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OF ECONOMICS
AND BUSINESS

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Underpricing in U.S. IPOs during Crisis

by

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DECEMBER 2017

CERTIFICATION OF THESIS PREPARATION

“I hereby declare that this particular thesis has been written by me, in order to obtain the Postgraduate Degree in Accounting and Finance, and has not been submitted to or approved by any other postgraduate or undergraduate program in Greece or abroad. This thesis presents my personal views on the subject. All the sources I have used for the preparation of this particular thesis are mentioned explicitly with references being made either to their authors, or to the URL’s (if found on the internet).”

ZARRI ELENI

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Abstract

This thesis provides a theoretical and empirical explanation of the underpricing phenomenon in Initial Public Offerings (IPOs) by using data from the U.S. Stock Exchanges. A theoretical presentation of the reasons of Underpricing and the IPO market characteristics are extensively discussed. This study mainly refers to the periods “January 2007 – December 2009” which is considered as part of the Global Financial Crisis. The degree of Underpricing is lower than the historical underpricing level in U.S. Exchange Market.

The variables used to test the Underpricing phenomenon, are the Firm’s Age, the IPO Gross Proceeds, the possibility of a firm to has secondary shares, the number of underwriters hired by each firm, the underwriters reputation, the firm’s assets, the total debt of the firm, sales per share and earnings per share. All these variables follow existing literature. They are used in order to test the effect of the Initial Theoretical Hypothesis of the Underpricing Phenomenon in U.S.

The variable that was found significant in at least 10% confidence level is the total debt of the firm.

CHAPTER 1

Introduction

Private companies who want to raise capital, typically in order to expand, may decide to go public. Going public actually means that the company issues stocks in a secondary market through an Initial Public Offering (IPO). Of course there are also other reasons that lead a company to making such a decision, for example companies with liquidity problems. Regardless the reason that actually drives a company to go public, we will analyze the whole procedure step by step and observe all the consequences of this choice. The most direct and also very important reaction from the first day of the completion of the process is the Underpricing phenomenon, which was first introduced by Reilly and Hatfield (1969). Underpricing is the difference between the price paid by the subscribers of newly issued stocks or bonds and the price at which these securities are finally traded for the first time on the secondary market. This observation from Reilly and Hatfield was the beginning, or better, the motivation for a series of controversial research by scientists from all over the world. There are still many researchers who try to demonstrate the reasons that this anomaly exists. Surveys are differentiated by the variables that anyone includes in their research, as well as by the market they choose to examine.

This study contains a review of the existing literature regarding the IPO characteristics and the process of going public in the US Stock Market. Empirical studies and historical findings regarding the Underpricing of IPOs are introduced while a more detailed examination of the Underpricing in US IPOs Market is presented adding several references in the Global Financial Crisis. The reasons for that phenomenon are categorized and empirical findings are reported while a discussion regarding this subject has been attempted in order to complete the puzzle of underpricing.

The aim of this study is to investigate the Underpricing Phenomenon using data from U.S. Stock Markets of New York Stock Exchange “NYSE” and NASDAQ for the period during the Global Financial Crisis (January 2007 - December 2009). In 2007 there were a lot of IPOs but the next year the number was dramatically reduced. Moreover the degree of underpricing dropped but the underpricing phenomenon was still present. The reasons of underpricing are investigated empirically using some of the explanations suggested in the cited academic literature and an extensive discussion of the findings has been attempted.

In the 2nd chapter, a literature review regarding the IPOs and the Underpricing phenomenon is developed. Chapter 3 includes the data collection process and the

methodology that was used to explain underpricing. Then, chapter 4 contains the results of the regression analysis that will be presented and discussed extensively. Finally, in chapter 5, a conclusion of the whole study will be provided.

CHAPTER 2

Literature Review

2.1 Introduction

The aim of this chapter is to provide all the necessary information about the theoretical background that the reader should have in order to convey both the characteristics and the process of the underpricing phenomenon on the American Secondary Market of New York Stock Exchange “NYSE” and NASDAQ. The following presentation will be based on results of several empirical studies and academic literature that will be additionally discussed at the end of the chapter.

2.2 Decision to “Go Public”

2.2.1 What exactly is an IPO?

An Initial Public Offering is the result of the action that a private company takes in order to offer securities to the public for the first time. The private company can be an old, large company which decides to be publicly traded. Or, on the other hand, it can be a young, small private company which decides to raise capital typically for an expansion. An underwriting firm should be appointed to help the firm with the whole procedure, in order to determine the type of securities that the company should issue, as well as determine the best possible price that it can offer its securities at in order to raise the needed capital at the least possible cost. The underwriting firm will also help the interested company to find the right timing to get into the securities market. Presumably the underwriter has a very good knowledge of the procedure and of all the “small things” that make for a successful IPO. That is the reason that a private company should hire an expert to accomplice the whole process with accuracy step by step. In addition the company will require hiring lawyers and accountants in order to conduct the necessary company audits.

