased availability of data and background information (Loughran and Vijh, 1997). The level of asymmetric information is lower.

A company that considers acquiring another firm would prefer to negotiate privately with the target, rather than to enter a competitive auction. There are several ways a transaction process can be designed. This ranges from a one-on-one deal, with only one bidder, to a broad auction that may include over ten bidders. In an auction, there is a decreased chance for acquirers to be successful and the purchase price is likely to increase (Sarkar et al., 2007).

Mergers are defined as combining of two or more entities into one entity by a share-swap or a pooling of interests and are, per definition, generally friendly and enjoy the full support of the board of directors in both companies (Pike et al., 2012). Consequently, mergers do not share the risk profile of hostile acquisitions (Tuch and O'Sullivan, 2007).

Due to the lower level of information asymmetries as well as management's endorsement and lower premiums, friendly mergers are expected to yield a higher precision in fairness opinions than hostile deals.

3.1.7 Main findings of factors causing wealth transfers in mergers and acquisitions

Six variables are discussed in chapter 3.1. These variables have their foundation in the discussion of the functions and objectives of fairness opinions, which are presented in chapter 2. However, the variables number of fairness opinions, number of valuations, previous relation, FINRA (year) and contingency fees are not discussed as they are not deal specific variables. Only deal specific characteristics can be analysed in M&A research. These mentioned variables are fairness opinion specific variables and can, hence, only be discussed in the following sub chapter. Nonetheless, deal specific variables can be addressed again with the focus on FO research.

As the previous discussion has shown, the return of the selling shareholders is generally positive and, hence, for an overall creation of wealth in a merger, the wealth destruction on the buyer side must be as low as possible and below the gains of the target shareholders. Transferring this to fairness opinions, the overall precision of FOs is better, if the undervaluation on the target side and the overvaluation on the acquirer side are smaller.

The next sub chapter is going to discuss research with a strong link to fairness opinions. As fairness opinions are used in the context of financial markets, the introduction to general M&A success factors is helpful to understand the following arguments more easily.

3.2 CURRENT RESEARCH ON FAIRNESS OPINIONS AND HYPOTHESES FORMULATION

The upcoming subchapter discusses the current state of research in the field of fairness opinions. The aim of this dissertation, determining variables influencing the precision of fairness opinions, is nearly completely untouched by researchers so far and this lack of research is also the reason for the detailed discussion in chapter 3.1.

However, at least some comparable research is carried out on cumulative abnormal returns in M&A under the condition that fairness opinions are used. These research results will be used to come up with hypotheses for the empirical research. In order to summarise all previously discussed research results, the first paragraph of these subchapters is always used to briefly summarise the results of the M&A research and the principal-agent theory. Firstly the deal specific variables will be discussed and afterwards the fairness opinion specific variables.

3.2.1 Deal specific variables

3.2.1.1 Target or acquirer requesting the fairness opinion

The need to distinguish between target and acquirer shareholders is stated in the PAT and general discussion of FOs and M&A transactions. According to the principle-agency theory, uninsured people will only buy health protection, if their costs of obtaining medical services are above the costs for the insurance. People with lower costs for medical services will not enter into the contract as they are better off without the contract (Akerlof, 1970). This means for shareholders that they will only sell their shares if the benefits promised in the FO are larger than the benefits of keeping the shares.

The results of company valuations in IPOs suggest a general undervaluation of the company (Campbell et al., 2008; Carter and Manaster, 1990) going public in order to convince the market participants to buy the shares.

Hence, shareholders of the target will only sell shares to the acquirer, if the monetary return is larger as they would be, if they keep the shares and sell them somewhere else, e.g. stock market. However, a moral hazard for the acquirer exists as the offer cannot be too high, otherwise the own shareholders will suffer due to overpayment. This would increase the risk of shareholder litigation as court cases have shown (Smith vs. van Gorkom). Consequently, fairness opinions are profoundly impacted by these opposing ideas.

In order to convince the target shareholders to sell the shares, the fairness opinion of the target's advisor must provide an undervaluation (the fair value in the fairness opinion is lower than the offered price) in the valuation models. Doing so, the target shareholders realise that the offered price is near the maximum of a "fair" valuation and keeping the shares will not lead to higher returns. Contrary to that, the advisors of the acquirer must indicate in their fairness opinions that the target's price offered is in the lower range of a "fair" price. In order to do that, the advisors come on average to an overvaluation (the fair price in the fairness opinion is higher than the offered price) of the target, meaning that the later paid price is below the average prices that the bidder would normally have to pay, according to the FO (Cain and Denis, 2012).

Research on fairness opinions support this view by finding strong evidence that the investment banks of acquirers do normally value targets significantly above the offered price. This overvaluation is on average 20%. The authors of this study, Cain and Denis (2012), have also demonstrated that target advisor's median valuations are significantly below the offer price, which supports the allegation that targets are significantly undervalued in target advisors fairness opinions and significantly overvalued in acquirers' fairness opinions.

In the sample of Cain and Denis, the mean range is 76% of the offer price with a median range of 48% for acquirers' advisor fairness opinions and 60% for the mean and 36% for the median of all target advisors' fairness opinions. Therefore, they conclude that fairness opinions of target advisors produce more informative valuations. Hence, the level of asymmetric information is better reduced by fairness opinions of the target. These test results will be repeated by the tests on under-/overvaluation.

Hence, it is interesting to challenge the fairness opinions on the basis of its requester. If the acquirer has asked an advisor to issue a fairness opinion, it can be assumed that the valuation will justify the price and even overvalue the target. On the other hand, a fairness opinion demanded by the target will most properly undervalue the target.[10] Suggesting a price below the initial offer will help convincing shareholders to sell their shares to the acquirer.

Due to the argumentation in current theory, with regards to fairness opinions especially expressed by Cain and Denis (2012), it is necessary to account for the differences between the valuations issued by the target advisors and those issued by the advisors of the acquirers. Table 4 lists the arguments for the acquirers and targets. Target fairness opinions are more informative according to Cain and Denis (2012).

Table 4: Arguments for under- and overvaluation depending on the provider of the fairness opinion

Acquirer	Target
overvaluation is limited due to litigation risks	undervaluation is needed to convince shareholders
overvaluation is needed to convince shareholders	undervaluation is smaller than overvaluation

Source: own production

Hypothesis 1a: Fairness opinions issued by the acquirer's advisor overvalue the target whereas FOs of the target's advisor undervalue the target.

Hypothesis 1b: The valuation range in FOs of target advisors is smaller than the valuation range in FOs of the acquirer.

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[10] In this paper the term undervaluation always means that the valuation of the target is below the mean valuation of a deal with opinions from the target and acquirer. Consequently, it can also only be a theoretical undervaluation, if the acquirer also comes to an undervaluation. For the term overvaluation the definition is used vice versa.

Hypothesis 1c: The difference between target and acquirer valuations has no association to the valuation accuracy.

3.2.1.2 Cash payment in fairness opinion

The principal agent theory has elaborated on the reasons why cash deals are predicted to have a better outcome for shareholders on the buyer side. Paying with cash instead of own shares is believed to lead to higher returns on the buyer side. The literature review of M&A performance agrees generally on the fact that cash-financed acquisitions yield better results, measured by the means of better cumulative abnormal returns, but also shorter deal closing times than for stock deals (Tichy, 2001; Andrade et al., 2001; Loughran and Vijh, 1997). Additionally, cash deals make the valuation process easier and have a positive signalling effect. Most importantly, the level of asymmetric information is lower for cash deals than for stock deals.

With regards to fairness opinions the risk of asymmetric information between any of the parties involved and costs of monitoring the agent are increased for share-exchange offers (Servaes and Zenner, 1996). The comparably ease in the valuation process for cash financed deals can be explained by the highly specified knowledge that is needed to value securities and stocks accordingly. If a deal is financed with newly issued shares, the financial expert crafting the fairness opinion needs further knowledge and experience in the issuance of new shares and how this affects the market capitalisation. Consequently an increase in risk is expected, which has to be reflected in the fairness opinion, leading to a lower precision (Servaes and Zenner, 1996).

Another argument for a less clear outcome for share financed deals is proposed by Kisgen et al. (2009) as a payment with shares carries the risks of stock market fluctuations. Compared to cash deals, the share prices of stock financed deals can fluctuate during the merger process on both sides – the target and acquirer side - compared to a stable cash offer. Nonetheless, although share prices can fluctuate, an inclusion of a change in a relevant stock index as the S&P 500 is not compulsory as it is the standard and obligatory procedure for research on CARs (e.g. Kisgen et al., 2009; Servaes and Zenner, 1996). The fairness opinions and deal price are not altered due to stock market changes. The valuation in the fairness opinion is derived without relations to the stock market and only based on the valuation models (Zimmermann, 2015). Additionally, as chapter 2.1.2 has elaborated, FOs are written and made public briefly before the public announcement is made. Hence, the market cannot fluctuate heavily in this short period of time compared to CAR research, where the time period observed is often 30 days or more long. Nonetheless, the pricing function of fairness opinions is not fully supported for share-exchange offers. These arguments are supported by Mihanovic (2005).

Setting all the findings in relation to FOs the results of higher premiums in stock financed deals indicate a higher underlying risk in stock financed deals compared to cash financed deals (McLaughlin, 1990). The legal risk of mitigation is increased due to the lowered power of the pricing function of fairness opinions and the risk of higher levels of asymmetric information for share-financed transactions (Kisgen et al., 2009). Consequently, increased legal risks for stock deals are added to the existing arguments from the general M&A discussion as an argument for a higher precision of cash financed deals. Fairness opinion providers are expected to incorporate a risk premium of e.g. 15% to a valuation range to compensate the higher risk. In turn, the valuation range will increase further and, hence, lower the precision of fairness opinions.

To summarise the theoretical outline on cash, the current body of literature is in favour of a higher precision for cash deals, a view which is support by the limited amount of research on cumulative abnormal returns with regards to fairness opinions due to signalling effects of cash, a better pricing function and fairness opinions less concerned with asymmetric information.

Table 5 summarises all arguments.

Table 5: Benefits of cash and disadvantages of stock payment

Advantages of cash	Disadvantages of stock
cash has a positive signalling effect	higher undervaluing risk
faster deal closing	specialised knowledge needed
Lower information asymmetries	increased legal risks

Source: own production

Hypothesis 2: A higher fraction of cash increases the precision of fairness opinions.

3.2.1.3 *Size of target in fairness opinion*

The general indecisiveness in relation to the influence of size on M&A transactions, especially expressed by Servaes and Zenner (1996), is shared by one of the researches that are carried out with regards to fairness opinions. Focussing on cumulative abnormal returns for deals obtaining fairness opinions, Kisgen et al. (2009) do also not come to clear results. The size of a target in terms of its market capitalisation has a direct negative influence on the complexity of the company valuation process and, henceforth, on the uncertainty felt by advisors. This uncertainty is expected to be reflected in a larger range of possible firm values and, hence, a lower precision. However, this uncertainty might be absorbed by experienced M&A managers in the own company or simply by more costly and assumingly better deal advisors (Kisgen et al., 2009).

A target selling its entire firm and not only a minority position is a relative large deal and the duty of care by the target's management board accordingly high. The potential risk of litigation by the target's shareholders is likewise high. Thence, target's management wants to promote a fair deal by asking for a fairness opinion. The increased risk for the provider of the fairness opinion and the target's management board for litigation might result in a higher valuation range in the fairness opinion to lower these risks (Kisgen et al., 2009). But despite the increased importance of big deals, larger acquirers might have internal resources to value a target and better appraisal figures, which can support the fairness opinion provider with helpful information and limit the valuation range stated in the fairness opinion. The last argument shows a strong correlation to the arguments given in the discussion on size in M&A activities in general. However, the just presented results are only theoretically discussed and do not provide any statistical evidence to support these assumptions (Kisgen et al., 2009).

German data for the use of fairness opinions in mergers and acquisition has shown that larger transaction, which are defined as transactions with more than 1 billion Euro share capital valuation, make use of fairness opinions in 87.5% of all deals compared to only 40% for smaller deals. However, the quintessence of this research is limited in its significance due to the small sample size of only 22 mergers and the period, which is limited to 2007 (Aders et al., 2012). Nonetheless, the increased usage of fairness opinions for larger deals should, assuming a general usefulness of fairness opinions, which is accepted in this dissertation, lead to an increased precision of larger deals. Especially the discussion of the functions of fairness opinions provides a positive association of size.

Table 6 summarises the pro and cons of the discussion.

Table 6: Pros and Cons of size

Pro	Con
more experience with M&A	increased complexity
more internal resources	increased uncertainty
increased use of FO	risk of litigation

Source: own production

Hypothesis 3: Larger deals lead to a higher precision of fairness opinions than smaller deals.

3.2.1.4 Reputation of investment bank providing the fairness opinion

The expected association of reputation based on the principal agent theory and M&A research provides a clear picture. A higher reputation is positively associated with lower asymmetric information levels, a better deal selection and more thorough analysis by the bank. Thence, reputation is seen to be highly relevant for the precision of fairness opinions.

First theoretical researches of reputation and fairness opinions attach a negative association to the reputation as the reputation is proclaimed to be used by corporate directors only to help persuading shareholders to approve transactions. The stringent focus of Bebchuk and Kahan (1989) on law issues might explain their scepticism. The questions raised by the legal community existing of Bebchuk and Kahan (1989), Cooke (1996) as well as Rau (2000) is whether investment banks should draft an imprecise FO to complete a transaction, earn significant premiums for that and foster its own market share and, thus, the position as a top-tier investment bank? Or is the risk of losing this top-tier image by drafting a friendly, and imprecise, FO of higher importance for the FO provider (Rau, 2000)? The theoretical discussion has either led to a negative association or a neutral association as the deal completion hypothesis might be the main driver of the investment banks.

However, more recent empirical results provide a completely different mind-set towards reputation and fairness opinions. They contradict and negate previous results of the legal community.

The current body of literature agrees that the thread of losing reputation will prevent top-tier investment banks from issuing low quality fairness opinions, which implies that the precision is higher for fairness opinions of top-tier investment banks. Therefore, a quality sign is attached to fairness opinions and the underlying deal by a higher reputation, which is in favour of the superior deal hypothesis (von Dryander, 2001).

The long-term damage from ill-advised and biased fairness opinions is seen by Kisgen et al. (2009) to be more severe than possible financial gains from advising and finishing off a bad transaction. Kisgen et al. (2009) are able to demonstrate this with empirical tests.

Robust results in another sample of mergers dating between 1994 and 2003 indicate that top-tier advisors and, therefore, top-tier investment banks only certify deals by issuing fairness opinions if the deal is fair. This even holds true after controlling for contingent fees, meaning that possible fees do not influence the banks, but the threat of losing reputation does (Bao and Edmans, 2011).

Even directly considering the valuation ranges of fairness opinions, empirical, univariate tests support the superior deal hypothesis. Evidence is given that the valuations of top-tier investment banks are of a better quality, if the focus is put on the absolute valuation errors. Hiring a top-tier investment bank[11] has been proven to produce "significantly lower absolute estimation errors" (Cain and Denis, 2012) and decrease deal premia (Kisgen et al., 2009), if the buyer acquires their services. Whereas lower deal premia are not necessarily leading to a higher valuation precision, lower absolute estimation errors help to improve the precision of fairness opinions.

Therefore, it is concluded that advisor rankings play a role in the precision of fairness opinions (Cain and Denis, 2013), where a more positive association is expected. Advisor rankings, so called league tables, will also be used in the later analysis to put the advisor's name in meaningful and number based ranking. Otherwise statistical analysis would not be possible.

To round the discussion off a statement of Kisgen et al. shall be quoted. "Firms use more reputable advisors because they are interested in improving the quality of the FOs, while lower-quality advisors are more willing to provide biased, or at least less informative, opinions. Further, despite conflicts of interest, higher-quality advisors might be more likely to provide high-quality FOs because reputation concerns can overcome conflicts of interest, whereas a low-quality advisor could issue a biased opinion to generate fees even if it is unaffiliated" (Kisgen et al., 2009, p.185). However, a test with significant hypotheses is still not carried out. This quotation reveals that higher-quality advisors do also help to lower asymmetric information levels as they produce more informative fairness opinions.

Nonetheless, the discussion indicates that a higher reputation is generally seen to lead to a higher precision of fairness opinions, especially expressed by the superior deal hypothesis (Angwin, 2001; Shapiro, 1983) and clear results on IPOs (Neupane and Thapa, 2013). The negative considerations against reputation are

[11] Top-Tier investments banks are normally described as the leading five investment banks in M&A advices during the last year in relation to the deal size. League tables are issued on a regular basis on SDC Platinum. The top five banks in the last league table are considered as top-tier investment banks.

only theoretically discussed and have not been observed in any of the more recent research so far.

Table 7 summarises all arguments.

Table 7: Pros and Cons of reputation

Pro	Con
superior deal hypothesis signalling function lower estimation errors fear of loss of reputation only fair deals are certified better skills	reputation used to persuade shareholders

Source: own production

Hypothesis 4: A higher reputation of the investment bank leads to an improved precision of fairness opinions.

3.2.1.5 Focused versus diversified mergers in fairness opinions

The results from the merger and acquisition analysis always recommend measuring M&A performance under the premise to include a factor for the industry relatedness as the results on related (horizontal or vertical merger) or diversified mergers differ.

The research on related or diversified mergers on fairness opinions is nearly blank as only one source can be found. Servaes and Zenner (1996) summarise in their research that the problem of asymmetric information is less likely for related mergers. The information level of the acquirer is higher as the acquirer has in-depth knowledge of the business segments itself and the applicable discount factors therein. For other industries, this knowledge does not exist in the same extent. Hence, controlling the investment bank or providing relevant and accurate information is easier for mergers within the same industry (Servaes and Zenner, 1996).

Nonetheless, the benefits of obtaining a fairness opinion are higher for transactions outside the own industry as more information gains can be achieved. However, this drawback is only limited to the increased benefits from FOs, but has no link to the precision of fairness opinions as the prior and after fairness opinion creation information levels are still better for related mergers (Servaes and Zenner, 1996).

Coming from the recommendation from classical M&A research to include a factor for related mergers, the analysis of current research on the expected association allows the conclusion that financial advisors will find it easier to value a target when both parties are active in the same industry. Therefore, fairness opinions created for related mergers are expected to have a higher precision than fairness opinions of non-related mergers. The level of asymmetric information is lower between management and target as well as management and investment bank, if related mergers are preferred. Monitoring powers of the principal towards the agent are increased as well.

Table 8 summarises the pros and cons of related and diversified mergers

Table 8: Pros and cons of related and diversified mergers

	Pro	Con
Related	costs to diversify are lower for shareholders knowledge transfer is easier synergies are easier to be achieved	
Diversified	gains from FOs are larger	higher discount rates information asymmetries larger

Source: own production

Hypothesis 5: Related mergers lead to a higher precision of fairness opinions, diversified transactions lower the precision.

3.2.1.6 *Friendly versus hostile deals in fairness opinions*

The main argument given in the discussion of friendly mergers in M&A is that friendly offers are welcomed and accepted by the management team (Kroll et al. 2008), whereas hostile bids lead to a decline of the initial offer. Several scenarios are feasible after this. The bidder might raise the initial offer to convince the target's shareholders and management team to accept the offer. The second out of many alternatives can be a company, acting as a "white knight", presented by the target's management team that will offer the same or a higher price than the hostile bidder in order to offer an alternative to the shareholders. M&A research has, however, clearly shown that friendly deals are preferable in order to lower premiums as the level of asymmetric information is reduced.

Hostile transactions can end in a spectacular battle and research by Cain and Denis (2012) has shown that fairness opinions are not frequently updated[12]. Therefore, fairness opinions do not always consider the best available alternative anymore and become obsolete. Taking these outdated fairness opinions into consideration, it is obvious that the credibility and precision of these fairness opinions is of limited value. The pricing function of fairness opinions is not fully supported in hostile transactions.

Additionally, in a friendly merger or takeover, the later paid price is often negotiated in internal discussions of both, acquirers and targets, management teams. The price range in a fairness opinion can consequently be set smaller, whereas the price for hostile takeovers is, firstly, not agreed on before and, secondly, derived from market forces. The fairness opinion should, hence, be less precise in hostile takeovers (Kisgen et al., 2009). Again, these allegations are linked to the pricing function of fairness opinions.

Fairness opinions requested in a friendly transaction indicate whether a prudent board can accept the offer by delivering valuation estimates that are based on available financial data and management projections. In a hostile deal fairness

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[12] The data set used in this dissertation has seen many, frequently updated fairness opinions. However, it is not stated whether the valuation models are updated or other, less relevant information, e.g. spelling mistakes.

opinions are often limited in the provided information content due to data availability problems as management projections are not obtainable. Therefore, provided information can be limited to recommendations by the bank whether a better price might be achievable with another partner or an improved offer (Bebchuk and Kahan, 1989), instead of providing a valuation range.

In line with that, the valuation process is more complicated in a hostile tender offer from the point of view of an acquirer-side advisor. Since targets will not share internal information, financial advisors are left with a greater degree of uncertainty. Valuing a hostile tender offer in a FO is generally considered to be more difficult (Hunter and Jagtiani, 2003).

Consequently, fairness opinions issued in a hostile takeover attempt offer a larger valuation range and lower precision due to a higher level of asymmetric information.

Timing issues due to the need to react fast after a first bid by a competitor in a merger battle is made and, thereby, increasing the pressure on the fairness opinion provider can also lower the precision of the fairness opinion (Servaes and Zenner, 1996).

These difficulties in finding appropriate financial data in connection with time pressure are highlighted by higher premiums that are paid in hostile deals (McLaughlin, 1990). The premium is accordingly lower in friendly deals. This should also imply that a fairness opinion is less precise in hostile deals.

In line with these arguments, Bebchuk and Kahan (1989) use the problem of existing conflicts of interests. In a prearranged merger, investment banks might conclude a deal to be fair and change valuations accordingly to come to a medium price in line with the offer. On the other hand, investment banks might conclude a proposed take-over deal being unfair by artificially increasing the valuation for the target, if managers want to employ defensive moves and have communicated this to the bank. The later argument leads to a violation of the pricing function of fairness opinions. Nonetheless, both arguments are in favour of a higher precision for friendly deals.

The signalling function and superior deal hypothesis are the last arguments for a higher precision of friendly mergers. First-tier investment banks are less likely to be involved in hostile mergers and acquisitions (Servaes and Zenner, 1996). As first-tier investment banks are supposed to deliver better results, according to the previous discussion of reputation and accepting the superior deal hypothesis (Kisgen et al, 2009), this would imply that hostile bids will lead to less precise fairness opinions.

Summarising current research results it can be expected that friendly mergers lead to a higher precision of fairness opinions. Table 9 summarises all arguments given in this chapter.

Table 9: Pros of friendly deals and cons of hostile deals

Pros of friendly deals	Cons of hostile deals
banks with higher reputation avoid hostile mergers	FOs for hostile deals are created by advisors with a lower reputation
management cooperation	FOs are faster outdated
less asymmetric information	higher fees for FOs
less difficult to value	data availability is limited

Source: own production

Hypothesis 6: Friendly deals increase the precision of fairness opinions.

3.2.2 Fairness opinion specific variables

3.2.2.1 Number of fairness opinions for one party

In the classical principal-agent dilemma, the example of an insurer is often cited. The insurer cannot observe the level of care taken by the person being insured (Pauly, 1968). To solve this problem a risk-sharing contract is usually accepted. Either penalties or incentives should result in a risk-sharing with the insurance taker (Grossman and Hart, 1983). Another solution is the sale of (parts of) the risk to a reinsurance company. Though risk sharing between the management board and the investment bank issuing the fairness opinion is not industry standard and the sale of risks arising from M&A to a reinsurance company not possible, the risk can be spread in a different way. Multiple fairness opinions can be requested to spread the risk of one extremely wrong evaluation on more shoulders. Hence, more opinions should lead to a higher precision.

This approach is in line with the results of the principal-agent discussion. Managers of the target as well as the acquirer should, consequently, consider more than only one source for obtaining fairness opinions. The results are expected to moderate the risk and lead to a better precision, if more fairness opinions are acquired.

The advantages of at least two fairness opinions are theoretically discussed by Kisgen et al. (2009), where the second fairness opinion has the role to act as an objectivity test for the first opinion. Various banks have additionally introduced frameworks requiring at least a second opinion for certain, high risk transactions (Schönefelder, 2007). Both arguments provide a strong positive association for the number of fairness opinions and research on fairness opinions with a focus on deal premiums as well as cumulative abnormal returns confirms this view.

First of all, the pricing function of fairness opinions is stronger for deals with multiple advisors. The incentives to hide critical information and to influence the outcome of the valuation process in the desired direction, either by management or the investment bank, may be easy to accomplish when any investment bank is the sole advisor to either the target or acquirer. Justifying input changes in a multiple advisor structure on one side of the deal becomes more difficult since forecasts and estimates will be, at least partly, consensus driven or based on joint collaboration (Kolasinski and Kothari, 2008). Thus, one will expect more precise investment valuations if there is more than one advisor to the target or acquirer.

Secondly, the superior deal hypothesis is stronger for multiple advisors. The use of multiple advisors does not affect the likelihood of deal completion (Kisgen et al., 2009), but leads to lower premia paid (Shaked and Kempainen, 2009). Research of Shaked and Kempainen (2009) analyses cumulative abnormal returns for M&A transactions supported by at least one FO and finds out that deals where acquirers obtained more than one fairness opinion have lower deal premiums. In another study, the highest premium of acquirers in mergers and acquisitions is paid in deals where no fairness opinion is obtained (46.52%), whereas the premium is the smallest where multiple FOs have been acquired (28.11%). In the same vein, targets receive the lowest premium, if at least two FOs are obtained (37.3%). However, the highest premium is paid if exactly one FO is consumed in the deal (44.06%) (Kisgen et al., 2009). Hence, the results are not consistent for targets and acquirers or the overall sample. This underlines the need to distinguish the data sets in this dissertation into different data sets for all deals and those of targets and acquirers.

Thirdly, more fairness opinions reduce the level of uncertainty and asymmetric information. Every fairness opinion sheds some light on the transaction and has a certain, yet unknown, value to the shareholders (Kroll et al., 2008). Consequently, many fairness opinions increase the knowledge about the valuation object more than one FO does. By doing so, FOs lower the risks and should, as a consequence, reduce the uncertainty in a deal and increase in turn the precision of fairness opinions.

Fourthly, monitoring of the agent becomes easier for the principal as multiple advisors decrease the risk of affiliated advisors resulting from conflicts of interests and increase the likelihood of independent advisors being involved in the deal. Furthermore, the advisory groups will be less likely to give a not backed up fairness opinion if they know that their results will be compared to each other (Kolasinski and Kothari, 2008). The discussion how to improve the quality of fairness opinions has named the advantages of obtaining more than one fairness opinion. The risks of a potential bias from previous relations between the principal and the agent are lowered.

Hence, multiple fairness opinions can control risks and mitigate the effects of some variables like reputation and, especially, previous relation. The chance for biased or incorrect fairness opinions is as well smaller as advisors drafting fairness opinions would have to produce the same or at least similarly biased opinions (Kisgen et al., 2009). Even Bebchuk and Kahan, who share a critical mind-set towards FOs, agree in 1989, that managers looking for unbiased fairness opinions should hire a second investment bank to write an opinion. They consent that this will lower conflicts of interest and eliminate the problem of contingency fees.

In contrast to the previous arguments, Kisgen et al. (2009) found out that more FOs are obtained in hostile takeovers and the prefix of precision is negative for hostile takeovers. This highlights the need for further research and clear results. Nonetheless it can be postulated that multiple fairness opinions in one deal, either on the target or acquirer side or on both sides, should reduce the uncertainty in fairness opinions. Table 10 summarises all arguments.

Table 10: Pros and Cons of multiple fairness opinions

Pro	Con
pricing function is stronger	
monitoring of agent easier	
asymmetric information are better reduced	
spread of risks among banks	often used in hostile deals
hiding of critical information more difficult	
valuation models altering more difficult	

Source: own production

Hypothesis 7: Multiple fairness opinions increase the precision of FOs.

3.2.2.2 *Number of valuations within one fairness opinion*

Adopting the arguments from the principal-agent problem with regards to the number of fairness opinions, the moral hazard problem does also exist for the number of valuations. Shaked and Kempainen (2009) have theoretically addressed the issue that if the investment bank is unable to come to any valuation, the moral hazard to please the principle may call the need to provide at least one fitted valuation. By doing so the chances of delivering one extremely wrong valuation are large and the pricing function of fairness opinions is violated. Additionally, the argumentation used for spreading risks leads automatically to the assumption that multiple valuations allow spreading the risk of one extremely wrong evaluation on other valuations. This will mitigate the impact of a possible wrong valuation.

The current body of literature on deal premiums and cumulative abnormal returns in mergers with fairness opinions in contrast to M&A transactions without a fairness opinion agrees with the conclusion that multiple valuations are beneficiary for the precision of fairness opinions.

With regards to the pricing function of fairness opinions, it is according to Shaked and Kempainen (2009) a bad sign for the precision of FOs, if only one valuation method is used. The Delaware Court has already suggested that "it is preferable to take a more robust approach involving multiple techniques—such as a DCF analysis, a comparable transactions analysis … and a comparable companies analysis…, to triangulate a value range, as all three methodologies individually have their own limitations" (Matthews, 2012, p.72). Hence, the use of only one valuation method implies that any other valuation method is not able to deliver a plausible calculation and most likely the used valuation method is adapted to deliver results. The pricing function is, hence, not fulfilled.

In the same vein, Mihanovic (2005) criticises the arbitrariness of the valuation models used in fairness opinions and recommends to use as many valuation models as possible to improve the quality of fairness opinions. Due to that, precision should be lower in fairness opinions with only one valuation method than in FOs with multiple valuation methods.

Especially fast growing companies and companies facing bankruptcy yield imprecise valuations under the DCF valuation method, but transaction multiple or earnings multiple valuations are more precise in these situations and will mitigate the inaccurate valuation obtained from the DCF valuation. Therefore, in line with the Delaware court decision, more valuations lower the risk of one extremely inaccurate valuation due to the valuation methods' unique advantages and disadvantages (Schönefelder, 2007). Therefore, monitoring and judging the precision of a fairness opinion is easier, if more methods are applied. Additionally, more information are made public (Ratner et al., 2010), which helps to lower the level of asymmetric information.

Based on the results of the previous discussion it is expected that more valuation methods in one fairness opinion will lead to a lower valuation range and higher valuation accuracy. The reasons for that are that if only one valuation method is used, the advisor has faced severe difficulties to draw up any valuation and might have only delivered a valuation to fulfil the assignment due to moral hazard. In the own interest, fairness opinion providers should deliver as many valuations as possible to moderate the risks of wrong valuation methods over more precise valuation methods. More valuations show easier access to data or management information and will lead to a more precise valuation.

Table 11: Pros and Cons of multiple valuation models

Pro	Con
pricing function is stronger risk sharing signalling function less asymmetric information wrong valuation models are moderated	---

Source: own production

Hypothesis 8: More valuation models in one fairness opinion lead to a higher precision of the FO.

3.2.2.3 *Previous relation between principal and advisor*

The criticism towards fairness opinions names the advantages and disadvantages of a previous relation between the target or acquirer and the consulting investment bank. Whereas a previous relation helps to easier understand the company to be valued and the market it is acting within, disadvantages are seen in potentially friendly valuations as people know each other.

The discussion of the principal-agent theory names the lower risk of selecting a highly reputable, but lowly qualified advisor as the biggest advantage if a previous relation is accepted.

Due to different levels of asymmetric information the monitoring costs for external advisors are seen to be higher in fairness opinions as an increased need for interaction with management is given. If an advisor with no previous relation is selected, the advisor is less familiar with the valuation object. Consequently, the familiarity of related advisors, who know the company well and have a reduced need for interaction with management, which might potentially influence the independency of the advisor or data integrity, outweigh the latent conflict of interest (Hartmann-Wendels et al., 2015). Furthermore, the typical job of advisors is the ongoing valuation process of businesses or at least parts of the business, implying that tied advisors will have access to more precise multiplies or discount rates and, consequently, better valuations (Kisgen et al., 2009). Related advisors have the advantage that the level of asymmetric information is smaller than for unrelated advisors.

The superior deal hypothesis is supported by a second study on the influence of a previous relation on fairness opinions, where the accuracy of fairness opinions is analysed based on a data set of mergers between 1998 and 2005. This research concludes that relationship-based information appears to play a role in the precision of fairness opinions (Cain and Denis, 2012). Advisors on both sides, targets as well as advisors, produce significantly lower absolute valuation errors, if previous business relationships have been established. The results are limited for two reasons. First of all, the tests are performed on CARs after the deal is completed and not on the precision of fairness opinions. Secondly, statistic results are only based on univariate tests. However, these lower absolute valuation errors lead to a stronger pricing function of fairness opinions with a previous relation.

