Assignment name: Thesis upload
Name: Julia Stübben
Handed in: 2014-05-26 11:39
Generated at: 2014-06-13 20:03

LUND UNIVERSITY
School of Economics and Management

Determinants of IPO underpricing

- A comparison between the UK and Germany -

Master Thesis

In Corporate and Financial Management

Lund University

Authors: Julia Stübben, Rita Berkholz

Supervisor: Maria Gårdängen

May 2014

Acknowledgements

The authors would like to thank their supervisor Maria Gårdängen for the professional support and helpful comments throughout the process of writing this thesis. The advices the authors received were always highly efficient and straightforward.

The authors would also like to thank everybody that was involved in the process and increased the quality of this dissertation, especially the appreciated correction readers. Additionally, the authors want to thank their parents for the opportunity to study at Lund University.

Abstract

Title:	Determinants of IPO underpricing - A comparison between the UK and Germany
Date:	2014-05-26
Course:	BUSN 89 - Degree Project in Corporate and Financial Management – Master Level, 15 ECTS
Authors:	Julia Stübben, Rita Berkholz
Supervisor:	Maria Gårdängen
Key words:	IPO, underpricing, United Kingdom, Germany, legal framework, ownership structure, common law, civil law, institutional framework, legal origin
Purpose:	The purpose of this study is to investigate the influencing factors on underpricing in the UK and Germany. The focus hereby lies on the different institutional framework (common and civil law) and implied ownership structure of both countries.
Methodology:	A quantitative analysis is conducted using multiple linear regression model and descriptive statistics. The dependent variable underpricing is regressed on country- and firm-specific variables. The underlying OLS aussumptions are tested and robustness tests of the findings are performed.
Theoretical perspective:	This study is based on prior research that explores stock market and or firm specific data to investigate underpricing patterns of IPOs. Furthermore, the impact of a countries institutional framework on underpricing is analysed and insights on the respective implied ownership structure is provided.
Empirical foundation:	The analysis includes 177 IPOs listed on the UK and German stock exchanges (LSE, AIM, FSE) during 2009-2013. Data was obtained from the S&P IQ Capital Database.
Conclusion:	The outcomes of this study indicate that the UK as common law country encourages underpricing, which contradicts previous empirical research. Characteristics of institutional framework, such as legal enforcement and quality of legal framework, are positively and negatively related to underpricing respectively. It is further found that the implied ownership structures for both legal origins seem to favour blockholder in the after-crisis period.

Table of Contents

Abbreviations

2SLS	Two-Stage-Least-Square
BJ	Bera – Jarque
DAX	Deutscher Aktien Index
DBAG	Deutsche Börse AG
DSP	Direct Stock Purchase
EU	European Union
EUR	Euro
FQB	First Quotation Board
GBP	Great Britain Pound
GER	Germany
IPO(s)	Initial Public Offering(s)
IV	Instrumental Variable
LE	Legal enforcement
LSE	London Stock Exchange
NM	Neuer Markt
OLS	Ordinary Least Square
P/E	Price earnings ratio
PC	Principal Component
PCA	Principal Component Analysis
pp	Private Placement
PwC	Price Waterhouse Coopers
QLF	Quality of legal framework
S&P	Standard and Poor's
SB	Shareholder Breadth
SE	Standard error
SQB	Second Quotation Board
UK	United Kingdom
UKLA	United Kingdom Listing Authority
UPR	Underpricing
US	United States of America
VC	Venture Capital

Figures

Tables

Equations

1 Introduction

The first chapter introduces the topic by explaining the background. A detailed problem discussion and identification of the research gap follows. This results in the specific purpose and research questions established for this study. Finally, this section gives a short overview of delimitations that set the parameters for data collection and analysis and an outline guiding the reader through the remaining report.

1.1 Background

The European Initial Public Offerings (IPOs) market in the young 21st century already faced drastic changes in the economic and regulatory market environment. The bursting of the dot-com-bubble[1] in 2000 or the implementation of Basel II[2] are only extracts of these cutting events. A striking rise and fall of the Euro NM markets[3] and a substantial increase of bookbuilding as a pricing and allocation mechanism in IPOs are further important features (Ritter, 2003). The tension in the IPO market peaked when the global financial crisis hit Europe in 2008. That caused not only the emission activity and share prices, but also the stock exchange indices to collapse (Glavina, 2013). Compared to 2008, the activity on the European exchanges fell by 57% in 2009 from previously 295 to 126 IPOs annually. Additionally, a decline of 49% in total offering value from €13.953 in 2008 to €7.112 in 2009 is mirrored (PwC, 2010).

Furthermore, the market conditions are influenced by the instability in the political environment and the debt crisis in Europe, which has a permanent impact on the confidence of investors (Glavina, 2013). '*IPO activity across European exchanges has continued to suffer in 2009, largely due to the worldwide loss of investor confidence and the global economic crisis*', as stated in the IPO European market report 2009 by Pricewaterhouse Coopers (PwC) (2010, p.1). Considering the extreme diverse

[1] Dot-com-bubble refers to the stock price bubble of Internet companies in the late 1990s.
[2] Basel II, first published 2004, the second of Basel Committee on Bank Supervision's, which sets minimum capital requirements for financial institutions.
[3] NM refers to the 'Neuer Markt' segment on the German stock exchange for high-tech growth firms during the new economy period, which was introduced 1997 and finally closed in 2002. Similar segments were introduced in other European markets as well.

scenarios, the IPO market in Europe and its participants have been exposed to, coherently generate new vibrant fields of study and challenge existing research.

The recent events have driven the seemingly mature IPO research further by the existence of three apparent anomalies: issuing activity, underpricing, and long-run underperformance (Günther and Rummer, 2006). In this context a well-documented phenomenon is the underpricing (UPR) of IPOs[4] (Engelen and Essen, 2010). The existing research and results indicate that underpricing in IPOs occurs worldwide, while attempting to explain the apparent contraction with market efficiency.

The shares that initially are sold to the public are defined as underpriced when the first day trading price exceeds the final offer price and thus the share price experiences a substantial jump (Ljungqvist, 2007). An extensive body of research tried to explain the underpricing in IPOs with different models that can be broadly categorized as information revelation, targeting particular investors, and conflicts of interest (Jenkinson and Jones, 2004). In relation to these models, empirical evidence shows the first-order effect on underpricing due to information frictions. The vast variation in the extent of underpricing over time challenges the impact of additional explanations, especially in a cross-country test perspective (Ljungqvist, 2007; Hopp and Dreher, 2007).

1.2 Problem discussion

There is a large number of partly contradictory explanations for the underpricing phenomenon. Early investigations focus on the existence of information frictions and agency problems as justification for first-day price jumps[5]. More recent research tries to find further explanations for instance in a countries´ legal structure and strategic goals of participants involved in the IPO process[6].

[4] For example, Ritter (1984), Beatty and Ritter (1986), Rock (1986), Ibbotson et al. (1994), Jenksinon and Ljungqvist (2001), Ritter and Welch (2002), Ljungqvist and Wilhelm (2002, 2003), Loughran and Ritter (2004), among others.

[5] Ibbotson and Jaffe (1975), Ritter (1984), Rock (1986), Beatty and Ritter (1986), Welch (1992), among others.

[6] Alavi *et al.* (2008), Boulton *et al.* (2010), Brennan and Franks (1997), Engelen and Essen (2010), Hopp and Dreher (2007), Pham *et al.* (2003), among others.

The extreme variations of underpricing open up for further potential research topics. As stated by Ljungqvist and Wilhelm (2003), '*it strains belief that even collectively this body of theory can account for the profound change in market behaviour*' more research is suggested in explaining the underpricing phenomenon in the 21st century.

However, empirical studies have mainly focused on the United States' (US) market, but show immense differences in the degree of underpricing across countries[7]. Arising from this debate, it is of interest to explore the diverse country settings within Europe. A comparison of IPOs in the United Kingdom (UK) as a common law and Germany (GER) as a civil law country is considered as particularly interesting with regards to differences in legal framework, and hence ownership structure.

The origin and characteristics of firms going public were found to affect the level of underpricing (La Porta *et al.*, 2002). In general, common law countries show a higher degree of investor protection and like the UK have a more developed financial market, whereas French civil law countries have the lowest class of investor protection. In between these two extremes are the civil law systems of Scandinavian and German origin (Engelen and Essen, 2010). Empirical evidence generally suggests that underpricing is less severe in countries with a high level of shareholder protection and a good quality of institutional framework (Engelen and Essen, 2010; Hopp and Dreher, 2007; Shi *et al.*, 2007). An overview of the level of underpricing for the respective representatives – UK, GER, and France – of a countries legal system is shown in Table 1 below.

[7] Engelen and Essen, 2010; Hopp and Dreher, 2007; Boulton *et al.*, 2010; Ritter, 2013; Loughran *et al.*, 1994; among others.

Table 1: Empirical findings in previous IPO literature

Author	Period	Germany		United Kingdom		France	
		N	Mean*	N	Mean*	N	Mean*
Shi *et al.*, 2007	1995-2002	281	0,458	305	0,366	306	0,187
Engelen & Essen, 2010	2000-2005	132	0,372	471	0,202	171	0,131
Hopp & Dreher, 2007	1988-2005	513	0,378	838	0,139	462	0,123
Boulton *et al.*, 2009	2000-2006	223	0,300	1034	0,177	282	0,126
Lin *et al.*, 2013	1991-2011	349	0,218	188	0,269	494	0,175

* mean 1st Day returns = underpricing

(Source: created by authors)

The UK institutional framework on one hand favours small investors and thus promotes a wider shareholder breadth (SB). Some researchers argue that greater ownership dispersion requires a higher level of underpricing. The German system on the other hand, favours more concentrated ownership and larger shareholders, which induce a lower level of underpricing (Pham *et al.*, 2003; Brennan and Franks, 1997; Engelen and Essen, 2010; Boulton *et al.*, 2010[8]). This contradicts the argument of weaker legal protection – for German civil law – and higher level of underpricing. Nonetheless, in times of economic downturns and crisis the established theories could be reversed due to the fact that civil law structures usually are associated with lower debt levels and therefore lower distress risk and uncertainty involved in the IPO process (La Porta *et al.*, 1997, 1998). This conflict is the focus of the present study and is investigated by comparing the underpricing of IPOs in UK and Germany in the post-financial crisis period.

There has been empirical research on the two extremes UK and France (Cahine *et al.*, 2007[9]) and even on the UK and Germany (Goergen and Renneboog, 2007[10]). The mentioned articles focused on different factors and periods that determine underpricing. However, to the researchers best knowledge there is no study focussing on Germany with its bank-based system and the UK with its market-based system in the aftermath of

[8] Boulton*et al.* (2010) studied a sample of 4,461 IPOs across 29 countries during 2000-2004.
[9] Cahine*et al.* (2007) studied a sample of 444 IPOs in the UK and France during 1996-2002 from which 303 were UK and 141 were French companies.
[10] Goergen and Renneboog (2007) analyzed a sample of 764 UK and 98 German IPOs (total sample: 862) during 1981-1988.

the recent financial crisis. The different set ups of the two institutional systems may be especially exposed to such conflicts and have not yet been investigated with regards to influences and evolvements of underpricing during the period after the financial crisis from 2009-2013. Table 2 shows an overview of related historical literature with information on the different theories explaining IPO underpricing, periods and countries that were investigated. Germany and the UK are particularly interesting since they represent Europe's largest and most established stock exchanges.

Table 2: Overview of previous literature

Recent Researcher	Asymmetric Information	Institutional	Ownership and Control	Behavioural Explanations	**Sample Geography**	**Period**
Chambers & Dimson, 2009		**X**	**X**		**UK**	1917-2007
Zheng & Li, 2008			**X**		**US**	1993-2000
Nagata, 2013				**X**	**Japan**	1989-2005
Bessler et al., 2014	**X**				**Germany**	1998-2008
Hoque, 2014	**X**	**X**			**UK**	1999-2006
Georgen & Renneboog, 2007			**X**		**Germany, UK**	1981-1994
Engelen & Essen, 2010		**X**			**Europe**	2000-2005
Alavi et al., 2008			**X**		**Australia**	1995-2005
Boulton et al., 2009 & 2010	**X**		**X**		**Global**	2000-2004
Lin et al., 2013		**X**			**Global**	1991-2011

(Source: created by authors)

1.3 Purpose and research question

The main objective of this study is based on the research gap identified in the previous paragraph. It will thus add further empirical insight and knowledge with regards to IPO underpricing and its influencing factors in the most recent years. Further explanations for the driving factors of the underpricing phenomenon of IPOs with respect to a cross-country perspective after severe periods, i.e. the financial crisis, is provided.
The central question in this dissertation asks how IPO underpricing in the UK and Germany, as representative inter-European countries of common and civil law, is influenced by differences in institutional frameworks, particularly in the aftermath of the recent financial crisis. In order to answer the main question, several sub questions were established.

The resulting research questions are the following:

Main research question:

1. How does the institutional (legal) framework affect the level of IPO underpricing in the UK and Germany as European representatives of common and civil law countries?

Sub-questions:

2. What are the main influencing factors of IPO underpricing in Europe?
3. Is there a difference in the level of underpricing between civil law (Germany) and common law (UK) IPOs?
4. How does the legal origin implied ownership structure influence the level of underpricing in IPO firms?

The findings of this study intent to contribute to existing research and reveal possible strategic implementations for the participants involved in the IPO process, depending on the country´s legal origin.

1.4 Delimitations

The researchers set boundaries to this study in order to clearly define the parameters of investigation. The project is limited to a period of eight weeks. Because of the extensive literature available, it is chosen to focus on major reputable authors like Jay Ritter, Alexander Ljungqvist, Charles Shi, Engelen and Essen, and Rafael La Porta, who offer comprehensive empirical research reports, also in corporation with other authors. The indices considered in the analysis are taken from previous literature and thus might not be applicable to the investigated period since the financial crisis had a large impact on laws and regulations. Further, all amounts stated in GBP (British Pound) are converted into Euro at historical exchange rates. This is a potential source of biases in the presented results. The sample population of 252 IPOs during 2009-2013 is restricted to a final sample size of 177 companies due to alignment and comparability reasons.

1.5 Outline

The remaining paper is divided into four main parts. The following chapter examines previous literature and empirical findings on IPOs and mispricing in general as well as specifically for the UK and Germany. It results in the development of five hypotheses that are based on historical literature. The third chapter deals with the methodological framework of this study and introduces the research approach, data collection methods as well as an introduction to the regression model applied. Further, the reliability and validity of regression results are assessed at the end of the same chapter. In the following Chapter 4 the empirical results are presented, moving from descriptive statistics to the regression and hypotheses testing results. The final chapter offers an interpretation and critique of the findings, tying up the various theoretical and empirical outcomes in order to derive a logical conclusion. Then the results are being applied to possible strategic implementations for participants involved in the IPO process. Potential future research topics are indicated at the end of that chapter.

2 Literature review and hypotheses development

This chapter establishes the literature framework of this study. The rational of IPOs as well as the process of introducing a company to the market are explained. Then, different theories of the underpricing phenomenon are introduced and critically reviewed. After summarising the previous empirical findings, the chapter concludes in establishing relevant hypotheses from the previous literature findings.

2.1 Initial Public Offerings

2.1.1 Rational of IPOs

Raising funds through a stock market offering is often very cost intensive (Ritter, 1987; Barry *et al.*, 1991). This raises the question, why firms initially take the step to enter the stock market and go public. Ellingsen and Rydqvist (1997) emphasize four different reasons: (i) to obtain new finance; (ii) to enhance a company's image and increase its publicity; (iii) to motivate managers and other employees; (iv) to *´cash in´* by selling off shares. The access to alternative sources of funds makes an important watershed in the life of a young company. At the same time the company acquires new obligations concerning transparency and disclosure requirements. In this context, Röell (1996, p. 1079) concludes that there must be additional benefits to compensate this costly trade off, like *´an informative stock price, a more liquid stock, and increased competition among providers of finance.´* Overall, the stock market provides a venue for trading the companies' shares and allows existing shareholders to differentiate their portfolio (Ljungqvist, 2007).

The start in the process of going public is marked with the choice of exchange upon which the new shares will be traded. Then a prospectus containing the relevant statutory authority needs to be filed by the issuer. The fulfilment of listing requirements and the different IPO mechanisms are important cornerstones for a company before going public. A period of marketing and public subscription to IPO begins subsequently. The process is finally concluded with the public trading of the issue (Shi *et al.*, 2007). Appendix XVI shows a brief overview of the general IPO process in Europe.

2.1.2 Different IPO mechanisms

There are different pricing methods, which have proven to affect underpricing. Initial pricing and allocation mechanisms can be categorized into: fixed-price offerings, auctions, bookbuilding and hybrid offerings.

In a fixed price regime the offer price is set after which investors are able to submit their orders at the predetermined rate. This has historically been the dominant approach in the UK and in most of Europe (Benveniste and Busaba, 1997). Subsequent investors could adopt earlier investors purchasing decision and ignore their own private information. Welch (1992) argues that the fixed price method uniquely offers the potential to exploit the market structure and prevent information aggregation by pricing the issue low enough i.e. underprice, to attract primary investors and thus create a subsequent high demand. The rules for allocating shares in fixed price offerings can differ and be either non-discretionary e.g. UK, Finland, or discretionary e.g. Germany, Sweden. However, fixed price offerings have become uncommon in most of the European countries in recent years (Ritter, 2003).

Different to fixed price offers, in terms of price determination and information produced throughout the offering, is an IPO auction (Chemmanur and Liu, 2006). In an auction, investors place an order that includes a certain number of shares at a desired offer price. Based on the binding orders an auction price mechanism assigns the shares (Engelen and Essen, 2010). Thus, the price is determined as a result of various competing informed bidders[11], but unlike in fixed price offerings mainly outsiders produce the information. Throughout the auction these investors will compete away much of the surplus with those investors that know best about the true value of the firm. Consequently, IPO auctions are considered to be theoretically optimal in terms of maximizing proceeds, since auctions or tender offers allow market demand to at least partially influence the issue price (Chemmanur and Liu, 2006). Hence, auction-like mechanisms such as tender in the UK or the Netherlands are usually associated with a lower level of underpricing (Jenkinson and Ljungqvist, 1996; Derrien and Womack, 2003). Nevertheless, the practice of auction and fixed price mechanisms has tended to

[11] Informed investors are referred to as institutional and uninformed investors are referred to as retail investors respectively.

decline in Europe. Auctions even disappeared completely in Germany, but rarely exist in the UK (Gajewski and Gresse, 2006).

A number of previous articles have documented the decline of these two mechanisms for pricing IPOs in Europe and instead support the growth of bookbuilding procedures (Biais and Faugeron, 2002; Sherman, 2005; Ljungqvist *et al.*, 2003). It is an introduction method in which the underwriter, requests signs of interest from institutional investors consisting of a bid and quantity of demanded shares and possibly a maximum price i.e. limit price. Based on investors' indications of interest, the underwriter sets a price range for the shares to be placed. The fact that pricing and allocation rules are not announced, leaves these actions to the full discretion of the underwriter i.e. investment banker (Cornelli and Goldreich, 2001). The majority of the theoretical literature emphasises that bookbuilding enhances information transfer about the value of the stock throughout the procedure and thus price the issue more accurately. The investors, who reveal information, are compensated with a favourable allocation of shares by the underwriter (Benveniste and Spindt 1989; Spatt and Srivastava, 1991). There is proven evidence that countries that use bookbuilding generally have less underpricing compared to countries that commit to fixed price offerings (e.g. Ritter, 1988; Loughran *et al.*, 1994). According to previous researchers, bookbuilding is an optimal dynamic mechanism where the different phases i.e. road-show[12] and pre-marketing period, prior to the actual IPO serve as an information extraction process. Jenkinson and Jones (2004) or Ljungvist (2003) claim the uncertainty about the final price is small and prices outside the preliminary range seldom occur. The bookbuilding as an IPO mechanism has been used increasingly during the 1990s and represents the standard procedure conducted by banks in European domestic offerings since the late 1990s (Ljungqvis t*et al.,* 2003).

Ljungqvist *et al.* (2000) declare that after bookbuilding has been introduced internationally, its use increased by about 80% of non-US offerings brought to the market or some hybrid, which was largely a phenomenon in Europe. Since then many countries have used hybrids that combine any two of the three IPO mechanisms. There exist auction/public offer and auction/bookbuilding hybrid IPOs, while the most

[12] A road-show refers to the managements´ activity and presentations to advertise their IPO shares.

commonly exercised hybrid is bookbuilding/public offer. This is also the case for both UK and GER as illustrated in Appendix XIV regarding the different IPO mechanisms by country. The general practise for hybrids is that bookbuilding is used to set the price and allocate the shares either to institutional or foreign investors. Whereas for retail investors that do not take part in the price setting, a public offer tranche is reserved (Jagannathan and Sherman, 2006). In France, only sequential hybrids in which the price must be set a long time in advance was allowed. Derrien and Womack (2003) found in their study that this procedure was less efficient. This is confirmed by Chowdhry and Sherman (1996), who suggest that setting the price too early adds risk and hence requires higher levels of underpricing[13]. A degree of freedom is removed for some hybrids, especially in the UK, that include an automatic clawback provision, which enables retail investors to adjust their demand on feedback received from institutional investors. The clawback provision forces the banker to reassign shares when retail investors spot strong demand by institutional investors and thus follow a suit. Consequently, incentives for institutional investors to show strong interest will be weak, while facing the fear to be crowded out (Ljungqvist and Wilhelm, 2002[14]).