2.2.2 Reasons for Going Public

Concerning the topic of why and when firms go public there are many approaches based on various theories found in academic literature. Modigliani and Miller in 1958 proposed that firms act rationally when they go public as they attempt to maximize the firm’s market value. However there may be more reasons, for example the ability to spread the risk of ownership among a large number of

shareholders. Furthermore going public reduces the overall cost of capital and also the cost of interest on existing debt the company might have.

Among the first publications on the subject was that by Myers and Majluf (1984) based on information asymmetry and possible mispricing, who argue that there is a pecking order of financing internal / external funds and loans in order to undertake investment opportunities. Zingales (1995) and Mello and Parsons (2000) argued that, through IPOs, internal investors may take back their capital. According to Zingales, Mergers and Acquisitions are possible through IPOs since the company's securities can be used as a currency for an M&A. Another explanation for possible reasons is that it can be characterized as a strategic move by the company which might aim to broaden its shareholders base (Chemmanur and Fulghieri (1999)). Some other theories assert that an IPO may give an advantage to the firm against private competitors, through an increase in its reputation and publicity (Maksimovic and Pichler (2001)). Another proposition as reason is the role of stock markets as monitors of management, according to Holmstrom and Tirole (1993); and that management wants to take advantage of the positive sentiment in bull up markets in order to sell the stock at attractive price, as Ritter and Welch argued (2002), Ritter (1991), and Loughran and Ritter (1995). Finally, Bradley, Jordan, and Ritter (2003), also show that analyst reports and suggestions are positively biased after IPO. Carlin and Mayer (2003) suggested that external finance is much more important than it was considered, depending on industry and market. Frank and Goyal (2003), Abe de Jong, Huijgen, Marra and Roosenboom (2012) found similar results.

In 2002, Lowery and Schwert, argue that an IPO first day's abnormal returns drive other firms to go public. This is a very important argument because it gives a good answer to many questions. Choe, Masulis, and Nanda (1993) argued that many firms will proceed with an IPO when other good firms do. They also claim that firms will do an IPO when they reach a certain point in the life-cycle of the sector and need external capital to continue growing.

All the suggested reasons for going public exhibit some tradeoff between the benefits of being publicly traded and the associated costs which will be described in following section. Consequently, as the conditions and the environment under which the firm operates change, it is logical that the incentives to go public also change.

2.2.3 Reasons for Staying Private (and Cost of Going Public)

A firm that considers undertaking an Initial Public Offering should value the pros and cons in order to ensure that it would be beneficial for the company. The decision to go public most of the times is considered to be irreversible and managers prepare detailed analysis and take into account all the factors regarding the future of the company.

The IPO accords several advantages for the firm. First of all, this move gives to the firm the opportunity to enlarge itself and diversify its equity base. It also increases its exposure, prestige and public image. The firm is able to execute acquisitions, most of the times in return for shares. The firm can take the advantage of having cheaper access to capital and furthermore it attracts and retains better management and employees through liquid equity participation. Thus, this decision leads to multiple financial opportunities in equity, convertible debts, cheaper bank loans and many more.

However there are also several potential disadvantages that the firm must evaluate. First, the costs for the completion of the process (including auditing, and financial and business disclosure costs) and of course the risk that the required funding may not be raised. Second, the lower post-issue operating performance after the company is going public is also a fact. According to Paleari et al (2006) the accounting performance of the newly listed companies in the private sector becomes worse after going public. This may be because meaningful time, effort and attention is required of the management and this may distract it from running the business. Third, the public dissemination of company's information may be useful to competitors, suppliers and firms' customers. Forth, there is a considerable risk that the management loses control of decision-making due to the new shareholders. Fifth, there is always the litigation risk, including private securities' class actions and shareholders' derivative actions.

According to research by Brau and Fawcett (2006), the reason firms decide to stay private is mainly because they want to maintain decision making control. Moreover for the majority of CFOs, unfavorable markets and industry conditions play the second leading negative role in undertaking the decision to list to a secondary market; while the loss of confidentiality is the third most important reason for a firm to stay private (Campbell (1979)). By extending this research, many CFOs state that, by staying private, a firm can follow a long term investment plan without worrying about the effect of this plan on the firm's stock price. The accounting rules and standards that the listed firms are obliged to follow are also a negative aspect of undertaking

the decision of issuing securities in a stock market.