Nonetheless, the study discovers only little evidence that fairness opinions might be driven by conflicts of interest. Instead, the researchers demonstrate that unaffiliated third-party investment banks do not provide more accurate valuations than affiliated investors Cain and Denis (2012).

Even the two combatants of fairness opinions, Bebchuk and Kahan (1989), do generally come to comparable results to the presented view of Kisgen et al. (2009) and Cain and Denis (2012). They suppose independent advisors are chosen to add persuasive support for management's position, but not with the aim to add any value in the transaction process. However, they also assume that established advisors will craft a fairness opinion in the right light of management to retain the client and due to psychological loyalty to managers. However, both propositions are not proven by any empirical test.

Summarising the results of the current state of research a previous relation between the company and the investment bank helps to understand the business faster and more thoroughly and allows to come up with better valuations. Hence, previous relation will increase the precision.

Table 12: Pro and cons of previous relation

Pro	Con
more knowledge of company	more management interaction
ongoing valuation experience	conflicts of interest
lower absolute valuation errors	FO to pleasure management
lower level of asymmetric information	

Source: own production

Hypothesis 9: A previous relation between the principal and the agent increases the valuation precision of fairness opinions

3.2.2.4 *Year of fairness opinion*

The introduction of FINRA rule 2290 in 2007 is seen as a possible major milestone in increasing the implied value of fairness opinions and, hence, increasing the precision.

Courts have largely ignored the need for FOs in mergers and acquisitions before mid-1985, when the Delaware Supreme Court found the managers of Trans Union Corporation guilty of not making a sufficiently informed decision (Davidoff, 2006). Albeit the court laid out that they "do not imply that an outside valuation study is essential to support an informed business judgment" and that they do not "state that fairness opinions by independent investment bankers are required as matter of law" (Smith vs. van Gorkom, 488 A.2d. at 873), an small, though statistically insignificant increase in FO acquisition frequency has been proven in the following years (Bowers, 2002). In the following, several lawsuits have been filed against fairness opinion advisors for issuing unreasonable recommendations (e.g. City Partnership Co. vs. Lehman Bros. Inc., and Rosser vs. New Valley Corp.). However, courts have failed to hold advisors liable at least partly because "it is problematic enough to decide between even two conflicting appraisals" (Pinson v. Campbell-Taggart, Inc. (C.A. No. 7499, 1989 Del. Ch. LEXIS 50, 24–25, Del. [November 8, 1989]).

The new regulations introduced with the adoption of FINRA rule 2290 require further annotations in the fairness opinions. Since the rule became effective, fairness opinion providers are, for example, obligated to indicate any previous relation, possible contingency fees paid and the qualifications of the people involved. Especially the referencing of a previous relation, as discussed before, might significantly increase the quality of a fairness opinion.

However, due to the publication years of the papers dealing with fairness opinions available in the current body of literature, many of them do not have the possibility to check for an increase in the usefulness or precision of fairness opinions after the new regulations became effective. Others, more recent research, did not address this topic. Hence, no paper can be quoted here. Nonetheless, it is expected that the changes are beneficial for the precision of fairness opinions.

Hypothesis 10: Fairness opinions issued after legislation change at the end of 2007 are more precise than FOs issued before.

3.2.2.5 Contingency fees in fairness opinions

Contingency fees are one of the most common contractual forms of advisor compensation. Generally the advisor receives only a comparably small fee for the provision of a FO and the bulk of the compensation depending on deal completion (Giuffra, 1986) either as a percentage of the complete transaction value, as a predefined dollar amount, or as a sliding scale (Calomiris and Hitscherich, 2007). The problems linked to contingency fees are already briefly mentioned in the discussion of the conflicts of interest raised by the agent and are a heavily debated topic with respect to fairness opinions.

Kisgen at el. (2009) describe contingency fees as the appetiser to complete the deal as the premium for obtaining an FO is relatively small compared to the overall fees paid for deal completion. The incentives for investment banks are on average around 1% of the total deal value (Servaes and Zenner, 1996) or according to data from Mergers and Acquisitions reports, the contingency fees paid from 1985 to 1994 totalled on average 0.85% of the total dollar value (Servaes and Zenner, 1996).

However, first-tier banks earn on average 55% of their fees as contingent fees, whereas third-tier banks only earn 32% on average. In tender offers the percentage charge goes up to 73% for first-tier banks (Rau, 2000). Rau explains the higher fees by a better quality, supporting the superior deal hypothesis, of the advisor as well as with a higher percentage of completed deals. The number of completed deals is positively and significantly aligned with the market share in subsequent years. Therefore, his final argument states that the contingency fees have no impact on the quality of deals and, hence, fairness opinions.

In fact, there is mixed evidence on the influence of contingency fees on precision. Some researchers found evidence of proper alignment of incentives (Hunter and Walker, 1990) and faster deal completion (Hunter and Jagtiani, 2003), which might free managerial time for core activities and reduce the time spent on monitoring the agent. An alignment of incentives increases the chances of a positive working environment and better access to data for the fairness opinion provider. Faster deal completion lowers the risks of M&A battles and, as previously discussed, increases the likelihood of a better precision.

While directors of the acquirer or target might favour this kind of compensation because they believe that it might align their interests and those of the investment bankers, the same setup has been widely criticised, especially by researchers of law, as being contra productive since deal execution becomes the primary objective instead of giving a prudent and truly independent advice (Bebchuk and Kahan, 1989). Given that the financial advisor receives the bulk of the compensation if the deal is closed, a strong incentive will be there to render the fairness opinion in a way that maximizes two crucial aspects.

Firstly, the advisor is interested in increasing the likelihood of deal consummation, and ultimately the odds of receiving the larger chunk of fees. If the advisor thinks that there is a realistic chance that the proposed bid will be rejected, it will be logical to increase the range of financially fair values in order to create room for an upward price correction without losing a direct justification (Bebchuk and Kahan, 1989).

Secondly, leaving only room for an upward revision might have a signalling effect to the market that the advisor might consider the current bid to be at the lower bound. Even though a fairness opinion does not represent an investment advice, target-side shareholders might be lured in thinking that a higher price is obtainable, which will lead to a rejection of the first bid (Bebchuk and Kahan, 1989). Both arguments have a negative impact on the precision of FOs.

McLaughlin (1990) demonstrates a link between some features of investment banking's contracts and its customers. In 95% of all deals in her sample, contingency fees increased if the acquisition was successful. Therefore, she concludes, that investment banks might have an incentive to suggest higher premiums and valuation ranges in order to close the deal.

More recent research (Cain and Denis, 2012; Calomiris and Hitscherich, 2007; Rau, 2000) contradicts the results of McLaughlin. In the most recent research of fairness opinions and its accuracy, the authors are able to provide a data set that has not shown any evidence that fairness opinions are less accurate when contingency fees are paid. They mention their rejection of previous research results explicitly (Cain and Denis, 2012). They support the research results of Rau (2000) and Calomiris and Hitscherich (2007), who did also find no relation between the advisor's fee structure and the precision of their fairness opinions (Cain and Denis, 2012).

Table 13 summarises all given arguments on pros and cons. Judging from the function of contingency fees to align the interests of management and the advisor, neither the level of asymmetric information nor the pricing function of fairness opinions should be affected. Due to that and the most recent research results, where contingency fees do not significantly influence the precision of fairness opinions, no influence of contingency fees on fairness opinions is assumed.

Table 13: Pros and Cons of contingency fees

Pro	Con
alignments of goals	deal execution in focus
faster deal completion	

Source: own production

Hypothesis 11: Contingency fees do not influence the precision of fairness opinions.

3.3 VALUATION MODELS IN FAIRNESS OPINIONS

The advantages and disadvantages of the most used valuation models in fairness opinions should be discussed as an analysis on the precision of these models is expected to deliver further, significant results.

3.3.1 Valuation models and their frequency of usage

Previous discussion of approaches how to improve the quality of fairness opinions has shown that the valuation models are often criticised for their arbitrariness (Mihanovic, 2005). Furthermore, Ratner et al. (2010) criticise the advantages and disadvantages of the valuation models with regards to their unique strength and weaknesses. Valuation models can be classified into three different groups, according to Schönefelder (2007). These groups are fundamental valuation models (DCF, residual income, dividend discount model), comparison models (earnings multiples and transaction multiples) and individual valuation models.

Not all valuation models are used with the same frequency. Schönefelder (2007) has seen the following usage rates for valuation models in his data set, which focuses on US mergers. The numbers are comparable to other research in Germany (Aders et al., 2011). The numbers show that DCF valuations are used in nearly every fairness opinion and are, hence, the leading valuation model. Earnings multiple valuations are used in 75.1% of all fairness opinions followed by transaction multiple valuations with 56.6%. Sum-of-the-parts analysis is the fourth most used valuation model with 22.4%, any other valuation model is used in 80.5% of fairness opinions.

Table 14: Usage rate of valuation models in fairness opinions

Usage rate of valuation models			
Valuation model	**Buyer**	**Target**	**Total**
DCF	84.6%	94.4%	93.2%
Earnings Multiple	69.2%	76.0%	75.1%
Transaction Multiple	7.7%	63.7%	56.6%
Sum-of-the-parts	42.3%	19.6%	22.4%
Other	57.7%	83.8%	80.5%
Observations	26	179	205

Source: own production, based on numbers of Schönefelder (2007)

Due to the leading role of the three most used valuation models, the focus will now be put deliberately on these models and the other valuation models will not be discussed. The discussion focuses on the essential methodological foundations and the advantages and disadvantages of the valuation models.

3.3.2 Discounted Cash Flow valuation

In the DCF valuation model, the company valuation is derived from the sum of all discounted future free cash flows (FCF) that are available for distribution. The FCF available for distribution can either be calculated from the FCF minus borrowing costs (net method) or before the deduction of borrowing costs (gross method). The FCF is forecasted over a detailed planning period, called forecasting horizon, often three years, and afterwards a residual value is calculated (Damodaran, 2012b). The residual value is either calculated with a percentage growth per year or without a growth rate or based on a terminal value calculation based on multiples (Brealey et al., 2009). This calculation leads to the firm value. If the gross method of FCF is chosen, net debts need to be deducted from the firm value to arrive at the equity value (Ernst et al., 2017).

The discount factor for the FCF can be calculated from the weighted average cost of capital (WACC), where the cost of equity is determined by market-based models like the capital asset pricing model (Timmreck, 2002). There are other methods to calculate the discount factor in DCF besides the described WACC, which usually use a combination of a factor to discount for the time value of money (inflation) and a risk premium, which investors demand for their investment compared to a “risk-free” investment (Simkovic, 2017). However, as the exact model to calculate the DCF value in fairness opinions is neither always fully stated in the fairness opinions nor in the scope of this dissertation, further detailed descriptions are not beneficial. Instead the focus will now be shifted to the advantages and disadvantages of the valuation model.

The advantages of the DCF valuation include its wide-spread use in other business calculations. Discounted cash flows are, hence, well-known by managers and shareholders and easy to understand. Cash flows are additionally less distorted by different accounting methods than profit-based methods. The risk of manipulation by a change in accounting standards is, hence, less likely (Ballwieser, 2011). The FCF calculation delivers precise results for companies with a positive cash flow, stable growth and known risk proxies, which are needed for the discount factor (Kranebitter, 2017).

The disadvantages of the DCF valuation include problems to determine the free cash flow for young and fast growing companies with a negative FCF, companies facing bankruptcy, companies with unsteady growth and generally fast growing companies (Kranebitter, 2017). Furthermore, the discount factor is crucial for the firm value due to its impact on the calculations. A small variation of 0.5% can change the entire valuation significantly. Hence, the determination of the capital costs is often difficult or, with regards to fairness opinions, can be adjusted to derive at the desired valuation (Rau, 2000).

Due to the high usage rate of DCF calculations, which gives them the status as the standard valuation model in fairness opinions, there is no difference in the valuation precision expected for FOs that use the DCF valuation to those, who do not make use of it. The DCF model is often the only valuation model employed in fairness opinions.

Hypothesis 12: The use of DCF calculations does not influence the precision of fairness opinions.

3.3.3 Earnings multiple valuation

For the earnings multiple valuations the advisor first chooses a relevant peer group of stock-listed companies. The selection of the peer group is based on different criteria, but should be as similar as possible to the valuation object. These criteria are resting on a combination of the branch, growth, size, profitability and other factors (Kranebitter, 2017).

In a next step, market-based multiples for the peer group are calculated, e.g. price-earnings ratio, firm value (FV)/EBITDA, FV/EBIT, FV/Sales (Berner/Rojahn, 2003). The selected multiples are applied accordingly (for example 9.5xEBIT) to the corresponding reference value of the company to be evaluated (e.g. EBIT of 20 million USD) (Kranebitter, 2017).

The advantages of the earnings multiple valuation models include the fastness and easiness to be applied. The stock market prices of the peer group contain implicit and current assumptions on growth and actual and future capital costs, which are comparable to the valuation object. Furthermore, earnings multiples are often used as a reference model and to check for plausibility of more complex assessments like the DCF valuation as EM valuations allow to communicate the results of complex calculations in a more efficient way (Liu et al., 2002).[13]

The disadvantages of the earnings multiple valuations are mostly related to the peer group. First of all, companies must be found that are comparable to the valuation object. It is possible that no comparable company can be found or the differences are so huge that the method becomes meaningless for valuation purposes (Litigation process: Radiology Associates, Inc., 611 A.2d 485, 490). Secondly, under- and overvaluations of the market with regards to the peer group companies influence the valuation of the company to be valued in the fairness

[13] Liu et al., 2002, p.136: „Multiples are used often as a substitute for comprehensive valuations, because they communicate efficiently the essence of those valuations.“

opinion (Penman, 2013). Thirdly, due to the focus on the peer group, company specific valuation details might be left out of consideration (Kranebitter, 2017).

Fourthly, different kinds of shares can either have voting rights or not. Shares without voting rights are traded with an average discount of 0-10% (Masulis et al., 2009). However, these special share price discounts shall be corrected by the creator of the fairness opinion by either finding a corresponding peer group, where the same voting rights are given, or by discounting the fair value of a peer group without voting right discounts. By doing so, both methods allow a representative comparison and result in a contrastable valuation (Zimmermann, 2015).

Nonetheless, the easiness of valuation and the inclusion of market valuations of comparable companies together with the assumption that more valuations increase the precision (Shaked and Kempainen, 2009), a positive association of the usage of the earnings multiple valuation on the precision of fairness opinions is assumed.

Hypothesis 13: The use of the earnings multiple valuation increases the precision of fairness opinions.

3.3.4 Transaction multiple valuation

The transaction multiple valuation follows the same logical standards as the earnings multiple valuation. A peer group is selected; however in this model the focus is put on comparable companies that have been engaged in mergers and acquisitions in the previous years. The major advantage is that in the underlying valuations, control premiums are included as well as synergy gains (Kranebitter, 2017). Especially the control premiums and efficiency gains from transactions are in the focus of the price negotiations (Campbell, 2003). The model allows, therefore, to make use of previously paid premiums and can indirectly deduct appropriate premiums for the transaction covered in the underlying fairness opinion.

The main disadvantage of the transaction multiple valuation is a lack of comparability between peer companies, takeover environment and buyer nature (potential for synergy), which can distort the valuation and its precision (Finnerty and Emery, 2004). If no comparable transactions can be found, no valuation can be crafted.

However, the advantages to make implicitly use of transaction premiums and synergies gained in previous, comparable transactions are assumed to have a positive association on the precision of fairness opinions (Kranebitter, 2017). Additionally, the hypothesis of increased precision, if more valuation models are used (hypothesis 8) supports these arguments. Hence, fairness opinions making use of the transaction multiple valuations are expected to be more precise than FOs without.

Hypothesis 14: The use of the transaction multiple valuations increases the precision of fairness opinions.

3.4 MAIN FINDINGS OF CHAPTER 3

Chapter 3.1 discusses the general wealth transfers arising from M&A activities. Additionally, it names the theoretical background of six variables that belong to the deal specific characteristics. These six variables are derived from the analysis of the different functions fairness opinions have to fulfil in chapter 2.

Chapter 3.2 summarises current research on fairness opinions, which is primarily focusing on cumulative abnormal returns of deals with FOs and without FOs. Besides the deal specific characteristics, the discussion is also able to theoretically deduct the association of the fairness opinion specific characteristics in relation to the precision of fairness opinions. Six variables are considered as being deal specific variables and five as FO specific.

Lastly, chapter 3.3 discusses the three most commonly used valuation methods and three additional hypotheses are deducted from the discussion. The DCF valuation is the standard valuation method used in nearly all fairness opinions and, hence, no difference is expected. But the earnings multiple and transaction multiple valuations are expected to increase the precision, if used.

These in total 14 hypotheses can serve as an answer to the sub objective to deduct variables and associations from the current body of literature. Starting from the different functions fairness opinions have to fulfil over to the principal-agent theory, first variables are extracted. These variables are explained in the context of M&A and the expected influence on M&A.

Table 15 on the next page summarises the expected associations for each hypothesis based on the four different aspects that are discussed in the previous chapters. Table 16 finally summarises all 14 hypotheses on one page.

Table 15: Overview of variables discussion and expected impact

	Functions of FO	Principal-agent theory	M&A research	FO research
Acquirer	+		+	+
Cash	+	+	+	+
Size	+	+	+	+
Reputation	+	+	+	+
Related mergers	o		+	+
Friendly deals	+		+	+
Number of fairness opinion	+	+		+
Number of valuations	+	+		+
Previous relation	o			+
FINRA (year)	+			+
Contingency fees	o			o

Source: own production

Where + indicates a positive association on the variable, e.g. higher fraction of cash increases precision. o means mixed evidence and – indicates a negative association of variable on precision.

Table 16: Overview of hypothesis

Hypothesis 1a: Acquirer	Fairness opinions issued by the acquirer's advisor overvalue the target whereas FOs of the target's advisor undervalues the target.
Hypothesis 1b: Acquirer	The valuation range in FOs of target advisors is smaller than the valuation range in FOs of the acquirer.
Hypothesis 1c: Acquirer	The difference between target and acquirer valuations has no association to the valuation accuracy
Hypothesis 2: Cash	A higher fraction of cash increases the precision of fairness opinions.
Hypothesis 3: Size	Larger deals lead to a higher precision of fairness opinions than smaller deals.
Hypothesis 4: Reputation	A higher reputation of the investment bank leads to an improved precision of fairness opinions.
Hypothesis 5: Related mergers	Related mergers lead to a higher precision of fairness opinions, diversified transactions lower the precision.
Hypothesis 6: Friendly deals	Friendly deals increase the precision of fairness opinions.
Hypothesis 7: No. of FO	Multiple fairness opinions increase the precision of FOs.
Hypothesis 8: No. of valuations	More valuations models in one fairness opinion lead to a higher precision of the FO.
Hypothesis 9: Previous relation	A previous relation between the principal and the agent increases the valuation precision of fairness opinions
Hypothesis 10: FINRA (year)	Fairness opinions issued after legislation change at the end of 2007 are more precise than FOs issued before.
Hypothesis 11: Contingency fees	Contingency fees do not influence the precision of fairness opinions.
Hypothesis 12: DCF	The use of DCF calculations does not influence the precision of fairness opinions.
Hypothesis 13: EM	The use of the earnings multiple valuation increases the precision of fairness opinions.
Hypothesis 14: TM	The use of the transaction multiple valuations increases the precision of fairness opinions.

Source: own production

4 DATA, METHODOLOGY AND UNIVARIATE TESTS

The previous chapter has introduced the expected associations of the variables on the precision. Based on that, hypotheses are formulated.

The current chapter will now define in a first step the definition of the term precision of fairness opinions in more detail by explaining the mathematical foundation. Once the necessary distinction between range, under-/overvaluation and accuracy is clear, the basis for the final data set as well as the selection and filtering procedures can be explained. Chapter 4.1 explains how the precision is calculated by introducing all three measurements. Chapter 4.2 introduces the data set and the descriptive statistics as well as general tests on the data set for outliers and normal distribution. Chapter 4.3 carries out univariate tests on the data sets.

4.1 PRECISION OF FAIRNESS OPINIONS

4.1.1 Valuation range

The valuation range measures the difference between the highest and the lowest provided value in every valuation model in the fairness opinions[14].

$$Valuation_{High} - Valuation_{Low} = range\ in\ USD \qquad (1)$$

Let us assume that a fairness opinion offers the following fair value ranges:

[14] Cain and Denis (2012) make use of exactly the same calculations, who also find some significant results based on univariate tests.

- Valuation model DCF: 20-30$
- Valuation model EM: 25-40$
- Valuation model TM: 20-35$

Entering the values into the described formula for highest valuation minus lowest valuation, the range in USD is calculated, which leads to the following ranges in USD:

- Valuation model DCF: 30$ - 20$ = 10$
- Valuation model EM: 40$ - 25$ = 15$
- Valuation model TM: 35$ - 20$ = 15$

The range in USD is then divided by the lower valuation to get to the valuation range in percentage points:

$$\frac{range\ in\ USD}{valuation_{Low}} = valuation\ range \qquad (2)$$

This leads to the following ranges in percent:

- Valuation model DCF: 10$ / 20$ = 50%
- Valuation model EM: 15$ / 25$ = 60%
- Valuation model TM: 15$ / 20$ = 75%

The average of those valuation ranges leads to the mean valuation range; in this example the following formula is used:

$$\frac{(Valuation\ range\ _1 + Valuation\ range\ _2 + Valuation\ range\ _3)}{number\ of\ valuation\ ranges} = mean\ percentage\ range\ in\ USD \qquad (3)$$

This leads to mean a percentage range of 61.66% in this example.

4.1.2 Under- and overvaluation

A small valuation range might indicate that the investment bank is sure about the valuation models and the circumstances of the deal so that it does not need to build reserves for risks in the valuation models due to biased data or missing data. But this does not necessarily mean that the valuation is accurate in relation to the later paid price. Taking the previous fair values of the three valuation models again and assuming a transaction price of 30 USD, the under- or overvaluation can be calculated by the following formula. The following formulas are derived from Dolgopolik (2018). Dolgopolik uses average values of statistical estimations and compares those to the later observed values.

The mean valuation in USD is built by averaging over the lowest and the highest value of each valuation method, e.g. for DCF the following formula is used:

$$\frac{DCF_{Low} + DCF_{High}}{2} = mean\ valuation\ in\ USD \qquad (4)$$

For the three valuation models this means:

- Valuation model DCF: (20$+30$) / 2 = 25.00$
- Valuation model EM: (25$+40$) / 2 = 32.50$
- Valuation model TM: (20$+35$) / 2 = 27.50$

The mean valuation in USD is then divided by the later paid price minus one (compare with Rockafellar and Wets, 1998). If the result is negative, undervaluation is given and if it is positive, the target has received an overvaluation. The examples of formula 5 make use of the results of formula 4 divided by the paid price per share.

$$\frac{mean\ valuation\ in\ USD}{deal\ price\ per\ share} - 1 = under - /overvaluation \qquad (5)$$

- Valuation model DCF: (25.00$ / 30.00$) - 1 = -16.67%
- Valuation model EM: (32.50$ / 30.00$) - 1 = + 8.33%
- Valuation model TM: (27.50$ / 30.00$) - 1 = - 8.33%

The average of those valuation accuracies leads to the mean under-/overvaluation. In this example the mean under-/overvaluation is calculated as following:

$$\frac{(Valuation\ precision_1 + Valuation\ precision_2 + Valuation\ precision_3)}{number\ of\ valuation\ precisions} =$$

$$Mean\ under-/overvaluation\ in\ \% \qquad (6)$$

This leads to an undervaluation of -5.56%.

Formula 6 indicates whether an under- or overvaluation is present and regression analysis on this formula will provide answers how to reduce the **under- or overvaluation**. This formula is especially important to answer hypothesis 1a. If an undervaluation is given, significant results will indicate how the significant variable will change the undervaluation. A negative coefficient leads to an increase in the undervaluation, a positive association to a reduction of undervaluation. For the acquirer data set with overvaluation the results are exactly opposing. Hence, linearity is given for the individual data sets on target and acquirer, but the formula is not able to answer the question how to get to a valuation difference of zero percent in the fairness opinion. For that the formula on valuation accuracy is needed.

These tests are only possible for the target and acquirer data set due to the expected under- and overvaluation. In the entire data set the effects of negative and positive valuations would lead to a levelling of effects and the needed linearity for regression analysis is not given any more (Wooldridge, 2013), which will later be discussed in more detail. Nonetheless, for deals with one-sided fairness opinions, the reader might be interested in knowing which variables will lower the under- or overvaluation. Depending on the point of view, the reader of the fairness opinion can deduct the level of precision from this information. The reader of the acquirer's fairness opinion would prefer to see a lower overvaluation as this increases the precision of the fairness opinion. The reader of the target's fairness opinion would prefer a lower undervaluation as this would mean in turn a higher precision of the fairness opinion according to the definitions of the presented formulas. However, the regressions will only indicate the direction of impact of the independent variable and is important for the general under-/overvaluation discussion. For any other reference, the valuation accuracy is needed. Hence, robustness checks will not be carried out on under-/overvaluation.

4.1.3 Valuation accuracy

The question is whether an under- or overvaluation is preferable. In case of valuation accuracy, both valuation discrepancies are not favoured. The reader of a fairness opinion would prefer an exact value in relation to the later paid price. Furthermore, the effects of under-/overvaluation are expected to level each other, which means that studying both fairness opinions, the expected undervaluation in the target advisor's fairness opinion should match the overvaluation in the acquirer's fairness opinion on average. Hence, both valuation mismatches can be seen as equally bad and the focus of the analysis will, consequently, focus on how to reach a valuation difference of zero.

For the statistical tests, the absolute value of the mean accuracy should be considered and is of greater interest than the under- and overvaluation. By taking the **absolute** values of formula 6, a difference in **absolute** percentage is given. The previously calculated undervaluation of -5.56% is, consequently, transferred to a valuation discrepancy of +5.56%. The calculation is shown in formula 7.

$$|mean\ under - / overvaluation\ in\ \%| = mean\ \ accuracy \tag{7}$$

Regression analysis on formula 7 is able to provide answers how the variables can increase the accuracy by reducing the difference between the average prices in the fairness opinion to the later paid price towards 0%. Hence, the valuation accuracy is maximised. The use of absolute values for accuracy is also allowed to be carried out on the entire data set as linearity concerns are not given any more (Wooldridge, 2013). In contrast to the formula for under-/overvaluation, the valuation accuracy allows a concrete answer in how far a change of one unit in any independent variable will influence the valuation precision.

A significant variable in this test indicates how the variable affects the valuation accuracy. As the average valuation difference is not zero, but due to the absolute values always positive, a significant variable with a negative coefficient will help to increase the precision but lowering the difference.

The calculations and formulas in this paragraph have clarified the term precision and also highlight why it is meaningful to analyse the data set from three different aspects, which are range, accuracy and under-/overvaluation.

4.2 DATA SET

4.2.1 Data collection

The data collection process for the final data set used in this research begins with an extract from the Securities Data Company's (SDC) Platinum database, which is the industry standard software for information on mergers and acquisitions.

Included in the final data set and counted as deals are all acquisitions of at least 50% of the target company's equity, repurchases and exchange offers for equity or securities that can be converted into equity of the target. Hence, a change in the controlling majority of shares is required.

Additionally, these transactions must have made use of a fairness opinion requested by at least one of the two parties involved, the target or the acquirer. SDC qualifies a company as a financial advisor if the company acts as the deal manager, is the lead underwriter, offers financial advice or provides a fairness opinion. As these roles are typically combined and offered by one company, the mentioned company is mostly the fairness opinion provider as well. Therefore, deals that have made use of a FO can be identified by the provided information.

No specific requirements are imposed on the data sample, except the date of merger execution must be between 2003 and 2013 and the deal size (value of the target) must be at least 10 million dollars. A limit of 10 million dollars is set to exclude very small deals, where financial data is mostly not available or not available from trustworthy sources as legal filings are not mandatory[15] (IRS, 2014).

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[15] Those corporations with $10 million or more in total assets and that file 250 or more returns per calendar year are required to electronically file their Form 1120, 1120-S, and 1120-F.

Generally fairness opinions need to be included in the form S-4[16], which must be filed in all mergers or acquisitions made in the United States and sent to the Unites States Securities and Exchange Commission (SEC) in order to continue with the deal (SEC, 2017). This legal requirement is also the main reason to focus on US mergers as the S-4 form forces companies to unveil their fairness opinions. In other countries, companies are not obliged to do this.

The following list summarises the deal's criteria to be considered in the final data set.

- At least one party must have requested an fairness opinion
- Completed acquisition
- Tender/merger acquisition technique
- Size of at least 10 million USD in total assets
- M&A announcement date corresponds to the aforementioned time period
- Both the acquirer as well as target are US companies
- Percent of shares acquired: At least 50%
- At least one fairness opinion must be publicly available (S-4 form)
- At least one valuation method must deliver a valuation

The time period up to 2013 has been chosen to have a final list of deals, where no deals are withdrawn at a later stage, but yet unknown of getting withdrawn when the data is collected. Consequently, the data set only contains finalised and

[16] S-4: Form S-4, also known as the Registration Statement under the Securities Exchange Act of 1933. The Securities Exchange Act of 1933, often referred to as the "truth in securities" law, requires that these registration forms, providing essential facts, are filed to disclose important information upon registration of a company's securities. It helps the SEC achieve the objectives of this act - requiring investors to receive significant information regarding securities offered, and to prohibit fraud in the sale of the offered securities.

definite deals. The beginning in 2003 was chosen for two reasons. First of all, since the end of 2002 and the adoption of the Sarbanes-Oxley Act (SOX), auditors are no longer permitted to issue fairness opinions. Since SOX fairness opinions must come from a credible, objective and independent source (PWC, 2013). Furthermore, disclosure requirements on potential conflicts of interests were improved. Therefore, the quality of the fairness opinions is believed to have improved after the change in legislation. This change in legislation has no relation to the discussed changes that occurred at the end of 2007, which are extensively considered in chapter 2.

The chosen filter criterions observation period from 2003 to 2013, deals with a market capitalisation of at least 10 million USD, deals executed in the United States as well as the focus on mergers and acquisitions delivers 325 transactions. Out of these 325 transactions, 24 transactions are cancelled or were at the end of 2013 still pending. These transactions are excluded from the data set as no transaction has taken place and, hence, recognition of the transaction value is not possible. Therefore, only 301 transactions remain in the data set. For 26 deals no fairness opinions on any side are requested according to SDC Platinum. The correctness of the information of SDC Platinum for those 26 deals that should not have requested FOs is manually double-checked and the information is correct. As a consequence, these 26 transactions have to be eliminated as well.

275 transactions have requested fairness opinions, but for 45 of these fairness opinions are not published or do not deliver any valuation model. It is possible that the published part of the fairness opinion does not deliver a valuation range, but valuations can still be stated in the not published valuation memorandum. Nonetheless, as valuations are needed for the statistical tests, these transactions must be excluded as well, reducing the data set to 230 deals.

For the remaining 230 deals the fairness opinions are not always published from both advisors, those of the target and the acquirer. On the target side 25 deals have not delivered any valuation in the fairness opinion. On the acquirer side, 37 deals have not delivered any valuation.

These deals must be excluded as well in the corresponding data sets, which means that 205 deals on the target data set are remaining and 193 on the acquirer data set. This leads to two different sized data sets for targets and acquirers and a third, differently sized data set for the entire data set, which combines the target and acquirer data sets.

Figure 4: Process from raw data to the final data set

- 325 transactions between 2003 and 2013 following the limitations on the data set
- - 24 transactions are marked as being cancelled or still pending
- - 26 deals that have not requested fairness opinions (no legal obligation to buy FOs
- - 45 deals, where no fairness opinion is published or where the fairness opinions does not contain valuations
- 230 deals remain in the sample
- 205 target valuations and 193 acquirer valuations are contained as 25 target side FOs have not delivered a valuation and 37 on the acquirer side

Source: own production

All valuations and the information on the valuation methods have been gathered manually from the SEC filings by downloading and working through every fairness opinion that is included in the S-4 form. In the following, the terms FO and S-4 will be used interchangeably. The S-4 form itself is downloaded and opened, but only the included fairness opinion is read and considered. Due to the different calculations of range and accuracy, different sub data sets will later be separated from the final data set for the empirical analysis.

4.2.2 Independent variables

With the aim to use only information that is provided by the fairness opinion, the values for the independent variable size are extracted manually from the S-4 statement, although the **size (h3)** of the transaction has initially been extracted from the target's value provided by SDC. The manual amendment is done to overcome possible shortcomings in the SDC database as SDC does not specifically explain whether the value of the target is based on the initial offering price or the final price in case the deal's details have been altered. Moreover, the S-4 form must be updated whenever the offer is amended. On average, the targets have a market capitalisation of 3,946.4 million USD (SD=8,578.4). Tests for skewness and kurtosis indicate a positive, right skew (skew=4.2483) and high kurtosis for the exogenous variable with 23.4027.