2.1.3 Principal theories explaining IPO underpricing

In the 70s, early writers, notably Ibbotson (1975) documented the shares of companies that go public, tend to be underpriced and that on the first day of trading the share price jumps significantly. Since 1980s, this '*underpricing discount'* has tended to fluctuate to a great extent, averaging at 7% in the 1980s, which increased to 15% in the 1990s. After peaking at 65% during the burst of the dot-com-bubble and averaged at 22% in the four years since 2000 (Gajewski and Gresse, 2006[15]). Hence, IPO firms appear to leave considerable amounts of *´money-left-on-the-table'*[16] denoting indirect costs to a firms owner, when the shares sold for personal account at a too low price. The extensive theoretical literature trying to validate underpricing, established models that are confronted with ever changing settings and data, but can be broadly grouped into: asymmetric information, institutional explanations, ownership and control, and

[13] This is a problem specifically for France, and sequential hybrids, where open pricing allows fixing the offering price shortly before shares begin trading.
[14] Ljungqvist and Wilhelm (2002) studied a sample of 1,032 IPOs worldwide between 1990-2000.
[15] Gajewski and Gresse (2006) investigated a sample of 2,307 IPOs in 15 European countries.
[16] Money-left-on-the-table as defined by Ritter (1984) represents the difference of first-day closing price less offer price times the number of shares sold at the IPO.

behavioural explanations (Ljungqvist, 2007). This subchapter intends to outline the principal theories of IPO underpricing and discuss their empirical evidence.

2.1.3.1 Asymmetric information models

Research on information asymmetries as an explanation for underpricing focuses on the different levels and access to information throughout the listing process between numerous participants including the IPO firm, banks-underwriters, entrepreneurs, and external investors (Cahine *et al.,* 2007)[17]. All theories of underpricing based on asymmetric information have a common believe that underpricing is positively correlated to the degree of asymmetric information (Ljungqvist, 2007).

One of the best-known asymmetric information model is Rock's (1986) winner's curse, which is an application of Akerlof's (1970) lemon problem, presumed that issuing firms are better informed than investors (Günther and Rummer, 2006). The uninformed investor buys new shares intuitively, while the informed investor only subscribes to more appealing shares in an IPO. In a winner's curse, the uninformed investors receive all the shares they have bid for in unattractive offerings i.e. overpriced IPOs, but only a partial allocation of underpriced IPOs in attractive offerings (Ljungqvist, 2007). Thus, the uninformed investors receive an expected return below the average unconditional i.e. underpriced, or even negative return (Ritter and Welch, 2002). For the IPO market Rock (1986) assumes that demand of the uninformed investors is needed, in the sense that the participation of only informed investors is insufficient to transact all existing shares on offer. To avoid an IPO market that is only populated by (equally) informed investors, because uninformed investors are unwilling to bid, underpricing is needed on average for them to expect a positive return or at least to break even (Ljungqvist, 2007). Beatty and Ritter (1986) extend this model showing that the level of underpricing is positively correlated to the *ex ante* uncertainty about the value of the firm with respect to investment banks price setting. Since underpricing is a cost attributed to the firm, this induces an incentive to free ride for an individual entity, when underpricing too little. The empirical results from Koh and Walter (1989) in Singapore and Levis (1990) for the UK confirm this relationship. In addition to Rocks theory, pricing too high might

[17] Within the available space it seems not possible to cover all theoretical and empirical contributions. For a comprehensive survey of the large scope of literature, see Jenkinson and Ljungqvist (2001), Ritter and Welch (2002), and Ljungqvist (2007).

induce a negative cascade proposed by Welch (1992). The view that investors try to evaluate the interest of other investors is supported by, Amihud *et al.* (2001) findings, that IPOs tend to be either undersubscribed or hugely oversubscribed.

Another theory reverses Rock´s (1986) assumptions regarding the informational asymmetry between issuing firms and investors, namely signalling models that use underpricing as a signal of a firms quality (Allen and Faulhaber, 1989; Grinblatt and Hwang, 1989; Welch, 1989). Even though it is clearly costly, underpricing may be used to signal the company's '*true*' high value, if companies have superior information about potential future risks in order to '*leave a good taste in investors' mouths*' (Ibbotson, 1975). However, evidence for these signalling theories is somewhat mixed. The empirical results of Jegadeesh *et al.* (1993) do not support the signalling models and instead find no distinction in returns at and after the first day. Michaely and Shaw (1994) reject signalling and note, the decision of the degree of underpricing and whether to reissue[18] equity at a later stage are not independent of each other in the signalling context.

In this framework the different introduction methods, mainly fixed price offers and bookbuildings, have been investigated. Benveniste and Spindt (1989), Benveniste and Wilhelm (1990), and Spatt and Srivastava (1991) focus on the most common practise of bookbuilding in many countries and argue that this method gives underwriters wide discretion over the allocation of shares and thus allows them to obtain information from informed investors throughout the listing process. Hence, the bookbuilding method mitigates the incentive to misrepresent positive information, since this investor will be excluded from the IPO. At the same time, favourable investors that bid aggressively are rewarded by a larger allocation of shares (Ljungqvist, 2007). Nevertheless, certain restrictions, common in for instance in Europe and Asia[19], may interfere with the efficiency and force bidders to rely more on price than on allocations. This extended framework, to allow for costly information gathering, is studied by Sherman (2000) and Sherman and Titman (2002), who suggest that it is the information gathering constraint, instead of the truth-telling constraint, that determines pricing and allocation of shares.

[18] Reissue refers to the theory of share repurchases as an indication of undervaluation.
[19] Some parts of Europe and Asia require a certain fraction of shares that have to be allocated to retail (uninformed) investors.

Hanley (1993) finds evidence in favour of bookbuilding theories, that the price revision over the course of the process and the first-day underpricing return are positively correlated. This is often referred to as *'partial adjustment'* phenomenon, which indicates that underwriters do not sufficiently adjust their pricing upward to keep underpricing constant in situations of strong demand i.e. more positive information is revealed. Consistent with the information revelation theory of bookbuilding, Cornelli and Goldreich (2001, 2003), and Jenkinson and Jones (2004), show informed investors request more and preferentially receive more allocations in the IPO process.[20]

Moreover, the important role of investment banks in extracting information that is valuable in the price setting and their discretion over share allocation, highlights the potential for agency problems. The allocation and trading based research of IPO shares is most prominently emphasized by Loughran and Ritter (2004). Among others, Ljungqvist and Wilhelm (2003) suggested the incentive of insiders in bargaining over the offer price and the degree of underpricing, depends on their involvement in the deal and wealth effects for shareholders. The researchers claim, that conflicts are potentially severe, whenever underwriters own stake or a company underwrites the IPO itself[21]. These findings contradict a previous research of Muscarella and Vetsuypens (1989) who stated that investment banks suffered equally when underwriting their own IPOs. Another aspect stressed by Habib and Ljungqvist (2001) is that the degree of underpricing is impacted by the quantity owners intend to sell. In line with the previous argument is the prospect theory proposed by Loughran and Ritter (2002) that determined the covariance of the money-left-on-the-table through underpricing and the owners' wealth changes. Their findings have been challenged and stay in contrast to Wasserfallen and Wittleder (1994) that support the view that underpricing is negatively correlated to the owners' retention rate[22]. Early models, linked to agency conflicts and IPO underpricing, focused on the informational advantages by banks and their exploiting in marketing and distribution of the stock traded. Circumstances where effort

[20] Jenkinson and Jones (2004) only find minor support but that can be attributed to different European Investment banks that have been taken into consideration in the studies.

[21] Their evidence reports, the greater the investment banks own stake in the process, the lower the first-day underpricing returns.

[22] The study explores the hot-issue-period in Germany, where direct stock purchase (DSP) programs (also referred to as 'family and friends' programs, that allow individuals to purchase a stock directly from a company or through a transfer agent and thus, avoids commission) became increasingly popular that might create incentive to underprice to favour to the targeted clients.

is not entirely observable might lead to a moral hazard situation for banks. Therefore, a screening model has been constructed by Baron and Holmström (1980), and Baron (1982), in order to reveal the underwriters' benefit from underpricing.

2.1.3.2 Institutional explanations

The literature offers an additional explanation for IPO underpricing that is provided by institutional explanations, which focus on the three features of the marketplace – legal liability, price stabilization, and tax arguments.

First, the legal liability has stimulated a legal insurance or lawsuit avoidance hypothesis, which indicates that underpricing reduces the likelihood and extent of future legal liability claims costs against issuers and underwriters and hence serves as a form of litigation insurance for these participants (Hughes and Thakor, 1992; Tinic, 1988). The basic idea that firms intentionally sell their stock at a discount to minimize the probability of future lawsuits from disappointed shareholders with the post-performance of their shares goes back at least to Logue (1973) and Ibbotson (1975). This explanation is somewhat US-centric, but it is still possible that lawsuit avoidance is a second order of IPO underpricing .The stringent disclosure rules in the US expose underwriters and issuers to substantial risk of litigation by investors claiming important facts were stated misleadingly or omitted from the IPO prospectus (Ljungqvist, 2007). Since US companies are subject to a '*quiet period*'[23] that requests the full content of relevant information in the written prospectus and not other documents, but those restrictions do not exist in Europe. Thus, lawsuits are common in the US and rare in Europe (Ritter, 2003).

According to previous empirical findings the probability of being sued is not economically significant for instance in Finland (Keloharju 1993), Germany (Ljungqvist, 1995), or the UK (Jenkinson, 1990). Empirical evidence on the lawsuit hypothesis is, at best, mixed (Lin *et al.*, 2013). Tinic (1988) and Lowry and Shu (2002) find evidence in support of the lawsuit avoidance hypothesis in the US, whereas Drake and Vetsuypens (1993) find that underpricing did not protect IPOs from being sued,

[23] Starting from the decision to go public until 40 calendar days after, analysts that are affiliated with underwriters are prohibited from issuing research reports or recommendations.

thus is inconsistent with the legal insurance hypothesis. However, the discussion developed during the internet bubble, where concerns about the '*lofty*' valuation of internet stocks were severe and anxiety for lawsuits alarmed underwriters who could not justify a higher offer price (Loughran and Ritter, 2004). Ritter and Welch (2002) interpret underwriters' actions as '*leaning against the wind'* by not exploiting over-optimism on the part of some investors at that time. Nevertheless, in general it can be concluded that the degree of litigation risk in a certain country has an effect on the extent of underpricing for companies in that country (Lin *et al.*, 2013).

Second, price stabilisation, as one of the services that underwriters provide in connection with an IPO, shows another institutional explanation of underpricing (Ljungqvist, 2007). This practice of price support, also referred to as '*price manipulation'*, is intended to reduce price drops after going public for a limited time and has a statistical implication. According to Ruud (1993), IPOs are not intentionally underpriced, but rather priced at expected market value. Those offerings whose prices loom to drop below the offer price experience support in the subsequent trading after going public. The price stabilisations seem to lead to a positive average price jump, which is largely due to a statistical affect[24]. The most recent research has emphasised the role of price support in reducing underpricing, because it creates a mechanism that ties underwriters and investors through the course of a bookbuilding procedure (Benveniste *et al.*, 1996; Smith, 1986). They support the view that underwriters may have an incentive to increase the offer price, since their dollar fees increase in gross proceeds. The investors in the bookbuilding exercise might detect the unfavourable behaviour of underwriters and are positively influenced when underwriters commit in price support. Since the price support is costly for the underwriter, the investor is more likely to believe that the issue will not be deliberately overpriced (Ljungqvist, 2007).

The empirical evidence remains unclear, whether and by how much, the provision of price support decreases the level of underpricing. Ruud (1993) argues that observed underpricing is the by-product of price support. This is contrary to the findings of Asquith *et al.* (1998) who claim that underpricing is a result of other factors than price support. In line with Benveniste *et al.*(1996), Chowdhry and Nanda (1996) propose that

[24] Such actions would tend to remove the left tail of the distribution of initial returns.

price stabilization decreases the need of underpricing. While for Benveniste *et al.*(1996) institutional investors and for Chowdhry and Nanda (1996) retail investors respectively are the main beneficiaries of price support.

Finally, there may be tax advantages to IPO underpricing. This tax argument emerges from the different tax rates on employment income and capital gains (Ljungqvist, 2007). In this context Rydqvist (1997)[25] concluded that this discrepancy in tax rates creates incentives to pay employees by allocating appreciating assets i.e. an underpriced stock instead of a normal salary.[26] Analogue is Taranto's (2003) argumentation that one characteristic of US tax law may induce managers to underprice their own company's shares in an IPO. Managers pay income tax when exercising the option as well as when they eventually sell the underlying stock. Both tax payments are based on the residual of the strike price and sale price respectively to the '*fair market value'*. Due to the double taxation for managers holding employee stock options they prefer the '*fair market value*' to be as low as possible (Ljungqvist, 2007). In other words this is a '*trade-off between the tax benefit and the dilution cost of underpricing*' (Ljungqvist, 2007, p. 402).

However, there is no empirical evidence for the explanatory power of tax arguments for underpricing in IPOs. These arguments could rather help to explain the cross-section of underprcing returns (Ljungqvist, 2007). Due to the similarity of tax rates on capital gains up to 28% for the UK and GER it is not assumed to play a role in this cross-country context.

2.1.3.3 Ownership and control

Going public results in a significant change in the ownership structure of a business and thus, changing control mechanisms. That is why the structure of a firm and interests of decision makers and shareholders play an important role when investigating potential mispricing. Goergen and Renneboog (2007) argue that the discrepancy of interests between shareholders and management is the major disadvantage of going public.

[25] Rydqvist (1997) investigated Swedish IPOs before 1990, when Sweden taxed employment income was much higher than capital gains.

[26] The Swedish tax authorities removed the incentive to allocate underpriced stock to employees in 1990 by making gains related to underpricing subject to income tax.

Potential arising agency conflicts between the participants involved in the IPO process (issuer, investor, and underwriter) and the role of underpricing in this context is investigated in this chapter.

Intentional underpricing can be utilised as means to reduce the arising agency costs and to retain managerial control of the firm (Ljungqvist, 2007). The UK common law system favours minority shareholders, whereas the German civil law supports concentrated ownership and network effects (Cahine *et al.*, 2007; Goergen and Renneboog, 2007). Empirical research provides different interpretations of how ownership and control are associated with underpricing.

Brennan and Franks (1997) studied the underpricing phenomenon in the UK and argue that it supports the retention of managerial control and entrenchment of agency costs by reducing monitoring requirements of large outside shareholders (*´reduced monitoring hypothesis´*). Managers therefore aim at creating an excess demand for shares by underpricing hence, being able to strategically allocate shares to small external shareholders. This is also supported by more recent studies like Boulton *et al.* (2010) who argue that *´underpricing is a cost that insiders pay to maintain control in countries with legal systems designed to empower outsiders´* (Boulton *et al.*, 2010, p 206). As a result, the dispersion of ownership is relatively high, which enables managers to maintain control without the presence of major shareholders that require a high level of monitoring to reduce their own risk of investment failure (Brennan and Franks, 1997; Boulton *et al.*, 2010). Smart and Zutter (2003[27]) found the same trend of underpricing being positively related to ownership dispersion in the US IPO market. The presence of a large number of small investors on the other hand incurs adverse selection costs and leads to a higher degree of underpricing required when attracting them thus, leading to even higher indirect costs for the company (Pham *et al.*, 2003[28]).

[27] Smart and Zutter (2003) studied 253 US IPO firms between 1990 and 1998.
[28] Pham *et al.* (2003) studied 113 Australian IPOs from 1996-1999.

Stroughton and Zechner (1998) on the other hand present underpricing as means to encourage monitoring and thereby reducing agency costs. A large shareholder who is monitoring managerial decisions could therefore be beneficial for reducing agency costs for all other investors as well. This is supported by Pham *et al.* (2003) who favour large shareholders as means to minimise agency costs and creating value. Large pre-IPO shareholders on the other hand are generally concerned about their exit possibilities rather than retaining control of the company. This usually leads to an increase in issue size and costs of the IPO (Alavi *et al.*, 2008[29]).

These two main perspectives differ in that they use different underlying assumptions. Whereas Brennan and Franks (1997) made use of the fixed price mechanism as central foundation, Stroughton and Zechner (1998) assume the bookbuilding process as underlying pricing technique for IPO shares. That makes a direct comparison difficult, since the fixed price regime does not allow for price revision after the marketing process of shares began. The bookbuilding process on the other hand, allows for price adjustments that intend to balance supply and demand for IPO shares (Chambers and Dimson, 2009[30]).

Zheng and Li (2008[31]) found evidence that underpricing is negatively related to the total number of shareholders, which contradicts the notion of Booth and Chua (1996[32]). They found that a high level of ownership dispersion encourages underpricing, since small investors have to incur high information costs, which are offset by a low initial offer price. The main argument they support is that issuers intentionally aim to underprice their shares in order to encourage investors to incur information costs, which leads to high information, underpricing, and ownership dispersion costs (Booth and Chua, 1996). Also Pham *et al.* (2003) argue in that way, stating that a higher level of underpricing results in a broader ownership structure.

[29] Alavi *et al.* (2008) researched 565 industrial IPOs in Australia between 1995 and 2005.
[30] Chambers and Dimson (2009) researched a sample of 4,540 IPOs during the world wars (1917-1945), post world war period (1946-1986), and from Big Bang until recent years (1987-2007).
[31] Zheng and Li (2008) investigated 1,179 IPO listings on NASDAQ during 1993-2000.
[32] Booth and Chua (1996) studied a sample of 2,151 IPO companies in the US during 1977-1988.

Further, the presence of venture capitalists (VC) has an influence on monitoring and control issues during the IPO process. Nonetheless, there are mixed empirical findings about the actual influence of VCs on underpricing (Cahine *et al.*, 2007; Barry *et al.*, 1990). Engelen and Essen (2010) and Megginson and Weiss (1991) suggest that VC-backed companies are less underpriced than non-VC firms. This is mainly caused by venture capitalists, who usually perform an extensive due diligence, which is assumed to reduce the perceived uncertainty with regards to the IPO firm. Baker and Compers (2003) found that founders are less likely to remain managers of the firm when the same is VC-backed.

2.1.3.4 Behavioural explanations

Investor behaviour and sentiment plays a central role in the pricing process of an IPO as well as issuer behaviour does. However, the behavioural perspective still is relatively unexplored and hard to measure (Ljungqvist, 2007).

Behavioural explanations assume that investors are biased by their own interests and perceptions and thus tend to ignore excessive underpricing. The effect of investor sentiment on IPO pricing is particularly high, since those companies are hard to value because of their young, uncertain, and non-transparent nature (Ljungqvist, 2007; Ljungqvist *et al.*, 2006).

The theory of *´informational cascades´* developed by Welch (1992) found that investors joining the bidding process later sometimes disregard their own information and base their actual bid on those from earlier investors. It is assumed that earlier investors held positive information, thus making later investors believe that the investment can be favourable for them as well. That contradicts the partial adjustment phenomenon, which indicates that a high level of quality information revealed during the pricing process will lead to a high demand for an issue (Hanley, 1993).

Loughran and Ritter (2002) on the contrary, see the main impact on underpricing coming from behavioural biases among decision-makers within the firm. They argue that issuers are ready to incur large indirect costs in the form of money-left-on-the-table if the predicted gains from after-market price jumps are higher, which indicates a justification for hot issue markets.[33] There is further evidence that managers intentionally influence earnings or earnings forecasts to keep the offer price down in order to realise their own motivations and post-issuance benefits (Bessler *et al.*, 2014). Nagata (2013[34]) states that these practices of aggressive earnings management increase the uncertainty of value, which in turn drives price discounts.

Ljungqvist *et al.* (2006) suggest that underwriters generally prefer marketing the issued shares to a small group of regular investors, which usually are institutional investors. This is supported by Hanley and Wilhelm (1995) as well as Cornelli and Goldreich (2001), who found that frequent and institutional investors are being favoured in the share allocation process. Empirical evidence was found that the allocation and marketing practices during the bookbuilding process favour institutional investors and thus encourage underpricing, since investors have low incentives to increase prices by aggressive bidding. Especially, the European market is characterized by a high level of regulations to avoid discretionary share allocations by banks (Ljungqvist and Wilhelm, 2002).

Even though not in the focus of this research, the behavioural explanations can be applied to give additional explanations when interpreting the connection of ownership structure and underpricing.

[33] Hot issue market as defined by Ibbotson and Jaffe (1975) is a period of time where there is high demand for IPO shares and excessively optimistic market sentiment thus leading to first-day returns that exceed the median first-day return for the same period. An example is the Internet Bubble of 1999-2000.

[34] Nagata (2013) investigated 1,476 Japanese companies during 1989-2005.