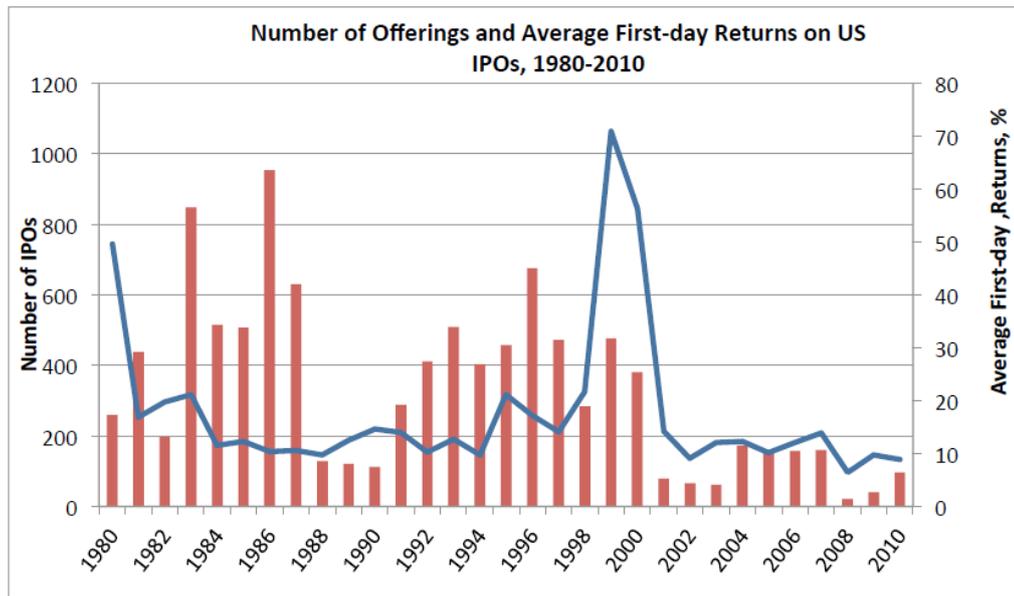
The cost of Going Public is separated into three categories: *the adverse selection, the loss of confidentiality and the administrative expenses and fees*, according to Pagano, Panetta and Zingales (1998). The adverse selection effect as type of information asymmetry affects the price of IPOs (Leland and Pyle (1997)). Furthermore it determines the underpricing spread according to Rock (1986), and becomes a great obstacle mostly for small, young firms (Chemmanur and Fulghieri (1995)). The cost of underpricing is considered as “money left on the table” by Loughran and Ritter (2002), and varies according to the choice between auctions and firm commitment underwriting or fixed price offerings. Then, listed firms have to make public information that may be crucial for their competitive advantage (Campbell, 1979). And last but not least, besides the underpricing costs and the loss of confidentiality that can be considered indirect costs, according to Ritter (1987), the IPOs process implies initial, direct, fixed costs as for example underwriter’s fees or registration fees. Even though direct costs have been a subject of research and they are estimated by researchers in many markets, they are not a subject of interest in this paper while the indirect cost of underpricing will be examined thoroughly at following chapters.

2.3 Underpricing phenomenon

2.3.1 Definition of underpricing

The pricing of an initial public offering (IPO) below its market value, is a quick and clear definition of the underpricing phenomenon. In other words, when the offer price is lower than the price of the first trade, the stock is considered to be underpriced. Stocks are usually underpriced temporarily because the laws of supply and demand will eventually drive them toward its intrinsic value. IPOs have historically had very large initial first day gains compared to the performance of the rest of the market. The following diagram (Figure 1Figure) shows the number of IPOs (left axis) and the average first day return (right axis) on the US market for the period from 1980 to 2010.

Loughran and Ritter (2001) point out that underpricing is a form of indirect compensation to underwriters to gain favorable allocation on hot issues. According to Khurshed, Paleari and Vismara (2005), there are three major hypotheses explicating such post-issue underperformance: *market timing hypothesis, window dressing (earnings management) hypothesis and theory of information asymmetry* among investors. We will examine them one by one.



Source: Official website of Ritter <http://bear.warrington.ufl.edu/ritter/ipodata.htm>

Figure 1: Number of Offerings and Average First-day Returns on US IPOs, 1980-2010

2.3.2 Timing of IPOs

The market timing hypothesis is based on the assumption that companies do not enter the capital market when they have a high growth potential and need to raise additional funding, but at the time when they are able to display positive growth opportunities, and thus to induce optimistic valuations. According to Loughran and Ritter (1995), existing shareholders try to enter the capital market at the time when their company enjoys very good financial results, reports maximum operational performance, and the sector in which it operates is at the peak of its growth.

According to the timing hypothesis, firms choose a window of opportunity to issue IPOs based on two basic considerations. The first consideration is about *market conditions*, and the second about the *firm's life-cycle*, which is introduced later in this subsection. With respect to market conditions, Ritter (1994) introduced the phenomenon of *hot-issue markets*, in which a large number of firms goes public in a short period of time. In this period of time, investors are very optimistic about the growth prospects and the companies take advantage of this window of opportunity by issuing larger number of securities. However there are more market considerations. One such consideration according to Choe, Masulis and Nanda (1993), says that firms avoid going public when other good firms do, but in contrary, they prefer to go public when other firms in the same industry are overvalued, as Ritter also argued

(1991). Furthermore, Brau and Fawcett (2006) proposed that managers recognize industry and market conditions as more important than IPO market in their timing decisions, while venture capitalists view market conditions more important than the industry. Taking a different approach, based on IPO market valuation, Alti (2005) tries to explain when firms decide to go public by separating the months of IPO activity into three categories: hot, neutral and cold.

