# ESSAYS ON INITIAL PUBLIC OFFERINGS

by

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## Table of Contents

## List of Tables

## List of Figures

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# DECLERATION

I grant powers of discretion to the City University Librarian to allow this thesis to be copied in whole or in part without further reference to me. I also declare any material contained in this thesis has not been submitted for a degree to any other university.

# ABSTRACT

The present dissertation includes three essays on initial public offerings (IPO). The first chapter investigates the impact of venture capital (VC) syndicate size and diversity on the IPO and post-IPO performances of investee companies. We provide evidence that firms backed by larger and more diverse VC syndicates experience greater underpricing and lower post-IPO profitability. We suggest that this might be the consequence of coordination problems and conflicts of interests within large and heterogeneous VC syndicates which ultimately results in poorer added value for the investee companies. We also provide some evidence that the negative impact of VC syndicate size and diversity on IPO underpricing can be mitigated by the existence of alternative monitoring mechanisms such as bank loans.

In the second essay, using text sentiment analysis, we investigate the relationship between tone, length and information content of prospectuses and underpricing in a sample of UK IPOs between 2004 and 2012. The peculiar feature of the UK IPO market is the wide use of fixed-priced offerings to go public, which, contrary to bookbuilding, does not allow any price discovery. Our results show that, for fixed-priced IPOs, the length of the admission document is positively correlated to the offer price and negatively correlated to underpricing and to ex-post volatility, whereas different tone and information content in the document seem to matter less. We further show that admission documents have become substantially longer for all types of IPOs since the recent financial crisis but that their impact on IPO pricing appears to be significant only during the pre-crisis period.

The last chapter, the third essay, investigates how the market for European IPOs has changed, if at all, since the recent financial crisis. For this purpose we have constructed a comprehensive dataset of European IPOs between 2000 and 2012. Our research focuses on whether and how the costs, both direct and indirect, of going public have changed in the wake of the recent financial crisis. Our results suggest that both underpricing and underwriting fees have decreased since 2007. A closer look at the underwriting markets also shows that, since the financial crisis, underwriters have tended to syndicate more, and that there are some newcomers among the top ten underwriters. Additionally, we shed some light on the determinants of going public during post-crisis period, and we find that traditional models are of very little use in explaining IPO decisions during the recent recession.

# INTRODUCTION

Initial public offering (IPO) is one of the key decisions in the life of a company. Transition from a private company to a publicly-traded one provides numerous advantages for corporations, and the benefits of access to public equity markets include lower cost of capital, the attraction of more institutional investors, liquidity of shares, initiation of analyst coverage, increased transparency and disclosure, among others. However, those gains come with a price. Company owners incur direct and indirect costs that can add up to a significant proportion of the proceeds. Direct costs include fees for advisory channels (underwriters, auditors and lawyers) and fees for filing and listing, while the indirect costs of placing an IPO are mainly to do with underpricing, one of the most puzzling issues in finance. By going public, owners' shares are diluted and companies leave millions "on the table" as a result of underpricing, which is defined by the ratio of difference between first-day closing price and offer price to offer price. The extent of underpricing fluctuates greatly in different time horizons and market conditions. The US firms incur an average underpricing of 21% in the 1960s, 16% in the 1980s, 21% in the 1990s, and 40% between 2000 and 2004 (Ljungqvist (2007)). Average underpricing for UK firms during the period 1959-1990 was 12% (Loughran, Ritter, and Rydqvist (1994)). With varying levels of percentages, underpricing exists in almost all stock markets around the world.

The literature on underpricing is immense, and a wide range of theoretical arguments accompanied by empirical evidence has been suggested to explain first-day return. Ljungqvist (2007) neatly summarizes those explanations, categorizing them into four groups[1]: agency cost approach, institutional explanations, behavioral arguments and asymmetric information models.

[1]Reviews by Ibbotson (1975) and Ritter and Welch (2002) also classify theoretical arguments into similar groups.

Here, I intend only to mention the general underlying notion for each class of model and to show how my dissertation contributes to the IPO theories proposed by existing studies.

*i. Agency cost approach*

When ownership and control are separated, agency conflicts between owners and managers arise (Jensen and Meckling (1976)). Managers tend to prioritize their personal benefits over those of the company. Monitoring provides one mechanism to reduce the conflict between principals and agents. Since initial public offerings eventually contribute to the separation of ownership and control, principal-agent models attempt to explain underpricing via agency cost arguments.

Two major models place underpricing in the agency costs context, but present opposite explanations. Brennan and Franks (1997) propose that managers can deliberately reduce offer price and circumvent monitoring by large shareholders by disperse ownership among the shareholders, while Stoughton and Zechner (1998), on the other hand, argue that managers can allocate large shares to one investor at lower prices and benefit from monitoring. In this case, underpricing plays a role in minimizing agency problems. Although both models have received empirical support from the literature, most results are in line with the arguments of Brennan and Franks (1997). Smart and Zutter (2003), for example, show that IPOs with non-voting shares enjoy less underpricing and attract more institutional investors after the IPO date.

*ii. Institutional Models*

Institution-based studies attempt to explain underpricing in the context of legal environments. One hypothesis is concerned with the relationship between litigation risk and underpricing. The basic intuition is that companies intentionally lower price to avoid shareholders' reaction in the form of lawsuits (Ibbotson (1975)). Several papers show that this

hypothesis is relevant to the US firms only, and that the likelihood of lawsuits does not have a negative economic impact on the IPO firm in countries such as Germany and Japan (see for example Ljungqvist (1997)).

Another institutional motive is the tax advantages of underpricing. Compensation packages usually involve stock option grants that are subject to capital gain taxes, whereby managers exploit tax gains by selling shares at a discount, leading to underpricing. Taranto (2003) finds that underpricing provides managers with greater profits than selling equity stakes. However, as Ljungqvist (2007) points out, boards offer strategic stock options to avoid dilution by underpricing, suggesting reversed causality.

*iii. Behavioral Hypotheses*

IPO underpricing during the bubble period (1999-2000) reached a significant level, with some authors claiming that such large increases in initial returns (for example, 65%) are hard to explain through earlier hypotheses such as agency-based models or institutional environments. Behavioral hypotheses posit that investor sentiment or irrational investors can play a role in explaining initial returns. Welch (1992) argues that communication among investors leads to informational spillover so that initial investors with favorable information encourage the rest to invest. Later stage bids are therefore often motivated by irrational incentives, which helps early investors to drive prices up further and enjoy the benefits of greater underpricing.

Ljungqvist, Nanda, and Singh (2004) propose that investors maintain their optimistic expectations about the future performance of the firm. As a result, trading with overoptimistic beliefs pushes prices upwards, and it takes longer for prices to revert to the fundamental value of the company. Consistent with this view, Ofek and Richardson (2003) document that underpricing

takes place because institutional investors exit their positions and sell shares to retailers on the first day of trading.

Loughran and Ritter (2002) point out another form of behavioral bias that is prevalent among issuers rather than investors. They argue that owners are not overly concerned with the underpricing because they expect wealth loss to be recouped by retained shares and higher prices in the subsequent periods after the issue date.

*iv. Information Asymmetry Hypotheses*

Asymmetric information arguments have been inspiration for the majority of the IPO literature. These are based on the assumption that one of the parties, which can be the issuing firm, the outside investor or the underwriter, involved in the transaction is less informed then the others (Rock (1986), Beatty and Ritter(1986)). Winners' curse hypothesis by Rock (1986) proposes that uninformed investors' demand for attractive deal is partly captured by informed investors. As a result, uninformed traders obtain all shares that they bid for unattractive deals. Information heterogeneity among investors therefore helps those investors with favorable information to exploit underpricing, and leads to investors with less information suffering from overpricing.

Another form of information asymmetry can take place between the issuer and the underwriter. Banks with an information advantage may not exert the optimal effort to allocate the shares efficiently to uninformed investors. This moral hazard problem was studied as far back as two decades ago. In a screening model, issuers design a contract where monitoring of the delegate, the underwriter, is costly, and the contract induces optimal effort by allowing the underwriter to exploit some underpricing (Baron (1982)). Muscarella and Vetsuypens (1989) provide empirical evidence that in part suggests the opposite of this prediction, finding that

underpricing still takes place when underwriters go public, implying no monitoring costs. Ljungqvist and Wilhelm (2003) extend the literature by examining the impact of bookrunners' equity shares on underpricing, finding that underpricing is inversely correlated with equity holding.

When the information friction is between issuers and investors such that outside investors are less informed than firms, issuers can signal their quality by means of greater underpricing (Ibbotson (1975), Allen and Faulhaber (1989)). By doing so, low-quality firms are deterred from mimicking because of its high cost. Such models argue that high-quality firms that provide a good taste for investors through greater underpricing can recoup their losses in raising of capital in future. This prediction is empirically supported by several studies: Jegadeesh, Weinstein, and Welch (1993), for instance, find that negative price reaction to secondary equity offering is lower for firms with higher IPO underpricing.

One of the key empirical implications of information asymmetry models is about the link between ex-ante uncertainty and underpricing (Ritter (1984)). Using issuer or issue-specific proxies such as age, sales, industry, or gross proceeds for ex-ante uncertainty, a number of studies provide empirical findings that suggest that a lower degree of uncertainty decreases the level of underpricing (see for example Ritter (1984), Megginson and Weiss (1991), Ljungqvist and Wilhelm (2003), and Benveniste, Ljungqvist, Wilhelm, and Yu (2003)). Apart from offer-related details, an important information resource for investors is provided by the investment banks that issuing firms choose to hire. Owners can curb the extent of underpricing by endorsing IPO placement with their own costly choices when marginal benefits outweigh the cost of selection. Consistent with this line of argument, certification of the quality of issues by prestigious financial intermediaries such as underwriters and auditors can play a role in reducing

IPO underpricing by producing soft information (Carter and Manaster (1990), Chemmanur and Fulghieri (1994), Michaely and Shaw (1994), Titman and Trueman (1986)).

In addition to auditors and underwriters, there are two other important intermediaries that can provide financing and hence generate information and certification about issuers. The first of these is banks. Banking relationships involving loans and lines of credit convey significant information to the markets and equity markets usually react positively to bank loan announcements because banks are unique in their monitoring and disciplining skills (Fama (1985), James (1987), Diamond (1991, 1994), Chemmanur and Fulghieri (1994)). As regards underpricing, the impact of pre-existing banking relationships is significant. Schenone (2004) finds that bank loans initiated before the IPO date lead to approximately 16 to 17% less underpricing whereas relation between underwriters and issuers remains less important. The second type of financing provider is the venture capital firm. As shown by Barry et al. (1990) and Megginson and Weiss (1991), venture capital (VC) firms provide certification and reduce the direct and indirect costs of IPO. They find that non-VC backed firms have higher degree of underpricing than VC-backed ones. Between 1990 and 2007, almost 45% of IPOs received venture capital financing. Thus, role of venture capitalists in the performance of companies on IPO date and after is expected to be significant. However, venture capital financing is mostly syndicated, and earlier literature has not focused on potential problems within the syndicates.

In the first chapter of my dissertation, I empirically investigate the relation between agency costs associated with large venture capital (VC) syndicates and the performance of investee companies around the IPO date. By addressing concerns about endogeneity problems for VC syndication, I provide the evidence that larger VC syndicates experience greater underpricing and lower post-IPO profitability. Alternative governance mechanisms and

monitoring by banks reduce the negative impact of VC syndicate size on performance. Results suggest that agency problems associated with large VC syndicates have a persistent effect on company performance.

Contribution of my first essay to the literature is thus twofold. Firstly, I provide an alternative agency-based explanation for the performance of VC-backed firms around the IPO date. The agency problems here revolve around principal-principal agency conflicts, in contrast to earlier studies, which are structured around the classic principal-agent framework. The earlier venture capital literature that I have mentioned above explores the functions of VCs in the information asymmetry context, reaching the conclusion that VC financing provides certification which mitigates underpricing. I now add another layer to VC-based explanations in the agency cost context, arguing that agency problems within VC firms are significant and robust determinants of underpricing.

Secondly, I combine two schools of thought: venture capital literature and banking literature. Although both VC firms and banks provide capital and guidance to companies prior to IPO, the interaction of those two types of funding and its impact on issuers' performance has not yet been investigated. I fill this gap in the first chapter and show that bank financing exerts a moderating effect on the negative impact of large VC syndicate size on underpricing.

One body of information asymmetry theories of IPOs is bookbuilding theory. According to traditional bookbuilding theories, underpricing is required to incentivize institutional investors to reveal costly information during pricing process during bookbuilding (Benveniste and Spindt (1989), Benveniste and Wilhelm (1990)). Thus, underpricing can be viewed as a compensation to investors for generating costly information thereby enabling underwriters a more accurate pricing of the IPO (Sherman (2000), Sherman and Titman (2002)). In addition to information

extracted from investors, a second source of pre-IPO information is the IPO prospectus. There has been a lack of research on the relationship between IPO pricing and information disclosed by prospectuses. Recent studies examine the link between the pricing of book-built IPOs and the information tone and content of IPO prospectuses. The empirical evidence so far suggests that prospectuses have a significant impact on underpricing, pricing accuracy and after market return volatility for book-built IPOs (Hanley and Hoberg (2010,2012), Loughran and McDonald (2013)).

The second chapter of the thesis contributes to this branch of information asymmetry theories of IPOs by focusing on the relation between pre-IPO information production and IPO pricing. More specifically, we examine the impact of prospectuses of UK IPOs on offer price and underpricing between 2004 and 2012. Using textual analysis, we look at the effects of prospectus length, tone and information content on underpricing, offer price and post-IPO return volatility. Our results show that document length is positively correlated to the offer price and negatively correlated to underpricing and to ex-post return volatility for a sample of fixed-priced IPOs. The tone and information content of prospectuses, on the other hand, seem to matter less.

Our key departure from previous studies in the second chapter lies in the fact that we make a comparison between the impact of prospectus information on IPO pricing for two different pricing mechanisms: bookbuilding and fixed-pricing. There has been very little research on fixed-priced IPOs, despite the fact that the specific feature of the UK IPO market is the large dominance of fixed-priced IPO mechanisms. Unlike book-built IPOs, fixed-priced IPOs are not underwritten, and thus price discovery does not take place once the offer price is fixed. It is therefore an open question how the impact of pre-market information production for fixed-priced

IPOs, as measured by length, tone and content of prospectuses, differs from that of book-built issues. By looking at the UK market, we are able to fill this gap.

My third essay, Chapter Three, investigates varying costs and determinants of IPO decision over time by incorporating the effects of the recent 2008 financial crisis into the account. We show that pre-crisis IPO determinants have little explanatory power during the period after 2007. Empirical results show that during the recent recession the standard determinants proposed by existing literature can only explain 5% of variation in the likelihood of an IPO. More importantly, industry-based market-to-book ratio appears to make opposite predictions in the pre-crisis and during-crisis regimes. Our second set of findings are related to variation in costs of going public. We document that IPO costs, as measured by underwriting fees and underpricing, have significantly fallen in the EU but not in the US since 2007. In addition, underwriters tend to syndicate more, and top-ten underwriter list has seen a number of new players during the recession.

The final chapter makes two main contributions to IPO literature. Firstly, this study is among the very few empirical papers focusing on the determinants of IPOs. The reason why there have been so few empirical studies on IPO determinants is the lack of available data for private companies, which makes it difficult to design a setting where both private and public companies are compared. Our data on a large number of private UK companies overcome this issue. Moreover, our analysis incorporates the impact of market downturns on IPO decisions by examining the effects of the recent 2008 crisis. The study's second contribution is about the variation in costs involved in going public. Underpricing and gross spread are the two main costs of IPO, and with the 2008 financial crisis, there has been major concern over investment banks' reputation spillover and hence their role in the recession. Examining the fees charged by banks

and syndicate dynamics both before and during the crisis periods in both EU and the US, we extend the scope of literature and findings by Chen and Ritter (2000) and Abrahamson, Jenkinson and Jones (2011).

# CHAPTER 1

## Size and Diversity in VC Syndicates and Their Impact on IPO Performances

*"Too many people on the board, misalignment of interests,…, whenever you've got at least four VCs sitting around a table, you run the risk of a decision vacuum …***"**

**– Brad Feld –** ***Managing Director of Foundry Group*****.**

## 1.1. Introduction

The impact of venture capital (VC) financing on IPO performances has been extensively researched over the years as it provides an indirect test of whether VCs do indeed create value for their portfolio companies. Two contrasting hypotheses have emerged and received support in the literature. Some papers provide support to the *certification hypothesis* according to which VC backing results in lower first day returns at the IPO date because, in essence, VCs certify the quality of the companies they take public (Megginson and Weiss (1991)). In contrast, several other papers document the opposite result that VC backing seems to be associated with larger underpricing (Hamao et al. (2000), Lee and Wahal (2004), Gompers and Lerner (1997)). This evidence is consistent with the *grandstanding hypothesis* (Gompers (1996)) according to which VCs tend to take firms public prematurely in order to increase their reputation.

The majority of the venture capital literature compares VC-backed IPOs with non-VC-backed ones. However, Tian (2011) reports that approximately 88% of VC-backed firms that went public in the period between 1980 and 2005 were funded by a syndicate (i.e. by two or more VCs). Yet, despite this impressive figure, to date there are very few papers that try to assess whether the size and composition of the VC syndicate plays a role in determining the short and long run performances of their portfolio companies.

This paper aims to shed some light on this specific dimension of VC financing by investigating the impact of VC syndicate size and composition on the underpricing and long-run performances of a sample of VC-backed US IPOs in the period between 1990 and 2007.

The reason why we conjecture that IPO firms backed by large and more diverse VC syndicates perform differently from those backed by small and relatively more homogeneous VC syndicates is that VC syndicates represent an example of multiple principals monitoring a common agent in a moral hazard environment, where these principals are likely to have conflicting interests and misaligned objectives. The finance literature, both theoretical and empirical, has often stressed how similar situations tend to suffer from coordination, communication and free riding problems which ultimately prevent an optimal solution of the agency problem vis a vis the agent (Khalil et al. (2007), Carletti et al. (2007)). Prior research on syndicated private equity investments, including on firms that are later taken public, emphasize that goal incongruence and different decision making horizons among the involved investors may lead to internal agency conflicts that weaken the potential certification benefits of VC backing (Bruton et al. (2010), Chahine et al. (2012)). Similarly, in the banking literature, Carletti et al. (2007) theoretically show that multiple-bank lending is characterized by a strong free riding problem among principals which, in instances where the conflict of interest is very severe, might ultimately result in under-monitoring of the agent and hence a poor mitigation of the moral hazard problem.[2]

More recently, Dass et al. (2012) provide both theoretical and empirical support to the existence of conflicts of interest within lending syndicates. In a similar vein, an extensive empirical literature documents a negative relation between the size of corporate boards and firm performances. Yermack (1996), Eisenberg et al. (1998), and Bennedsen et al. (2008) provide strong support to Jensen's view that "*When boards get beyond seven or eight people they are less likely to function effectively and are easier for the CEO to control*" (Jensen (1993)). Along the

[2] Khalil et al. (2007) provides a very similar result in a more general multiple-principals context stressing the role of conflicting preferences among principals.

same lines, Hermalin and Weisbach (2003) conclude that "*large boards exacerbate some free riding problems among directors vis-à-vis the monitoring of management*".

We suggest that coordination and free-riding problems are likely to affect large VC syndicates as well, particularly when this is also associated with greater diversity of the VCs involved in the syndicates. Hence, VC syndicates are likely to be characterized by conflicting preferences and objectives (Chemmanur et al. (2011), Chahine et al. (2012)).

However, VC investment represents one of many governance mechanisms at play in an IPO firm. Very often, firms are coming to the stock market with a substantial amount of debt which underpins another important governance mechanism associated with fixed claims holders (Dewatripont and Tirole (1994), Hart (1995)). These alternative governance mechanisms may operate in concert with VC funding, and monitoring by other lenders may, to some extent, compensate for agency problems embedded within a VC syndicate.

The contribution of this paper is thus twofold. First, we test our conjecture that large and more diverse VC syndicates suffer from conflicts of interest, and hence lead to poor performance of the companies they take public. We look at both short and long term IPO performance measures where the short term performance is proxied by the first day return (underpricing) and long term performance is measured by several indicators including industry adjusted return on assets (ROA) and cumulative abnormal returns (CAR).

Secondly, we investigate whether the existence of an alternative monitoring mechanism such as bank financing is able to curb the inefficiencies caused by large and heterogeneous VC syndicates.

After controlling for the endogeneity of VC syndicate size, we find that our results provide strong support to the first hypothesis and are robust to alternative measures of diversity and size.

We show that IPOs underpricing increases in both the size and the diversity of the VC syndicates, whereas long run operating and stock performances decrease in both measures. With respect to the second hypothesis, we document that, in line with the existing literature, bank lending has a positive impact on IPO performances also for VC-backed IPOs. In addition, we do provide some evidence that bank financing has a moderation effect on VC size and diversity.

As previously discussed, very few papers to date specifically look at whether the size of VC syndicates does matter in explaining the performance of their portfolio companies. One notable exception is a recent paper by Tian (2011) which compares the performance of syndicate-backed and single-backed IPO companies in a sample of IPOs from 1980 to 2005. His results show that syndicate-backed IPOs generally outperform single VC-backed IPOs in the short as well as in the long run. He further documents that VC syndicates are more likely to successfully exit their investment through either IPOs or M&As. However, Tian (2011) does not differentiate VC syndicates according to their size which is the focus of our analysis. Although, Tian (2011) controls for the number of VCs, this variable appears to be insignificant in all model specifications. In his concluding remarks, Tian (2011) acknowledges that his results are to some extent at odds with the potential cost associated with VC syndication documented in the literature.

The novelty of our paper is to explore this specific dimension of VC financing in greater detail by looking not only at the size but also at the diversity within the VC syndicate. In addition, we investigate possible ways to mitigate the costs associated with large and diverse VC syndicates through alternative governance mechanisms.

The rest of the paper is organized as follows. In Section 2, we review the relevant literature and develop our testable hypotheses. Section 3 describes the sample. The methodology is

detailed in Section 4 while the results and robustness tests are discussed in Section 5. The last section concludes.

## 1.2. Literature Review

In this section, we review the literature that is most closely related to our paper. As the paper links with several strands of the literature, we divide this section accordingly.

### 1.2.1. *VC Syndicate Size and IPO Performance*

Large VC syndicates are likely to involve different types of investors with divergent objectives. We argue that several inefficiencies can arise as syndicate size grows[3]. Firstly, participating VCs might have very different objectives and this can cause misalignment of interests. In a model of strategic venturing, Hellmann (2002) argues for instance that private independent VCs look only for financial profits whereas corporate VCs pursue multiple goals including achieving strategic gains along with financial returns. Such misalignments of interests among the principals are expected to influence strategic decisions such as exit timing and share disposals. Consistently, Arping and Falconieri (2010) develop a model that shows how corporate VCs might be less effective at terminating non-performing ventures than financial VCs thereby causing ex-ante a sub-optimal effort provision by the entrepreneur.

Chahine et al. (2012) examine the relation between the degree of diversity within a VC syndicate and earnings management in a sample of 274 VC-backed IPOs in the UK and the US. They construct an index of VC syndicate diversity that encompasses several dimensions such as VC affiliation, age, and origin. Their findings show that VC syndicate diversity increases the

[3] In this paper, we take the size of the VC syndicate as given and hence we do not address the question of what determines the size of a VC syndicate. There is a quite extensive literature that addresses the question of why VCs come together to form a syndicate. Some of the explanations suggested by the theory include the benefits from risk diversification (Lockett and Wright (1999, 2001), the need of a second opinion particularly in cases of high uncertainty (Lerner (1994), Casamatta and Haritchabalet (2007), Cestone, Lerner, and White (2006)), the value added by bringing in VCs with complementary skills (Brander, Amit and Antweiller (2002)), and the benefits of building a network that can ensure more deals in the future (Lockett and Wright (2001)).

likelihood of earnings management and the impact is stronger for the US IPOs. They motivate the result as being the consequence of stronger conflicts of interest within more diverse syndicates which ultimately leads to poor monitoring of the investee companies. They also document that earning management leads to a poorer IPO performance. Du (2011) studies the effect of heterogeneity on the performance of VC syndicates. She argues that the costs of heterogeneity in terms of miscommunication, misaligned objectives and often inefficient decision making need to be traded off against the benefits in terms of learning opportunities in the long run. Consistent with her conjecture, she provides evidence that heterogeneous syndicates tend to have lower exit rates but longer survival rates.

The literature has often stressed that large financial syndicates lead to sub-optimal level of monitoring of the borrowing company because of free-riding problems among the syndicate members and this applies equally to VC syndicates and bank syndicates. In a recent paper, Chemmanur and Tian (2011) develop a model to explain the dynamics of VC syndicate formation. Their model formalizes the idea that VCs need to provide effort in order to add value to the entrepreneur's project and in the context of co-financing, they may be encouraged to free-ride on one another thereby causing an under-effort provision. In this framework, they are able to predict which types of venture should opt for a single VC rather than a syndicate and how, in the latter case, the composition of the VC syndicate evolves over time. Similarly, in the banking literature Carletti et al. (2007) theoretically examine the effect of free-riding problems in the context of multiple banking relationships. They argue that as the number of banks increases, the benefits from more risk diversification need to be traded off against more severe free riding problems resulting in sub-optimal monitoring efforts.

From the above discussion, it seems plausible to assume that the size of the VC syndicates matters when it comes to assessing the IPO performances of their investee companies. The largest part of the existing literature has focused on comparing the IPO performance of VC-backed firms with non VC-backed ones. In the short term, IPO performances is typically measured by the underpricing, that is the price spike of a firm's stock at the opening of the trading on the secondary market[4]. Several pioneering studies have linked IPO underpricing to venture capital backing but reached different conclusions. On the one hand, using a matched sample of 320 VC-backed and non VC-backed IPOs between 1983 and 1987, Megginson and Weiss (1991) document that VC-backed IPOs exhibit lower underpricing than non-VC-backed IPOs. They explain this evidence by arguing that VC financing, very much in the same way as bank financing, provides certification to outside investors about the quality of the listing company, and thus mitigates the adverse selection problem. They also show that VC-backed IPOs typically have more experienced underwriters and lower underwriting fees.

Barry et al. (1990) specifically examine the relation between IPO underpricing and the quality of monitoring provided by venture capitalists. For a sample of 433 VC-backed US IPOs completed during the period 1978-1987, the authors document that VC firms hold quite large equity positions, on average 34 percent of shares, and nominate approximately one-third of the IPO's board. They argue that VCs closely monitor their portfolio companies and hence are able to certify the quality of the offering. They conjecture that IPO underpricing should decrease with the quality of monitoring and propose six different proxies of the VCs' quality of monitoring to test this conjecture, one of these being the number of venture capitalists. Their findings suggest

[4] The focus of this paper is not on IPO undepricing per se. Hence, we refer to Ritter and Welch (2002) and Ljungqvist (2007) for a survey of the literature.

that the number of VCs carries the expected negative sign but with a weak statistical and economic significance.

On the other hand, Gompers (1995) developed a theoretical model where new venture capital firms have an incentive to take their portfolio companies public earlier than what would be optimal in order to increase their reputation and hence their future fund flow. Subsequent research has tested the predictions of the "grandstanding hypothesis" formalized by Gompers (1995). For instance, Lee and Wahal (2004) test the grandstanding hypothesis on a sample of 6,413 IPOs between 1980 and 2000 of which 37% consists of VC-backed IPOs. After controlling for the endogeneity of the VC financing decision, they find that VC-backed IPOs are underpriced more than non VC-backed IPOs and the difference ranges from 2% in the period 1980-1998 to 25% during the internet bubble (1998-2000). They interpret this result by arguing that a successful IPO enables VC to raise more funds in the future and confirm their conjecture by documenting a positive relationship between IPO underpricing and future fund-raising.

Finally, Bradley and Jordan (2002) show that the first day return of VC-backed IPOs is not significantly different from that of non VC-backed IPO after controlling for industry, listing exchange and underwriter quality.

At present, few papers have investigated whether the size of the VC syndicate plays a role in explaining the first day return. This paper attempts to fill this gap. The closest paper to ours is Tian (2011) which compares the value creation of VC syndicates as opposed to that of a single VC. The author looks at several dimensions to assess the value creation which includes the exit mode, the degree of innovation, and also short and long run IPO performance.

In our analysis, we specifically focus on the effect of size and diversity of VC syndicates on IPO performances. More importantly, we are interested in investigating whether the potential

negative impact of large and diverse syndicates on IPO underpricing can be mitigated by the existence of alternative monitoring mechanisms such as bank lending.

Banks have traditionally been viewed as delegated monitors (Diamond (1984, 1991)) whose comparative advantage relative to the market is their expertise to closely monitor the borrower.

The governance role of bank loans is intuitively of great importance to IPO companies which suffer from severe adverse selection problems vis-à-vis the market. Not surprisingly, several papers in the IPO literature have investigated whether the existence of credit relationships prior to the IPO date improves the IPO performance, by reducing the first day return. The existing evidence provides strong support to this conjecture.

For instance, using a sample of 316 US IPO between 1980 and 1984 Slovin and Young (1990) find that pre-existing bank loans or credit lines significantly reduce IPO initial returns. Similarly, James and Wier (1990) develop a theoretical model that show how established credit relationship at the IPO date reduces the ex-ante uncertainty about the firm's value and hence the underpricing. They test the predictions of their model on a sample of 549 US IPOs between 1980 and 1983 and document that firms with borrowing relationship before the IPO date are underpriced less than companies that have no credit history.

Schenone (2004) investigates the role of relationship banks – i.e. banks that have an established lending relationship with the IPO firm - that decide to act as underwriter in the IPO of a borrowing company. The repeal of the Glass-Steagall act in 1998 has allowed commercial banks to compete with investment banks to secure underwriting mandates. An obvious concern is the potential conflict of interest arising when a relationship bank also acts as the underwriter of the firm. Using a sample of 306 US IPOs between 1998 and 2000, Schenone (2004) finds that

pre-existing lending relationship with a potential bookrunner at the IPO date results in approximately 16% less underpricing even though the relationship bank has ultimately not acted as a bookrunner in the IPO. She explains her results by arguing that relationship banks have a strong certification role because they hold a lot of information about the firm and they are, thus, better able to mitigate asymmetric information problems.

More recently, Neupane and Poshakwale (2010) investigate the relationship between new bank loans and IPO underpricing. They study a sample of Indian IPOs between 2001 and 2008 and focus on companies that take new bank loans shortly before the IPO date. They find that even very new bank loan results in lower underpricing at the IPO date because the bank screening required to be granted a loan is, per se, a positive signal about the firm's quality, reducing the ex ante uncertainty about the firm's value.