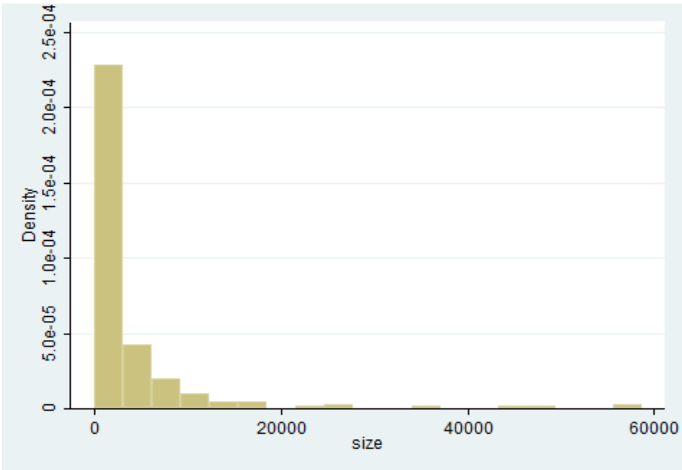
A normal distribution has a skew of zero and a kurtosis of three. Kurtosis indicates how much data is in the tails. Distributions with kurtosis less than 3 are said to be platykurtic. A platykurtic distribution means that the distribution produces fewer and less extreme outliers than does a normal distribution. Distributions with kurtosis greater than 3 are said to be leptokurtic. The tails approach zero more slowly than in a Gaussian distribution. Therefore a leptokurtic distribution produces more outliers than the normal distribution (Wooldridge, 2013).

For a unimodal distribution, negative skew indicates that the tail on the left side of the probability density function is longer or fatter than the right side. Conversely, positive skew indicates that the tail on the right side is longer or fatter than the left side. Skewness is expected to have a value of zero in a Gaussian distribution (Wooldridge, 2013).

Although no hard thresholds are defined, both kurtosis and skewness are considered too large and, hence, a transformation of the variable is carried out. Figure 5 illustrates the histogram of size before the transformation.

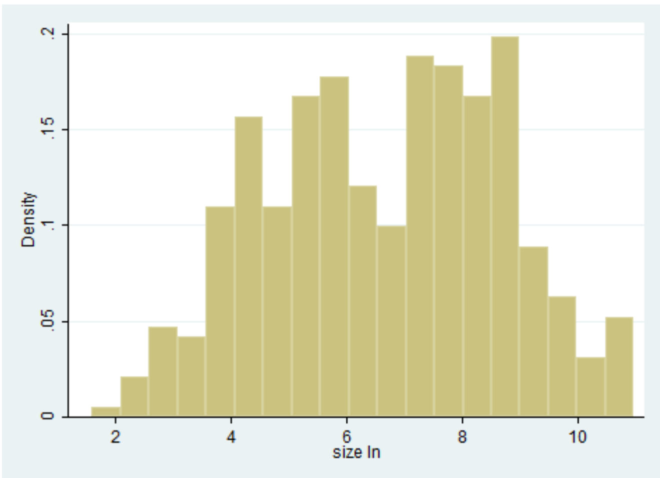
Source: Own production

Figure 5 Size before transformation



The standard procedure to transform a positive skewed variable is to use the natural logarithm (Wooldridge, 2013; Peck and Devore, 2012). After transforming the variable, the histogram in figure 6 follows more a normal distribution. This also supported by the skewness (-0.2760) and kurtosis (3.0030) of the transformed variable. The mean of the transformed variable size is 6.6363 (SD=2.0646).

Figure 6: Size after transformation



Source: Own production

The payment terms of the deal are included in the original SDC Platinum software and the corresponding notes to the deals. Nevertheless, the S-4 statement is used once again to test on the correctness of information provided by SDC Platinum as the payment details might be altered during the negotiation's process. In two mergers the payment details have changed from pure stock payments to a mixture of stock and cash. The fairness opinions of these two deals indicate that the changes have occurred during the negotiation phase. The corrected information retrieved from the S-4 statements is manually entered into the data sample and the incorrected information has been replaced. The exogenous variable is named **cash (h2)** and can take any value between 0% and 100%, where 0% stands for a deal fully paid with stocks of the acquirer and 100% for a fully cash financed deal. The mean of cash is 27.35% (SD=37.01%) and the median is 0.5%. The distribution of cash is bimodal with peaks at both ends (0% cash and 100% cash). Consequently, cash is not following the Gaussian-Markov distribution and subsequent tests must be robust to this violation. Nonetheless, the variable is right-tailed as the median is smaller than the mean with skewness of 1.0803 and kurtosis of 2.6148. A bimodal distribution with peaks at both ends does not require a transformation of the data and hence, no transformation is carried out.

The SEC filing is used to double check the correctness of SDC Platinum in relation to the financial advisor and the assumed connection to the fairness opinion provider. Four deals have been identified to have used different fairness opinion providers due to a change in the fairness opinion provider for several reasons. In these four cases the information from the fairness opinion and the corresponding S-4 statement are used. The deals have been updated and corrected and have not let to an exclusion from the final data set.

The **reputation (h4)** of the fairness opinion provider is taken from the fairness opinion itself. The name is stated in the fairness opinions and then looked up in the corresponding league table for the year (compare with chapter 3.2.1.4). The position in the league table is transferred into a range of numbers from 0 to 100. In other words, reputation is directly taken from the fairness opinion, but for the statistical analysis modulated by the help of league tables. League tables are rankings of companies based on a set of criteria such as sales or any other relevant metrics. The league tables used for the investment banks are derived from previous period advised M&A transactions and the market capitalisation of the target. Three different league tables are used to adjust for changes in the positions during the years. However, in line with Rau (2000), the rankings are relatively stable across the years, meaning that the top 5 investment banks just change the position in the top 5, but never dropped out in the years covered[17]. The position is calculated by the average M&A market share of investment banks based on the market capitalisation of deals assisted during the previous period. League tables of M&A activities do not only reflect past M&A market shares of banks, they also influence future market share of banks (Derrien and Dessaint, 2018). Furthermore, league tables contribute to the reputation of banks, according to Derrien and Dessaint. Position 1 in the league table for a certain year gives 100 points, the second place 96 points and so on. Position 24 in the league table grants 4 points for the provider, every position below or investment banks not mentioned in the league tables receive a zero. The league tables contain the top 25 investment banks that have accompanied mergers in terms of market capitalisation over the given time horizon. The mean reputation value is 52.6633 (SD=38.7435). The distribution is left-tailed (-0.2446) and kurtosis is 1.3953.

Deals with more than one fairness opinion provider are aggregated and shown once in the data sample. This step is introduced to overcome problems with double or even triple data samples for one merger, which would influence all other variables. Furthermore, a separation is not feasible as the writers of the fairness opinions are supposed to work together and come together to agreed and matching valuations. These matching valuations have been observed in nearly all FOs. Hence, it cannot be separated which fairness opinion writer contributed which part to the opinion. Fairness opinions created by investment banks with a low and a high reputation do normally follow the opinion of the leading investment bank, which is always the most experienced bank. Therefore, summarising these opinions to one and taking the higher reputation is the best option. Otherwise, the influence of fairness opinions advised by a low-tier bank, but using the presumably superior knowledge of top-tier banks, would negatively influence the data sets. Whether

[17] Lehmann Brothers is the only top 5 investment bank that dropped out of the list due to the insolvency and take-over by Barclays.

multiple fairness opinions are used is measured by the independent variable **number of FO (h7)**. The minimum value is 1 and the maximum number of official fairness opinions (fairness opinions requested by investors do not need to be published) is 3. The mean is 1.2073 (SD=0.4464) and the distribution is right-tailed (skew=2.0309) and shows a kurtosis of 6.3670. Due to that, the variable is used as a dummy variable for the multiple regressions, where deals with exactly one FO receive a 0 and all other deals a 1 for multiple fairness opinions. In total, 75 targets and acquirers have used multiple fairness opinions. The majority of 323 targets and acquirers used only one fairness opinion. For the univariate tests, though, the exact number of fairness opinions is used.

Information on the **previous relation (h9)** between the target or acquirer and the issuer of the fairness opinion is stated in the fairness opinion. If no information is provided, no relation is assumed. This is corresponding with FINRA rule 2290 of the Financial Industry Regulatory Authority (Davis, 2008), which stipulates additional disclosure requirements whenever the fairness opinion provider has had a material relationship with any party of the deal in the past two years or did any actions that could mutually be understood as a relationship. Previous relation is mutually a dummy variable as there is either a previous relation or not. 231 targets and acquirers have not had any previous business relation to the FO provider and 167 have a previous relation. The mean is 0.4196.

The **number of valuations (h8)** variable is calculated by adding up all valuations models used in the fairness opinion, which have yielded a valuation. Valuation models without a valuation are not counted. The maximum number of valuations in a fairness opinion is 7. The median number of valuations is 2 with a mean of 2.5126, which leads to a right-tailed distribution (skew=0.4959) and a kurtosis of 2.3749. No transformation is carried out.

The industry sector is provided by SDC platinum and was manually reallocated to eight different industries, which are

- energy
- financial services
- IT
- manufacturing

- media
- pharma
- retail
- other.

Out of the 230 deals with fairness opinions, 220 are deals within the same industry. Hence, a distinction between related and diversified mergers cannot be applied as intended by hypothesis 5. As an alternative, the distinction bank (financial services) and non-bank (non-financial services) is chosen. This approach offers another advantage as well. The theoretical discussion has highlighted that valuation models must be adjusted to bank deals and the flexibility of the valuation models is often criticised. Hence, it can be tested whether these allegations are correct and significant. Whereas the industry segments are infrequently stated in fairness opinions, the information on the segment is mostly based on SDC. However, the information whether any of the companies is active in the financial industry, is given in the FO. The information can be retrieved either directly from the sector information, if mentioned, or indirectly by the name or the valuation models, when they have to be fitted to the explicit needs of financial services industries from the fairness opinions. Consequently, changing the industry segment to a dummy variable bank and non-bank follows the objectives of this dissertation to use only information provided directly by the fairness opinion. In the data set, 167 targets or acquirers are identified as banks and 231 as non-banks. The mean is 0.4196.

The date of merger execution is used as a dummy variable in the univariate and multiple tests to check for a significant change in valuation precision due to **FINRA (h10)** rule 2290. Deals carried out before the adoption of the law receive a 0 and deals after that a 1. The mean of the dummy variable is 0.3929 (SD=0.4890), which implies that 242 fairness opinions are requested before the adoption of the rule and 156 after the adoption. The dummy variable is named FINRA

The original information on deal execution is additionally used to order the data in the final data set. The first deal in the final data set is the first completed merger and the last deal, accordingly, the last executed deal at the end of 2013.

The assumed undervaluation of the targets' advisors and the expected overvaluation of the bidders' advisors lead to the last exogenous variable, the dummy variable target/**acquirer (h1a-1c)**. All deals in the final data set have received either a 0 for fairness opinions issued by the target advisor or a 1 for FOs of the acquirers. The mean is 0.4849, which indicates that 205 target fairness opinions and 193 FOs of the acquirer are summarised in the original data set. The variable is only relevant for tests on the entire data sets.

Out of the 11 hypotheses based on variables mentioned in chapter 3.2, two are not yet discussed for good reasons.

A test on **contingency fees (h11)** in form of hypotheses is not feasible due to the fact that all deals in the data set have made use of contingency fees. Therefore, no comparison and statistical analysis is possible.

The hypothesis on **friendly deals (h6)** cannot be tested for similar reasons. Only two out of all 230 deals are hostile and both deals did not publish their fairness opinions, which means that no valuations can be used. Again, no comparison and statistical analysis can be made.

Hence, due to the restrictions of the data set, only nine of the previous eleven hypotheses can be analysed. The elimination of contingency fees and friendly deals is not made arbitrarily, but based on the distribution of observations, which do not allow statistical tests for these two variables.

For the target's valuations, 167 fairness opinions use the discounted cash flow valuation **(DCF (h12))**, 123 use earnings multiples **(EM (h13))** and 93 transaction multiples **(TM (h14))**. For the acquirers, 152 fairness opinions make use of the discounted cash flow valuation, 104 employ the earnings multiples and 93 comparable transaction multiples.

Table 17 summarises the number of observations for all data sets before outliers are eliminated.

Table 17: Data set size and characteristics

Sample criteria	**Number of acquisitions**	**%**

Deal size of at least 10 million between 2002 and 2013 and indicated as having used a fairness opinion	275	
Deals with S-4 statement and valuations in the fairness opinion	230	
Target:		
with any valuation	205	100.00
Information on DCF	167	81.46
Information on earnings multiples	123	60.00
Information on transaction multiples	93	45.36
Acquirer:		
with any valuation	193	100.00
Information on DCF	152	78.76
Information on earnings multiples	104	53.89
Information on transaction multiples	93	48.19

Source: Own production

It is noteworthy that 97.16% of all deals used at least one of the three mentioned valuation models, 57.73% at least two of the three valuation models and 32.22% used all three valuation models. For the tests on hypothesis 12 to 14, whether FOs with any one of the three most used valuation models are more precise, the information is collected as dummy variables. If DCF is used, the dummy variable has a value of 1, if not zero. The same conversion is chosen for EM and TM. For the univariate tests, the 1 is changed to yes and the 0 to no.

The percentage values provided for the usage rate of the valuation models DCF, EM and TM are similar to those of Schönefelder (2007). The most used valuation model is the DCF valuation, which is used in 80% of the FOs considered and delivering valuations, the EM model is used in 57% of the FOs and the TM model in 47% of the FOs.

4.2.3 Identification of outliers

In a next step outliers in the data sets are identified and eliminated. It is important to differentiate between outliers or influential points. Influential points and outliers are first tested visually by the help of a scatter plot. However, a better way to detect outliers is the t-score test or Z-score test (Meier et al., 2012).

The t-score test is often recommended in literature to test for outliers in a data set. Another method that can be used to screen data for outliers is the Z-Score, using the mean and standard deviation. The Z-Score is recommended to be used, when the data sample's size is above 30 and the standard deviation is known (Meier et al., 2012)). Formula 7 shows the calculation of the Z-score.

$$Z_i = \frac{x_i - \bar{x}}{sd} \qquad (7)$$

Where $X_i \sim N$, $\bar{x}$ is the sample mean and sd the standard deviation

When X is normally distributed, Z is a standard normal distribution. According to Shiffler (1988) a possible maximum Z-score is dependent on sample size and no Z-score exceeds 3 in a sample size of more than or equal to 10. Any value above 3 highlights outliers. One disadvantage of the Z-score test is that it is not very precise for outlier labelling as the standard deviation can be inflated by a few or even a single observation having an extreme value. Thus, it can cause a masking problem, i.e., the less extreme outliers go undetected because of the most extreme outliers, and vice versa (Iglewicz and Hoaglin (1993).

To overcome this shortcoming, the modified Z-Score is used. Instead of the mean and standard deviation of the sample, the median and the median of the absolute deviation of the median (MAD) of the sample are used in the modified Z-score, according to Iglewicz and Hoaglin (1993). The formula is as following:

$$MAD = median\ (|x_i - \tilde{x}|) \qquad (8)$$

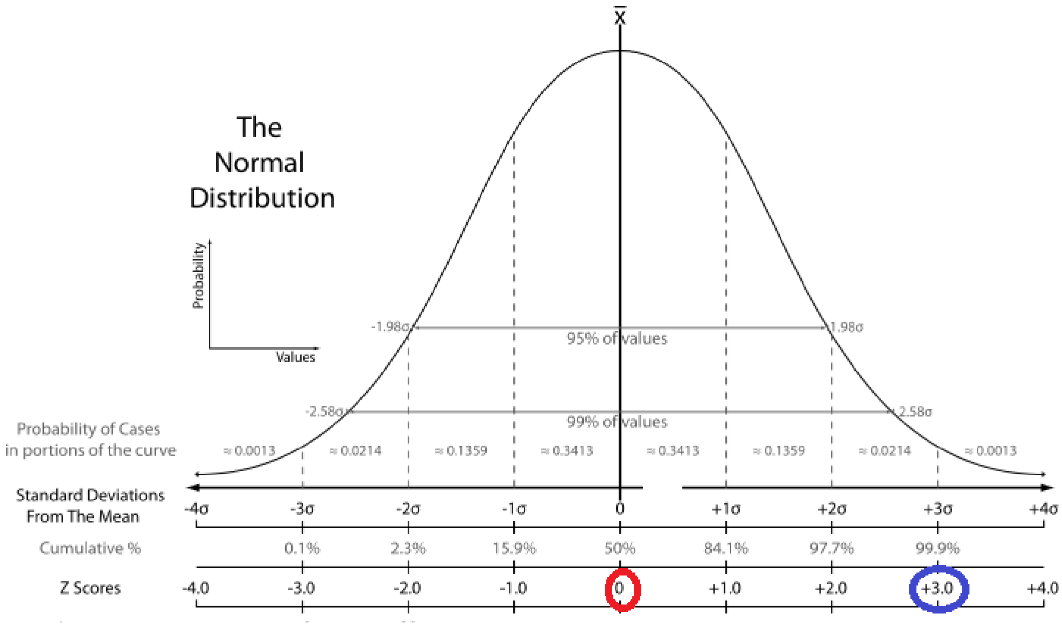
Where $\tilde{x}$ is the median

The modified Z-Score is computed as

$$Modified\ Z - Score = \frac{0.6745(x_i - \tilde{x})}{MAD} \qquad (9)$$

The modified Z-score test identifies data points as outliers, if the modified Z-score is higher than 3.50 (Barnett and Lewis, 1994; Hawkins, 1980). Barnett and Lewis recommend, though, to check values detected as an outlier individually, if it is a real outlier or an influential point. Hence, in two rare cases the Z-score is accepted to be above 3.50. Figure 7 summarises what it means to have a Z-score of above 3.50 and how many of the cumulative data points are expected to be in this range.

Figure 7: Z-Score and normal distribution



Source: Meier et al. (2012, p.128)

Cock's distance test is a second test to detect outliers and is applied to double check the results of the modified Z-score.

For Cook's distance test, Cook suggests an upper limit of 1 for outliers (Cook, 2000; Cook and Weisberg, 1982). Cook's distance test is a standard test to exam the influence of one data point when carrying out least-square regression analysis (Mendenhall and Sincich, 1996).

The tests on outliers on the independent variables have not delivered any results that would lead to changes on the number of observations.

However, outliers are identified in the dependent variables. Due to the different calculations of range, accuracy and under-/overvaluation, the data sets are not comparable and must be considered separately. This leads also to a different number of outliers in the data sets. For the range data set, 10 data points are eliminated, 5 observations on the target side and 5 observations on the acquirer side as the valuation ranges are too large. For the accuracy and under-/overvaluation data sets 8 outliers need to be excluded, where 3 deals on the target side and 5 deals on the acquirer side are eliminated for the reason that the valuation accuracies are too low, hence, the over- or undervaluation too large compared to the other observations. This leads to changes in the three data sets. Hence, the final data set for the entire data set on range has 388 entries, consisting of 200 entries in the target data set and 188 in the acquirer data set. The accuracy and under-/overvaluation data sets have now 390 observations, based on 202 observations in the target data set and 188 observations in the acquirer data set.

4.2.4 Dependent variables

The dependent variables for range are generally following a Gaussian distribution and show only small difference in means between the data sets and valuation models. The average valuation range is 30.6% with a standard deviation of 15.0% for the entire and the target data set. The acquirer data set has a lower valuation range with 30.1% and SD of 13.1%. Skewness is positive, but always between zero and one. Kurtosis is between 2.5 and 3.5. Hence, no transformation is carried out.

The dependent variables for accuracy are all transformed by taking the square root from the absolute mean to lower the positive skewness and kurtosis. The original absolute means for the data sets are 14.92% for the entire data set with a SD of 14.4% based on 390 observations, 7.72% for the target data set with a SD of 12.01% based on 202 observations and an average mean of 14.92% for the acquirer data set with a SD of 15.74% based on 188 observations. Skewness and kurtosis are above the thresholds in all three data sets (skewness = 1.6, kurtosis = 6.0) and, hence, new values are transformed by taking the root of the absolute mean values. The average mean accuracy is around 35% afterwards. Standard deviation is 18%. The skewness is positive and between 0.6-1.0, kurtosis is around 3. Hence, accuracy is following the Gauss distribution more closely after transformation.

The last dependent variables under-/overvaluation with its different means for the target and acquirer data sets show in its descriptive values the expected undervaluation and overvaluation. The target data set provides an undervaluation of -8.1% and the acquirer data set an overvaluation of +6.0%. The kurtosis of the variable is between 4.9 and 6.0, which indicates that the variable is not normally distributed. Nonetheless, a transformation is not necessarily needed to run the univariate and multiple analyses and, hence, no transformation is performed.

Tables 18-20 show the descriptive statistics for the entire data sets, the target data sets and the acquirer data sets. All statistics are based on the transformed variables.

4.2.5 Descriptive statistics

Table 18: Descriptive statistics for the entire data sets

Entire data set									
Dependent variable	**Observations**	**Min. value**	**Max. value**	**Mean**	**Median**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**
Mean (range)	388	0.006	0.7293	0.3060	0.2842	0.1327	0.0176	0.6083	2.8630
Mean (accuracy)	390	0.030	0.8975	0.3445	0.3298	0.1751	0.0307	0.5977	2.9268
Mean (DCF range)	314	0.002	0.7795	0.3166	0.2857	0.1489	0.0222	0.7740	3.4158
Mean (DCF accuracy)	312	0.040	0.9274	0.3739	0.3592	0.1882	0.0354	0.6479	2.9897
Mean (EM range)	223	0.000	0.7873	0.3025	0.2697	0.1661	0.0276	0.9123	3.3746
Mean (EM accuracy)	223	0.000	0.8341	0.3654	0.3674	0.1612	0.0260	0.1733	2.7206
Mean (TM range)	184	0.017	0.7994	0.3127	0.2723	0.1687	0.0285	0.8099	3.0281
Mean (TM accuracy)	182	0.050	0.8786	0.3662	0.3371	0.1805	0.0326	0.5669	2.7166
Independent variable	**Observations**	**Min. value**	**Max. value**	**Mean**	**Median**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**
Bank	390	0	1	0.4175	0.0000	0.4938	0.2438	0.3345	1.1119
Size (ln)	390	0.095	10.979	6.6686	6.7211	2.0092	4.0368	-0.0619	2.1848
Cash	390	0	1	0.2723	0.0050	0.3677	0.1352	1.0866	2.6433
Reputation	390	0	100	53.5297	68.0000	38.5356	1484.9910	-0.2833	1.4231
Number of FO (dummy)	390	0	1	0.1881	0.0000	0.3913	0.1531	1.5959	3.5468
Previous relation	390	0	1	0.4330	0.0000	0.4961	0.2461	0.2705	1.0732
Number of valuations	390	1	7	2.5567	3.0000	1.3826	1.9115	0.4871	2.3959
Year (dummy)	390	0	1	0.3840	0.0000	0.4870	0.2372	0.4769	1.2275
Target/acquirer	390	0	1	0.4820	0.0000	0.5003	0.2503	0.0722	1.0052

Source: Own production

Table 19: Descriptive statistics for the target data sets

Target data set

Dependent variable	Observations	Min. value	Max. value	Mean	Median	Standard deviation	Variance	Skewness	Kurtosis
Mean (range)	200	0.006	0.6763	0.3063	0.2769	0.1290	0.0166	0.4921	2.6131
Mean (accuracy)	202	0.030	0.8233	0.3520	0.3493	0.1596	0.0255	0.5557	3.1339
Mean (undervaluation)	202	-0.678	0.5755	-0.0808	-0.0797	0.1816	0.0330	0.2287	5.4183
Mean (DCF range)	164	0.006	0.7468	0.3182	0.2879	0.1411	0.0199	0.6693	3.2301
Mean (DCF accuracy)	164	0.090	0.8257	0.3735	0.3636	0.1668	0.0278	0.4907	2.7388
Mean (undervaluation accuracy)	164	-0.663	0.6818	-0.0695	-0.0819	0.2086	0.0435	0.5218	4.7000
Mean (EM range)	121	0.000	0.7798	0.3056	0.2800	0.1604	0.0257	0.7703	3.1784
Mean (EM accuracy)	121	0.000	0.8341	0.3820	0.3901	0.1653	0.0273	0.0975	2.8866
Mean (EM undervaluation)	121	-0.696	0.5678	-0.1134	-0.1162	0.1877	0.0352	0.1968	4.6946
Mean (TM range)	92	0.017	0.7994	0.3127	0.2789	0.1669	0.0279	0.6521	2.7900
Mean (TM accuracy)	92	0.083	0.8085	0.3436	0.3243	0.1777	0.0316	0.7121	2.7511
Mean (TM undervaluation)	92	-0.640	0.6537	-0.0539	-0.0565	0.2042	0.0417	0.6100	5.2858
Independent variable	**Observations**	**Min. value**	**Max. value**	**Mean**	**Median**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**
Bank	202	0.000	1.0000	0.4158	0.0000	0.4941	0.2441	0.3415	1.1166
Size (ln)	202	2.332	10.9790	6.6361	6.6777	2.0059	4.0234	-0.0446	2.1212
Cash	202	0.000	1.0000	0.2829	0.0130	0.3741	0.1400	1.0223	2.4774
Reputation	202	0.000	100.0000	52.9109	68.0000	39.3353	1547.2660	-0.2427	1.3806
Number of FO (dummy)	202	0.000	1.0000	0.2030	0.0000	0.4032	0.1626	1.4770	3.1815
Previous relation	202	0.000	1.0000	0.3960	0.0000	0.4903	0.2404	0.4251	1.1807
Number of valuations	202	1.000	7.0000	2.4851	3.0000	1.3429	1.8033	0.4642	2.2350
Year (dummy)	202	0.000	1.0000	0.3861	0.0000	0.4881	0.2382	0.4677	1.2188

Source: Own production

Table 20 Descriptive statistics for the acquirer data sets

Acquirer data set									
Dependent variable	**Observations**	**Min. value**	**Max. value**	**Mean**	**Median**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**
Mean (range)	188	0.055	0.7001	0.3012	0.2832	0.1307	0.0171	0.5882	2.7176
Mean (accuracy)	188	0.035	0.8975	0.3365	0.3189	0.1905	0.0363	0.6536	2.7369
Mean (overvaluation)	188	-0.66	0.8056	0.0596	0.0207	0.2089	0.0436	0.455	4.8506
Mean (DCF range)	150	0.002	0.7795	0.3096	0.2850	0.1514	0.0229	0.8316	3.5823
Mean (DCF accuracy)	148	0.04	0.9274	0.3742	0.3522	0.2099	0.0441	0.7142	2.8848
Mean (overvaluation accuracy)	148	-0.554	0.86	0.0721	0.0271	0.2588	0.0670	0.9069	4.2554
Mean (EM range)	102	0.037	0.7873	0.2952	0.2571	0.1697	0.0288	1.0746	3.7006
Mean (EM accuracy)	102	0.042	0.766	0.3456	0.3449	0.1546	0.0239	0.2357	2.4752
Mean (EM undervaluation)	102	-0.285	0.5867	-0.0372	-0.0576	0.1809	0.0327	0.8819	4.0824
Mean (TM range)	92	0.049	0.7411	0.3082	0.2668	0.1668	0.0278	0.9611	3.3358
Mean (TM accuracy)	90	0.05	0.8786	0.3893	0.3839	0.1815	0.0329	0.4387	2.7822
Mean (TM overvaluation)	90	-0.396	0.7719	0.0877	0.0599	0.2290	0.0524	0.5709	3.5679
Independent variable	**Observations**	**Min. value**	**Max. value**	**Mean**	**Median**	**Standard deviation**	**Variance**	**Skewness**	**Kurtosis**
Bank	188	0	1	0.4309	0	0.4965	0.2465	0.2793	1.078
Size (ln)	188	1.609	10.9796	6.6670	6.6777	2.0172	4.0692	-0.0888	2.2664
Cash	188	0	1	0.2752	0.0104	0.3701	0.137	1.0815	2.6316
Reputation	188	0	100	52.234	68	37.9365	1439.175	-0.2384	1.4191
Number of FO (dummy)	188	0	1	0.1809	0	0.3859	0.1489	1.6584	3.7502
Previous relation	188	0	1	0.4947	0	0.5013	0.2513	0.0213	1.0005
Number of valuations	188	1	7	2.5745	3	1.4027	1.9677	0.5055	2.5091
Year (dummy)	188	0	1	0.3989	0	0.491	0.2411	0.4128	1.1704

Source: Own production

4.3 TWO-SAMPLE KOLMOGOROV-SMIRNOV TESTS

4.3.1 Introduction to two-sample Kolmogorov-Smirnov tests

Univariate statistical tests can be a helpful tool to get a thorough understanding of the data set. Additionally, these tests allow a first check of the 14 postulated hypotheses. Kolmogorov-Smirnov (K-S) tests are used as the tests do not ask for the equality of distributions and more importantly, for homoscedastic data. Whereas violations of the normal distribution can be ignored, if the central limit theorem limit theorem of 30 observations (Le Cam, 1986) is met, homoscedasticity is still needed for classical univariate tests like ANOVA (Wooldridge, 2013). The existence of heteroscedasticity is a concern in the application of analysis of variance tests (ANOVA) as it can invalidate statistical tests of significance that assume that the modelling errors are uncorrelated and uniform; that their variances do not vary with the effects being modelled (Wooldridge, 2013). Kolmogorov-Smirnov is a non-parametric test of the equality of probability distribution, which is not affected by heteroscedasticity. Pre-tests have indicated violations of the homoscedasticity assumption and later tests will indicate this more precisely.

Furthermore, univariate tests in this research can be used to compare and check previous research results of Kisgen et al. (2009), who obtained most of their results purely from univariate statistics. Therefore, the univariate tests can demonstrate the appropriateness of the regression analysis by supporting and repeating the obtained results. In this dissertation the significance levels are chosen to be between 0.000-1.000%, 1.001%-5.000% and 5.001%-10%, where *** indicate a significance on the 1% level, ** at the 5% level and * at the 10% level.

4.3.2 Set-Up of Kolmogorov-Smirnov tests

Some adjustments are made for the Kolmogorov-Smirnov tests. For the independent variables size and cash some data points are excluded from the data set while running the Kolmogorov-Smirnov tests to increase the distinction between the two groups. Lilliefors (1967) recommends this statistical procedure to minimise risks of type I and type II errors. It is recommended to exclude deals around the mean of the independent variable. Deals with a value between 3 billion US Dollar and 5.0 billion US Dollar are excluded from the data set as the mean of size is 4 billion USD. Table 21 summarises the eliminated data points.

Table 21: Number of excluded size data points for K-S tests

		target	acquirer	entire
Size:	range	18	13	31
	accuracy	8	15	23
	under-/overvaluation	8	15	23

Source: Own production

Deals with a cash/stock ratio between 0.22 and 0.32 are excluded as the mean is around 0.27. Table 22 summarises the eliminated data points for the variable cash:

Table 22: Number of excluded cash data points for K-S tests

		target	acquirer	entire
Cash:	range	14	12	26
	accuracy	12	12	24
	under-/overvaluation	12	12	24

Source: Own production

All other variables are used in the existing version of a dummy variable or for the number of valuations, transformed accordingly. Deals with one valuation model have single valuations, all other are multiple valuations.

It is important to understand that the p-values of the Kolmogorov-Smirnov test can be too conservative for smaller samples (n<50). Nevertheless, a significant p-value will, even with this limitation, still be significant (Steinskog et al., 2007). Furthermore, even for the smallest of the data sets that is used in this thesis, the number of samples is still larger than 50.

4.3.3 Range

The Kolmogorov-Smirnov tests on valuation range fail to reject three of the nine remaining hypotheses on the independent variables in all three data sets. Table 21 on the next page summarises the results of all Kolmogorov-Smirnov tests. The distribution between targets and acquirers is not significantly different for range, which leads to a rejection of hypothesis 1b and contradicts the results of Cain and Denis. The valuations of targets do not have a significantly lower range and are, hence, not superior to fairness opinions of the acquirer.

Cash deals have on average a smaller valuation range than deals paid with stocks. The results of the K-S-test are highly significant for the entire data and acquirer data set and significant for the target and acquirer data sets. The significance of the three tests leads to a failure to reject hypothesis 2.

The variable size is highly significant in the entire data set and acquirer data set and significant on the 5% confidence level for the target data set. Smaller means can always be found in the group of larger deals. Therefore, larger deals lead to a lower valuation range in fairness opinions. The results fail to reject hypothesis 3.