The current market climate helps us determine IPO underpricing, as Derrien and Womack argued (2000). Accordingly, hot market investors may be exuberantly optimistic about a firm's prospects, causing the aftermarket equilibrium price to be higher than in normal conditions. Market climate not only affects the number of successful IPOs but also the mean and variance of underpricing. Kooli and Suret in 2001 argue that, when market is hot, the level of underpricing can be double or even triple compared to normal market conditions. Likewise, when the market is cold the level of underpricing is much lower than it would be under normal market conditions.

In general, it can be said that companies prefer to issue stock in periods when shares are in higher demand and tend to be overvalued. Based on that assumption, a hypothesis has been developed that long-term return on stock, issued during periods of higher IPO activity, is lower than that on stock issued during periods of low IPO activity. This hypothesis is supported by several empirical studies.

Chemmanur and Fulghieri proposed (1999) a second set of considerations, in accordance with the timing hypothesis, which concern the *firm's life-cycle*. More specifically, firms reach a point in their life-cycle in which they have to grow their business and, in order to reach their goal, they have to raise capital, which can be achieved through equity issuance (Brau and Fawcett (2006)). Conversely, according to Lucas and McDonald (1990), a firm will not issue equity if it is currently undervalued as a consequence of the adverse selection effect which was argued by Myers and Majluf (1984). Moreover, according to Loughran and Ritter (1995), the shareholders of the private company will try to time the IPO when their company can report good financial results and the industry sector in which it operates is at the peak of its growth.

2.3.3 Window dressing (earnings management) hypothesis

When a firm goes public the managers have an incentive to work towards producing the most favorable financial results. As an example, window dressing is used by mutual fund and other portfolio managers near the year or quarter end in order to improve the appearance of a fund's performance before presenting it to

clients and shareholders. The window dressing (or earnings management) hypothesis is based on an assumption that, before the public offering, a company will try to window-dress its accounting numbers in order to make the firm look better before the IPO. This tactic often results in equity overvaluation. As a consequence, post-IPO companies may not be able to achieve the long-term results expected by the investors, and share price will tend to drop. In view of this, in most developed countries, issuer companies are required to file financial statements that meet International Financial Reporting Standards (IFRSs) and to have them audited, before the IPO. For investors, window dressing provides another good reason to monitor a firm's performance reports closely. Given that window dressing affects the fair market value of a company's stock, investment researchers and regulators watch closely for evidence of window dressing, and regulators in particular may introduce new rules that demand greater transparency, as well as enforce compliant reporting.

2.3.4 Theory of Information Asymmetry among investors

One of the most important factors that has been studied is the asymmetric information hypothesis, which occurs due to the inefficiency of the markets and it is the situation in which one party has superior information compared to the other. The most recent theory that strives to explain long-term post-issue underperformance is based on the hypothesis of the existence of information asymmetry. Investors have different expectations with respect to the issuer's real value. If there are enough optimistic investors on the market, the issue will be overpriced. But sometime after the issue date and with the emergence of new information that helps alleviate the information asymmetry, the pessimistic and the optimistic opinions of investors will converge, resulting in a decrease in the shares' price. George Akerlof was the first who coined the term "lemon markets", in 1970. Actually the term "lemon" was used to describe a "bad" car. He tried to explain the reasons that information asymmetry exists, by using examples with buyers and sellers of cars. He pointed out the information asymmetry that exists in that the seller would provide information to the buyer about all the "good" features of a car in order to successfully complete a sale. Information asymmetries tend to be greatest in the areas that we examine, because there is a high volume of complicated information that needs to be taken into account.

Rock (1986) introduced the most popular model of the asymmetric information hypothesis, which was the *winner's curse model*. The winner's curse phenomenon is based on the fact that in inefficient markets, investors cannot ex-ante

observe if the offering that they participate in is a “lemon” or not. Investors are categorized between informed and uninformed, while IPOs are separated between the “good” and the “bad” offerings through the valuation process of the informed individuals. The uninformed investors will ultimately be the ones who will obviously buy the “bad” IPOs due to superior information of informed investors. But even though they “won” by buying the IPO, the same IPO is “bad” and the winners curse occurs. There is also a suggestion by Beatty and Ritter (1986), about the uninformed investors, which says that, by acting as a free rider, or differently, as representative investor, faced with adverse selection, will buy IPOs only if they are underpriced. Issuers deliberately underprice their IPOs so that the expectation of high initial returns ensures the participation of uninformed investors. Koh and Walter (1989) for Singapore market, Levis (1990) for the UK market, Chowdhry and Sherman (1996) and Keloharju (1993) for the Finnish market, Amihud, Hauser and Kirsh (2003) for Tel Aviv market, and Michaely and Shaw (1994) confirmed the relation between winner’s curse and underpricing.