### **1.2.2.** *VC Syndicate Size and Post-IPO performance*

VC firms tend to maintain significant equity holdings in the post-IPO periods within the lock-up arrangements. Cumming and MacIntosh (2003) provide cross country evidence that VCs often partially exit their portfolio companies and retain a large part of their holdings beyond one year after the IPO. Their evidence is consistent with other studies. For instance, using a sample of US IPOs between 1983 and 1987, Megginson and Weiss (1991) find that VC ownership reduces from 36.6% of the firm before the IPO date to 26.3% after the offer date, suggesting that VCs effectively maintain the majority of their equity stake even after the IPO. These authors argue that this is a commitment device or "bonding mechanism". Similarly, Barry et al. (1990) show that, in their sample of 433 US VC-backed IPOs between 1978 and 1987, venture capitalists sell on average 6.6% of their per-IPO equity stake at the offering. However, 58% of them do not sell any of their shares. The authors explain that "*By retaining their share ownership after the*

*offering, the venture capitalists can provide assurance of continued monitoring and can credibly signal their belief in the firm's prospects*". Krishnan et al. (2011) find similar results in a more recent sample of US IPOs between 1993 and 2004. They document that VCs maintain a significant equity stake until three years after the IPO. Specifically they find that the lead VC equity position at the IPO date averages 9.4% and declines to 8.05%, 7.70% and 6.62% in the first, second and third year after the IPO respectively.

If VC firms do keep a substantial share of their holdings in their portfolio companies after the listing and remain strongly involved in their governance and monitoring, then it is no surprise that this will affect the companies' long-run performance.

Jain and Kini (1995) compare the long-run operating performance of VC-backed IPOs and non-VC-backed IPOs during the period 1976-1988. They construct a matched sample of 272 VC-backed and non VC-backed and compare the post-IPO operating performance measured by return on assets, cash flows/total assets, sales growth and capital expenditure growth. They find that VC-backed IPOs significantly outperform non-VC-backed ones for each of their measures over three years after the IPO date.

Brav and Gompers (1997) investigate the long-run performance of VC-backed IPOs by looking at the cumulative abnormal stock returns on a sample of 934 VC-backed IPOs between 1972 and 1992. They construct the CAR measure using four different benchmarks: the S&P 500, the value-weighted NASDAQ composite index, the value-weighted NYSE/AMEX index, and the equally-weighted NYSE/AMEX index. They find that, when using equally weighted CARs, VC-backed IPOs do outperform non VC-backed IPOs. However, they also find that VC-backed firms with low book-to-market value significantly underperform non VC-backed firms when using Fama-French (1993) three factor model to measure long-run performance.

Finally, Krishnan et al. (2011) examine the relation between VC firm reputation and post-IPO performance of the portfolio company. For a sample of 1503 VC-backed IPOs between 1993 and 2004, they find that more reputable lead VCs get actively involved in the management of the portfolio companies, and VC reputation is positively related to the firm's long-run performance proxied by return on assets, market to book equity ratio, survival, and long run abnormal stock returns.

None of the papers discussed above does however distinguishes between single versus syndicate-backed firms. The notable exception as previously discussed is Tian (2011) and his findings seem to suggest that syndicate-backed IPO firms outperform single-backed ones in the long run. Tian (2011) however does not specifically address the question of whether the size of the VC syndicate and more importantly its composition might also play a role in determining the long run IPO performances. In his regressions, he does control for the number of VCs but the variable appears to be insignificant in all model specifications which, as he acknowledges in his concluding discussion, is at odds with the potential cost associated with VC syndication documented in the literature.

### **1.2.3.** *Hypotheses*

Following the previous discussion, we can now summarize the hypotheses we aim to test:

- **H1:** The IPO underpricing depends on the size of the VC syndicate.

Syndicate size as the number of all financing VCs might not be an adequate measure because it is possible that the financing is in fact concentrated in the hands of few VCs. Similar situations should intuitively result in a more concentrated control over the investee company and hence stronger incentives for the VC to actively and effectively monitor. Hence, we expect that

more concentrated VC funding has a positive impact on IPO underpricing. Therefore, assuming we find support to our first conjecture, we then test the following ancillary hypothesis:

- **H1a:** More concentrated VC funding reduces IPO underpricing.

We measure the concentration of funding by constructing a Hirfindhal index based on the financial contribution of each VC in the syndicate.

The argument behind the first hypothesis is that IPO underpricing would be increasing in the size of the syndicate as a result of fiercer coordination problems and conflict of interests. To corroborate our conjecture we subsequently investigate the impact of greater diversity within the syndicate on IPO performances. More diverse syndicates would in fact exacerbate internal agency problems. Hence the next hypothesis:

- **H2:** IPO underpricing depends on the degree of diversity of the VC syndicate.

As we will explain later we construct two different proxies of diversity.

Linking to the existing results in the IPO literature, we next examine whether the existence of bank loans does help IPO firms backed by large VC syndicates to reduce their underpricing.

- **H3:** Bank financing reduces the negative impact of VC syndicate size on IPO underpricing.

This hypothesis aims to test whether bank financing has a moderation effect on VC syndicate size (and diversity). That is, ceteris paribus, IPO firms backed by larger VC syndicates benefits more from having bank loans than IPO firms backed by smaller VC syndicates.

And finally, the last hypothesis we test is the following:

- **H4:** The long-run performances of VC-backed IPOs depend on the size and degree of diversity of VC syndicates.

Our conjecture is that the negative impact of large and diverse VC syndicates is long lasting and might affect the company value in the long term. Hence, we expect a negative correlation between long run performances and VC size and diversity.

### 1.3. Data and Sample Selection

Data used in this study are obtained from various sources including Securities Data Corporation (SDC) New Issues, Venture Economics, Loan Pricing Corporation's Dealscan (LPC), Compustat, and CRSP. The sample is composed of VC-backed IPOs over the period January 1990- December 2007. We use a cut-off year of 2007 so that our analysis is not affected by the 2008-2009 financial crisis.

IPO related measures come mainly from SDC Platinum New Issues. To be consistent with earlier studies, we eliminate financial firms (SIC codes between 6000 and 6999), utilities (SIC codes between 4900 and 4999), equity carve outs, foreign issues, depository offerings, Real Estate Investment Trusts (REITs), closed-end-fund investments, unit issues, leveraged buyouts (LBOs) and IPOs with offer price less than 5 dollars. We obtain supplementary company level characteristics such as company age at the time of IPO and underwriter bank reputation from Prof. Jay Ritter's website[5].

We get details about the VC financing from Venture Economics. Venture Economics provides several important details such as disclosed round amount, VC firm investment focus, VC firm affiliation and round number among others. The record of venture-backed IPO offerings come from merging SDC New Issues with SDC Venture Economics tapes[6]. As highlighted by Tian (2011), there are some discrepancies between SDC and Venture Economics. Specifically, during the matching process, we identify several observations that SDC New Issues database

[5] http://bear.cba.ufl.edu/ritter/ipodata.htm

[6] We perform matching by using Cusip numbers. For the observations that have missing Cusip, we carry out the matching with company names.

mistakenly code as non-VC-backed for which we can in fact find corresponding round based financing records in Venture Economics. These observations are included in our final sample. Using Compustat tapes, we then obtain accounting and balance sheet data for our sample observations.

Return data are obtained from Center for Research in Security Prices at the University of Chicago (CRSP). Private loan agreements are retrieved from Loan Pricing Corporation's DealScan (LPC) which provides details on coupon, deal maturity, loan size, use of proceeds, syndicating banks, general covenants, and seniority structure. DealScan's coverage for all commercial U.S. loans in early 90s ranges from 50% to 75%. The coverage ratio improves after 1995. To match our IPO sample with the bank variables, we use GVKEY number and name of the company provided by DealScan[7]. After all filtering and merging, our final sample is composed of 1515 VC-backed IPOs.

## 1.4. Methodology

### 1.4.1. *VC syndicate size and IPO performance*

In this section, we test our first hypothesis which looks at the relationship between the VC syndicate size and IPO underpricing. To do this, we run the following OLS regression

$$Underpricing = \alpha + \beta_1 VCSize + \beta_2 LeadVCRep + \beta_3 Log(Sales) + \beta_4 Log(Age) + \beta_4 Log(Proceeds) + \beta_5 Rank + \beta_6 MarketReturn + Industry\ Dummies + Year\ Dummies \quad (1)$$

The dependent variable in equation (1) is IPO *Underpricing* defined as $\frac{1}{100} \cdot \frac{P - OP}{OP}$ where, in line with most of the existing literature, *P* is the first available closing price after floatation and *OP* is the offering price. On the right hand side of equation (1), our variable of interest is *VCSize*

[7] We are indebted to Prof. Michael Roberts for sharing Compustat identifiers that allow me to merge Dealscan Loan data to accounting data from Compustat. See Chava and Roberts (2008) for a description of these identifiers.

which measures the number of VCs in the syndicate. We construct this variable by counting the number of distinct VCs that provide financing to the firm before the IPO date and taking the sum as our VC syndicate size proxy.

Gompers (1996) argues that VC reputation is key in future fundraisings. Hence to control for VC reputation, we take the reputation of the lead VC where the lead VC is defined, following Lee and Wahal (2004) and Hochberg, Ljungqvist and Lu (2007), as the venture firm that makes the largest investment across all financing rounds[8]. Our reputation proxy, *LeadVCRep,* is then defined as the lead VC's IPO market share during the three year period prior to the first investment round. Similar to Krishnan et al. (2010) and Nahata (2008), for a given IPO, the IPO market share is constructed as the aggregate net proceeds of all IPOs backed by the same lead VC normalized by the aggregate net proceeds of all IPOs over the three years prior to the first round of financing. For example, if the portfolio company had received the first financing in 1994, then VC reputation measure is the ratio of total net proceeds IPOs backed by the same lead VC between 1991 and 1993 to the total net proceeds of all IPOs completed over the same years. In those cases where the portfolio company has multiple lead VCs, the reputation is taken to be the average reputation of all lead VCs.

Previous theoretical and empirical results indicate that greater ex-ante uncertainty about the firm's value is likely to result in higher underpricing (Rock (1986), Beatty and Ritter (1986)). To control for the impact of ex-ante uncertainty, we include in our regression some company characteristics that are typically used as uncertainty proxies, namely (the log of) sales, company age, and IPO proceeds (Habib and Ljungqvist (2001), Loughran and Ritter (2004)). We expect

[8] The results are robust to alternative definitions of the lead VC such as the VC who makes the first investment.

A*ge* and *Sales* to be negatively correlated with IPO underpricing while *Proceeds* is usually positively related to the first day return.

The variable *Rank* denotes the lead underwriter's rank which we obtain from Loughran and Ritter's (2004) classification. The underwriter's rank ranges from 1 to 9 with higher rank denoting more reputable underwriters. The higher the underwriter's reputation is the lower the underpricing is (Megginson and Weiss (1991), Habib and Ljungqvist (2001)).

Finally, we control for market and industry conditions by including industry dummies, year dummies and the variable *MarketReturn* defined as mean value-weighted CRSP index return over the month before the issue date (Loughran and Ritter (2004), Lowry and Schwert (2004))[9].

To test hypothesis H1a, we then replace *VCSize* by a Herfindahl Index constructed as follows. For each company, we compute the percentage share of each VC's total investment relative to total funding received across all financing rounds until the IPO date. We then take the squared sum of those percentages to get the Herfindahl concentration index labeled as *VCH-index.*

### **1.4.2.** *VC Diversity and IPO underpricing*

The second step is to test the impact of VC syndicate diversity on first day return. We construct two different proxies of diversity. The first proxy for diversity we propose is based on the VC firm affiliation. VCs with different affiliations, e.g. investment bank affiliated VC firms vs. corporate VC firms, are likely to have different objectives and different investment horizons. Hence our first proxy, labeled as *VCDiversity1,* captures this and it is given by the total number of different VC affiliations represented in a syndicate. To identify the type of affiliation, we use

[9] We control for outliers and multicollinearity among the variables. Pairwise variable analysis based on the VIF (variance inflation factor) reveals that there is no sign of collinearity among the variables used in equation (1)

the affiliation classification compiled by Venture Economics which categorizes VCs in 14 different affiliations. The variable takes values between 1 and 14 with a mean value of 3.18.

The second proxy of diversity we use, labeled as *VCDiversity2,* is based on the number of different industry preferences represented in a syndicate. To construct this proxy, we rely on the industry classification defined by Venture Economics which recognizes 88 different industries. We are able to identify the industry preferences of all the VCs in our sample. This measure of diversity takes values between 1 and 11 in our sample with a mean value of 4.12. It should be noted that both diversity measures are highly correlated with the *VCSize* proxy – the correlation coefficient is 0.71 and 0.90 respectively for the two measures – thereby clearly suggesting that the diversity of a VC syndicate does increase with its size as it should be expected. We then run equation (1) replacing *VCSize* with the two diversity proxies. A comprehensive list of the key variables used in our analysis can be found in Appendix A.

### **1.4.3.** *The moderation effect of bank financing*

The third hypothesis we want to test focuses on the moderation effect, if any, of bank financing which represents a strong alternative monitoring mechanism.

For this purpose we augment equation (1) as follows to incorporate the effect of bank loan:

$$\begin{aligned} Underpricing = {} & \alpha + \beta_1 VCSize + \beta_2 Bank\ Loan + \beta_3 VCSize * Bank\ Loan + \beta_4 LeadVCRep \\ & + \beta_5 Log(Sales) + \beta_6 Log(Age) + \beta_7 Log(Proceeds) + \beta_8 Rank \\ & + \beta_9 MarketReturn + Industry\ Dummies + Year\ Dummies \end{aligned} \qquad (2)$$

The variable *Bank Loan* is defined as the firm's total amount (in dollar value) of bank loans over the firm's total assets. It measures the direct effect of bank financing on IPO performances for VC-backed IPOs. However, for the purpose of our analysis, we are specifically interested in testing whether the existence of bank lending can help mitigate the negative impact

of large and diverse VC syndicates on IPO underpricing. In order to capture this effect, we interact *Bank Loan* with *VCSize* and, if there is indeed a moderation effect, we should find a negative coefficient estimate associated to the interaction term[10].

**1.4.4.** *Controlling for Endogeneity: Instrumental Variable and 2SLS*

One potential problem with VC syndicate size is represented by the fact that size might be endogenously determined. For example, small VC syndicates can experience less IPO underpricing and better long term performances because of the portfolio company's specific features. More specifically, ex-ante deals that look to be promising might result in smaller VC syndicates simply because VCs are less concerned about diversifying the risk in these firms and also because they want to appropriate all the benefits generated by the potentially profitable ventures. In other words, we might be facing a problem of reversed causality which makes our VC syndicate size proxy endogenous in the regressions and leads to biased OLS estimators[11].

Hence, we deal with the potential endogeneity problem of a syndicate formation by using the instrumental variable (IV) method in a 2SLS regression. We run the following first stage regression to determine the VC syndicate size:

$$VCSize = \alpha + \beta_1 Start\text{-}up + \beta_2 Early + \beta_3 Expansion + \beta_4 Later + \beta_5 Bank\ Loan + \beta_6\, LeadVCRep + \beta_7 Log(Age) + \beta_8 Log(Proceeds) + \beta_{10} Rank + \beta_{13} MarketReturn + Industry\ Dummies + Year\ Dummies \quad (3)$$

where we instrument our endogenous variable with the development stage of the investee company at the first round of financing. We include four development stages; *start-up/seed, early, expansion*, and *later*[12]. Tian (2011) documents that the development stages of the investee company have a clear impact on the size of the VC syndicates. The rationale for this is that

[10] Results remain qualitatively the same if we use a dummy variable that takes value 1 is the firm has bank lending and 0 otherwise.
[11] See also Tian (2011) for a discussion on the potential endogeneity of this variable.
[12] We leave out the buyout stage which will be our benchmark stage.

companies at different development stage would have different financing needs which would ultimately affect the number of financing VCs[13].

The second stage regression of 2SLS model is the same as equation (1) with the exception that the VC syndicate size has been replaced by its predicted value generated by the first stage regression. The same approach is used to correct for potential endogeneity problems of the VC diversity proxies.

### **1.4.5.** *VC syndicate size and long-run firm performance*

In this section, we test our last hypothesis which aims to investigate if the VC syndicate size also affects the long term performances of the portfolio companies that are taken public.

To study the impact of VC syndicate size on long-run IPO performances, we look at operating as well as stock performances by using three alternative proxies:

i.) Return on assets (ROA),

ii.) Ratio of earnings before interest, taxes, depreciation, and amortization (EBITDA) to total assets (TA),

iii.) Value weighted and equally weighted cumulative abnormal returns (CAR).

To make sure that the ROA and EBITDA/TA are truly reflecting the firm's operating performances and not some common industry trends, we adjust them for possible industry effects. In order to do this, following Krishnan et al. (2011), we identify for each IPO firm its industry classification based on the Fama-French 48 industry categorization. Next, we calculate the median ROA and EBITDA/TA for each industry group and we finally subtract these median values from the ROA and EBITDA/TA of each sample firm in that industry.

We then run the following OLS regression:

[13] We discuss the suitability of this instrument in the Result section.

$$ROA\ (or\ EBITDA/TA) = \alpha + \beta_1 VCSize + \beta_2 Bank\ Loan + \beta_3 LeadVCRep + \beta_4 Log(Age) + \beta_5 Log(Sales) + \beta_6 Log(Proceeds) + \beta_7 Nasdaq + \beta_8 Internet + \beta_9 Rank + Industry\ Dummies + Year\ Dummies \quad (4)$$

We complement the analysis by also looking at the Cumulative Abnormal Returns (CAR) over the three years following the IPO.

For an IPO firm *i*, the CAR is defined as $CAR_{i,n} = \sum_{t=1}^{n} AR_{it}$ where $AR_{it} = R_{it} - E(R_{it})$ is the abnormal return of firm *i* in month *t*. $E(R_{it})$ represents the expected return and it is replaced by value weighted (and equally weighted) monthly market return. We calculate the CAR for 1, 2 and 3 years after the IPO date and compare the CAR of firms backed by large VC syndicate with that of firms backed by small VC syndicates.

In the next section, we report and discuss the results of our analysis.

## 1.5. Results

### 1.5.1. *Summary Statistics*

The distribution of VC-backed IPOs over the sample period (1990-2007) is presented in Panel A in Table 1.1. It appears clear that the number of issues is not evenly distributed across the sample period. Not surprisingly, the peak of the IPO activity takes place during the internet bubble years, followed by a slowdown in the subsequent years. The Dotcom period has a total of 400 IPOs, covering approximately 26 percent of the full sample. The mean syndicate size is 5.86 for the whole sample period and becomes higher, 6.98, during the internet bubble period. Panel B reports the distribution of VC-backed IPOs and average syndicate size across 12 different industries. The industry classification is based on Fama-French 12 industry groups. As before, we note that the IPO distribution is not homogeneous across industries as the largest share of IPOs belong to high-tech and healthcare / medical industries. This is consistent with what is

documented by other papers as well (e.g. Megginson and Weiss (1991)). It can also be noticed that the average VC syndicate size is higher in these industries.

Panel A in Table 1.2 shows the summary statistics of the main variables used in the subsequent analysis. It is worthwhile noting that nearly 90 percent of the final sample is represented by firms listing on the Nasdaq[14]. Furthermore, 22.4% of companies (340 in total) in our sample have some bank loans.

Panel B in Table 1.2 provides summary statistics for small and large syndicates and a difference in means test for all relevant variables. A VC syndicate is deemed to be large when the number of VCs is above the median value of 5. Otherwise, the syndicate is regarded as small. Further, we note that the average size among large syndicates is 9.93 against 2.62 in the small syndicates subsample and the difference is strongly significant. The table also highlights a significant difference in the size of underpricing which turns out to be 6% smaller in companies backed by small VC syndicates and the difference is statistically significant at 1%. We note that, as it is expected, firms backed by small VC syndicates rely slightly more on bank loans to complement VC financing than firms backed by large VC syndicates.

Large VC syndicates also appear to be involved in younger and smaller companies - when looking at the value of sales and total assets - than small VC syndicates and the differences are statistically significant at 1%. This suggests that the larger underpricing associated with firms backed by larger VC syndicates might in fact be the consequence of these companies being on

[14] In a recent paper, Anderson and Dyl (2008) examine the listing decisions of company and the SEC Rule 144 which restricts the number of unregistered shares an individual can sell. They find that the Rule seems to explain why many NYSE eligible companies ultimately decide to go public on the Nasdaq, and they also document that this is more likely when the company is VC-backed as VCs are more keen to offload quickly their unregistered shares compared to other initial shareholders. This might hence provide another explanation for why such a large fraction of our IPOs sample is indeed listed on the Nasdaq.

average riskier than those backed by small VC syndicates. We shall take this into account in our empirical analysis by including control variables that capture the firm's riskiness.

### **1.5.2.** *Syndicate size, diversity and IPO performance: baseline results*

The first column in Table 1.3 reports the results of a baseline regression where the dependent variable is IPO underpricing and our variable of interest is *VCSize*. Consistent with the preliminary evidence based on the descriptive statistics, the coefficient estimate of *VCSize* is positive and significant at 1%, suggesting a clear positive correlation between IPO underpricing and size of the VC syndicate. In terms of economic significance, we observe that an increase by one VC in the syndicate increases IPO underpricing by 0.4%. With regard to the other explanatory variables, the results show that the coefficient estimates of the company age and the log of net proceeds have the expected sign and are statistically significant at 1 percent level. Finally, greater pre-market return also leads to more underpricing.

Column 2 and 3 in Table 1.3 report the results of the OLS model for the two diversity measures. Both of them are statistically significant at 1%. Finally, in Column 4 the *VCSize* proxy has been replaced by the Herfindhal index, *VCH-index.* As expected, higher concentration of VC funding reduces IPO underpricing and the effect is both economically and statically significant. Finally, as a further test, in Column 5 we report the results of the OLS regression where the VC size proxy has been replaced by a dummy variable *VCLarge* which takes value one if the size of the syndicate is larger than the median of the sample, i.e. 5, and zero otherwise. Consistent with the other results, the coefficient estimate of the dummy variable has the expected positive sign and is statistically significant at 1%. The economic significance is also substantial as it indicates that IPO firms backed by large VC syndicates are underpriced 4% more than IPO firms backed by small VC syndicates.

Overall, the results presented in Table 1.3 seem to provide strong support to our conjecture that the negative impact of large VC syndicates on IPO underpricing is a result of coordination problems and conflict of interest that are exacerbated by more diversity among financing VCs. A caveat is in order, however, as we have not yet addressed the potential endogeneity of our variables of interest which we do in Section 5.4.

### **1.5.3.** *Syndicate size, Banking relationships, and underpricing*

We now turn to our third hypothesis, which investigates whether bank financing has a moderation effect on VC syndicate size and diversity. To put results into perspective, it is useful to note that the average syndicate size on the subsample of companies with positive bank lending is 4.85 which is not substantially different from the full sample average (5.85). Also, the mean (median) value of our *Bank Loan* variable on the subsample is 0.22 (0.16) which represents a non trivial amount of bank lending.

The results of the OLS regression defined in equation (2) are reported in Table 1.4. The first three columns look at the existence of a direct effect of bank lending on IPO underpricing. Coefficient estimates are negative as expected and statistically and economically significant for all of our variables of interests (*VCSize* and *VCDdiversity1* and *VCDdiversity2*). Hence, in line with previous papers (James and Wier (1990), Schenone (2004)) we find that bank financing does benefit VC-backed IPO companies by generally reducing IPO underpricing. However, our main interest is to investigate whether the use of bank loan can mitigate the agency conflicts within large VC syndicates and hence lead to better performance as formalized in equation (2). The result of this regression for our variables of interest are reported in columns (4)-(6) of Table 1.4. The coefficient estimate of the interaction term is never statistically significant though it has the expected negative sign when we use VC diversity proxies. We also note that the variable

*Bank* is no longer significant except in column 4 where its statistical significance is substantially reduced. Our variables of interest all remain statistically significant at 1%.

The results of Table 1.4 should be carefully interpreted as we face two potential problems. First of all, a look at the correlation matrix shows a high correlation (above 70%) between the variable bank and the interaction terms which might distort the estimate. Secondly, we have not yet addressed the potential endogeneity problem of the VC syndicate proxies which we do in the next Section.

### **1.5.4.** *Endogenous VC syndicate size*

A potential problem with the previously presented OLS results is that our variables of interest, the size of the VC syndicate and the diversity proxies, may not be exogenous to the model as discussed in Section 4.3. We address the problem by running a two stage least squares (2SLS) model where the first stage is defined by equation (3). Here, we note that our first stage regression is Poisson rather than standard OLS[15]. As discussed earlier, our instrument of choice is the stage of the investee companies at their first round of financing which can be classified as *Start-up, Early* stage, *Expansion* stage or *Later* stage. When using an instrumental variable approach, the *relevance* and the *exclusion* conditions must both hold to ensure the validity of the approach. The relevance condition essentially requires the instrument to be correlated with the endogenous variable and explain it sufficiently well. The choice of the instrument is inspired by Tian (2011) who shows that the development stage is strongly correlated with the number of financing VCs. The relevance of the instrumental variables is also confirmed by the high chi-

[15] See Greene (2008) and Wooldridge (2006) for a discussion about the comparison between standard OLS and Poisson regressions. In our context, a simple OLS in the first stage would generate very similar results to those of Poisson regression. The reason for employing a Poisson regression instead of an OLS is because the VC syndicate size measure is a count variable and hence the normality assumption required by the OLS model is violated.

squares as in our model which, according to the rule of thumb suggested by Staiger and Stock (1997), should be above 20 as it is in our case.

The second condition that the instrument needs to satisfy is the exclusion restriction. This condition requires the instrument to be uncorrelated with the dependent variable. In our case, we believe there is no reason to expect that the development stage of the company at the first round of VC financing might have an impact on the subsequent IPO performance of the investee company. This is also confirmed by the fact that Tian (2011) does not use the development stage as a control variable in the underpricing regression.

The coefficient estimates of the first stage regression are reported in Table 1.5. The instruments are all strongly significant at one percent levels. Also, we observe that explanatory power of "Start up" stage is the largest in magnitude compared to other instruments[16].

The predicted value of the VC syndicate proxy derived from the first stage is then used in the second stage which otherwise replicates the OLS regression. The results of the second stage of the 2SLS are reported in Table 1.6. VC syndicate size remains strongly statistically significant in all models and its economic significance appears stronger with coefficient estimates double than their corresponding OLS estimates. The same applies to both diversity proxies for which the economic significance of the coefficient estimates is substantially larger than the OLS ones. Hence we can conclude that after controlling for the endogeneity, we still find convincing support to our first two hypothesis.

We now turn to the third hypothesis on the moderation effect of bank lending. The second stage results are reported in Columns (1)-(3) of Table 1.7 and they appear to be in line with the OLS results. While we confirm the significance of our VC syndicate proxies, bank loan variable

[16] The results refer to the first stage where *VCSize* is the dependent variable, but they are analogous when using the VC diversity proxies.

does not show evidence of a moderation effect. However a more careful analysis highlights a severe multi-collinearity problem among the regressors confirmed by Variance Inflation Factors (VIF) values ranging between 8 and 16 for the *Bank Loan* variable and the interaction term. Hence, to overcome this problem, we complete the analysis by running a regression where we drop the bank variable while keeping the interaction term. Results for this last test are reported in Columns (4) – (6). The coefficient estimates of the VC syndicate proxies are in line with previous regression results but the interaction terms are now always negative and statistically significant. This suggests the existence of some moderation effect of bank lending where the economic significance is not negligible. In fact, for an IPO firm with a bank lending equal to 22% of its total assets (the average in the subsample), the negative impact of an additional VC on IPO underpricing is reduced by 0.26% while the impact of a marginal increase of the VC syndicate diversity goes down by 0.7% (0.5%) for *VCDiversity1* (*VCDiversity2*). We note that the explanatory powers of the regressions in columns (4)-(6) are in line with those of the regressions in columns (1)-(3) and the VIFs of the relevant regressors are also within acceptable values.

### **1.5.5.** *Post- IPO Performance of syndicates*

In this final section, we discuss the result of our analysis for post-IPO performances. Recall that our hypothesis 4 conjectures that the inefficiencies of large VC syndicates have a long term impact on the investee companies and may result in poorer long term performances. The first test we conduct compares the long run performances of companies backed by small VC syndicates (less than six VCs) with those of companies backed by large syndicates. We then look at the differences in means. For long run performances, we use four proxies: ROA, EBIDTA/TA (both industry-adjusted), Value Weighted CAR and Equally Weighted CAR. The results of the

univariate analysis are presented in Table 1.8. The differences in means for operating performance measures clearly show that companies backed by small VC syndicates outperform in the long term companies backed by large VC syndicates. Nearly all differences are significant at 1% level.

Results in Table 1.8 do not take endogeneity into account. As argued earlier the apparent underperformance of companies backed by large syndicates might stem from the endogenous syndicate decision due to a reverse causality or omitted variable problem. To address this problem and provide stronger evidence of the long term impact of large VC syndicates, we run both OLS and 2SLS regressions where the dependent variables are (mean industry adjusted) ROA, EBITDA/TA over the three year period after the IPO date. Table 1.9 and 1.10 show the OLS and 2SLS results respectively.

Similar to the regression results on underpricing, we again find that the 2SLS confirms and reinforces the OLS results. In fact, the 2SLS estimates show a strong statistically significant effect of our variables of interest in both regressions as well as a large economic significance. An increase of the VC syndicate by one VC decreases the long run performances of the company by approximately 3%. Similarly, a marginal increase in the degree of diversity of the VC syndicate decreases the long run performances by 10% (6% for *VCdiversity2*). Bank lending does not seem to affect the long run performances of these companies, confirming that bank lending is crucial in situations characterized by severe adverse selection problems. The reputation of the lead VC has instead positive and strongly statistically significant coefficient estimate.

## 1.6. Conclusion

In this paper, we investigate the impact of internal agency conflicts within venture capital syndicates on the IPO performance of portfolio companies. Our conjecture is that large and

heterogeneous VC syndicates do tend to suffer from conflict of interests and coordination problems. This undermines VCs ability to monitor effectively their investee companies, jeopardizing their ability to create value. As a consequence, this might lead to poorer IPO performances.

We explore the effect of size and diversity of VC syndicates on short and long run IPO performances and examine whether the existence of alternative governance mechanisms such as bank loans might attenuate the impact of agency conflicts on the performances of the investee companies around the IPO date.

Our findings provide convincing evidence that VC syndicate size has a very strong negative effect on IPO underpricing and long term operating performances. This result is robust to many different specifications of our model and to controlling for the endogeneity of our variable of interest. Results appear to be stronger for our two VC diversity proxies which support our interpretation of the results centered on the conflict of interest and coordination problems within large and heterogeneous VC syndicates. This is further confirmed by the fact that, given the size of the VC syndicate, a greater concentration of the funding in the hands of few VCs does benefit IPO performances, because it implies fewer controlling VCs who have stronger incentives to monitor the venture.

Finally, we do also provide some evidence that, by representing an alternative monitoring mechanism, the existence of bank lending is able to moderate the distortions created by large VC syndicate and therefore reduce their negative impact on IPO underpricing.