Table 23: K-S results for range

Entire data set				
Independent variable:	**smaller mean**	**larger mean**	**p-value**	**Sig.**
Acquirer	Acquirer:	Target	0.323	
Cash	Cash	Stock	0.003	***
Size	Large	Small	0.000	***
Reputation	Top Tier	Not Top Tier	0.000	***
Bank	No	Yes	0.092	*
Number of FO	Multiple	Single	0.018	**
Number of valuations	Multiple	Single	0.011	**
Previous relation	Yes	No	0.203	
FINRA	Before	After	0.230	
Target data set				
Independent variable:	**smaller mean**	**larger mean**	**p-value**	**Sig.**
Cash	Cash	Stock	0.051	*
Size	Large	Small	0.029	**
Reputation	Top Tier	Not Top Tier	0.015	**
Bank	No	Yes	0.145	
Number of FO	Multiple	Single	0.251	
Number of valuations	Multiple	Single	0.152	
Previous relation	Yes	No	0.615	
FINRA	Before	After	0.436	
Acquirer data set				
Independent variable:	**smaller mean**	**larger mean**	**p-value**	**Sig.**
Cash	Cash	Stock	0.044	**
Size	Large	Small	0.001	***
Reputation	Top Tier	Not Top Tier	0.003	***
Bank	Yes	No	0.328	
Number of FO	Multiple	Single	0.055	*
Number of valuations	Multiple	Single	0.019	**
Previous relation	Yes	No	0.150	
FINRA	After	Before	0.279	

Source: Own production

Hypothesis 4 also fails to be rejected as all three models have delivered significant results for the independent variable reputation. Fairness opinions of banks with a higher reputation are more precise as the valuation range is smaller than for deals with a lower reputation. The results are highly significant for the entire and acquirer data sets and significant on the 5% level for the target data set.

Furthermore, the independent variables number of fairness opinions and number of valuations are significant in the entire and acquirer data set. Hence, the hypotheses 6 and 7 fail to be rejected. The smaller means can be found in the groups of multiple fairness opinions and multiple valuations. Hypothesis 5 has delivered marginally significant results in the entire data set, accordingly non-bank transaction have a smaller valuation range than bank deals.

The results of the K-S tests on range support the theoretical assumptions. None of the hypotheses has delivered significant results that are opposing the expected association on the valuation range.

It is noteworthy that the differences for size and cash are also significant, if the data around the means would not have been excluded.

4.3.4 Accuracy

The K-S results for valuation accuracy agree mostly with the results for valuation range. Hypothesis 3 fails to be rejected in all three data sets and, hence, larger deals increase significantly the valuation accuracy of fairness opinions. The results are highly significant for the entire data set and significant for the target and acquirer data set.

A top-tier reputation of the advisor leads to a higher precision of the valuations, which leads to a failure to reject hypothesis 4. Results are significant in all three data sets. The results for number of fairness opinions and number of valuations show significant results in all data sets and lower means for multiple fairness opinions and multiple valuations. The results are significant and marginally significant for number of fairness opinions and highly significant for the number of valuations.

Table 24: K-S results for accuracy

		Entire data set		
Independent variable:	**smaller mean**	**larger mean**	**p-value**	**Sig.**
Acquirer	Acquirer	Target	0.014	**
Cash	Cash	Stock	0.486	
Size	Large	Small	0.000	***
Reputation	Top Tier	Low Tier	0.015	**
Bank	No	Yes	0.185	
Number of FO	Multiple	Single	0.018	**
Number of valuations	Multiple	Single	0.000	***
Previous relation	Yes	No	0.342	
FINRA	Before	After	0.201	
		Target data set		
Independent variable:	**smaller mean**	**larger mean**	**p-value**	**Sig.**
Cash	Stock	Cash	0.028	**
Size	Large	Small	0.019	**
Reputation	Top Tier	Low Tier	0.076	*
Bank	No	Yes	0.043	**
Number of FO	Multiple	Single	0.052	*
Number of valuations	Multiple	Single	0.003	***
Previous relation	Yes	No	0.389	
FINRA	After	Before	0.344	
		Acquirer data set		
Independent variable:	**smaller mean**	**larger mean**	**p-value**	**Sig.**
Cash	Cash	Stock	0.167	
Size	Large	Small	0.015	**
Reputation	Top Tier	Not Top Tier	0.020	**
Bank	Yes	No	0.853	
Number of FO	Multiple	Single	0.088	*
Number of valuations	Multiple	Single	0.000	***
Previous relation	Yes	No	0.447	
FINRA	Before	After	0.184	

Source: Own production

Hence, hypotheses 6 and 7 fail to be rejected. The results so far are also found in the K-S tests on range.

However, the results for hypothesis 2, cash, are only significant in the target data set and they do not support hypothesis 2. Hypothesis 2 expects a positive association of cash on the valuation precision, but the K-S test shows smaller means and a higher precision for deals paid with stock. For the entire data set and the acquirer data set a higher precision can be found in the cash groups, however the results are not significant.

Lastly, a significant difference between targets and acquirers is observed. The valuation accuracy of the advisors of the acquirer is higher than that of the targets. The results lead to a rejection of hypothesis 1c and are, hence, in contrast to the results of Cain and Denis (2013), who have found FOs of the target to be more precise, however with regards to the valuation range.

4.3.5 Under-/overvaluation

The under- and overvaluation in the accuracy data sets is not only shown in the descriptive statistics, but also the K-S test on the entire data set has delivered highly significant results for hypothesis 1a. Smaller means can be found in the target data set and, consequently, hypothesis 1a fails to be rejected. For the following results discussion it is important to remember that the entire data set shows an undervaluation of approximately -1.3%. This implies that larger means help to lower the undervaluation, which is in contrast to the previous two K-S tests, where lower means increased the precision.

Table 25: K-S results for under-/overvaluation

Entire data set				
Independent variable:	**smaller mean**	**larger mean**	**p-value**	**Sig.**
Acquirer	Target	Acquirer	0.000	***
Cash	Cash	Stock	0.004	***
Size	Small	Large	0.012	**
Reputation	Not Top Tier	Top Tier	0.126	
Bank	Yes	No	0.005	***
Number of FO	Single	Multiple	0.133	
Number of valuations	Single	Multiple	0.002	***
Previous relation	Yes	No	0.013	**
FINRA	After	Before	0.004	***

Target data set				
Independent variable:	**smaller mean**	**larger mean**	**p-value**	**Sig.**
Cash	Cash	Stock	0.002	***
Size	Small	Large	0.015	**
Reputation	Not Top Tier	Top Tier	0.060	*
Bank	Yes	No	0.001	***
Number of FO	Single	Multiple	0.157	
Number of valuations	Single	Multiple	0.009	***
Previous relation	Yes	No	0.189	
FINRA	After	Before	0.064	*

Acquirer data set				
Independent variable:	**smaller mean**	**larger mean**	**p-value**	**Sig.**
Cash	Cash	Stock	0.044	**
Size	Large	Small	0.026	**
Reputation	Top Tier	Not Top Tier	0.229	
Bank	Yes	No	0.298	
Number of FO	Multiple	Single	0.359	
Number of valuations	Multiple	Single	0.102	
Previous relation	Yes	No	0.017	**
FINRA	After	Before	0.029	**

Source: Own production

The previously found mixed results on the association of cash on the precision are highlighted by the results for under-/overvaluation. In the entire data set and the target data set cash payments increase the undervaluation and, hence, lower the precision. The opposing association is given for the acquirer data set, where cash payments increase the precision significantly. The results for the acquirer data set fail to reject hypothesis 2. The descriptive statistics have shown that the target data set contains more valuations and a stronger overall undervaluation than is the overvaluation in the acquirer data set. Therefore, the results of the entire data set are influenced by the larger data set and the stronger misappraisal. Nonetheless, the association of cash on precision of fairness opinions can be doubted and further tests are needed.

The results of the K-S test for the independent variable size are significant in all three data sets and the precision is increased by a larger size of the deal. Hypothesis 3 fails to be rejected.

In contrast to the other tests on range and accuracy, the reputation of the advisor has no significant influence on the under-/overvaluation. Only for the target data set a marginal significance is found, where the association on the precision is as expected.

For the two data sets with undervaluation, the variable bank is highly significant. The undervaluation is reduced, if non-bank deals are evaluated. Therefore, hypothesis 5 fails to be rejected. The discussion has briefly addressed the issue that valuations models must be adapted to the needs of financial services in order to be used successfully. Hence, the association of a lower precision of bank deals is expected (Damodaran, 2013).

The number of valuations in one fairness opinion lowers the undervaluation in the entire and target data set. Results are highly significant and agree with previous findings on range and accuracy. Hypothesis 7 fails to be rejected.

The results for the exogenous variable FINRA are significant in all three data sets. The precision is always higher for deals before the legislation has changed. This is in contrast to the expected association of FINRA on the precision of fairness opinion. The results can be interpreted as a first indication that criticism on FINRA rule 2290 is correct and that the changes in legislation have only incorporated the de-facto industry standard into law. The previous K-S tests on range and accuracy support this argument as no significant, positive association is found and, consequently, no positive effects of FINRA are found. However, the results lead to a rejection of hypothesis 10.

4.3.6 Valuation models

The test of an influence of the valuation models on the precision of fairness opinions is also conducted with Kolmogorov-Smirnov tests. A dummy variable is build, which takes the value yes, if the valuation model to be analysed, is used in the underlying fairness opinion. If the model is not used, a no is assigned.

For the valuation range, DCF valuations do not influence the precision, which means that fairness opinions having a DCF valuation are not more precise than fairness opinions not making use of DCF valuations. Hence, hypothesis 12 fails to be rejected. The transaction multiple valuation does also not influence the valuation range, which leads to a rejection of hypothesis 14. In contrast to that, fairness opinions with earnings multiple valuations are more precise than deals without earnings multiple valuations. Hence, hypothesis 13 fails to be rejected. Deals in the entire data set using EM valuations have on average a valuation range of 29.4%, whereas fairness opinions without have a valuation range of 32.2%.

The tests on valuation accuracy fail to reject the three hypotheses 12 to 14 as the DCF valuation does not significantly change the valuation accuracy, whereas EM and TM both positively and highly significantly impact the valuation accuracy. Both help to increase the accuracy. For the entire data set, the difference between the suggested price and the paid price of fairness opinions with EM valuations is 12.8%, whereas the difference of FOs without the EM valuation is 17.8%. The differences for TM are 12.1% compared to 17.4%.

Concerning the under-/overvaluation of the fairness opinions all three hypotheses 12 to 14 fail to be rejected, again. The undervaluation of the entire and the target data set is reduced, if EM and TM are delivering valuations. For the entire data set, FOs with TM valuations do on average undervalue the deals by -0.7%, whereas FOs without the TM valuation come to an undervaluation of -1.8%. For EM the under valuations are -1.2% and -1.5% for the entire data set and -6.6% and -10.4% for the target data set, respectively.

The tests on the valuation models will be limited to univariate tests as an inclusion in the regression analysis will lead to problems of multicollinearity and endogeneity due to double accounting for the effects of multiple valuations.

Table 26: Results K-S tests for valuation models

Independent variable:	smaller mean	larger mean	p-value	Sig.
Data sets range				
DCF entire	Yes	No	0.945	
EM entire	Yes	No	0.002	***
TM entire	Yes	No	0.740	
DCF target	Yes	No	0.148	
EM target	Yes	No	0.040	***
TM target	Yes	No	0.409	
DCF acquirer	Yes	No	0.421	
EM acquirer	Yes	No	0.008	***
TM acquirer	Yes	No	0.132	
Data sets accuracy				
DCF entire	Yes	No	0.188	
EM entire	Yes	No	0.001	***
TM entire	Yes	No	0.004	***
DCF target	Yes	No	0.451	
EM target	Yes	No	0.004	***
TM target	Yes	No	0.004	***
DCF acquirer	Yes	No	0.216	
EM acquirer	Yes	No	0.067	*
TM acquirer	Yes	No	0.085	*

Independent variable:	smaller mean	larger mean	p-value	Sig.
Data sets under-/overvaluation				
DCF entire	No	Yes	0.478	
EM entire	No	Yes	0.054	*
TM entire	No	Yes	0.021	**
DCF target	No	Yes	0.255	
EM target	No	Yes	0.010	***
TM target	No	Yes	0.022	**
DCF acquirer	Yes	No	0.339	
EM acquirer	Yes	No	0.290	
TM acquirer	Yes	No	0.106	

Source: Own production

4.3.7 Main findings of Kolmogorov-Smirnov tests

The nine K-S tests on range, accuracy and under-/overvaluation have delivered consistent results for most of the exogenous variables. The results for size, reputation, number of fairness opinions and number of valuations show a strong, positive association to the precision of fairness opinions. The exogenous variables previous relation and FINRA have only delivered significant results in the under-/overvaluation analysis, which is in line with the discussions of the theoretical deduction. Cash has provided mixed results.

Cash shows a strong and negative association on the valuation range. Cash helps to lower the valuation range, but if the focus is moved to accuracy, the results are mixed. Cash helps to lower the overvaluation in the acquirer data set, but increases the undervaluation in the target data set and entire data set. The target data set for valuation accuracy sees also a decrease in the precision, if cash is used.

The size of the transaction is eminently important. Larger deals increase the valuation precision of fairness opinions in all three ways to measure the precision. The range is significantly lower, accuracy higher and under-/overvaluation is reduced. Based on the univariate statistics, readers of fairness opinions should consider the size of a target, if they doubt in the precision and information provided. It can be assumed that the increased availability of public and unbiased data helps to come to a better valuation.

The number of fairness opinions used in one deal has delivered significant results for the range and accuracy tests. The positive association, which is assumed in the theoretical discussion, is supported. More fairness opinions increase significantly the precision of fairness opinions.

The same results are observed for the number of valuations within one fairness opinion. If more valuation models are employed, the precision increases in all three groups of K-S tests.

The reputation of the advisor has delivered significant results for range and accuracy. The under-/overvaluation shows no association to the reputation. Top-Tier investment banks are able to deliver a lower valuation range and more precise valuations with regards to the later paid price. The theoretical discussion has delivered different assumptions why a positive association is expected. One of these assumptions is that advisors with a higher reputation cost more for the principal and are, hence, more likely engaged in larger transactions. Furthermore, it is assumed that top-tier advisors take more time in the creation process to come up with more valuation models. Additional K-S tests on the reputation[18] have delivered highly significant results supporting these arguments. Advisors with a higher reputation are engaged in larger deals that consume more fairness opinions and more valuations models. Hence, the certification hypothesis claiming that top-tier advisors are chosen to certify a bad deal must be rejected (Bebchuk and Kahan, 1989). Instead, the superior deal hypothesis is supported, which states that top-tier investment banks deliver better valuations as they fear a loss of reputation by certifying bad deals (Kisgen et al., 2009).

The results for the exogenous variables previous relation and FINRA are only significant in some of the tests on under-/overvaluation. Therefore, the results confirm the assumption that a previous relation does either positively or does not influence the precision. Criticism on a previous relation focuses on possible bias of the agent due to moral hazard and the will to satisfy a long-term partner. No indications are found for this. However, the positive association is neither found. There are no indications that the previous relation is beneficial to precision due to a better understanding of the company.

Theory assumes a positive association of the adoption of FINRA rule 2290 on the precision. However, this positive association is not confirmed by the K-S tests. Obviously the more scrutinised view by some researchers claiming that only the de-facto standard was implemented in legislation should be supported.

The significant test results of five variables in nearly all K-S tests demonstrate that the information provided by the fairness opinions can help to prudently check the quality of a fairness opinion. Hence, based on the univariate results, the hypothesis of law researchers that fairness opinions are just an expensive rubber

[18] See appendix 1

stamp cannot be supported. Contrary, fairness opinions are able to add value to M&A transaction by lowering asymmetric information levels.

Table 27 summarises the results of the Kolmogorov-Smirnov tests and indicates the general expected association of the independent variables for the OLS regressions. Only significant results are entered, hence an empty box does not imply that a test is not conducted, instead it means that the results are not significant.

The results of the K-S test should be briefly put in contrast to the results of Kisgen et al. (2009) and Cain and Denis (2013) on cumulative abnormal returns as their work was used to deduct the association of some of the independent variables with regards to fairness opinions. The statistical tests of Kisgen et al. are based solely on univariate tests. Hence, the results here allow a comparison. Kisgen et al. find significant results for cash, reputation and the number of fairness opinions used within one deal and a positive association to cumulative abnormal returns. The variables reputation and number of fairness opinions show the same positive association to the precision as the results of Kisgen et al. (2009) do for CARs. The association of cash on the precision is less explicit. Cain and Denis (2013) have found lower valuation ranges and CARs for fairness opinions of the target advisor. The results of the K-S tests support the opposing view and have significantly rejected their results. A higher precision is found for fairness opinions of the acquirer.

The tests on the influence of valuation models on the precision of fairness opinions have delivered clear results. The usage of DCF models does not influence the precision, but EM and TM do significantly increase the precision of fairness opinions, if they are applied.

Table 27: Summary of Kolmogorov-Smirnov test results

Independent variable	K-S range, entire	K-S range, target	K-S range, acquirer	K-S accuracy, entire	K-S accuracy, target	K-S accuracy, acquirer	K-S under-/overvaluation entire	K-S under-/overvaluation target	K-S under-/overvaluation acquirer	Result
Acquirer				+			+			+
Cash	+	+	+		-		-	-	+	o
Size	+	+	+	+	+	+	+	+	+	+
Reputation	+	+	+	+	+	+		+		+
Non-bank	+				+		+	+		+
Number of fairness opinions	+		+	+	+	+	+			+
Number of valuations	+		+	+	+	+	+	+		+
Previous relation							-		+	o
FINRA							-	-	+	o
DCF										
EM	+	+	+	+	+	+	+	+		+
TM				+	+	+	+	+		+

Source: Own production

Where + indicates a positive association on the variable, e.g. higher fraction of cash increases precision. o means mixed evidence and – indicates a negative association of variable on precision. Blanc fields have not delivered significant results

5 MULTIPLE REGRESSION ANALYSIS

The data set and its exogenous and endogenous variables are described and univariate tests have provided first results on the significances of the hypotheses. However, the power of the results is limited to the often unrealistic assumption that the effect of a variable x on the dependent variable is uncorrelated to variable y. Multiple regression analysis is able to capture these effects (Wooldridge, 2013). Therefore, chapter 5 will focus on multiple regression analyses.

5.1 LINEAR REGRESSIONS

5.1.1 Requirements for linear regressions

Multiple regression analysis is more amenable to ceteris paribus analysis because it allows to explicitly control for many other factors that simultaneously affect the dependent variable y. Ceteris paribus analysis is concerned with the question how x affects y. The key assumption for univariate tests is that all other factors influencing the dependent variable y are uncorrelated with the independent variable x, which is mostly unrealistic (Wooldridge, 2013).

Multiple regression models can accommodate many explanatory variables that may be correlated. The more useful factors are added to the model, the more of the variation in y can be explained. Thus, multiple regression analysis can be used to build better models for predicting the dependent variable. Ordinary least square regression models (OLS models) are the most common multiple regression model (Wooldridge, 2013). A linear regression, to which OLS regressions are counted, has three major purposes (Quinn and Keough, 2014):

(1) Describe the linear relationship between the dependent and the independent variable

(2) Explain how much of the variation in the dependent variable can be explained by changes in the independent variable

(3) Facilitate the prediction of future values of the dependent variable by changes of the independent variable.

The linear relationship between the dependent and the independent variables is shown by the following three formulas, where the regressions on range for the entire data set make use of the following formula. These formulas are derived from the standard multiple regression formula by Wooldridge (2013).

$$\boldsymbol{range} = \beta_0 + cash * \beta_{i1} + size * \beta_{i2} + reputation * \beta_{i3} + previous\ relation * \beta_{i4} + number\ of\ FO * \beta_{i5} + number\ of\ valuations * \beta_{i6} + bank * \beta_{i7} + year * \beta_{i8} + acquirer * \beta_{i9} + \varepsilon_i \qquad (10)$$

The regressions on accuracy are based on the following formula:

$$\boldsymbol{accuracy} = \beta_0 + cash * \beta_{i1} + size * \beta_{i2} + reputation * \beta_{i3} + previous\ relation * \beta_{i4} + number\ of\ FO * \beta_{i5} + number\ of\ valuations * \beta_{i6} + bank * \beta_{i7} + year * \beta_{i8} + acquirer * \beta_{i9} + \varepsilon_i \qquad (11)$$

The regressions on under-/overvaluation are based on the following formula:

$$\boldsymbol{under-/overvaluation} = \beta_0 + cash * \beta_{i1} + size * \beta_{i2} + reputation * \beta_{i3} + previous\ relation * \beta_{i4} + number\ of\ FO * \beta_{i5} + number\ of\ valuations * \beta_{i6} + bank * \beta_{i7} + year * \beta_{i8} + acquirer * \beta_{i9} + \varepsilon_i \qquad (12)$$

Where β_0 *the intercept of the model is,* β_1 *is the parameter associated with first independent variable,* β_2 *is the parameter associated with second independent variable etc., i stands for a randomly drawn observation from the population and* ε *the error term.*

The amount of variation in the dependent variable by a change of the independent variables is explained by the coefficient. By delivering these values for all independent variables, the future values of the dependent variable can be predicted, if the independent variables are known.

The ordinary least square regression models for the precision tests of the main analysis, range, accuracy and under-/overvaluation, are carried out in the statistical software STATA. The regression models for the robustness checks follow the same calculations; only the endogenous variable is replaced with the according variable.

To achieve robust results in a regression analysis, the underlying data need to exhibit different requirements (Kritzman, 1991a):

(1) Linearity
(2) No serial correlation/autocorrelation
(3) Homoscedasticity
(4) Normally distributed residuals
(5) No perfect multicollinearity
(6) Expected value of residuals equals zero
(7) No endogeneity

The first requirement is that the parameters are linear, which means that a one-unit increase in x changes the expected value of y by the amount of β_i. The linearity for range and accuracy is given as a change in the independent variables will either increase or decrease valuation range or accuracy.

For under-/overvaluation a deeper explanation is needed. The descriptive statistics and the results of the univariate tests have shown that the target data set faces an undervaluation and the acquirer data set an overvaluation. Linearity could not be assumed, if the question is raised how to increase precision on the entire data set as the effects of under- and overvaluation mitigate the effects on each other. However, if the research question is focussing on the answer how to lower the undervaluation (target data set) or how to lower the overvaluation (acquirer data set), linearity is given. In case of undervaluation, the stronger the overvaluation, the better are the results and vice versa.

No serial correlation, also known as autocorrelation, is tested by the help of Breusch-Godfrey tests. Violations of the homoscedasticity requirement are tested by the help of Breusch-Pagan and White tests. If the requirement of homoscedasticity is violated, heteroscedasticity is given, which requires changing the regression model from an OLS regression to an ordinary least squares regression, where heteroscedasticity robust standard errors are used (Wooldridge, 2013). The requirement of normally distributed residuals does not need to be qualified as the limit theorem of Levy states (Le Cam, 1986) that the residuals should be regarded as sufficiently normally distributed, if the number of observations is large enough. A number of 30 observations is considered as a large number of observations and as the smallest multiple regression is carried out on a data set of 88 observations, the normal distribution assumption can be accepted.

Multicollinearity is tested by the help of variance inflation factors. Multicollinearity does not reduce the predictive power or reliability of the model as a whole, at least within the sample data set; it only affects calculations regarding individual predictors as long as no perfect multicollinearity is given. That is, a multiple regression model with collinear predictors can indicate how well the entire bundle of predictors predicts the outcome variable, but it may not give valid results about any individual predictor, or about which predictors are redundant with respect to others (Wooldridge, 2013).

The expected value of the residuals being zero is generally considered as given as long as long as β_0 as the constant term is considered. The assumption is tested by visual tests of the residuals.

Endogeneity is especially problematic in panel data sets, which are not used in the empirical discussion. Endogeneity can also be caused in other data sets by omitting variables or overfitting. Autocorrelation can also lead to endogeneity, but is sufficiently tested for. Other causes for endogeneity are measurement errors in one of the independent variables, which can be neglected due to the way the data is derived. The last cause for endogeneity can be simultaneous causality, which can originate from multiple formulas to predict the causality; a situation which is also not given (Wooldridge, 2013). Hence, endogeneity is not a relevant factor in this empirical research.

In the following, the just described tests will be explained in more detail.

5.1.2 Multicollinearity: Variance inflation factor

Multicollinearity is often observed and a relevant case when R^2 of a regression analysis is "close" to one (Wooldridge, 2013). High (but not perfect) correlation between two or more of the independent variables is called multicollinearity and leads to a violation of the linearity requirement (1) (Wooldridge, 1989).

The variance inflation factor (VIF) is used in statistics to quantify the severity of multicollinearity in an ordinary least squares regression analysis (Balakrishnan, 2014). The tolerance and variance inflation factor for each variable is calculated to reveal potential multicollinearity problems. The threshold for tests on the VIF is set at 10 (Miles, 2014), although O'Brien claims for a less strict approach (2007). According to O'Brien "values of the VIF of 10, 20, 40, or even higher do not, by themselves, discount the results of regression analyses, call for the elimination of one or more independent variables from the analysis, suggest the use of ridge regression, or require combining of independent variable into a single index" (O'Brien, 2007, p. 676). This implies that the amount of variables used in the regression models must be reduced, if multicollinearity is detected. However, the variance inflation factor tests show clearly that multicollinearity does not exist in the data sets as the highest VIF value is below 3 and, hence, a discussion to use higher thresholds is not necessary, if the valuation models are not included in the OLS. Therefore, no independent variables need to be excluded. All tests for all regression analyses can be found in appendix 2.

5.1.3 Misspecification: Ramsey's RESET test

Ramsey's regression specification error tests (RESET tests) are carried out after every single regression analyses to detect general forms of misspecifications of the model (Ramsey, 1969). The test has proven to be most powerful to detect general functional form misspecifications like violations of the linearity requirement (Wooldridge, 2013). In case a misspecification of the model is indicated by the RESET test, independent variables will be tested up to the power of 4. This is a standard procedure recommended. If the F-test of the RESET test becomes significant, a functional form of misspecification does exist. A drawback with the RESET test is that it provides no real direction on how to proceed if the model is rejected. Furthermore, the test is not able to detect heteroscedasticity (Wooldridge, 1995).

5.1.4 Autocorrelation: Breusch-Godfrey test

Autocorrelation has two different forms. The first form of autocorrelation is related to time series data sets. The second form of autocorrelation is called spatial autocorrelation and can affect any data set. The Durbin–Watson test is a standard test to detect the presence of autocorrelation. Autocorrelation describes a relationship between values separated from each other by a given time lag in the residuals from a regression analysis (Durbin and Watson, 1971). Durbin and Watson applied this statistic to the residuals from least squares regressions (Chatterjee and Simonoff, 2013). Autocorrelation leads to a violation of the BLUE efficiency since the Gauss-Markov assumption is violated. Autocorrelation can be a significant problem in analysing historical data, especially of stock prices. Stock prices do not tend to change radically from one day to another. This means that a stock price might go down from 40 USD to 39.60 USD. The prices from one day to the next could be highly correlated. In order to avoid autocorrelation issues, the easiest solution is to convert the series of historical prices into a series of percentage-price changes from day to day, according to Wooldridge, 2013. According to this solution for autocorrelation, a time-series autocorrelation cannot exist as the precision for range, accuracy and under-/overvaluation is measured in percentage points. Additionally, the only time-series related variable is year, but no transaction has more than one data point and, hence, no series is given.

Although the first form of autocorrelation can generally be found in time-series analysis and panel data, where none of the two is applicable for the data sets used, tests on autocorrelation are conducted for all data sets. The test is needed as a second form of autocorrelation can, theoretically, exist, although geographical effects are not considered in this research as only the US market is analysed (Wooldridge, 2013).

In order to be able to run the analyses some minor adjustments on the dates are needed. By definition, every time point must be unique. Where the merger execution is made on the same day twice, the next free day was chosen. This limitation is present for every deal in the entire data sets as the fairness opinions of the target and the acquirer are mutually for the same deal and, as a consequence, the date of one of the two deals needs to be adjusted.

Although the described Durbin-Watson tests are a standard test for autocorrelation, Breusch-Godfrey tests are carried out. Breusch-Godfrey tests are similar to the Durban-Watson test, but are more general and have no restrictions on the regressors. Furthermore, the test is more powerful (Wooldridge (1991b)). Any probability of the Chi square test below 0.10 indicates autocorrelation (Godfrey, 1996). Despite the use of the more powerful Breusch-Godfrey tests, as expected, no autocorrelation is found in any of the data sets and regression analyses. The results of tests are stated in appendix 2.

5.1.5 Heteroscedasticity: Breusch-Pagan test and Information-matrix-test

The Breusch-Pagan test on random coefficients and the White test on specification robustness are conducted to check the presence of spatial heteroscedasticity. The Breusch-Pagan test begins by allowing the heteroscedasticity process to be a function of one or more of the used independent variables. The test is usually applied by assuming that heteroscedasticity may be a linear function of all the independent variables in the model (Pedace, 2013). A Chi-squared test is the basis of the Breusch-Pagan test. If the test statistic of the Chi-square test has a p-value below an appropriate threshold, in this case 10%, then the null hypothesis of homoscedasticity is rejected and heteroscedasticity is assumed.

The White-test is a specialisation of the Breusch-Pagan test and is less sensitive against violations of the standard distribution (Cameron and Trivedi, 2010). The White-test firstly uses the squared residuals from the original model. These serve as a proxy for the variance of the error term at each observation. The independent variables in the auxiliary regression account for the possibility that the error variance depends on the values of the original regressors in some way (Waldman, 1983). The non-constant coefficients in the auxiliary regression should be statistically indistinguishable from zero and R squared should be low. A high R^2 indicates violations of the hypothesis of homoscedasticity (Wooldridge, 2013).

Furthermore, an information matrix test (IM-test) is run for all regressions. The IM-test tests for heteroscedasticity, skewness and kurtosis follows the set-up of Cameron and Trivedi (1992). The test has the advantage that it also includes in its first term the just described White test for homoscedasticity against unrestricted forms of heteroscedasticity.

If heteroscedasticity is present, the ordinary least square regressions are made robust for heteroscedasticity. Robust regressions are indicated by the term "OLS HC3 YES". Heteroscedasticity does not influence the coefficients, but the standard errors and t-value. As a consequence of that, the P>t is too optimistic for large values. Nonetheless, heteroscedasticity does not cause a bias or inconsistency of the OLS estimators and does not violate the BLUE efficiency, if the sample size is large enough. Furthermore, it is not recommended to change from OLS to weighted least squares (WLS) or generalised least squares (GLS) regressions, if the functional form of heteroscedasticity is not known (Hayes and Cai, 2007).

Instead it is recommended to use heteroscedasticity-consistent standard error (HCSE) estimators of OLS parameter estimates (Long and Erwin, 2000; Davidson and MacKinnon, 1993). The main advantage is seen in the fact that, unlike WLS or GLS regressions, the fitted OLS regression requires neither knowledge about nor a model of the functional form of the heteroscedasticity and no transformation of Y is needed (Hayes and Cai, 2007). They describe the HCSE model as "an alternative and highly appealing method of reducing the effects of heteroscedasticity on inference […]. With this approach, the regression model is estimated using OLSs, but an alternative method of estimating the standard errors is employed that does not assume homoscedasticity." (Hayes and Cai, 2007, p.711).

Over the last 40 years different HCSE consistent estimators have been proposed. Starting with the work of Eicker (1963) and Huber (1967) over White (1980), HC0 to HC3 estimators are recommended. In current research HC3 estimators are seen as the most advanced estimators and simulations. Long and Ervin (2000) have evaluated the empirical power functions of the t test of the regressions coefficients, using both the ordinary OLS estimator and the four HC methods. They recommended that HC3 should always be used because it can keep the test size at the nominal level regardless of the presence or absence of heteroscedasticity. Additionally, only a slight loss of power is associated with HC3 when the errors are indeed homoscedastic. Cribari's et al. (2005) simulations results also suggest the superiority of HC3 over its predecessors. Nonetheless, HC3 consistent estimators are only used if heteroscedasticity is observed; otherwise the normal OLS regression will be carried out. This approach ensures that heteroscedasticity is carefully considered in the analysis.

The tests for heteroscedasticity can be found in appendix 2.

Summarising the results of the tests on the requirements for linear regressions it can be concluded that the regression models are only affected by heteroscedasticity and, where heteroscedasticity is detected, the regressions will be made robust to it. Any other concern like autocorrelation, misspecifications of the model and multicollinearity between the variables do not exist as the tests have indicated. Linearity is given due to transformation of the dependent variable under-/overvaluation to absolute values (dependent variable: accuracy). Autocorrelation is tested by the Breusch-Godfrey test, homoscedasticity by testing for heteroscedasticity and adjusting the regression models to a heteroscedasticity robust model, if needed. The residuals are normally distributed by visual checks; multicollinearity is tested by the variance inflation factor test. Expected value of the residuals is zero and endogeneity can be ignored due to the definitions of the tests.