Nevertheless, as it was expected, the winner’s curse was based on assumptions that raised several questions. Thus, according to Keasey and Short (1992), the winners curse hypothesis suffers from conflicting assumptions, such as that the demand for IPOs increases by both informed and uninformed investors, that the firms would give their profits from underpricing to the group of informed investors, that the informed investors’ demand is not sufficient enough to cover all IPOs, and the uninformed investors are needed and the underpricing results in higher demand by uninformed investors. Hanley and Wilhelm (1995) claim that institutions, consisting of informed traders, do not pick the best offerings compared to retail traders, consisting of uninformed traders, while Aggarwal, Prabhala and Puri (2002) found that institutions gain superior returns from IPO allocations. Michaely and Shaw (1994) argued that the existence of heterogeneity among investors is a condition for the winner’s curse hypothesis and its absence of homogeneity leads to zero underpricing. Rock (1986), also tested what happens when abnormal initial returns are adjusted for rationing, or in other words no information asymmetry, and found that underpricing doesn’t exist in these circumstances. Finally, Levis (1993) found that underpricing occurs in the flotation method of placements where there cannot be a winner’s curse phenomenon. As far as the winner’s curse theories concerned, Beatty and Ritter (1986) suggested that asymmetric information leads to ex ante uncertainty. This kind of uncertainty is the one about the value of the offering before it is initiated. The ex ante uncertainty is based on the likelihood that an investor will get a good or bad issue and ultimately leads to the winners curse phenomenon. Beatty

and Ritter argued that this theory has a positive relation with underpricing and created some proxies with the use of proceeds disclosed to measure the uncertainty described. The lack of information about how the proceeds of a firm will be used creates uncertainty and the firm underprices its issue in order to compensate investors for its uncertainty. The riskier IPOs are more underpriced according to Ritter (1984), while Loughran and Ritter (2004) suggested that the changing risk composition of the IPO market also leads to higher underpricing.

Within the framework of information asymmetry, there is a common suggestion by Beatty and Ritter in 1986 along with Carter and Manaster (1990) analyzing that prestigious underwriters decide to take up low risk IPOs in order to underwrite them. They also choose high quality offerings in order to meet their goals and manage to enhance their reputation. Carter, Dark and Singh (1998), Megginson and Weiss (1991) and Kenourgios, Papathanasiou and Melas (2007) found evidence that the initial excess return on the IPOs is negatively correlated with underwriter's reputation. In 1973 Logue was the first who suggests that the choice of the underwriter has important impact on the price of the IPO. That is the main reason that low risk firms hire prestigious underwriters in order to show the low risk of their IPOs and make them more attractive to the investors (Carter and Manaster (1990)). The presence of a prestigious underwriter and reputable auditors reduce the uncertainty and consequently the risk to investors about the future of the firm that decides to go public, and produce a certain signal about the information and the security of the firm's stocks. Willenborg (1999) and Brau and Fawcett (2006), argued that when large firms hire underwriters, they are concerned about IPO allocation of shares to potential clients, or in other words spinning, more than smaller companies. It is also worth mentioning that the number of criteria used, in order to determine the quality of the firm are enough, according to the academic literature. As Beatty and Ritter suggested (1986) the higher market share the higher the quality for the underwriter. After that statement, Carter and Manaster (1990), suggested that the ranking must be based on "tombstone announcements", that are announced in main financial newspapers. The problem in this method is that it does not count for underwriters' change in quality during the period tested for underpricing. Finally, Jalilvand, Stewart and Switzer (1996), tried to evaluate underwriters quality by combining the previously described evaluation methods.

Table 2.1 Empirical Evidence of the Winner's Curse Model

Testable Hypothesis	Empirical Evidence Supportive	Contrast
The abnormal initial returns for uninformed investors are zero when adjusted for rationing	Rock (1986), Koh and Walter (1989), Levis (1990), Keloharju (1993), Lee, Taylor and Walter (1996), Huang (1999), How (2000), Amihud, Hauser and Kirsh (2003), Derrien (2005)	Khurshed et al (1999)
Underpricing is lower if information is distributed homogeneously across investor group	Michaely and Shaw (1994)	
The greater the ex-ante uncertainty about the value of the IPO company, the higher is the expected underpricing	Ritter (1984), Beatty and Ritter (1986), Ritter (1991), Keasey and Short (1992), Kiyamaz (2000)	McGuinness (1992)
Underwriters that underprice too much will lose business from issuers	Beatty and Ritter (1986), Nada and Yun (1997), Dunbar (2000)	
Underpricing can be reduced by minimizing information asymmetry, by choosing a prestigious underwriter and a reputable auditor	Booth and Smith (1986), Carter and Manaster (1990), Timan and Trueman (1986), Michaely and Shaw (1994), Habib and Ljungqvist (2001)	McGuinness (1992), Beatty and Welch (1996)

Source: Ljungqvist (2008) and the papers published by them who are listed in the table.