## Appendix A: Definition of variables

| *Variable* | Definition |
|---|---|
| *Underpricing* | 1/100 times the ratio of difference between first available closing stock price and offer price to offer price |
| *VCSize* | number of distinct VCs that provide capital before the IPO date |
| *Large Syndicates* | one if VC syndicate size is greater than 6, zero otherwise. |
| *Small Syndicates* | one if VC syndicate size is less than or equal to 6, zero otherwise |
| *Leverage* | ratio of long term debt (Compustat data item *DLTT*) to total assets (data item *AT*) in the fiscal year before the IPO date |
| *Bank Loan* | ratio of total bank loan to total assets before the IPO date |
| *Age* | difference between year of IPO date and the year of date when the company is incorporated |
| *LeadVCRep* | the lead VC's IPO market share during the three calendar year-period before the first investment round where lead VC firm is the venture firm that makes the largest investment across all investment rounds |
| *Proceeds* | offer size in terms of net proceeds |
| *Market Return* | mean value-weighted CRSP index return over the month before the issue date |
| *Sales* | net company sales (data item *SALE*) in the fiscal year before issuance |
| *Internet* Dummy | one if the IPO firm is identified as internet company in the database complied by J. Ritter, zero otherwise |
| *Rank* | Loughran and Ritter underwriter rank classification |
| *Nasdaq Dummy* | one if the firm is listed in Nasdaq and zero otherwise |
| *Start-up Dummy* | one if investment round takes place in the start-up stage of the company, zero otherwise |
| *Early Dummy* | one if investment round takes place in the early stage of the company, zero otherwise |
| *Expansion Dummy* | one if investment round takes place in the expansion stage of the company, zero otherwise |
| *Later Dummy* | one if investment round takes place in the later stage of the company, zero otherwise |
| *ROA* | ratio of income before extraordinary items (data item *IB*) to total assets (data item *AT)* |
| *EBITDA* | Earnings before interest, taxes, depreciation, and amortization (data item *EBITDA*) |
| *CAR* | Cumulative abnormal returns defined as $CAR_{i,n} = \sum_{t=1}^{n} AR_{it}$ where $AR_{it} = R_{it} - E(R_{it})$ is the abnormal return of firm *i* in month *t.* $E(R_{it})$ is the expected return and replaced by value weighted (and equally weighted) monthly market return |
| *VCDiversity1* | Total number of different VC types within the syndicate (e.g. private, investment bank or corporate VC) |
| *VCDiversity2* | Total number of different industry preferences of syndicating VCs |
| *VCH-index* | The squared sum of the percentage share of each VC's total investment to total funding received over all financing rounds till IPO date. |

**Table 1.1. Sample distribution over time and industry**

**Panel A**. *VC-backed IPO frequencies by year*

| Year | Number of VC - backed IPOs | Mean VC Syndicate Size |
|---|---|---|
| 1990 | 25 | 5.84 |
| 1991 | 75 | 6.33 |
| 1992 | 92 | 6.61 |
| 1993 | 107 | 6.32 |
| 1994 | 66 | 4.41 |
| 1995 | 122 | 4.93 |
| 1996 | 165 | 4.43 |
| 1997 | 106 | 4.60 |
| 1998 | 72 | 4.51 |
| 1999 | 209 | 6.34 |
| 2000 | 191 | 7.61 |
| 2001 | 31 | 4.94 |
| 2002 | 30 | 4.03 |
| 2003 | 18 | 6.56 |
| 2004 | 62 | 7.55 |
| 2005 | 44 | 5.70 |
| 2006 | 43 | 6.09 |
| 2007 | 57 | 6.79 |
| Total | 1515 | |

**Panel B.** *VC-backed IPO frequencies by industry*

| Industry Classification | Number of VC-backed IPOs | Mean VC Synd. Size | VC-backed IPOs with bank loan | VC-backed IPOs with positive leverage |
|---|---|---|---|---|
| Consumer Non-Durables | 31 | 3.64 | 13 | 29 |
| Consumer Durables | 14 | 3.27 | 3 | 11 |
| Manufacturing | 45 | 5.57 | 15 | 37 |
| Oil, Gas and Coal Extraction | 16 | 3.11 | 7 | 15 |
| Chemicals and Allied Products | 7 | 6.8 | 1 | 7 |
| Business Equipment | 753 | 6.91 | 167 | 579 |
| Telephone and Television Transmission | 72 | 5.87 | 26 | 69 |
| Wholesale, Retail and Services | 114 | 5.42 | 38 | 89 |
| Healthcare, Medical Equipment and Drugs | 320 | 7.64 | 41 | 270 |
| Others- Mines, Constr, BldMt, Trans, Hotels. | 143 | 5.97 | 29 | 120 |

**Table 1.2. Summary statistics**
**Panel A.** *Full sample summary statistics*

| Variable | Minimum | Mean | Median | Std Dev | Maximum |
|---|---|---|---|---|---|
| Underpricing | -0.49 | 0.17 | 0.13 | 0.20 | 0.78 |
| VCSize | 1.00 | 5.86 | 5.00 | 4.56 | 33.00 |
| Leverage (81%) | 0.00 | 0.17 | 0.06 | 0.23 | 1.00 |
| Bank loan (22.4%) | 0.00 | 0.05 | 0.00 | 0.13 | 0.98 |
| Total Assets | 0.13 | 85.08 | 20.57 | 479.16 | 16915.00 |
| LeadVCRep | 0.00 | 0.02 | 0.01 | 0.03 | 0.24 |
| Sales | 0.00 | 78.05 | 19.24 | 373.61 | 10079.00 |
| Age | 0.00 | 10.35 | 7.00 | 13.73 | 121.00 |
| Proceeds | 2.13 | 54.66 | 37.70 | 60.92 | 730.31 |
| Rank | 1.00 | 7.91 | 8.21 | 1.35 | 9.00 |
| Nasdaq | 0.00 | 0.87 | 1.00 | 0.34 | 1.00 |
| Internet | 0.00 | 0.19 | 0.00 | 0.39 | 1.00 |
| Market Return | -0.64 | 0.06 | 0.06 | 0.14 | 0.58 |

Panel A reports the descriptive statistics of 1515 VC-backed IPOs completed during 1990-2007. *Underpricing* is defined by the ratio of difference between first available closing stock price and offer price to offer price and divided by 100. *VCSize* is the number of distinct VCs that provide capital before the IPO date. *Leverage* is the ratio of long term debt to total assets in the fiscal year before the IPO date. *Bank Loan* is the ratio of bank loan amount to total assets. In brackets we report the percentage of companies in our sample for which the variable is different from zero. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Proceeds* is the offer size in terms of net proceeds. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Internet* dummy is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. *Rank* is from Loughran and Ritter underwriter rank classification. *Nasdaq* dummy takes value one if the firm is listed in Nasdaq and zero otherwise.

***Panel B.*** *Summary statistics for two subsamples*

| Variable | Small Syndicates | Large Syndicates | Differences in means |
|---|---|---|---|
| Underpricing | 0.14 | 0.20 | -0.06*** |
| VCSize | 2.62 | 9.93 | -7.31*** |
| Leverage | 0.21 | 0.10 | 0.11*** |
| Bank loan | 0.06 | 0.03 | 0.03*** |
| Total Assets | 120.66 | 40.33 | 80.33*** |
| LeadVCRep | 0.02 | 0.02 | 0.00 |
| Sales | 116.42 | 29.77 | 86.65*** |
| Age | 12.58 | 7.53 | 5.05*** |
| Proceeds | 57.12 | 51.56 | 5.56*** |
| Rank | 7.73 | 8.12 | -0.39*** |
| Market Return | 0.06 | 0.05 | 0.01** |
| Num. of obs. | 844 | 671 | |

This panel presents the descriptive statistics for the sample firms that are backed by small or large VC syndicates. If the VC syndicate size is less than or equal to 5, then the syndicate is coded as *Small Syndicate.* Otherwise, it is labeled as *Large Syndicate.* Last column reports the differences in means. *Underpricing* is defined by the ratio of difference between first available closing stock price and offer price to offer price and divided by 100. *VCSize* is the number of distinct VCs that provide capital before the IPO date. *Leverage* is the ratio of long term debt to total assets in the fiscal year before the IPO date. *Bank Loan* is the ratio of bank loan amount to total assets. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Proceeds* is the offer size in terms of net proceeds. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Rank* is from Loughran and Ritter underwriter rank classification. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

**Table 1.3. OLS regressions for the impact of VC syndicate size on underpricing**

| Variable | Expected Sign | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| Intercept | | -0.161*** | -0.178*** | -0.168*** | -0.116*** | -0.156*** |
| | | (0.044) | (0.045) | (0.044) | (0.045) | (0.044) |
| VCSize | + | 0.004*** | | | | |
| | | (0.001) | | | | |
| VCDiversity1 | + | | 0.012*** | | | |
| | | | (0.003) | | | |
| VCDiversity2 | + | | | 0.008*** | | |
| | | | | (0.002) | | |
| VCH-index | - | | | | -0.068*** | |
| | | | | | (0.016) | |
| VCLarge | + | | | | | 0.041*** |
| | | | | | | (0.009) |
| LeadVCRep | - | 0.043 | 0.063 | 0.019 | 0.046 | 0.049 |
| | | (0.164) | (0.164) | (0.164) | (0.164) | (0.164) |
| Log Sales | - | -0.001 | -0.001 | -0.001 | -0.001 | 0.001 |
| | | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Log Age | - | -0.021*** | -0.021*** | -0.020*** | -0.020*** | -0.020*** |
| | | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) |
| Log Proceeds | + | 0.062*** | 0.061*** | 0.062*** | 0.063*** | 0.061*** |
| | | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) |
| Rank | + | 0.004 | 0.006 | 0.004 | 0.004 | 0.005 |
| | | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Market Return | + | 0.192*** | 0.191*** | 0.190*** | 0.193*** | 0.192*** |
| | | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) |
| Industry dummies | | YES | YES | YES | YES | YES |
| Year dummies | | YES | YES | YES | YES | YES |
| R-square | | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |
| Numb. of obs. | | 1515 | 1515 | 1515 | 1515 | 1515 |

This table presents baseline OLS results. In all columns, dependent variable is IPO *Underpricing* defined as the ratio of difference between first available closing stock price and offer price to offer price and divided by 100. *VCSize* is the number of distinct VCs that provide capital before the IPO date. *VCDivesity1 is* total number of different VC types within the syndicate (e.g. private, investment bank or corporate VC). *VCDiversity2* is total number of different industry preferences of syndicating VCs. *VCH-index* is the squared sum of the percentage share of each VC's total investment to total funding received over all financing rounds till IPO date. *VCLarge* is a dummy variable that takes value one if the syndicate size is greater than the median. It is zero otherwise. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

**Table 1.4. OLS regressions for the moderation effect of bank loan on underpricing**

| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Intercept | -0.169*** | -0.187*** | -0.177*** | -0.168*** | -0.189*** | -0.177*** | -0.167*** | -0.189*** | -0.177*** |
| | (0.044) | (0.045) | (0.044) | (0.044) | (0.045) | (0.044) | (0.044) | (0.045) | (0.044) |
| VCSize | 0.004*** | | | 0.004*** | | | 0.004*** | | |
| | (0.001) | | | (0.001) | | | (0.001) | | |
| VCDiversity1 | | 0.012*** | | | 0.012*** | | | 0.013*** | |
| | | (0.003) | | | (0.003) | | | (0.003) | |
| VCDiversity2 | | | 0.009*** | | | 0.008*** | | | 0.009*** |
| | | | (0.002) | | | (0.002) | | | (0.002) |
| Bank Loan | -0.083** | -0.086** | -0.085** | -0.096* | -0.052 | -0.062 | | | |
| | (0.034) | (0.034) | (0.034) | (0.052) | (0.067) | (0.056) | | | |
| VCSize * Bank Loan | | | | 0.003 | | | -0.009* | | |
| | | | | (0.008) | | | (0.005) | | |
| VCDiversity1 *Bank Loan | | | | | -0.013 | | | -0.028** | |
| | | | | | (0.022) | | | (0.011) | |
| VCDiversity2 * Bank Loan | | | | | | -0.007 | | | -0.019** |
| | | | | | | (0.014) | | | (0.008) |
| LeadVCRep | 0.038 | 0.056 | 0.013 | 0.038 | 0.056 | 0.013 | 0.040 | 0.058 | 0.016 |
| | (0.164) | (0.163) | (0.164) | (0.164) | (0.163) | (0.164) | (0.164) | (0.163) | (0.164) |
| Log Sales | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | -0.001 | 0.001 | 00.001 |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Log Age | -0.022*** | -0.022*** | -0.021*** | -0.022*** | -0.022*** | -0.021*** | -0.021*** | -0.022*** | -0.021*** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) |
| Log Proceeds | 0.062*** | 0.062*** | 0.063*** | 0.062*** | 0.062*** | 0.063*** | 0.062*** | 0.062*** | 0.063*** |
| | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) |
| Rank | 0.005 | 0.006 | 0.004 | 0.005 | 0.006 | 0.004 | 0.005 | 0.006 | 0.004 |
| | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) | (0.004) |
| Market Return | 0.191*** | 0.190*** | 0.189*** | 0.191*** | 0.189*** | 0.189*** | 0.190*** | 0.189*** | 0.188*** |
| | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) |
| Industry dummies | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| R-square | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |
| Numb. of obs. | 1515 | 1515 | 1515 | 1515 | 1515 | 1515 | 1515 | 1515 | 1515 |

This table presents baseline OLS results. In all columns, dependent variable is IPO *Underpricing* defined as the first day initial return and divided by 100. *Bank Loan* is the ratio of bank loan amount to total assets.

**Table 1.5. First stage Poisson regression for determinants of VC syndicate size**

| Variable | Estimates | Standard errors |
|---|---|---|
| Intercept | 0.568*** | 0.135 |
| **Portfolio company related instruments** | | |
| Start-up | 0.874*** | 0.058 |
| Early | 0.682*** | 0.056 |
| Expansion | 0.655*** | 0.054 |
| Later | 0.775*** | 0.056 |
| **Other controls** | | |
| Bank Loan | -0.305*** | 0.095 |
| LeadVCRep | 2.145*** | 0.377 |
| Log Age | -0.028 | 0.017 |
| Log Proceeds | -0.099*** | 0.021 |
| Rank | 0.120*** | 0.010 |
| Market Return | -0.119 | 0.080 |
| Industry dummy | | YES |
| Year dummy | | YES |
| R-square | | |
| Numb. of obs. | | 1515 |

This table provides first stage coefficient estimates. The dependent variable is VC syndicate size and defined as the number of syndicating VC firms before the IPO date. Instruments are the following indicator variables: *start-up, early, expansion and later*. *Bank Loan* is the ratio of bank loan amount to total assets. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

**Table 1.6. 2SLS regressions for the impact of VC syndicate size and bank loan on underpricing**

| Variable | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Intercept | -0.181*** | -0.225*** | -0.195*** | -0.098** | -0.187*** | -0.232*** | -0.201*** | -0.108** |
| | (0.048) | (0.057) | (0.050) | (0.049) | (0.047) | (0.057) | (0.050) | (0.049) |
| VCSize | 0.008** | | | | 0.008** | | | |
| | (0.004) | | | | (0.004) | | | |
| VCDiversity1 | | 0.027** | | | | 0.026** | | |
| | | (0.012) | | | | (0.012) | | |
| VCDiversity2 | | | 0.016** | | | | 0.015** | |
| | | | (0.007) | | | | (0.008) | |
| VCH-index | | | | -0.122** | | | | -0.118** |
| | | | | (0.052) | | | | (0.053) |
| Bank Loan | | | | | -0.073** | -0.078** | -0.076** | -0.078** |
| | | | | | (0.035) | (0.034) | (0.035) | (0.034) |
| LeadVCRep | -0.006 | 0.021 | -0.050 | 0.013 | -0.009 | 0.016 | -0.053 | 0.010 |
| | (0.174) | (0.169) | (0.181) | (0.169) | (0.173) | (0.168) | (0.181) | (0.169) |
| Log Sales | -0.002 | -0.002 | -0.002 | -0.002 | -0.001 | -0.001 | -0.001 | -0.001 |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Log Age | -0.019*** | -0.018*** | -0.017** | -0.016** | -0.019*** | -0.019*** | -0.017** | -0.016** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) |
| Log Proceeds | 0.066*** | 0.065*** | 0.067*** | 0.067*** | 0.066*** | 0.066*** | 0.068*** | 0.068*** |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) |
| Rank | 0.002 | 0.004 | 0.001 | 0.002 | 0.002 | 0.004 | 0.001 | 0.002 |
| | (0.005) | (0.004) | (0.005) | (0.005) | (0.005) | (0.004) | (0.005) | (0.005) |
| Market Return | 0.194*** | 0.192*** | 0.190*** | 0.195*** | 0.193*** | 0.191*** | 0.189*** | 0.194*** |
| | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) |
| Industry dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| R-square | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 |
| Numb. of obs. | 1515 | 1515 | 1515 | 1515 | 1515 | 1515 | 1515 | 1515 |

This table reports second stage results where dependent variable is underpricing. *VCSize, VCDiversity1, VCDivesity2* and *VCH-index* are the predicted values from the first-stage regressions. *Bank Loan* is the ratio of bank loan amount to total assets. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

**Table 1.7. 2SLS regressions for moderation effect of bank loan on underpricing**

| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Intercept | -0.186*** | -0.235*** | -0.201*** | -0.189*** | -0.236*** | -0.203*** |
| | (0.047) | (0.057) | (0.050) | (0.047) | (0.057) | (0.050) |
| VCSize | 0.008* | | | 0.009** | | |
| | (0.004) | | | (0.004) | | |
| VCDiversity1 | | 0.028** | | | 0.028** | |
| | | (0.012) | | | (0.012) | |
| VCDiversity2 | | | 0.015** | | | 0.016** |
| | | | (0.008) | | | (0.007) |
| Bank Loan | -0.125 | -0.004 | -0.072 | | | |
| | (0.097) | (0.133) | (0.107) | | | |
| VCSize * Bank Loan | 0.011 | | | -0.012* | | |
| | (0.020) | | | (0.007) | | |
| VCDiversity1 *Bank Loan | | -0.029 | | | -0.031** | |
| | | (0.050) | | | (0.013) | |
| VCDiversity2 * Bank Loan | | | -0.001 | | | -0.022** |
| | | | (0.033) | | | (0.011) |
| LeadVCRep | -0.009 | 0.015 | -0.053 | -0.014 | 0.015 | -0.056 |
| | (0.173) | (0.169) | (0.181) | (0.173) | (0.168) | (0.181) |
| Log Sales | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Log Age | -0.019*** | -0.019*** | -0.017** | -0.019*** | -0.019*** | -0.017** |
| | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) | (0.007) |
| Log Proceeds | 0.066*** | 0.066*** | 0.068*** | 0.066*** | 0.066*** | 0.068*** |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) |
| Rank | 0.002 | 0.004 | 0.001 | 0.002 | 0.004 | 0.001 |
| | (0.005) | (0.004) | (0.005) | (0.005) | (0.004) | (0.005) |
| Market Return | 0.193*** | 0.191*** | 0.189*** | 0.193*** | 0.191*** | 0.19*** |
| | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) | (0.032) |
| Industry dummies | YES | YES | YES | YES | YES | YES |
| Year dummies | YES | YES | YES | YES | YES | YES |
| R-square | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 |
| Numb. of obs. | 1515 | 1515 | 1515 | 1515 | 1515 | 1515 |

This table reports second stage results where dependent variable is underpricing. *VCSize*, *VCDiversity1* and *VCDivesity2* are the predicted values from the first-stage regressions. *Bank Loan* is the ratio of bank loan amount to total assets. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Sales* stand for company size and represent net company sales (in millions) in the fiscal year before issuance. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Market Return* is defined as mean value-weighted CRSP index return over the month before the issue date. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

## Table 1.8. Univariate analysis of post-IPO performance

| Year | Small VCs Syndicates | Large VCs Syndicates | Differences in Means |
|---|---|---|---|
| | | ROA | |
| 0 | -0.186 | -0.413 | 0.227*** |
| 1 | -0.033 | -0.105 | 0.072*** |
| 2 | -0.081 | -0.196 | 0.115*** |
| 3 | -0.115 | 0.238 | 0.123*** |
| | | EBITDA/Total Assets | |
| 0 | -0.133 | -0.404 | 0.271*** |
| 1 | -0.026 | -0.126 | 0.100*** |
| 2 | -0.048 | -0.160 | 0.112*** |
| 3 | -0.058 | -0.155 | 0.097*** |
| | | Value Weighted CAR | |
| 1 | 0.014 | -0.048 | 0.062 |
| 2 | 0.031 | 0.005 | 0.026 |
| 3 | 0.150 | 0.184 | -0.034 |
| | | Equally Weighted CAR | |
| 1 | 0.002 | -0.085 | 0.087** |
| 2 | -0.011 | -0.090 | 0.079 |
| 3 | 0.075 | 0.055 | 0.019 |

This table provides univariate results of comparing long-run IPO performance of the sample. We divide the sample into two groups: IPOs that are backed by small syndicates and large syndicates. If the number syndicating VC firms exceed the median value, 5, then the sample IPO company is labeled as large VC syndicate. Otherwise, it belongs to small VC syndicates. Dividing the sample using mean values rather than median gives qualitatively the same results. Long-run performance measures are industry adjusted ROA and EBITDA/Total Assets. We also include stock return performance in terms of CAR as a third measure. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively.

**Table 1.9. OLS regressions for the relation between VC syndicate size and post-IPO profitability**

| Variable | ROA | | | | EBITDA / Total Assets | | | |
|---|---|---|---|---|---|---|---|---|
| Intercept | -0.545*** | -0.515*** | -0.535*** | -0.611*** | -0.537*** | -0.505*** | -0.528*** | -0.614*** |
| | (0.075) | (0.075) | (0.075) | (0.075) | (0.064) | (0.064) | (0.064) | (0.065) |
| VCSize | -0.007*** | | | | -0.008*** | | | |
| | (0.002) | | | | (0.001) | | | |
| VCDiversity1 | | -0.022*** | | | | -0.023*** | | |
| | | (0.005) | | | | (0.004) | | |
| VCDiversity2 | | | -0.014*** | | | | -0.014*** | |
| | | | (0.003) | | | | (0.002) | |
| VCH-index | | | | 0.094*** | | | | 0.111*** |
| | | | | (0.026) | | | | (0.022) |
| Bank Loan | 0.019 | 0.025 | 0.022 | 0.024 | 0.082* | 0.088* | 0.086* | 0.087* |
| | (0.055) | (0.055) | (0.055) | (0.055) | (0.047) | (0.047) | (0.047) | (0.047) |
| LeadVCRep | 0.526** | 0.498* | 0.561** | 0.497* | 0.603*** | 0.57** | 0.632*** | 0.575** |
| | (0.263) | (0.263) | (0.264) | (0.264) | (0.225) | (0.225) | (0.226) | (0.225) |
| Log Age | 0.064*** | 0.064*** | 0.063*** | 0.062*** | 0.053*** | 0.053*** | 0.051*** | 0.05*** |
| | (0.010) | (0.010) | (0.010) | (0.010) | (0.009) | (0.009) | (0.009) | (0.009) |
| Log Proceeds | 0.035*** | 0.036*** | 0.034*** | 0.035*** | 0.043*** | 0.044*** | 0.042*** | 0.042*** |
| | (0.013) | (0.013) | (0.013) | (0.013) | (0.011) | (0.011) | (0.011) | (0.011) |
| Rank | 0.026*** | 0.025*** | 0.027*** | 0.026*** | 0.027*** | 0.025*** | 0.027*** | 0.026*** |
| | (0.006) | (0.006) | (0.006) | (0.006) | (0.005) | (0.005) | (0.005) | (0.005) |
| Internet | -0.162*** | -0.161*** | -0.163*** | -0.165*** | -0.119*** | -0.118*** | -0.12*** | -0.121*** |
| | (0.023) | (0.023) | (0.023) | (0.023) | (0.020) | (0.020) | (0.020) | (0.020) |
| Nasdaq | 0.065*** | 0.068*** | 0.068*** | 0.066*** | 0.045** | 0.047** | 0.048*** | 0.046** |
| | (0.022) | (0.022) | (0.022) | (0.022) | (0.018) | (0.018) | (0.018) | (0.018) |
| Industry dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| Year dummies | YES | YES | YES | YES | YES | YES | YES | YES |
| R-square | 0.21 | 0.21 | 0.21 | 0.20 | 0.21 | 0.21 | 0.21 | 0.21 |
| Numb.of obs. | 1476 | 1476 | 1476 | 1476 | 1472 | 1472 | 1472 | 1472 |

Dependent variables are industry adjusted return mean ROA and EBITDA/Total Assets during the three-year period after the IPO date. *VCSize* is the number of distinct VCs that provide capital before the IPO date. *VCDivesity1 is* total number of different VC types within the syndicate (e.g. private, investment bank or corporate VC). *VCDiversity2* is total number of different industry preferences of syndicating VCs. *VCH-index* is the squared sum of the percentage share of each VC's total investment to total funding received over all financing rounds till IPO date. *Bank Loan* is the ratio of bank loan amount to total assets. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Nasdaq* takes value one if the firm is listed in Nasdaq and zero otherwise. *Internet* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively. Standard errors are provided in parentheses.

**Table 1.10. 2SLS regressions for the relation between VC syndicate size and post-IPO profitability**

| Variable | ROA | | | EBITDA / Total Assets | | |
|---|---|---|---|---|---|---|
| Intercept | -0.381*** | -0.271*** | -0.320*** | -0.310*** | -0.168** | -0.232*** |
| | (0.081) | (0.090) | (0.085) | (0.068) | (0.076) | (0.072) |
| VCSize | -0.033*** | | | -0.045*** | | |
| | (0.006) | | | (0.005) | | |
| VCDiversity1 | | -0.100*** | | | -0.133*** | |
| | | (0.017) | | | (0.014) | |
| VCDiversity2 | | | -0.064*** | | | -0.085*** |
| | | | (0.011) | | | (0.009) |
| Bank Loan | -0.016 | 0.009 | -0.002 | 0.032 | 0.066 | 0.052 |
| | (0.055) | (0.055) | (0.055) | (0.047) | (0.046) | (0.046) |
| LeadVCRep | 0.949*** | 0.792*** | 1.134*** | 1.200*** | 0.979*** | 1.436*** |
| | (0.276) | (0.268) | (0.287) | (0.233) | (0.226) | (0.242) |
| Log Age | 0.058*** | 0.058*** | 0.049*** | 0.044*** | 0.045*** | 0.032*** |
| | (0.010) | (0.010) | (0.011) | (0.009) | (0.009) | (0.009) |
| Log Proceeds | 0.040*** | 0.035*** | 0.040*** | 0.049*** | 0.042*** | 0.049*** |
| | (0.013) | (0.013) | (0.013) | (0.011) | (0.011) | (0.011) |
| Rank | 0.020*** | 0.020*** | 0.020*** | 0.020*** | 0.020*** | 0.020*** |
| | (0.006) | (0.006) | (0.006) | (0.005) | (0.005) | (0.005) |
| Internet | -0.131*** | -0.126*** | -0.133*** | -0.075*** | -0.069*** | -0.079*** |
| | (0.024) | (0.024) | (0.024) | (0.020) | (0.020) | (0.020) |
| Nasdaq | 0.090*** | 0.097*** | 0.106*** | 0.080*** | 0.088*** | 0.100*** |
| | (0.022) | (0.022) | (0.023) | (0.019) | (0.019) | (0.019) |
| Industry dummies | YES | YES | YES | YES | YES | YES |
| Year dummies | YES | YES | YES | YES | YES | YES |
| R-square | 0.21 | 0.21 | 0.22 | 0.24 | 0.24 | 0.24 |
| Numb. of obs. | 1472 | 1472 | 1472 | 1472 | 1472 | 1472 |

Dependent variables are industry adjusted return mean ROA and EBITDA/Total Assets during the three-year period after the IPO date. *VCSize*, *VCDivesity1*,*VCDivesity2* are predicted values from the first stage regressions. *Bank Loan* is the ratio of bank loan amount to total assets. *LeadVCRep* is the lead VC's IPO market share during the three-year period before the first investment round. *Age* is the difference between year of IPO date and the year of date when the company is incorporated. *Proceeds* is the offer size in terms of net proceeds. *Rank* is from Loughran and Ritter underwriter rank classification. *Nasdaq* takes value one if the firm is listed in Nasdaq and zero otherwise. *Internet* is equal to one if the IPO firm is identified as internet company in the database complied by J. Ritter. Significance levels at 1%, 5%, and 10% levels are represented by ***, **, and * respectively. Standard errors are provided in parentheses.

# CHAPTER 2

## The Role of Admission Documents on the Pricing of UK IPOs

## 2.1. Introduction

Traditional bookbuilding theories argue that underpricing is needed to provide institutional investors with the right incentives to reveal valuable information during the bookbuilding process (Benveniste and Spindt (1989), Benveniste and Wilhelm (1990)). Thus, underpricing can be viewed as a compensation to investors for generating costly information thereby enabling underwriters a more accurate pricing of the IPO (Sherman (2000), Sherman and Titman (2002)). In addition to information revealed by investor, the main source of pre-IPO information is the IPO prospectus. Recent studies examine the link between the pricing of book-built IPOs and the information tone and content of IPO prospectuses. The empirical evidence so far suggests that prospectuses have a significant impact on underpricing, pricing accuracy and after market return volatility for book-built IPOs (Hanley and Hoberg (2010,2012), Loughran and McDonald (2013)).

In this paper, we investigate the impact of IPO prospectuses on a sample of UK IPOs between 2004 and 2012. The specific feature of the UK IPO market is large dominance of fixed-priced IPOs. In contrast to book-built IPOs, fixed-priced IPOs are not underwritten and do not allow any price discovery once the offer price is fixed. In our sample, 320 out of 389 are fixed-priced offerings, hence it is legitimate to ask whether pre-market information production, as measured by length, tone and content of prospectuses, plays a role at all in explaining the pricing of IPOs, and if it does , to what extent it differs from that of book-built IPOs. By looking at the UK market, we are thus able to shed light on the relation between pre-IPO information production and IPO pricing for different offering mechanisms.

Using text sentiment analysis, we show longer admission documents lead to higher offer price and smaller underpricing and lower ex-post return volatility. The same holds for the length

of the risk factor sections of the prospectus. We further find that the use of more uncertain language as measured by the proportion of negative, weak and uncertain words also surprisingly increase the offer price while decreasing IPO underpricing. The proportion of these types of words is typically larger in longer admission documents, which explains our findings. In addition, we decompose the information provided in the prospectus into standard and distinctive following Hanley and Hoberg (2010) and find that standard information reduces the offer price but does not seem to have an impact on either the level of underpricing or ex-post return volatility.