5.2 MAIN ANALYSIS

5.2.1 Range

5.2.1.1 Entire data set on range

Model 1a examines the determinants of the valuation range for the entire data set. The F-test of the regression is highly significant (0.000) and R^2 shows a model fit of 0.137. The variables cash and size are highly significant and both variables lower the valuation range. Hence, hypothesis 2 and 3 fail to be rejected. The results do support the results of the univariate analysis. Reputation has a significant, positive influence on the range and a higher reputation leads to a lower valuation range. Hypothesis 4 fails to be rejected.

In contrast to the results of the univariate analysis, bank deals lower the valuation range. The K-S tests have provided that non-bank deals lower the valuation range. The results contradict the positive association of non-bank deals on valuation range that is expected.

The variables number of fairness opinions and number of valuation have not delivered significant results. However, the coefficients still support the positive association on range. For the other two variables, previous relation and FINRA, no significant results are found. This corresponds to the results of the univariate tests.

The missing significance of the variable acquirer leads to a rejection of hypothesis 1b. Previous studies by Cain and Denis (2013) have found lower valuation ranges for targets, but the OLS regression does not support this view.

Table 28: OLS regression valuation range on entire data set

Entire data set (model 1a)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Acquirer	-0.009	0.480	
Cash	-0.056	0.000	***
Size (ln)	-0.015	0.002	***
Reputation	-0.001	0.037	**
Bank	-0.027	0.073	*
Number of FO	-0.001	0.950	
Number of valuations	-0.008	0.125	
Previous relation	0.023	0.121	
FINRA	0.016	0.229	
Constant	0.468	0.000	***

R^2	0.137		
Probability F-test	0.000		
Sample size	388		
OLS HC3	Yes		

Source: Own production

5.2.1.2 *Target data set on range*

Model 1b focuses on fairness opinions issued by the advisors of the targets and offers a highly significant R^2 of 0.150 with a probability of the F test of 0.000.

The results for the variables cash and size are significant and highly significant and lower the valuation range of target's fairness opinions. These results are congruent to the results for the entire data set in model 1a and the results of the K-S tests. The results fail to reject the hypotheses 2 and 3.

The number of fairness opinions is marginally significant and more fairness opinions lower the valuation range. Hypothesis 7 fails to be rejected. The K-S tests did not deliver significant results for the number of FO.

A previous relation increases the valuation range for targets and the results are significant. Based on previous results and based on the theoretical outline, a previous relation is positively associated to the precision and not negatively.

Table 29: OLS regression valuation range on target data set

Target data set (model 1b)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.045	0.049	**
Size (ln)	-0.020	0.004	***
Reputation	0.000	0.328	
Bank	-0.022	0.327	
Number of FO	0.011	0.579	
Number of valuations	-0.013	0.055	*
Previous relation	0.040	0.043	**
FINRA	0.016	0.358	
Constant	0.484	0.000	***
R^2	0.150		
Probability F-test	0.000		
Sample size	200		
OLS HC3	Yes		

Source: Own production

5.2.1.3 *Acquirer data set on range*

Model 1c with its focus on the acquirer data set is based on 188 observations. The model itself is highly significant and R^2 is 0.138. The variables cash and size are significant as in the other two models on range, where cash is highly significant and size marginally significant. Both variables have a negative coefficient, which means that the valuation range gets smaller and the precision increases. The positive association is, hence, recognised. Hypotheses 2 and 3 fail to be rejected.

Comparable to the entire data set, reputation is significant and the range is lowered by advisors with a higher reputation. Hypothesis 4 fails to be rejected. All three results are confirmed by the previous univariate tests. In the univariate tests, number of fairness opinions and number of valuations have delivered significant results, reducing the valuation range. The positive association to the precision can be acknowledged by the negative coefficients, but the results are not significant.

Table 30: OLS regression valuation range on acquirer data set

Acquirer data set (model 1c)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.064	0.004	***
Size (ln)	-0.011	0.097	*
Reputation	-0.001	0.049	**
Bank	-0.028	0.182	
Number of FO	-0.001	0.972	
Number of valuations	-0.004	0.592	
Previous relation	0.003	0.898	
FINRA	0.001	0.966	
Constant	0.447	0.000	***
R^2	0.138		
Probability F-test	0.001		
Sample size	188		
OLS HC3	Yes		

Source: Own production

5.2.1.4 *Main findings on range*

To summarise the results of models 1a to 1c, it can be said that the same two independent variables are significant in all three models. These are cash and size. Based on the theoretical deduction, a large target is easier to value as more information sources are available, for example due to higher media coverage, which leads to lower levels of asymmetric information between the principal and the agent. Hence, the FO provider is not purely depending on the target's cooperation and goodwill to get the necessary data for the valuation process. Instead, the fairness opinion provider can access more publicly available and unbiased data. Additionally, controlling and monitoring of the agent is easier for the principal. The results of the first three regression analyses support this view.

The theory shows that cash deals are more precise as the final value of the offer is known whereas stocks can fluctuate and change the cash-equivalent exchange ratio in the acquisition process. Hence, a buffer is needed which will negatively influence the precision of fairness opinions.[19] These statements can be supported by the results of all three models 1a to 1c. Additionally, cash deals do better serve the pricing function of fairness opinions.

The reputation of the investment bank is built on the monetary size of deals supported in the past and, therefore, shows experience in valuing companies. The experience helps to come up with better valuations and comparisons, which reduce the valuation range. This perspective has been supported by two of three models (1a, 1c). The additional tests on reputation while carrying out the K-S tests have furthermore shown that the statements of Titman and Trueman (1986) are maintained that advisors with a higher reputation are more engaged in larger deals, where a higher fraction of cash is used and more fairness opinions are obtained. All three variables are assumed to have a positive association on the precision, which is supported by the OLS results. The results support the superior deal hypothesis.

The results of the first multiple analysis are in line with the results of the univariate tests of the previous chapter for hypotheses 1-3. The hypotheses for cash, size and reputation deliver significant results in both univariate tests and increase the precision. Hence, hypotheses 1-3 fail to be rejected. In the univariate tests, the hypothesis 5 (number of valuations) and 6 (number of fairness opinions) are both

[19] Due to the independence of the agreed purchase price and the prices in the fairness opinion, a correction for changes in an underlying index like the S&P 500 as it is needed for CAR analysis, is not mandatory (compare with chapter 3.2.1.2).

significant in two of three tests. The significances of the univariate tests are not supported by the multiple tests. This does, however, not mean that previous results of the univariate tests are wrong. Instead, the influence on the regression might be too low compared to size, cash and reputation. Hence, the results are not significant in the regression analyses.

5.2.2 Accuracy

5.2.2.1 Entire data set on accuracy

Model 2a examines the determinants of the valuation accuracy for the entire data set. The F-test of the regression is highly significant (0.000) and R^2 shows a model fit of 0.126. The mean of the transformed endogenous variable is 0.3445.

Size is again highly significant and a larger size of the target lowers the difference between the valuation and the paid price and is, therefore, beneficial for a higher precision. Hypothesis 3 fails to be rejected.

Highly significant are the number of valuations in one fairness opinion. The more valuations are used, the higher the precision. Hence, hypothesis 8 fails to be rejected.

Interestingly and against the assumed association, deals carried out before FINRA 2290 became effective, are more precise than deals afterwards. This leads to a rejection of hypothesis 10.

The variables acquirer, reputation and number of fairness opinions have not delivered significant results. The results are significant in the univariate analysis, though.

Table 31: OLS regression valuation accuracy on entire data set

	Entire data set (model 2a)		
Independent variable:	**coefficient**	**p-value**	**Sig.**
Acquirer	-0.015	0.389	
Cash	-0.001	0.973	
Size (ln)	-0.021	0.001	***
Reputation	0.000	0.723	
Bank	-0.026	0.203	
Number of FO	0.007	0.739	
Number of valuations	-0.028	0.000	***
Previous relation	0.025	0.177	
FINRA	0.042	0.022	**
Constant	0.552	0.000	***
R^2	0.126		
Probability F-test	0.000		
Sample size	390		
OLS HC3	Yes		

Source: Own production

5.2.2.2 *Target data set on accuracy*

The OLS regression on the target data set is highly significant and R^2 is 0.145. The mean of the endogenous variable, after transformation, is 0.352. The target data set shows the highest difference of the three data sets on accuracy.

The two variables size and number of valuations are significant, which is in line with the previous test on the entire data set. The negative coefficients indicate for both variables an increase in precision. Therefore, the hypotheses 3 and 8 fail to be rejected. Both variables have also delivered significant results in the univariate tests.

However, other variables that have shown significant results in the univariate analysis like cash, reputation, bank and number of fairness opinions fail to deliver significant results in the regression analysis.

Table 32: OLS regression valuation accuracy on target data set

Target data set (model 2b)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	0.041	0.126	
Size (ln)	-0.020	0.013	**
Reputation	0.000	0.884	
Bank	-0.009	0.736	
Number of FO	0.032	0.241	
Number of valuations	-0.030	0.003	***
Previous relation	0.016	0.476	
FINRA	0.030	0.194	
Constant	0.534	0.000	***

R^2	0.145		
Probability F-test	0.000		
Sample size	202		
OLS HC3	Yes		

Source: Own production

5.2.2.3 *Acquirer data set on accuracy*

The mean of the dependent variable, after transformation, is 0.336, which means that the acquirer data set has the highest accuracy of the three data sets. The OLS regression on the acquirer data set is highly significant and R^2 is 0.141.

The independent variables size and number of valuations are again significant and increase the precision of the fairness opinion, which leads to a failure to reject the hypotheses 3 and 8. These results are also observed in the other two data sets on accuracy and the univariate analysis.

The variable bank is marginally significant and bank deals increase the precision. This is against the predicted association that non-bank deals are more precise. The Kolmogorov-Smirnov test supports the view that the valuation accuracy is higher for bank deals, but did not find significant results.

Reputation and number of fairness opinions have delivered significant results in the univariate tests, but these results are not supported in the OLS regressions.

Lastly, the independent variable FINRA is marginally significant and deals analysed after the change in legislation are less precise. This leads to a rejection of hypothesis 10, where an increased precision after the adoption of FINRA rule 2290 is assumed.

Table 33: OLS regression valuation accuracy on acquirer data set

Acquirer data set (model 2c)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.041	0.257	
Size (ln)	-0.022	0.018	**
Reputation	0.000	0.894	
Bank	-0.054	0.097	*
Number of FO	-0.024	0.529	
Number of valuations	-0.029	0.006	***
Previous relation	0.027	0.368	
FINRA	0.058	0.064	*
Constant	0.567	0.000	***
R^2	0.1405		
Probability F-test	0.006		
Sample size	188		
OLS HC3	Yes		

Source: Own production

5.2.2.4 Main findings on accuracy

The main findings for the three OLS regressions on accuracy are that the valuation accuracy is significantly increased, if the deal is larger and more valuation models are used within the fairness opinion. Hence, hypotheses 3 and 8 fail to be rejected in all three data sets. The results for the number of valuation models support the arguments that with more valuation models the pricing function of fairness opinions is better fulfilled and that information asymmetries are lowered by every valuation model used.

The implications of size based on the theoretical discussion are already addressed in the main findings of range. However, further univariate tests, which can be found in the appendix 1, deliver further significant results. Larger deals are more likely to be advised by top-tier investment bank, which are believed to assist only better performing deals. Furthermore, larger deals are more likely to use multiple fairness opinions and fairness opinions with multiple valuation models. All results are highly significant (see appendix 1 for details). These significant results might also explain why the univariate tests have provided significant results for reputation and number of fairness opinions for all three data sets. These findings are not supported by the OLS regressions.

Only for the acquirer data set, the accuracy is increased by bank deals. The results are marginally significant. The assumptions are that non-bank deals are more precise as valuation models need to be adapted to value banks accordingly. The univariate tests have not delivered significant results for bank in the acquirer data set, but in the target data set. For the target data set, non-bank deals increase the precision of fairness opinions. But the OLS regression failed to deliver significant results for this.

5.2.3 Under- and overvaluation

The tests on the under- and overvaluations in the data sets must be limited to the target and acquirer data sets as linearity concerns are raised for the entire data set in chapter 5.1.1. Hence, the analysis will begin with the target data set.

5.2.3.1 Target data set on under-/overvaluation

The endogenous variable for the target data set shows an undervaluation of -8.08%. Hence, a positive coefficient helps to lower the undervaluation and increase the precision. The OLS regression delivers two significant variables.

The first significant variable is cash. The negative coefficient of cash, however, does violate the positive association of cash, which is assumed based on the theoretical outline and indicates that hypothesis 2 must be rejected. Stock deals are more precise than cash deals as the undervaluation is lower. This result is supported by the univariate tests.

The other significant variable is bank and bank deals increase the undervaluation and are, consequently, less precise. With regards to hypothesis 5, the results indicate a failure to reject hypothesis 5. Non-bank deals are expected to be more precise as valuation models do not need to be adjusted. The K-S test agrees to these findings.

The univariate tests have again delivered further significant variables, which are not supported by the OLS regression. The results provided by the tests include a higher precision of large deals and fairness opinions issued by an advisor with a higher reputation. Additionally, the number of valuations is highly significant in the K-S tests and more valuations lower the undervaluation. Although the results are not significant in the regression analysis, the coefficients indicate that larger deals and FOs with more valuation models are more precise.

Table 34: Under-/overvaluation on target data set

Target data set (model 3a)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.069	0.047	**
Size (ln)	0.006	0.519	
Reputation	0.000	0.734	
Bank	-0.067	0.024	**
Number of FO	0.001	0.972	
Number of valuations	0.002	0.824	
Previous relation	-0.025	0.384	
FINRA	0.011	0.683	
Constant	-0.082	0.154	
R^2	0.082		
Probability F-test	0.033		
Sample size	202		
OLS HC3	Yes		

Source: Own production

5.2.3.2 *Acquirer data set on under-/overvaluation*

The endogenous variable for the acquirer data set shows an overvaluation of +5.96%, which is significantly smaller than the undervaluation of -8.08% in the target data set. This is in line with the previous results, where the acquirer data sets have also been superior to the target data sets with regards to the precision. Due to the overvaluation, a negative coefficient helps to lower the overvaluation and increases the precision. The OLS regression delivers four significant variables.

Highly significant is the variable size, which helps to lower the overvaluation in the acquirer data set. Hence, hypothesis 3 fails to be rejected. Cash is significant on the conventional level of 5% and, in contrast to the target data set, helps to increase the precision. Cash reduces the overvaluation attached by the advisor of acquirer on the target, which is also in line with the theoretical deduction. Both variables are also significant in the univariate tests.

Table 35: Under-/overvaluation on acquirer data set

Acquirer data set (model 3b)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.082	0.032	**
Size (ln)	-0.028	0.008	***
Reputation	0.001	0.057	*
Bank	-0.062	0.077	*
Number of FO	0.044	0.314	
Number of valuations	-0.018	0.158	
Previous relation	-0.004	0.905	
FINRA	0.029	0.440	
Constant	0.223	0.009	***
R^2	0.0851		
Probability F-test	0.009		
Sample size	188		
OLS HC3	Yes		

Source: Own production

Marginally significant are reputation and bank, where a higher reputation increases the overvaluation and bank deals lower it. Hence, both results are contradicting the hypothesis 4 and 5. Based on the theoretical deduction non-bank deals and deals of advisors with a higher reputation are expected to be more precise. Both results are not supported by the Kolmogorov-Smirnov tests, where even a higher precision was found for deals advised by top-tier banks. However, the results have not delivered significant results. Besides the marginal significance of reputation, the coefficient is also around zero with 0.001 and, hence, reputation has nearly no influence on the overvaluation as an 1 point increase in reputation does only lead to an improvement of 0.001% of the overvaluation.

5.2.3.3 *Main findings on under-/overvaluation*

The main findings of the OLS regressions on under-/overvaluation are that due to linearity problems a discussion of the entire data set is not possible and a break-down into the target and acquirer data set does also not deliver consistent results. The univariate tests are better suited for tests on the under- and overvaluation of the data sets as they can also be performed on the entire data set, where significant results for nearly all variables are obtained.

The results of the OLS regressions are limited as they do not match between the data sets as in previous tests on range and accuracy. The main reason is that the difference in the valuations is explainable by the variable acquirer, which has yielded highly significant results in the Kolmogorov-Smirnov test on the entire data set. This variable is consistent with hypothesis 1a as the main determinant whether the target is overvalued or undervalued in FOs. Hence, the theoretical deduction is correct and advisors of the acquirer overvalue the target to indicate that the offered price offers a good investment to the shareholders. The shareholders of the acquirer can assume to buy an undervalued asset as the fair price is, according to the fairness opinion, higher than the market capitalisation suggests.

The limitations of the under-/overvaluation due to the linearity concerns of the entire data set lead to an exclusion from tests on the robustness of the results in the chapters 5.3 to 5.5.

5.2.4 Main findings on regressions

The results of the multiple regression tests just carried out are for the most significant variables in line with expectation from theory and the results put forward by the univariate tests carried out before.

In all eight OLS regressions, the variable size increases the precision of fairness opinions. The valuation range is significantly reduced and the accuracy increases. The undervaluation in the target data set is reduced and the overvaluation in the acquirer data set is lowered as well. The results for size fail to reject hypothesis 3 in all data sets. Further univariate tests have shown that some of the assumptions of the theoretical deduction are correct. Larger deals make more often use of advisors with a higher reputation and larger deals consume more fairness opinions than smaller deals and make use of more valuation models per fairness opinion. All three variables have proven to improve the precision in the Kolmogorov-Smirnov tests.

The independent variable cash has a significant influence on the valuation range. In all three models the valuation range is reduced, if cash is used as the payment method. Therefore, hypothesis 2 fails to be rejected. The theoretical deduction has highlighted that cash financed deals are easier to value for the advisor as no specific knowledge is needed in valuing additional share capital. Cash deals do also carry a fixed monetary value, whereas share prices can fluctuate, which required an additional buffer for these fluctuations.

In the same vein, reputation does significantly lower the valuation range. Advisors with a higher reputation create fairness opinions with a smaller valuation range, leading to a failure to reject hypothesis 4. Further tests on reputation have shown that, in line with expectations, higher reputation is often linked to deals with a larger size and more fairness opinions with more valuation models. Again, all three variables have a positive association to the precision of fairness opinions.

Whereas the number of valuations has delivered significant results on range and accuracy in the univariate tests, the significance of the variable is only found in the regressions on accuracy. In these regressions, the number of valuations is highly significant and helps to increase the valuation accuracy. Hence, hypothesis 7 fails to be rejected.

Although the number of fairness opinions has delivered significant results in the univariate tests, none of the regression analyses has supported this view. The number of fairness opinions is not significant in the regression models. One explanation for this discrepancy can be seen in the correlations to size and reputation, which is demonstrated before. Larger deals and deals assisted by top-tier advisors are linked to an increased number of fairness opinions. Hence, in the

OLS regression analysis this positive correlation can explain the missing significance.

Furthermore, the missing significant results for bank, previous relation and FINRA are worth to be discussed in more detail. All variables have only yielded significant results in one of the tests on range and accuracy. The missing significances of bank and previous relation indicate that the problems and doubts in the variables raised in the theoretical discussion by some researchers are not severe. Advisors have to adopt the valuation models for banking services, but do obviously not use these adjustments to their advantage by issuing heavily manipulated valuations only to foster deal completion.

The deal completion hypothesis is also used to explain the concerns by some researchers towards a previous relation. Due to moral hazard, Morgensohn (2005) sees risks from a previous relation that might potentially lower the precision of fairness opinions. He assumes that previous connections and personal bonds between the advisor and the management might put pressure on the advisor to craft a fairness opinion in the interest of the management team. The results of this analysis show that these negative associations are not supported. However, Cain and Denis (2013) and Kisgen et al. (2009) assume that a previous relation will help to increase the precision of fairness opinions as the company is better known and due to ongoing valuations more reliable and updated financial forecasts exist for affiliated advisors. These assumptions have also let to the positive association expressed by hypothesis 8. However, these positive associations can also not be significantly supported by the regression analysis and the univariate tests.

Criticism on FINRA rule 2290 has largely focused on the fact that de-facto industry standards given by previous court rulings are only put into legislation. Based on the results of the univariate and multiple tests, these assumptions are supported and the increase in disclosure requirements has not let to a significant increase in the precision of fairness opinions.

5.3 ROBUSTNESS CHECK: DISCOUNTED CASH FLOW VALUATION

5.3.1 Introduction to robustness checks

The previous chapter has shown that most of the hypotheses can be significantly supported, but some of the variables have come up with different coefficients than assumed. All models have in common that a valuation mean is used, which is calculated based on the results of all valuation methods. However, not all valuation models are used equally often within fairness opinions. When the data set was introduced, it is mentioned that DCF valuations are used in roughly 80% of all fairness opinions considered in this research, earnings multiple valuations in nearly 60% and transaction multiples in approximately 45% of all these fairness opinions. Any other valuation models are only used in 53% of any fairness opinion.

Due to the importance of the three valuation models DCF, earnings multiple and transaction multiple on the previously used valuation means, further analyses is beneficial to either support previous findings or come up with new findings. If the independent variables are also significant for the valuation models, the results can be seen as tested and reinforced. The following tests on the three valuation models fulfil, consequently, the role of robustness tests.

The test of the valuation models will follow in the same order as before. First the range will be analysed and afterwards, the accuracy. Under-/overvaluation is analysed as well, but the results are only shown in the appendices as again no tests on the entire data set are possible.

Outliers are eliminated before running the regressions. This leads for the DCF regressions on range to an elimination of three deals on the target side and two on the acquirer side, resulting in 5 data points for the entire data set. For the accuracy data set three and four data points are eliminated on the target and acquirer side, respectively, totalling seven for the entire data set.

For the EM regressions two data points are removed in the target and acquirer data sets, respectively, totalling four in the entire data set. This applies to both the range and accuracy data sets.

For the TM regressions one data points is removed from the target data set and one from the acquirer data set, totalling two data points in the entire data set for range. Again one data point is removed for the target data set on accuracy and three on the acquirer data set, totalling four data points in the entire data set.

5.3.2 Regression Analysis: Range Discounted Cash Flow Valuation

The first robustness check on the entire data set is highly significant and R^2 is 0.121. The dependent variable has a mean value of 0.316, which implies that the valuation range of DCF valuations for the entire data set is approximately 1% larger than the mean of all valuation models on range.

The most significant variables of model 1a are supported by the robustness checks. Cash and size are highly significant again and both lower the valuation range. Hence, hypothesis 2 and 3 fail to be rejected. The significant results for reputation and bank are not supported by the DCF test. Instead, previous relation is highly significant and a previous relation increases the valuation range. This leads to a rejection of hypothesis 9, where smaller valuation ranges are expected, if a previous relation exists. The significance of hypothesis 9 suggests that the most used valuation method might be used to come to favourable valuations that are in line with management's expectations.

The robustness check for the target data set supports previous findings of model 1b. Cash and size are marginally significant and both lower the valuation range. This leads to a failure to reject hypothesis 2 and 3. Previous relation is again highly significant and a previous relation increases the valuation range. Model 1b has delivered the same result. The significance of number of valuation is not supported by the DCF robustness check. Model 4b is highly significant with R^2 of 0.113.

Table 36: OLS regression DCF range on entire data set

Entire data set (model 4a)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Acquirer	-0.013	0.408	
Cash	-0.081	0.000	***
Size (ln)	-0.018	0.002	***
Reputation	0.000	0.491	
Bank	-0.024	0.222	
Number of FO	-0.025	0.154	
Number of valuations	-0.004	0.539	
Previous relation	0.056	0.002	***
FINRA	0.004	0.801	
Constant	0.475	0.000	***
R^2	0.121		
Probability F-test	0.000		
Sample size	314		
OLS HC3	Yes		

Table 37: OLS regression DCF range on target data set

Target data set (model 4b)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.055	0.069	*
Size (ln)	-0.017	0.051	*
Reputation	0.000	0.882	
Bank	-0.015	0.610	
Number of FO	-0.031	0.195	
Number of valuations	-0.008	0.338	
Previous relation	0.070	0.006	***
FINRA	-0.008	0.714	
Constant	0.460	0.000	***
R^2	0.113		
Probability F-test	0.010		
Sample size	164		
OLS HC3	Yes		

Source: Both tables 36 and 37 are own production

Table 38: OLS regression DCF range on acquirer data set

Acquirer data set (model 4c)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.105	0.001	***
Size (ln)	-0.018	0.021	*
Reputation	0.000	0.498	
Bank	-0.027	0.326	
Number of FO	-0.007	0.793	
Number of valuations	-0.001	0.914	
Previous relation	0.034	0.200	
FINRA	-0.001	0.973	
Constant	0.477	0.000	***
R^2	0.139		
Probability F-test	0.001		
Sample size	150		
OLS HC3	Yes		

Source: Own production

The DCF robustness check on accuracy supports the results for cash and size. Again, a larger fraction of cash and a larger size in a transaction lead to an increased precision, resulting in a failure to reject hypotheses 2 and 3. The variable reputation is not significant in the robustness check. The dependent variable has a mean of 0.285, which is below the mean of model 1c with 0.3012. Hence, the DCF valuations of the acquirer are more precise than those of the target advisors. The model itself is highly significant and R^2 is 0.138.

5.3.3 Regression Analysis: Accuracy Discounted Cash Flow Valuation

Based on a sample size of 312 deals, model 5a is highly significant with R^2 of 0.083. The results fully support previous findings on the accuracy for the entire data set. The variables size and number of valuations are highly significant and increase the valuation accuracy, which leads to a failure to reject hypotheses 3 and 8. The independent variable FINRA is marginally significant and deals after changes in legislation lower the accuracy, also supporting previous results. The result leads to a rejection of hypothesis 10.

Table 39: OLS regression DCF accuracy on entire data set

Entire data set (model 5a)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Acquirer	0.005	0.827	
Cash	-0.028	0.320	
Size (ln)	-0.022	0.003	***
Reputation	0.000	0.847	
Bank	-0.017	0.513	
Number of FO	0.008	0.788	
Number of valuations	-0.017	0.047	**
Previous relation	0.012	0.612	
FINRA	0.044	0.051	*
Constant	0.548	0.000	***
R^2	0.083		
Probability F-test	0.001		
Sample size	312		
OLS HC3	Yes		

Source: Own production

Model 5b does again fully support previous findings of model 2b. Size and number of valuations are significant and increase the valuation accuracy. Hence, hypotheses 3 and 7 fail to be rejected. Model 5b's R^2 is 0.151 and is the model is highly significant. Model 5c fails to be significant and, therefore, no analysis is presented.

Table 40: OLS regression DCF accuracy on target data set

Target data set (model 5b)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.040	0.231	
Size (ln)	-0.022	0.005	***
Reputation	0.000	0.835	
Bank	0.000	0.992	
Number of FO	0.007	0.831	
Number of valuations	-0.021	0.052	*
Previous relation	-0.003	0.926	
FINRA	0.039	0.131	
Constant	0.568	0.000	***
R^2	0.151		
Probability F-test	0.000		
Sample size	164		
OLS HC3	Yes		

Table 41: OLS regression DCF accuracy on acquirer data set

Acquirer data set (model 5c)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.012	0.804	
Size (ln)	-0.021	0.093	*
Reputation	0.000	0.918	
Bank	-0.036	0.408	
Number of FO	0.004	0.938	
Number of valuations	-0.014	0.353	
Previous relation	0.029	0.466	
FINRA	0.051	0.272	
Constant	0.531	0.000	***
R^2	0.052		
Probability F-test	0.506		
Sample size	148		
OLS HC3	Yes		

Source: Both tables 40 and 41 are own production

The valuation accuracy of all three DCF models on accuracy is lower than the accuracies of the main analysis. Whereas the data sets of model 2a-2c have an average accuracy of 14.9%, the difference for DCF valuations is 17.5%, hence the difference between the valuation in the FO and the paid price is 2.6% higher. The just stated values of the means are not transformed (in contrast to those used in the regressions and are, hence, not comparable to the values provided in chapter 4.2.5).

5.4.1 Regression Analysis: Range Earnings Multiple Valuation

Model 6a is significant at the 5% confidence level and R^2 is 0.110. The independent variables cash and size are significant, which agrees to the results of model 1a. Both lower the lower the valuation range, which leads to a failure to reject the hypotheses 2 and 3. The variables acquirer and previous relation fail to deliver significant results. The results are, therefore, in line with model 1a. The significances for reputation and bank of model 1a are not supported by the robustness checks on earnings multiple for the entire data set.

Table 42: OLS regression EM range on entire data set

Entire data set (model 6a)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Acquirer	-0.009	0.690	
Cash	-0.056	0.053	**
Size (ln)	-0.024	0.007	***
Reputation	0.000	0.635	
Bank	-0.032	0.243	
Number of FO	0.010	0.695	
Number of valuations	0.009	0.371	
Previous relation	-0.005	0.830	
FINRA	0.023	0.316	
Constant	0.472	0.000	***
R^2	0.110		
Probability F-test	0.022		
Sample size	223		
OLS HC3	Yes		

Source: Own production

The OLS regressions on the targets' data set and the acquirers' data set in model 6b and 6c are not significant and, hence, no further results can be drawn from the analysis. The missing significances of the models 6b and 6c indicate that further, yet unknown, variables explain the valuation range for the earnings multiple model. Naturally the selection of corresponding companies (peer group) is expected to be the most important variable, although this assumption cannot be tested.

Table 43: OLS regression EM range on target data set

Target data set (model 6b)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.049	0.280	
Size (ln)	-0.021	0.076	*
Reputation	0.000	0.510	
Bank	-0.030	0.452	
Number of FO	0.049	0.180	
Number of valuations	0.004	0.809	
Previous relation	0.009	0.768	
FINRA	0.031	0.342	
Constant	0.450	0.000	***
R^2	0.097		
Probability F-test	0.398		
Sample size	121		
OLS HC3	Yes		

Source: Own production

Table 44: OLS regression EM range on acquirer data set

Acquirer data set (model 6c)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.046	0.243	
Size (ln)	-0.026	0.094	*
Reputation	0.000	0.655	
Bank	-0.029	0.459	
Number of FO	-0.023	0.553	
Number of valuations	0.010	0.509	
Previous relation	-0.017	0.689	
FINRA	0.004	0.908	
Constant	0.502	0.000	***
R^2	0.151		
Probability F-test	0.138		
Sample size	102		
OLS HC3	Yes		

Source: Own production

5.4.2 Regression Analysis: Accuracy Earnings Multiple Valuation

Model 7a investigates the accuracy of fairness opinions using the multiple earnings valuation model on the entire set. The model is significant at the 5% confidence level and R^2 of the model is 0.077. Two independent variables are significant, reputation and acquirer. Both variables are not significant in the main analysis. However, as reputation helps to increase the precision, hypothesis 4 fails to be rejected. The significance of acquirer leads to a rejection of hypothesis 1c. The significance of acquirer indicates that the valuation accuracy of the bidder advisors is better than that of the targets. This does imply that the quality of the fairness opinions of acquirers is higher than that of the targets. Consequently, the results are contradicting previous results of Cain and Denis (2012), who found a higher quality for target advisors' fairness opinions.

Table 45: OLS regression EM accuracy on entire data set

Entire data set (model 7a)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Acquirer	-0.040	0.064	*
Cash	0.042	0.178	
Size (ln)	0.003	0.691	
Reputation	-0.001	0.019	**
Bank	-0.026	0.313	
Number of FO	-0.007	0.758	
Number of valuations	-0.006	0.625	
Previous relation	0.001	0.970	
FINRA	0.037	0.114	
Constant	0.425	0.000	***
R^2	0.077		
Probability F-test	0.050		
Sample size	223		
OLS HC3	Yes		

Source: Own production

In line with the results for EM on range, the regression models for the target and acquirer data sets are not significant.

Table 46: OLS regression EM accuracy on target data set

Target data set (model 7b)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	0.022	0.628	
Size (ln)	0.002	0.831	
Reputation	-0.001	0.026	**
Bank	-0.010	0.787	
Number of FO	0.008	0.792	
Number of valuations	-0.008	0.620	
Previous relation	0.030	0.396	
FINRA	0.031	0.340	
Constant	0.423	0.000	***
R^2	0.067		
Probability F-test	0.435		
Sample size	121		
OLS HC3	Yes		

Table 47: OLS regression EM accuracy on acquirer data set

Acquirer data set (model 7c)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	0.065	0.131	
Size (ln)	0.003	0.772	
Reputation	-0.001	0.267	
Bank	-0.049	0.195	
Number of FO	-0.027	0.421	
Number of valuations	-0.005	0.750	
Previous relation	-0.030	0.380	
FINRA	0.049	0.138	
Constant	0.398	0.000	***
R^2	0.101		
Probability F-test	0.250		
Sample size	102		
OLS HC3	Yes		

Source: Both tables 46 and 47 are own production

5.5 ROBUSTNESS CHECK: TRANSACTION MULTIPLE VALUATION

5.5.1 Regression Analysis: Range Transaction Multiple Valuation

The dependent variable of model 8a has a mean of 0.312. The model is highly significant and R^2 is 0.1503. The independent variables cash and reputation are significant. Both lower the valuation range and increase the precision, which leads to a failure to reject the hypotheses 2 and 4. Both variables are also significant in the main analysis. The significance of size and reputation, which is found in the main analysis, is not supported by the results on the transaction multiple valuation model.