In order to conclude, all these theories and studies that were presented tried to explain the underpricing phenomenon basically as a result of information asymmetry among investors. All these are mainly based on the winner's curse model.

2.4 Underpricing phenomenon as part of IPO market anomalies

Initial Public Offerings have been a public concern and resulted in a number of theoretical and empirical studies focused mainly on the IPOs' stock returns both in the long and the short run. These studies showed that puzzling anomalies occurred in the IPO market. Underpricing was the first anomaly documented that has been a subject of research since 1970. It has been documented both in developed and emerging markets regardless of the method of pricing. This first puzzling empirical finding led to extensive research about anomalies found in the IPOs, including the hot-market phenomenon and the long run underperformance. A summary of both theoretical and empirical studies on the latter two anomalies will be presented below as well as a more detailed explanation about the findings regarding the underpricing phenomenon.

2.5 Underpricing

The Underpricing phenomenon refers to the significant positive initial returns of IPOs after the initial listing of the shares, which is the main reason of IPO anomalies as argued by Ritter and Welch (2002). More specifically, Ritter (1991) suggested that the IPO long run underperformance is the main reason of the underpricing, while Jaffe and Ibbotson (1975) recorded the different degree of underpricing between "hot" and "cold" periods in the market. Therefore it is reasonable that all the researches focused on IPO underpricing and investigate the reasons that result in this phenomenon.

Table 2.2: Equity weighted average initial returns for 52 countries

Equally weighted average initial returns for 52 countries				
Country	Source	Sample Size	Time Period	Avg. Initial Return
Argentina	Eijgenhuijsen & van der Valk; Dealogic	26	1991-2013	4.2%
Australia	Lee, Taylor & Walter; Woo; Pham; Ritter	1,562	1976-2011	21.8%
Austria	Aussenegg	103	1971-2013	6.4%
Belgium	Rogiers, Manigart & Ooghe; Manigart DuMortier; Ritter	114	1984-2006	13.5%
Brazil	Aggarwal, Leal & Hernandez; Saito; Ushisima	275	1979-2011	33.1%
Bulgaria	Nikolov	9	2004-2007	36.5%
Canada	Jog & Riding; Jog & Srivastava; Kryzanowski, Lazrak & Rakita; Ritter	720	1971-2013	6.5%
Chile	Aggarwal, Leal & Hernandez; Celis & Maturana; Dealogic	81	1982-2013	7.4%
China	Chen, Choi, & Jiang; Jia, Xie & Zhang	2,512	1990-2013	118.4%
Cyprus	Gounopoulos, Nounis, and Stylianides; Chandriotis	73	1997-2012	20.3%
Denmark	Jakobsen & Sorensen; Ritter	164	1984-2011	7.4%
Egypt	Omran; Hearn	62	1990-2010	10.4%
Finland	Keloharju	168	1971-2013	16.9%
France	Husson & Jacquillat; Leleux & Muzyka; Paliard & Belletante; Derrien & Womack; Chahine; Ritter; Vismara	697	1983-2010	10.5%
Germany	Ljungqvist; Rocholl; Ritter; Vismara	736	1978-2011	24.2%
Greece	Nounis, Kazantzis & Thomas; Thomadakis, Gounopoulos & Nounis	373	1976-2013	50.8%
Hong Kong	McGuinness; Zhao & Wu; Ljungqvist & Yu; Fung, Gul, and Radhakrishnan; Dealogic	1,486	1980-2013	15.8%
India	Marisetty and Subrahmanyam; Ritter	2,964	1990-2011	88.5%
Indonesia	Suherman	464	1990-2014	24.9%
Iran	Bagherzadeh	279	1991-2004	22.4%
Ireland	Dealogic	38	1991-2013	21.6%
Israel	Kandel, Sarig & Wohl; Amihud & Hauser; Ritter	348	1990-2006	13.8%
Italy	Arosio, Giudici & Paleari; Cassia, Paleari & Redondi; Vismara	312	1985-2013	15.2%
Japan	Fukuda; Dawson & Hiraki; Hebner & Hiraki; Pettway & Kaneko; Hamao, Packer, & Ritter; Kaneko & Pettway	3,236	1970-2013	41.7%
Jordan	Al-Ali and Braik	53	1999-2008	149.0%
Korea	Dhatt, Kim & Lim; Ihm; Choi & Heo; Mosharian & Ng; Cho; Joh; Dealogic; Lee	1,758	1980-2014	58.8%
Malaysia	Isa; Isa & Yong; Yong; Ma; Dealogic	474	1980-2013	56.2%