Our findings on fixed-priced IPOs substantially differ from the evidence documented in recent studies on book-built IPOs by Hanley and Hoberg (2010), and Loughran and McDonald (2013). Our sample of open-priced IPOs is too small to allow us to make any strong inference from our analysis. However, our results on the tone of the prospectus on the subsample of book-built IPOs are partially consistent with those provided by previous studies. Specifically, we document that prospectuses with a more negative tone exhibit a lower offer price and a larger underpricing and post-IPO return volatility in line with Loughran and McDonald (2013) who argue that this evidence provides support to bookbuilding theories as more uncertain prospectuses require underwriters to rely more on the information provided by investors during the bookbuilding process and hence result in a higher compensation in the form of larger underpricing.

Bookbuilding theories cannot however explain our findings on fixed-priced IPOs. In the absence of a proper price discovery process that can help to price the issue more accurately, fixed-priced IPOs are typically characterized by a more conservative pricing in order to stimulate

investors' demand. This ensures the success of the offering which ultimately leads to a large underpricing, traditionally larger than that of book-built IPOs (Jenkison and Ljungqvist (2001)).

We argue that our results depend on the specific feature of the fixed-price mechanism as well as on the characteristics of the IPO firms that use fixed-priced offerings to go public. By their nature, fixed-priced IPOs are generally riskier because they are smaller, both in terms of size of the listing and size of the company, and usually list on the second segment of the stock exchange (AIM in the UK). Overall, our evidence suggests that providing more information is always beneficial to issuing companies in fixed-priced IPOs regardless of whether this communicates more uncertainty about the company.

Finally, we also investigate whether the tone, content and length of the admission documents become more valuable in bad times by looking specifically at their impact after the recent financial crisis. Although admission documents for both IPO mechanisms have become significantly longer after 2007, they seem however to play no role in explaining the pricing of IPOs.

The rest of the paper is organized as follows. Section 2 reviews the recent literature on sentiment and content of information provided by financial documents. Section 3 describes the institutional background of UK IPOs. The sample and methodology are given in Section 4. In Section 5, we present and discuss the results of our analysis. Finally, Section 6 concludes.

### 2.2. Literature Review

A growing body of the finance literature have recently focused on investigating the pricing effect of tone and sentiment of annual reports, newspaper articles, and company filings. Using the media news provided by Wall Street Journal, Tetlock (2007) documents that content of news and market prices are related. More specifically, he finds that the number of negative words in

major newspaper columns has a significant negative impact on next day market return. Tetlock, Saar-Tsechansky, and Macskassy (2008) document that the proportion of negative words in firm related news can predict low earnings and markets react negatively to the negative tones embedded in media news. Quantifying document complexity and readability by using Fog index, which combines frequency of words per sentence and syllables per word, Li (2008) shows that the readability of annual reports is associated with earnings performance. He shows that firms with lower earnings typically publish annual reports that are long and hard to read. On the other hand, firms with annual reports that are relatively easy to read have more persistent positive earnings. Loughran and McDonald (2014) show that electronic file size of annual reports of US companies can be used as a simple readability measure. They find that firms with larger 10-K files exhibit greater return and analyst forecast volatility after the disclosure date.

Recently, Garcia (2013) extends this literature by examining time variation in sentiment. Using the proportion of positive and negative words in articles published in the New York Times, he shows that the predictive power of sentiment of media news is stronger during recessions, defined by NBER, in the past century from 1905 to 2005. He finds that media sentiment can explain the change in Dow Jones Industrial Average returns more in recession periods than expansions.

In the IPO context, however, our understanding about the relation between sentiment and information content of IPO prospectuses and the pricing or performance of IPOs is still quite limited. Pre-IPO information production is costly for firms because it requires due diligence and brings litigation risk. It is costly for investors to collect information too (Sherman and Titman (2002)). Nevertheless, prospectus is the main and usually the single source of information provided to outside investors. More importantly, IPO valuation heavily depends upon the details

presented in prospectus. Thus, information within prospectuses is expected to play a central role in the process of investor valuation for IPO firms that suffer from the lack of soft information.

There are only three fairly recent studies about the impact of prospectus information on the pricing of IPOs by Loughran and McDonald (LM, henceforth) (2013) and Hanley and Hoberg (HH, henceforth) (2010, 2012).

LM (2013) examines the relation between the tone of S-1 forms, initial prospectuses filed to U.S. Securities and Exchange Commission (SEC), and first day return of US IPOs along with price revisions and trading volatility. They find that underpricing increases as prospectuses contain more uncertain language. They argue that this finding is in line with key theories of IPO underpricing proposed by Ritter (1984) and Rock (1986). More specifically, greater ex-ante uncertainty implies more first-day returns. Uncertainty theory thus predicts that information asymmetry proxies such as firm age or IPO size can explain reduced underpricing. The results provided by LM (2013) indicates that uncertain language used in IPO prospectus can function as another uncertainty proxy.

They interpret their results as providing support to bookbuilding theories (Benveniste and Spindt (1989) and Spatt and Srivastava (1991)) because prospectuses indicating greater uncertainty will lead the underwriter to rely more on institutional investors to reveal useful information to set the appropriate price. This will however imply a higher compensation to investors in the form of larger underpricing as predicted by bookbuilding theories. Consistent with this, LM (2013) finds that uncertain text is positively correlated with absolute price revision.

In contrast to LM (2013), HH (2010) focuses on the association between information content of IPO prospectus and IPO pricing for a sample of book-built US IPOs completed

between 1996 and 2005. They start by classifying prospectus information into standard and distinctive. This classification is done by calculating the correlation between word distribution of sample IPO firm's prospectus and word distribution of recent IPOs as well as past IPOs in the same industry. Standard information is basically the degree of such correlation. Uncorrelated part, then, gives the distinctive information content. HH (2010) documents that IPOs with more distinctive information content enjoy less underpricing and less gross spread. For tone of the prospectus, they find that tone is marginally correlated with IPO pricing. More specifically, they show that only the risk factors sections from the prospectuses seem to increase pricing accuracy when the tone is positive. Because of reputational and litigious concerns of issuers, a positive tone in risk factors is viewed credible by investors. Thus, it leads to an increase in pricing accuracy.

HH (2012) extends the literature by examining the relation between litigation risk of material omission and underpricing. They conjecture that first day underpricing and degree of disclosure are substitutes that can mitigate liability risk. Consistent with this, they document that issuers use strong strategic disclosure and underpricing to hedge against lawsuits.

### 2.3. Institutional Background to UK IPOs

Unlike the US stock market, the EU markets have been less standardized and stringent on disclosure requirements of IPO prospectuses until late 1990s. In order to increase market efficiency and protect investors through increased disclosure standards, the European Parliament and the council of the European Union approved the Prospectus Directive on 4$^{th}$ November 2003, which came into effect on 31$^{st}$ December 2003. Based on this Directive, issuers must publish the prospectus when securities are admitted to stock markets or placed for offering. The Directive additionally standardized the content of IPO prospectuses by requiring them to provide some key

information about directors, financial data, use of proceeds, risk factors, and so on. The EU member states had to implement the Prospectus Directive by 1 July 2005. Thus, for the UK stock market, we contend that prospectuses of IPOs after 2004 do convey key details that investors can utilize for valuing the deals. A caveat applies to the AIM market which at present is exempt from the Prospectus Directive and, more generally, the regulatory requirements on prospectus disclosure are less stringent than those of the Main Market, although over time they have become more standardized and informative. Fixed-priced IPOs do mainly list on AIM.

Also the preparation and timeline of initial offerings in the UK differ substantially from those of US IPOs even with regard to the publication of the prospectus. While US IPO prospectuses are publicly filed as S-1 forms several months before the offering date, UK IPO prospectuses are made available to potential investors for significantly shorter time periods. We describe the timeline of the "live" IPO process in Figure 1. Once the IPO is announced, a preliminary prospectus also called pathfinder is released to the investors approached by the underwriters/advisors. At this point investors first go through an "investor education" period which entails that the analysts and equity sale teams of the bookrunners give briefing about the upcoming offering and its main features. The investor education period usually lasts around two weeks and helps the management and analysts set the price range. Then, the road show and the bookbuilding take place and a final offer price is determined. This second part of the process usually lasts a couple of weeks. Once the stock starts trading a final prospectus is officially published and becomes public.

For fixed-priced IPOs, this whole process is usually much shorter. Specifically the roadshow and bookbuilding take place within a few days given that they are only needed to

collect the orders from the investors and not also to help setting the offer price which is already announced in the preliminary prospectus.

In conclusion, the IPO process in the UK is structured in such a way that prospectuses are available to interested investors for a much shorter period of time compared to the US IPOs, typically publicly available for approximately 10 weeks before the issue date.

This raises the question of whether the prospectuses of UK IPO do play the same role on pricing as it is documented for the US IPOs given the discussed differences in terms of timetable and offering mechanism.

### 2.4. Data and Methodology

We obtain the sample of UK initial public offerings completed during 2004-2012 from Dealogic which has a better coverage for European IPOs than SDC Platinum. In addition, it provides a wider range of relevant information such as gross fee, tranche incentive fee, and fee notes that other databases have incomplete access to. To be consistent with existing literature, we apply the standard filters by excluding IPOs from the following industries: Financials, Insurance, Real Estate/Property, and Closed End Funds. We also drop IPOs with a market value lower than 5 million Euros.

To obtain prospectuses, we carry out searches through Thomson ONE, Factset, and Dealogic. Aim Rule 26 which came into force in February 2007 ensures that issuing companies maintain a webpage where admission documents are stored. Thus, for AIM firms that are not delisted and whose IPO takes place after 2007, we obtain the prospectuses from the company websites. For firms whose IPOs are completed before 2007, we make use of the databases mentioned above. We have to exclude further 55 IPOs for which the prospectus is either not available in any of the database or not machine readable at all. Our final sample consists of 389

UK IPOs where 320 IPOs are fixed-priced and the remaining 69 are book-built (or open-priced) IPOs. To be able to perform word content analysis, we first manually parse each prospectus into three text files. The first text file contains the whole document. The second and third text files instead isolate respectively the risk factors and use of proceeds sections of the prospectus[17]. Since most admission documents are stored as scanned files by data providers, we remove redundant characters from the corresponding text file.

In this paper, we merge the approaches used by LM and HH and focus our analysis on the impact of both the tone and the type of information content of IPO prospectuses. Tone, as defined by LM, essentially refers to use of certain type of words and their predictive power of IPO underpricing, offer price and post-IPO return volatility. HH classifies instead the information content into either standard or distinctive, whereby distinctive means that the prospectus provides relevant firm specific information. We provide the exact details about how the tone and information content of prospectuses are worked out in the following sections.

### **2.4.1.** *Tone and length of document*

Tetlock (2007) finds that the number of negative words in major newspaper articles can forecast next day market return. To calculate the frequency of negative and positive words, he utilizes the General Inquirer's Harvard IV-4 psychosocial dictionary. This lexicon currently involves almost 2000 negative words and 1300 positive words. Using the same source as their word dictionary, Tetlock et al. (2008) document that the proportion of negative words in media news is negatively correlated to the company's earnings.

LM (2011) argue that standard word lists used by earlier studies are not suitable for financial texts as they are likely to make the categorization of words misleading. For example,

[17] Unlike US S-1 forms, UK prospectuses do not usually include management discussion sections or a detailed summary of the issue at the beginning of the admission document.

words such as “tax” and “liability” are coded as negative in the General Inquirer's word list although they are regarded neutral in a financial context. By compiling a new word list, they show that words embedded in 10-K filings are linked to returns, fraud, material weakness, and earnings surprises. We follow LM (2011) and distinguish six different categories of words: positive, negative, uncertainty, litigious, strong, and weak. These lists have been used by several recent studies about sentiment in news (Gurun and Butler (2012)), annual reports (Jegadeesh and Wu (2011)) and conference calls (Mayew and Venkatachalam (2012)). To generate tone related proxies, we use word lists of LM (2011) and simply look at the fractions of six tone categories in admission documents of our sample firms. Below, we list the most frequently used words in each of the six categories:

| | **Positive** | **Negative** | **Uncertain** | **Litigation** | **Weak** | **Strong** |
|---|---|---|---|---|---|---|
| 1 | Good | Failure | probable | consent | almost | Undoubtedly |
| 2 | Success | Claims | intangible | regulatory | uncertain | Never |
| 3 | Greater | Adversely | conditional | laws | depends | Lowest |
| 4 | opportunities | termination | possible | legal | appears | Clearly |
| 5 | Gain | Adverse | believe | regulations | depend | Strongly |
| 6 | Gains | impairment | risks | contracts | depending | Always |
| 7 | Able | Disclosed | approximately | contract | might | Highest |
| 8 | Outstanding | Losses | could | law | possible | Best |
| 9 | Effective | Against | risk | shall | could | Must |
| 10 | Benefit | Loss | may | admission | may | Will |

A complex set of information can lead to investor underreaction and poor valuation (Hirshleifer (2001), Brav and Heaton (2002)). Using the word count of annual reports as a complexity measure, You and Zhang (2009) find that longer 10-K documents lead to a stronger investor under-reaction. Recently, LM (2013) shows that the electronic document size of 10-K files can significantly predict subsequent return volatility and analyst forecast dispersion. More specifically, larger files exhibit a higher volatility of post-announcement returns and of analyst forecast. In line with this finding, Arnold, Fishe, and North (2010) find that information

ambiguity in the risk factor section of IPO prospectuses, proxied by the proportion of words used in the risk factor section relative to those used in the entire document, is positively correlated with underpricing and post-IPO return volatility for a sample of US IPOs completed during 1998-2005.

To test the pricing effect of information complexity or ambiguity provided by UK IPO prospectuses, we make use of total number of words in i.) the whole document, and ii.) risk factor sections. Our length variable is then calculated as the natural logarithm of total words.

### **2.4.2.** *Distinctive versus Standard Content*

Following a similar approach to HH (2010), we represent each text file as a normalized vector that shows the fraction of certain words appearing throughout the document. In order to create a lexicon, we first retrieve the set of all words that appear in all documents. Then, we reduce this set to a list of words by requiring each word to appear in at least 5 percent of the whole document. More specifically, we delete those words from main lexicon if they repeat less than 50 times. After eliminating articles, conjunctions, prepositions and pronouns, we reduce the word list to 9083. We next map similar words that share the same word root into one word. For example, the words "acquire", "acquiring", and "acquired" need to be mapped to the single word "acquire". To be able to find the root of each word in our list, we employ a web crawling algorithm and pull word roots from Webster's online dictionary[18]. Once words with the same roots are merged, our final base dictionary is reduced to 5036 words. We use this vector of words as our text spanning set. Then, for each word in this master list, we look at the number of occurrence in the text file of the company admission document and generate a representation based on these numbers.

[18] http://www.merriam-webster.com/dictionary/

As a simplified demonstration, suppose the whole admission document of a generic company *i* is the following statement: "The key advantage of the company's product over other companies' products is". This segment involves only four spanning words, "key, advantage, company, product". The corresponding vector representation based on word frequency is $rep_i$=(1,1,2,2) because the words "key" and "advantage" appear only once while the words "product" and "company" appear twice. Given the total number of occurrences, which is six in this example, the vector representation finally normalizes into $rep_i$ =(0.17, 0.17, 0.33, 0.33). We carry out this exercise for the whole document and the risk factor section.

The next step is to classify the information content of the admission documents into standard and distinctive components. HH (2010) argues that costly premarket information production can induce firms to disclose a minimum amount of standard information that is sufficient to meet with regulatory requirements. In this case, the content of an IPO prospectus would be expected to be very much similar to the prospectuses published by other companies who have gone public around the same period of time and/or belong to the same industry. We quantify the extent to which the information content of firm *i*'s prospectus overlaps with that of other recent IPOs by calculating the following measure:

$$rep_{cur,i} = \frac{1}{N}\sum_{n=1}^{N} rep_n$$

Where N is the number of most recent IPOs which we set equal to 15[19].

In a similar way, we quantify the extent to which the information content of firm *i*'s prospectus overlaps with that of other IPOs within the same industry or closely related industries by calculating the following measure:

[19] We do try different threshold and results are unaffected.

$$rep_{ind,i} = \frac{1}{M}\sum_{m=1}^{M} rep_m$$

Where M denotes the number of IPOs within the same industry which are identified using the industry classification provided by Thomson One. To eliminate a possible overlap with recent IPOs, we exclude the 15 most recent IPO in the same industry and we also require that each IPO in our sample has at least five past IPOs in the same industry. Finally, as for the previous measure we set the maximum to 15, so $M \in [5,15]$ .

A linear combination of the components calculated above provides our final measure of standard information in a given IPO prospectus. More specifically, standard information content is determined by following OLS estimation without constant term

$$rep_i = \beta_{cur,i} rep_{cur,i} + \beta_{ind,i} rep_{ind,i}. \quad (1)$$

We run the model above for each sample firm that has 5036 observations in the vector representation. Standard content is the sum of the coefficient estimates as

$$\beta_{standard,i} = \beta_{cur,i} + \beta_{ind,i}.$$

$\beta_{standard,i}$ can be interpreted as the fraction of standard words used in the admission document. The residual term in model (1) stands for the variation in word distribution that cannot be explained by standard words used in recent and similar industry IPOs. Therefore, distinctive content of the admission documents can be quantified by the absolute sum of residual term.

### **2.4.3.** *OLS Models*

Our first aim is to analyze the link between admission document and IPO underpricing. After constructing document tone, content and length variables, we start our analysis by investigating their impact on IPO underpricing by running the following fixed effect models

$$Underpricing = \alpha + \beta_1\ Tone / Sentiment / Length\ Variables + \beta_2\ VC\ backed +$$
$$+ \beta_3\ Log\ (Proceeds) + \beta_4\ AIM + \beta_5\ Internet + \beta_6\ Underwriter\ Share + \beta_7 \log(1+Age)$$
$$+ \beta_8\ Pre\text{-}IPO\ Market\ Average\ + Industry\ Dummies + Year\ Dummies \qquad (2)$$

The dependent variable in equation (2) is IPO *Underpricing* defined as the percentage change from offer price to first day closing price. Our main coefficient of interest is $\beta_1$ for which we use three different independent variables. First, we look at the relation between text tone - as defined by fraction of positive, negative, weak, strong and litigious words - and underpricing. Second, we investigate the link between text information content, standard versus distinctive, and underpricing. Third, we examine the impact of document length on underpricing.

Our independent variables are as follows. *VC backed* is dummy variable that takes value 1 if the sample firm has VC financing before the IPO. The relation between IPO underpricing and the venture capital backing has been investigated by several pioneering studies. Megginson and Weiss (1991) shows that VC-backed IPOs experience lower underpricing than non-VC-backed IPOs. They contend that VC backing certifies the quality of the offer and hence leads to lower underpricing. Gompers and Lerner (1997) further examine the certification of VC argument and find that underpricing of VC-backed IPOs and non-VC-backed IPOs depends on methodology as well as the sample periods.

*Proceeds* is the offer size in terms of net proceeds. Prior studies find that older and bigger companies are less risky and hence underpriced less. Thus, we expect to find a negative coefficient on proceeds. To be consistent with earlier studies, we take the natural logarithm of this variable (see also Loughran and Ritter (2004) and Cliff and Denis (2004)).

Smart and Zutter (2003) and Bradley and Jordan (2002) argue that IPOs on the Nasdaq exchange are smaller and riskier than those on the NYSE. So, the listing location is considered to

be another proxy of ex-ante uncertainty that has impact on IPO underpricing. A similar argument can be applied to firms that decide to list on the AIM as opposite to the main exchange. Hence, to control for the listing decision, we include the dummy variable *AIM* which takes value one if the firm is listed in AIM and zero otherwise. Ljungqvist and Wilhelm (2003) and Loughran and Ritter (2004) find that internet firms are associated with significantly higher initial returns because they are considered riskier companies. In line with the existing literature, we also include the dummy variable *Internet* which is equal to one if the IPO firm is identified as an internet company in the Dealogic database.

Most studies on IPO underpricing do control for the underwriter reputation which is often shown to reduce the underpricing because it mitigates the information asymmetry *vis-à-vis* investors. Following HH (2010), we measure the underwriter's reputation by the *Underwriter share* defined as the log of past year's market share in dollars amount.

Several studies find that the firm age at the time of the IPO has a significant impact on underpricing (Carter, Dark, and Singh (1998) , Ljungqvist and William (2002), Ellul and Pagano (2006)). We define A*ge* as the natural logarithm of one plus the difference between the IPO date and the date of incorporation. We retrieve incorporation dates for our companies from Orbis database, compiled by Bureau van Dijk. Whenever the information is missing in Orbis, we obtain the incorporation dates directly from the prospectuses.

Market conditions and waves in IPO placements can predict the first day returns to some extent. For example, Bradley and Jordan (2002) report that more than 35 percent of IPO underpricing can be explained by incorporating the hot issue markets. Since our sample covers the recent recession period caused by 2008 financial crisis, we control for market and industry conditions by including industry dummies, year dummies and *Pre-IPO Market Average* defined

as the mean AIM index return over the 30 day trading period before the issue date (see Loughran and Ritter (2004), Lowry and Schwert (2004)).

Our second aim is to investigate the impact of tone, content and length of admission documents on the offer price and post-IPO return volatility. To do this, we replace dependent variable in Equation 2 by offer price and post-IPO return volatility and keep the same explanatory variables.

## 2.5. Empirical Results

### 2.5.1. *IPO frequencies and Summary Statistics*

Table 2.1 presents the distribution of IPOs across time and industry. As it Is expected, the number of IPOs declines sharply during the crisis period. The total number of IPOs between 2008 and 2012 is 83 representing approximately 21 per cent of the total sample. The fraction of fixed-priced IPOs, 82%, indicates that the UK IPO market remains to be dominated by fixed-pricing mechanism.

Panel B in Table 2.1 shows the IPO frequency based on the macro industry classification provided by Thomson One. Almost 23 percent of the sample IPOs is composed of IPOs from the High Technology industries. Similar to year distributions, industry distribution shows that fixed-priced IPOs dominates book-built IPOs in all industries.

Summary statistics are reported in Table 2.2. We note that the mean (median) underpricing for fixed-priced and open-priced IPOs are 10% (8%) and 6% (6%) respectively. The last column shows that difference of means between the two groups is statistically significant at 1 per cent level. This preliminary evidence is in line with the IPO literature which stresses that fixed-priced offerings do typically exhibit higher underpricing given the lack of information discovery which

is instead possible in bookbuilding. Post-IPO return volatility seems to be very similar across the two mechanisms, whereas there is a remarkable difference in trading volumes. This is not surprising for several reasons. Firstly, fixed-priced IPOs are generally smaller than open-priced ones as the deal amount value in Panel B of Table 2.2 suggests. Secondly, the majority of them, 95 percent in our sample as per Panel B of Table 2.2, are listed on AIM.

Panel B reports mean and median values for control variables used in the subsequent analysis. Open-priced IPOs are significantly older and larger than fixed-priced offers. Mean proceeds is 231 million Euros for book-built IPOs. The sample of fixed-priced IPOs is mostly composed of AIM listed companies and as a robustness test, we later check whether our results are different if we restrict our attention only to AIM IPOs.

Unlike the US IPO market, UK IPO market has relatively less number of offerings that have VC backing. The percentage of VC backed IPOs in the sample is 19 for book-built IPOs and 8 for fixed-priced issues. Finally, the proportion Internet IPOs and pre-IPO mean market return do not change significantly from one group to another.

Panel C in Table 2.2 provides descriptive statistics for our word semantic analysis. It is apparent that open-priced IPOs have longer prospectuses than fixed-priced IPOs. The number of total words in the whole document and in the risk factors section of open-priced IPOs is twice as big as that of fixed-priced offers. For tone variables, book-built issues are significantly more negative and uncertain than the other group. However, the difference between the proportion of uncertain words changes for the risk factor section. Admission documents of fixed-priced IPOs have significantly stronger tone than those of open-priced ones. With regard to the information content variables, we note that open-priced IPOs provide less standard content than fixed-priced

issues. The difference is significant at 1 per cent level for both whole document and risk factor sections.

Table 2.3 presents the correlations among the dependent variables and our variables of interest. We note that the length of the admission document is negatively correlated with IPO underpricing in both fixed and open-priced IPOs and the same holds for the standard content. The correlation between underpricing and the tone variables instead is very much different across tone classifications and types of offering mechanism.

### **2.5.2.** *First Day Underpricing*

We present the baseline OLS results for the relation between the length and tone of the admission document and IPO underpricing in Panel A in Table 2.4. For fixed-priced IPOs, we find that negative, uncertain, litigious and weak words are negatively correlated with underpricing. The impact is both statistically and economically significant. For example, one standard deviation increase in negative tone increases underpricing by 1.02%, calculated as the product of standard deviation of negative tone, 0.18, and its coefficient estimate, 0.057. Our results are in contrast with those documented by LM (2013) who instead finds a positive relation between IPO underpricing and negative or uncertain words.

When we repeat the analysis for open-priced IPOs, we find that the relation between negative tone and underpricing is positive in line with LM (2013), suggesting that more negative words result in larger underpricing. The coefficient on negative tone is 0.165 and significant at 10 per cent level. The remaining tone variables are not significant although the signs of coefficients seem to be consistent with those documented by LM. However, we are cautious to attempt any further interpretation of this set of results given the very limited size of the open-priced IPOs subsample.

Based on the results of Panel A in Table 2.4, we can argue that the role of admission documents on IPO pricing varies with the type of offering mechanisms and in the following sections we will try and shed more light on this question.

Panel B in Table 2.4 extends the analysis to investigate the relationship between length of the prospectus and first day return. It is clear that longer admission documents and more specifically longer risk factor sections do significantly reduce IPO underpricing for the fixed-priced offerings. The effect is statistically significant at 1 per cent level and we further note a higher R square for regression in Panel B, which confirms that the length of the admission document has a strong explanatory power of IPO underpricing.

On the other hand, the document length appears to play no role in open-priced IPOs, though the same caveat as before applies here that our findings might be biased by the very limited sample size.

Finally, in Panel C of Table 2.4 we look at the impact of the prospectus content, standard vs. informative, on first day returns. We distinguish between the content of the whole document and that of the risk factor section only. Results show that more informative content both at the level of the whole document and risk factors section increases underpricing in fixed-price IPOs. One standard deviation increase in informative content increases the underpricing by 2.62%. Standard content seems not to have an effect as coefficient estimates are not significant although they are also positive. Similar to the results on tone analysis, our findings on content analysis are in contrast with HH (2013), suggesting again that the role of the admission document on IPO pricing depends on the specific offering mechanism.

Finally, the results on open-priced IPOs also differ from those in HH (2013). Specifically, we surprisingly find that more standard content of the whole admission documents can

significantly reduce the level of underpricing for book-built IPOs while more informative content of the risk factor section has a significant and positive impact on underpricing.

In the next section, we look at implications of tone, content of prospectuses and the document length for offer price, which might help us interpreting the results above.

### **2.5.3.** *Implications for Offer Price*

Panel A in Table 2.5 reports coefficient estimates of all tone variables. It is immediate to note that they all have positive statistically significant impact on the offer price of fixed-price IPOs, with the exception for litigation and strong words which are not significant.

For open-priced IPOs, we document that there is negative relation between offer price and negative tone of the document. The coefficient on negative tone is -3.327 and significant at 10 per cent level. However, we similarly find that positive words do have the same effect that negative words which seems to be less intuitive. The limited sample size makes any further interpretation of the results quite daring.

Panel B in Table 2.5 looks at prospectus length and its impact on the offer price. For fixed-priced IPOs, we document a positive correlation between the length of the whole prospectus as well as of the risk factor section and the offer price - opposite sign compared to the results on underpricing - which is statistically and economically significant. Unlike the findings with 10-K files or US IPO prospectuses provided by LM (2013) and Arnold et al. (2010), the amount of information in UK fixed-priced IPO prospectuses play an essential role in achieving better pre and post-IPO valuation. Document length appears to have no impact on the offer price of book-built IPOs.

Finally, in Panel C in Table 2.5 we investigate the role of the different information types on the offer price and document that, while this seems to play no role in book-built IPOs, for

fixed-priced IPOs more standard content clearly reduces the offer price as we would intuitively expect. The relation is negative and significant at 10 per cent level for the whole document and at 5 per cent for risk factor section. We fail to find any association between content and offer price for book-built IPOs though.

### **2.5.4.** *Post-IPO Return Volatility*

Information asymmetry or uncertainty theories predict that more uncertainty increases the ambiguity about IPO valuation and hence leads to more underpricing (Rock (1986), Beatty and Ritter (1986)). Moreover, more pre-IPO uncertainty is likely to result in more post-IPO return volatility. Consistent with this, LM (2013) find that uncertain language in S-1 forms are positively associated with underpricing and return volatility after the issue date. For fixed-priced IPOs, we find however the opposite result that a more uncertain tone decreases underpricing. To test whether the tone of document can also contribute to explain the subsequent return volatility, we run Equation 2 by replacing dependent variable with standard deviation of 60-day return during the period from day +5 to day +64 after the issue date. Our results are reported in Table 2.6.

Results in Panel A in Table 2.6 show that there is no empirical evidence of a relation between post-IPO return volatility and the tone of the IPO prospectuses. All tone variables appear to be insignificant for fixed-price IPOs. This could suggest that our results do not support uncertainty hypotheses for fixed-price IPOs. We note however that the variable *log net proceed* which is also considered a proxy for ex-ante uncertainty carries the expected negative sign, that is larger issues have significantly less ex-post return volatility. In the next section, we try and provide a possible interpretation for our results for fixed-price offerings.

For open-priced subsample, consistent with LM (2013), we find that the coefficient on negative tone is positive and significant at ten percent level while the remaining tone variables are all insignificant.

Similar to results on underpricing and offer price, the length of the whole admission document as well as the risk factor section does explain post-IPO return volatility. We find that both coefficient estimates are negative and statistically significant at 1 per cent level. The economic significance is smaller compared to the results on the offer price and underpricing, however taken together our findings provide a strong evidence that the document length, rather that the tone as suggested by LM (2003), plays a major role in determining the pricing and short term performances of fixed-priced IPOs.

Finally, for completeness we also report in Panel C the regression results for the document content which show that a more distinctive information content has a positive and statistically significant impact on the ex-post return volatility whereas standard content does not have any impact. We find a similar result for open-priced IPOs. The coefficients estimates are 0.055 and 0.077 for fixed and open-priced subsamples respectively. Both estimates are significant at 10 per cent level. This provides another piece of empirical evidence against the uncertainty hypothesis because distinctive information would normally be expected to reduce post-IPO return volatility.

### **2.5.5.** *Time variation in the impact of admission tone*

In the analysis so far, we control for market-wide fluctuations by year dummy variables. Garcia (2013) finds that the sentiment of information, provided by newspaper articles, has a stronger impact in bad times (e.g. recessions) rather than in good times. This could similarly apply to the information conveyed by IPO prospectuses. As our sample comprises the recent financial crisis of 2008 and thus raises the question of whether the period after 2008 bias in some way our

results. To be able to test whether this is the case we re-run our tests in the two regimes: before the recent crisis and during the recent recession. We set the beginning of the crisis in 2008.