Table 48: OLS regression TM range on entire data set

Entire data set (model 8a)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Acquirer	-0.012	0.616	
Cash	-0.083	0.006	***
Size (ln)	-0.016	0.137	
Reputation	-0.001	0.092	*
Bank	-0.011	0.708	
Number of FO	0.012	0.659	
Number of valuations	0.001	0.928	
Previous relation	-0.002	0.922	
FINRA	0.046	0.135	
Constant	0.475	0.000	***
R^2	0.1503		
Probability F-test	0.001		
Sample size	184		
OLS HC3	Yes		

Source: Own production

R^2 of model 8b is 0.230 and the model itself is highly significant. The mean of the dependent variable is 0.313 and the valuation range is significantly reduced by the independent variables size, whereas FINRA increases the valuation range. As size lowers the valuation range and, hence, increases the precision of the FO, hypothesis 3 fails to be rejected. The negative association of FINRA on range leads to a rejection of hypothesis 10. The significance of the variables cash, number of valuations and previous relation in the main analysis are not supported by model 8b.

Table 49: OLS regression TM range on target data set

Target data set (model 8b)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.070	0.148	
Size (ln)	-0.033	0.021	***
Reputation	-0.001	0.426	
Bank	-0.018	0.694	
Number of FO	0.054	0.163	
Number of valuations	-0.001	0.947	
Previous relation	0.015	0.661	
FINRA	0.090	0.030	**
Constant	0.550	0.000	***
R^2	0.230		
Probability F-test	0.003		
Sample size	92		
OLS HC3	Yes		

Source: Own production

The F-test of the OLS regression for model 8c is not significant and will not be further analysed.

Table 50: OLS regression TM range on acquirer data set

Acquirer data set (model 8c)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.076	0.056	*
Size (ln)	0.003	0.818	
Reputation	-0.001	0.043	**
Bank	-0.007	0.863	
Number of FO	-0.005	0.915	
Number of valuations	0.002	0.923	
Previous relation	-0.014	0.714	
FINRA	-0.005	0.922	
Constant	0.382	0.000	***
R^2	0.125		
Probability F-test	0.117		
Sample size	92		
OLS HC3	Yes		

Source: Own production

5.5.2 Regression Analysis: Accuracy Transaction Multiple Valuation

The F-test of model 9a is highly significant and R^2 explains 0.075 of variation in the model. The significance of size and number of valuations corresponds to the results of the main analysis and the negative coefficients indicate that the precision increases, if the target is larger and more valuation models are used. Hence, hypothesis 3 and 8 fail to be rejected. Cash and acquirer have not delivered significant results in the main analysis. However, in model 9a a higher fraction of cash helps to increase the precision, which leads to a failure to reject hypothesis 2. The valuation provided by the acquirer shows a lower accuracy than those of the targets. The marginal significance leads a rejection of hypothesis 1c.

The OLS regression of model 9b is not significant.

Table 51: OLS regression TM accuracy on entire data set

Entire data set (model 9a)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Acquirer	0.046	0.084	*
Cash	-0.061	0.091	*
Size (ln)	-0.017	0.067	*
Reputation	0.000	0.429	
Bank	-0.034	0.267	
Number of FO	-0.065	0.020	**
Number of valuations	-0.010	0.480	
Previous relation	0.001	0.968	
FINRA	0.048	0.117	
Constant	0.445	0.000	***
R^2	0.1207		
Probability F-test	0.007		
Sample size	182		
OLS HC3	No		

Table 52: OLS regression TM accuracy on target data set

Target data set (model 9b)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	0.004	0.944	
Size (ln)	-0.019	0.143	
Reputation	0.000	0.616	
Bank	-0.066	0.193	
Number of FO	0.080	0.059	*
Number of valuations	-0.012	0.600	
Previous relation	-0.022	0.604	
FINRA	0.001	0.982	
Constant	0.449	0.000	***
R^2	0.102		
Probability F-test	0.301		
Sample size	92		
OLS HC3	Yes		

Source: Both tables 51 and 52 are own production

Table 53: OLS regression TM accuracy on acquirer data set

Acquirer data set (model 9c)			
Independent variable:	**coefficient**	**p-value**	**Sig.**
Cash	-0.110	0.018	**
Size (ln)	-0.012	0.608	
Reputation	0.000	0.688	
Bank	0.002	0.961	
Number of FO	0.036	0.524	
Number of valuations	-0.021	0.325	
Previous relation	0.017	0.703	
FINRA	0.092	0.097	*
Constant	0.505	0.000	***
R^2	0.169		
Probability F-test	0.074		
Sample size	90		
OLS HC3	Yes		

Source: Own production

Model 9c is marginally significant with an R^2 value of 0.169. Cash and FINRA are the two significant, independent variables. Cash increases the valuation accuracy, which leads to a failure to reject hypothesis 2. Deals analysed after the adoption of FINRA rule 2290 are less precise, supporting the results of the main analysis. This leads to a rejection of hypothesis 10.

5.6 RESULTS AND IMPLICATIONS OF REGRESSION ANALYSIS

5.6.1 Range

For range, consistent with the expectations, size, cash and reputation play an important role in determining the precision of fairness opinion, indicated by significant results. Nearly all univariate and multiple tests have yielded significant results for size and cash. Therefore, the results fail to reject the hypotheses 2 and 3. The valuation range is smaller if deals are larger and a higher fraction of cash is used as a method of payment. For reputation, in two out of three tests in the main analysis, hypothesis 4 fails to be rejected. In both tests deals with a higher reputation of the investment bank offer a smaller valuation range than deals advised by a lower tiered investment bank.

The distinction between target and acquirers is, as expected, not significant for the valuation range. This leads to a failure to reject hypothesis 1b. The theory has shown that targets are expected to be undervalued by the advisors of the selling company and overvalued by the advisor of the buyer. Both advisors do this to imply that the offered conditions of the deal are beneficial for the corresponding party. The selling party will get a better price than a fair price would suggest and the acquirers will not find a better investment opportunity as the fair value of the target is higher than the offered price. As diverging valuation prices do not necessarily affect the valuation range, no association was assumed.

Marginally significant are the results for bank deals in the entire data set. Bank deals offer a lower valuation range and in turn a higher precision than non-bank deals. The theory has suggested opposite associations. Interestingly, the univariate test shows a higher precision for non-bank deals. The number of valuations has delivered significant results for the target data set on range. More valuations lower the range. Hence, hypothesis 8 fails to be rejected. The Kolmogorov-Smirnov tests found significant results in all three data sets.

Table 54: Summary independent variables, only significant variables and directions for main analysis

Independent variable Data set	Acquirer	Cash	Size	Reputa-tion	Non-Bank	Number of FO	Number of valuations	Previous relation	FINRA
Range, entire		+	+	+	-				
Range, target		+	+				+	-	
Range, acquirer		+	+	+					
Accuracy, entire			+				+		-
Accuracy, target			+				+		
Accuracy, acquirer			+		-		+		-
under-/overvaluation, target	+	-			+				
under-/overvaluation, acquirer	+	+		-	-				
K-S range, entire		+	+	+	+	+	+		
K-S range, target		+	+	+					
K-S range, acquirer		+	+	+		+	+		
K-S accuracy, entire	+		+	+		+	+		
K-S accuracy, target		-	+	+	+	+	+		
K-S accuracy, acquirer			+	+		+	+		
K-S under-/overvaluation, entire	+	-	+		+	+	+	-	-
K-S under-/overvaluation, target		-	+	+	+		+		-
K-S under-/overvaluation, acquirer		+	+					+	+
Result	+	+	+	+	o	+	+	o	-

Source: Own production

Where + indicates a positive impact on the precision of fairness opinions, o a neutral influence on precision and – a negative impact. Empty fields indicate no significant results.

Previous relation is expected to have a positive association to the valuation range, but only for the target data set significant results are given. These results support the opposing view that a previous relation is bad for the valuation range.

The results for cash, size and reputation are also supported by the robustness checks. For the DCF valuation on range, the independent variable previous relation is highly significant for the entire and the target data set. However, a previous relation does not increase the precision; it lowers the precision and increases the valuation range. Hence, the results do again contradict the expectations and investors should be careful, when a previous relation is given and DCF valuations are used. For any other valuation model this risk is not statistically supported.

5.6.2 Accuracy

The valuation accuracy is influenced by two independent variables, size and number of valuations. Both have delivered significant results in all three models of the main analysis on accuracy. Both variables help to increase the accuracy of the fairness opinions and, hence, hypothesis 3 and 8 fail to be rejected. These results are also supported by the univariate tests. The relevance of size and number of valuations on accuracy is supported by significant results in the robustness checks on the DCF valuation model and transaction multiples.

Hypothesis 1c claims that the difference between acquirer and target valuations is not relevant for the valuation accuracy. The hypothesis fails to be rejected as no significant results are found. The Kolmogorov-Smirnov tests fully support this view. However, the robustness checks have delivered significant results in two of the tests; one has a positive association, the other one a negative association.

The distinction between deals carried out before the change in legislation, FINRA, has delivered significant results for the entire data set and marginally significant results for the acquirer data set. According to hypothesis 10, deals after the change are associated with a higher precision. The results suggest a different association, which leads to a rejection of hypothesis 10. The valuation accuracy was higher before the changes in legislation have occurred. These results are supported by some of the robustness checks for accuracy. In two of them significant results are found and the association is negative, again. Consequently, the robustness checks support the results of the main analysis. The univariate tests do not support, but also not contradict, the results as they find no significant results for the variable FINRA.

5.6.3 Under-/Overvaluation

The results for the tests on under-/overvaluation are not as clear as the results for valuation range and accuracy. Most significantly, the univariate tests on the entire data set are also able to demonstrate with highly significant results that acquirer advisors come to higher valuations than target advisors. Hence, hypothesis 1a fails to be rejected. It is important to highlight that this difference between undervaluation and overvaluation has a strong influence on the results of the independent variables in the further discussion of the results of under-/overvaluation.

The most important result, the difference between target and acquirer valuations, is highly significant in both regression models on the target and the acquirer set. Due to the violation of linearity, tests on the entire data set are not possible. However, for the two data sets analysed, acquirer based fairness opinions are more precise than those of the target. This is a clear contradiction to previous studies on fairness opinions, where better results are found in the target sought fairness opinions.

Cash, for example, is significant in all tests on under-/overvaluation. However, the questions whether cash deals are more precise than stock deals cannot be answered in a simple sentence due to diverging results. In the target data set, cash deals lower the valuation, which leads to a larger undervaluation and a lower precision. For the acquirer data set, however, cash deals are more precise than stock deals as they help to lower the overvaluation. The univariate tests support these results.

The same differentiation is needed for bank deals. Bank deals are less precise in the target data set, but more precise in the acquirer data set. However, in the univariate tests, bank deals are always less precise.

Surprisingly, for the under-/overvaluation discussion, size has not delivered significant results in the regression analysis, but in all three Kolmogorov-Smirnov tests. Based on the univariate tests, larger deals are more precise than smaller deals as they help to lower the under- and overvaluation.

Table 55 summarises the results of the robustness checks.

Table 55: Summary of significant variables robustness tests

<table>
<tr><th>Independent variable</th><th>DCF range, entire data set</th><th>DCF range, target data set</th><th>DCF range, acquirer data set</th><th>DCF accuracy, entire data set</th><th>DCF accuracy, target data set</th><th>DCF accuracy, acquirer data set</th><th>EM range, entire data set</th><th>EM range, target data set</th><th>EM range, acquirer data set</th><th>EM accuracy, entire data set</th><th>EM accuracy, target data set</th><th>EM accuracy, acquirer data set</th><th>TM range, entire data set</th><th>TM range, target data set</th><th>TM range, acquirer data set</th><th>TM accuracy, entire data set</th><th>TM accuracy, target data set</th><th>TM accuracy, acquirer data set</th><th>Result</th></tr>
<tr><td>Acquirer</td><td></td><td></td><td></td><td></td><td></td><td rowspan="9">not significant</td><td></td><td rowspan="9">not significant</td><td rowspan="9">not significant</td><td>+</td><td rowspan="9">not significant</td><td rowspan="9">not significant</td><td></td><td></td><td rowspan="9">not significant</td><td>-</td><td rowspan="9">not significant</td><td></td><td>o</td></tr>
<tr><td>Cash</td><td>+</td><td>+</td><td>+</td><td></td><td></td><td>+</td><td></td><td>+</td><td></td><td>+</td><td>+</td><td>+</td></tr>
<tr><td>Size</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td><td>+</td><td></td><td></td><td>+</td><td>+</td><td></td><td>+</td></tr>
<tr><td>Reputation</td><td></td><td></td><td></td><td></td><td></td><td></td><td>+</td><td>+</td><td></td><td></td><td></td><td>+</td></tr>
<tr><td>Bank</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>o</td></tr>
<tr><td>Number of fairness opinions</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>o</td></tr>
<tr><td>Number of valuations</td><td></td><td></td><td></td><td>+</td><td>+</td><td></td><td></td><td></td><td></td><td>+</td><td></td><td>+</td></tr>
<tr><td>Previous relation</td><td>-</td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td></tr>
<tr><td>FINRA</td><td></td><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td><td>-</td><td></td><td>-</td><td>-</td></tr>
</table>

Source: Own production

Where + indicates a positive impact on the precision of fairness opinions, o a neutral influence on precision and – a negative impact. Empty fields indicate no significant results.

5.7 MAIN FINDINGS OF EMPIRICAL ANALYSES

The results of the empirical research can help to end some of the ongoing discussions which variables are important for fairness opinions and which impact they are expected to have for some variables, for which neither clearly positive nor clearly negative results were found so far as the theoretical discussion has shown. The tests at hand have also delivered the so far missing multiple statistics for fairness opinion research.

First of all, the results show that some variables are crucial for the precision of fairness opinions, demonstrated in form of the significances found. Fairness opinions can add value to mergers and acquisitions by lowering information asymmetries and providing insides to the valuation models applied within the valuation process and delivering precise and accurate results under certain circumstances as the failure to reject most of the hypotheses has shown.

Therefore, fairness opinions can be more than a legal protection for managers. They are able to fulfil their pricing function under given situations very well. Shareholders can gain additional information from fairness opinions and use them for their advantages. The information content delivered solves, at least partly, the classical information gap arising from the principal-agent problem. The principal (shareholder) gains additional information to oversight the agent (management board) and make a more profound decision whether to sell the shares. The principal achieves the power to distinguish a good deal from a bad deal and might be able to intervene in deal execution. Alternatively, the principal is able to apply sanctions on the agent in form of a dismissal of management or litigation. Therefore, the results of this paper are showing that fairness opinions can be or are more than just a "rubber stamp" (Liu, 2015, p.8).

Secondly, the results demonstrate that cash payments and a larger size are generally helpful to increase the quality of a fairness opinion, even when checking the results on the three mostly used valuation models. For cash, the results are limited to the valuation range as the valuation accuracy provides no significant results and the under-/overvaluation mixed results. The results for size are significantly reducing the valuation range and the valuation accuracy is higher for larger deals.

A higher reputation of the investment bank lowers the valuation range significantly and helps to increase the accuracy, at least in the univariate tests. Further research has shown that top-tier banks are more associated with larger deals that have used multiple valuations and valuation models and cash. Hence, a missing significance in the multiple tests can be explained by these correlations, although the correlations are statistically not relevant for the regression analysis. Nonetheless, the superior deal hypothesis is supported by a higher reputation.

Thirdly, a higher number of fairness opinions created for one deal as well as a larger number of valuation models used in the opinion help to increase the precision based on the findings of the univariate tests. The results for the number of valuations are also supported by the OLS regressions for accuracy. With more valuation models and fairness opinions in one deal, information asymmetries are better lowered between all parties involved and pricing function is additionally better fulfilled.

Fourth of all, the theoretical outline has already shown that a previous relation is not expected to have a negative influence on the precision of fairness opinions. As only in one regression a significant result was found, the hypothesis that a previous relation does not influence the precision negatively fails to be rejected. This means that the concerns raised with regards to previous relations and a possible bias of FOs can statistically not be supported.

The results do, furthermore, indicate that the changes in legislation by passing the FINRA rule 2290 in the end of 2007 have not led to significant changes in the quality of fairness opinions. The precision has not increased after that, neither for range nor for accuracy. Criticism on the improved disclosure requirements discussed in the literature review, hence, seems to be correct. The change in legislation appears to have adopted the de-facto requirements set by court decisions into written law.

Furthermore, the tests and missing tests on the hypotheses 5 (bank/non-bank), 6 (friendly deals) and 11 (contingency fees) help to answer and end some of the ongoing discussion in the current body of literature. Contingency fees are used in nearly every fairness opinion nowadays and must, therefore, not be seen as a warning signal to the readers of fairness opinions. Contingency fees are instead a common remuneration component and FOs are nonetheless able to fulfil their pricing function and information function.

The data set also demonstrates that fairness opinions are only issued in friendly mergers. The risks of being engaged in a hostile merger, where the pricing function of fairness opinions is at risk due to a huge level of asymmetric information as the support of the target is not given, prevent the investment banks from accepting the contract. Hence, in hostile mergers fairness opinions are only very rarely written.

The reformulated hypothesis on bank/non-bank deals has not provided clear results, which means that the needed changes in the valuation models for bank deals are not used by investment banks to manipulate the valuation models in a negative kind. This would results in a lower precision. If valuation models are changed, these changes occur obviously only to deliver a valuation and not to do harm to the shareholders or managers.

An overview of all outcomes of the main analysis is presented in table 54 on page 218 and table 55 on page 222. A plus indicates a positive influence on the precision of fairness opinions.

6 CONCLUSION AND OUTLOOK

Fairness opinions are subject of intensive discussions amongst researchers. On the one hand law researchers assume that fairness opinions are sought by management to protect themselves from liability in case of shareholder litigation. Any other objective than that is denied. On the other hand, economic research indicates that further benefits must exist. "Even at high values for price variance, fairness opinions appear to contain incremental information", according to Cain and Denis (2013, p.24).

The aim of the dissertation is to find and define variables that influence the precision of fairness opinions. In order to achieve this objective, four sub objectives have been formulated in the introduction. The first three sub objectives consider the theoretical deduction of variables and its association to the precision of fairness opinions.

The first sub objective is to extract variables from the discussion of the functions fairness opinions have to fulfil and the information they provide. The discussion of the functions has provided eleven variables that are assumed to influence the precision plus the three hypotheses on the valuation models. The second sub objective is to discuss the principal-agent theory in relation to fairness opinions in order to gain associations of the variables. This sub objective is successfully reached and in combination with the first and third sub objective, positive, negative and neutral associations of the variables are derived. The third sub objective is to deduct the association to precision of deal specific variables from M&A research and fairness opinion specific variables from existing FO research.

The fourth sub objective is to analyse the data with appropriate statistical models. This is achieved in the empirical chapters and the provided results will now be summarised.

Deals paid in cash rather than in stock lower the valuation range. However, evidence on accuracy is not significant and on under-/overvaluation mixed. For the acquirer data set deals paid in cash increase the precision, for the target data set these deals lower the precision.

Additionally, the argument stated in the discussion of the results of the regression analysis on under-/overvaluation that “last-minute” price changes might not be fully considered in a fairness opinion might explain the discrepancies to the expected outcome. The argument can be supported by the fact that the results on valuation range are clear, where a raised price does not influence the range due to the different calculations for range and under-/overvaluation.

The hypothesis that target advisors significantly undervalue the target, whereas acquirer advisors overvalue the target is supported. The under-/overvaluation discussion provides significant results for that. The results and the means suggest that the most accurate valuation with regards to the under-/overvaluation can be achieved, if the two valuations of the target and the acquirer’s bank are averaged. This valuation is near the later paid price. However, in contrast to previous research results by Kisgen et al. (2009), fairness opinions by the advisor of the acquirer are more precise than those of the advisor of the target.

All significant variables are an addition to current research due to the explorative nature of this research. Especially the results on number of valuations and number of fairness opinions are an addition to current research. Besides some general ideas on risk sharing or mitigation of extremely wrong valuations by either obtaining multiple fairness opinions or employing multiple valuations, no research in relation to fairness opinions is carried out on this so far, but the expected positive association due to pricing function and information asymmetries is supported.

The research of this dissertation supports previous results of Kisgen et al. (2009) on deal size and reputation. Therefore, at least a minor connection to cumulative abnormal return studies is indicated by the results of this research. This means that for further research other exogenous variables that are significant for cumulative abnormal returns might be of significance for research on the precision of fairness opinions as well.

The use of robustness checks by the means of the three most used valuation methods of the data set and running the same ordinary least square regressions on these methods, is new in relation to fairness opinions. The results of the main analysis hold true even after the robustness checks.

The Kolmogorov-Smirnov tests on the valuation models have provided significant results for the hypotheses that the use of earnings multiple and transaction multiple valuation models increase the precision of fairness opinions compared to those that do not make use of these models.

Although not in the focus of this research, the paper is able to support the numbers presented by Cain and Denis (2013) for their data set on multiple fairness opinions in mergers. Cain and Denis (2013) have seen that 8% of the deals in their data set use two fairness opinions and 1% obtain three opinions. In this newer data set 10% of all deals make use of two opinions and 2% make use of three opinions. The average valuation ranges have improved since the research of Cain and Denis (2013). They reported average valuation ranges of 76% for acquirers and 60% for targets and 57% for deals where both sides obtained fairness opinions. The average ranges in this data set are 31% for targets and 30% for acquires, 31% in the total data set.

Due to the limitations of the data set, tests on the hypotheses for contingency fees and hostile mergers are not possible. Nearly all deals in the data set make use of contingency fees, which implies that contingency fees are an industry standard, at least in the US market. The limited number of hostile transactions does also support the statements of Servaes and Zenner (1996) that especially advisors with a high reputation try to avoid assisting in hostile acquisitions.

Finally it can be said that the paper at hand provides a first and comprehensive insight to variables influencing the precision of fairness opinions. Precise fairness opinions can be assumed to serve more functions than the stated certification and processing function. These opinions are worth to be read by the shareholders or other involved parties. The results support the statement of Cain and Denis (2013), who argument that "it is possible that fairness opinions are informative when they are presented within a narrow range, but uninformative when there is greater variability in the valuation estimates" (Cain and Denis 2013, p.23), if the higher quality assumption of more precise FOs is accepted. Fairness opinions are able to lower information asymmetries and to fulfil the pricing function. They do not only limit the liability of management by providing an insurance function.

Changes and improvements in legislation are still not strict enough and need to be continued. The impact of FINRA rule 2290 on the precision of fairness opinions is rather negative than positive, although significant results are only found in some tests. Nonetheless, where significant results are achieved, the precision of fairness opinions have been higher before legislation was improved.

Further research:

Due to the fact that the results of this research are new and exclusive so far, they indicate a need for further research. In general, the results need to be repeated in another research with the same focus, but a different data set. Furthermore, the results of the regressions indicate that further variables influence the precision of fairness opinions as R^2 and adjusted R^2 are explaining only parts of the variations. These results are expected as only variables directly obtainable from the fairness opinions are considered. Future research should concentrate on any of the different fields offered in M&A research to find additional, significant variables.

Further research should also expand the geographical region. The research at hand has sorely focused on US mergers and acquisitions, but especially the Swiss market offers great potential for further research. Swiss companies are obliged to publish fairness opinions as well as US American companies are compelled to do. Testing the results of this research on the Swiss market does not only add a new country to the discussion, but also a new continent with financial markets that are not fully comparable to the US markets. The data set in this dissertation does also not incorporate cross-border mergers. Including this element might provide additional and new insights as well.

Secondly, a test on the significance of other variables related to M&A research seems to be promising. Weber et al. (2014) show that different focus points in M&A like financial data, negotiation and due diligence, just to mention a few, offer further variables to be researched. The theoretical discussion has highlighted one specific variable that might be of interest, relative size of the target. But also the discussion on the different strategies to acquire a target by obtaining a toehold has illustrated the ongoing discussion in recent M&A research on the importance of blockholders and their level of activism. Therefore, blockholdership as a variable might deliver further, significant results (Gaughan, 2011, Ireland et al., 2009). In the last years stock market performance of companies engaged in M&A activities has also introduced the concept of debt levels of the engaged companies. Results suggest that the level of debt has an influence on the performance due to tax advantages and, consequently, debt levels might also affect the precision of fairness opinions (Trinchera, 2012).

While discussing the fundamentals on fairness opinions, different areas of usage are identified, although fairness opinions are mostly used in M&A transactions. However, testing the significant variables on the other objectives, where FOs are used, can confirm the findings of this research.

Furthermore, the unpublished Factoral Memorandum can be researched, if the focus is placed on litigation. This would allow testing whether the normally unpublished Factoral Memorandum contains additional information that have an influence on the precision and should, consequently, always be published.

Lastly, the DCF valuation model has shown that it is negatively biased by a previous relation of the investment bank to the requester of the fairness opinion. As in many fairness opinions the DCF valuation is the only valuation model that comes to a valuation range, promising results can be expected from a data set only containing these deals.

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APPENDICES

APPENDIX 1: UNIVARIATE TEST RESULTS

Results for range, entire data set:

independent variable: Bank

Smaller group	D	P-value	Corrected
No:	0.1122	0.092	
Yes:	-0.0858	0.248	
Combined K-S:	0.1122	0.184	0.153

n=388

independent variable: Size

Smaller group	D	P-value	Corrected
Large:	0.2517	0.000	
Small:	-0.0176	0.958	
Combined K-S:	0.2517	0.000	0.000

n=357

independent variable: Cash

Smaller group	D	P-value	Corrected
Cash:	0.2154	0.003	
Stock:	-0.0560	0.680	
Combined K-S:	0.2154	0.007	0.004

n=362

independent variable: Reputation

Smaller group	D	P-value	Corrected
Top Tier:	0.2289	0.000	
not Top Tier:	-0.0177	0.943	
Combined K-S:	0.2289	0.000	0.000

n=388

independent variable: No. of fairness opinion

Smaller group	D	P-value	Corrected
Multiple:	0.1831	0.018	
Single:	-0.0316	0.887	
Combined K-S:	0.1831	0.036	0.025

n=388

independent variable: Previous relation

Smaller group	D	P-value	Corrected
No:	0.0167	0.948	
Yes:	-0.0912	0.203	
Combined K-S:	0.0912	0.403	0.357

n=388

independent variable: Number of valuations

Smaller group	D	P-value	Corrected
Multiple:	0.1627	0.011	
Single:	-0.0613	0.530	
Combined K-S:	0.1627	0.023	0.016

n=388

independent variable: Who acquirer

Smaller group	D	P-value	Corrected
Acquirer:	0.0762	0.323	
Target:	-0.0216	0.913	
Combined K-S:	0.0762	0.625	0.578

n=388

independent variable: year

Smaller group	D	P-value	Corrected
after FINRA rule 2290	0.0700	0.386	
before FINRA rule 2290	-0.0870	0.230	
Combined K-S:	0.0870	0.455	0.407

n=388

Results for range, target data set:

independent variable: Bank

Smaller group	D	P-value	Corrected
No:	0.1409	0.145	
Yes:	-0.1138	0.283	
Combined K-S:	0.1409	0.289	0.235

n=200

independent variable: Size

Smaller group	D	P-value	Corrected
Large:	0.2227	0.029	
Small:	-0.0114	0.991	
Combined K-S:	0.2227	0.058	0.040

n=182

independent variable: Cash

Smaller group	D	P-value	Corrected
Cash:	0.2133	0.051	
Stock:	-0.0268	0.954	
Combined K-S:	0.2133	0.101	0.03

n=186

independent variable: Reputation

Smaller group	D	P-value	Corrected
Top Tier:	0.2069	0.015	
not Top Tier:	-0.0245	0.942	
Combined K-S:	0.2069	0.029	0.020

n=200

independent variable: No. of fairness opinion

Smaller group	D	P-value	Corrected
Multiple:	0.1512	0.251	
Single:	-0.0909	0.607	
Combined K-S:	0.1512	0.494	0.413

n=200

independent variable: Previous relation

Smaller group	D	P-value	Corrected
No:	0.0509	0.778	
Yes:	-0.0708	0.615	
Combined K-S:	0.0708	0.968	0.954

n=200

independent variable: Number of valuations

Smaller group	D	P-value	Corrected
Multiple:	0.1451	0.152	
Single:	-0.0672	0.667	
Combined K-S:	0.1451	0.303	0.246

n=200

independent variable: year

Smaller group	D	P-value	Corrected
after FINRA rule 2290	0.0663	0.642	
before FINRA rule 2290	-0.0908	0.436	
Combined K-S:	0.0908	0.801	0.753

n=200

Results for range, acquirer data set:

independent variable: Bank

Smaller group	D	P-value	Corrected
No:	0.0931	0.451	
Yes:	-0.1102	0.328	
Combined K-S:	0.1102	0.632	0.568

n=188

independent variable: Size

Smaller group	D	P-value	Corrected
Large:	0.3308	0.001	
Small:	-0.0490	0.854	
Combined K-S:	0.3308	0.001	0.001

n=175

independent variable: Cash

Smaller group	D	P-value	Corrected
Cash:	0.2333	0.044	
Stock:	-0.1302	0.379	
Combined K-S:	0.2333	0.088	0

n=176

independent variable: Reputation

Smaller group	D	P-value	Corrected
Top Tier:	0.2542	0.003	
not Top Tier:	-0.0141	0.982	
Combined K-S:	0.2542	0.006	0.004

n=188

independent variable: No. of fairness opinion

Smaller group	D	P-value	Corrected
Multiple:	0.2209	0.055	
Single:	-0.0331	0.937	
Combined K-S:	0.2209	0.110	0.076

n=188

independent variable: Previous relation

Smaller group	D	P-value	Corrected
No:	0.0273	0.933	
Yes:	-0.1423	0.150	
Combined K-S:	0.1423	0.300	0.245

n=188

independent variable: Number of valuations

Smaller group	D	P-value	Corrected
Multiple:	0.2232	0.019	
Single:	-0.0983	0.464	
Combined K-S:	0.2232	0.038	0.025

n=188

independent variable: year

Smaller group	D	P-value	Corrected
after FINRA rule 2290	0.1168	0.279	
before FINRA rule 2290	-0.0550	0.753	
Combined K-S:	0.1168	0.545	0.480

n=188

Results for accuracy, entire data set:

independent variable: Bank

Smaller group	D	P-value	Corrected
No:	0.0943	0.185	
Yes:	-0.0066	0.992	
Combined K-S:	0.0943	0.367	0.339

n=390

independent variable: Size

Smaller group	D	P-value	Corrected
Large:	0.2565	0.000	
Small:	0.0000	1.000	
Combined K-S:	0.2565	0.000	0

n=367

independent variable: Cash

Smaller group	D	P-value	Corrected
Cash:	0.0656	0.486	
Stock:	-0.0827	0.319	
Combined K-S:	0.0827	0.617	0.578

n=366

independent variable: Reputation

Smaller group	D	P-value	Corrected
Top Tier:	0.0098	0.982	
not Top Tier:	-0.1498	0.015	
Combined K-S:	0.1498	0.029	0.026

n=390

independent variable: No. of fairness opinion

Smaller group	D	P-value	Corrected
Multiple:	0.0076	0.993	
Single:	-0.1822	0.018	
Combined K-S:	0.1822	0.036	0.031

n=390

independent variable: Previous relation

Smaller group	D	P-value	Corrected
No:	0.0197	0.928	
Yes:	-0.0956	0.172	
Combined K-S:	0.0956	0.342	0.315

n=390

independent variable: Number of valuations

Smaller group	D	P-value	Corrected
Multiple:	0.000	1.000	
Single:	-0.274	0.000	
Combined K-S:	0.274	0.000	0.000

n=390

independent variable: FINRA

Smaller group	D	P-value	Corrected
after FINRA rule 2290	0.0929	0.201	
before FINRA rule 2290	-0.0377	0.767	
Combined K-S:	0.0929	0.398	0.370

n=390

independent variable: Acquirer

Smaller group	D	P-value	Corrected
Target	0.0703	0.382	
Acquirer	-0.1486	0.014	
Combined K-S:	0.1486	0.027	0.02