2.2 Institutional frameworks in UK and Germany

An institutional framework is defined as *´the systems of formal laws, regulations, and procedures, and informal conventions, and norms, that shape socioeconomic activity and behaviour´* (Wiktionary.org, 2014). It consists of both, formal (laws and regulations) and informal (norms and culture) institutions with the intention to reduce *ex ante* uncertainty in a corporate financial environment (La Porta *et al.*, 1997, 1998). The term captures a large variety of possible aspects related to the IPO context and underpricing, but this research primarily focuses on the main findings related to the formal institutional framework (laws and regulations) and its implied ownership structure of the countries of interest, UK and Germany. Hence, the authors refer to the institutional framework or legal framework correspondingly from now on.

The content of the introduction prospectus is subject to regulations and is the basis for a request for a stock exchange listing. In principle, there exist three market segments to list shares, mainly dependent on size and resulting special transparency requirements. The so called '*Main Market'* which is regulated and designed for the listing of large companies, typically has the highest listing standards and costs aligned. The '*Parallel Market*' for middle and small capitalisations and finally the '*New Market*' for growth companies have less stringed listing requirements. However, a few exchanges in Europe have never started or recently closed their New Market segment including the London Stock Exchange (LSE) the Deutsche Börse AG (DBAG). The LSE was missing a specific market segment for the listing of small and medium enterprises, due to the general acceptance of all firms at the main market regardless of size unless market capitalizations exceeds GBP 700.000 (approx. EUR 850.000). Since February 2013 the LSE has announced to launch a new '*High Growth Segment*' in its EU-regulated Main Market, which was established for fast-growing firms to be included in the premium segment of the United Kingdom Listing Authority's (UKLA) official list (PwC, 2013). The second UK IPO market segment for young companies - the Alternative Investment Market (AIM) - is unregulated and entry requirements are much lighter (Hoque, 2014). In Germany the two different market segments – Regulated Market (General Standard) and Regulated Unofficial Market (Open Market; First Quotation Board (FQB)/Second Quotation Board (SQB)) – are somewhat more diverse in terms of transparency levels within each segment (Appendix XVIII). The lowest level of transparency is required for

the (First) Quotation Board[35] in the Open Market, which consists of minimum requirements defined by EU-law, followed by the Entry Standard. In the Regulated Market, the minimum requirements apply to the General Standard, whereas the highest level for investor transparency is requested for the Prime Standard (DBAG, 2014).
The Main markets´ most common listing requirements concern accounting records history, capital size and floating capitalisation. Additionally, the IPO candidate is obligated to provide audited accounts with three years of trading statements. Concerning the regulations on free float, at least 25% of the shares must be offered to the public in all European countries except Turkey, Spain and the Netherlands. Listing requirements for the Parallel Markets are very low and often no minimum market capitalisation is necessary and financial statements must generally provide a publication history of two years (Gajewski and Gresse, 2006). Appendix XVII shows the main listing requirements that an IPO candidate has to fulfil for the UK and Germany respectively.

Previous research by Shi *et al.* (2007) found evidence that the extent of IPO underpricing on average is negatively associated with the strength of disclosure requirements and is consistent with the argument that disclosure regulation reduces information asymmetries and consequently leads to lower underpricing. La Porta *et al.* (2006) studies the different securities laws and finds that extensive disclosure requirements next to standards of liability facilitating investors recovery of losses are associated with a larger stock market, which is the case for the UK. Hence, the country's legal origin predicts the stock market development. The author sees a benefit of common law since it emphasises on market discipline and private litigation through private contracting and standardised disclosure. The empirical findings by Shi *et al.* (2007) support that common law countries have more stringent disclosure requirements than do code law countries and are likely to have lower information asymmetry and consequently less underpricing.

[35] The FQB with the lowest transparency requirements was closed on 4 April 2012, after experiencing suspected cases of market manipulation multiple times. Stricter rules and tighter follow-up requirements were applied to the Entry Standard, the Open Markets transparency segment for SMEs, since 1 July 2012. New requirements were also applied to the Quotation Board (formerly the SQB) on 1 October 2012.

The countries' legal origin – English common law and French civil law – has been investigated in order to provide insights into the extent of IPOs underpricing (Cahine *et al.* 2007). The common law countries typically exhibit a higher degree of investor protection and have a highly developed stock market compared for instance to French civil law countries (La Porta *et al.*, 1997, 1998). The civil law system of German origin is placed in a middle position, but has a special role with its bank-based system compared to the UKs market-based system. In terms of size the UK has larger IPOs, that are assumed to be less risky, uncertain and hence less underpriced, than the public offer of less developed stock market of Germany (Georgen and Renneboog, 2007).

The majority on the law and finance literature show the relationship between underpricing and a countries' legal framework in the sense that a weaker legal system can increase the *ex ante* uncertainty about the firm value over and above firm-level risk factors. Moreover, weaker legal institutions also increase the *ex ante* uncertainty of the distribution of shares among different investors and thus force investor dilution (Cheung *et al.* 2009). Furthermore, mangers and controlling shareholders experience greater opportunities through transferring profits or assets (also referred to as *´tunnelling´*) out of the firm for their private benefit at the expense of less protected minority shareholders (Engelen and Essen, 2010). In general, weaker legal protection increases the *ex ante* uncertainty about the value of the investment, since investors are more uncertain about realising a return on their investment (Shleifer and Vishny, 1997). Theoretical and empirical studies support the connection between distinct legal frameworks and IPO underpricing though mechanism of *ex ante* uncertainty (Engelen and Essen, 2010). Therefore, one would expect IPOs of firms operating in the UK with better legal protection, to have lower level of underpricing (Table 1).

Furthermore, the British institutional system is described as an active market of corporate control and a focus on shareholder value with the popularity of institutional well-protected investors. The German blockholder-based system on the other hand is characterised by a strong control concentration and complex pyramidal ownership structure in which bank finance is more prevalent (Georgen and Renneboog, 2007). As banks often follow their own agenda in maximising their market value, arising agency conflicts seem logic. Especially for the German universal banking system in which financial institutions traditionally hold equity stake in firms and provide underwriter

services might be affected by conflicts of interest arising from these relationships (Bessler and Kurth, 2007). At the same time underwriters in the UK enjoy great influence in setting the issue price, while investment banks became more powerful, makes the relationships between underwriter/investors/issuers with evolving conflicts interesting i.e. agency conflicts (Chambers and Dimson, 2009).

Together with the underwriters discretion for allocating shares and thereby influencing the degree of dispersion of shareholder distribution leads to another recent topic in IPO underpricing the ownership structure and control that are also determined by a countries legal origin. The UK – common law – is characterised with a more dispersed ownership structure, whereas Germany – civil law – is considered to have a more concentrated ownership structure. Pham *et al.* (2003) shows that these two dimensions of ownership structure, breadth and equality of shareholder distribution are influenced by underpricing. Several studies claim that it is crucial to an issues success to attract not only large investors, but also a certain proportion of small, less informed investors (Rock, 1986; Michaely and Shaw, 1994). Theories of underpricing in the sense of influencing shareholder distribution is promoted, since uninformed investors will not be induced to participate otherwise and higher underpricing is hence, associated with a more diverse shareholder base i.e. wider breadth (Michaely and Shaw, 1994). Alternatively, Brennan and Franks (1997) argue that underpricing allows the owners to discriminate larger investors throughout the allocation process in order to protect companies' insiders and remain in control. Contrary, Benveniste and Spindt (1989) suggest that large applicants are more likely to be prioritised, since it is the issuers need to induce the best-informed investors to reveal their information.

The different objectives of domestic firms in terms of ownership structure and control through the allocation of new shares play an important role in the underpricing of IPOs. The UK tends to favour small investors, and higher underpricing induces participation from a larger number of new investors and thus promotes a wider breadth (Pham *et al.*, s2003). Furthermore, underpricing gives the issuer permission to discriminate against larger applicants to ensure greater dispersion. On the other hand, for German companies that favour more concentrated ownership and larger shareholders a lower level of underpricing is required to achieve full allocation for the typically better informed investors that are compensated with a higher proportion for the less underpriced IPO

and lower agency costs due to better monitoring (Pham *et al.*, 2003). This is also in contrast to the argument of weaker legal protection – for German civil law – and higher level of underpricing.

2.3 Summary of previous literature

Although it is a costly process and associated with additional obligations, the main reason for companies to go public is the access to funds at the capital market (Ellingsen and Rydqvist, 1997; Ritter 1987; Barry *et al*., 1991). Nowadays, the most commonly used pricing process in European IPOs is the bookbuilding mechanism (Biais and Faugeron, 2002; Sherman, 2004; Ljungqvist *et al.*, 2003). Researchers believe that this mechanism allows for a more accurate pricing of IPO shares than traditional methods, i.e. fixed price offerings (Ritter, 1988; Loughran *et al.*, 1994; Jenkinson and Jones, 2004; Ljungvist, 2003). Nonetheless, underpricing never disappeared and is severe as ever. In recent years the European market in particular established hybrid pricing mechanisms which combine the bookbuilding with traditional approaches and distinguish informed and uninformed investors (Jagannathan and Sherman, 2006; Ljungqvist and Wilhelm, 2002).

Until today most of the literature analysed information frictions and agency problems as main influencing factors of underpricing (Rock, 1986; Cahine et al., 2007; Günther and Rummer, 2006; Ritter and Welch, 2002; among others). The most established and well known theories are Rock´s (1986) winners curse (i.e. underpricing as means to create sufficient demand and attract uninformed investors) and the signalling model (i.e. underpricing as means to indicate a good firm quality) (Welch, 1989, Allen and Faulhaber, 1989; Grinblatt and Hwang, 1989; among others).

Other influencing factors for share pricing are IPO process participant sentiment and strategy (behavioural explanation). This viewpoint investigates possible decision biases of investors, underwriters, and firms. The informational cascade theory in this context is the most established and states that subsequent investors might disregard their own information and base their bids on opinions of previous bidders (Welch, 1992). Other

theories like aggressive earnings management to keep share prices low (Nagata, 2013; Bessler *et al.*, 2014) have not yet been confirmed by many empirical studies. The general practice that underwriters seem to prefer their regular and institutional investors when marketing the IPO shares on the other hand is a more established theory (Hanley and Wilhelm, 1995; Cornelli and Goldreich, 2001; Ljungqvist *et al.*, 2006).

Since early investigators like Ibbotson and Jaffe (1975), Ritter (1984), and Rock (1986) detected the underpricing phenomenon when companies go public, a comprehensive body of research has been established. Although first day returns have been studied extensively during the past decades there still are controversial opinions and empirical findings, especially in cross-country perspectives.

There has been less research on institutional explanations for the undepricing phenomenon. The lawsuit avoidance theory, which assumes underpricing as means to reduce the probability of future legal liabilities (Logue, 1973; Ibbotson, 1975; Hughes and Thakor, 1992; Tinic, 1988) only finds mixed support in a cross-country perspective. Underpricing was also studied as ownership and control argument as it enables the issuing firm to create an excess demand and higher dispersion of ownership (Brennan and Franks, 1997; Boulton *et al.*, 2010; Smart and Zutter, 2003; Booth and Chua, 1996; Pham *et al.*, 2003). This implies that common law countries, characterised by a high dispersion of ownership, should be more underpriced. Empirical evidence suggests the opposite and usually found civil law structures being more underpriced (Shi *et al.*, 2007; Cahine *et al.*, 2007; Engelen and Essen, 2010; Boulton *et al.*, 2009; Hopp and Dreher, 2007). This is mainly supported by La Porta *et al.* (1997, 1998, 2002, 2006) who argument that a common law structures are associated with a high level of shareholder protection and thus create less uncertainty for investors, which in turn leads to a low level of underpricing.

2.4 Hypotheses development

Hypotheses are constructed using previous literature and thus ensuring a high level of comparability. H_0 represents the null hypothesis assuming that the variables tested are equal to zero. Otherwise, the alternative hypothesis H_1 assumes a significant difference from zero. The t-statistics is applied to reject or not reject the null hypotheses, when empirically tested.

As mentioned previously, the UK and Germany belong to different legal origins. It is well known that the legal system and performance of capital markets are closely related (Boulton *et al.*, 2010; La Porta *et al.*, 1998, 1997, 2002). This research therefore aims to find out if there is a relationship between the level of underpricing and the difference in the legal origin. There is mixed evidence for the relation of underpricing to the institutional framework and the implied ownership structure. Some researchers argue that company insiders use underpricing as means to create a high level of ownership dispersion (i.e. a characteristic of common law countries) to retain control (Brennan and Franks, 1997; Smart and Zutter, 2003). Other empirical evidence focusing on uncertainty related to the IPO process, suggest that a higher minority shareholder protection (i.e. in common law countries) is related to a lower level of underpricing (Hopp and Dreher, 2007; Shi *et al.*, 2007). The researcher assumes that this might be reversed in the context of the crisis since La Porta *et al.* (1997, 1998) found evidence that civil law structures create less uncertainty in times of economic downturn. The following general hypothesis is developed in order to test if the general level of underpricing is significantly different in the UK as a common law country than in Germany as a civil law country.

H_0a: The legal origin has no influence on IPO underpricing.

$$H_0: \beta_{COM\_DV} = 0$$

H_1a: The level of IPO underpricing in the UK, a common law country, is significantly different than in Germany, a civil law country.

$$H_1: \beta_{COM\_DV} \neq 0$$

To go further into detail and investigate the influence of the specific characteristics of the different legal frameworks on the level of underpricing, two other hypotheses are tested. Engelen and Essen (2010) established legal enforcement (LE) and quality of legal framework (QLF) variables to test for such influences, which are used in this study a well. A negative correlation was found for both of the variables and underpricing (Engelen and Essen, 2010; Shi *et al.*, 2007). There is further evidence that companies in common law countries, characterized by a high level of legal enforcement and good quality of legal system, are more underpriced than firms in civil law structures (Brennan and Franks, 1997; Boulton *et al.*, 2010; Smart and Zutter, 2003). Nonetheless, when looking at the post crisis period it is assumed that a positive relationship will be found, relying on La Porta *et al.* (1998, 1997) who state that civil law structures work better in times of crisis for the reason that companies have lower debt levels. Common law countries on the other hand seem to be more advantageous in economic upturns, because growth is achieved through high debt levels. This would indicate that the level of uncertainty in civil law countries is lower than in common law countries in times of crisis.

H_0b: The level of LE has no influence on the level of underpricing.

$$H_0: \beta_{LE} = 0$$

H_1b: The level of LE has a significant influence on the level of underpricing.

$$H_1: \beta_{LE} \neq 0$$

H_0c: The QLF has no influence on the level of underpricing.

$$H_0: \beta_{QLF} = 0$$

H_1c: The QLF has a significant influence on the level of underpricing.

$$H_1: \beta_{QLF} \neq 0$$

Pham *et al.* (2003) detected empirical evidence that a larger number of investors (higher ownership breadth) is related to a higher level of underpricing. Hence, the same research discovered that a high inequality of shareholder distribution (mirrored by a large proportion of blockholders) induces a low level of underpricing. This is supported by Brennan and Franks (1997) and Boulton *et al.* (2010) who found that underpricing can be used as means to reduce the number of block shareholders. Some other empirical studies found that underpricing is positively related to ownership dispersion as well (Booth and Chua, 1996; Brennan and Franks, 1997; Boulton *et al.*, 2010; Smart and Zutter, 2003). Based on these perspectives the following hypotheses are established to find if there is a significant relationship between the level of underpricing and ownership breadth as well as inequality of shareholder distribution.

H_0d: The ownership breadth does not influence the level of underpricing.

$$H_0: \beta_{SB} = 0$$

H_1d: The higher the ownership breadth, the higher the level of underpricing.

$$H_1: \beta_{SB} > 0$$

H_0e: The inequality of shareholder distribution does not influence the level of underpricing.

$$H_0: \beta_{BLOCK} = 0$$

H_1e: The higher the inequality of shareholder distribution the lower the level of underpricing.

$$H_1: \beta_{BLOCK} < 0$$

Table 3 outlines the authors' expected correlations to underpricing with regards to the developed hypotheses.

Table 3: Hypotheses Overview

Variables	**UPR**
Country-level	
Common law DV	+/-
Quality of legal framework	-
Legal enforcement	-
Firm-level	
Shareholder Breadth:	
SB	+
Shareholder Inequality:	
BLOCK	-

3 Methodology and data

This research utilises the Saunders et al. (2009)´Research Onion´ approach to establish the methodological framework. The onion consists of different layers describing the underlying philosophy, approach, strategy and specific techniques of the research, which is further explained in this chapter. Additionally, the data collection process, sampling approach, regression model and delimitations of the research are introduced. Finally, the chapter concludes analogue to Brooks (2008), with a test of reliability and validity of the regression results to ensure the quality of data presented.

3.1 Research philosophy, approach, and strategy

The project follows a *positivist research philosophy*, focusing on hypothesis testing. These hypotheses are built using previous empirical findings and existing theories to either approve or reject the same for the specific sample of UK and German IPOs in the aftermath of the financial crisis. It will be particularly interesting if the existing theories hold true for this period of time since the crisis induced major changes in legislation and behaviour of participants in the IPO process. The positivist philosophy is particularly suitable due to the fact that the study focuses on facts and observations rather than personal impressions or opinions of the researcher. It is further supporting the usage of quantitative numerical data. This also implies a *deductive research approach*, utilising theoretical findings to establish the reasoning for the specific sample. This so-called *´top-down´* approach allows for logical conclusions resulting from existing theories and an objective interpretation of data (Greener, 2008; Saunders *et al.*, 2009).

An *experiment strategy* is used to select appropriate samples from the known population of IPOs in the UK and Germany during 2009 to 2013. To do so a *mono method quantitative data collection* technique is applied, since raw data is mainly gathered from the Standard and Poor's (S&P) Capital IQ database and is statistically analysed. A *linear multiple regression model* using cross-sectional data for all firms that went public during the chosen time frame is applied. The time horizon is set to five years (2009-2013) which implies a *longitudinal study* approach, investigating the underpricing

phenomenon over a period of time. Since a causal relationship between certain numerical variables is investigated, this study is termed as *explanatory* (Greener, 2008; Saunders *et al.*, 2009).

3.2 Data Collection

3.2.1 Data Set

In this study the probability of each company being chosen from the data set is known, thus *probability sampling* is utilised, which is also the most commonly used sampling technique for experimental research. It is also called representative sampling since it considers a complete population and allows for statistically relevant investigations (Saunders *et al.*, 2009).

For this research 252 new IPO admissions in the UK market and 62 in the German market during 2009-2013 are investigated. The data set is divided into two portfolios of German and UK firms, which allow for a direct comparison. Nonetheless, the significantly smaller German sample size has to be considered when analysing data. Non-domestic firms that were listed on the respective stock exchanges, are only included in the sample when headquarters are located in the countries of interest, since the purpose of this project is to investigate the underpricing phenomenon for UK and German firms only. Companies that were delisted and private placements (pp) within the given period of time are not included in the analysis. This is a potential for misspecification known as the survival-related bias that occurs when failing firms are not included in the sample (Pukthuanthong *et al.*, 2007). Nonetheless, this is not assumed to lead to biases in the regression result, since the number of firms is marginal and the problem more relevant when a long-run behaviour of IPOs is considered.

Based on the data available and missing values that could be added manually a noticeable adjustment to the sample regarding the UK in 2013 is conducted by the authors. Due to lacking data regarding the ownership information for the most recent[36] IPOs the sample reduced by another 27 firms for the UK. To replace the missing values by an alternative approximation seems not suitable and arbitrary for the respective

[36] This affects IPOs from the end of year 2013 from which no annual reports or such is available yet.

characteristic of a firm's ownership structure. Previous studies often exclude Penny Stocks[37], but due to the high number of such shares in this sample they are included in the analysis. However, because of their highly speculative nature the presence of these stocks in large numbers can be an explanation of the high level of variability of the sample. After analysing the information provided, a final sample of 177 (138 UK and 39 German) companies is selected.

Missing data, which could not be found using the S&P Capital IQ database is retrieved and corrected manually by using other reliable secondary sources, like publications from DBAG and LSE as well as respective annual reports of IPO companies. To avoid inconsistencies, years with missing financial data and negative share price and asset values are eliminated and not included in the study.

The sample is distributed of the years 2009-2013 as shown in the table below.

Table 4: Sample distribution of IPOs across UK and GER

Sample distribution across years:

Year	**2009**		**2010**		**2011**		**2012**		**2013**		**Total**	
Country	N	UPR*	N	UPR	N	UPR	N	UPR	N	UPR	N	UPR
UK	13	9%	42	5%	32	16%	27	13%	24	14%	39	3%
GER	2	2%	10	4%	13	0%	8	-2%	6	4%	138	16%
Total	15	6%	52	5%	45	8%	35	6%	30	9%	177	9%

* Mean underpricing in percentage.

(Source: created by authors)

3.2.2 Sample Source

Main source for previous literature and empirical research on the topic is the Lund University Library database, which provides access to comprehensive directories such as Science Direct and Emerald. Articles were mainly retrieved from the two reputable periodicals; Journal of Finance and Journal of Financial Economics.