Country	Source	Sample Size	Time Period	Avg. Initial Return
Mauritius	Bundoo	40	1989-2005	15.2%
Mexico	Aggarwal, Leal & Hernandez; Eijgenhuijsen & van der Valk; Villarreal	123	1987-2012	11.6%
Morocco	Alami Talbi; Hearn	33	2000-2011	33.3%
Netherlands	Wessels; Eijgenhuijsen & Buijs; Jenkinson, Ljungqvist, & Wilhelm; Ritter	181	1982-2006	10.2%
New Zealand	Vos & Cheung; Camp & Munro; Alqahtani; Dealogic	242	1979-2013	18.6%
Nigeria	Ikoku; Achua; Dealogic	122	1989-2013	13.1%
Norway	Emilsen, Pedersen & Sættem; Liden; Dealogic	209	1984-2013	8.1%
Pakistan	Mumtaz	80	2000-2013	22.1%
Philippines	Sullivan & Unite; Dealogic	155	1987-2013	18.1%
Poland	Jelic & Briston; Woloszyn	309	1991-2014	12.7%
Portugal	Almeida & Duque; Dealogic	32	1992-2013	11.9%
Russia	Dealogic	64	1999-2013	3.3%
Saudi Arabia	Al-Anazi, Forster, & Liu; Alqahtani	80	2003-2011	239.8%
Singapore	Lee, Taylor & Walter; Dawson; Dealogic	609	1973-2013	25.8%
South Africa	Page & Reyneke; Ali, Subrahmanyam & Gleason; Dealogic	316	1980-2013	17.4%
Spain	Ansotegui & Fabregat; Alvarez Otera; Dealogic	143	1986-2013	10.3%
Sri Lanka	Samarakoon	105	1987-2008	33.5%
Sweden	Rydqvist; Schuster; de Ridder	374	1980-2011	27.2%
Switzerland	Kunz, Drobotz, Kammermann & Walchli; Dealogic	164	1983-2013	27.3%
Taiwan	Chen; Chiang	1,620	1980-2013	38.1%
Thailand	Wethyavivorn & Koo-smith; Lonkani & Tirapat; Ekkayokkaya and Pengniti; Vithessonthi	500	1987-2012	35.1%
Tunisia	Hearn	32	2001-2013	24.3%
Turkey	Kiyamaz; Durukan; Ince; Kucukkocaoglu; Elma	399	1990-2013	9.7%
United Kingdom	Dimson; Vismara; Levis	4,932	1959-2012	16.0%
United States	Ibbotson, Sindelar & Ritter; Ritter	12,702	1960-2014	16.9%

Source: Initial Public Offerings-International Insights, Tim Loughran, Jay R. Ritter, Kristian Rydqvist, 2015

Underpricing was first documented in the US market by Reilly and Hatfield in 1969. In this study, even though a significant degree of mispricing was expected given the uncertainty about the true value of the shares, IPOs were significantly and systematically underpriced. Ritter (1984) also discovered this phenomenon in both emerging and developed markets and Loughran, Ritter, Rydqvist (1994), summarized the evidence of IPO underpricing in a large number of countries presented in Table 2.2. From this table it can be easily demonstrated that there is a 40% volatility of underpricing and that the underpricing is not the same for every country and specifically, emerging markets show higher initial returns, or in other

words higher underpricing. Loughran, Ritter and Rydqvist interpreted this phenomenon as the effect of different regulations, contractual mechanisms and characteristics of the firms going public in each country. In order to compare the underpricing among these countries, the weighted average of initial returns was calculated in the last row of the last column. As we can see the weighted average is equal to 33.88%, while the average initial return of the most developed markets is far lower, as for United Kingdom is 16.0% and United States 16.9%. In 2004 Loughran and Ritter observed the persistency of underpricing, taking data from 25 countries.

2.6 Underpricing Volume

It is also very important to mention that the time needed for the company to be finally listed in the stock market plays a big role. The bigger this period is the bigger becomes the uncertainty and, as a result, that also affects the underpricing volume. Lowry and Schwert (2000) observed that initial returns are significantly negatively correlated with past IPO volume and significantly positively correlated with future IPO volume.

Next we present the main characteristics that determine the IPO volume that is going to be issued. According to Lowry and Schwert (2002), high initial returns lead managers to issue more IPOs. Lowry (2003) suggested that the IPO's volume is determined by the business cycle, as for example economic expansion or the need for capital. What also affect the IPO volume is the investors' perception and finally the investors' uncertainty. And of course the capital demands hypothesis according to Choe et al. (1993). Furthermore the information asymmetry hypothesis, including adverse selection costs, as Myers suggested (1977), Myers and Majluf (1984) and Korajczyk et al. (1992), and the investor sentiment hypothesis according to De Long, Shleifer, Summers and Waldmann (1990).