We begin our analysis by first looking at the summary statistics of the sample over the two time horizons. Table 2.7 shows that admission documents have become substantially longer during the recession period. For fixed-priced IPOs, the mean number of words increases from 43k to 67k. Admission documents also have more negative and uncertain tone during the crisis period than they do in pre-crisis period. The differences in means are significant at 5 per cent level for both tone measures. Consistent with this pattern, we find that prospectuses use less strong language in the recent crisis. The changes in descriptive statistics for open-priced IPOs are similar to those observed for fixed-priced IPOs. One important figure is about the information content variable. On average, both types of firms tend to provide more distinctive information during the crisis period but the difference is significant (at 5 per cent level) only for open-priced IPOs.

To perform the regression analysis about the impact of document tone and length in the two sample periods, we use only fixed-priced IPOs due to the very small number of open-priced IPOs during the crisis period which would make very difficult to obtain meaningful results. The regression results are in Table 2.8. We report only the results on underpricing. We observe that despite the evident increase of the information provided by the admission documents during the crisis period, none of our variables appear to be significant in the post-crisis subsample. In contrast, regression results on the first subsample before 2008 confirm those obtained for the whole sample. In un-tabulated results, similar to results in Panel C in Table 2.4, we find that distinctive information content variable is positive and significant, at 1 per cent level, but standard content proxy is not significant for pre-crisis subsample.

We also observe that none of the regressors that do have some explanatory power in the period before the crisis do so after 2008. Interestingly enough the Internet dummy appears to be negatively correlated with IPO underpricing and the coefficient estimates are all strongly statistically significant[20].

In conclusion, our findings are clearly driven by the period before the crisis as the tone, length and content of the admission documents do not seem to play any role on the pricing of fixed-price IPO after 2008. We also examine the relation between tone and offer price over two periods but find no significant effect during the recession period.

**2.5.6.** *Interpretation of the results*

Our overall evidence clearly suggest that, for fixed-price offerings, providing more information is clearly beneficially to the issuing company as it results in a higher offer price, smaller underpricing and lower ex-post volatility. And this is a fortiori true for the length of the risk factor section. Our findings on fixed-priced IPOs are in sharp contrast with previous findings on book-built IPOs by LM (2013) and Arnold et al. (2011). Similarly, our results show that use of a more uncertain language as measured by the proportion of negative, weak and uncertain words increases the offer price while decreasing IPO underpricing, substantially differing from the evidence documented in recent studies on book-built IPOs by HH (2010), and LM (2011).

Overall, our findings show admission documents play a different role on the pricing of IPOs depending on the offering mechanisms used to go public. Additionally, a closer inspection of the correlation matrix of Panel A in Table 2.3 reveals that the length of the admission document is negatively correlated with the proportion of positive and strong words whereas it is highly positively correlated with the proportion of negative and uncertain words. In other words,

[20] We note that fraction of internet IPOs increases only 1% from 6% in pre-crisis period to 7% in during-crisis period.

admission documents are longer when there is overall more uncertainty about the firm. This would then explain our, at first counterintuitive, results for the tone variables and provides further support to our interpretation that more information is always better for fixed-priced IPOs. The reason for this might be that by their nature, fixed-priced IPOs are generally riskier because they are smaller, both in term of size of the listing and size of the company. Furthermore such IPOs usually get listed on the second segment of the stock exchange (AIM in the UK), and this is known from the beginning. However, providing more information can improve the pricing of these IPOs as it clarifies the situation of the company to prospective investors.

On the other hand, our findings on open-priced IPOs, weak because of the relative small sample size, seem to be generally in line with the evidence documented by LM (2011). This provides further support to our view that the different results we obtain for fixed-priced IPOs are the consequence of the specificity of fixed-price mechanism as well as the characteristics of companies that go public with a fixed-priced offering.

## 2.6. Conclusion

In this paper, we perform text analysis for the admission documents of a sample of UK IPOs between 2004 and 2012 to examine the pricing effects of tone, length and information content of prospectuses. UK IPOs are peculiar for the large proportion of companies that decide to go public using a fixed-priced offering. Contrary to most common bookbuilding mechanism used by the US IPOs, fixed-pricing does not allow any price discovery from institutional investors.

Unlike recent findings for book-built US IPOs, the length of the prospectus explains a significant fraction of variation in first day underpricing. Specifically, longer admission

documents result in higher offer price and a lower underpricing and lower post-IPO return volatility. However, more standard prospectuses do have the opposite impact of reducing the offer price although we find no significant impact on the level of underpricing.

On the other hand, a higher level of uncertain document tone surprisingly increases the offer price and reduces the level of underpricing. This seems to be the consequence of uncertainty words being positively correlated with the document length.

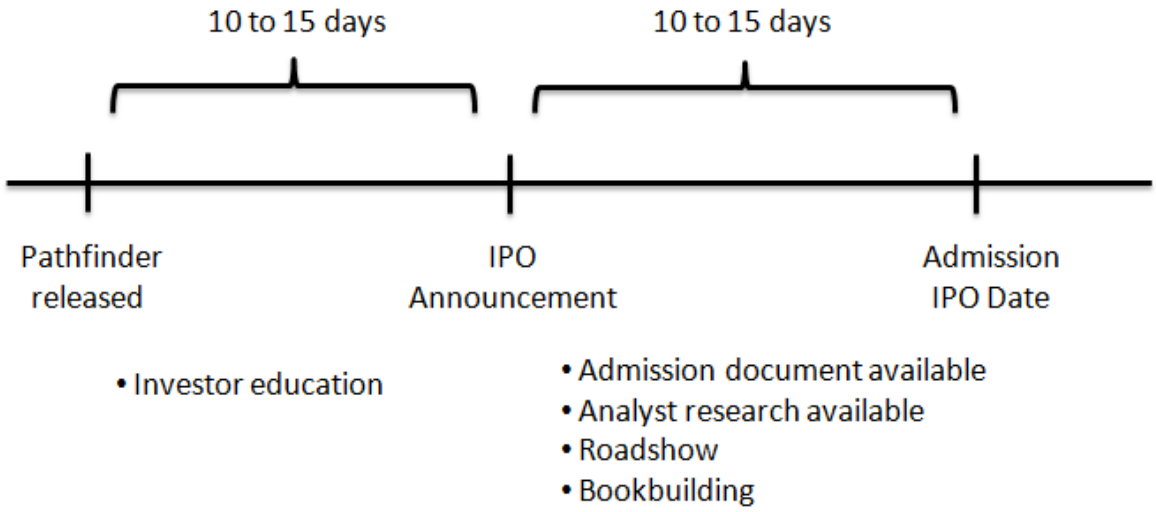
Overall our findings clearly suggest that for fixed-price IPOs more information is always better regardless of whether the additional information reveals more uncertainty about the issuing firm.

A further contribution of the paper is to investigate whether the role of admission document on the pricing of IPOs have changed after the recent financial crisis. We observe that, after 2007, admission documents have become generally much longer and more negative and uncertain in their tone as compared to prospectuses before the crisis. Nonetheless, our regression analysis reveals that they do not seem to have any explanatory power on the pricing of IPOs in the crisis period.

**Appendix B: Definition of variables**

| *Variable* | Definition |
|---|---|
| *Underpricing* | the percentage change from offer price to first day closing price |
| *Post-IPO Return Volatility* | standard deviation of 60-day return during the period from day +5 to day +64 after the issue date |
| *Offer Price* | natural logarithm of net proceeds. |
| *VC Backed* | one if the company gets VC financing before the IPO date and zero otherwise |
| *Log Net Proceeds* | natural logarithm of net proceeds. |
| *AIM Dummy* | one if the firm is listed in AIM and zero otherwise |
| *Internet Dummy* | one if the company is internet stock, zero otherwise. |
| *Log Underwriter Share* | underwriter market share as the percent of proceeds underwritten by each underwriter to the total amount underwritten by all underwriters in a given year. |
| *Log Firm Age* | natural logarithm of one plus the difference between the IPO date and the date of incorporation |
| *Market Return* | mean AIM index return over the 30 day trading period before the issue date |
| *% Positive words* | fraction of positive words in the whole prospectus or risk factor section |
| *% Negative words* | fraction of negative words in the whole prospectus or risk factor section |
| *% Uncertain words* | fraction of uncertain words in the whole prospectus or risk factor section |
| *% Litigation words* | fraction of litigious words in the whole prospectus or risk factor section |
| *% Weak words* | fraction of weak words in the whole prospectus or risk factor section |
| *% Strong words* | fraction of strong words in the whole prospectus or risk factor section |
| *Document Length* | natural logarithm of total number words in the whole document or risk factor section |
| *Standard Content* | the sum of coefficients, $\beta_{standard,i} = \beta_{cur,i} + \beta_{ind,i}$, in the OLS regression: $rep_i = \beta_{cur,i} rep_{cur,i} + \beta_{ind,i} rep_{ind,i}$ where *rep* stands for word frequency vector. |
| *Distinctive Content* | absolute sum of residual term in the regression above. |

**Figure 2.1. IPO process in the UK**




This figure outlines overall IPO process in the UK. It is based on the information given by LSE's (London Stock Exchange) guide to AIM.

## Table 2.1. Frequency distribution IPOs over time and industry

**Panel A.** *IPO frequencies by year*

| Year | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| All IPOS | 21 | 116 | 96 | 73 | 14 | 2 | 33 | 17 | 17 | 389 |
| FP IPO | 21 | 94 | 84 | 59 | 12 | 2 | 24 | 12 | 12 | 320 |
| Percentage | 1.00 | 0.81 | 0.88 | 0.81 | 0.86 | 1.00 | 0.73 | 0.71 | 0.71 | 0.82 |

This panel shows number of IPOs per each year during the sample period (2000-2012). *FP IPOs* stands for fixed-priced IPOs.

**Panel B.** *IPO frequencies by industry*

| Industry | All IPOs | FP IPOs | Percentage |
|---|---|---|---|
| Consumer Products and Services | 34 | 29 | 0.85 |
| Consumer Staples | 5 | 5 | 1.00 |
| Energy and Power | 67 | 50 | 0.75 |
| Healthcare | 35 | 25 | 0.71 |
| High Technology | 87 | 75 | 0.86 |
| Industrials | 42 | 34 | 0.81 |
| Materials | 74 | 66 | 0.89 |
| Media and Entertainment | 22 | 18 | 0.82 |
| Retail | 10 | 6 | 0.60 |
| Telecommunications | 13 | 12 | 0.92 |
| Total | 389 | 320 | 0.82 |

This panel presents the IPO frequency based on the macro industry classification provided by Thomson One. *FP IPOs* stands for fixed-priced IPOs.

**Table 2.2. Summary statistics**

| Variable | Open-Priced IPOs | | | Fixed-Priced IPOs | | | Differences in means |
|---|---|---|---|---|---|---|---|
| | Mean | Std | Median | Mean | Std | Median | |
| *Panel A: IPO Pricing and Performance variables* | | | | | | | |
| Underpricing | 0.06 | 0.10 | 0.06 | 0.10 | 0.10 | 0.08 | -0.04*** |
| Post-IPO Return Volatility | 0.03 | 0.01 | 0.02 | 0.03 | 0.02 | 0.02 | -0.00 |
| Offer Price | 1.96 | 1.46 | 1.73 | 1.03 | 0.72 | 0.96 | 0.93*** |
| Trading Volume | 7.82 | 2.83 | 8.25 | 5.70 | 2.23 | 5.77 | 2.12*** |
| *Panel B: Control variables* | | | | | | | |
| VC Backed | 0.19 | 0.39 | 0.00 | 0.08 | 0.27 | 0.00 | 0.11*** |
| Deal amount (million €) | 231.47 | 332.40 | 106.78 | 32.42 | 43.23 | 16.10 | 199.05*** |
| AIM | 0.48 | 0.50 | 0.00 | 0.95 | 0.22 | 1.00 | -0.47*** |
| Internet Dummy | 0.09 | 0.28 | 0.00 | 0.07 | 0.25 | 0.00 | 0.02 |
| Underwriter Share | 7.16 | 2.41 | 7.84 | 4.74 | 2.16 | 4.77 | 2.42*** |
| Company Age | 6.04 | 13.09 | 2.00 | 4.12 | 7.53 | 1.00 | 1.92* |
| Market return | 0.02 | 0.18 | 0.06 | 0.01 | 0.22 | 0.06 | 0.01 |
| *Panel C: Admission Document Components* | | | | | | | |
| *Whole document (All)* | | | | | | | |
| Total words | 89688.43 | 44712.58 | 85946.00 | 49178.02 | 26357.08 | 42704.50 | 40510.41*** |
| % Positive words | 0.59 | 0.12 | 0.56 | 0.58 | 0.14 | 0.58 | 0.01 |
| % Negative words | 1.10 | 0.16 | 1.07 | 1.04 | 0.18 | 1.03 | 0.06** |
| % Uncertain words | 1.16 | 0.19 | 1.14 | 1.12 | 0.19 | 1.09 | 0.04* |
| % Litigation words | 1.08 | 0.22 | 1.04 | 1.16 | 0.25 | 1.14 | -0.08* |
| % Weak words | 0.59 | 0.14 | 0.58 | 0.56 | 0.12 | 0.55 | 0.03** |
| % Strong words | 0.48 | 0.09 | 0.47 | 0.51 | 0.11 | 0.50 | -0.03* |
| Standard Content | 0.94 | 0.09 | 0.93 | 0.99 | 0.10 | 1.00 | -0.05*** |
| Distinctive Content | 0.54 | 0.05 | 0.54 | 0.55 | 0.05 | 0.55 | -0.01 |
| *Risk Factors(RF)* | | | | | | | |
| Total words | 7019.64 | 4264.22 | 6130.00 | 3887.05 | 2913.42 | 3114.00 | 3132.59*** |
| % Positive words | 0.87 | 0.30 | 0.81 | 0.92 | 0.33 | 0.88 | -0.05 |
| % Negative words | 3.05 | 0.73 | 3.16 | 2.67 | 0.66 | 2.68 | 0.38*** |
| % Uncertain words | 3.23 | 0.57 | 3.16 | 3.56 | 0.60 | 3.51 | -0.33*** |
| % Litigation words | 1.35 | 0.52 | 1.28 | 1.27 | 0.52 | 1.23 | 0.08 |
| % Weak words | 2.11 | 0.46 | 2.13 | 2.16 | 0.38 | 2.17 | -0.05 |
| % Strong words | 0.70 | 0.27 | 0.66 | 0.85 | 0.27 | 0.84 | -0.15*** |
| Standard Content | 0.94 | 0.16 | 0.96 | 1.00 | 0.12 | 1.00 | -0.06*** |
| Distinctive Content | 0.79 | 0.13 | 0.78 | 0.83 | 0.14 | 0.81 | -0.01** |

The sample includes 320 fixed-priced and 69 book-built IPOs completed during 2004-2012. *Underpricing* is percentage change from offer price to first day closing price. *Post-IPO return volatility* is standard deviation of 60-day return during the period from day +5 to day +64 after the issue date. *Trading volume* is the log of total shares traded. Definitions of controls are given in Appendix. Tone variables (positive, negative, uncertain, litigation, weak and strong) are constructed by word lists provided by LM (2011). Standard content is the sum of coefficients, $\beta_{standard,i} = \beta_{cur,i} + \beta_{ind,i}$, in the OLS regression: $rep_i = \beta_{cur,i} rep_{cur,i} + \beta_{ind,i} rep_{ind,i}$ where *rep* stands for word frequency vector. Distinctive content is the absolute sum of residual term in the regression above.

**Table 2.3. Correlations**

**Panel A.** *Correlations for fixed-priced IPOs*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Underpricing | 1.00 | | | | | | | | | | | |
| Post-IPO Ret. Volatility | 0.60 | 1.00 | | | | | | | | | | |
| Offer Price | -0.07 | -0.25 | 1.00 | | | | | | | | | |
| Doc. Length | -0.21 | -0.13 | 0.04 | 1.00 | | | | | | | | |
| % Positive words | 0.00 | -0.16 | 0.02 | -0.11 | 1.00 | | | | | | | |
| % Negative words | -0.10 | -0.02 | 0.03 | 0.34 | 0.08 | 1.00 | | | | | | |
| % Uncertain words | -0.07 | 0.03 | 0.03 | 0.16 | -0.07 | 0.37 | 1.00 | | | | | |
| % Litigation words | -0.09 | -0.06 | 0.00 | -0.33 | 0.06 | 0.12 | -0.03 | 1.00 | | | | |
| % Weak words | -0.08 | -0.01 | 0.02 | -0.12 | 0.12 | 0.32 | 0.68 | 0.36 | 1.00 | | | |
| % Strong words | -0.04 | -0.06 | 0.04 | -0.27 | 0.21 | 0.00 | 0.10 | 0.26 | 0.27 | 1.00 | | |
| Standard Content | 0.07 | -0.02 | 0.01 | -0.52 | -0.07 | -0.22 | -0.09 | 0.45 | 0.19 | 0.16 | 1.00 | |
| Distinctive Content | 0.11 | 0.18 | 0.01 | 0.01 | -0.08 | 0.09 | 0.02 | 0.03 | 0.05 | 0.14 | -0.08 | 1.00 |

The sample includes 320 fixed-priced IPOs completed during 2004-2012. Underpricing is percentage change from offer price to first day closing price. Post-IPO return volatility is standard deviation of 60-day return during the period from day +5 to day +64 after the issue date. *Doc. Length* is log of total number words in the whole document. Tone variables (*positive, negative, uncertain, litigation, weak* and *strong*) are constructed by word lists provided by LM (2011). Standard content is the sum of coefficients, $\beta_{standard,i} = \beta_{cur,i} + \beta_{ind,i}$, in the OLS regression: $rep_i = \beta_{cur,i} rep_{cur,i} + \beta_{ind,i} rep_{ind,i}$ where *rep* stands for word frequency vector. Distinctive content is the absolute sum of residual term in the regression above.

**Panel B.** *Correlations for open-priced IPOs*

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Underpricing | 1.00 | | | | | | | | | | | |
| Post-IPO Ret. Volatility | 0.17 | 1.00 | | | | | | | | | | |
| Offer Price | 0.04 | -0.06 | 1.00 | | | | | | | | | |
| Doc. Length | -0.16 | -0.10 | 0.41 | 1.00 | | | | | | | | |
| % Positive words | 0.18 | -0.06 | -0.07 | -0.28 | 1.00 | | | | | | | |
| % Negative words | 0.16 | -0.13 | -0.03 | 0.10 | 0.14 | 1.00 | | | | | | |
| % Uncertain words | 0.06 | 0.08 | 0.01 | 0.08 | -0.09 | 0.34 | 1.00 | | | | | |
| % Litigation words | 0.03 | 0.16 | -0.15 | -0.55 | 0.08 | 0.27 | 0.20 | 1.00 | | | | |
| % Weak words | 0.17 | -0.09 | -0.07 | -0.18 | 0.10 | 0.43 | 0.80 | 0.30 | 1.00 | | | |
| % Strong words | 0.03 | -0.18 | -0.09 | -0.08 | 0.07 | -0.03 | -0.01 | 0.03 | 0.24 | 1.00 | | |
| Standard Content | -0.06 | 0.19 | -0.27 | -0.56 | -0.14 | -0.09 | 0.11 | 0.43 | 0.19 | -0.07 | 1.00 | |
| Distinctive Content | 0.11 | 0.10 | 0.06 | -0.04 | 0.11 | 0.07 | -0.21 | 0.00 | -0.19 | -0.10 | -0.22 | 1.00 |

The sample includes 69 book-built IPOs completed during 2004-2012. *Underpricing* is percentage change from offer price to first day closing price. *Post-IPO return volatility* is standard deviation of 60-day return during the period from day +5 to day +64 after the issue date. *Doc. Length* is log of total number words in the whole document. Tone variables (*positive, negative, uncertain, litigation, weak* and *strong*) are constructed by word lists provided by LM (2011). *Standard content* is the sum of coefficients, $\beta_{standard,i} = \beta_{cur,i} + \beta_{ind,i}$, in the OLS regression: $rep_i = \beta_{cur,i} rep_{cur,i} + \beta_{ind,i} rep_{ind,i}$ where *rep* stands for word frequency vector. *Distinctive content* is the absolute sum of residual term in the regression above.

**Table 2.4. Effects of admission documents on underpricing**

**Panel A.** *OLS results for the relation between underpricing and tone of admission document*

| Tone Variable | Tone | VC backed | Log Net Proceeds | AIM Dummy | Internet Dummy | Log Und. Share | Log Firm Age | Market Return | Intrcpt. | Year & Industry | R-sqr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Fixed-priced IPOs* | | | | | | |
| % Positive | 0.002 | **0.065** | **-0.012** | -0.013 | 0.006 | **-0.006** | -0.003 | **0.089** | **0.133** | YES | 0.13 |
| | (0.04) | (2.13) | (-1.99) | (-0.57) | (0.29) | (-2.28) | (-0.54) | (3.00) | (2.12) | | |
| % Negative | **-0.057** | **0.068** | **-0.012** | -0.014 | 0.011 | **-0.006** | -0.003 | **0.089** | **0.194** | YES | 0.14 |
| | (-1.84) | (2.30) | (-2.01) | (-0.66) | (0.56) | (-2.19) | (-0.63) | (3.00) | (3.24) | | |
| % Uncertain | **-0.058** | **0.065** | **-0.011** | -0.013 | 0.012 | **-0.006** | -0.004 | **0.087** | **0.198** | YES | 0.14 |
| | (-1.85) | (2.21) | (-1.93) | (-0.54) | (0.64) | (-2.32) | (-0.70) | (2.87) | (3.27) | | |
| % Litigation | **-0.043** | **0.062** | **-0.012** | -0.013 | 0.009 | **-0.006** | -0.003 | **0.086** | **0.192** | YES | 0.14 |
| | (-2.97) | (2.11) | (-2.01) | (-0.59) | (0.48) | (-2.43) | (-0.60) | (2.84) | (3.80) | | |
| % Weak | **-0.077** | **0.063** | **-0.012** | -0.011 | 0.013 | **-0.006** | -0.004 | **0.086** | **0.176** | YES | 0.14 |
| | (-1.71) | (2.16) | (-1.98) | (-0.51) | (0.62) | (-2.32) | (-0.73) | (2.80) | (3.16) | | |
| % Strong | -0.056 | **0.067** | **-0.011** | -0.009 | 0.004 | **-0.006** | -0.004 | **0.089** | **0.157** | YES | 0.14 |
| | (-0.68) | (2.21) | (-1.72) | (-0.42) | (0.21) | (-2.31) | (-0.72) | (3.04) | (2.52) | | |
| | | | | | *Open-priced IPOs* | | | | | | |
| % Positive | 0.182 | -0.020 | -0.002 | -0.048 | **0.086** | **-0.019** | 0.003 | 0.048 | **0.225** | YES | 0.34 |
| | (1.58) | (-0.43) | (-0.12) | (-1.16) | (1.92) | (-2.36) | (0.22) | (0.59) | (2.26) | | |
| % Negative | **0.165** | -0.004 | -0.007 | -0.052 | 0.052 | **-0.020** | 0.001 | 0.054 | 0.147 | YES | 0.35 |
| | (1.76) | (-0.10) | (-0.45) | (-1.25) | (1.06) | (-2.56) | (0.04) | (0.65) | (1.30) | | |
| % Uncertain | 0.182 | 0.001 | -0.014 | -0.049 | 0.071 | **-0.016** | 0.009 | 0.074 | 0.111 | YES | 0.36 |
| | (1.41) | (0.03) | (-0.80) | (-1.33) | (1.53) | (-2.03) | (0.57) | (0.78) | (0.73) | | |
| % Litigation | -0.043 | 0.009 | -0.003 | -0.030 | **0.102** | **-0.018** | 0.005 | 0.058 | **0.354** | YES | 0.31 |
| | (-0.53) | (0.25) | (-0.23) | (-0.60) | (2.02) | (-2.37) | (0.33) | (0.68) | (3.80) | | |
| % Weak | 0.233 | -0.005 | -0.007 | -0.047 | 0.049 | **-0.017** | 0.008 | 0.093 | 0.156 | YES | 0.36 |
| | (1.59) | (-0.13) | (-0.49) | (-1.35) | (0.93) | (-2.31) | (0.49) | (0.96) | (1.26) | | |
| % Strong | -0.034 | 0.008 | -0.005 | -0.039 | **0.102** | **-0.017** | 0.004 | 0.059 | **0.335** | YES | 0.31 |
| | (-0.23) | (0.23) | (-0.35) | (-1.04) | (2.09) | (-2.19) | (0.27) | (0.68) | (3.35) | | |

The dependent variable is *Underpricing* defined as the percentage change from offer price to first day closing price. Tone variables (*positive, negative, uncertain, litigation, weak* and *strong*) are constructed by word lists provided by LM (2011). Definitions of controls are given in Appendix.

**Table 2.4 Continued**

**Panel B.** *OLS results for the relation between underpricing and length of admission document*

| Section | Document Length | VC backed | Log Net proceeds | AIM Dummy | Internet Dummy | Log Und. Share | Log Firm Age | Market Return | Intrcpt. | Year & Industry | R-sqr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Fixed-priced IPOs* | | | | | | |
| All | **-0.076** | **0.077** | -0.004 | **-0.044** | 0.012 | -0.003 | -0.001 | **0.096** | 0.970 | YES | 0.18 |
| | (-3.65) | (2.77) | (-0.76) | (-1.97) | (0.62) | (-1.04) | (-0.36) | (3.11) | (4.12) | | |
| RF | **-0.057** | **0.068** | -0.001 | -0.029 | 0.024 | **-0.004** | -0.004 | **0.097** | 0.612 | YES | 0.22 |
| | (-6.76) | (2.50) | (-0.20) | (-1.46) | (1.34) | (-1.70) | (-0.78) | (3.40) | (7.41) | | |
| | | | | | *Open-priced IPOs* | | | | | | |
| All | -0.017 | 0.005 | -0.002 | -0.038 | 0.076 | **-0.015** | 0.004 | 0.048 | 0.785 | YES | 0.28 |
| | (-0.42) | (0.16) | (-0.13) | (-0.98) | (1.44) | (-1.76) | (0.77) | (0.60) | (2.46) | | |
| RF | -0.043 | 0.004 | 0.006 | -0.032 | 0.072 | -0.011 | 0.006 | 0.024 | 0.622 | YES | 0.36 |
| | (-1.51) | (0.13) | (0.46) | (-0.94) | (1.59) | (-1.27) | (0.41) | (0.30) | (2.58) | | |

The dependent variable is *Underpricing* defined as the percentage change from offer price to first day closing price. *Document Length* is log of total number words in the whole document. See Appendix for variable definitions of controls.

**Panel C.** *OLS results for the relation between underpricing and information content of admission document*

| Section | Standard Content | Distinctive Content | VC backed | Log Net proceeds | AIM Dummy | Internet Dummy | Log Und. Share | Log Firm Age | Market Return | Intrcpt. | Year & Industry | R-sqr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *Fixed-priced IPOs* | | | | | | |
| All | 0.095 | **0.262** | **0.071** | -0.010 | -0.015 | 0.003 | **-0.006** | -0.004 | **0.093** | -0.113 | YES | 0.16 |
| | (1.63) | (2.79) | (2.50) | (-1.59) | (-0.61) | (0.17) | (-1.93) | (-0.73) | (3.37) | (-1.02) | | |
| RF | 0.028 | **0.266** | **0.068** | -0.007 | -0.013 | 0.010 | -0.004 | -0.006 | **0.100** | -0.104 | YES | 0.22 |
| | (0.62) | (5.07) | (2.57) | (-1.09) | (-0.57) | (0.60) | (-1.62) | (-1.31) | (3.51) | (-1.35) | | |
| | | | | | | *Open-priced IPOs* | | | | | | |
| All | **-0.396** | -0.095 | 0.005 | -0.012 | -0.048 | **0.116** | **-0.025** | 0.012 | 0.063 | **0.785** | YES | 0.37 |
| | (-2.42) | (-0.30) | (0.12) | (-0.74) | (-1.11) | (2.38) | (-3.22) | (0.70) | (0.76) | (2.46) | | |
| RF | -0.123 | **0.327** | 0.025 | -0.001 | -0.023 | **0.078** | **-0.016** | 0.004 | 0.005 | 0.093 | YES | 0.45 |
| | (-1.35) | (1.97) | (0.72) | (-0.05) | (-0.76) | (2.27) | (-2.06) | (0.30) | (0.07) | (0.56) | | |

The dependent variable is *Underpricing* defined as the percentage change from offer price to first day closing price. *Standard content* is the sum of coefficients, $\beta_{standard,i} = \beta_{cur,i} + \beta_{ind,i}$, in the OLS regression: $rep_i = \beta_{cur,i} rep_{cur,i} + \beta_{ind,i} rep_{ind,i}$ where *rep* stands for word frequency vector. *Distinctive content* is the absolute sum of residual term in the regression above. See Appendix for variable definitions of controls.

**Table 2.5. Relation between offer price and admission documents**
**Panel A.** *OLS results for the relation between offer price and tone of admission document*

| | Tone Variable | VC backed | Log Net Proceeds | AIM Dummy | Internet Dummy | Log Und. Share | Log Firm Age | Market Return | Intrcpt. | Year & Industry | R-sqr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Fixed-priced IPOs* | | | | | | |
| % Positive | **0.893** (2.18) | **-0.259** (-2.01) | **0.238** (5.05) | -0.038 (-0.28) | -0.005 (-0.06) | **0.051** (2.60) | 0.025 (0.59) | 0.033 (0.17) | -0.296 (-0.85) | YES | 0.29 |
| % Negative | **0.414** (1.66) | **-0.175** (-1.66) | **0.246** (5.37) | -0.051 (-0.39) | -0.091 (-1.22) | **0.050** (2.39) | 0.030 (0.68) | 0.040 (0.21) | -0.251 (-0.66) | YES | 0.27 |
| % Uncertain | **0.500** (2.14) | -0.154 (-1.42) | **0.242** (5.44) | -0.068 (-0.52) | -0.106 (-1.54) | **0.052** (2.52) | 0.034 (0.80) | 0.059 (0.30) | -0.358 (-0.98) | YES | 0.28 |
| % Litigation | 0.091 (0.55) | -0.146 (-1.34) | **0.247** (5.53) | -0.061 (-0.46) | -0.059 (-0.79) | **0.051** (2.48) | 0.027 (0.63) | 0.044 (0.23) | 0.060 (0.16) | YES | 0.26 |
| % Weak | **0.858** (2.15) | -0.131 (-1.19) | **0.244** (5.59) | -0.087 (-0.65) | -0.13 (-1.52) | **0.051** (2.43) | 0.037 (0.95) | 0.078 (0.40) | -0.279 (-0.82) | YES | 0.28 |
| % Strong | 0.509 (1.18) | -0.172 (-1.52) | **0.240** (5.55) | -0.094 (-0.71) | -0.038 (-0.55) | **0.052** (2.52) | 0.035 (0.87) | 0.036 (0.18) | -0.030 (-0.09) | YES | 0.27 |
| | | | | | *Open-priced IPOs* | | | | | | |
| % Positive | **-3.006** (-1.85) | 0.260 (0.69) | **0.342** (1.90) | 0.250 (0.44) | -0.80 (-1.17) | 0.088 (0.99) | -0.125 (-1.02) | **1.467** (1.81) | 0.905 (0.69) | YES | 0.40 |
| % Negative | **-3.327** (-1.80) | 0.033 (0.09) | **0.430** (2.22) | 0.354 (0.61) | -0.078 (-0.08) | 0.111 (1.35) | -0.067 (-0.52) | 1.389 (1.54) | 2.815 (1.35) | YES | 0.45 |
| % Uncertain | -1.075 (-0.61) | -0.167 (-0.49) | **0.443** (2.02) | 0.154 (0.26) | -0.791 (-1.03) | 0.044 (0.53) | -0.17 (-1.22) | 1.198 (1.46) | 0.613 (0.26) | YES | 0.38 |
| % Litigation | -2.276 (-1.16) | -0.182 (-0.49) | **0.471** (2.26) | 0.631 (0.84) | -0.927 (-1.26) | 0.007 (0.07) | -0.082 (-0.62) | 1.103 (1.28) | 1.445 (0.77) | YES | 0.42 |
| % Weak | -0.820 (-0.44) | -0.162 (-0.47) | **0.398** (2.05) | 0.119 (0.21) | -0.749 (-0.82) | 0.051 (0.61) | -0.154 (-1.19) | 1.173 (1.46) | -0.042 (-0.02) | YES | 0.38 |
| % Strong | -1.277 (-0.45) | -0.215 (-0.62) | **0.378** (1.91) | 0.108 (0.19) | -0.744 (-0.86) | 0.058 (0.68) | -0.145 (-1.13) | 1.259 (1.52) | 0.098 (0.05) | YES | 0.38 |

The dependent variable is *Offer Price.* Tone variables (*positive*, *negative*, *uncertain*, *litigation*, *weak* and *strong*) are constructed by word lists provided by LM (2011). Definitions of controls are given in Appendix.