[37] Penny Stocks are characterized by having an offering price, which is below a certain threshold (usually €1) and are very speculative investments.

IPO and company data is primarily retrieved from the S&P Capital IQ database, which offers condensed and standardised financial statement information and additional insights into the specific companies and IPO deals of the sample. That enables the researchers to efficiently and rationally analyse the complete set of UK and German IPO admissions in the limited time frame of this study. UK numerical data is converted from GBP to EUR at historical monthly exchange rates to enable a realistic comparison of both samples. This is considered to be a potential source of biases in the findings and could further inhibit the accuracy of data presented.

Information about de-listing, and missing historical data (e.g. price per share, ownership structures) is retrieved from the respective annual reports of the companies, DBAG, and LSE websites. When matching the data gathered with these other sources, minor deviations of information are found. This is a potential source for variances of the empirical results when comparing them to other research studies.

The indices considered in the analysis are taken from previous literature and thus might not be applicable to the investigated period since the financial crisis had a large impact on laws and regulations

3.3 Regression

Based on the above explained data sample, the relationship between the response variable *underpricing* and the *firm-specific* and *country-specific* explanatory variables that reveal the impact of institutional frameworks across a countries legal origin, is tested in a multiple linear regression model. The regression model and the definition of the respective variables are specified. Finally, the tests and techniques undertaken to ensure the robustness of the model and results are described.

3.3.1 The regression model

The study performs an Ordinary Least Square (OLS) regression model for the final data sample of the 177 IPOs from both countries – UK and GER - that went public between 2009-2013. The sample misses some cross-sectional elements observations and it is therefore highly important to test the data material, whether the underlying assumptions

for a linear regression model hold, to secure significant test results. Especially, violations of OLS assumptions that cause heteroscedasticity or non-normality, but also other problems like multicollinearity need to be checked and ideally solved. Table 7 illustrates the underlying assumptions and how to test for the desirable properties of the OLS estimator that is consistent, unbiased and efficient (Brooks, 2008).

To examine the relationship between underpricing and institutional factors, as well as ownership structure, as typical features of a countries legal origin (legal system), the model is specified as follows. Various factors that have proven to affect IPO underpricing both firm-specific risk factors and the country-specific risk factors as control variables are included in the regression.

The regression model for the determinants of IPO underpricing across countries and firms is consequently:

Equation 1: Regression Model

$$Underpricing_{ij} = a + \sum_{m=1}^{M} \beta_m C_{mij} + \sum_{n=1}^{N} \gamma_n \, F_{nij} + \varepsilon_{ij}$$

where $underpricing_{ij}$ is the percentage return of firm i, which denotes cross-section unit (i.e. IPOs), in country j[38]. The notations C_{mij} illustrate country-specific factors, whereas F_{nij} control for firm-specific factors and ε_{ij} denotes the error term.

In the basic equation 1 the authors control for general country- and firm-specific factors that have most frequently been used and that are not directly attributable to one of the hypotheses. Therefore, the variables allocated to the five hypotheses are classified and added to the basic equation and follow a general-to-specific approach.

Equation 1 is estimated using a pooled sample of 177 IPOs from the two countries on a firm level, which is consistent with earlier cross-country studies like Shi *et al.* (2007), and offers several advantages over the country-level specification. The firm level

[38] Time subscript omitted.

analysis captures more information about the IPO dataset, like the fact that IPO underpricing varies not only across countries but also within countries and over time. Hence, this approach allows controlling for both variations in the dependent variable of $underpricing_{ij}$ directly. Moreover, the smaller number of observations and empirical evidence of industry and time-series effects on IPO underpricing cannot be included in a country-level analysis. However, a potential drawback of this approach worth considering during the analysis is the unwarranted weighting to the country with a larger number of IPOs that is the UK in this case (Shi *et al.,* 2007).

All statistical tests are conducted with the EViews software, Version 8.

3.3.2 Response Variable

Consistent with previous research on this topic (Pham *et al.*, 2003; Beatty and Ritter, 1986; Ritter and Welch, 2002; Engelen and Essen, 2010; Rock, 1986, Ibbotson and Jaffe, 1975; Shi et al, 2007, among others) the most relevant indicator for underpricing (UPR) is the initial return, which is calculated as difference of first day closing and offer price as proportion of the offer price:

Equation 2: Underpricing

$$UPR = \frac{(first\ day\ closing\ price - offer\ price)}{offer\ price}$$

Underpricing is always used as the dependent variable in the hypotheses testing process. Since the research aims at investigating various influencing factors on the level of underpricing.

3.3.3 Explanatory Variables

Following the hypotheses development, the firm specific and the country-specific factors will be defined according to their classification of either hypotheses or control variables.

3.3.3.1 Country-specific risk factors

To investigate the cross-country differences and measure the quality of institutional factors on underpricing, variables such as legal origin, legal enforcement, and a measure of the general quality of the legal framework are used to test the proposed hypotheses.

Legal origin

The legal origin can influence the level of underpricing in respective countries (La Porta *et al.*, 1998, 2006; Engelen and Essen, 2010). In general it is found that the common law origin is negatively related to underpricing. This is mainly due to the fact that minority shareholder are favoured by laws and regulation, and thus uncertainty is reduced, which in turn requires less underpricing (La Porta *et al.,* 1998; Engelen and Essen, 2010; Shi *et al.*, 2007; Hopp and Dreher, 2007). To test the first general hypothesis the Common Law Dummy (COM_DV) variable and its influence on the level of underpricing is tested. The values are the following:

0 – GER civil law structure

1 – UK common law structure

Law enforcement

Law enforcement consists of three index numbers namely, Disclosure Requirements (DISC), Liability Standards (LIAB), and Public Enforcement (PUB) index. The numbers are taken from the La Porta *et al.* (2006) research (Table 5).

Table 5: Law enforcement index numbers

	Disclosure Requirements	Liability Standard	Public Enforcement
Germany	0.42	0.00	0.22
United Kingdom	0.83	0.66	0.68

(Source: La Porta *et al.* 2006)

Shi *et al.* (2007) found the disclosure index being negatively related and liability standard and public enforcement being positively related to underpricing. Engelen and Essen (2010) on the other hand found that a higher public enforcement index has a negative influence on underpricing.

Quality of legal framework

The quality of the legal framework includes two main variables, namely Rule of Law (ROL) and Corruption (COR). As suggested by Shi *et al.* (2007) and Engelen and Essen (2010) the ROL index numbers of the La Porta *et al.* (1998) are used. In addition to that the annual corruption index numbers are taken from the Transparency International (2014) research body.

The corruption index is measured on a scale from zero to one, where a lower value means higher corruption. It indicates the corruption in government, i.e. politicians accepting illegal payments, bribe connected to licenses, taxes etc. Hence, it provides a measure of how public power is used to gain private benefits. The Rule of Law on the

other hand mirrors the tradition of laws and orders. It is also measured on a scale from zero to one, where lower scores indicate less tradition for law and order (La Porta *et al.*, 1998).

Table 6: Quality of legal framework index numbers

	Rule of Law	Annual Corruption Index				
		2009	2010	2011	2012	2013
Germany	0,923	0.125	0.127	0.125	0.127	0.128
United Kingdom	0.857	0.130	0.132	0.128	0.135	0.132

(Source: La Porta *et al.*, 2006; Transparency International, 2014)

3.3.3.2 Firm-specific risk factors

To assess the impact of ownership structure as indicators for a countries' legal origin on underpricing firm-specific variables are introduced.

Since shareholders are not a homogeneous group and the distribution of size of share holdings can vary largely it is hard to measure the ownership structure with one variable (Pham *et al.*, 2003). Pham *et al.* (2003) use breadth and equality of shareholder distribution as determinants of ownership structure which seems intuitively appealing.

Shareholder breadth

Breadth of shareholder distribution as defined by Pham at al. (2003): size and diversity of outside investors and the IPO share allocation; number of new investors divided by value of issued shares. In contrast to most previous studies this study takes the original owners and their retained shares into consideration. Pension funds are considered as institutional owners.

Shareholder breadth, adjusted for size differences can be calculated as follows:

Equation 3: Shareholder Breadth

$$SB = \frac{Shares\ held\ by\ Investors\ with\ less\ than\ 5\%\ Ownership}{Value\ of\ Shares\ offered}$$

Shareholder inequality

However, the above-mentioned ratio does not mirror the actual distribution of shareholders and concentration of ownership. To show the varying types of investors two other variables, indicating the inequality of shareholder distribution are developed. The S&P IQ Capital software offers data for different shareholding groups, namely institutional (including banks and pension funds), individual/insider, family offices and trusts, VC/Private Equity firms, and CEO ownership. To ensure the robustness of results this study is categorised shareholders into two groups: large and block. A shareholder who holds 100,000 and more shares is herein considered as *´large´*. Additionally, investors holding more than 5% of the issued stocks are considered as *´blockholder´* (Wruck, 1989; Pham *et al.* 2003).

Equation 4: Large Shareholders

$$LARGE = \frac{shares\ held\ by\ investors\ owning\ more\ than\ 100{,}000\ shares}{total\ number\ of\ shares\ issued}$$

Equation 5: Blockholder

$$BLOCK = \frac{shares\ held\ by\ investors\ owning\ more\ than\ 5\%\ of\ shares}{total\ number\ of\ shares\ issued}$$

The variable LARGE is added as a dummy variable to the regression, due to the similarity to the BLOCK variable. These measures ensure a certain robustness of the presented findings, but also lead to potential limitations since they are mostly sensitive to changes in major shareholdings, but ignore variations in the remainder of shareholder distribution (Pham *et al.*, 2003).

3.3.3.3 Control variables

To control for *ex ante* uncertainty the *age of the firm* is used, which is found to be negatively correlated to the level of underpricing by Ritter (1984), Cahine (2008), and Loughran and Ritter (2004). A *VC-dummy variable* is further utilised, since evidence was found such that the presence of VCs can reduce the level of underpricing (Engelen and Essen, 2010; Megginson and Weiss, 1991; Suchard, 2009). The annual *IPO volume* is also taken into consideration, since the number of IPOs fluctuates over time and can vary immensely in times of economic bubbles and years following a crisis (Shi *et al.*, 2007; Loughran and Ritter, 2004; Ibbotson and Jaffe, 1975; Lowry and Schwert, 2002). The *debt level* is included in the analysis, since La Porta *et al.* (1997, 1998) connect the civil law structure with a lower debt level and therefore lower uncertainty, particularly in times of economic downturns (Shi *et al.*, 2007).

The firm size is assumed to be associated with the *proceed size* of the issue. Consistent with Shi *et al.* (2007) the logarithm of issue proceeds is used as variable indicating the firm size. As larger firms are assumed to be less risky and hence less underpriced a negative correlation of a firms proceeds with respect to the degree of IPO underpricing can be expected (Beatty and Ritter, 1986; Shi *et al.*, 2007). The logarithmic transformation is conducted in order to improve the variables normal distribution and increase the fit to the dependent variable. Moreover, Engelen and Essen (2010) suggest including the *price earnings* (*P/E) ratio* as control variable, which seems intuitively suitable for this analysis as well. It indicates the level of *ex ante* uncertainty involved in the IPO. It is calculated as the share price divided by EPS, where EPS equals net income divided by number of shares outstanding.

The empirical literature also finds evidence that information asymmetry tends to be similar within industries and makes use of an *industry dummy variable* to control for the riskiness of the firm (Ljungqvist *et al.* 2003, Loughran and Ritter, 2004). In general high-tech and internet firms are assumed to be more risky than other non-technological industries and therefore have a higher level of underpricing (Engelen and Essen, 2010; Benveniste *et al.*, 2003; Lin *et al.*, 2013). The researchers decided to introduce an additional *recession dummy variable* to control for the influence of the immediate aftermath of the crisis in 2009 since it is believed that that year might be severely different from the others. The year 2009 is classified as a recession year, where the level of IPO underpricing was at a low point (Pwc, 2012). An *equity market size proxy* using the respective company market capitalisation is utilised to control for the quality of the stock markets. La Porta *et al.* (2006) and Shi *et al.* (2007) suggest that the equity market size is related to higher quality disclosure and lower information asymmetry, resulting in a lower level of underpricing.

A detailed description of each investigated variable and the respective source can be found in Appendix XV.

3.3.4 Reliability and validity of regression results

The pooled multiple regressions are run to test the influence of the explanatory variables on $underpricing_{ij}$. The regression t-statistic as a test of significance is used to test a single hypothesis i.e. hypotheses involving only one coefficient[39] ($H_0: \beta_1 = 0$; $H_1 \neq 0$). Especially, some missing observations in the data are a potential problem for linear multiple regressions, and thus the reliability of the estimation results must be ensured by the fulfilment of the underlying OLS assumptions.

[39] H_0 is the Hypothesis that is actually tested, whereas H_1 represents the remaining outcomes (alternative) of interest.

Table 7: OLS Assumptions and other potential problems

OLS Assumptions	Interpretation	Test
1: E (u_t) = 0	The errors have zero mean	no test needed
2: Var (u_t) = $\sigma^2 < \infty$	The variance of the errors is constant (homoscedasticity)	Graphical method; Breusch-Pagan-Godfrey, Goldfeld-Quandt, White's, etc.
3: Cov (u_i,u_j) = 0	The covariance between the errors (cross-sectional) equal zero i.e. uncorrelated with one another	Breusch-Godfrey test; Durban-Watson test
4: Cov (u_i, x_i) = 0	The x_t are non-stochastic; There is no relationship between the error and corresponding x variable	Hausman test
5: u_t – N (0,σ^2)	The disturbances are normally distributed	Bera-Jarque test
Implicit Assumptions		
Multicollinearity	Explanatory variables are very highly correlated with each other	Correlation matrix
Non-linearity	Relationship between x and y expected to be approx. linear	Scatterplots; Ramsey RESET test
Parameter stability	Parameters (beta's) are constant for the entire sample period	Recursive estimation (plot)
Causes of endogeneity		(see Assumption 4)
Omitted Variables	Leaving out some explanatory variables that should be included	
Simultaneity	Reverse causality	
Measurement Error		
Selection Bias	Non-random assignment to two groups (treatment and control)	

(Source: Brooks, 2008)

OLS Assumptions

For the first assumption that the errors have zero means no test is needed. With a constant term (c) in the regression equation this requirement will never be violated. A violation of Assumption 3 for a zero covariance between disturbance terms cross-sectionally is rather intuitive for time-series data, but the possibility of autocorrelation is not common in a cross-sectional context[40]. The test for autocorrelation in this case is rather more complex and a straightforward remedy for autocorrelation is to use the Newey-West option in the model that produces standard errors (SE) that correct for both heteroscedasticity and autocorrelation. However, the results for the variables of

[40] The cross-sectional autocorrelation occurs when the residuals from the IPOs from one country may be correlated.

interest of the OLS regression remain consistent when using the Newey-West robust SE (Appendix XI) thus indicates that the data is not affected by autocorrelation.

The second assumption of homoscedasticity is that the variance of the errors is constant, otherwise they are said to be heteroscedastic and no longer have the minimum variance among the class of unbiased estimates. The White's heteroscedasticity test output from the (Appendix VIII), where the auxiliary regression of the squared residuals are run, indicates an ambiguous conclusion here. Both the F- and χ^2 do not reject the null hypothesis that the errors are homoscedastic ($H_0 = \alpha_2 = 0, \alpha_3 = 0, \dots, \alpha_k = 0$) with p-values that are in excess of the critical 0,05 value. On the other hand the '*Scaled explained SS*' suggests that there is evidence (p-value 0,00) of heteroscedasticity. To avoid any incorrect SE and/or hypotheses tests, all models are conducted using the White's modified '*robust*' or heteroscedasticity-consistent standard error estimates (in Eviews).

Assumption 4 is that the x_t are non-stochastic, but only provide specified OLS estimates when the repressors are not correlated with the error term. If the assumption of no relationship between the error and the corresponding x variate is violated, resulting in biased and inconsistent parameter estimates is defined as endogeneity. Causes of endogeneity among the repressors and according to Lin *et al.* (2013) a common limitation of cross-country studies through possibly omitted (correlated) variables. The simulateneity bias or in other words reverse causality is diluted, since the variables regarding the institutional framework are chosen in a country-level, not on a firm level. First, it is necessary to test for endogeneity among the independent variables by conducting a Hausman test manually. Therefore, the dependent variable $underpricing_{ij}$ is regressed on the fitted values/residuals as additional explanatory variables. The fitted values/residuals are highly significant (p-value 0.00) (Appendix IX) and thus the null hypothesis of exogeneity[41] is rejected. The significant endogeneity means that other factors not captured in the equation influence the dependent variable $underpricing_{ij}$. A standard econometric remedy to deal with endogeneity, that is consistent to earlier research methodology (Lin *et al.,* 2013; Shi *et al.,* 2007), is to rely on exogenous variation by an instrumental variable (IV) approach (Two-Stage-Least-Square (2SLS))

[41] H_0 that the coefficients of the fitted values equal zero.

and/or include additional control variables. The main difficulty with IV/2SLS is to find a valid instrument, thereby to risk the consequence that non-exogenous and/or weak instruments cause unreliable parameter estimates. Additionally, the IVs used by Lin *et al.* (2013) and Shi *et al.* (2007) – such as *common law dummy variable, public enforcement index* or *rule of law index* – are already included as explanatory variables in the regression model. Thus, the 2SLS approach is not applied, but the inclusion of an additional control variable (P/E ratio) is used to address the problem of endogeneity.

In order to conduct single or joint hypotheses tests about the model parameters the fifths assumption that the disturbances are normally distributed is required (Table 7). To ensure a normally distributed ($u_t \sim N(0, \sigma^2)$) sample, the authors conducted the most commonly applied test, the Bera-Jarque (BJ) test. The BJ tests whether the coefficient of skewness (b_1) and the excess kurtosis ($b_2 - 3$) are jointly zero with the following test statistic:

Equation 6: Bera – Jarque test-statistics

$$BJ = \frac{T}{6}\left(b_1^2 + \frac{1}{4}b_2^2\right) \sim \chi^2(2)$$

Appendix X shows the test results for the final data sample together with a graphical method that shows a histogram plot of the residuals. The test statistic rejects the null hypothesis that the residuals are normally distributed in other words that the series is symmetric and mesokurtic. One approach to deal with non-normality that is consistent with Brooks (2008), who suggests to draw a graph of the residuals and remove the observations that do not fit in with the pattern of the remainder of the data known as outliers, is adopted. Therefore, three IPOs of the UK and one from the German sample that showed extreme positive first day returns (exceeding 200%) are removed. For sample sizes that are sufficiently large the central limit theorem[42] holds and violations of the normality assumptions are irrelevant. This seems less applicable for the given sample size in this data set, and consequently the OLS coefficient estimates of the findings might be unreliable and cannot be precisely interpreted. The authors are aware

[42] The central limit theorem states that the sample mean converges to a normal distribution (Brooks, 2008).

of these circumstances and consider the shortcomings when interpreting and concluding the results of the findings.

The implicit assumptions of an appropriate OLS estimation are adopting the right functional form[43] or parameter stability in the regression model that needs to be taken into account. As the Ramsey Reset test regarding the first is a general test for Regression Specification Error and does not suggest any better specification, it is addressed by the remedies applied to the present errors of potentially omitted variables and endogeneity, whereas the parameters are assumed to be linear. The latter is based on recursive estimation and the plot of both the recursive residuals and the CUSUM Test. The lines illustrated in Appendix XII and XIII are well within the coefficient bands and it can be concluded the null hypothesis of stability is not rejected.

In order to improve the results further, a number of dummy variables that are described above, are introduced consistent with the IPO underpricing research body. To address the problem of seasonality and correct for time-varying levels of underpricing year dummy variables for each year – *YEAR_DV* – are included (for example Loughran and Ritter, 2004; Lin *et al.,* 2013; Shi *et al.*, 2007). Apart from the other year dummies, the year 2009 is labelled differently as *RECESSION_DV,* due to its significance at a 5% level. An industry dummy variable – *INDUSTRY_DV* – is introduced to control for industry variations in underpricing. The firms that fall into one of the two categories of high-tech and Internet firms are captured in the industry dummy variable. Finally, a dummy variable for venture-backed IPO – *VC_DV* – is included in the regression.
The regression results are summarized in Appendix II.

Robustness tests

Omitted Variables

As mentioned above the problem of potentially Omitted Variables is addressed by including the price earnings (P/E) ratio – *PE* – as an additional control variable. Chen *et al.* (2004) state that firms with a lot of growth opportunities, causing an increased risk and uncertainty about the investment that are characterized with a higher P/E ratio. As a result a positive relationship between a high P/E ratio and thus higher levels of

[43] A violation or wrong functional form implies non-linearity in the parameters.

underpricing can be expected and confirmed empirically by Engelen (2003). Even though the coefficient estimate shown in Appendix II for the P/E ratio is not significant and would not allow a reliable interpretation, the trend is in line with previous results of a positive relationship. However, the overall regression results for the variables regarding hypotheses tests remain unchanged and the goodness of fit (R^2) only changes marginal by 0,0001 (Appendix VII).