n=390

Results for accuracy, target data set:

independent variable: Bank

Smaller group	D	P-value	Corrected
No:	0.1790	0.043	
Yes:	-0.0167	0.973	
Combined K-S:	0.1790	0.086	0.074

n=202

independent variable: Size

Smaller group	D	P-value	Corrected
Large:	0.3085	0.019	
Small:	-0.0211	0.981	
Combined K-S:	0.3085	0.037	0.028

n=194

independent variable: Cash

Smaller group	D	P-value	Corrected
Cash:	0.0613	0.722	
Stock:	-0.2027	0.028	
Combined K-S:	0.2027	0.057	0.048

n=190

independent variable: Reputation

Smaller group	D	P-value	Corrected
not Top Tier:	0.0085	0.993	
Top-Tier:	-0.1617	0.076	
Combined K-S:	0.1617	0.152	0.134

n=202

independent variable: No. of fairness opinion

Smaller group	D	P-value	Corrected
Single:	0.0551	0.82	
Multiple:	-0.2125	0.052	
Combined K-S:	0.2125	0.104	0.088

n=202

independent variable: Previous relation

Smaller group	D	P-value	Corrected
No:	0.0242	0.945	
Yes:	-0.1299	0.196	
Combined K-S:	0.1299	0.389	0.349

n=202

independent variable: Number of valuations

Smaller group	D	P-value	Corrected
Single:	0.007	0.995	
Multiple:	-0.254	0.003	
Combined K-S:	0.254	0.006	0.004

n=202

independent variable: FINRA

Smaller group	D	P-value	Corrected
after FINRA rule 2290	0.1365	0.168	
before FINRA rule 2290	-0.0926	0.440	
Combined K-S:	0.1365	0.334	0.300

n=202

Results for accuracy, acquirer data set:

independent variable: Bank

Smaller group	D	P-value	Corrected
No:	0.0567	0.744	
Yes:	-0.0897	0.477	
Combined K-S:	0.0897	0.853	0.809

n=188

independent variable: Size

Smaller group	D	P-value	Corrected
Large:	0.2614	0.015	
Small:	-0.022	0.971	
Combined K-S:	0.2614	0.030	0.024

n=173

independent variable: Cash

Smaller group	D	P-value	Corrected
Cash:	0.1496	0.167	
Stock:	-0.011	0.99	
Combined K-S:	0.1496	0.332	0.293

n=176

independent variable: Reputation

Smaller group	D	P-value	Corrected
not Top Tier:	0.0237	0.951	
Top-Tier:	-0.2093	0.020	
Combined K-S:	0.2093	0.039	0.033

n=188

independent variable: No. of fairness opinion

Smaller group	D	P-value	Corrected
Single:	0.013	0.991	
Multiple:	-0.2089	0.088	
Combined K-S:	0.2089	0.176	0.149

n=188

independent variable: Previous relation

Smaller group	D	P-value	Corrected
No:	0.0724	0.611	
Yes:	-0.1257	0.226	
Combined K-S:	0.1257	0.447	0.395

n=188

independent variable: Number of valuations

Smaller group	D	P-value	Corrected
Single:	0.000	1.000	
Multiple:	-0.318	0.000	
Combined K-S:	0.318	0.001	0.000

n=188

independent variable: FINRA

Smaller group	D	P-value	Corrected
after FINRA rule 2290	0.1626	0.092	
before FINRA rule 2290	-0.0401	0.865	
Combined K-S:	0.1626	0.184	0.158

n=188

Results for under-/overvaluation, entire data set:

independent variable: Bank

Smaller group	D	P-value	Corrected
No:	0.0044	0.996	
Yes:	-0.1677	0.005	
Combined K-S:	0.1677	0.009	0.007

n=390

independent variable: Size

Smaller group	D	P-value	Corrected
Large:	0.1268	0.108	
Small:	-0.1791	0.012	
Combined K-S:	0.1791	0.024	0.017

n=367

independent variable: Cash

Smaller group	D	P-value	Corrected
Cash:	0.2120	0.004	
Stock:	-0.0304	0.891	
Combined K-S:	0.2120	0.007	0.005

n=366

independent variable: Reputation

Smaller group	D	P-value	Corrected
Not Top Tier:	0.1045	0.126	
Top Tier:	-0.0672	0.425	
Combined K-S:	0.1045	0.252	0.214

n=390

independent variable: No. of fairness opinion

Smaller group	D	P-value	Corrected
Multiple:	0.8620	0.406	
Single:	-0.1289	0.133	

Combined K-S:	0.1289	0.266	0.218

n=390

independent variable: Previous relation

Smaller group	D	P-value	Corrected
No:	0.0544	0.574	
Yes:	-0.0152	0.013	
Combined K-S:	0.1516	0.027	0.020

n=390

independent variable: Number of valuations

Smaller group	D	P-value	Corrected
Multiple:	0.0913	0.236	
Single:	-0.1918	0.002	
Combined K-S:	0.1918	0.003	0.002

n=390

independent variable: Acquirer

Smaller group	D	P-value	Corrected
Target:	0.4288	0.000	
Acquirer	0.0000	1,000	
Combined K-S:	0.4288	0.000	0.000

n=390

independent variable: FINRA

Smaller group	D	P-value	Corrected
after FINRA rule 2290	0.0431	0.697	
before FINRA rule 2290	-0.1693	0.004	
Combined K-S:	0.1693	0.008	0.005

n=390

Results for under-/overvaluation, target data set:

independent variable: Bank

Smaller group	D	P-value	Corrected
No:	0.0085	0.993	
Yes:	-0.2651	0.001	
Combined K-S:	0.2651	0.002	0.001

n=202

independent variable: Size

Smaller group	D	P-value	Corrected
Large:	0.0685	0.714	
Small:	-0.2425	0.015	
Combined K-S:	0.2425	0.030	0.019

n=194

independent variable: Cash

Smaller group	D	P-value	Corrected
Cash:	0.3017	0.002	
Stock:	-0.0439	0.880	
Combined K-S:	0.3017	0.005	0.003

n=190

independent variable: Reputation

Smaller group	D	P-value	Corrected
Not Top Tier:	0.1688	0.060	
Top Tier:	-0.0476	0.800	
Combined K-S:	0.1688	0.120	0.090

n=202

independent variable: No. of fairness opinion

Smaller group	D	P-value	Corrected
Multiple:	0.0802	0.464	
Single:	-0.1682	0.157	
Combined K-S:	0.1682	0.313	0.247

n=202

independent variable: Previous relation

Smaller group	D	P-value	Corrected
No:	0.0704	0.634	
Yes:	-0.1347	0.189	
Combined K-S:	0.1347	0.375	0.313

n=202

independent variable: Number of valuations

Smaller group	D	P-value	Corrected
Multiple:	0.0496	0.799	
Single:	-0.2271	0.009	
Combined K-S:	0.2271	0.018	0.012

n=202

Results for under-/overvaluation, acquirer data set:

independent variable: Bank

Smaller group	D	P-value	Corrected
Yes:	0.1146	0.298	
No:	-0.0048	0.998	
Combined K-S:	0.1146	0.580	0.514

n=188

independent variable: Size

Smaller group	D	P-value	Corrected
Large:	0.2343	0.026	
Small:	-0.1098	0.449	
Combined K-S:	0.2343	0.052	0.035

n=173

independent variable: Cash

Smaller group	D	P-value	Corrected
Cash:	0.2307	0.044	
Stock:	-0.0230	0.970	
Combined K-S:	0.2307	0.089	0.060

n=176

independent variable: Reputation

Smaller group	D	P-value	Corrected
Not Top Tier:	0.0789	0.569	
Top Tier:	-0.1277	0.229	
Combined K-S:	0.1277	0.452	0.386

n=188

independent variable: No. of fairness opinion

Smaller group	D	P-value	Corrected
Multiple:	0.1209	0.443	
Single:	-0.1355	0.359	
Combined K-S:	0.1355	0.685	0.607

n=188

independent variable: Previous relation

Smaller group	D	P-value	Corrected
No:	0.0689	0.639	
Yes:	-0.2073	0.017	
Combined K-S:	0.2073	0.034	0.024

n=188

independent variable: Number of valuations

Smaller group	D	P-value	Corrected
Multiple:	0.1671	0.102	
Single:	-0.1589	0.126	
Combined K-S:	0.1671	0.203	0.157

n=188

independent variable: FINRA

Smaller group	D	P-value	Corrected
after FINRA rule 2290	0.0256	0.941	
before FINRA rule 2290	-0.1946	0.029	
Combined K-S:	0.1946	0.059	0.042

n=188

Results for valuation models on range:

independent variable: EM entire data set

Smaller group	D	P-value	Corrected
No:	0.042	0.718	
Yes:	-0.183	0.002	
Combined K-S:	0.183	0.004	0.003

independent variable: TM entire data set

Smaller group	D	P-value	Corrected
No:	0.053	0.581	
Yes:	-0.067	0.420	
Combined K-S:	0.067	0.778	0.740

independent variable: DCF entire data set

Smaller group	D	P-value	Corrected
No:	0.066	0.606	
Yes:	-0.066	0.599	
Combined K-S:	0.066	0.960	0.945

independent variable: EM target data set

Smaller group	D	P-value	Corrected
No:	0.049	0.798	
Yes:	-0.184	0.040	
Combined K-S:	0.184	0.080	0.058

independent variable: TM target data set

Smaller group	D	P-value	Corrected
No:	0.095	0.409	
Yes:	-0.035	0.886	
Combined K-S:	0.095	0.762	0.710

independent variable: DCF target data set

Smaller group	D	P-value	Corrected
No:	0.182	0.148	
Yes:	-0.089	0.631	
Combined K-S:	0.182	0.295	0.227

independent variable: EM acquirer data set

Smaller group	D	P-value	Corrected
No:	0.065	0.675	
Yes:	-0.227	0.008	
Combined K-S:	0.227	0.017	0.011

independent variable: TM acquirer data set

Smaller group	D	P-value	Corrected
No:	0.109	0.329	
Yes:	-0.147	0.132	
Combined K-S:	0.147	0.263	0.212

independent variable: DCF acquirer data set

Smaller group	D	P-value	Corrected
No:	0.100	0.562	
Yes:	-0.122	0.421	
Combined K-S:	0.122	0.780	0.714

Results for valuation models on accuracy:

independent variable: EM entire data set

Smaller group	D	P-value	Corrected
No:	0.000	1.000	
Yes:	-0.186	0.001	
Combined K-S:	0.186	0.003	0.002

independent variable: TM entire data set

Smaller group	D	P-value	Corrected
No:	0.023	0.900	
Yes:	-0.167	0.004	
Combined K-S:	0.167	0.009	0.006

independent variable: DCF entire data set

Smaller group	D	P-value	Corrected
No:	0.131	0.116	
Yes:	-0.019	0.955	
Combined K-S:	0.131	0.231	0.188

independent variable: EM target data set

Smaller group	D	P-value	Corrected
No:	0.008	0.994	
Yes:	-0.241	0.004	
Combined K-S:	0.241	0.007	0.005

independent variable: TM target data set

Smaller group	D	P-value	Corrected
No:	0.000	1.000	
Yes:	-0.236	0.004	
Combined K-S:	0.236	0.008	0.005

independent variable: DCF target data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.145	0.271	
Yes:	-0.048	0.867	
Combined K-S:	0.145	0.532	0.451

independent variable: EM acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.015	0.979	
Yes:	-0.171	0.067	
Combined K-S:	0.171	0.133	0.101

independent variable: TM acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.081	0.543	
Yes:	-0.162	0.085	
Combined K-S:	0.162	0.169	0.131

independent variable: DCF acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.156	0.216	
Yes:	-0.027	0.955	
Combined K-S:	0.156	0.427	0.350

Results for valuation models on under-/overvaluation:

independent variable: EM entire data set

Smaller group	D	P-value	Corrected
No:	0.124	0.054	
Yes:	-0.080	0.299	
Combined K-S:	0.124	0.109	0.088

independent variable: TM entire data set

Smaller group	D	P-value	Corrected
No:	0.141	0.021	
Yes:	-0.062	0.477	
Combined K-S:	0.141	0.041	0.032

independent variable: DCF entire data set

Smaller group	D	P-value	Corrected
No:	0.077	0.478	
Yes:	-0.074	0.508	
Combined K-S:	0.077	0.854	0.817

independent variable: EM target data set

Smaller group	D	P-value	Corrected
No:	0.219	0.010	
Yes:	-0.042	0.842	
Combined K-S:	0.219	0.019	0.013

independent variable: TM target data set

Smaller group	D	P-value	Corrected
No:	0.195	0.022	
Yes:	-0.053	0.753	
Combined K-S:	0.195	0.045	0.031

independent variable: DCF target data set

Smaller group	D	P-value	Corrected
No:	0.065	0.774	
Yes:	-0.149	0.255	
Combined K-S:	0.149	0.501	0.420

independent variable: EM acquirer data set

Smaller group	D	P-value	Corrected
No:	0.065	0.675	
Yes:	-0.115	0.290	
Combined K-S:	0.115	0.566	0.501

independent variable: TM acquirer data set

Smaller group	D	P-value	Corrected
No:	0.072	0.614	
Yes:	-0.154	0.106	
Combined K-S:	0.154	0.212	0.168

independent variable: DCF acquirer data set

Smaller group	D	P-value	Corrected
No:	0.131	0.339	
Yes:	-0.051	0.851	
Combined K-S:	0.131	0.651	0.575

Results for valuation models range:

independent variable: EM entire data set

Smaller group	D	P-value	Corrected
No:	0.042	0.718	
Yes:	-0.183	0.002	
Combined K-S:	0.183	0.004	0.003

independent variable: TM entire data set

Smaller group	D	P-value	Corrected
No:	0.053	0.581	
Yes:	-0.067	0.420	
Combined K-S:	0.067	0.778	0.740

independent variable: DCF entire data set

Smaller group	D	P-value	Corrected
No:	0.066	0.606	
Yes:	-0.066	0.599	
Combined K-S:	0.066	0.960	0.945

independent variable: EM target data set

Smaller group	D	P-value	Corrected
No:	0.049	0.798	
Yes:	-0.184	0.040	
Combined K-S:	0.184	0.080	0.058

independent variable: TM target data set

Smaller group	D	P-value	Corrected
No:	0.095	0.409	
Yes:	-0.035	0.886	
Combined K-S:	0.095	0.762	0.710

independent variable: DCF target data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.182	0.148	
Yes:	-0.089	0.631	
Combined K-S:	0.182	0.295	0.227

independent variable: EM acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.065	0.675	
Yes:	-0.227	0.008	
Combined K-S:	0.227	0.017	0.011

independent variable: TM acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.109	0.329	
Yes:	-0.147	0.132	
Combined K-S:	0.147	0.263	0.212

independent variable: DCF acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.100	0.562	
Yes:	-0.122	0.421	
Combined K-S:	0.122	0.780	0.714

Results for valuation models accuracy:

independent variable: EM entire data set

Smaller group	D	P-value	Corrected
No:	0.000	1.000	
Yes:	-0.186	0.001	
Combined K-S:	0.186	0.003	0.002

independent variable: TM entire data set

Smaller group	D	P-value	Corrected
No:	0.023	0.900	
Yes:	-0.167	0.004	
Combined K-S:	0.167	0.009	0.006

independent variable: DCF entire data set

Smaller group	D	P-value	Corrected
No:	0.131	0.116	
Yes:	-0.019	0.955	
Combined K-S:	0.131	0.231	0.188

independent variable: EM target data set

Smaller group	D	P-value	Corrected
No:	0.008	0.994	
Yes:	-0.241	0.004	
Combined K-S:	0.241	0.007	0.005

independent variable: TM target data set

Smaller group	D	P-value	Corrected
No:	0.000	1.000	
Yes:	-0.236	0.004	
Combined K-S:	0.236	0.008	0.005

independent variable: DCF target data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.145	0.271	
Yes:	-0.048	0.867	
Combined K-S:	0.145	0.532	0.451

independent variable: EM acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.015	0.979	
Yes:	-0.171	0.067	
Combined K-S:	0.171	0.133	0.101

independent variable: TM acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.081	0.543	
Yes:	-0.162	0.085	
Combined K-S:	0.162	0.169	0.131

independent variable: DCF acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.156	0.216	
Yes:	-0.027	0.955	
Combined K-S:	0.156	0.427	0.350

Results for valuation models under-/overvaluation:

independent variable: EM entire data set

Smaller group	D	P-value	Corrected
No:	0.124	0.054	
Yes:	-0.080	0.299	
Combined K-S:	0.124	0.109	0.088

independent variable: TM entire data set

Smaller group	D	P-value	Corrected
No:	0.141	0.021	
Yes:	-0.062	0.477	
Combined K-S:	0.141	0.041	0.032

independent variable: DCF entire data set

Smaller group	D	P-value	Corrected
No:	0.077	0.478	
Yes:	-0.074	0.508	
Combined K-S:	0.077	0.854	0.817

independent variable: EM target data set

Smaller group	D	P-value	Corrected
No:	0.219	0.010	
Yes:	-0.042	0.842	
Combined K-S:	0.219	0.019	0.013

independent variable: TM target data set

Smaller group	D	P-value	Corrected
No:	0.195	0.022	
Yes:	-0.053	0.753	
Combined K-S:	0.195	0.045	0.031

independent variable: DCF target data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.065	0.774	
Yes:	-0.149	0.255	
Combined K-S:	0.149	0.501	0.420

independent variable: EM acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.065	0.675	
Yes:	-0.115	0.290	
Combined K-S:	0.115	0.566	0.501

independent variable: TM acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.072	0.614	
Yes:	-0.154	0.106	
Combined K-S:	0.154	0.212	0.168

independent variable: DCF acquirer data set			
Smaller group	**D**	**P-value**	**Corrected**
No:	0.131	0.339	
Yes:	-0.051	0.851	
Combined K-S:	0.131	0.651	0.575

Results for reputation:

independent variable: size

Smaller group	D	P-value	Corrected
Large:	0.000	1.000	
Small:	-0.546	0.000	
Combined K-S:	0.546	0.000	0.000

independent variable: No. of provider

Smaller group	D	P-value	Corrected
0:	0.375	0.000	
1:	0.000	1.000	
Combined K-S:	0.375	0.000	0.000

independent variable: No. of valuations

Smaller group	D	P-value	Corrected
0:	0.305	0.000	
1:	-0.047	0.690	
Combined K-S:	0.305	0.000	0.000

Results for size:

independent variable: reputation

Smaller group	D	P-value	Corrected
High tier:	0.000	1.000	
Low tier:	-0.519	0.000	
Combined K-S:	0.519	0.000	0.000

independent variable: No. of provider

Smaller group	D	P-value	Corrected
0:	0.538	0.000	
1:	-0.006	0.995	
Combined K-S:	0.538	0.000	0.000

independent variable: No. of valuations

Smaller group	D	P-value	Corrected
0:	0.325	0.000	
1:	-0.027	0.884	
Combined K-S:	0.325	0.000	0.000

APPENDIX 2: REGRESSION RESULTS FOR RANGE

Entire data set:

Linear regression

Number of observations:	388
F(9, 377)	6.18
Prob > F	0.000
R-squared	0.1371
Root MSE	0.12482

Mean	**Coef.**	**HC3 Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
Acquirer	-0.00904	0.01280	-0.71	0.480	-0.03421	0.01612
Bank	-0.02722	0.01512	-1.80	0.073	-0.05696	0.00251
FINRA	0.01598	0.01326	1.21	0.229	-0.01008	0.04204
Size (ln)	-0.01459	0.00469	-3.11	0.002	-0.02381	-0.00537
Cash	-0.05624	0.01563	-3.60	0.000	-0.08697	-0.02552
Reputation	-0.00053	0.00025	-2.10	0.037	-0.00103	-0.00003
Number of FO	-0.00092	0.01478	-0.06	0.950	-0.02998	0.02813
Previous relation	0.02258	0.01452	1.56	0.121	-0.00597	0.05113
Number of valuations	-0.00798	0.00519	-1.54	0.125	-0.01818	0.00222
Constant	0.46757	0.03166	14.77	0.000	0.40531	0.52982

<u>Breusch-Pagan</u>

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 40.48

Prob > chi2 = 0.0000

IM-Test

Source	chi^2	df	p
Heteroscedasticity	70.03	49	0.0259
Skewness	10.77	9	0.2920
Kurtosis	0.00	1	0.9628
Total	80.80	59	0.0313

VIF

Variable	VIF	1/VIF
Size (ln)	2.17	0.461243
Reputation	1.89	0.527906
Number of valuations	1.38	0.725023
Bank	1.27	0.784538
Number of FO	1.27	0.787888
Previous relation	1.22	0.81724
FINRA	1.04	0.960219
Cash	1.03	0.968091
Acquirer	1.01	0.990664
Mean VIF |	1.37	

Ramsey RESET test

Ho: model has no omitted variables

$F(3, 374) = 1.95$

$Prob > F = 0.1216$

Breusch-Godfrey

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	1.326	1	0.2495

H0: no serial correlation

Target data set:

Linear regression

Number of observations:	200
F(9, 377)	4.12
Prob > F	0.0001
R-squared	0.1500
Root MSE	0.12142

Mean	Coef.	HC3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.02188	0.02227	-0.98	0.327	-0.06582	0.02205
FINRA	0.01631	0.01771	0.92	0.358	-0.01862	0.05124
Size (ln)	-0.01963	0.00678	-2.90	0.004	-0.03301	-0.00626
Cash	-0.04523	0.02332	-1.94	0.049	-0.09124	0.00077
Reputation	-0.00033	0.00034	-0.98	0.328	-0.00100	0.00034
Number of FO	0.01130	0.02036	0.56	0.579	-0.02886	0.05147
Previous relation	0.03984	0.01952	2.04	0.043	0.00133	0.07835
Number of valuations	-0.01288	0.00666	-1.93	0.055	-0.02602	0.00027
Constant	0.48438	0.04699	10.31	0.000	0.39169	0.57707

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 19.92

Prob > chi2 = 0.0000

IM-Test

Source	chi^2	df	p
Heteroscedasticity	54.58	40	0.0620
Skewness	6.15	8	0.6310
Kurtosis	1.92	1	0.1663
Total	62.64	49	0.0912

VIF

Variable	VIF	1/VIF
Size (ln)	2.35	0.424841
Reputation	2.17	0.460653
Number of valuations	1.38	0.727227
Bank	1.33	0.751498
Number of FO	1.29	0.776892
Previous relation	1.28	0.782414
FINRA	1.02	0.983194
Cash	1.07	0.938151
Mean VIF	1.48	

Ramsey RESET-Test

Ho: model has no omitted variables

$F(3, 187) = 0.14$

$Prob > F = 0.9354$

Breusch-Godfrey

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	0.000	1	1.0000

H0: no serial correlation

Acquirer data set:

Linear regression

Number of observations:	188
F(9, 377)	3.65
Prob > F	0.0006
R-squared	0.1380
Root MSE	0.12424

Mean	Coef.	HC3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.02804	0.02092	-1.34	0.182	-0.06932	0.01325
FINRA	0.00086	0.02023	0.04	0.966	-0.03907	0.04079
Size (ln)	-0.01051	0.00631	-1.67	0.097	-0.02296	0.01936
Cash	-0.06366	0.02179	-2.92	0.004	-0.10666	-0.02067
Reputation	-0.00067	0.00034	-1.98	0.049	-0.00134	-1.00000
Number of FO	-0.00078	0.02217	-0.04	0.972	-0.04452	0.04297
Previous relation	0.00269	0.02091	0.13	0.898	-0.03857	0.04395
Number of valuations	-0.00446	0.00831	-0.54	0.592	-0.02086	0.01193
Constant	0.44700	0.04156	10.76	0.000	0.36499	0.52901

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 17.05

Prob > chi2 = 0.0000

IM-Test

Source	chi²	df	p
Heteroscedasticity	47.91	40	0.1826
Skewness	13	8	0.1119
Kurtosis	0.32	1	0.5695
Total	61.23	49	0.1128

VIF

Variable	VIF	1/VIF
Size (ln)	2.05	0.48811
Reputation	1.74	0.57620
Number of valuations	1.47	0.68258
Bank	1.25	0.80136
Number of FO	1.28	0.77832
Previous relation	1.20	0.83506
FINRA	1.13	0.88201
Cash	1.02	0.97970
Mean VIF	1.39	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 174) = 1.98

Prob > F = 0.1195

Breusch-Godfrey

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	0.000	1	1.0000

H0: no serial correlation

APPENDIX 3: REGRESSION RESULTS FOR ACCURACY

Entire data set:

Linear regression

Number of observations:	390
F(9, 377)	6.03
Prob > F	0.0000
R-squared	0.1261
Root MSE	0.16563

Mean	**Coef.**	**HC3 Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
Acquirer	-0.01473	0.01708	-0.86	0.389	-0.04831	0.01884
Bank	-0.02565	0.02011	-1.28	0.203	-0.06520	0.01389
FINRA	0.04155	0.01800	2.31	0.022	0.00615	0.07695
Size (ln)	-0.02125	0.00619	-3.43	0.001	-0.03344	-0.00907
Cash	-0.00074	0.02186	-0.03	0.973	-0.04373	0.04225
Reputation	-0.00011	0.00032	-0.35	0.723	-0.00073	0.00051
Number of FO	0.00732	0.02192	0.33	0.739	-0.03578	0.05041
Previous relation	0.02515	0.01861	1.35	0.177	-0.01145	0.06174
Number of valuations	-0.02823	0.00704	-4.01	0.000	-0.04208	-0.01438
Constant	0.55236	0.04318	12.79	0.000	0.46746	0.63726

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 14.00

Prob > chi2 = 0.0002

IM-Test

Source	**chi²**	**df**	**p**
Heteroscedasticity	78.41	49	0.0048
Skewness	20.46	9	0.0153
Kurtosis	1.05	1	0.3050
Total	99.92	59	0.0007

VIF

Variable	VIF	1/VIF
Size (ln)	2.18	0.45791
Reputation	1.81	0.55328
Number of valuations	1.34	0.74871
Bank	1.29	0.77293
Number of FO	1.28	0.74871
Previous relation	1.19	0.84244
FINRA	1.03	0.96646
Cash	1.03	0.97333
Acquirer	1.02	0.98442
Mean VIF	1.35	

Ramsey RESET test

Ho: model has no omitted variables

F(12, 368) = 1.61

Prob > F = 0.0853 (testing for the power of 3 shows no omitted variables with 0.6741)

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	0.684	1	0.4084

H0: no serial correlation

Target data set:

Linear regression

Number of observations:	202
F(9, 377)	4.23
Prob > F	0.0001
R-squared	0.1452
Root MSE	0.15055

Mean	Coef.	HC3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.00911	0.02703	-0.34	0.736	-0.06243	0.04420
FINRA	0.03006	0.02306	1.30	0.194	-0.01542	0.07553
Size (ln)	0.02047	0.00821	-2.49	0.013	-0.03666	-0.00429
Cash	0.04052	0.02635	1.54	0.126	-0.01146	0.09250
Reputation	0.00006	0.00041	-0.15	0.884	-0.00088	0.00075
Number of FO	0.03186	0.02707	1.18	0.241	-0.02154	0.08526
Previous relation	0.01613	0.02257	0.71	0.476	-0.02838	0.06064
Number of valuations	0.03007	0.01009	-2.98	0.003	-0.04998	-0.01016
Constant	0.53360	0.05575	9.57	0.000	0.42364	0.64355

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 4.69

Prob > chi2 = 0.0303

IM-Test

Source	chi²	df	p
Heteroscedasticity	50.47	40	0.1241
Skewness	17.17	8	0.0284
Kurtosis	0.10	1	0.7465
Total	67.74	49	0.0392

VIF

Variable	VIF	1/VIF
Size (ln)	2.36	0.42303
Reputation	1.96	0.51098
Number of valuations	1.36	0.73747
Bank	1.35	0.74027
Number of FO	1.30	0.76911
Previous relation	1.25	0.79837
FINRA	1.02	0.98261
Cash	1.05	0.95493
Mean VIF	1.46	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 190) = 0.30

Prob > F = 0.8283

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	0.135	1	0.7134

H0: no serial correlation

Acquirer data set:

Linear regression

Number of observations:	188
F(9, 377)	2.82
Prob > F	0.0058
R-squared	0.1405
Root MSE	0.18054

Mean	Coef.	HC3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.05380	0.03226	-1.67	0.097	-0.11746	0.00986
FINRA	0.05829	0.03124	1.87	0.064	-0.00337	0.11994
Size (ln)	-0.02247	0.00937	-2.40	0.018	-0.04096	-0.00397
Cash	-0.04141	0.03643	-1.14	0.257	-0.11329	0.03048
Reputation	-0.00007	0.00050	-0.13	0.894	-0.00106	0.00092
Number of FO	-0.02407	0.03817	-0.63	0.529	-0.09939	0.05124
Previous relation	0.02690	0.02982	0.90	0.368	-0.03195	0.08575
Number of valuations	-0.02918	0.01058	-2.76	0.006	-0.05006	-0.00830
Constant	0.56724	0.06919	8.20	0.000	0.43070	0.70378

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 6.64

Prob > chi2 = 0.0099

IM-Test

Source	chi^2	df	p
Heteroscedasticity	61.53	40	0.0159
Skewness	15.81	8	0.0451
Kurtosis	0.24	1	0.6244
Total	77.58	49	0.0057

VIF

Variable	VIF	1/VIF
Size (ln)	2.04	0.49122
Reputation	1.70	0.58990
Number of valuations	1.37	0.73057
Bank	1.26	0.79545
Number of FO	1.30	0.76945
Previous relation	1.13	0.88404
FINRA	1.13	0.88594
Cash	1.02	0.97774
Mean VIF	1.37	

Ramsey RESET test

Ho: model has no omitted variables

F(12, 167) = 0.98

Prob > F = 0.4723

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	0.000	1	1.0000

H0: no serial correlation

APPENDIX 4: REGRESSION RESULTS FOR UNDER-/OVERVALUATION

Target data set

Linear regression

Number of observations:	202
F(9, 377)	2.15
Prob > F	0.0327
R-squared	0.0820
Root MSE	0.17754

Mean	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.06689	0.02939	-2.28	0.024	-0.12486	-0.00892
FINRA	0.01061	0.02591	0.41	0.683	-0.04050	0.06172
Size (ln)	0.00586	0.00908	0.65	0.519	-0.01204	0.02377
Cash	-0.06857	0.03423	-2.00	0.047	-0.13608	-0.00107
Reputation	0.00015	0.00044	0.34	0.734	-0.00071	0.00101
Number of FO	0.00107	0.03049	0.04	0.972	-0.05906	0.06120
Previous relation	-0.02495	0.02861	-0.87	0.384	-0.08137	0.03147
Number of valuations	0.00241	0.01081	0.22	0.824	-0.01890	0.02372
Constant	-0.08177	0.05711	-1.43	0.154	-0.19442	0.03087

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 1.56

Prob > chi2 = 0.2110

IM-Test

Source	chi²	df	p
Heteroscedasticity	43.43	41	0.3684
Skewness	4.58	8	0.8014
Kurtosis	12.17	1	0.0005
Total	60.18	50	0.1535

VIF

Variable	VIF	1/VIF
Size (ln)	2.21	0.45178
Reputation	1.88	0.53318
Number of valuations	1.34	0.74486
Bank	1.34	0.74356
Number of FO	1.34	0.78915
Previous relation	1.25	0.79722
FINRA	1.02	0.98031
Cash	1.05	0.95642
Mean VIF	1.42	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 190) = 0.15

Prob > F = 0.9325

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	0.063	1	0.8011

H0: no serial correlation

Acquirer data set

Linear regression

Number of observations:	188
F(9, 377)	2.64
Prob > F	0.0093
R-squared	0.0851
Root MSE	0.2042

Mean	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.06227	0.03505	-1.78	0.077	-0.13144	0.00690
FINRA	0.02941	0.03801	0.77	0.440	-0.04559	0.10441
Size (ln)	-0.02768	0.01024	-2.70	0.008	-0.04789	-0.00748
Cash	-0.08176	0.03775	-2.17	0.032	-0.15626	-0.00726
Reputation	0.00104	0.00055	1.91	0.057	-0.00003	0.00212
Number of FO	0.04361	0.04323	1.01	0.314	-0.04169	0.12890
Previous relation	-0.00426	0.03565	-0.12	0.905	-0.07462	0.06609
Number of valuations	-0.01767	0.01247	-1.42	0.158	-0.04227	0.00693
Constant	0.22265	0.08484	2.62	0.009	0.05523	0.39007

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 11.52

Prob > chi2 = 0.0007

IM-Test

Source	chi²	df	p
Heteroscedasticity	69.09	41	0.0039
Skewness	13.05	8	0.1102
Kurtosis	6.02	1	0.0142
Total	88.16	50	0.0007