**Table 2.5 Continued**

**Panel B**. *OLS results for the relation between offer price and length of admission document*

| Section | Document Length | VC backed | Log Net Proceeds | AIM Dummy | Internet Dummy | Log Und. Share | Log Firm Age | Market Return | Intrcpt. | Year & Industry | R-sqr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Fixed-priced IPOs* | | | | | | |
| All | **0.256** | **-0.190** | **0.223** | 0.045 | -0.069 | **0.041** | 0.022 | 0.016 | **-2.615** | YES | 0.28 |
| | (2.07) | (-1.74) | (4.32) | (0.32) | (-1.03) | (2.04) | (0.53) | (0.08) | (-1.96) | | |
| RF | **0.260** | -0.165 | **0.200** | 0.013 | -0.133 | **0.043** | 0.031 | 0.005 | **-1.988** | YES | 0.30 |
| | (2.61) | (-1.52) | (4.12) | (0.10) | (-1.71) | (2.32) | (0.76) | (0.02) | (-2.34) | | |
| | | | | | *Open-priced IPOs* | | | | | | |
| All | 0.835 | -0.149 | **0.296** | 0.311 | -0.972 | 0.004 | -0.142 | **1.653** | -9.894 | YES | 0.41 |
| | (0.99) | (-0.44) | (1.73) | (0.50) | (-1.30) | (0.03) | (-1.19) | (1.84) | (-1.09) | | |
| RF | -0.122 | -0.225 | **0.444** | 0.138 | -0.980 | 0.088 | -0.136 | **1.272** | -0.386 | YES | 0.39 |
| | (-1.13) | (-0.66) | (2.36) | (0.24) | (-1.37) | (1.09) | (-1.08) | (1.65) | (-0.24) | | |

The dependent variable is *Offer Price. Document Length* is log of total number words in the whole document. See Appendix for variable definitions of controls.

**Panel C.** *OLS results for the relation between offer price and information content of admission document*

| Section | Standard Content | Distinctive Content | VC backed | Log Net Proceeds | AIM Dummy | Internet Dummy | Log Und. Share | Log Firm Age | Market Return | Intrcpt. | Year & Industry | R-sqr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *Fixed-priced IPOs* | | | | | | |
| All | **-0.891** | 1.022 | **-0.212** | **0.234** | -0.014 | -0.034 | **0.048** | 0.022 | -0.018 | 0.664 | YES | 0.28 |
| | (-1.75) | (1.61) | (-1.72) | (4.82) | (-0.09) | (-0.47) | (2.37) | (0.49) | (-0.09) | (1.07) | | |
| RF | **-0.577** | -0.008 | -0.164 | **0.231** | -0.051 | -0.067 | **0.053** | 0.021 | 0.019 | 0.833 | YES | 0.27 |
| | (-1.99) | (-0.03) | (-1.50) | (4.83) | (-0.38) | (-0.89) | (2.55) | (0.48) | (0.10) | (1.56) | | |
| | | | | | | *Open-priced IPOs* | | | | | | |
| All | 0.291 | 0.717 | -0.197 | **0.391** | 0.089 | -0.962 | 0.060 | -0.148 | 1.277 | -1.300 | YES | 0.38 |
| | (0.15) | (0.27) | (-0.55) | (1.94) | (0.15) | (-1.34) | (0.59) | (-1.12) | (1.53) | (-0.41) | | |
| RF | 1.335 | 1.012 | -0.310 | **0.403** | 0.024 | -0.966 | 0.091 | -0.157 | 1.093 | -2.45 | YES | 0.39 |
| | (1.36) | (0.81) | (-1.01) | (2.14) | (0.04) | (-1.27) | (1.06) | (-1.13) | (1.47) | (-1.14) | | |

The dependent variable is *Offer Price. Standard content* is the sum of coefficients, $\beta_{standard,i} = \beta_{cur,i} + \beta_{ind,i}$, in the OLS regression: $rep_i = \beta_{cur,i} rep_{cur,i} + \beta_{ind,i} rep_{ind,i}$ where *rep* stands for word frequency vector. *Distinctive content* is the absolute sum of residual term in the regression above. See Appendix for variable definitions of controls.

**Table 2.6. Post-IPO return volatility and admission documents**

**Panel A.** *OLS results for the relation between Post-IPO return volatility and tone of admission document*

| | Tone Variable | VC backed | Log Net Proceeds | AIM Dummy | Internet Dummy | Log Und. Share | Log Firm Age | Market Return | Intrcpt. | Year & Industry | R-sqr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Fixed-priced IPOs (N=264)* | | | | | | |
| % Positive | -0.017 (-1.21) | 0.010 (1.53) | **-0.002** (-2.49) | **-0.011** (-2.73) | -0.001 (-0.02) | **-0.001** (-2.44) | -0.001 (-0.59) | **0.011** (2.08) | **0.058** (5.37) | YES | 0.16 |
| % Negative | -0.002 (-0.26) | 0.008 (1.22) | **-0.002** (-2.59) | **-0.011** (-2.58) | 0.001 (0.12) | **-0.001** (-2.29) | -0.001 (-0.60) | **0.011** (1.99) | **0.051** (5.19) | YES | 0.15 |
| % Uncertain | 0.001 (0.08) | 0.008 (1.23) | **-0.002** (-2.56) | **-0.011** (-2.49) | 0.001 (0.04) | **-0.001** (-2.34) | -0.001 (-0.57) | **0.011** (2.20) | **0.048** (4.36) | YES | 0.15 |
| % Litigation | -0.006 (-1.00) | 0.007 (1.19) | **-0.003** (-2.73) | **-0.011** (-2.53) | 0.001 (0.10) | **-0.001** (-2.42) | -0.001 (-0.64) | **0.011** (1.93) | **0.057** (4.96) | YES | 0.15 |
| % Weak | 0.002 (0.18) | 0.008 (1.23) | **-0.002** (-2.54) | **-0.011** (-2.46) | 0.001 (0.01) | **-0.001** (-2.35) | -0.001 (-0.56) | **0.011** (2.24) | **0.048** (5.27) | YES | 0.15 |
| % Strong | -0.008 (-0.49) | 0.008 (1.27) | **-0.002** (-2.36) | **-0.01** (-2.10) | 0.001 (0.02) | **-0.001** (-2.36) | -0.001 (-0.64) | **0.011** (2.07) | **0.052** (6.30) | YES | 0.15 |
| | | | | | *Open-priced IPOs* | | | | | | |
| % Positive | 0.010 (0.73) | -0.002 (-0.33) | -0.002 (-0.75) | -0.004 (-0.70) | **0.025** (4.06) | -0.001 (-1.61) | -0.003 (-1.16) | 0.001 (0.08) | **0.065** (4.18) | YES | 0.45 |
| % Negative | **0.027** (1.84) | -0.002 (-0.39) | -0.002 (-0.94) | -0.006 (-0.86) | **0.018** (2.39) | -0.002 (-1.55) | -0.003 (-1.45) | -0.002 (-0.18) | 0.038 (1.63) | YES | 0.48 |
| % Uncertain | 0.024 (1.10) | -0.002 (-0.28) | -0.004 (-1.23) | -0.006 (-1.32) | **0.021** (5.46) | -0.001 (-0.90) | -0.002 (-1.04) | 0.005 (0.43) | **0.046** (1.91) | YES | 0.49 |
| % Litigation | 0.001 (0.14) | -0.001 (-0.12) | -0.002 (-0.86) | -0.004 (-0.62) | **0.025** (3.90) | -0.001 (-1.29) | -0.003 (-1.12) | 0.002 (0.18) | **0.069** (4.07) | YES | 0.45 |
| % Weak | 0.042 (1.60) | -0.003 (-0.56) | -0.003 (-1.12) | -0.006 (-1.30) | **0.015** (2.77) | -0.001 (-0.93) | -0.002 (-1.17) | 0.010 (0.73) | **0.041** (1.87) | YES | 0.52 |
| % Strong | -0.009 (-0.33) | -0.001 (-0.13) | -0.002 (-0.94) | -0.004 (-0.67) | **0.026** (4.90) | -0.001 (-1.36) | -0.003 (-1.19) | 0.001 (0.11) | **0.076** (4.02) | YES | 0.45 |

Dependent variable is *Post-IPO return volatility* calculated as the standard deviation of 60-day return during the period from day +5 to day +64 after the issue date. Tone variables (*positive, negative, uncertain, litigation, weak* and *strong*) are constructed by word lists provided by LM (2011). Definitions of controls are given in Appendix.

**Table 2.6 Continued**

**Panel B.** *OLS results for the relation between Post-IPO return volatility and length of admission document*

| Section | Document Length | VC backed | Log Net Proceeds | AIM Dummy | Internet Dummy | Log Und. Share | Log Firm Age | Market Return | Intrcpt. | Year & Industry | R-sqr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Fixed-priced IPOs* | | | | | | |
| All | **-0.009** | 0.009 | -0.001 | **-0.014** | 0.001 | -0.001 | -0.001 | **0.011** | **0.153** | YES | 0.17 |
| | (-2.32) | (1.52) | (-1.41) | (-2.87) | (0.22) | (-1.62) | (-0.38) | (2.15) | (3.25) | | |
| RF | **-0.005** | 0.008 | -0.001 | **-0.012** | 0.002 | **-0.001** | -0.001 | **0.011** | **0.098** | YES | 0.17 |
| | (-2.80) | (1.32) | (-1.35) | (-2.56) | (0.57) | (-2.07) | (-0.50) | (2.16) | (4.94) | | |
| | | | | | *Open-priced IPOs* | | | | | | |
| All | -0.002 | -0.001 | -0.002 | -0.004 | **0.026** | -0.001 | -0.003 | 0.012 | **0.091** | YES | 0.43 |
| | (-0.45) | (-0.14) | (-0.76) | (-0.80) | (3.62) | (-0.98) | (-1.15) | (0.12) | (1.72) | | |
| RF | -0.003 | -0.001 | -0.002 | -0.004 | **0.025** | -0.001 | -0.002 | -0.001 | **0.096** | YES | 0.46 |
| | (-0.60) | (-0.17) | (-0.64) | (-0.68) | (4.46) | (-0.60) | (-1.16) | (-0.02) | (1.96) | | |

Dependent variable is *Post-IPO return volatility* calculated as the standard deviation of 60-day return during the period from day +5 to day +64 after the issue date. *Document Length* is log of total number words in the whole document. See Appendix for variable definitions of controls.

**Panel C.** *OLS results for the relation between Post-IPO return volatility and information content of admission document*

| Section | Standard Content | Distinctive Content | VC backed | Log Net Proceeds | AIM Dummy | Internet Dummy | Log Und. Share | Log Firm Age | Market Return | Intrcpt. | Year & Industry | R-sqr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | *Fixed-priced IPOs* | | | | | | |
| All | -0.002 | **0.055** | 0.007 | **-0.002** | **-0.011** | -0.001 | **-0.001** | -0.001 | **0.011** | **0.022** | YES | 0.16 |
| | (-0.13) | (2.27) | (1.22) | (-2.25) | (-2.30) | (-0.07) | (-2.16) | (-0.64) | (2.18) | (0.95) | | |
| RF | -0.009 | **0.025** | 0.007 | **-0.002** | **-0.011** | 0.001 | **-0.001** | -0.001 | **0.011** | **0.039** | YES | 0.17 |
| | (-0.95) | (1.72) | (1.33) | (-2.29) | (-2.29) | (0.03) | (-1.71) | (-0.80) | (2.12) | (2.53) | | |
| | | | | | | *Open-priced IPOs* | | | | | | |
| All | 0.006 | **0.077** | 0.001 | -0.002 | -0.005 | **0.023** | -0.001 | -0.003 | -0.001 | 0.024 | YES | 0.48 |
| | (0.34) | (2.49) | (0.14) | (-1.11) | (-0.72) | (4.20) | (-1.47) | (-1.12) | (-0.12) | (0.67) | | |
| RF | 0.016 | 0.049 | -0.002 | -0.002 | -0.005 | **0.022** | -0.001 | **-0.004** | -0.005 | 0.016 | YES | 0.55 |
| | (1.41) | (1.54) | (-0.35) | (-0.93) | (-0.94) | (5.94) | (-0.24) | (-1.73) | (-0.53) | (0.50) | | |

Dependent variable is *Post-IPO return volatility* calculated as the standard deviation of 60-day return during the period from day +5 to day +64 after the issue date. *Standard content* is the sum of coefficients, $\beta_{standard,i} = \beta_{cur,i} + \beta_{ind,i}$, in the OLS regression: $rep_i = \beta_{cur,i} rep_{cur,i} + \beta_{ind,i} rep_{ind,i}$ where *rep* stands for word frequency vector. *Distinctive content* is the absolute sum of residual term in the regression above. See Appendix for variable definitions of controls.

**Table 2.7. Time varying tone of admission documents over the recent 2008 crisis period**

*Fixed-priced IPOs*

| | Pre-Crisis | | | During Crisis | | | Difference |
|---|---|---|---|---|---|---|---|
| | Mean | Std | Median | Mean | Std | Median | |
| Total words (Whole doc) | 42821.37 | 19261.09 | 38297.00 | 67627.82 | 34454.13 | 56990.50 | -24806.45*** |
| Total words (Risk factors ) | 3081.26 | 2140.49 | 2583.00 | 6147.04 | 3621.68 | 5320.00 | -3065.78*** |
| Total words (Risk factors %) | 0.07 | 0.03 | 0.06 | 0.09 | 0.04 | 0.09 | -0.02*** |
| % Positive words | 0.58 | 0.14 | 0.58 | 0.56 | 0.13 | 0.56 | 0.02 |
| % Negative words | 1.01 | 0.17 | 1.00 | 1.14 | 0.18 | 1.11 | -0.13** |
| % Uncertain words | 1.09 | 0.19 | 1.06 | 1.19 | 0.16 | 1.20 | -0.10** |
| % Litigation words | 1.16 | 0.24 | 1.14 | 1.16 | 0.26 | 1.14 | 0.00 |
| % Weak words | 0.55 | 0.12 | 0.54 | 0.57 | 0.12 | 0.57 | -0.02 |
| % Strong words | 0.51 | 0.11 | 0.51 | 0.48 | 0.11 | 0.47 | 0.03** |
| Standard Content | 0.99 | 0.10 | 1.00 | 1.00 | 0.09 | 1.00 | -0.01 |
| Distinctive Content | 0.55 | 0.05 | 0.55 | 0.54 | 0.06 | 0.54 | 0.01 |

*Open-priced IPOs*

| | Pre-Crisis | | | During Crisis | | | Difference |
|---|---|---|---|---|---|---|---|
| | Mean | Std | Median | Mean | Std | Median | |
| Total words (Whole doc) | 83426.85 | 39526.99 | 82517.00 | 103065.45 | 52688.43 | 99147.00 | -19638.60* |
| Total words (Risk factors ) | 6067.55 | 3785.96 | 5374.00 | 9182.45 | 4798.21 | 8088.50 | -3114.90** |
| Total words (Risk factors %) | 0.08 | 0.04 | 0.06 | 0.09 | 0.02 | 0.08 | -0.01** |
| % Positive words | 0.59 | 0.13 | 0.56 | 0.59 | 0.10 | 0.56 | 0.00 |
| % Negative words | 1.09 | 0.16 | 1.07 | 1.11 | 0.17 | 1.09 | -0.02 |
| % Uncertain words | 1.13 | 0.18 | 1.10 | 1.25 | 0.18 | 1.25 | -0.12** |
| % Litigation words | 1.09 | 0.21 | 1.07 | 1.05 | 0.24 | 0.97 | 0.04 |
| % Weak words | 0.58 | 0.15 | 0.56 | 0.61 | 0.13 | 0.62 | -0.03 |
| % Strong words | 0.50 | 0.10 | 0.48 | 0.45 | 0.07 | 0.45 | 0.05** |
| Standard Content | 0.93 | 0.10 | 0.92 | 0.96 | 0.08 | 0.98 | -0.03 |
| Distinctive Content | 0.55 | 0.04 | 0.55 | 0.52 | 0.06 | 0.52 | 0.03** |

The sample consists of 320 fixed-priced and 69 book-built IPOs completed during 2004-2012. Pre-crisis period is from 2004 to 2007. Tone variables (*positive, negative, uncertain, litigation, weak* and *strong*) are constructed by word lists provided by LM (2011). *Standard content* is the sum of coefficients, $\beta_{standard,i} = \beta_{cur,i} + \beta_{ind,i}$, in the OLS regression: $rep_i = \beta_{cur,i} rep_{cur,i} + \beta_{ind,i} rep_{ind,i}$ where *rep* stands for word frequency vector. *Distinctive content* is the absolute sum of residual term in the regression above.

**Table 2.8. Time varying impact of admission documents**

**Panel A.** *Time varying impact of tone of admission document on underpricing*

| | Tone Variable | VC backed | Log Net Proceeds | AIM Dummy | Internet Dummy | Log Und. Share | Log Firm Age | Market Return | Intrcpt. | Year & Industry | R-sqr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Before the 2008 Crisis (N. Obs=240)* | | | | | | | | | | | |
| % Positive | -0.009 | **0.076** | -0.007 | 0.001 | 0.019 | **-0.007** | -0.002 | **0.097** | 0.126 | YES | 0.12 |
| | (-0.13) | (2.34) | (-0.95) | (0.05) | (0.70) | (-1.96) | (-0.26) | (2.51) | (1.61) | | |
| % Negative | **-0.068** | **0.079** | -0.006 | 0.001 | 0.021 | **-0.007** | -0.002 | **0.101** | **0.185** | YES | 0.13 |
| | (-1.79) | (2.38) | (-0.93) | (0.04) | (0.77) | (-1.91) | (-0.28) | (2.79) | (2.61) | | |
| % Uncertain | **-0.085** | **0.074** | -0.007 | 0.001 | 0.026 | -0.007 | -0.003 | **0.094** | **0.204** | YES | 0.14 |
| | (-2.23) | (2.31) | (-0.98) | (0.03) | (1.04) | (-1.91) | (-0.47) | (2.44) | (2.62) | | |
| % Litigation | **-0.049** | **0.070** | -0.007 | 0.001 | 0.023 | **-0.008** | -0.001 | **0.096** | **0.185** | YES | 0.13 |
| | (-2.90) | (2.17) | (-0.94) | (0.04) | (0.87) | (-2.14) | (-0.17) | (2.47) | (2.87) | | |
| % Weak | **-0.110** | **0.071** | -0.007 | 0.003 | 0.032 | **-0.007** | -0.003 | **0.092** | **0.176** | YES | 0.14 |
| | (-1.89) | (2.21) | (-1.01) | (0.11) | (1.21) | (-1.87) | (-0.50) | (2.33) | (2.55) | | |
| % Strong | -0.038 | **0.076** | -0.007 | 0.004 | 0.019 | **-0.007** | -0.002 | **0.098** | **0.138** | YES | 0.12 |
| | (-0.35) | (2.30) | (-0.87) | (0.13) | (0.71) | (-2.01) | (-0.36) | (2.58) | (1.71) | | |
| *After the 2008 Crisis (N. Obs=80)* | | | | | | | | | | | |
| % Positive | 0.093 | -0.080 | -0.023 | -0.040 | **-0.060** | -0.003 | -0.008 | 0.068 | **0.219** | YES | 0.26 |
| | (0.80) | (-1.30) | (-1.34) | (-0.95) | (-3.04) | (-0.57) | (-0.68) | (0.81) | (2.03) | | |
| % Negative | -0.013 | -0.039 | -0.023 | -0.042 | **-0.061** | -0.004 | -0.008 | 0.064 | **0.304** | YES | 0.24 |
| | (-0.20) | (-0.90) | (-1.30) | (-1.01) | (-2.32) | (-0.88) | (-0.59) | (0.75) | (2.54) | | |
| % Uncertain | 0.069 | -0.036 | -0.026 | -0.050 | **-0.073** | -0.003 | -0.008 | 0.073 | **0.213** | YES | 0.27 |
| | (1.34) | (-1.03) | (-1.56) | (-1.18) | (-3.44) | (-0.60) | (-0.60) | (0.94) | (2.12) | | |
| % Litigation | -0.017 | -0.035 | -0.024 | -0.040 | **-0.062** | -0.004 | -0.008 | 0.063 | **0.308** | YES | 0.26 |
| | (-0.39) | (-0.89) | (-1.36) | (-0.97) | (-2.88) | (-0.90) | (-0.61) | (0.76) | (3.15) | | |
| % Weak | 0.021 | -0.044 | -0.024 | -0.045 | **-0.065** | -0.004 | -0.007 | 0.069 | **0.279** | YES | 0.26 |
| | (0.31) | (-1.26) | (-1.36) | (-1.10) | (-3.20) | (-0.77) | (-0.54) | (0.83) | (2.54) | | |
| % Strong | -0.120 | -0.036 | -0.018 | -0.025 | **-0.070** | -0.006 | -0.010 | 0.049 | **0.322** | YES | 0.27 |
| | (-0.97) | (-1.01) | (-1.13) | (-0.58) | (-3.22) | (-1.32) | (-0.83) | (0.60) | (3.15) | | |

The dependent variable is *Underpricing* defined as the percentage change from offer price to first day closing price. Tone variables (*positive, negative, uncertain, litigation, weak* and *strong*) are constructed by word lists provided by LM (2011). Pre-crisis period is from 2004 to 2007.Definitions of controls are given in Appendix.

**Table 2.8 Continued**

**Panel B.** *Time varying impact of admission document's length on underpricing*

| Section | Document Length | VC backed | Log Net Proceeds | AIM Dummy | Internet Dummy | Log Und. Share | Log Firm Age | Market Return | Intrcpt. | Year & Industry | R-sqr |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | *Before the 2008 Crisis(N. Obs=240)* | | | | | | |
| All | **-0.088** | **0.091** | 0.001 | -0.037 | 0.017 | -0.005 | -0.001 | **0.105** | **1.065** | YES | 0.18 |
| | (-3.31) | (3.11) | (0.01) | (-1.27) | (0.65) | (-1.29) | (-0.16) | (2.59) | (3.64) | | |
| RF | **-0.063** | **0.080** | 0.003 | -0.020 | 0.026 | -0.005 | -0.003 | **0.106** | **0.614** | YES | 0.21 |
| | (-6.39) | (2.73) | (0.56) | (-0.82) | (1.07) | (-1.45) | (-0.52) | (2.92) | (6.62) | | |
| | | | | | *After the 2008 Crisis (N. Obs=80)* | | | | | | |
| All | -0.057 | **-0.061** | -0.013 | -0.067 | -0.037 | 0.001 | -0.004 | 0.078 | **0.886** | YES | 0.30 |
| | (-1.36) | (-1.75) | (-0.65) | (-1.48) | (-1.24) | (0.05) | (-0.33) | (1.07) | (2.01) | | |
| RF | -0.03 | -0.049 | -0.013 | -0.041 | -0.033 | -0.004 | -0.006 | 0.075 | 0.517 | YES | 0.29 |
| | (-1.29) | (-1.45) | (-0.61) | (-1.03) | (-0.92) | (-0.87) | (-0.46) | (1.01) | (3.04) | | |

The dependent variable is *Underpricing* defined as the percentage change from offer price to first day closing price. *Document Length* is log of total number words in the whole document. Pre-crisis period is from 2004 to 2007. See Appendix for variable definitions of controls.

# CHAPTER 3

## Trends in European IPO market after the Financial Crisis

## 3.1. Introduction

The recent crisis has had a major impact on IPO activity throughout the world, which has experienced a long period of stagnancy with very few new offerings and underwriters engaging in fierce competition to secure the few available deals. In 2011, Bloomberg reported that IPO fees in Europe had hit a historical record low at 1.88%, far lower than the 5.4% fees charged on the US IPOs[21].

Underwriting fees represent substantial costs for a listed company. Underwriters have charged substantially less on European IPOs as compared to US ones, as documented by Abrahamson et al. (2011). Is it indeed the case that gross spreads have become even lower during and after the financial crisis? Gross spreads, though, are only part of the costs of going public. As the literature on IPOs widely documents, another substantial cost is underpricing, or money left "on the table". Ritter (2012) states that a medium-sized candidate company loses, on average, 5% of its post-IPO market value because of underpricing. If we include gross spread, the total cost of an IPO, in the US, can reach 10 to 17% of post-IPO capitalization, indicating that the cost of going public plays a important role in a company's decision in this regard. He further argues that it is not clear whether and how the direct and indirect costs of IPO have changed over the last decade, and indeed very little research has been carried out to shed light on this question, particularly in Europe. This paper attempts to fill this gap by investigating whether and how the costs of going public in Europe, both direct (gross spreads) and indirect (underpricing), have changed in the wake of the recent financial turmoil.

Up to now very few papers have investigated European IPO markets, and usually these have been country-specific (mostly in the UK). To the best of our knowledge, no paper has looked at recent IPOs in Europe. In this paper, we construct a pan-European dataset of IPOs

[21]Bloomberg "IPO Fees in Europe Fall to Record Low as More Banks Chase Deals", 2011-09-20

between 2000 and 2012 which allows us to address our research question. Our results show that both underpricing and underwriting fees have decreased since 2007. When comparing our results with those of Abrahmason et al. (2011), it clearly emerges that gross spreads in Europe have decreased further, whereas this is much less the case in the US. We also provide evidence that underwriter reputation increases the level of underpricing in the post-crisis period, suggesting that the certification role of investment banks has become much weaker. In addition, in the EU underwriters seem to be syndicating more in the recession than they did in the pre-crisis period.

The paper goes onto attempt to shed light on the determinants of the decision to go public during the financial crisis. The question “Why do companies go public?” is in general a very important one, and, as Ritter and Welch (2002) argue, "there are myriad theoretical reasons for firms wanting to go public, but only sparse evidence due to a general lack of data on the pool of private firms". The lack of suitable data on private companies does indeed tend to be a major obstacle for the investigation of this question. A notable exception is the seminal paper by Pagano, Panetta and Zingales (1998). Using a proprietary database of public and private Italian companies, they empirically test alternative theories that have been proposed to explain IPO decisions. They show that company size and industry market-to-book ratio may explain the likelihood of going public, and that for a company the incentive for IPO is not primarily to obtain external financing, but to rebalance accounts in times of high investment or growth. The authors also find that IPO lowers the cost of borrowing and increases turnover in control.

Building on this paper, we investigate the determinants of going public during the financial crisis. Owing to availability of data, we restrict our focus to the UK IPO market only, as in the UK we are also able to gather data on private companies, which allows us to conduct a meaningful analysis, given that both private and public companies are subject to similar regulations and tax rules (Ball and Shivakumar 2005). The UK is, however, the largest

European IPO market, and so it is certainly pertinent to acquire a deeper insight into what has motivated UK companies to go public during the crisis, and whether these factors have changed when compared to listing decisions before 2007. We show that pre-crisis determinants do not have the same explanatory power since 2007, and, more generally, that the models have very little power to explain IPO decisions during the financial crisis. Interestingly, we find that market-to-book ratio has opposite coefficient estimates in the two periods.

The rest of the paper is organized as follows. Section 2 reviews earlier literature on IPO decisions and the costs of IPO, while Section 3 is concerned with data and methodology. In Section 4, we provide preliminary results, along with summary statistics, and Section 5 provides a conclusion.

## Literature Review

### *3.2.1. The Costs of IPO*

Gross spread represents the largest part of the direct costs of an IPO. Chen and Ritter (2000) show that during the period between 1995 and 1998, there is a clustering of underwriters' fees at exactly 7% for IPOs of a size ranging from 20 million to 80 million dollars. They demonstrate that 90% of medium-sized issues paid a gross spread of 7%.

Recently, Abrahamson, Jenkinson and Jones (2011) have found that this figure of 7% remains relevant for the US market, reaching an even bigger proportion of approximately 95% between 1998 and 2007. They also provide empirical evidence that European IPO fees do not show such a clustering, and that there is a clear wedge between gross spreads in the US and those in Europe, specifically showing that underwriters in Europe which also operate in the US tend to charge 3% less for fees. The authors test for several alternative explanations such as litigation risk, legal cost and retail offerings, but conclude that none of these provide clear evidence which explains why fees for European IPOs are cheaper.

Corwin and Schultz (2005) show that gross spread and the number of underwriters are positively correlated. Similarly, using a sample of secondary equity offerings (SEO) completed in the US between 1995 and 2004, Huang and Zhang (2011) find that the number of underwriters is positively associated with gross spread. This suggests that more bookrunners induce more marketing efforts and hence demand more compensation. Their results show no sign of variation in the cost of SEOs.

The indirect costs of placing an IPO are mainly related to underpricing, one of the most puzzling issues in finance. The literature on underpricing is wide-ranging, and a number of theoretical arguments, accompanied by empirical evidence, have been suggested to explain first day return. As pointed out in the first chapter, Ljungqvist (2007) classifies theoretical arguments into several groups such as information asymmetry theories, agency cost arguments, institutional explanations and behavioral approach (see Chapter One for a detailed discussion of literature on underpricing).