Multicollinearity

The problem of Multicollinearity for OLS estimation if the explanatory variables are correlated with one another, is especially well known for country-level variables. Appendix I contains a correlation matrix[44] that shows that all of the indices for the quality of a countries legal framework and legal enforcement are perfectly collinear (1.00/-1,00). This seems intuitive, when having constant index numbers for only two countries, and thus having insufficient variety. An ad hoc solution for dealing with the existence of multicollienearity is to drop one of the collinear variables (Brooks, 2008). Therefore, only the two variables of interest for legal enforcement – *ROL_index and COR_index* – are included in Equation 1 and the results can be applied to the other index variables, due to the perfect collinearity. Nonetheless, to test this assumption one variable of the legal enforcement – *PUB_index* – is added separately to the regression and supports the proposed relationship (Table 3, Appendix II). The firm-level variables do not suffer from collinear data as the correlation matrix visualizes (Appendix I).

An alternative and common estimation technique (see for example La Porta *et al.* 2006; Shi *et al.,* 2007; Lin *et al.,* 2013) in the presence of multicollinearity is to perform a principal component analysis (PCA). The applicability of the principal components (PC) is limited, as they typically do not allow for theoretical motivation or interpretation, but reveal an impact on the estimated regression model (Brooks, 2008). Following the idea of PCA to derive a new set of variables called principal components that are orthogonal to each other i.e. straight, for those country-level variables that are most highly correlated. The first principal component consists of the three index variables – *Disclosure, Liability Standard, and Public enforcement* – that belong to the group, describing the legal enforcement (Appendix IV). As these indexes are perfectly

[44] Rule of thumb: Corr $(x_i, x_j) \geq 0.8$ (near multicollinearity).

collinear to the rule of law and corruption indexes, the two build the second principal component representing the quality of legal framework (Appendix III). There is a great deal of common variation in the series of 87% and 100% that the PCA output reveals. The respective correlation matrix (Appendix V) for the PCAs still indicates a correlation greater than 0.8. The original country-levels are therefore replaced separately by the two principal components – *QLF_pc* and *LE_pc* – and the OLS regression of Equation 1 is re-run. The estimation output (Appendix VI) of the respective coefficients at the1% significance level, implies that the findings are unaffected by the presence of collinearity in the data and are consistent with those in Appendix II. The *LE_pc* is positive, whereas the *QLF_pc* is negative, which is consistent with the former model specifications and hence the essence of the overall findings remains intact (Appendix VII).

The overall fit of the data to the regression model indicates how well the included explanatory variables actually explain variations in the dependent variable, $underpricing_{ij}$. The most common goodness of fit statistic is to look at the squares of the correlation coefficients defined by R squared (Brooks, 2008). The value of R squared[45] from the regression result (Appendix II) in this study is with approximately 0,2 not particularly high, but this is rather expected, as there are numerous more explanations determining IPO underpricing as outlined throughout the thesis.

Even though the authors tried to solve for potential biases and generate significant results and the regression generally confirms the results of the initial model, it is unlikely that all potential omitted correlated variables are captured and definite answers at least at a high significance level ($p < 0,01$) are not possible to conclude for all the variables of interest.

[45] Values for R^2 range from 0 to 1 indicating that the model explains almost all variability oft he dependent variable.

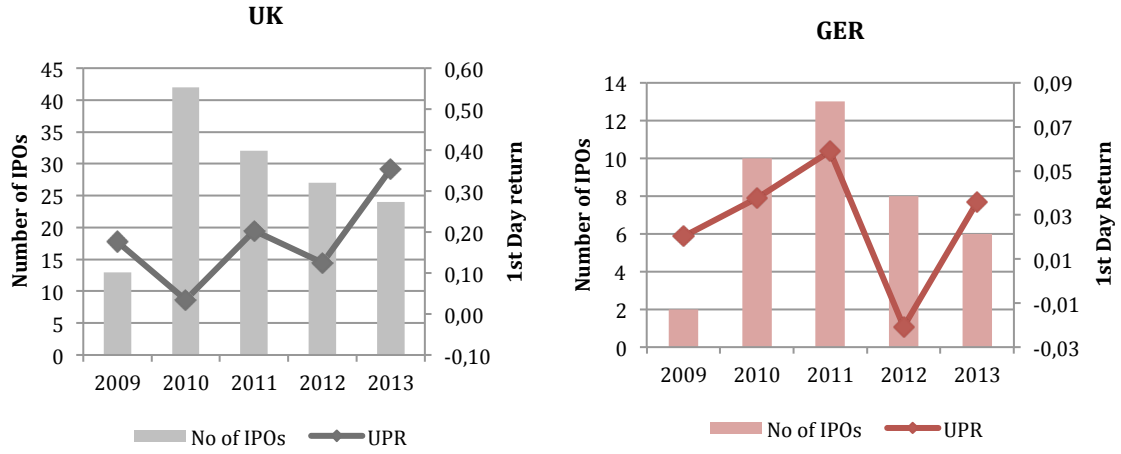
4 Empirical results

This section provides the empirical results of the research conducted. It starts with a market activity and underpricing overview. The following paragraph introduces the descriptive statistics of the pooled sample as well as the respective country samples. Afterwards, the outcomes of the hypotheses testing are introduced and interpreted. Finally, this section concludes with a summary of results, which merges previous literature and findings from this study.

4.1 IPO activity and underpricing

The IPO activity in Europe has been increasing over the last decade, but was recently hit by the financial crisis. Figure 1 shows the IPO activity of Germany and UK and the levels of underpricing respectively.

Figure 1: IPO Activity and level of underpricing



(Source: S&P Capital IQ Database, adjusted by authors)

Previous literature revealed the dependency of IPO activity on country-level laws and governance institutions. The British governance system is characterised by a well developed and active capital market of corporate control aligned with a substantial investor protection (Georgen and Renneboog, 2007). Hence, the activity is higher in

common law countries compared to countries belonging to the civil law origin. However, there further exists a relation between IPO activity and domestic market conditions. Consistently, firms are assumed to increase public trading activity when valuations are higher in the home market (Doidge, 2011). According to Lowry and Schwert (2002), both IPO volume and average initial returns are highly correlated and the initiatives of going public increase after periods of abnormal high initial returns (often referred to as *'hot-market-periods'* or simply *'hot issues'*), which indicate underpriced IPOs. This is in line with Ritter and Welch (2002) who confirm the correlation between underpricing and issuing activity in the subsequent months. The findings are based on the argument that underwriters might encourage more firms to enter the stock market when valuations turn out to be higher than expected and in turn discourage firms from filing or proceeding when valuations are lower than expected (Ritter and Welch, 2002). However, the graphs above interestingly indicate a mixed support for the implemented theories.

The trend observed in the German IPO market supports the findings by Ritter and Welch (2002) and Lowry and Schwert (2002), that underpricing leads to an increase in IPO activity in the following periods. The low number of new issues in the beginning of the investigated period experiences a substantial subsequent upward trend. The same can be seen for the average first day return i.e. level of underpricing. The German IPO market shows a drop in activity and underpricing in 2012, which might be due to the ending of the First/Second Quotation Board at the Open Market segment of the DBAG in 2012. The segment with the lowest listing requirements was subject to manipulation and consequently shut down in April 2012. According to arguments about the link of underpricing to the strength of disclosure requirements (Shi *et al.*, 2007), those IPOs were probably the issues underpriced the most, which might explain the low point. The IPO market report published by PwC (2013) saw an increase in proceeds despite a reduced number of IPOs, and the Deutsche Börse index DAX was the best performing index. This might also indicate the arguments established by La Porta *et al.* (1997), stating that civil law is better in times of crisis and hence a lower degree of underpricing is assumed in the subsequent period of the economic downturn.

The UK analysis shows contradictory movements to the above-mentioned empirical evidence. When underpricing decreases the activity seems to increase. The UK market shows a slight decline in 2012, followed by a sharp UPR growth in 2013, which is probably due to the amendment in EU Prospectus Directive and the implementation of the '*High Growth Segment*' at the LSE. This also supports the finding that underpricing is extremely severe in high-tech/fast-growing companies due to their valuation difficulties, which was also derived by studies after the burst of the Dot-Com-Bubble (Ljungqvist and Wilhelm, 2003).

4.2 Descriptive statistics

Variables are divided into country- and firm-specific items. The summary of descriptive statistics for the pooled sample is presented in tables 8 and 9. Particularly, P/E ratio, ln(proceeds), Age, IPO volume, and Market Cap are characterized by a high standard deviation and thus largely variable values, which is further indicated by the high spread of minimum and maximum amounts. These variables were subject to high variations in other research studies as well (Cahine *et al.*, 2007; Engelen and Essen, 2010; Lin *et al.*, 2013). Nonetheless, the standard deviation for underpricing is significantly lower, compared to previous cross-country studies (Engelen and Essen, 2010; Shi *et al.*, 2007; Boulton *et al.*, 2010). It is notable that the amount of block and large shareholder is almost equal since most of the large owners (more than 100,000 shares) are block holders at the same time. The authors therefore introduced a dummy variable for large owners, to test for their influence on underpricing. Table 9 further shows that the country-specific index numbers in particular are well distributed since they mostly remain constant for both countries respectively.

Table 8: Descriptive statistics firm-specific variables

	UPR	SB	BLOCK	LARGE	Debt Level	P/E Ratio	ln(Proceeds)	Age
Mean	0,090	0,158	0,371	0,372	0,408	-17,796	3,004	17,876
Median	0,067	0,031	0,334	0,341	0,328	0,000	2,838	7,000
Maximum	0,603	1,000	1,000	1,000	3,439	196,447	7,139	178,000
Minimum	-0,269	-0,008	0,000	0,000	0,000	-2683,422	-1,475	0,000
Std. Dev	0,137	0,391	0,292	0,292	0,409	206,223	1,916	22,769

(Source: S&P Capital IQ database, La Porta*et al.*, 2006, adjusted by authors)

Table 9: Descriptive statistics country-level statistics

	IPO Volume	Market Cap	DISC Index	LIAB Index	PUB Index	COR Index	ROL Index
Mean	26,186	342,102	0,740	0,515	0,579	0,130	0,872
Median	27,000	205,967	0,830	0,660	0,680	0,132	0,857
Maximum	42,000	1672,613	0,830	0,660	0,680	0,135	0,923
Minimum	2,000	55,650	0,420	0,000	0,220	0,125	0,857
Std. Dev	11,947	336,749	0,170	0,274	0,191	0,003	0,274

(Source: S&P Capital IQ database, La Porta*et al.*, 2006, adjusted by authors)

The primary focus of this research is the level of underpricing. Table 10 summarises this main variable for Germany and the UK respectively. Sample clustering exists in this study, as roughly 78% of the sample companies belong to the UK market. This is not surprising, since the UK represents the largest and most active IPO market within Europe (Georgen and Renneboog, 2007).

Table 10: Underpricing in UK and Germany

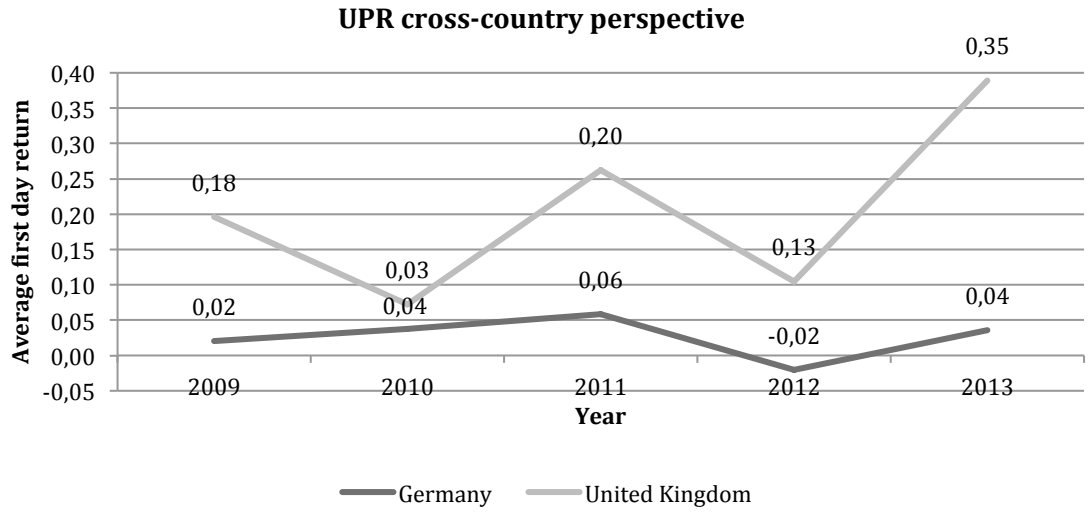
UPR	N	Mean	Median	Maximum	Minimum	StdDev
Germany	39	0,032	0,001	0,866	-0,269	0,161
UK	138	0,160	0,086	5,180	-0,989	0,488
Total	**177**	**0,090**	**0,067**	**0,603**	**-0,269**	**0,137**

(Source: created by authors)

On average, UK IPOs have an initial return of 16% and a median initial return of 8.6% which is coherent with prior empirical findings that showed similar results (Engelen and Essen, 2010; Boulton *et al.*, 2010; Hopp and Dreher, 2007). The large range (lower limit = -98,9%; upper limit = 518%) implies a high standard deviation of the sample of 48.8%, which is coherent with the researchers predictions as consequence of the large proportion of highly speculative Penny Stocks in the sample. As a result it can be said that initial returns in the UK are highly uncertain.

German IPOs show a considerable low level of underpricing. That contradicts most of the previous literature that found IPOs in common law structures being less underpriced (Figure 2). Nonetheless, it supports La Porta *et al.* (1998) argument that civil law structures work better in times of crisis and thus create less *ex ante* uncertainty which in turn leads to a lower level of underpricing.

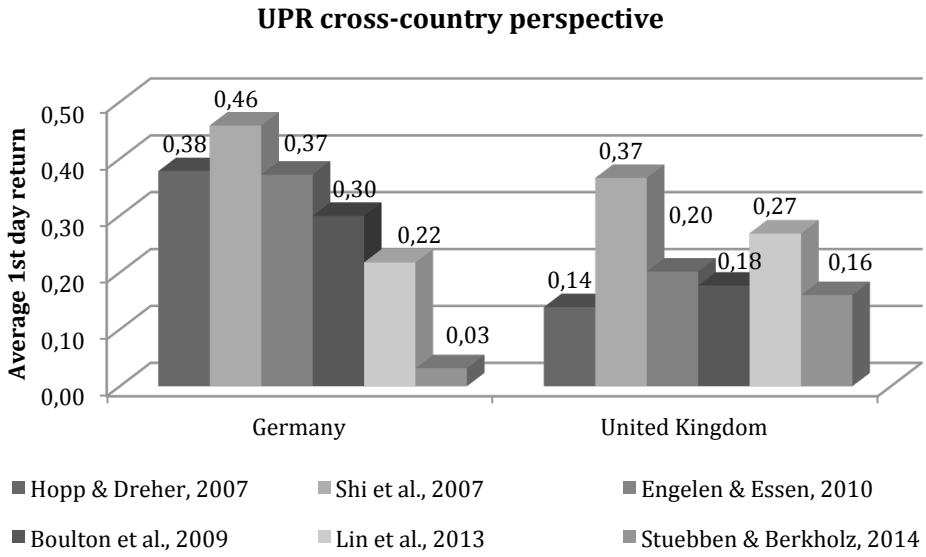
Figure 2: UPR cross-country perspective



(Source: created by authors)

Figure 3 shows the discrepancy of results compared to previous empirical findings. A complete overview of the shown studies, including sample size and investigated period, can be found in Table 1. This confirms the researchers expectations, as a consequence of the cutting financial crisis of 2008. Although, considering the relatively small German sample size, it is more evenly distributed with a low standard deviation. First day price jumps in Germany never exceeded the 100% mark (maximum 86,6%).

Figure 3: Overview of UPR levels in previous studies



(Source: created by authors)

4.3 Regression results

The multi linear regression model explained in section 3.3, allows establishing a relationship between explanatory and response variables. The following sections provide an overview of the hypotheses testing outcomes. The chapter is divided into country and firm-specific outcomes.

4.3.1 Country-specific analysis

4.3.1.1 Legal origin

To test the influence of the legal framework on the level of underpricing a common law dummy variable is established. Common law countries show a high level of protection, which would indicate a lower level of uncertainty (La Porta *et al.*, 1997, 1998). This leads to the general assumption that underpricing might be lower in common law countries (Engelen and Essen, 2010; Hopp and Dreher, 2007; Shit *et al.*, 2007).

The regression analysis shows a positive relationship (β_{COM}[46] = 0,2656) between the common law dummy variable and underpricing at a 1% significance level (Appendix II). Therefore, the null hypothesis is rejected for this sample, meaning companies belonging to the common law origin are more likely to be underpriced. This is further supported by the descriptive results, showing a mean underpricing of 16% for the UK and 3% for Germany. This finding contradicts most of the previous literature, which found civil law firms to be more underpriced than common law firms (Engelen and Essen, 2010; Hopp and Dreher, 2007; Shi *et al.*, 2007). Nonetheless, the present findings are supported by Lin *et al.* (2013) and other studies focusing on ownership structure and legal origin (Brennnan and Franks, 1997; Boulton *et al.*, 2010; Smart and Zutter, 2003), who also found a positive relationship of common law and underpricing.

As the authors expected, the legal origin effect might be reversed during and after a crisis period. La Porta *et al.* (1997, 1998) already assumed that civil law structures create less uncertainty because generally, firms have lower debt levels compared to common law structures. However, this does not hold true for this study since debt levels in Germany are higher than in the UK (Table 11). The regression analysis does not offer a significant test result for the debt level variable.

The authors assume that the lower level of underpricing is related to the considerable lower age of companies in the UK. Previous literature, focusing on information asymmetries, stated that younger companies are more underpriced, mainly because of lack of information und the perceived level of uncertainty involved (among others, Ljungqvist, 2007; Engelen and Essen, 2010). This sample also shows a notably higher market capitalization for German firms, which further indicated that more mature and established companies went public, whereas in the UK companies where almost 50% smaller on average (Table 11).

[46] β is the coefficient estimate of the regression results.

Table 11: Average country-specific firm characteristics

	Age	Debt Level	Market Cap
Germany	42,1	0,4468	597,7982
UK	11,0	0,3968	269,8394
Total	**17,9**	**0,4078**	**342,1015**

(Source: created by authors)

4.3.1.2 Legal framework

Law enforcement

Lin *et al.* (2013) and Engelen and Essen (2010) found evidence that legal enforcement is negatively related to the level of underpricing. Therefore, better and more stringent law enforcement leads to less IPO underpricing which seems logical as the level of *ex ante* uncertainty is reduced.

This research found different results. The three established variables, representing law enforcement, are positively related to underpricing in this sample. Thus, the null hypothesis is highly rejected at a 1% significance level for disclosure and public enforcement index, whereas at a marginal 10% level for the *liability index*. This indicates that there is a significant different impact of common- or civil law on underpricing. The researcher expected that the negative relationship might be reversed, since the focus of this study lies on the after crisis period. As literature suggests the law enforcement is strongest in the UK with disclosure, liability standard, and public enforcement index numbers being over 0,60 (1 is highest and 0 is lowest value) (La Porta *et al.*, 1998, 2006; Engelen and Essen, 2010; Lin *et al.*, 2013). Germany on the other hand, is characterized by relatively low law enforcement with all index variables being less than 0,5 (La Porta *et al.*, 2006).

Shi *et al.* (2007) found evidence that IPO underpricing is negatively associated with the strength of disclosure requirements. This is a logical conclusion since more stringent disclosure requirements reduce information asymmetries, which consequently lead to

lower underpricing. Nonetheless, there is mixed empirical evidence. Hopp and Dreher (2007) found disclosure requirements being positively correlated with underpricing, which supports the present findings of this study. They relate this finding to the fact that disclosure improvements could lead to transient ownership and thus volatile stock prices. The researchers believe that the large number of Penny Stocks in the UK sample could influence the results.

The liability index represents the burden of proof. The higher the index, the lower the burden of proof. It indicates the difficulty of recovering losses in a civil liability case (La Porta *et al.*, 2006). Generally, the liability index has a positive influence on underpricing (Shi *et al.*, 2007; Hopp and Dreher, 2007). This is approved by the present study. Even though a significantly positive relationship of the chosen liability standard and underpricing was found, the results are marginal and no strong inference can be made. However, these findings are consistent with the lawsuit avoidance hypothesis that considers underpricing as means to reduce potential legal liability at least playing a second order in IPO underpricing (Hughes and Thakor, 1992; Tinic, 1988; Lowry and Shu, 2002).

The public enforcement index is significantly lower for German civil law structures than in UK common law (La Porta *et al*., 2006; Shi *et al*., 2007). It shows a highly significant ($p < 0{,}01$) positive relationship with the dependent variable, which seems irrational. It could be that the index is obsolete, since the numbers are taken from 2006. Further, an inconsistency with the corruption index exists as well. The higher law enforcement index should indicate a lower level of corruption, which is not the case for the UK compared to Germany. It could also be argued that public enforcement itself does not significantly influence the behaviour and decisions of participants involved in the IPO process (investors, underwriters, firms). Jackson and Roe (2006) suggest splitting public enforcement and private enforcement and found that private enforcement has a more significant influence on capital markets than public enforcement. Nonetheless, until now there does not exist a clear distinction between both index numbers.