VIF

Variable	VIF	1/VIF
Size (ln)	2.04	0.48931
Reputation	1.69	0.59125
Number of valuations	1.37	0.72764
Bank	1.26	0.79511
Number of FO	1.28	0.78041
Previous relation	1.13	0.88263
FINRA	1.12	0.89240
Cash	1.02	0.97781
Mean VIF	1.37	

Ramsey RESET-Test

Ho: model has no omitted variables

F(3, 176) = 1.87

Prob > F = 0.1356

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	0.000	1	1.0000

H0: no serial correlation

APPENDIX 4: ROBUSTNESS TEST DISCOUNTED CASH FLOW

Range entire data set:

Linear regression

Number of observations:	314
F(9, 377)	5.03
Prob > F	0.0000
R-squared	0.1206
Root MSE	0.14182

Mean	**Coef.**	**HCE3 Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
Acquirer	-0.01345	0.01622	-0.83	0.408	-0.04537	0.01847
Bank	-0.02380	0.01945	-1.22	0.222	-0.06208	0.01448
FINRA	0.00417	0.01648	0.25	0.801	-0.02825	0.03659
Size (ln)	-0.01757	0.00575	-3.05	0.002	-0.02889	-0.00625
Cash	-0.08073	0.02100	-3.84	0.000	-0.12205	-0.03942
Reputation	-0.00022	0.00032	-0.69	0.491	-0.00085	0.00041
Number of FO	-0.02518	0.01762	-1.43	0.154	-0.05986	0.00950
Previous relation	0.05584	0.01802	3.10	0.002	0.02037	0.09130
Number of valuations	-0.00408	0.00663	-0.62	0.539	-0.01711	0.00896
Constant	0.47453	0.04050	11.72	0.000	0.39485	0.55421

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 29.18

Prob > chi2 = 0.0000

IM-Test

Source	**chi²**	**df**	**p**
Heteroscedasticity	61.07	49	0.1155
Skewness	26.73	9	0.0015
Kurtosis	1.26	1	0.2614
Total	89.06	59	0.0069

VIF

Variable	VIF	1/VIF
Size (ln)	2.11	0.47449
Reputation	1.86	0.53820
Number of valuations	1.42	0.70657
Bank	1.38	0.72379
Number of FO	1.30	0.76701
Previous relation	1.19	0.83785
FINRA	1.07	0.93226
Cash	1.04	0.96367
Acquirer	1.01	0.98836
Mean VIF	1.38	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 303) = 0.05

Prob > F = 0.9834

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	1.206	1	0.2721

H0: no serial correlation

Target data set:

Linear regression

Number of observations:	164
F(9, 377)	2.64
Prob > F	0.0097
R-squared	0.1134
Root MSE	0.13624

DCF	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.01510	0.02955	-0.51	0.610	-0.07348	0.04328
FINRA	-0.00771	0.02096	-0.37	0.714	-0.04912	0.03371
Size (ln)	-0.01725	0.00876	-1.97	0.051	-0.03456	0.00005
Cash	-0.05548	0.03029	-1.83	0.069	-0.11532	0.00435
Reputation	-0.00006	0.00043	-0.15	0.882	-0.00092	0.00079
Number of FO	-0.03101	0.02384	-1.30	0.195	-0.07810	0.01608
Previous relation	0.07020	0.02527	2.78	0.006	0.02029	0.12011
Number of valuations	-0.00842	0.00877	-0.96	0.338	-0.02575	0.00890
Constant	0.45983	0.06505	7.07	0.000	0.33133	0.58834

<u>Breusch-Pagan</u>

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 11.53

Prob > chi2 = 0.0007

<u>IM-Test</u>

Source	chi²	df	p
Heteroscedasticity	48.2	40	0.1750
Skewness	13.95	8	0.0832
Kurtosis	0.00	1	0.9880
Total	62.15	49	0.0983

VIF

Variable	VIF	1/VIF
Size (ln)	2.23	0.44855
Reputation	2.15	0.46433
Number of valuations	1.42	0.70603
Bank	1.54	0.64816
Number of FO	1.30	0.76696
Previous relation	1.27	0.78901
FINRA	1.03	0.96775
Cash	1.08	0.92703
Mean VIF	1.5	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 152) = 1.56

Prob > F = 0.195

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	0.000	1	1.0000

H0: no serial correlation

Acquirer data set:

Linear regression

Number of observations:	150
F(9, 377)	3.59
Prob > F	0.0008
R-squared	0.1393
Root MSE	0.1447

DCF	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.02707	0.02749	-0.98	0.326	-0.08143	0.02728
FINRA	-0.00094	0.02810	-0.03	0.973	-0.05649	0.05461
Size (ln)	-0.01806	0.00773	-2.34	0.021	-0.03334	-0.00278
Cash	-0.10487	0.03044	-3.44	0.001	-0.16505	-0.04469
Reputation	-0.00031	0.00046	-0.68	0.498	-0.00121	0.00059
Number of FO	-0.00710	0.02701	-0.26	0.793	-0.06050	0.04630
Previous relation	0.03436	0.02671	1.29	0.200	-0.01844	0.08716
Number of valuations	-0.00119	0.01101	-0.11	0.914	-0.02296	0.02058
Constant	0.47727	0.05019	9.51	0.000	0.37806	0.57648

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 14.65

Prob > chi2 = 0.0001

IM-Test

Source	chi²	df	p
Heteroscedasticity	35.47	40	0.6741
Skewness	21.6	8	0.0057
Kurtosis	1.14	1	0.2858
Total	58.22	49	0.1724

VIF

Variable	VIF	1/VIF
Size (ln)	2.05	0.48727
Reputation	1.70	0.58721
Number of valuations	1.35	0.64703
Bank	1.29	0.77391
Number of FO	1.35	0.74008
Previous relation	1.17	0.85823
FINRA	1.21	0.82339
Cash	1.03	0.97091
Mean VIF	1.42	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 136) = 1.560

Prob > F = 0.195

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	0.000	1	1.0000

H0: no serial correlation

Accuracy entire data set:

Linear regression

Number of observations:	312
F(9, 377)	3.28
Prob > F	0.0008
R-squared	0.0832
Root MSE	0.18284

DCF	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Acquirer	0.00472	0.02155	0.22	0.827	-0.03769	0.04712
Bank	0.01710	0.02612	-0.65	0.513	-0.06851	0.03430
FINRA	0.04439	0.02262	1.96	0.051	-0.00011	0.08889
Size (ln)	0.02162	0.00710	-3.04	0.003	-0.03560	-0.00764
Cash	0.02845	0.02859	-1.00	0.320	-0.08471	0.02780
Reputation	0.00007	0.00038	-0.19	0.847	-0.00081	0.00067
Number of FO	0.00757	0.02819	0.27	0.788	-0.04790	0.06305
Previous relation	0.01200	0.02364	0.51	0.612	-0.03451	0.05851
Number of valuations	0.01711	0.00856	-2.00	0.047	-0.03394	-0.00027
Constant	0.54750	0.05336	10.26	0.000	0.44250	0.65250

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 3.74

Prob > chi2 = 0.0530

IM-Test

Source	chi²	df	p
Heteroscedasticity	72.83	50	0.0192
Skewness	32.38	9	0.0002
Kurtosis	0.47	1	0.4933
Total	105.69	60	0.0002

VIF

Variable	VIF	1/VIF
Size (ln)	2.08	0.48023
Reputation	1.75	0.57123
Number of valuations	1.38	0.72576
Bank	1.41	0.70756
Number of FO	1.29	0.77683
Previous relation	1.16	0.85840
FINRA	1.06	0.94005
Cash	1.03	0.97434
Acquirer	1.02	0.98425
Mean VIF	1.35	

Ramsey RESET test

Ho: model has no omitted variables

F(13, 289) = 1.03

Prob > F = 0.4180

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	1.523	1	0.2172

H0: no serial correlation

Accuracy target data set:

Linear regression

Number of observations:	164
F(9, 377)	4.32
Prob > F	0.0001
R-squared	0.1505
Root MSE	0.15767

DCF	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.00034	0.03359	-0.01	0.992	-0.06668	0.06601
FINRA	0.03950	0.02604	1.52	0.131	-0.01194	0.09093
Size (ln)	-0.02210	0.00781	-2.83	0.005	-0.03752	-0.00667
Cash	-0.04026	0.03345	-1.20	0.231	-0.10633	0.02581
Reputation	-0.00010	0.00049	-0.21	0.835	-0.00107	0.00087
Number of FO	0.00703	0.03298	0.21	0.831	-0.05811	0.07218
Previous relation	-0.00256	0.02770	-0.09	0.926	-0.05727	0.05215
Number of valuations	-0.02114	0.01079	-1.96	0.052	-0.04246	0.00018
Constant	0.56816	0.05981	9.50	0.000	0.45001	0.68630

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 1.51

Prob > chi2 = 0.2194

IM-Test

Source	chi²	df	p
Heteroscedasticity	35.87	41	0.6978
Skewness	12.53	8	0.1289
Kurtosis	1.71	1	0.1914
Total	50.11	50	0.4692

VIF

Variable	VIF	1/VIF
Size (ln)	2.09	0.47952
Reputation	1.82	0.54973
Number of valuations	1.38	0.72357
Bank	1.55	0.64341
Number of FO	1.27	0.78746
Previous relation	1.23	0.81223
FINRA	1.05	0.95663
Cash	1.06	0.94612
Mean VIF	1.43	

Ramsey RESET test

Ho: model has no omitted variables

$F(3, 152) = 0.21$

$Prob > F = 0.8883$

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	$Prob > chi^2$
1	0.000	1	1.0000

H0: no serial correlation

Accuracy acquirer data set:

Linear regression

Number of observations:	148
F(9, 377)	0.92
Prob > F	0.5058
R-squared	0.0522
Root MSE	0.21015

DCF	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.03570	0.04301	-0.83	0.408	-0.12074	0.04933
FINRA	0.05055	0.04587	1.10	0.272	-0.04015	0.14125
Size (ln)	-0.02147	0.01269	-1.69	0.093	-0.04657	0.00362
Cash	-0.01188	0.04789	-0.25	0.804	-0.10657	0.08282
Reputation	0.00007	0.00063	0.10	0.918	-0.00118	0.00131
Number of FO	0.00438	0.05581	0.08	0.938	-0.10597	0.11472
Previous relation	0.02871	0.03931	0.73	0.466	-0.04902	0.10644
Number of valuations	-0.01393	0.01495	-0.93	0.353	-0.04349	0.01562
Constant	0.53123	0.09538	5.57	0.000	0.34265	0.71982

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 3.33

Prob > chi2 = 0.0681

IM-Test

Source	chi²	df	p
Heteroscedasticity	55.65	41	0.0631
Skewness	26.51	8	0.0009
Kurtosis	0.13	1	0.7225
Total	82.29	50	0.0027

VIF

Variable	VIF	1/VIF
Size (ln)	2.11	0.47307
Reputation	1.72	0.58001
Number of valuations	1.46	0.68448
Bank	1.32	0.75885
Number of FO	1.37	0.72945
Previous relation	1.12	0.89538
FINRA	1.21	0.82723
Cash	1.03	0.97542
Mean VIF	1.42	

Ramsey RESET test

Ho: model has no omitted variables

$F(3, 136) = 0.69$

Prob > F = 0.5567

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	0.000	1	1.0000

H0: no serial correlation

APPENDIX 5: ROBUSTNESS TEST EARNINGS MULTIPLE

Range entire data set

Linear regression

Number of observations:	223
F(9, 377)	2.22
Prob > F	0.0220
R-squared	0.1100
Root MSE	0.15983

Earnings Multiple	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Acquirer	-0.00887	0.02223	-0.40	0.690	-0.05268	0.03493
Bank	-0.03168	0.02706	-1.17	0.243	-0.08501	0.02165
FINRA	0.02323	0.02309	1.01	0.316	-0.02229	0.06874
Size (ln)	-0.02418	0.00880	-2.75	0.007	-0.04153	-0.00683
Cash	-0.05565	0.02854	-1.95	0.053	-0.11190	0.00061
Reputation	-0.00019	0.00040	-0.48	0.635	-0.00099	0.00060
Number of FO	0.00976	0.02488	0.39	0.695	-0.03929	0.05881
Previous relation	-0.00510	0.02373	-0.21	0.830	-0.05188	0.04168
Number of valuations	0.00872	0.00972	0.90	0.371	-0.01045	0.02788
Constant	0.47240	0.05929	7.97	0.000	0.35554	0.58926

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 29.45

Prob > chi2 = 0.0000

IM-Test

Source	chi^2	df	p
Heteroscedasticity	76	49	0.0080
Skewness	20.14	9	0.0170
Kurtosis	0.02	1	0.8774
Total	96.16	59	0.0016

VIF

Variable	VIF	1/VIF
Size (ln)	2.06	0.48539
Reputation	1.74	0.57361
Number of valuations	1.22	0.82103
Bank	1.04	0.96571
Number of FO	1.22	0.81928
Previous relation	1.36	0.73690
FINRA	1.1	0.91083
Cash	1.07	0.93363
Acquirer	1.05	0.95557
Mean VIF	1.32	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 211) = 0.50

Prob > F = 0.6828

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	0.001	1	0.9692

H0: no serial correlation

Range target data set

Linear regression

Number of observations:	121
F(9, 377)	1.06
Prob > F	0.3977
R-squared	0.0971
Root MSE	0.15772

Earnings Multiple	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	| -.0296473	0.03932	-0.75	0.452	-0.10756	0.04826
FINRA	| .0314761	0.03297	0.95	0.342	-0.03385	0.09680
Size (ln)	| -.0207744	0.01162	-1.79	0.076	-0.04380	0.00225
Cash	| -.0491002	0.04525	-1.09	0.280	-0.13875	0.04055
Reputation	| -.0003258	0.00049	-0.66	0.510	-0.00130	0.00065
Number of FO	| .0485653	0.03600	1.35	0.180	-0.02276	0.11989
Previous relation	| .0088155	0.02984	0.30	0.768	-0.05030	0.06793
Number of valuations	| .0035016	0.01445	0.24	0.809	-0.02513	0.03213
Constant	| .4499199	0.08220	5.47	0.000	0.28704	0.61279

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 12.81

Prob > chi2 = 0.0003

IM-Test

Source	chi²	df	p
Heteroscedasticity	48.95	40	0.1567
Skewness	11.56	8	0.1719
Kurtosis	0.58	1	0.4473
Total	61.09	49	0.1152

VIF

Variable	VIF	1/VIF
Size (ln)	2.15	0.46608
Reputation	1.91	0.52353
Number of valuations	1.31	0.76284
Bank	1.05	0.95380
Number of FO	1.23	0.81349
Previous relation	1.37	0.72956
FINRA	1.08	0.92317
Cash	1.12	0.88945
Mean VIF	1.40	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 109) = 0.67

Prob > F = 0.5746

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	0.000	1	1.0000

H0: no serial correlation

Range acquirer data set

Linear regression

Number of observations:	102
F(9, 377)	1.59
Prob > F	0.1382
R-squared	0.1505
Root MSE	0.16283

Earnings Multiple	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.02933	0.03941	-0.74	0.459	-0.10760	0.04894
FINRA	0.00396	0.03424	0.12	0.908	-0.06403	0.07195
Size (ln)	-0.02603	0.01538	-1.69	0.094	-0.05657	0.00452
Cash	-0.04626	0.03937	-1.17	0.243	-0.12445	0.03193
Reputation	-0.00031	0.00068	-0.45	0.655	-0.00166	0.00105
Number of FO	-0.02263	0.03798	-0.60	0.553	-0.09804	0.05279
Previous relation	-0.01694	0.04214	-0.40	0.689	-0.10062	0.06674
Number of valuations	0.00976	0.01473	0.66	0.509	-0.01948	0.03900
Constant	0.50220	0.09187	5.47	0.000	0.31976	0.68463

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 23.19

Prob > chi2 = 0.0000

IM-Test

Source	chi^2	df	p
Heteroscedasticity	58.79	40	0.0279
Skewness	17.32	8	0.0269
Kurtosis	1.33	1	0.2484
Total	77.45	49	0.0059

VIF

Variable	VIF	1/VIF
Size (ln)	2	0.49936
Reputation	1.63	0.61520
Number of valuations	1.21	0.82854
Bank	1.04	0.96295
Number of FO	1.24	0.80450
Previous relation	1.38	0.72723
FINRA	1.17	0.85112
Cash	1.05	0.95266
Mean VIF	1.34	

Ramsey RESET test

Ho: model has no omitted variables

$F(3, 91) = 1.26$

$\text{Prob} > F = 0.2920$

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	0.000	1	1.0000

H0: no serial correlation

Accuracy entire data set

Linear regression

Number of observations:	223
F(9, 377)	1.91
Prob > F	0.0524
R-squared	0.0773
Root MSE	0.15807

Earnings Multiple	**Coef.**	**HCE3 Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
Acquirer	-0.04006	0.02149	-1.86	0.064	-0.08241	0.00229
Bank	-0.02558	0.02527	-1.01	0.313	-0.07539	0.02423
FINRA	0.03679	0.02318	1.59	0.114	-0.00891	0.08249
Size (ln)	0.00284	0.00714	0.40	0.691	-0.01124	0.01693
Cash	0.04188	0.03102	1.35	0.178	-0.01927	0.10302
Reputation	-0.00089	0.00038	-2.37	0.019	-0.00163	-0.00015
Number of FO	-0.00684	0.02220	-0.31	0.758	-0.05061	0.03692
Previous relation	0.00094	0.02526	0.04	0.970	-0.04884	0.05073
Number of valuations	-0.00595	0.01214	-0.49	0.625	-0.02988	0.01798
Constant	0.42478	0.05442	7.81	0.000	0.31751	0.53205

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 6.10

Prob > chi2 = 0.0135

IM-Test

Source	**chi²**	**df**	**p**
Heteroscedasticity	43.47	50	0.7310
Skewness	18.53	9	0.0295
Kurtosis	3.47	1	0.0624
Total	65.47	60	0.2927

VIF

Variable	VIF	1/VIF
Size (ln)	1.94	0.51459
Reputation	1.64	0.60883
Number of valuations	1.17	0.85704
Bank	1.04	0.96104
Number of FO	1.19	0.83704
Previous relation	1.27	0.78441
FINRA	1.10	0.91224
Cash	1.05	0.94852
Acquirer	1.05	0.94971
Mean VIF	1.27	

Ramsey RESET test

Ho: model has no omitted variables

$F(3, 210) = 1.81$

$Prob > F = 0.1457$

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	0.000	1	1.0000

H0: no serial correlation

Accuracy target data set

Linear regression

Number of observations:	121
F(9, 377)	1.01
Prob > F	0.4352
R-squared	0.0671
Root MSE	0.1653

Earnings Multiple	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.01000	0.03691	-0.27	0.787	-0.08313	0.06313
FINRA	0.03055	0.03188	0.96	0.340	-0.03262	0.09373
Size (ln)	0.00219	0.01022	0.21	0.831	-0.01806	0.02244
Cash	0.02197	0.04521	0.49	0.628	-0.06760	0.11154
Reputation	-0.00114	0.00051	-2.25	0.026	-0.00214	-0.00014
Number of FO	0.00842	0.03177	0.26	0.792	-0.05453	0.07136
Previous relation	0.02953	0.03467	0.85	0.396	-0.03916	0.09822
Number of valuations	-0.00784	0.01576	-0.50	0.620	-0.03907	0.02340
Constant	0.42270	0.06878	6.15	0.000	0.28642	0.55899

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 0.91

Prob > chi2 = 0.3389

IM-Test

Source	chi²	df	p
Heteroscedasticity	32.64	41	0.8213
Skewness	9.23	8	0.3230
Kurtosis	2.14	1	0.1431
Total	44.01	50	0.7112

VIF

Variable	VIF	1/VIF
Size (ln)	1.89	0.52797
Reputation	1.60	0.62375
Number of valuations	1.25	0.80099
Bank	1.05	0.95620
Number of FO	1.17	0.85437
Previous relation	1.30	0.76677
FINRA	1.08	0.92182
Cash	1.1	0.91110
Mean VIF	1.31	

Ramsey RESET test

Ho: model has no omitted variables

$F(3, 109) = 1.71$

Prob > F = 0.1688

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	0.000	1	1.0000

H0: no serial correlation

Accuracy acquirer data set

Linear regression

Number of observations:	102
F(9, 377)	1.31
Prob > F	0.2499
R-squared	0.1010
Root MSE	0.15274

Earnings Multiple	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.04948	0.03793	-1.30	0.195	-0.12480	0.02585
FINRA	0.04878	0.03259	1.50	0.138	-0.01593	0.11349
Size (ln)	0.00333	0.01144	0.29	0.772	-0.01939	0.02605
Cash	0.06497	0.04264	1.52	0.131	-0.01970	0.14964
Reputation	-0.00061	0.00054	-1.12	0.267	-0.00169	0.00047
Number of FO	-0.02691	0.03326	-0.81	0.421	-0.09295	0.03913
Previous relation	-0.02990	0.03391	-0.88	0.380	-0.09725	0.03744
Number of valuations	-0.00499	0.01560	-0.32	0.750	-0.03596	0.02598
Constant	0.39763	0.07384	5.39	0.000	0.25100	0.54426

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 2.20

Prob > chi2 = 0.1376

IM-Test

Source	chi^2	df	p
Heteroscedasticity	53.38	41	0.0932
Skewness	12.27	8	0.1394
Kurtosis	3.47	1	0.0625
Total	69.12	50	0.0378

VIF

Variable	VIF	1/VIF
Size (ln)	2.03	0.49338
Reputation	1.72	0.58223
Number of valuations	1.14	0.87601
Bank	1.06	0.93973
Number of FO	1.27	0.78843
Previous relation	1.22	0.82103
FINRA	1.16	0.86463
Cash	1.04	0.95950
Mean VIF	1.33	

Ramsey RESET test

Ho: model has no omitted variables

$F(3, 90) = 0.54$

Prob > F = 0.6533

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	0.000	1	1.0000

H0: no serial correlation

APPENDIX 6: ROBUSTNESS TEST TRANSACTION MULTIPLE

Range entire data set

Linear regression

Number of observations:	184
F(9, 377)	3.44
Prob > F	0.0006
R-squared	0.1503
Root MSE	0.15995

Transaction Multiple	**Coef.**	**HCE3 Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
Acquirer	-0.01213	0.02415	-0.50	0.616	-0.05980	0.03553
Bank	-0.01089	0.02899	-0.38	0.708	-0.06810	0.04633
FINRA	0.04613	0.03069	1.50	0.135	-0.01443	0.10669
Size (ln)	-0.01576	0.01056	-1.49	0.137	-0.03660	0.00508
Cash	-0.08328	0.02980	-2.79	0.006	-0.14209	-0.02446
Reputation	-0.00073	0.00048	-1.51	0.092	-0.00169	0.00022
Number of FO	0.01242	0.02807	0.44	0.659	-0.04298	0.06782
Previous relation	-0.00248	0.02524	-0.10	0.922	-0.05230	0.04733
Number of valuations	0.00116	0.01283	0.09	0.928	-0.02416	0.02648
Constant	0.47452	0.06543	7.25	0.000	0.34538	0.60366

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 17.13

Prob > chi2 = 0.0000

IM-Test

Source	**chi²**	**df**	**p**
Heteroscedasticity	54.62	49	0.2696
Skewness	10.63	9	0.3017
Kurtosis	0.12	1	0.7277
Total	65.37	59	0.2651

VIF

Variable	VIF	1/VIF
Size (ln)	2.46	0.40709
Reputation	2.06	0.48551
Number of valuations	1.45	0.68778
Bank	1.16	0.86393
Number of FO	1.31	0.76350
Previous relation	1.43	0.70025
FINRA	1.25	0.79896
Cash	1.08	0.92213
Acquirer	1.03	0.96933
Mean VIF	1.47	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 171) = 0.68

Prob > F = 0.5643

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	0.612	1	0.4339

H0: no serial correlation

Range target data set

Linear regression

Number of observations:	92
F(9, 377)	3.29
Prob > F	0.0026
R-squared	0.2300
Root MSE	0.15335

Transaction Multiple	**Coef.**	**HCE3 Std. Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
Bank	-0.01800	0.04563	-0.39	0.694	-0.10876	0.07275
FINRA	0.09046	0.04091	2.21	0.030	0.00908	0.17183
Size (ln)	-0.03263	0.01384	-2.36	0.021	-0.06016	-0.00509
Cash	-0.07039	0.04825	-1.46	0.148	-0.16636	0.02558
Reputation	-0.00060	0.00076	-0.80	0.426	-0.00211	0.00090
Number of FO	0.05359	0.03810	1.41	0.163	-0.02218	0.12937
Previous relation	0.01474	0.03350	0.44	0.661	-0.05190	0.08138
Number of valuations	-0.00121	0.01822	-0.07	0.947	-0.03744	0.03503
Constant	0.54998	0.08389	6.56	0.000	0.38312	0.71683

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 4.99

Prob > chi2 = 0.0256

IM-Test

Source	**chi²**	**df**	**p**
Heteroscedasticity	36.29	40	0.6382
Skewness	4.23	8	0.8359
Kurtosis	0.03	1	0.8741
Total	40.54	49	0.7998

VIF

Variable	VIF	1/VIF
Size (ln)	2.52	0.39741
Reputation	2.22	0.44956
Number of valuations	1.5	0.66600
Bank	1.3	0.76794
Number of FO	1.40	0.71508
Previous relation	1.43	0.70149
FINRA	1.24	0.80933
Cash	1.21	0.82531
Mean VIF	1.60	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 80) = 0.84

Prob > F = 0.4766

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	0.000	1	1.0000

H0: no serial correlation

Range acquirer data set

Linear regression

Number of observations:	92
F(9, 377)	1.67
Prob > F	0.1174
R-squared	0.1253
Root MSE	0.16437

Transaction Multiple	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.00688	0.03966	-0.17	0.863	-0.08577	0.07202
FINRA	-0.00471	0.04802	-0.10	0.922	-0.10024	0.09082
Size (ln)	0.00340	0.01475	0.23	0.818	-0.02594	0.03274
Cash	-0.07622	0.03934	-1.94	0.056	-0.15448	0.00203
Reputation	-0.00127	0.00062	-2.06	0.043	-0.00250	-0.00004
Number of FO	-0.00488	0.04557	-0.11	0.915	-0.09553	0.08577
Previous relation	-0.01419	0.03854	-0.37	0.714	-0.09086	0.06248
Number of valuations	0.00192	0.01980	0.10	0.923	-0.03747	0.04131
Constant	0.38178	0.09326	4.09	0.000	0.19626	0.56731

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 8.76

Prob > chi2 = 0.0031

IM-Test

Source	chi^2	df	p
Heteroscedasticity	32.02	40	0.8116
Skewness	14.08	8	0.0798
Kurtosis	0.17	1	0.6821
Total	46.26	49	0.5847

VIF

Variable	VIF	1/VIF
Size (ln)	2.45	0.40883
Reputation	2.03	0.49285
Number of valuations	1.51	0.66381
Bank	1.08	0.92627
Number of FO	1.35	0.66381
Previous relation	1.46	0.68671
FINRA	1.36	0.73483
Cash	1.05	0.95571
Mean VIF	1.53	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 79) = 1.11

Prob > F = 0.3497

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	0.000	1	1.0000

H0: no serial correlation

Accuracy entire data set

Linear regression

Number of observations:	182
F(9, 377)	2.54
Prob > F	0.0092
R-squared	0.1207
Root MSE	0.17365

Transaction Multiple	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Acquirer	0.04565	0.02570	1.78	0.077	-0.00507	0.09638
Bank	-0.03372	0.03307	-1.02	0.309	-0.09899	0.03155
FINRA	0.04825	0.03442	1.40	0.163	-0.01968	0.11618
Size (ln)	-0.01736	0.01091	-1.59	0.113	-0.03889	0.00417
Cash	-0.06096	0.03276	-1.86	0.065	-0.12562	0.00371
Reputation	-0.00037	0.00050	-0.73	0.464	-0.00136	0.00062
Number of FO	0.06484	0.02956	2.19	0.030	0.00649	0.12319
Previous relation	0.00118	0.02922	0.04	0.968	-0.05650	0.05887
Number of valuations	-0.00987	0.01446	-0.68	0.496	-0.03841	0.01867
Constant	0.44453	0.06789	6.55	0.000	0.31052	0.57854

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 1.91

Prob > chi2 = 0.1668

IM-Test

Source	chi^2	df	p
Heteroscedasticity	59.34	50	0.1717
Skewness	19.24	9	0.0232
Kurtosis	3.89	1	0.0486
Total	82.47	60	0.0288

VIF

Variable	VIF	1/VIF
Size (ln)	2.23	0.44854
Reputation	1.84	0.54281
Number of valuations	1.37	0.73118
Bank	1.17	0.85664
Number of FO	1.24	0.73118
Previous relation	1.32	0.75647
FINRA	1.24	0.80405
Cash	1.08	0.92573
Acquirer	1.04	0.96101
Mean VIF	1.39	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 169) = 0.46

Prob > F = 0.7140

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi²	df	Prob > chi²
1	0.516	1	0.4725

H0: no serial correlation

Accuracy target data set

Linear regression

Number of observations:	92
F(9, 377)	1.21
Prob > F	0.3007
R-squared	0.1020
Root MSE	0.17628

Transaction Multiple	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	-0.06573	0.05004	-1.31	0.193	-0.16525	0.03380
FINRA	0.00118	0.05207	0.02	0.982	-0.10238	0.10475
Size (ln)	-0.01906	0.01290	-1.48	0.143	-0.04472	0.00659
Cash	0.00388	0.05522	0.07	0.944	-0.10595	0.11371
Reputation	-0.00031	0.00061	-0.50	0.616	-0.00151	0.00090
Number of FO	0.08014	0.04178	1.92	0.059	-0.00296	0.16325
Previous relation	-0.02151	0.04137	-0.52	0.604	-0.10379	0.06077
Number of valuations	-0.01160	0.02206	-0.53	0.600	-0.05549	0.03228
Constant	0.44909	0.08713	5.15	0.000	0.27579	0.62239

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 3.90

Prob > chi2 = 0.0483

IM-Test

Source	chi²	df	p
Heteroscedasticity	48.19	41	0.2047
Skewness	13.68	8	0.0905
Kurtosis	1.79	1	0.1810
Total	63.66	50	0.0928

VIF

Variable	VIF	1/VIF
Size (ln)	2.21	0.45228
Reputation	1.76	0.56844
Number of valuations	1.50	0.66580
Bank	1.30	0.76930
Number of FO	1.29	0.77682
Previous relation	1.46	0.68647
FINRA	1.25	0.79698
Cash	1.17	0.85314
Mean VIF	1.49	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 80) = 0.75

Prob > F = 0.5259

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	0.000	1	1.0000

H0: no serial correlation

Accuracy acquirer data set

Linear regression

Number of observations:	90
F(9, 377)	1.88
Prob > F	0.0744
R-squared	0.1692
Root MSE	0.17338

Transaction Multiple	Coef.	HCE3 Std. Err.	t	P>|t|	[95% Conf. Interval]	
Bank	0.00236	0.04848	0.05	0.961	-0.09410	0.09883
FINRA	0.09234	0.05504	1.68	0.097	-0.01716	0.20185
Size (ln)	-0.01168	0.02268	-0.52	0.608	-0.05680	0.03344
Cash	-0.10977	0.04544	-2.42	0.018	-0.20017	-0.01936
Reputation	-0.00040	0.00098	-0.40	0.688	-0.00235	0.00156
Number of FO	0.03650	0.05704	0.64	0.524	-0.07698	0.14998
Previous relation	0.01657	0.04329	0.38	0.703	-0.06958	0.10271
Number of valuations	-0.02069	0.02088	-0.99	0.325	-0.06224	0.02086
Constant	0.50468	0.10979	4.60	0.000	0.28623	0.72314

Breusch-Pagan

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

chi2(1) = 1.74

Prob > chi2 = 0.1872

IM-Test

Source	chi^2	df	p
Heteroscedasticity	53.4	41	0.0928
Skewness	9.24	8	0.3222
Kurtosis	1.00	1	0.3174
Total	63.65	50	0.0930

VIF

Variable	VIF	1/VIF
Size (ln)	2.41	0.41415
Reputation	2.03	0.49170
Number of valuations	1.37	0.73250
Bank	1.14	0.88015
Number of FO	1.35	0.74032
Previous relation	1.24	0.80519
FINRA	1.34	0.74790
Cash	1.06	0.94367
Mean VIF	1.49	

Ramsey RESET test

Ho: model has no omitted variables

F(3, 78) = 1.64

Prob > F = 0.1867

Breusch-Godfrey test

Breusch-Godfrey LM test for autocorrelation

lags(p)	chi^2	df	Prob > chi^2
1	0.753	1	0.3855

H0: no serial correlation