### ***3.2.2.*** *The IPO Decision*

The literature on IPO provides several theoretical arguments, but very little empirical evidence to explain the motivations for going public. Our understanding of the determinants of IPO decisions is limited to only one empirical paper by Pagano et al. (1998) and a few survey articles, such as Brau and Fawcett (2006) and Graham and Harvey (2001), the latter of which is concerned with CEOs' financing decisions rather than with IPO motivations.

Ritter and Welch (2002) nicely summarize most recognized explanations, categorizing them into two groups: the market timing approach, and life cycle theories. We shall briefly touch here on the general notions underlying each class of explanation.

Market timing hypothesis is concerned with the relationship between market wide conditions and external financing decisions made by equity offerings. Early studies such as Ibbotson and Jaffe (1975) and Ibbotson, Sindelar and Ritter (1988) show that IPOs are

clustered in time. These papers also show that there are "hot markets" where IPO offer price and underpricing increase. Lucas and McDonald (1990) study a model that posits that information asymmetry between issuer and investor plays a role in explaining equity offerings. If companies know that the market undervalues the true price then they will delay equity offerings until a bull market allows for more favorable pricing. Consistent with this argument, Benveniste, Ljungqvist, Wilhelm and Yu (2003) and Lowry and Schwert (2002) show that firms tend to time the IPO market, highlighting a substantial increase in initial IPO filings after high offer prices are observed. Ritter and Welch (2002) and Alti (2005) explain this pattern by the information spillover argument, namely that a potential issuer can assess investor demand by observing the price pattern of recent IPOs before deciding whether to go public. In a survey involving 336 chief financial officers (CFOs), Brau and Fawcett (2006) document the fact that their firms strategically time IPOs to exploit strong market conditions.

Life cycle theories rest on the notion that companies make corporate decisions based on the resources available, so that they can increase value over its lifetime. Such value creation by means of IPOs may be achieved for a variety of reasons. Some of the principal incentives for IPO in life cycle theories are diversification (Pagano 1993), after-market liquidity (Ellul and Pagano 2006), increased market monitoring (Stoughton and Zechner 1998), dispersed ownership (Chemmanur and Fulghieri 1999), higher likelihood of improved acquisition price (Zingales 1995), better reputation (Maksimovic and Pichler 2001), initiation of analyst coverage (Bradley, Jordan, and Ritter 2003), and innovation (Ferreira, Manso and Silva 2014).

## 3.3. Data and Methodology

### 3.3.1. *IPO Costs: Gross Spread and Underpricing*

Our IPO sample has been retrieved from Dealogic. Dealogic is one of the key databases used mainly by investment banks. For the EU deals, it has a wider coverage than standard IPO

databases such as SDC, and moreover it provides key pricing details as well as gross spreads of deals that are not easily available. The sample is composed of IPOs that took place between 2000 and 2012, inclusive. To be consistent with the standard exclusions done by many IPO studies, we have eliminated financial firms, closed-end funds, and real estate and property firms, as well as companies that are cross-listed.

To examine the impact of the recent financial crisis on the costs and determinants of IPOs, we divide our sample period into two regimes: the pre-crisis period, and the period of the crisis itself. We take the crisis period to be the time between 2008 and 2012, but our results remain qualitatively similar if we set the beginning of crisis as August 2007. In order to allow reasonable comparison of pre-crisis and crisis periods, we require each country in the sample to have at least five IPOs in both regimes. The data on price range and gross spread of underwriters in the US, on the other hand, is retrieved from the SDC database.

We investigate the determinants of underpricing by employing standard OLS regressions, where we take the following control variables into account:

*Und. share:* Underwriter market share calculated as the percentage of proceeds underwritten by each underwriter to the total amount underwritten by all underwriters in a given year.

*Fixed-Priced:* Dummy variable equal to one if the IPO mechanism is based on fixed pricing.

*Log Proceeds*: The natural logarithm of IPO proceeds.

*Market Ret:* Mean 30 day FTSE return before the issue date.

*Internet*: Dummy variable equal to one if the company is internet stock, zero otherwise.

*VC*: Dummy variable equal to one if the company is backed by venture capital funding.

*Main market*: Dummy variable equal to one if the IPO is listed in the main market of the corresponding country.

### *3.3.2. Determinants of IPO Decision*

We obtain financial balance sheet data on public and private UK companies from the Financial Analysis Made Easy (FAME) database compiled by Bureau Van Dijk. FAME provides comprehensive financial information for 2.8 million active firms, 1.8 million of which are provided in detailed format and the rest in summary format. In addition, the database covers about four million inactive firms, almost one million of which are in detailed format. FAME collects data from records such as annual reports, documents of incorporation, liquidator's accounts and articles filed at Companies House in the UK and the Companies Registration Office in Ireland. It also provides information about the ownership history of non-quoted companies, along with global and domestic ultimate ownership. When a firm is acquired, or switches from one type of ownership (public) to another (private), the database reports the date the company changed its name.

A number of checks are performed to filter and clean FAME data from outliers and data entry errors. First, we leave out those companies that show a change of over 30% in total assets from the prior fiscal year: through this, most divestments, mergers and acquisitions are controlled for, since such corporate events are likely to sharply alter the book value of total assets. Secondly, we compare financial statements for the same company provided by Computat Global tape, and finally all variables are winsorised at 1%.

Dealogic observations are then matched with FAME, based on the international securities identification number (ISIN), and for mismatched IPOs we perform merging based on company names. All of these steps leave us with a sample of a total of 455 IPOs, of which 367 IPOs are from the pre-crisis period (2003-2007) and the remaining 87 are completed during the crisis (2008-2012). Our sample of private firms for the same period is made up of 4,588 UK companies.

One of our main objectives is to test the varying determinants of IPO decisions over time. In order to achieve this, we follow Pagano et al. (1998), starting with the following Probit model:

$$Pr(IPO_{i,t}=1) = \alpha + \beta_1 ROA_{i,t-1} + \beta_2 CASH_{i,t-1} + \beta_3 SIZE_{i,t-1} + \beta_4 CAPEX_{i,t-1} + \beta_5 GROWTH_{i,t-1} + \beta_6 LEVERAGE_{i,t-1} + \beta_7 MTB_{i,t} + \beta_8 RATE_{i,t-1} + YEAR$$

The dependent variable IPO takes value 1 if the sample firm goes public in a given year, and 0 if the firm remains private. Return on assets (ROA) stands for profitability measure and is calculated as the ratio of EBITDA to total assets in the fiscal year before the given year *t*. CASH is the lagged total cash amount scaled by total assets. SIZE is measured by the log of sales at year *t-1*, while CAPEX is capital expenditure to total assets. GROWTH stands for the percentage change in sales from the prior year *t-1*. LEVERAGE is defined as long-term debt to total assets, and MTB the market-to-book ratio of listed companies in UK at year *t-1*. To incorporate the impact of borrowing constraints on IPO decisions, we have included the annual Euro LIBOR interest rate, *RATE*, from the European Central Bank.

### 3.4. Results

#### 3.4.1. *Summary Statistics*

In Table 3.1, we document IPO distribution over country and two time horizons. Our sample covers 2,864 IPOs completed between 2000 and 2012 in 13 European countries. The UK has the greatest number of issues, with 976 IPOs making up almost 35% of the whole sample. Offerings from France, Germany and Italy add up to 574, one fifth of the total. It is clear that the number of IPOs see a significant drop, falling from 2007 before the crisis to 857 during the crisis period. Another notable difference is in the market segment in which private companies intended to float. During the recent recession, firms in Belgium, France, Norway, Poland, Spain, Sweden and the UK tend to go to public in lower-equity market segments rather than through the main exchange of the country.

Panel B in Table 3.1 reports changes in determinant of IPOs by time and pricing mechanism. For fixed-priced IPOs, mean underpricing decreased by 1% during the crisis period, though the difference between the two time horizons is not significant. Fixed-priced IPOs are charged 0.46 % more during the recent financial recession, suggesting that going public via fixed pricing becomes more expensive. Both proceeds and listings on the main exchange show a significant drop during the crisis period.

On the other hand, IPO costs, underpricing and gross spread do not increase during the recent crisis. On average, underpricing declines by 13% in the EU since 2007. This difference is significant, at 1%. Similarly, mean gross spread falls from 3.69% to 3.02%. As with fixed-priced issues, open-priced IPOs received less VC funding during the crisis period, while listings on the main exchange increased by 6%. Unlike fixed-priced IPOs, there is no significant difference between proceeds in each of the two time horizons. In short, the summary statistics in Panel B indicate that companies that go public via fixed-pricing tend to be small, and have received lower proceeds and incurred greater costs during the unfavorable market conditions since 2007.

### *3.4.2. Underwriter Rankings and Fees in Europe*

Underwriter rankings in the EU during our sample period 2000-2012 are provided in Table 3.2. For each year, underwriters are ranked based on their market share, which is calculated as the percentage of IPO proceeds underwritten by each underwriter as part of the total amount underwritten by all underwriters in a given year. For syndicated deals, we do not take average proceeds, but assume that each syndicate member has underwritten the issue independently. Then, in each row, the top ten bookrunners' shares are reported, from the highest to the lowest. Panel A shows the abbreviated names of underwriters. We find that nine new underwriters (namely Millennium Investment Banking, Caixa, Banco Espirito Santo, Lazard-Natixis, Mediobanca, BBVA, PKO BP, Bankia and Bradesco BBI) enter the top ten during the

crisis period, and argue that these new arrivals might result from lower demand for reputable underwriters and increased underwriter competition after 2007.

In Panel B in Table 3.2, we report the dynamics of underwriter market shares for the top ten bookrunners during the sample period. For each year, the percentage underwriter share is provided. For example, UBS's market share in 2000 is 7%, and it varies from 2% to 9% between 2000 and 2012. The last row shows the total market share of the top ten underwriters, which is on average over 50%, with total market share reaching a peak of 74% in 2011.

The top ten underwriters in the EU are conglomerate investment banks which operate globally in most countries around the world. The EU underwriter market shares and fees are compared in Table 3.3 with those in the US market. The figures show first that eight of the top ten underwriters in both the EU and US are the same investment banks: Morgan Stanley, Goldman Sachs, Bank of America- Merrill Lynch, Deutsche Bank, Credit Suisse, JPMorgan, UBS Bank and Citi Group. Secondly, the top ten investment banks in the EU hold, on average, 58% of all underwriting business, whereas those in the US cover 91% of the whole IPO market. This shows that the IPO market in the EU is fragmented compared to the US. Thirdly, consistent with Abrahamson, Jenkinson and Jones (2011), there is a clear wedge between the mean fees charged by top underwriters in the EU and US.

Our next step is to look at the change in market share and fees of the top investments banks that operate in the EU and US. The results are shown in Panels B and C of 3.3. The volume of proceeds underwritten shows a remarkable drop for all investment banks after 2008. Although Morgan Stanley underwrites 100 billion Euros before the crisis, its market volume then shrinks to 26 billion between 2008 and 2012. However, the total market share of all top ten underwriters does not decline, but increase by almost 7% during the crisis period. In contrast to volume in the EU market, the volume of IPO proceeds of some underwriters in the US actually increased after 2007. For example, JPMorgan underwrites 22 billion dollars more

during the crisis period than in the pre-crisis era. Another difference between the EU and US is the change in total shares. In contrast to the total market share in the EU, the total market share of the top ten investment banks in the US remains closer across the two time periods: in both periods, those ten bookrunners underwrite more than 90% of all IPOs.

Panels B and C in Table 3.3 show that underwriters tend to demand lower fees during the crisis period. The difference is more obvious for the EU than for the US. In Panel D, differences in means for the same underwriters that do business in both continents are examined. In the EU, differences in gross spread are positive and significant for all eight investment banks. Goldman Sachs charges on average 1% less during the crisis period, and the difference is significant at 1% level. JPMorgan reduces mean fees from 2.96% to 2.52% after 2007. In the US, however, we do not find the same pattern. Firstly, fees do not drop significantly, with the largest difference being 0.29% which is statistically significant. Secondly, only four out of eight underwriters seem to reduce their fees significantly. New entries to the underwriting business and a preference for domestic underwriters may play some role in explaining the reduced fees in the EU.

### *3.4.3. Price Range*

Unlike US IPOs, IPOs in most EU countries tend to be priced within the price range indicated in the prospectus because of different practices in setting the price range and pricing regulations (Jenkinson, Morrison, Wilhelm (2006)). In the US, regulations prohibit companies from providing any information to investors before the initial prospectus is filed. In Europe, exchange of information begins at an earlier stage than in the US: analysts' reports, for example, are made available to investors before the announcement of the intention to float. Although there are less regulatory restrictions on firm-investor interaction in the early part of the IPO process, the EU rules impose greater constraint on price range. In the case of the UK, the offer is withdrawn if the final offer price is outside the initial price range: legal sanctions

thus deter underwriters from setting a price outside the range. We look at the differences in price range set by the same underwriters that manage IPOs in both the EU and US. Table 3.4 shows that in the EU the four of eight underwriters tended to widen price range during the crisis period, though differences are not significant. In contrast, the same underwriters' price ranges shrink after 2007 in the US. The difference is significant, though, for only three investment banks.

The frequency distribution of price range is provided in Figure 1.1 and Figure 1.2. To enable feasible comparison between the two markets, the price range of all EU offers is converted to US dollars. Figure 1.1 demonstrates that in the EU the price range set by the same US underwriters does not cluster, and the pre-crisis pattern does not seem to change during the crisis period after 2007. For the US markets, clustering at two dollars persists in both sample periods, as indicated in Figure 1.2. In summary, Table 3.4, taken in conjunction with Figure 1, suggests that, unlike the change in gross spread, underwriters' pricing practice in the pre-crisis period and during the crisis is similar in both the US and the EU.

### 3.4.4. *Changes in Underwriter Syndicate Structure*

IPO deals are usually managed by a syndicate of underwriters rather than by a single investment bank, and therefore the fee analysis above remains incomplete unless the dynamics of underwriter syndicates are incorporated. Corwin and Schultz (2005) state that syndicate members may compete against each other to maintain client relations with the issuing firm for future equity offerings.

We argue that competition among underwriters and demand for underwriter services can to some extent explain the drop in gross spread. European equity markets are not as liquid in terms of IPO volume as those in the US, where there is a high demand for underwriters. Moreover, the syndicate structure of underwriters in the US can restrict entry into the IPO market, leading to clustering in fees. Hochberg, Ljungqvist and Lu (2010) show that strong

networking among VC syndicates also give rise to such barriers to entry. As more players join the IPO market or tend to syndicate, then, fees are expected to decline. Our findings as reported in Tables 3.2 and 3.3 support this view.

Figure 2 demonstrates the change in syndicate structure from 2000 to 2012. The dark-colored bars represent the sample of the mean number of underwriters within syndicates, where minimum proceeds are 5 million Euros. It may be noted that average syndicate size grows significantly during the recession period following 2007. Syndicate size in 2009, 2010, 2011 and 2012 are all greater than mean size values before 2008. The light-colored bars represent the sample where the proceeds are greater than 10 million Euros. The figure is similar to the one in the dark color, suggesting that underwriters tended to syndicate more in the crisis period. The untabulated results show that the differences in mean syndicate size throughout is significant, at 1% level. This provides another layer of evidence on why fees in the EU have declined since 2007.

### 3.4.5. *Relationship between Underwriter Reputation and Underpricing*

Empirical findings about the relationship between underwriter reputation and underpricing are mixed. On the one hand, small, risky firms can hire reputable underwriters to reduce information asymmetry and hence experience less underpricing. In line with this argument, earlier studies such as Titman and Trueman (1986), Carter and Manaster (1990) and Megginson and Weiss (1991) find a negative relationship between underwriter rank and underpricing. On the other hand, reputable underwriters can strategically increase underpricing through discretionary allocation of discounted shares to maintain client relations with investors for the purpose of future deals. Consistent with this, Loughran and Ritter (2004) find that prestigious underwriters are associated with more underpricing.

We retest the relationship between underwriter prestige and underpricing in the context of the recent financial recession, when top underwriters suffer from reputation spillover, and by

doing so we also study changes in the determinants of underpricing. The OLS results are shown in Table 5. The first column reports coefficient estimates for the pre-crisis sub-sample. Underwriter reputation, proxied by the percentage market share of the underwriter, is positively linked to underpricing, with an estimate of 0.917 significant at a level of 1%. As regards the crisis sub-sample, the magnitude of the estimate of underwriter share is still positive, but more than tripled. IPOs with prestigious underwriters are therefore underpriced more during the crisis period than before the crisis.

For other determinants of underpricing, we find that the effect of Log Proceeds remains almost the same. Coefficient estimates on this variable barely change across the time horizons, and the significance level did not change at all. Market return, though, is able to predict underpricing for the pre-crisis era only, becoming insignificant during the crisis. Another difference is in Internet estimates. Internet stocks experience more underpricing during the crisis period, though the effect is not significant before 2008. The coefficient estimate on Main Market dummy flips sign in the crisis stage. Sub-sample analysis shows that the explanatory power of the models does not differ across the two time horizons, with R-squares dropping by 1% in the latter sample.

In the last column in Table 5, we run a full sample analysis with interaction terms in order to test whether differences in estimates are significant. The interaction term between crisis and underwriter share is significant at a level of 10%, implying that investment bank reputation leads to greater underpricing in the unfavourable market conditions after 2007. This finding is consistent with the view that it is likely that increased competition and reduced demand for underwriters in the recession boost incentives for more discretionary allocation of shares, leading to more underpricing.

#### 3.4.6. *Determinants of IPO Decisions*

The prior section shows that IPO costs in terms of fees and first-day initial return decreased during the recent recession after 2007. This section examines the varying determinants of IPO decisions over time. To be able to study the determinants of decisions to go public, we limit our sample to the UK, where there is publicly available data for private companies. As Ritter and Welch (2002) argue, when it comes to testing incentives for IPO decisions, lack of available data for private companies makes research design difficult.

Table 6 presents summary statistics for public and private UK companies during the periods 2003-2007 and 2008-2012. In Panel A, it is shown that the mean return on assets (ROA) of private companies is greater than that of public firms before 2008. IPO companies are likely to hold more cash and to have more capital expenditure than private ones, though capital structure does not seem to vary across the two groups. One key difference, however, is to be seen in sales growth, with public companies enjoying more growth before the crisis period. For IPO firms, the market-to-book ratio of listed companies within the same industry is greater than that of private companies.

Panel B explores the summary statistics in the recession period. Public UK companies have less ROA but more cash and sales growth than private companies do in the crisis period. We find that most of the differences in variables between the two samples are qualitatively similar to the pre-crisis figures, with the exception of market-to-book ratio. In the recent recession period, market-to-book ratio for IPO firms is smaller than the ratio for private companies, which potentially implies that companies with high growth opportunities prefer to remain private during the credit crunch period. Finally, we note that both types of companies increase their cash holdings between the pre-crisis era and the crisis era, and that long-term debt also increases for both groups in the latter period.

Table 7 shows the results of Probit analysis run on two sub-periods along with the whole period. In the first column, it is shown that cash, capital expenditure and sales growth are

positively associated with the decision to go public. All of these three variables are significant, at a level of 1%. Consistent with Pagano et al. (1998), we find that the likelihood of going public increases with log sales, proxy for firm size, and industry market-to-book ratio. In the second column, we document the fact that five out of seven significant pre-crisis determinants remain qualitatively the same during the crisis period.

There are three notable differences between the first and second columns. Firstly, short-term interest rates become insignificant during the second time period, and secondly and more importantly, market-to-book ratio flips sign. More specifically, high market-to-book ratio increases the likelihood of IPO before 2008, supporting market timing hypothesis by Barker and Wurgler (2002). This finding is qualitatively the same as the empirical evidence provided by Pagano et al. (1998). Consistent with these results, a recent study by Gao, Ritter, and Zhu (2013) reports that the quarterly number of IPOs increases along with the market-to-book ratio of small firms in the previous quarter. During the crisis period, we find that the probability of an IPO decreases with an increase in industry specific market-to-book ratio. Lastly, a notable difference is about the predictive power of the same model in the two different time regimes. The Pseudo R-square decreased from 30% in the pre-crisis period to 5% during the recession period.

In order to compare coefficient estimates over the two time periods, Probit regressions are run for the full sample between 2003 and 2012, with interaction terms. The results are shown in the last column. Interaction terms with return on assets and company size remain significant in the full sample analysis, and the coefficient estimate on the interaction between crisis and market-to-book ratio negative is significant, at a level of 1%.

**Conclusion**

This study contributes to IPO literature by investigating the varying determinants and costs of IPOs completed in Europe between 2000 and 2012. IPO activity in the EU is examined

for two time horizons: the pre-crisis regime (between 2000 and 2007), and the crisis itself (from 2008 to 2012).

As regards IPO costs, we focus on direct costs, underwriting fees, and the indirect cost of going public, underpricing. We find that IPOs completed in Europe during the crisis period after 2007 enjoy relatively lower underwriting fees and first-day underpricing then those of the pre-crisis regime. In particular, mean underpricing declines by 13% for book-built EU IPOs during the recession period, and the difference for gross spread was 0.67%.

We further investigated fee dynamics by looking at the market share of the top ten underwriters in both the EU and US. Although prestigious underwriters continue to hold more than 50%t of all underwriting business in Europe for both time horizons, there have been new entries in the top ten list after 2007, which suggests that reduced fees in the recession period were either the result of competition between local and global underwriters or of reduced demand for services provided by underwriters. We also find that all top eight investment banks which operate in both the EU and the US reduce fees significantly in the EU, while in the US fee reduction is not so obvious.

Using a pool of public and private UK firms, we investigate whether pre-crisis determinants are still valid for explaining IPO decisions after 2007, and find that the typical factors proposed by earlier literature have little explanatory power as regards explaining IPO activity in the recent recession. We document that industry market-to-book ratio of listed companies is negatively associated with IPO decisions during the crisis period. These findings extend the results of Pagano et al. (1998), the single empirical about the determinants of IPO decisions.

**Table 3.1. IPO frequency and summary statistics**
**Panel A.** *IPO Distribution by Country and Crisis Period*

| | Before the Crisis | | | | | | During the Crisis | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Num. IPOs | Fixed Priced | Main Market | Gross Spread | Underp. | VC Backed | Num. IPOs | Fixed Priced | Main Market | Gross Spread | Underp. | VC Backed |
| Belgium | 37 | 0.41 | 0.70 | 2.84 | 0.12 | 0.08 | 11 | 0.64 | 0.45 | 2.05 | 0.03 | 0.18 |
| Denmark | 24 | 0.46 | 1.00 | 4.16 | 0.19 | 0.08 | 5 | 0.00 | 1.00 | 2.75 | 0.06 | 0.20 |
| France | 191 | 0.06 | 0.28 | 3.08 | 0.11 | 0.10 | 91 | 0.49 | 0.38 | 3.29 | 0.04 | 0.11 |
| Germany | 264 | 0.08 | 0.52 | 4.14 | 0.27 | 0.11 | 53 | 0.28 | 0.00 | 3.67 | 0.03 | 0.02 |
| Greece | 98 | 0.29 | 0.95 | 3.83 | 0.43 | 0.00 | 7 | 0.86 | 1.00 | 3.00 | 0.24 | 0.00 |
| Italy | 119 | 0.02 | 0.39 | 3.58 | 0.09 | 0.06 | 26 | 0.31 | 0.81 | 3.83 | 0.11 | 0.08 |
| Norway | 71 | 0.35 | 0.99 | 3.81 | 0.04 | 0.18 | 28 | 0.32 | 0.93 | 2.05 | -0.01 | 0.04 |
| Poland | 129 | 0.08 | 0.99 | 3.20 | 0.22 | 0.07 | 401 | 0.73 | 0.26 | 2.06 | 0.31 | 0.04 |
| Romania | 6 | 0.83 | 0.00 | . | 0.46 | 0.00 | 6 | 0.67 | 0.00 | . | -0.05 | 0.00 |
| Spain | 6 | 0.00 | 1.00 | 3.14 | 0.15 | 0.33 | 20 | 0.45 | 0.20 | 2.47 | 0.06 | 0.00 |
| Sweden | 50 | 0.36 | 1.00 | 3.63 | 0.07 | 0.16 | 17 | 0.35 | 0.82 | 3.50 | -0.02 | 0.18 |
| Switzerland | 36 | 0.08 | 0.44 | 4.47 | 0.19 | 0.33 | 8 | 0.13 | 0.63 | 3.80 | 0.07 | 0.25 |
| UK | 976 | 0.85 | 0.15 | 3.85 | 0.19 | 0.08 | 184 | 0.84 | 0.12 | 4.15 | 0.09 | 0.02 |

This table reports summary statistics of key variables for 2864 European IPOs completed during 2000-2012. We require sample countries to have at least five offerings in both time periods. We drop the IPOs that belong to industries: Finance, Insurance, Real Estate and Closed End Funds. *Fixed Priced* is equal to one if the IPO mechanism is based on fixed pricing. *Main market* takes value one if the IPO is listed in the main market of the corresponding country. *Gross Spread* is the underwriter fee as percentage of the proceeds. Underpricing, *Underp.*, is the percentage change from offer price to first day closing price. If the firm has VC financing then, *VC Backed* takes value one, zero otherwise.

**Panel B.** *Differences in Means across the Two Time Periods by Pricing Mechanism*

| | Fixed-Priced IPOs | | | Open-Priced IPOs | | |
|---|---|---|---|---|---|---|
| Variable | Pre Crisis | During Crisis | Diff. in Means | Pre Crisis | During Crisis | Diff. in Means |
| Underpricing | 0.18<br>(0.11) | 0.17<br>(0.07) | 0.01 | 0.17<br>(0.05) | 0.04<br>(0.01) | 0.13*** |
| Gross Spread | 3.89<br>(4.00) | 4.35<br>(4.75) | -0.46*** | 3.69<br>(3.50) | 3.02<br>(3.00) | 0.67*** |
| VC Backed | 0.05<br>(0.00) | 0.04<br>(0.00) | 0.01* | 0.13<br>(0.00) | 0.07<br>(0.00) | 0.06*** |
| Main Market | 0.18<br>(0.00) | 0.09<br>(0.00) | 0.09*** | 0.61<br>(1.00) | 0.67<br>(1.00) | -0.06** |
| Internet | 0.12<br>(0.00) | 0.09<br>(0.00) | 0.03 | 0.15<br>(0.00) | 0.04<br>(0.00) | 0.11*** |
| Proceeds | 24.91<br>(8.37) | 9.44<br>(1.04) | 15.47*** | 157.85<br>(36.08) | 133.85<br>(14.64) | 22.00 |
| Price range | 0.10<br>(0.00) | 0.01<br>(0.00) | 0.09*** | 3.13<br>(1.84) | 2.57<br>(1.48) | 0.56** |
| Numb. of IPOs | 985 | 557 | | 1022 | 300 | |

This panel reports the differences in means across two time periods for two different subsamples. Open-priced IPOs are companies that are priced via bookbuilding. Otherwise, the sample firm classified as fixed-priced. *Underp.*, is first day underpricing defined as the percentage change from offer price to first day closing price. *Gross Spread* is the underwriter fee as percentage of the proceeds. If the sample firm is from Internet industry then *Internet* takes one, zero otherwise.

**Table 3.2. Underwriter rankings in Europe**

**Panel A.** *Rankings by shares (as percentage) over the sample period*

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | DB | GS | MS | Carne. | UBS | SEB | CS | BNP | Sant. | CG |
| 2001 | CIB | MS | Intesa | ABN | GS | BAML | CG | SG | BNP | UBS |
| 2002 | Citi | CIB | HSBC | Sant. | GS | DB | UBS | MS | CS | SEB |
| 2003 | BAML | GS | JP | UniCr. | CGC | CS | HSBC | Intesa | ABN | UBS |
| 2004 | GS | MS | Nomura | Citi | UBS | CIB | CS | BAML | Dexia | KBC |
| 2005 | CIB | BNP | BAML | CS | SG | MS | ABN | Nomura | DB | JP |
| 2006 | ABN | MS | JP | UBS | BAML | GS | CS | CG | Citi | DB |
| 2007 | DB | MS | GS | Citi | JP | CS | BAML | UBS | Sant. | RC |
| 2008 | Citi | JP | MIB | Caixa | MS | DB | BAML | GS | BES | UBS |
| 2009 | GS | MS | BAML | UniCr. | JP | ABN | BNP | CIB | Lazard | SG |
| 2010 | GS | JP | MS | CS | BAML | DB | Medio | BBVA | UBS | PKO |
| 2011 | CS | Citi | BAML | BNP | MS | JP | Bankia | DB | Barc. | UBS |
| 2012 | JP | Citi | UBS | MS | HSBC | GS | CS | BAML | BBI | DB |

Panel A reports rankings of underwriter for each year from 2000 to 2012. We calculate the underwriter share as the percent of proceeds underwritten by each underwriter to the total amount underwritten by all underwriters in a given year. The abbreviations are as follows. MS= Morgan Stanley, GS=Goldman Sachs, DB=Deutsche Bank, CS=Credit Suisse, Sant.=Santander, CG=Commerzbank Group, CIB= Credit Agricole CIB, SG= SG Corporate & Investment Banking, CGC= Canaccord Genuity Corp, RC= Renaissance Capital, MIB= Millennium Investment Banking, BES= Banco Espirito Santo, Medio= Mediobanca, PKO= PKO BP, BAML=Bank of America Merrill Lynch, JP=JPMorgan, BNP= BNP Paribas, ABN= ABN AMRO Bank, and Barc.=Barclays.

**Panel B.** *Rankings of top ten underwriters' shares (as percentage)*

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MS | 0.09 | 0.12 | 0.04 | 0.02 | 0.09 | 0.05 | 0.09 | 0.09 | 0.08 | 0.10 | 0.08 | 0.07 | 0.07 |
| GS | 0.10 | 0.07 | 0.06 | 0.20 | 0.09 | 0.03 | 0.07 | 0.09 | 0.05 | 0.21 | 0.11 | 0.02 | 0.07 |
| BAML | 0.02 | 0.06 | 0.02 | 0.21 | 0.05 | 0.09 | 0.07 | 0.05 | 0.05 | 0.10 | 0.05 | 0.14 | 0.05 |
| DB | 0.10 | 0.01 | 0.06 | 0.00 | 0.04 | 0.04 | 0.04 | 0.11 | 0.07 | 0.01 | 0.05 | 0.04 | 0.05 |
| CS | 0.05 | 0.01 | 0.04 | 0.06 | 0.05 | 0.07 | 0.06 | 0.06 | 0.02 | 0.01 | 0.07 | 0.15 | 0.05 |
| JP | 0.02 | 0.00 | 0.03 | 0.14 | 0.03 | 0.04 | 0.08 | 0.07 | 0.09 | 0.07 | 0.10 | 0.06 | 0.11 |
| Citi | 0.02 | 0.02 | 0.15 | 0.01 | 0.06 | 0.02 | 0.04 | 0.08 | 0.13 | 0.02 | 0.01 | 0.14 | 0.10 |
| UBS | 0.07 | 0.06 | 0.05 | 0.02 | 0.05 | 0.03 | 0.07 | 0.05 | 0.04 | 0.02 | 0.03 | 0.03 | 0.09 |
| BNP | 0.04 | 0.06 | 0.01 | 0.01 | 0.03 | 0.11 | 0.02 | 0.02 | 0.00 | 0.06 | 0.02 | 0.09 | 0.03 |
| ABN | 0.03 | 0.09 | 0.00 | 0.03 | 0.03 | 0.05 | 0.09 | 0.01 | 0.00 | 0.07 | 0.01 | 0.00 | 0.02 |
| Total | 0.54 | 0.50 | 0.46 | 0.70 | 0.52 | 0.53 | 0.63 | 0.63 | 0.53 | 0.67 | 0.53 | 0.74 | 0.64 |

Panel B presents rankings of top underwriters for each year from 2000 to 2012. We calculate the underwriter share as the percent of proceeds underwritten by each underwriter to the total amount underwritten by all underwriters in a given year. The abbreviations are as follows. MS= Morgan Stanley, GS=Goldman Sachs, BAML=Bank of America Merrill Lynch, DB=Deutsche Bank, CS=Credit Suisse, JP=JPMorgan, BNP= BNP Paribas, and ABN= ABN AMRO Bank.