Quality of legal framework

The quality of legal framework is represented by two index numbers, namely the corruption and rule of law index. Both variables show a significant negative influence on underpricing. This is supported by previous literature (Engelen and Essen, 2010; Hopp and Dreher, 2007; Lin *et al.*, 2013).

The corruption index generally, is higher in Germany, than in the UK sample. This indicates that in the UK corruption is higher (the higher the index, the lower corruption). The existence of corruption can create uncertainty that on the other hand leads to a higher level of underpricing. Therefore, it is a logical conclusion that UK common law countries are more underpriced. On the other hand the higher corruption index for the UK contradicts the high law enforcement variables.

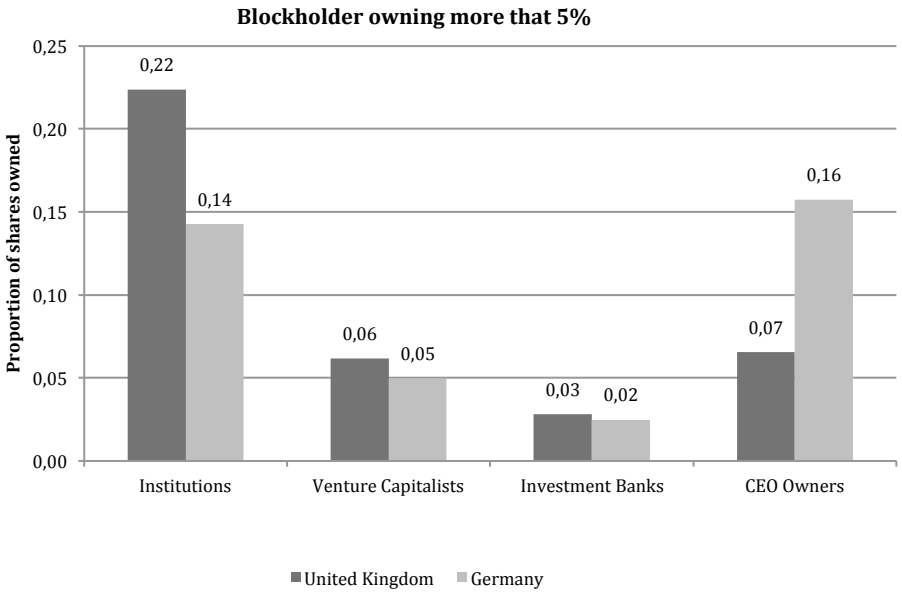
Rule of law, representing law and traditions in the respective countries has a significant negative relationship with underpricing. That was also found by previous empirical research on this topic (Engelen and Essen, 2010; Hopp and Dreher, 2007; Lin *et al.*, 2013). It seems to be a logical result that a higher ROL reduce the level of underpricing. The rule of law index can also be interpreted as investors' confidence in a legal system (Kaufmann *et al.*, 2005) and thus the perceived risk of investing is lower in Germany (ROL = 0,923) than in the UK (ROL = 0,857). As a logical consequence the level of underpricing is also considerably lower in Germany illustrated by the descriptive statistics of the two countries (Table 10).

4.3.1.3 Ownership structure

To test whether the ownership structure determines the level of underpricing, the variables shareholder breadth and shareholder inequality are established. There is various empirical evidence that larger shareholder breadth and equality is positively correlated to underpricing (Brennan and Franks, 1997; Booth and Chua, 1996; Pham *et al.*, 2003; Boulton *et al.*, 2010; Smart and Zutter, 2003). Therefore, large and blockholder owners as indicators for a considerable shareholder inequality, are assumed to have a negative influence on underpricing (Pham et al., 2003).

Contradictory to these previous studies, this study does not find significant evidence for a relationship of ownership structure and underpricing. Nonetheless, a conflicting trend was detected. According to the data collected, UK firms seem to have a larger proportion of institutional blockholders than German firms. The German sample on the other hand is characterised by a large proportion of CEO blockholders (Figure 4). Further, the shareholder breadth between both countries only shows minor deviations (Germany 14%, UK 16%; Figure 4). These findings indicate that after the crisis the ownership structure changed severely. It seems that the UK, although having a legal system that focuses on minority shareholders, turns to favour institutional and large shareholders.

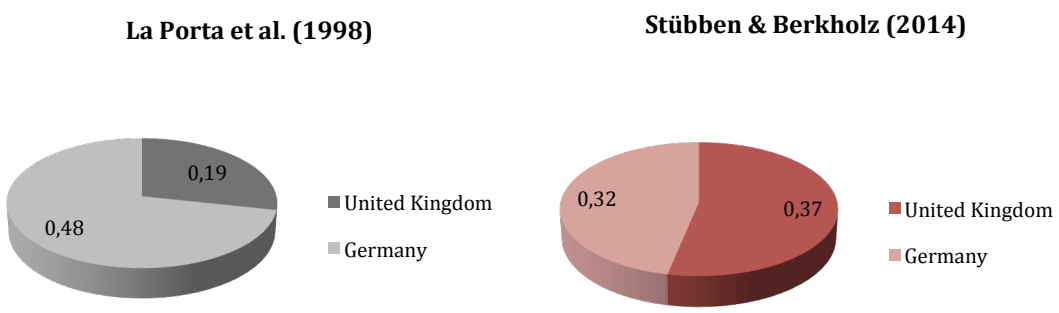
Figure 4: Ownership distribution by country



(Source: created by authors)

Chambers and Dimson (2009) already stated that institutional holders became more powerful in recent years. This is surprising since the level of underpricing is significantly higher in the UK, which usually attracts small investors (Brennan and Franks, 1997; Pham *et al.*, 2003). The researcher believes that this reversed phenomenon can also be explained by the loss of confidence in the capital markets after the crisis (Glavina, 2013; PwC, 2010). Institutions kept investing while small investors rather saved their money than investing it in speculative and uncertain shares. It is assumed that this risk avoiding behaviour of small investors could have caused these specific sample characteristics. When comparing the investigated sample with previous research by La Porta *et al.* (1998) it becomes clear that blockholders became very important investors during the last decade (Figure 5).

Figure 5: Proportion blockholder ownership 1998 versus 2014



(Source: created by authors)

4.3.2 Summary of findings

The outcomes of the regression analysis show controversial results. The authors found that underpricing is significantly positively related to common law and law enforcement, which can hardly be related to previous empirical findings. The quality of legal framework is as expected and confirmed by historical literature, negatively related to the level of underpricing. For the hypotheses related to the ownership structure, no significant results were found for neither of the two measures. However, a change in the generally assumed ownership structure was discovered that would make a logical implication to one of the countries arbitrary. A large proportion of institutional block shareholders characterise the UK sample, which contradicts to the assumed ownership patterns. An overview of the influence of all tested variables on underpricing is illustrated in table 12.

Table 12: Summary of results

Dependent Variable: UPR Period: 2009-2013			
Variable	**Hypothesis**	**Coefficient**	
c	**N/A**	18,57195	**
COMMON_LAW DV	+	0,265575	*
ROL_INDEX	-	-0,875377	*
COR_INDEX	-	-79,92635	***
LIAB_INDEX	+	0,0387617	*
BLOCK	-	-0,015	
LARGE_DV	+	0,024015	
SB	-	-0,029397	
AGE	-	-2,57E-05	
IPO_VOLUME	-	0,00707	**
VC_DV	-	0,050311	***
INDUSTRY_DV	-	-0,006097	
DEBT_LEVEL	+	0,007218	
LN PROCEEDS	-	-0,012409	***
MARKET_CAP	-	-0,000268	
RECESSION_DV	-	-0,409127	**
PE	+	5,70E-06	
* p< 0,01		R^2 0,1979	
** p< 0,05			
*** p< 0,10			

5 Conclusion

The following section comprises a discussion of results. The authors interpret empirical findings of this study in conjunction with previous research. Further, strategic implications for participants involved in the IPO process are outlined. Finally, suggestions for further research on this topic are proposed.

5.1 Concluding discussion

In order to address the main objective of this thesis, the authors compared IPOs from the UK and GER as appropriate representatives of the two legal systems of common and civil law during the most recent years. The purpose of the study is to add further knowledge with regards to IPO underpricing in a cross-country context by answering the question of what role a country´s institutional framework plays as a determinant of IPO underpricing with respect to different legal origins. In addition to that, the authors initially intend to connect and draw a conclusion on the findings to the countries ownership structure associated to their legal system.

To give answers to the proposed questions and achieve the purpose of the study, a regression analysis of underpricing on the most frequently used firm-specific and country-specific variables are conducted. An important consideration when concluding the findings is the authors' anticipations towards possible reverse effects of the coefficient estimates and implications caused by the recent financial crisis. The following Table 13 illustrates the proposed hypotheses next to their respective empirical results.

Table 13: Hypotheses and empirical results

Variables	Hypothesis	Empirical Results	sign.	
Country-level				
Common law DV	+/-	+	**	✓
Quality of legal framework	-	-	*	✓
Legal enforcement	-	+	*	×
Firm-level				
Shareholder Breadth:				
SB	-	+		⊗
Shareholder Inequality:				
BLOCK	-	-		⊗

* p< 0,01
** p< 0,05
*** p< 0,10

When summarising the previous sections, it is evidential that the financial crisis caused a major disruption of the capital markets in the UK and Germany. IPO activity has been highly volatile in both countries since 2009 (Figure 1). Also, the observation of underpricing being positively related to the common law origin stays in conflict to previous theories. Generally, common law is associated with lower levels of underpricing due to better minority shareholder protection and thus decreased uncertainty. The authors assume that the contradictory result could be related to the considerable lower age and thus higher uncertainty of companies in the UK. Further, German firms show a significantly higher market capitalization, which indicates thatmore mature and established companies went public.

The law enforcement and quality of legal framework variables showed some controversial results. The level of law enforcement is higher in the UK than in Germany. Therefore, one would suggest that more stringent law enforcement creates less uncertainty and therefore reduces underpricing. But all three variables showed a positive impact on underpricing. This is a logical conclusion for the liability standard and is consistent with the lawsuit avoidance hypothesis. A positive relationship for disclosure requirements and public enforcement on the other hand seems rather irrational. The authors believe that the results could be biased by the large amount of

Penny Stocks in the UK sample and thus highly volatile stock prices. Further, it is possible that the index numbers used are obsolete. The public enforcement variable further stays in conflict with the corruption index. The corruption index appears to be lower for the UK sample, meaning there is a higher level of corruption. But law enforcement on the other hand is stronger in the UK than in Germany. The finding that the quality of legal framework is significantly negatively related to underpricing is confirmed by various previous studies. The higher level of corruption and lower rule of law index for the UK emphasize the considerable higher level of underpricing.

When applying theories of ownership and control to the present sample it seems that in the aftermath of the crisis ownership structures have changed significantly. Thus, established theories could not be confirmed. Although no significant relationship of underpricing and ownership variables was found, it was discovered that UK firms are characterised by a large proportion of institutional blockholders, which is rather unusual but might be due to the loss of confidence, especially of small investors in the financial markets.

Overall, it can be concluded that the financial crisis did impact underpricing clusters of the stock markets of UK and GER through the quality of legal framework and legal enforcement had a significant influence and had reverse effects. At the same time the different findings make it such an interesting avenue of research, since it opposes the existing literature and findings related to the countries legal origin and institutional framework.

5.2 Strategic implications

The conclusions found in this research offer the possibility to propose strategic advice for the different participants involved in an IPO process and the government. Therefore, the authors suggest underwriters, firms, and investors strategies to consider during this process, when there is an economic upturn or downturn. There are different implications for the UK and Germany as representatives for common and civil law respectively.

The results of this thesis suggest that civil law is advantageous in times of crisis or economic downturns. Even though the authors are aware of the fact that the regression results do not support any significant ownership implications, the revealed ownership structures in Figure 4 indicate a desirable allocation and pricing of shares in an IPO. One striking feature concerning the ownership structure of the civil law country is the high retention of CEO ownership in GER. Hence, assuming the underwriter has full discretion over allocation of shares in an IPO with respect to the previous results the authors suggest that they should favour firms with CEOs as shareholder. The reason for the outperformance indicates and supports the theory proposed by Loughran and Ritter (2004) that CEO ownership reduces the bargaining power of issuing firm decision-makers for a higher offer price and hence a more accurate pricing or less underpricing. The increased incentive to avoid underpricing from a CEO point of view is argued by these researchers, as the market value of the CEO's holdings equal opportunity cost in the same amount that is money-left-on-the-table. Moreover, this backs the monitoring and reduced agency cost argument. A CEO representing a large shareholder, has more power to monitor managerial decisions and appear to limit total issuing costs with regards to the smaller number of shareholders after listing (Pham *et al*., 2003). It might further indicate that CEO as an insider knows best about the strengths, weaknesses and the opportunities of his firms and do not give his approval to the transaction if he has any doubts about the success. This single-handedly approval by the CEO is only usual in civil, but never in common law countries (Djankov, 2007).

The authors suggest firms and their underwriters in a civil law country and economic upturn to attract more smaller or outside investors that creates a broader base of potential traders, resulting in even more active trading, and hence, possibly improve aftermarket liquidity (Habib and Ljungqvist, 2001).

From an investors' perspective the status, if the participant is either informed or uninformed is crucial. For investors considered as informed it is regardless in which legal system they are active or the market or the timing, since the authors define them as rational traders that are aware of the risk of their investment. On the other hand, uninformed investors are typically not aware of the riskiness of the investment. For this group of investors the market timing is highly important as a risk indicator of the investment. In an economic downturn this group should adjust their activity and behave risk averse. For instance to invest only in stocks traded on the main markets, rather those on the AIM or Regulated unofficial market (Appendix XVII) respectively. Young and high-tech firms that incur a higher degree of uncertainty (Benveniste *et al.,* 2003, Lin et al., 2013) and more speculative stocks characterise these parallel markets. In economic upturns this group of investors could invest more aggressive or risky rather in common law countries as they are assumed to be better protected.

From a governments perspective the accurate or true valuation of firms that intend to go public could be a rudiment to interfere in order to decrease deteriorations on the domestic stock exchanges. It might be worth to consider employing an independent party that performs valuations and is integrated in the IPO process next to the usual participants. To avoid valuation manipulations, investors could consult not only the information (valuations) provided by their underwriters or firm's annual reports, but additionally from an independent party. This could possibly increase the transparency levels prior to an IPO.

5.3 Future research opportunities

Considering the findings and delimitations of this study together with previous research outcomes, the cross-country perspective on IPO underpricing should be further emphasized. The present sample showed a relatively high variable volatility why investigating the long-term implications of the financial crisis it is of interest. Thereby increasing the sample size and find additional indicators as well as increasing the explanatory power. Moreover, a more thorough investigation on the institutional frameworks is recommended such as the subsequent impact of special or severe regulatory changes on the underpricing behaviour i.e. stricter disclosure regulations in the prospectus. An analysis of different sample countries is suggested that strengthen the limited previous findings. Notably, in the context of institutional framework it is recommended to identify or establish more recent indices as quality measures of the studied countries. The indices of legal- framework and –enforcement were established before the considered periods in this study and other existing literature. An increase or decrease in the respective indices might give additional and more accurate information about the impact of different institutional frameworks on the IPO underpricing patterns.

Particularly, the discovered change of ownership structure for the typical legal systems reveal a further avenue of research. It will be interesting to examine how the degree of underpricing evolves according to those variations. Future research on a global level by connecting the stock market behaviour and thereby IPO underpricing to a macroeconomic environment/dynamics is another promising opportunity. For instance, the impact of the current striking Ukraine and Russian turbulences on the IPO market and investors sentiment is worth investigating.

6 References

Akerlof, G. A. (1970): The market for 'lemons': quality uncertainty and the market mechanism, *The Quarterly Journal of Economics*, Vol. 84, No.3, pp. 488-500.

Alavi, A., Pham, P.K., Pham, T.M. (2008): Pre-IPO ownership structure and its impact on the IPO process, *Journal of Banking & Finance*, Vol. 32, No.11, pp. 2361-2375.

Allen, F., Faulhaber, G.R. (1989): Signalling by underpricing in the IPO market. *Journal of financial Economics*, Vol. 23, No.2, pp. 303-323.

Amihud, Y., Shmuel H., Amir K. (2001): *Allocations, adverse selection and cascades in IPOs: Evidence from Israel*, Working paper, No. FIN-01-017, New York University.

Asquith, D., Jones, J.D., Kieschnick, R. (1998): Evidence on price stabilization and underpricing in early IPO returns, *The Journal of Finance*, Vol. 53, No.5, pp. 1759-1773.

Baker, M., Gompers, P.A., (2003): The Determinants of Board Structure and the Initial Public Offering, *Journal of Law and Economics*, Vol. 46, No. 2 ,pp. 569-598.

Baron, D.P. (1982): A Model of the Demand for Investment Banking Advising and Distribution Services for New Issues*, Journal of Finance*, Vol. 37, pp. 955-976.

Baron, D.P., Holmström, B. (1980): The investment banking contract for new issues under asymmetric information: Delegation and the incentive problem, *The Journal of Finance*, Vol. 35, No.5, pp. 1115-1138.

Barry, C., Muscarella C., Peavy, J., Vetsuypens, M., (1990): The Role of Venture Capitalists in the Creation of a Public Company, *Journal of Financial Economics*, Vol. 27, No. 2, pp. 447–71.

Barry, C.B., Muscarella, C.J., Vetsuypens, M.R. (1991): Underwriter warrants, underwriter compensation, and the costs of going public, *Journal of Financial Economics*, Vol. 29, No.1, pp. 113-135.

Beatty, R.P., Ritter, J.R. (1986): Investment banking, reputation, and the underpricing of initial public offerings, *Journal of financial economics*, Vol. 15, No. 1, pp. 213-232.

Benveniste, L.M., Busaba, W.Y. (1997): Bookbuilding vs. fixed price: An analysis of competing strategies for marketing IPOs, *Journal of Financial and Quantitative Analysis*, Vol. 32, No.4, pp. 383-403.

Benveniste, L.M., Busaba, W.Y., Wilhelm Jr, W.J. (1996): Price stabilization as a bonding mechanism in new equity issues, *Journal of Financial Economics*, Vol. 42, No.2, pp. 223-255.

Benveniste, L.M., Ljungqvist, A.P, Wilhelm, Jr, W.J., Yu, X. (2003): Evidence of Information Spillovers in the Production of Investment Banking Services, *The Journal of Finance*, Vol. 58, No. 2. Pp. 577-608.

Benveniste, L.M., Spindt, P.A. (1989): How investment bankers determine the offer price and allocation of new issues, *Journal of Financial Economics*, Vol. 24, No.2, pp. 343-361.

Benveniste, L.M., Wilhelm, W.J. (1990): A comparative analysis of IPO proceeds under alternative regulatory environments, *Journal of Financial Economics*, Vol. *28, No.*1, pp. 173-207.

Bessler, W., Drobetz, W., Seim, M. (2014): Share repurchases of initial public offerings: motives, valuation effects, and the impact of market regulation, *European Journal of Finance,* Vol. 20, No. 3, pp. 232–263.

Bessler, W., Kurth, A. (2007): Agency Problem and the Performance of Venture-backed IPOs in Germany: Exit Strategies, Lock-up Periods, and Bank Ownership, *The European Journal of Finance*, Vol. 13, No. 1, pp. 29-63.

Biais, B., Faugeron-Crouzet, A.M. (2002): IPO auctions: English, Dutch,… French, and Internet. *Journal of Financial Intermediation*, Vol. 11, No.1, pp. 9-36.

Booth, J.R. Chua, L. (1996): Ownership dispersion, costly information, and IPO underpricing, *Journal of Financial Economics,* Vol. 41, pp. 291–310.

Boulton, T. J., Smart, S. B., and Zutter, C. J. (*2009*): Earnings Quality and International IPO Underpricing. *The Accounting Review*, Vol. 86, No. 2, pp. 483-505.

Boulton, T.J., Smart, S.B., Zutter, C.J. (2010): IPO underpricing and international corporate governance, *Journal of International Business Studies*, Vol. 41, No.2, pp. 206-222.

Brennan, M.J., Franks, J. (1997): Underpricing, ownership and control in initial public offerings of equity securities in the UK, *Journal of Financial Economics*, Vol. 45, pp. 391–413.

Brooks, C., (2008): *Introductory Econometrics for Finance*, 2nd ed., Cambridge: Cambridge University Press.

Cahine, S., (2008): Underpricing versus gross spread: New evidence on the effect of sold shares at the time of IPOs, *Journal of Multinational Financial Management*, Vol. 18, pp. 180–196.

Cahine, S., Filatotchev, I., Wright, M. (2007): Venture Capitalists, Business Angels, and Performance of Entrepreneurial IPOs in the UK and France, *Journal of Business Finance & Accounting,* Vol. 34, No. ¾, pp. 505-528.

Chambers, D., Dimson, E. (2009): IPO Underpricing over the Very Long Run, *The Journal of Finance,* Vol. 64, No. 3, pp. 1407–1443.

Chemmanur, T.J., Liu, H. (2006): *How should a firm go public? A dynamic model of the choice between fixed-price offerings and auctions in IPOs and privatizations*, Working Paper*,* Boston College and University of Kentucky.

Chen, G., Firth, M., Kim, J.B. (2004): IPO underpricing in China´s new stock markets, *Journal of Multinational Financial Management*, Vol. 14, No. 3, pp. 183-302.

Cheung, Y.L., Qi, Y., Raghavendra-Rau, P., Stouraitis, A. (2009): Buy high, sell low: How listed firms price asset transfers in related party transactions, *Journal of Banking & Finance*, Vol. 33, No.5, pp. 914-924.

Chowdhry, B., Nanda, V. (1996): Stabilization, syndication, and pricing of IPOs, *Journal of Financial and Quantitative Analysis*, Vol. 31, No.1, pp. 25-42.

Chowdhry, B., Sherman, A. (1996): The winner´s curse and international methods of allocating initial public offerings, *Pacific-Basin Finance Journal*, Vol. 4, pp.15-30.

Cornelli, F., Goldreich, D. (2001): Bookbuilding and strategic allocation, *The Journal of Finance*, Vol. 56, No. 6, pp. 2337-2369.

Cornelli, F., Goldreich, D. (2003): Bookbuilding: How Informative Is the Order Book?, *The Journal of Finance*, Vol. 58, No. 4, pp. 1415-1443.

DBAG (2014): *Why Consider to be Listed on Deutsche Börse – The World's only IPO One-Stop Shop,* [PDF], Deustche Börse Group. Available from: http://deutsche-boerse.com/dbag/dispatch/en/kir/gdb_navigation_other_languages/ru/lc/20_listing_at_deutsche_boerse?horizontal=russia_listing_6_Audio_Listing_Guide, [Accessed 20/04/14].

Derrien, F., Womack, K.L. (2003): Auctions vs. bookbuilding and the control of underpricing in hot IPO markets, *Review of Financial studies*, Vol. 16, No.1, pp. 31-61.

Doidge, C. (2011): *The U.S. Left Behind: The Rise of IPO Activity Around the World*, Working Paper, Cambridge: National Bureau of Economic Research.

Drake, P.D., Vetsuypens, M.R. (1993): IPO underpricing and insurance against legal liability, *Financial Management*, Vol. 22, No. 1, pp. 64-73.

Eckbo, B.E. (Ed.) (2007): *Handbook of Corporate Finance*. Empirical Corporate Finance, Vol. 1, Amsterdam: Elsevier Inc

Ellingsen, T., Rydqvist, K., *The Stock Market as a Screening Device and the Decision to Go Public*, Working Paper, Economics and Finance, No. 174.

Engelen, P.J. (2003): Underpricing of IPOs – Belgian Evidence, *European Review of Economics and Finance*, Vol. 2, No. 1, pp. 53-69.

Engelen, P.J., van Essen, M. (2010): Underpricing of IPOs: Firm-, issue-and country-specific characteristics, *Journal of Banking & Finance*, Vol. 34, No.8, pp. 1958-1969.

Gajewski J.F., Gresse, C. (2006): *A Survey of the European IPO Market*, Working Paper, No. 2, European Capital Markets Institute.

Glavina, S. (2013): European IPO Market, Global And Regional Stock Exchanges, *Economics and Management*, Vol. 18, No.4, pp. 632-642.

Goergen, M., Renneboog, L. (2007): Does ownership matter? A study of German and UK IPOs, *Managerial Finance*, Vol. 33, No.6, pp. 368-387.

Greener, S. (2008): *Business Research Methods*, [ebook], Ventus Publishing ApS, Available from: http://www.ftvs.cuni.cz/hendl/metodologie/introduction-to-research-methods.pdf, [Accessed 16/04/14].

Gregoriou, G.N. (2006): *Initial Public Offerings_An International Perspective of IPOs*, Oxford: Butterworth-Heinemann

Grinblatt, M., Hwang, C.Y. (1989): Signalling and the pricing of new issues. *The Journal of Finance*, Vol. 44, No.2, pp. 393-420.

Günther, S, Rummer, M. (2006): The hot-issue period in Germany: what factors drove IPO underpricing?, In: Gregoriou, G.N. *Initial Public Offerings_An International Perspective of IPOs*, Oxford: Butterworth-Heinemann, pp. 215-245.

Habib, M.A., Ljungqvist, A.P. (2001): Underpricing and entrepreneurial wealth losses in IPOs: Theory and evidence, *Review of Financial Studies*, Vol. 14, No.2, pp. 433-458.

Hanley, K. W. (1993): The underpricing of initial public offerings and the partial adjustment phenomenon, *Journal of Financial Economics,* Vol. 34, pp. 231–250.

Hanley, K., Wilhelm, W.J., (1995): Evidence on the strategic allocation of initial public offerings, *Journal of Financial Economics*, Vol. 37, pp. 239–257.

Hopp, C., Dreher, A. (2007): *Do Differences in Institutional and Legal Environments Explain Cross-Country Variations on IPO Underpricing?*, Working Paper, No. 172, Zurich: KOF Swiss Economic Institute.

Hoque, H. (2014): Role of asymmetric information and moral hazard on IPO underpricing and lockup, *Journal of International Financial Markets, Institutions and Money*, Vol. *30*, pp. 81-105.

Hughes, P.J., Thakor, A.V. (1992): Litigation risk, intermediation, and the underpricing of initial public offerings, *Review of Financial Studies*, Vol. 5, No.4, pp. 709-742.

Ibbotson, R.G. (1975), Price performance of common stock new issues, *Journal of Financial Economics*, Vol. 3, pp. 235-272.

Ibbotson, R.G., Jaffe, F.J. (1975): "Hot Issue" Markets, *The Journal of Finance,* Vol. 30, No. 4, pp. 1027–1042.

Ibbotson, R.G., Sindelar, J.L., Ritter, J.R. (1994): The market's problems with the pricing of initial public offerings, *Journal of Applied Corporate Finance*, Vol. 7, No.1, pp. 66-74.

Jagannathan, R., Sherman, A.E. (2006): *Why do IPO auctions fail?,* Working Paper, No. 12151, Cambridge: National Bureau of Economic Research.

Jegadeesh, N., Weinstein, M., Welch, I. (1993): An empirical investigation of IPO returns and subsequent equity offerings, *Journal of Financial Economics*, Vol. 34, No.2, pp. 153-175.

Jenkinson, T., Jones, H. (2004): Bids and allocations in European IPO bookbuilding, *The Journal of Finance*, Vol. 59, No.5, pp. 2309-2338.

Jenkinson, T., Ljungqvist, A. (1996): *Going Public: The Theory and Evidence on how Companies Raise Equity Finance*, Oxford: Clarendon Press.

Jenkinson, T.J. (1990): Initial public offerings in the United Kingdom, the United States, and Japan, *Journal of the Japanese and International Economies*, Vol. 4, No.4, pp. 428-449.

Jenkinson, T.J., Ljungqvist A.P. (2001): *Going public: The Theory and Evidence on How Companies Raise Equity Finance*, 2nd ed., Oxford: Oxford University Press.

Kaufmann, D., Kraay, A., Mastruzzi, M. (2005): *Governance Matters IV: Governance Indicators for 1996-2004*, Working Paper, No. 3630, Washington: World Bank Policy Research.

Keloharju, M. (1993): The winner's curse, legal liability, and the long-run price performance of initial public offerings in Finland, *Journal of Financial Economics*, Vol. 34, No.2, pp. 251-277.

Koh, F., Walter, T. (1989): A direct test of Rock's model of the pricing of unseasoned issues, *Journal of Financial Economics, Vol.* 23, No. 2, pp. 251–272.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A. (2006): What works in securities laws?, *The Journal of Finance*, Vol. 61, No.1, pp. 1-32.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R. (2002): Investor protection and corporate valuation, *Journal of Finance*, pp. 1147-1170.

La Porta, R., Lopez-De-Silanes, F., Shleifer, A., Vishny, R., (1997): Legal determinants of external finance, *Journal of Finance*, Vol. 52, pp. 1131–1150.

La Porta, R., Lopez-De-Silanes, F., Shleifer, A., Vishny, R., (1998): Law and finance, *Journal of Political Economy*, Vol. 106, pp. 1113–1155.

Levis, M. (1990): The winner's curse problem, interest costs and the underpricing of initial public offerings. *Economic Journal*, Vol. 100, No.399, pp. 76-89.

Lin, H.L., Pukthuanthong, K., Walker, T.J. (2013): An international look at the lawsuit avoidance hypothesis of IPO underpricing, *Journal of Corporate Finance*, Vol. *19*, pp. 56-77.

Ljungqvist, A. (1995): *The timing, pricing, and long-term performance of initial public offerings*, Unpublished dissertation, Nuffield College, Oxford University.

Ljungqvist, A. (2003): *Conflicts of interest and efficient contracting in IPOs*, Working Paper, New York University.

Ljungqvist, A. (2007): IPO Underpricing, In: Eckbo, B.E. (Ed.): *Handbook of Corporate Finance*, Empirical Corporate Finance, Vol. 1, Amsterdam: Elsevier Inc, p. 375-422.

Ljungqvist, A., Nanda, V., Singh, R. (2006): Hot markets, investor sentiment, and IPO pricing, *The Journal of Business,* Vol. 79, No. 4, pp. 1667–1702.

Ljungqvist, A.P., Wilhelm Jr, W.J. (2002): IPO allocations: discriminatory or discretionary?, *Journal of Financial Economics*, Vol. 65, No. 2, pp. 167-201.

Ljungqvist, A.P., Wilhelm Jr, W.J., Jenkinson, T. (2003): Global integration in primary equity markets: The role of US banks and US investors, *Review of Financial studies*, Vol. 16, No.1, pp. 63-99.

Ljungqvist, A.P., Wilhelm, Jr, W.J (2003): IPO pricing in the dot-com bubble, *The Journal of Finance*, Vol. 58, No.2, pp.723-752.

Ljungqvist, A.P., Wilhelm, Jr., W.J., Jenkinson, T. (2000): *Has the introduction of bookbuilding increased the efficiency of international IPOs?,* Working Paper, Oxford: Said Business School.

Logue, D.E. (1973): On the Pricing of Unseasoned Equity Issues: 1965-1969, *Journal of Financial and Quantitative Analysis*, Vol. 8, No. 1, pp. 91-103.

Loughran, T., Ritter, J.R. (2002): Why Don´t Issuers Get Upset About Leaving Money on the Table in IPOs?, *The Review of Financial Studies,* Vol. 15, No. 2, pp. 413–443.

Loughran, T., Ritter, J.R. (2004): Why has IPO underpricing changed over time?, *Financial management*, pp. 5-37.

Loughran, T., Ritter, J.R., Rydqvist, K. (1994): Initial public offerings: International insights, *Pacific-Basin Finance Journal*, Vol. 2, No.2, pp. 165-199.

Lowry, M., Schwert, G.W. (2002): IPO Market Cycles: Bubbles or Sequential Learning?, *The Journal of Finance*, Vol. 67, No. 3, pp. 1171-1198.

Lowry, M., Shu, S. (2002): Litigation risk and IPO underpricing, *Journal of Financial Economics*, Vol. 65, No.3, pp. 309-335.

Megginson, W., Weiss, K.A., (1991): Venture capitalist certification in initial public offerings, *Journal of Finance*, Vol. 46, pp. 879–903.

Michaely, R., Shaw, W.H. (1994): The pricing of initial public offerings: Tests of adverse-selection and signalling theories, *Review of Financial studies*, Vol. 7, No. 2, pp. 279-319.

Muscarella, C.J., Vetsuypens, M.R. (1989): A simple test of Baron's model of IPO underpricing. *Journal of Financial Economics,* Vol. 24, pp. 125–135.

Nagata, K. (2013): Does earnings management lead to favourable IPO price formation or further underpricing? Evidence from Japan, *Journal of Multinational Financial Management,* Vol. 23, pp. 301–313.

Pham, P.K., Kalev, P.S., Steen, A.B. (2003): Underpricing, stock allocation, ownership structure and post-listing liquidity of newly listed firms, *Journal of Banking & Finance,* Vol. 27, pp. 919–947.

Pukthuanthong, K., Roll, R., Walker, T. (2007): How employee stock options and executive equity ownership affect long-term IPO operating performance, *Journal of Corporate Finance*, Vol. 13, pp. 695-720.

PwC (2010): *IPO Watch Europe: Review of the year 2009,* [PDF], Available from: https://www.pwc.pl/pl/ipo-watch-europe/2009_summary.pdf, [Accessed 09/04/14].

PwC (2012): *IPO Watch Europe 2012*, [Online], Available from: http://www.pwc.co.uk/audit-assurance/publications/ipo-watch-europe-2012.jhtml, [Accessed 09/04/14].

PwC (2013): *IPO Watch Europe Survey 2013,* [PDF]. Available from: https://www.pwc.co.uk/en_UK/uk/assets/pdf/ipo-watch-europe-q4-2013.pdf, [Accessed 21/04/14].

Ritter, J.R. (1984): The hot issue market of 1980, *Journal of Business,* Vol. 57, No. 2, pp. 215–240.

Ritter, J.R. (1987): The costs of going public, *Journal of Financial Economics*, Vol. 19, No.2, pp. 269-281.

Ritter, J.R. (1988): The buying and selling behaviour of individual investors at the turn of the year, *The Journal of Finance*, Vol. 43, No.3, pp. 701-717.

Ritter, J.R. (2003): Differences between European and American IPO Markets, *European Financial Management*, Vol. 9, No. 4, pp. 421-434.

Ritter, J.R. (2013): *Initial Public Offerings: Updated Statistics*, [Online], Available from: http://bear.warrington.ufl.edu/ritter/, [Accessed 18/04/14].

Ritter, J.R., Welch, I. (2002): A review of IPO activity, pricing, and allocations, *The Journal of Finance*, Vol. 57, No. 4, pp. 1795-1828.

Rock, K. (1986): Why new issues are underpriced, *Journal of financial economics*, Vol. 15, No.1, pp. 187-212.

Röell, A. (1996): The decision to go public: An overview, *European Economic Review*, Vol. 40, No.3, pp. 1071-1081.

Ruud, J.S. (1993): Underwriter price support and the IPO underpricing puzzle, *Journal of Financial Economics*, Vol. 34, No.2, pp. 135-151.

Rydqvist, K. (1997): IPO underpricing as tax-efficient compensation, *Journal of Banking & Finance*, Vol. 21, No.3, pp. 295-313.

Saunders, M., Lewis, P., Thornhill, A. (2009): *Research methods for business students*. 5th ed.. Essex: Pearson Education Limited.

Sherman, A. (2000): IPOs and long-term relationships: An advantage of bookbuilding, *Review of Financial Studies,* Vol. 13, pp. 697-714.

Sherman, A., Titman, S. (2002): Building the IPO orderbook: Underpricing and particpation limits with costly information, *Journal of Financial Economics,* Vol. 65, pp. 3-29.

Sherman, A.E. (2005): Global trends in IPO methods: Book building vs. auctions with endogenous entry. *Journal of Financial Economics*, Vol. 78, pp. 615-649.

Shi, C., Pukthuanthong, K., Walker, T. (2007): *Does disclosure regulation work? Evidence from international IPO markets*, Working Paper, University of California at Irvine, San Diego State University and Concordia University.

Shleifer, A., Vishny, R.W. (1997): A survey of corporate governance, *The Journal of Finance*, Vol. 52, No.2, pp. 737-783.

Smart, S.B., Zutter, C.J. (2003): Control as a motivation for underpricing: a comparison of dual and single-class IPOs, *Journal of Financial Economics*, Vol. 69, pp. 85-110.

Smith Jr, C.W. (1986): Investment banking and the capital acquisition process, *Journal of Financial Economics*, Vol. 15, No.1, pp. 3-29.

Spatt, C., Srivastava, S. (1991): Preplay communication, participation restrictions, and efficiency in initial public offerings, *Review of Financial Studies*, Vol. 4, No.4, pp. 709-726.

Stroughton, N.M., Zechner, J. (1998): IPO-mechanisms, monitoring and ownership structure, *Journal of Financial Economics,* Vol. 49, No. 1, pp. 45–77.

Suchard, J., (2009): The impact of venture capital backing on the corporate governance of Australian initial public offerings, *Journal of Banking and Finance*, Vol. 33, pp. 765–774.

Taranto, M. (2003): *Employee stock options and the underpricing of initial public offerings*, Working Paper, Philadelphia: University of Pennsylvania.

Tinic, S.M. (1988): Anatomy of initial public offerings of common stock, *The Journal of Finance*, Vol. 43, No.4, pp. 789-822.

Transparency International (2014): *Corruption Perceptions Index*, [Online], Available from: http://www.transparency.org/research/cpi/overview, {Accessed 20/04/14].

Wasserfallen, W., Wittleder, C. (1994): Pricing initial public offerings – Evidence from Germany*, European Economic Review*, Vol. 38, pp. 1505-1517.

Welch, I. (1989): Seasoned offerings, imitation costs, and the underpricing of initial public offerings, *Journal of Finance*, Vol. 44, pp. 421-449

Welch, I. (1992): Sequential sales, learning and cascades, *The Journal of Finance,* Vol. 47, No. 2, pp. 695–732.

Wiktionary.org, (2014) *Intsitutional_framework,* [Online], Available from: http://en.wiktionary.org/wiki/institutional_framework, [Accessed 20/04/14].

Wruck, K. (1989): Equity Ownership Concentration and Firm Value: Evidence From Private Equity Financings, *Journal of Financial Economics*, Vol. 23, pp. 3-28.

Zheng, S.X., Li, M. (2008): Underpricing, ownership dispersion, and aftermarket liquidity of IPO stocks, *Journal of Empirical Finance,* Vol. 15, pp. 436–45.

7 Appendix

Appendix I: Correlation Matrices: Firm- and Country-Level

	SB	BLOCK	LARGE	Debt Level	P/E Ratio	ln(proceeds)	Age
SB	1,000	-0,296	-0,293	0,075	0,029	-0,578	0,011
Block		1,000	0,980	0,060	-0,036	0,151	-0,063
Large			1,000	0,065	-0,052	0,152	-0,114
Debt Level				1,000	0,021	-0,007	-0,020
P/E Ratio					1,000	-0,007	0,028
ln(proceeds)						1,000	0,077
Age							1,000

No correlation greater than 0,5784.

The authors only included a Large_DV as they are often representing blockholders simultaneously.

	IPO Volume	Market Cap	DISC Index	LIAB Index	PUB Index	COR Index	ROL Index
IPO Volume	1,000	-0,396	0,742	0,742	0,742	0,498	-0,742
Market Cap		1,000	-0,405	-0,405	-0,405	-0,221	0,405
DISC Index			1,000	1,000	1,000	0,709	-1,000
LIAB Index				1,000	1,000	0,709	1,000
PUB Index					1,000	0,709	-1,000
COR Index						1,000	-0,709
ROL Index							1,000

Appendix II: OLS Regression results of IPO Underpricing

Dependent variable: **UPR -** Level of underpricing of IPOs from the UK and GER in period 2009-2013								
Method: Least Square		Obs: 177				Robustness tests:		
						Additional Control Variable		Principal Component Analysis
Independent variable		Coefficient		SE		Coef.	SE	Coef. SE
Intercept	**	18,57195		8,560098				
Country-level								
Common_law_DV	*	0,2656		0,0689				
Quality of legal framework:								
Rule of law	*	-0,8787		0,3277				
Corruption	***	-80,3578		44,6403				
Legal enforcement:								
Liability Standard	***		0,3876	0,1075				
Disclosure	*		0,624115	0,174692				
Public enforcement	*		0,556276	0,155704				
Firm-level								
Shareholder Breadth		-0,02939		0,03027				
Shareholder inequality								
Blockholder		-0,01500		0,04683				
Large_DV		0,024015		0,037459				
P/E ratio						5,70E-06	2,85E-05	
QLF_PC	*							-0,08678 0,026339
LE_PC	*							0,06123 0,017139
Control Variables								
Year dummies		Included						
Recession_DV	**	0,0203		0,0517				
Age		-2,61E-05		8,18E-05				
Debt level		0,00879		0,025537				
LN_Proceeds	*	-0,01241		0,007356				
Market Cap	**	-0,000268		0,000134				
VC_DV	***	-0,50311		0,028539				
IPO Volume	**	-0,00707		0,002943				
Industry_DV								
R^2		0,197943	Sum squared resid		2,678179	Mean dependent var		0,090177
Adjusted R^2		0,117658	Log likelihood		119,7252	S.D. dependent var		0,136838
S.E. of regression		0,128975	Prob(Wald F-statistic)		0,000002	Schwarz criterion		-0,869040
F-Stat	*	2,30825	Wald F-statistic		3,985129	Durbin-Watson stat		1,854048

* p< 0,01 Standard errors are adjusted for heterosketasticity using Whites (1980) robust standard errors.