**Table 3.3. Underwriter rankings across the EU and the US**

**Panel A.** *Top ten underwriters' total amounts across the EU and the US during (2000-2012)*

| | Europe | | | | United States | | | |
|---|---|---|---|---|---|---|---|---|
| Rank | Name | Total Amount | Und. Share(%) | Gross Spread | Name | Total Amount | Und. Share(%) | Gross Spread |
| 1 | MORGAN-STANLEY | 126535.5 | 8.48 | 3.18 | BOA-MERRILL | 249256.1 | 15.58 | 5.82 |
| 2 | GS | 112802.1 | 7.56 | 2.98 | CITI | 233613.2 | 14.61 | 5.57 |
| 3 | BOA-MERRILL | 92780.8 | 6.22 | 2.65 | MORGAN-STANLEY | 182710.7 | 11.42 | 6.05 |
| 4 | DEUTSCHE-BANK | 89846.4 | 6.02 | 3.27 | GS | 169937.4 | 10.62 | 6.25 |
| 5 | CREDIT-SUISSE | 89749.2 | 6.02 | 3.33 | CREDIT-SUISSE | 142068.5 | 8.88 | 6.36 |
| 6 | JPM | 84356.5 | 5.66 | 2.85 | JPM | 129437.8 | 8.09 | 6.40 |
| 7 | CITI | 78383.7 | 5.26 | 2.94 | BARCLAYS-CAP | 113220.8 | 7.08 | 6.31 |
| 8 | UBS-BANK | 77616.4 | 5.20 | 3.00 | UBS-BANK | 95137.3 | 5.95 | 5.80 |
| 9 | BNP Paribas | 62363.2 | 4.18 | 2.51 | DEUTSCHE-BANK | 77233.1 | 4.83 | 6.35 |
| 10 | ABN AMRO Bank | 56080.2 | 3.76 | 2.95 | WF | 68733.7 | 4.30 | 5.51 |
| Total | | | 58.36 | | | | 91.36 | |

This panel presents top ten underwriters' market share in the US and the EU. *Total Amount*, in millions € for the EU sample and $ for the US sample, is the sum of all proceeds underwritten by a the given underwriter during 2000-2012. Underwriter share, *Und. share*, is the percent of proceeds underwritten by each underwriter to the total amount underwritten by all underwriters. *Gross Spread* is the underwriter fee as percentage of the proceeds.

**Table 3.3 Continued**

**Panel B.** *Top ten underwriters' total amounts across the EU and US for pre-crisis period during (2000-2007)*

| | Europe | | | | United States | | | |
|---|---|---|---|---|---|---|---|---|
| Rank | Name | Total Amount | Total Amount(%) | Gross Spread | Name | Total Amount | Total Amount(%) | Gross Spread |
| 1 | MORGAN-STANLEY | 100386.0 | 8.80 | 3.32 | BOA-MERRILL | 144040.3 | 17.74 | 5.87 |
| 2 | GS | 88390.5 | 7.74 | 3.20 | CITI | 136358.0 | 16.79 | 5.52 |
| 3 | DEUTSCHE-BANK | 73694.1 | 6.46 | 3.35 | GS | 89731.7 | 11.05 | 6.31 |
| 4 | UBS-BANK | 63897.7 | 5.60 | 3.13 | MORGAN-STANLEY | 80560.1 | 9.92 | 6.18 |
| 5 | BOA-MERRILL | 63109.5 | 5.53 | 2.78 | CREDIT-SUISSE | 70201.6 | 8.64 | 6.46 |
| 6 | CREDIT-SUISSE | 59193.7 | 5.19 | 3.52 | UBS-BANK | 61588.4 | 7.58 | 5.83 |
| 7 | JPM | 54179.3 | 4.75 | 2.96 | JPM | 53620.0 | 6.60 | 6.52 |
| 8 | ABN AMRO Bank | 53849.6 | 4.72 | 2.96 | BARCLAYS-CAP | 46595.2 | 5.74 | 6.48 |
| 9 | Credit Agricole CIB | 47994.5 | 4.21 | 2.52 | WF | 36021.1 | 4.44 | 5.63 |
| 10 | CITI | 47982.9 | 4.20 | 3.12 | DEUTSCHE-BANK | 27952.9 | 3.44 | 6.50 |
| Total | | | 57.20 | | | | 91.94 | |

This panel presents top ten underwriters' market share and fees in the US and EU for pre-crisis period (2000-2007). *Total Amount*, in millions € for the EU sample and $ for the US sample, is the sum of all proceeds underwritten by a the given underwriter during 2000-2012. Underwriter share, *Und. share*, is the percent of proceeds underwritten by each underwriter to the total amount underwritten by all underwriters. *Gross Spread* is the underwriter fee as percentage of the proceeds.

**Panel C.** *Top ten underwriters' total amounts across the EU and US for crisis period during (2008-2012)*

| | Europe | | | | United States | | | |
|---|---|---|---|---|---|---|---|---|
| Rank | Name | Total Amount | Total Amount(%) | Gross Spread | Name | Total Amount | Total Amount(%) | Gross Spread |
| 1 | CREDIT-SUISSE | 30555.5 | 8.72 | 2.38 | BOA-MERRILL | 105215.8 | 13.36 | 5.71 |
| 2 | CITI | 30400.8 | 8.68 | 2.30 | MORGAN-STANLEY | 102150.6 | 12.97 | 5.91 |
| 3 | JPM | 30177.2 | 8.61 | 2.52 | CITI | 97255.2 | 12.35 | 5.65 |
| 4 | BOA-MERRILL | 29671.3 | 8.47 | 2.04 | GS | 80205.7 | 10.19 | 6.16 |
| 5 | MORGAN-STANLEY | 26149.5 | 7.46 | 2.62 | JPM | 75817.8 | 9.63 | 6.23 |
| 6 | GS | 24411.4 | 6.97 | 2.17 | CREDIT-SUISSE | 71866.9 | 9.13 | 6.15 |
| 7 | DEUTSCHE-BANK | 16152.3 | 4.61 | 2.80 | BARCLAYS-CAP | 66625.6 | 8.46 | 6.02 |
| 8 | BNP Paribas | 14938.1 | 4.26 | 2.01 | DEUTSCHE-BANK | 49280.2 | 6.26 | 6.21 |
| 9 | UBS-BANK | 13718.6 | 3.92 | 2.50 | UBS-BANK | 33548.9 | 4.26 | 5.73 |
| 10 | BARCLAYS-CAP | 8677.4 | 2.48 | 2.81 | WF | 32712.6 | 4.15 | 5.40 |
| Total | | | 64.18 | | | | 90.76 | |

This panel presents top ten underwriters' market share and fees in the US and EU for pre-crisis period (2008-2012). *Total Amount*, in millions € for the EU sample and $ for the US sample, is the sum of all proceeds underwritten by a the given underwriter during 2000-2012. Underwriter share, *Und. share*, is the percent of proceeds underwritten by each underwriter to the total amount underwritten by all underwriters. *Gross Spread* is the underwriter fee as percentage of the proceeds.

**Table 3.3 Continued**

**Panel D.** *Differences in fees charged by top eight underwriters that operate both in the EU and US*

| | Europe | | | | United States | | | |
|---|---|---|---|---|---|---|---|---|
| Rank | Name | Pre-Crisis | During Crisis | Difference | Name | Pre-Crisis | During Crisis | Difference |
| 1 | MORGAN-STANLEY | 3.32 | 2.62 | 0.70*** | MORGAN-STANLEY | 6.18 | 5.91 | 0.27** |
| 2 | GS | 3.20 | 2.17 | 1.03*** | GS | 6.31 | 6.16 | 0.15** |
| 3 | BOA-MERRILL | 2.78 | 2.04 | 0.74** | BOA-MERRILL | 5.87 | 5.71 | 0.16 |
| 4 | DEUTSCHE-BANK | 3.35 | 2.80 | 0.55* | DEUTSCHE-BANK | 6.50 | 6.21 | 0.29* |
| 5 | CREDIT-SUISSE | 3.52 | 2.38 | 1.14* | CREDIT-SUISSE | 6.46 | 6.15 | 0.31** |
| 6 | JPM | 2.96 | 2.52 | 0.44** | JPM | 6.52 | 6.23 | 0.29 |
| 7 | CITI | 3.12 | 2.30 | 0.82*** | CITI | 5.52 | 5.65 | -0.13 |
| 8 | UBS-BANK | 3.13 | 2.50 | 0.63** | UBS-BANK | 5.83 | 5.73 | 0.10 |

This panel presents average fees charged by top eight underwriters that operate in both the EU and US for two time horizons: pre-crisis (2000-2007) and during-crisis (2008-2012). *Gross Spread* is the underwriter fee as percentage of the proceeds.

**Table 3.4. Differences in price range set by top eight underwriters that operate both in the EU and US**

| | Europe | | | | United States | | | |
|---|---|---|---|---|---|---|---|---|
| Rank | Name | Pre-Crisis | During Crisis | Difference | Name | Pre-Crisis | During Crisis | Difference |
| 1 | MORGAN-STANLEY | 3.76 | 3.92 | -0.16 | MORGAN-STANLEY | 1.95 | 1.43 | 0.52*** |
| 2 | GS | 4.14 | 4.50 | -0.36 | GS | 2.12 | 1.96 | 0.16** |
| 3 | BOA-MERRILL | 3.65 | 1.91 | 1.74 | BOA-MERRILL | 1.33 | 1.37 | -0.04 |
| 4 | DEUTSCHE-BANK | 5.23 | 5.37 | -0.14 | DEUTSCHE-BANK | 1.76 | 1.57 | 0.19* |
| 5 | CREDIT-SUISSE | 4.81 | 3.12 | 1.69 | CREDIT-SUISSE | 1.99 | 1.96 | 0.03 |
| 6 | JPM | 2.65 | 3.01 | -0.36 | JPM | 1.87 | 1.85 | 0.02 |
| 7 | CITI | 3.37 | 3.65 | -0.28 | CITI | 1.09 | 1.07 | 0.02 |
| 8 | UBS-BANK | 3.96 | 1.93 | 2.03 | UBS-BANK | 1.25 | 1.15 | 0.10 |

This panel presents average price range set by top eight underwriters that operate in both the EU and US for two time horizons: pre-crisis (2000-2007) and during-crisis (2008-2012). Price range is the dollar difference between high and low values of filed offer price. For the EU offers, all issues in different currencies are converted to US Dollars.

**Figure 3.1. Frequency distributions of price range set by top eight underwriters that operate both in the EU and US**

**Figure 3.1.1.** *Price range in the EU*

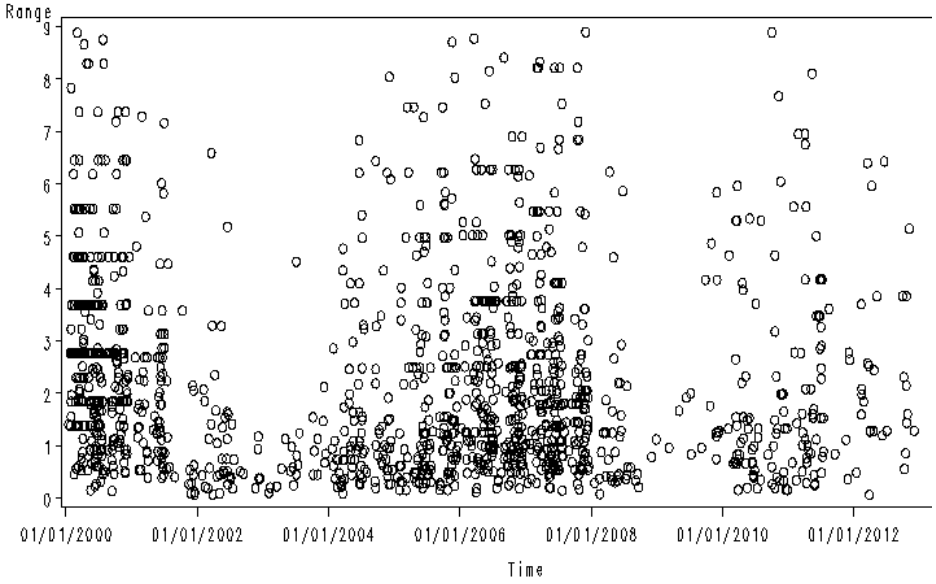



**Figure 3.1.2.** *Price range in the US*

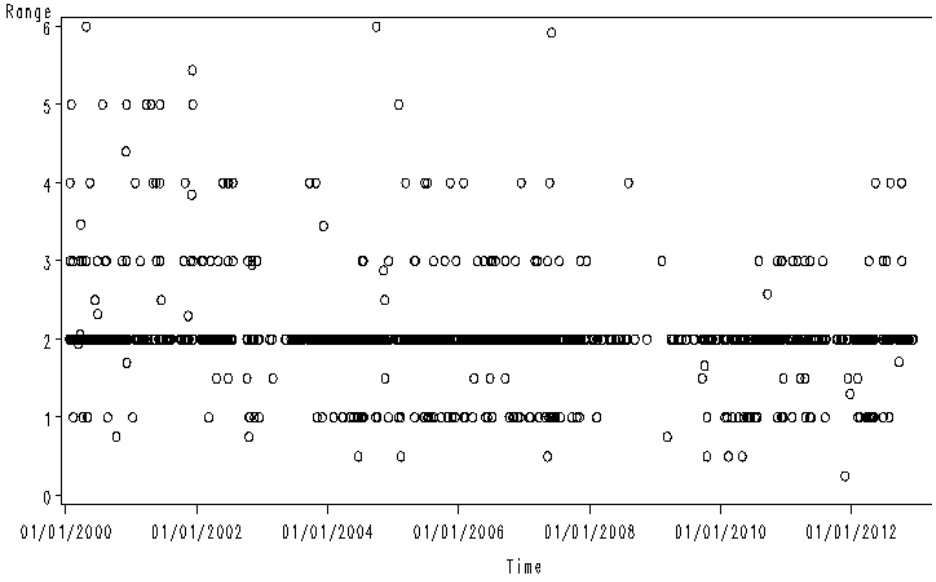
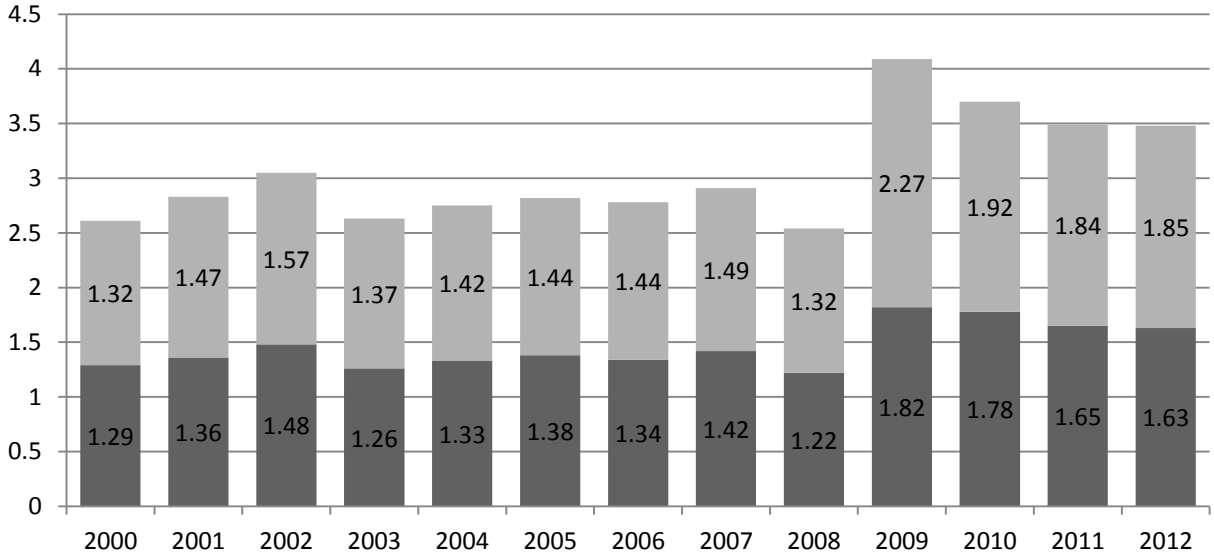


**Figure 3.2. Underwriter syndicate structure in EU**




This figure shows the variation in the average number underwriters in syndicates from 2000 to 2012. The dark colors represent the sample where minimum amount of proceeds is 5 million Euros. The light bars are for the sample where the proceeds are greater than 10 million Euros.

**Table 3.5. Underwriter ranking and IPO underpricing**

| | Before Crisis | During Crisis | Full Sample |
|---|---|---|---|
| Intercept | 0.958*** | 1.123*** | 0.970*** |
| | (0.13) | (0.28) | (0.12) |
| Und. Share | 0.917** | 2.957** | 0.889** |
| | (0.41) | (1.06) | (0.40) |
| Fixed-Priced | 0.053* | -0.012 | 0.048 |
| | (0.03) | (0.02) | (0.03) |
| Log Proceeds | -0.05*** | -0.057*** | -0.050*** |
| | (0.01) | (0.02) | (0.01) |
| Market Ret. | 0.196** | 0.146 | 0.196** |
| | (0.07) | (0.13) | (0.07) |
| Internet | -0.001 | -0.052** | -0.004 |
| | (0.03) | (0.02) | (0.03) |
| VC | -0.018 | -0.003 | -0.012 |
| | (0.02) | (0.03) | (0.02) |
| Main Market | 0.063*** | -0.105*** | 0.053** |
| | (0.02) | (0.03) | (0.02) |
| UK | -0.039 | -0.093** | -0.032 |
| | (0.03) | (0.04) | (0.02) |
| Germany | -0.039 | -0.145*** | -0.041 |
| | (0.02) | (0.04) | (0.03) |
| France | -0.039** | -0.209** | -0.040** |
| | (0.02) | (0.08) | (0.02) |
| Italy | 0.958** | -0.030 | -0.045** |
| | (0.13) | (0.03) | (0.02) |
| Crisis | | | 0.153 |
| | | | (0.31) |
| Crisis* Und. Share | | | 1.972* |
| | | | (1.01) |
| Crisis* Fixed-Priced | | | -0.063 |
| | | | (0.04) |
| Crisis* Log Proceeds | | | -0.007 |
| | | | (0.02) |
| Crisis* Market Ret. | | | -0.042 |
| | | | (0.13) |
| Crisis* Internet | | | -0.033 |
| | | | (0.04) |
| Crisis* VC | | | -0.015 |
| | | | (0.04) |
| Crisis* Main Market | | | -0.152*** |
| | | | (0.04) |
| Country Interactions Industry Dum. | YES | YES | YES |
| N.Obs | 1247 | 689 | 1936 |
| R-Sqr | 0.12 | 0.11 | 0.10 |

This table reports OLS regressions results for the link between underwriter reputation and IPO underpricing across two time horizons: pre-crisis (2000-2007) and during-crisis (2008-2012).Dependent variable is Underpricing defined as the percentage change from offer price to first day closing price. Underwriter share, *Und. share*, is the percent of proceeds underwritten by each underwriter to the total amount underwritten by all underwriters in a given year. *Fixed-Priced* is equal to one if the IPO mechanism is based on fixed pricing. *Log Proceeds* is the natural logarithm of IPO proceeds. *Market Ret.* is the mean 30 day FTSE return before the issue date. If the company is internet stock then *Internet* takes value one, zero otherwise. *VC* is a dummy variable equal to one if the company is backed by venture capital funding. *Main market* takes value one if the IPO is listed in the main market of the corresponding country.

**Table 3.6. Summary statistics of public and private UK firms**
**Panel B.** *Before the crisis*

| | IPO Firms | | | | Private Firms | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | Mean | Median | Min | Max | Mean | Median | Min | Max |
| ROA | 0.05 | 0.11 | -0.35 | 0.66 | 0.09 | 0.08 | -0.35 | 0.66 |
| CASH | 0.17 | 0.09 | 0.00 | 0.68 | 0.09 | 0.08 | -0.23 | 0.68 |
| DEBT | 0.18 | 0.06 | 0.00 | 1.11 | 0.18 | 0.10 | 0.00 | 1.11 |
| CAPEX | 0.07 | 0.04 | 0.00 | 0.21 | -0.05 | -0.02 | -0.73 | 0.21 |
| GROWTH | 0.53 | 0.29 | -0.58 | 2.50 | 0.09 | 0.05 | -0.58 | 2.50 |
| LOG SALES | 9.70 | 9.67 | 5.91 | 13.49 | 9.54 | 9.47 | 5.91 | 13.49 |
| RATE | 3.36 | 3.43 | 2.33 | 4.45 | 3.36 | 3.43 | 2.33 | 4.45 |
| MTB | 1.75 | 1.85 | 1.34 | 1.89 | 1.51 | 1.55 | 0.68 | 1.89 |

This panel presents summary statistics of 1824 private firms and 229 firms that went to public during 2003-2007. *ROA* is return on total assets. *CASH* is net cash holdings from operating activities. *DEBT* is defined as the ratio of long term debt to total assets. *CAPEX* is capital expenditures scaled by total assets. *GROWTH* is percentage change between sales between two consecutive calendar years. *RATE* is annual Euro LIBOR interest rate provided by European Central Bank. *MTB* is average market to book value of all public companies in the same two-digit industry in a given year.

**Panel B.** *During the crisis*

| | IPO Firms | | | | Private Firms | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | Mean | Median | Min | Max | Mean | Median | Min | Max |
| ROA | 0.03 | 0.08 | -0.35 | 0.63 | 0.11 | 0.08 | -0.35 | 0.66 |
| CASH | 0.18 | 0.09 | 0.00 | 0.68 | 0.11 | 0.08 | -0.23 | 0.68 |
| DEBT | 0.24 | 0.08 | 0.00 | 1.11 | 0.19 | 0.11 | 0.00 | 1.11 |
| CAPEX | 0.07 | 0.04 | 0.00 | 0.21 | -0.04 | -0.02 | -0.73 | 0.21 |
| GROWTH | 0.57 | 0.28 | -0.58 | 2.50 | 0.06 | 0.03 | -0.58 | 2.50 |
| LOG SALES | 10.07 | 10.15 | 5.91 | 13.49 | 9.54 | 9.41 | 5.91 | 13.49 |
| RATE | 2.03 | 1.60 | 0.45 | 4.82 | 2.03 | 1.60 | 0.45 | 4.82 |
| MTB | 0.98 | 0.95 | 0.68 | 1.19 | 1.11 | 1.11 | 0.68 | 1.69 |

This panel presents summary statistics of 3485 private firms and 87 firms that went to public during 2008-2012. *ROA* is return on total assets. *CASH* is net cash holdings from operating activities. *DEBT* is defined as the ratio of long term debt to total assets. *CAPEX* is capital expenditures scaled by total assets. *GROWTH* is percentage change between sales between two consecutive calendar years. *RATE* is annual Euro LIBOR interest rate provided by European Central Bank. *MTB* is average market to book value of all public companies in the same two-digit industry in a given year.

**Table 3.7. Determinants of IPO decision for pre-crisis and during crisis periods.**

| | Before Crisis | During Crisis | Difference |
|---|---|---|---|
| Intercept | -6.567*** | -6.591*** | -6.441*** |
| | (1.37) | (1.52) | (0.74) |
| ROA | -2.182*** | -5.208*** | -2.287*** |
| | (0.61) | (1.02) | (0.54) |
| CASH | 7.223*** | 7.332*** | 6.917*** |
| | (0.62) | (0.87) | (0.57) |
| DEBT | -0.306 | 0.259 | -0.068 |
| | (0.38) | (0.47) | (0.33) |
| CAPEX | 19.127*** | 23.222*** | 20.21*** |
| | (1.11) | (1.67) | (1.06) |
| GROWTH | 1.970*** | 1.588*** | 1.869*** |
| | (0.17) | (0.18) | (0.16) |
| LOG SALES | 0.367*** | 0.517*** | 0.356*** |
| | (0.06) | (0.09) | (0.05) |
| RATE | -0.573** | 0.084 | -0.806*** |
| | (0.26) | (0.62) | (0.10) |
| MTB | 0.657** | -4.605*** | 1.231*** |
| | (0.30) | (0.83) | (0.23) |
| Crisis | | | 0.170 |
| | | | (1.40) |
| Crisis*ROA | | | -3.557*** |
| | | | (1.14) |
| Crisis*CASH | | | 0.576 |
| | | | (1.03) |
| Crisis*DEBT | | | 0.268 |
| | | | (0.57) |
| Crisis*CAPEX | | | 2.628 |
| | | | (1.95) |
| Crisis*GROWTH | | | -0.329 |
| | | | (0.24) |
| Crisis*LOG SALES | | | 0.193* |
| | | | (0.10) |
| Crisis*RATE | | | 0.517*** |
| | | | (0.15) |
| Crisis*MTB | | | -5.156*** |
| | | | (0.79) |
| YEAR | YES | YES | YES |
| N. Obs | 4123 | 8774 | 12897 |
| Psedeo R-sqr | 0.30 | 0.05 | 0.15 |

This panel presents Probit results for the decision to go public for both public and private UK firms during 2003-2012. The dependent variable is equal to one if the sample firm floats in a given year, zero otherwise. *ROA* is return on total assets. *CASH* is net cash holdings from operating activities. *DEBT* is defined as the ratio of long term debt to total assets. *CAPEX* is capital expenditures scaled by total assets. *GROWTH* is percentage change between sales between two consecutive calendar years. *RATE* is the annual Euro LIBOR interest rate provided by European Central Bank. *MTB* is average market to book value of all public companies in the same two-digit industry in a given year.

# CONCLUDING REMARKS

This dissertation consists of three essays on initial public offering (IPO), with a focus on the costs of IPOs in terms of gross spread and underpricing.

In the first chapter, we investigate the impact of internal agency conflicts within venture capital syndicates on the IPO performance of portfolio companies. Our conjecture is that large and heterogeneous VC syndicates do tend to suffer from conflict of interests and coordination problems which undermine their ability to monitor effectively their investee companies and are, thus, likely to jeopardize their ability to create value. As a consequence, this might lead to poorer IPO performances.

We explore the effect of size and diversity of VC syndicates on short and long run IPO performances and examine whether the existence of alternative governance mechanisms such as bank loans might attenuate the impact of agency conflicts on the performances of the investee companies around the IPO date.

Our findings provide convincing evidence that VC syndicate size has a very strong negative effect on IPO underpricing and long term operating performances. This result is robust to many different specifications of our model and to controlling for the endogeneity of our variable of interest. Results appear to be stronger for our two VC diversity proxies which support our interpretation of the results centered on the conflict of interest and coordination problems within large and heterogeneous VC syndicates. This is further confirmed by the fact that, given the size of the VC syndicate, a greater concentration of the funding in the hands of few VCs does benefit IPO performances, because it implies fewer controlling VCs who have stronger incentives to monitor the venture.

We do also provide some evidence that, by representing an alternative monitoring mechanism, the existence of bank lending is able to moderate the distortions created by large VC syndicate and therefore reduce their negative impact on IPO underpricing.

In the second chapter, we perform textual analysis on the admission documents of UK IPOs and examine the pricing effects of tone, length and information content of prospectuses. Unlike recent findings for book-built US IPOs, we find that high level of uncertain tone and less distinctive content decrease underpricing for fixed-priced UK IPOs. More importantly, document length explains a significant fraction of variation in first day underpricing, suggesting that length variable can be used as another information uncertainty proxy along with firm age and firm size.

We further show offer price is positively associated with uncertain tone implied by more negative, weak and uncertain words. However, post-IPO return volatility cannot be explained by uncertain language of admission documents. Thus, our results based on document tone are hard to be explained by information uncertainty arguments. On the other hand, document length is negatively correlated with underpricing but positively correlated with offer price for a sample of fixed-priced UK IPOs. This indicate length of document seem to matter more than document tone or content of document.

Admission documents have more negative and uncertain tone during the crisis period than they do in pre-crisis period. In addition, we show that prospectuses use less strong language in the recent crisis. Our results stand still for the period before the recent crisis but not during the recent financial recession triggered in late 2007.

We report that length of whole admission document or risk factors, log of total words in the related section, is a powerful factor in explaining underpricing, offer price and post-IPO return volatility for fixed-priced UK IPOs. Thus, we suggest that future empirical research on IPOs can incorporate this variable into research design.

My last essay contributes to the IPO literature by investigating the time varying determinants and costs of IPO completed in Europe during 2000-2012. We examine the EU

IPO activity for two time horizons: pre crisis regime, between 2000 and 2007, and during recession regime, from 2008 to 2012.

For the costs of IPOs, we focus on the direct cost, underwriting fee, and the indirect cost of going public, underpricing. We find that IPOs completed during the crisis period after 2007 in Europe enjoy relatively less underwriting fees and first day underpricing then those do in pre-crisis regime. In particular, we document mean underpricing declines by 13 per cent for book-built EU IPOs in the recession period. For the gross spread, the difference is 0.67 per cent.

We further investigate the fee dynamics by looking at top ten underwriters' market share in both the EU and US. Although prestigious underwriters continue to hold more than 50 per cent of all underwriting business in Europe for both time horizons, there are new entries to the top ten list after 2007. This suggests that reduced fees in the recession period is either a result of competition among local and global underwriters or less demand for service provided by underwriters. We further find that all top eight investment banks that operate both in the EU and US reduces fees in the EU significantly. For the US, however, the fee reduction is not that obvious.

Using a pool of public and private UK firms, we investigate whether pre-crisis determinants are still able to explain IPO decision after 2007. We find that typical factors proposed by existing literature have poor explanatory power to explain IPO activity in the recent recession triggered by 2008 financial crisis. Moreover, we document industry market-to-book ratio of listed companies is negatively associated with IPO decision in crisis period. These findings extend the results by Pagano et al. (1998), one of the rare studies about the determinants of IPO decision.

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