** p< 0,05

*** p< 0,10

Appendix III: Principal Component Analysis – QLF

Principal Component Analysis - Quality of Legal Framework

Observations: 177

Eigenvalues: (Sum = 2, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	1,7903	1,1419	0,8547	1,7093	0,8647
2	2,91E-01	---	0,1453	2,0000	1,0000

Eigenvectors (loadings):

Variable	PC 1	PC2
COR_INDEX	-0,707107	0,707107
ROL_INDEX	0,707107	0,707107

Ordinary Correlations:

	COR_INDEX	ROL_INDEX
COR_INDEX	1	
ROL_INDEX	-0,709309	1

Appendix IV: Principal Component Analysis – LE

PrincipalComponent Analysis - Legal Enforcement

Observations: 177

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	3,0000	3,0000	1,0000	3,0000	1,0000
2	5,86E-17	3,39E-16	0,0000	3,0000	1,0000
3	-2,81E-16	---	0,0000	3,0000	1,0000

Egenvectors (loadings):

Variable	PC 1	PC2	PC3
DISC_INDEX	0,57735	0,742665	0,339287
LIAB_INDEX	0,57735	-0,077502	-0,81281
PUB_INDEX	0,57735	-0,665163	0,473523

OrdinaryCorrelations:

	DISC_INDEX	LIAB_INDEX	PUB_INDEX
DISC_INDEX	1		
LIAB_INDEX	1	1	
PUB_INDEX	1	1	1

Appendix V: Correlation Matrix - PCs

Correlation Matrix - Principal Components

	LE_PC	QLF_PC
LE_PC	1	-0,924475
QLF_PC	-0,924475	1

Appendix VI: OLS regression of IPO underpricing on PCs

Method: Least Square

Observations: 177

Dependent varibale: UPR - Level of underpricing of IPOs from the UK and GER in period 2009-2013

Independent variable		Coefficient	SE
Intercept	**	18,57195	8,560098
QLF_PC	*	-0,086782	0,026339
LE_PC	*	0,061233	0,017139
Control Variables			
Year dummies	Included		
Recession_DV	**	0,0203	0,0517
Age		-1,20E-04	7,07E-05
Debt level		0,00879	0,025537
LN_Proceeds		-0,01241	0,007356
Market Cap		-0,000268	0,000134
VC_DV		-0,50311	0,028539
P/E ratio		5,70E-06	2,85E-05
IPO Volume	**	-0,00707	0,002943
Industry_DV			
R^2	0,180851		
Adjusted R^2	0,098936		
F-Stat	* 2,207789		

Standard errors are adjusted for heterosketasticity using Whites (1980) robust standard errors.

* p< 0,01

** p< 0,05

*** p< 0,10

Appendix VII: Robustness tests of OLS regression results

Dependent Variable: UPR								
	Quality of legal framework		Legal enforcement		*Shareholder Breadth*		*Shareholder equality*	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Potentially Omitted Variables								
Additional Control Variable[1]								
P/E Ratio[2]	-0,878735 *	0,327672	0,387766 *	0,108537	-0,029408	0,03061	-0,014826	0,047008
Multicollinearity								
Principal Component Analysis [3]	-0,086782 *	0,026339	0,061233 *	0,017139	-0,034259	0,032117	-0,024547	0,046965

Standard errors are adjusted for heterosketasticity using Whites (1980) robust standard errors.

[1] The Rule of law index is considered as a representative of the Quality of a countries legal framework due to the perfect correlation to the Corruption indexes.

* p< 0.01

[2] R^2 0,197953

** p< 0.05

[3] The same principal is applied for Legal enforcement with the Liability Standard index as a representative of its group indexes.

*** p< 0.10

The coefficient estimates and SE are the respective principal components -*QLF-pc and LE-pc* -whereas the ownership measures remain equivalent.

93

Appendix VIII: Diagnostic tests–Heteroskedasticity

Heteroskedasticity test: White

Dependent Variable: Residual^2			
F - statistic	0,637844	Prob F-stat	0,7635
Obs * R^2	5,882151	Prob Chi² (9)	0,7517
Scaled explained SS	65,21509	Prob Chi² (9)	0,0000

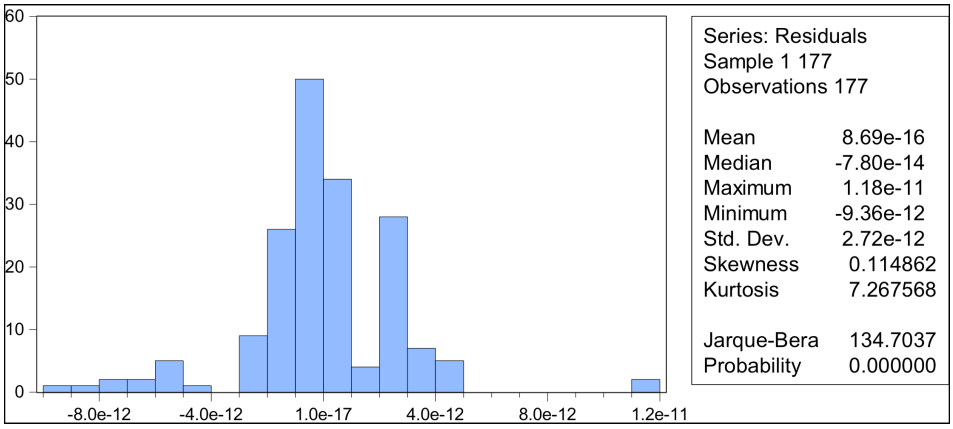
The number of explanatory variables in parentheses.

Appendix IX: Diagnostic Tests – Endogeneity

Endogeneity - Hausman Test

Dependent Variable:UPR	Prob.
Residuals	0,0000
Fitted values	0,0000
R^2	1,0
Observations	177

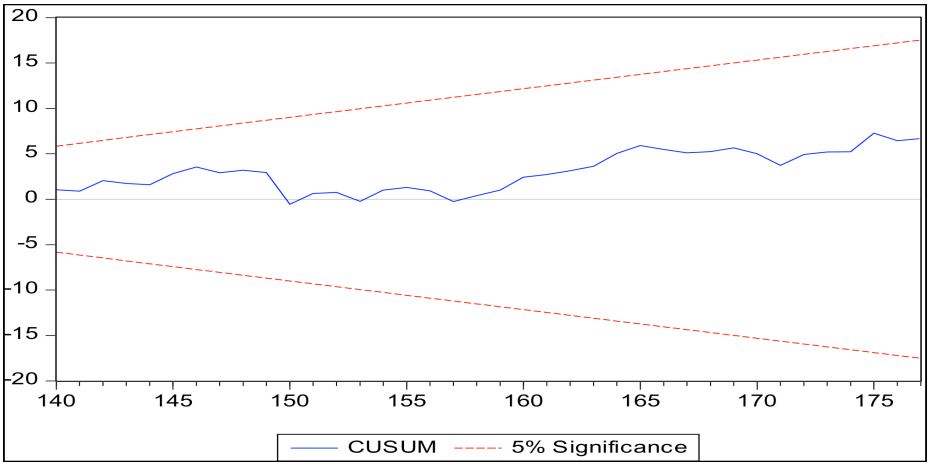
Appendix X: Histogram – BJ Normality Test



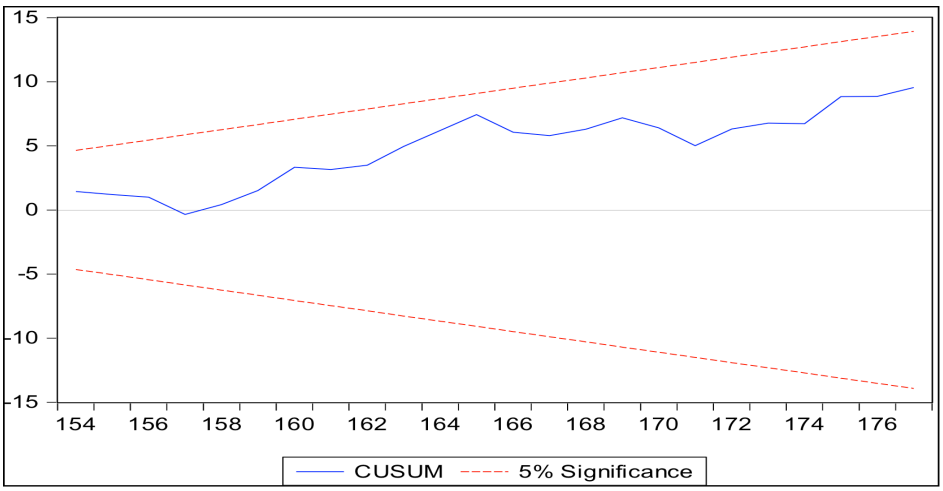
Appendix XI: Newey-West robust SE

Dependent Varianle: UPR Method: Least Squares HAC standard errors & covariance (Bartlett kernel, Newey-Westfixed bandwidth = 5.0000) Period: 2009-2013		
Varibale	**Coefficient**	
c	18,57195	**
COMMON_LAW DV	0,265575	*
ROL_INDEX	-0,875377	*
COR_INDEX	-79,92635	**
LIAB_INDEX	0,0387617	*
BLOCK	-0,015	
LARGE_DV	0,024015	
SB	-0,029397	
AGE	-2,57E-05	
IPO_VOLUME	0,00707	**
VC_DV	0,050311	***
INDUSTRY_DV	-0,006097	
DEBT_LEVEL	0,007218	
LN_PROCEEDS	-0,012409	***
MARKET_CAP	-0,000268	**
RECESSION_DV	-0,409127	**
PE	5,70E-06	

Appendix XII: Parameter Stability Tests – Recursive Residuals



Appendix XIII: Parameter Stability Tests – CUSUM Test



Appendix XIV: IPO mechanisms by country

Country	Exchange	Book-building institutional only	Book-building with public offer	Fixed-price offering	Auction
Germany	Deutsche Börse	*yes*	*no*	*yes*	*not any more*
United	LSE	*yes (placing)*	*yes*	*yes*[1]	*yes*[2]
France	Euronext Paris	*yes (placement)*	*yes*	*yes*	*Various types organised by the exchange (direct admission, minimum price offer, open price offer)*
Pricing and allocation rules by IPO mechanism					
Offering price			Price range	Fixed price	Minimum price or price range
Order types			Limit orders	Market orders	Limit order/ Market orders in some cases
Organiser			Lead manager	Lead manager or the exchange	Lead manager or the exchange
Actual issue price			At the discretion of the lead manager	Offering price	Lowest limit filling the offer
Orders filled			Discretionary	All	At equilibrium price or higher
Allocation			Discretionary	Proportional	Price priority and/or Proportional

[1] Offer for sale at fixed price, offer for subscription at fixed price

[2] Offer for sale by tender offer, offer for subscription by tender offer, open offer

(Source: Gajewski and Gresse, 2006)

97

Appendix XV: Variable Description

Variable	Source	Description	Measurement
Underpricing			
Underpricing (UPR)	e.g. Rock, 1986 Beatty and Ritter, 1986	Underpricing is defined as proportion of the difference between first day closing price and offer price and offer price	= (1st day close price - offer price)/ offer price
Institutional Framework Variables			
Common Law (COM_DV)	La Porta *et al.*, 1998 La Porta *et al.*, 2006 Engelen and Essen, 2010	Identifies the legal origin of the company law or commercial code of each country. This research focuses on two legal origins.	Germany = 0 United Kingdom = 1
Law enforcement variables			
Disclosure requirements (DISC)	La Porta*et al.*, 2006 Shi *et al.*, 2007	The index equals the arithmetic mean of prospect, compensation, shareholders, insider ownership, contracts irregular, and transactions. The higher the index, the more stringent disclosure regulations. The calculated index numbers of La Porta*et al.* (2006) are used in this study.	Germany = 0.42 United Kingdom = 0.83
Liability standard (LIAB)	La Porta*et al.*, 2006 Shi *et al.*, 2007	The index equals the arithmetic mean of liabaility standard for issuer, distributor, and accountant. It indicates the difficulty of recovering losses from the before mentioned in a civil liability case. The higher the index, the lower the burden of proof. The calculated index numbers of La Porta*et al.* (2006) are used in this study.	Germany = 0.00 United Kingdom = 0.66
Public enforcement (PUB)	La Porta *et al.*, 2006 Shi *et al.*, 2007 Engelen and Essen, 2010 Djankov*et al.*, 2008	This index equals the arithmetic mean of: supervisor characteristics index, rule making power index, investigative powers index, orders index, criminal index. The higher the index, the stronger public enforcement. The calculated index number of La Porta*et al.* (2006) are used in this study.	Germany = 0.22 United Kingdom = 0.68
Quality of legal framework			
Rule of law (ROL)	La Porta *et al.*, 1998 Kaufmann, 2005 Djankov*et al.*, 2003 Shi *et al.*, 2007	Measure of law and other tradition in a given country where 1 is the highest and 0 is the lowerst rating. Can also be considered as measurement for investor confidence. The La Porta*et al.* (1998) index numbers are used.	Germany = 0,923 United Kingdom = 0,857
Corruption (COR)	Kaufmann, 2005 Engelen and Essen, 2010 La Porta *et al.*, 1998 Transparency.org, 2014	Measures the exercise of public power for private gain. The index is measured on a scale from 0 to 10 where 0 equals high corruption and 10 no corruption. In this research the inverse of 1/Corruption Index is used to ensure comparability with other index numbers and underpricing which are rated on a scale from 0 to 1, where 1 equals high level and 0 equals low level of the respective variable. The yearly index numbers are taken from the annual research of Transparency.org (2014).	annually changing index numbers

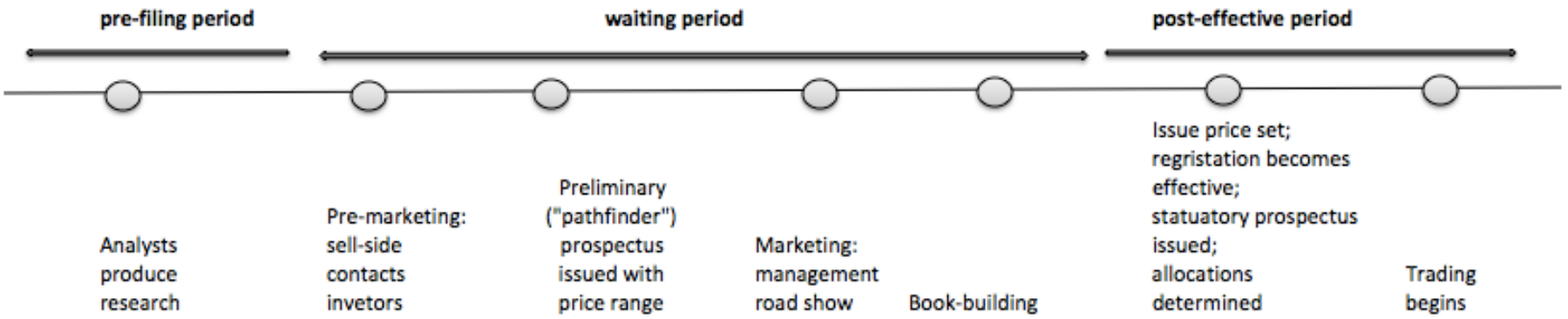
98

(cont.)

Ownership Variables			
Shareholder Breadth (SB)	Pham *et al.*, 2003	Reflects the size and diversity of the investor base of an IPO company after the share allocation process. It is calculated by owners holding less than 5% shares divided by total numbers of shares offered.	= (shares held by investors with less than 5% ownership) / value of shares offered
Shareholder Equality (SE)	Pham *et al.*, 2003	Reflects the difference in the proportions of ownership possessed by investors. By calculating this variable the researcher is able to categorize shareholder into LARGE- (owning more than 100,000 shares) and BLOCK holder (owning more than 5% of all shares).	= shares held by investors/ total number of shares offered
Control Variables			
IPO volume	S&P Capital IQ	The number of IPOs in the respective time frame (yearly)	annual number of IPOs
ln(proceeds)	S&P Capital IQ	Natural logarithm of IPO proceeds, converted into Euro at historical rates	= ln(proceeds)
Age of company	S&P Capital IQ Engelen and Essen, 2010	The age of the company is measured as difference between year of introduction to the market and foundation year.	= year of IPO - year of founding
P/E ratio	S&P Capital IQ Engelen and Essen, 2010	The P/E ratio is measured as price per share at the IPO divided by the earnings per share. EPS is calculated as Net Income/shares offered	= price per share/ earnings per share
Debt level	S&P Capital IQ La Porta*et al.*, 1998	The debt level is measured as proportion of of the total balance sheet sum.	= total debt/total assets
Market Capitalization	Shi *et al.*, 2007 La Porta*et al.*, 2006	The size of a country´s equity market is measured as market capitalization	market capitalization of respective companies
Year	Lin *et al.*, 2013 Loughran and Ritter, 2004 Shi *et al.*, 2007	Year dummy variables are added to control for time series variations in IPO underpricing	Year 2013 Year 2012 Year 2011 Year 2010 Year 2009
Dummy Variables			
VC-backed	S&P Capital IQ Engelen and Essen, 2010	The presence of venture capitalists can reduce the level of underpricing since VCs influence the level of information and can give important signals to investors	0 if non-VC-backed and 1 if otherwise
Industry	S&P Capital IQ Engelen and Essen, 2010 Benviste*et al.*, 2003 Lin *et al.*, 2013	The industry dummy variable is included for technology and internet firms since they are considered to be correlated to higher underpricing because of higher risk and uncertainty involved	0 if non-technology or internet firm and 1 if otherwise

(Source: created by authors)

Appendix XVI: European time-line IPO



(Source: Jenkinson *et al.* 2006)

100

(cont.)

	Exchange:	Admission Authority:	
United Kingdom	**LSE**	**FSA (UKLA)**	
Market Segments	**Main Market**		**AIM**
Companies min. age	3 years (normally) trading record required	High Growth Segment'*** Historic revenue CAGR (?) of 20%; or more over a three-year period	Created in 1995 No trading record required
Min. Market capitalization	700,000 GBP		No minimum market capitalization
Min. shares in public hands i.e. flotation	25%	10%	Not required
Financial reporting	UK GAAP, US GAAP and IFRS		Admission is only subject to the approval of the Nominal Advisor in charge of the IPO
Admission document	Pre-vetting by FSA	Publication of an approved prospectus	not pre-vetted by the LSE

* Since 1 July 2012, stricter rules were applied to the Entry Standard, the Open Markets transparency segment for SMEs.

** First and Second Quotation Board closed in April 2012, since October 2012 the Quotation Board came into force.

*** Launch of the new Segment in ist EU-regulated Main Market in February 2013 for fast-growing companies

(Source: DBAG, 2014; PwC, 2014)

Appendix XVII: Listing Requirements for GER and UK Market Segments

	Exchange:	Admission Authority:		
Germany	**DBAG**	**Frankfurt Stock Exchange**		
Market Segments	**Main Market**		**Parallel Market**	
	Regulated Market (General Standard)		**Regulated Unofficial Market (Open Market)**	
Companies mi. age	3 years, publication of annual reports required (§ 3 Sec. 1 BörsZuIV)	3 years, publication of annual reports required (§ 3 Sec. 1 BörsZuIV)	(at least 2 years)	
Issuing volume	Market capitalization or equity capital of EUR 1.25 Mio Min. issuing volume: 10,000 (§Sec. 1 and 3 BörsZuIV)	Market capitalization or equity capital of EUR 1.25 Mio Minimum issuing volume: 10,000 (§Sec. 1 and 3 BörsZuIV)	Min. equity of 250,000 EUR (750,000, a par value of 1 per-share)	Min. equity of 250,000 EUR
Min. free float	25% (§9 Sec. 1 BörsZuIV)	25% (§9 Sec. 1 BörsZuIV)	(10 %)	-
Prospectus Accounting Standards	EU issuers: national GAAP or IAS/IFRS Non-EU issuers: IAS/IFRS or standard equivalent	see Prime Standard	see Prime Standard	see Prime Standard
Reporting Accounting Standards	EU issuers: national GAAP or IAS/IFRS Non-EU issuers: IAS/IFRS or standard equivalent	see Prime Standard	National GAAP or IAS/IFRS	-
Listing Fee	3,000 EUR (Admission) 2,500 EUR (Introduction)	see Prime Standard	1,500 EUR	750 EUR
Annual Fee	10,000 EUR	7,500 EUR	5,000 EUR	2,500 EUR

Appendix XVIII: Transparency Level Deutsche Börse AG

Regulated Market	
Prime Standard	Quarterly financial statements English language Corporate calendar Analyst conference
General Standard	**Minimum transparency defined by EU-Law** Annual and interim financial statements Disclosure of director's deadlines and ad-hoc disclosure Shareholder stake and takeover reporting
Regulated Unofficial Market (Open Market)	
Entry Standard	Respective corporate filings Annual and interim reports Corporate calendar Corporate profile
First Quotation	**Minimum transparency defined by EU-Law** Insider trading rules Market abuse rules Takeover rules

(Source: DBAG, 2014)