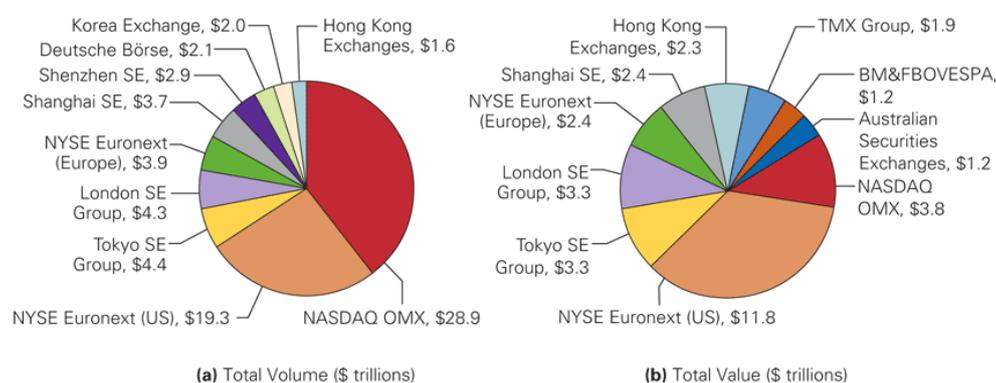


Figure 2: (a) Total Volume (\$ trillions), (b) Total Value (\$ trillions)

The drawings in Figure 2 depict: a. the total volume of the ten largest stock exchanges around the world, with NASDAQ at \$28.9trillion and NYSE at \$19.3trillion; and b. the total value of the ten largest stock exchanges, where NYSE has the first place with \$11.8trillions, while NASDAQ follows with \$3.8trillions.

2.7 The role of the Underwriter

It has been observed by Krigman et al. (2001), that firms often change underwriter between the IPO and the next equity issue. The findings suggest that CFOs believe that the ability of the underwriter to provide sophisticated “know-how” and advice is the most important reason.

As we observe from the survey presented in table 2.3, the most important characteristic of the underwriters is their overall reputation and status, with a mean of 4.39 out of 5, and 91% agreeing. Then, the quality and reputation of the research department or analysts follows with 4.25 out of 5 and the percent of those who agree at 83%. After that, underwriter’s industry expertise takes place, along with their connections, with 4.24 and 87.5%. Market making, trading desk and liquidity provision services follow. Institutional investor client base of the underwriter is the next most important characteristic and after that is the pricing and valuation promise to the firm. Of course, the fee structure could not be out of this list. There is also the retail client base of the underwriter and the non-equity related services. Finally, at the end of the list, it is the underwriter’s spinning reputation.

Table 2.3

Survey Responses to the Question: How Important Were/Are the Following Criteria in Selecting a Lead IPO Underwriter?

Means are based on a five-point scale with anchors of 1 = not important to 5 = very important. Size is based on revenues with large firms over \$100,000,000. An Underwriter Prestige ranking of high represents firms with underwriters who are rated over 8.1 in Jay Ritter's underwriter database. Overhang is defined as the quantity of shares outstanding prior to the issue minus secondary shares offered in the IPO all divided by total shares offered in the IPO. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Superscripts indicate significant simultaneous differences using Tukey inference tests. Means with the same superscript are significantly different from means with different superscripts. Means without superscripts are not significantly different from the other two means. The sample consists of 336 completed surveys composed of 37 withdrawn IPOs, 87 successful IPOs, and 212 firms that were large enough, but did not attempt to go public during the period 2000 to 2002.

	Overall		IPO Status			Size		Underwriter Prestige		Overhang	
	Mean	% 4-5	Withdrawn	Successful	Not Tried	Small	Large	Low	High	Low	High
Underwriter's overall reputation and status	4.39	90.58	4.46	4.40	4.33	4.40	4.35	4.03	4.53**	4.24	4.65**
Quality and reputation of the research department/analyst	4.25	82.53	4.35*	4.41*	3.87 ^b	4.34	4.10*	3.78	4.56***	4.26	4.58*
Underwriter's industry expertise and connections	4.24	87.50	4.38	4.15	4.28	4.24	4.23	3.93	4.30**	4.06	4.19
Market making, trading desk, and liquidity provision services	3.50	55.62	3.46	3.45	3.61	3.50	3.47	3.24	3.49	3.42	3.39
Institutional investor client base of the underwriter	3.50	56.89	3.70	3.32	3.65	3.48	3.48	3.03	3.54*	3.38	3.13
Pricing and valuation promises	3.24	44.97	3.16*	3.01*	3.72 ^b	3.14	3.31	3.50	2.86***	3.14	2.74
Fee structure	2.75	24.85	2.49*	2.43*	3.54 ^b	2.49	3.01***	2.93	2.22***	2.54	2.13*
Retail client base of the underwriter	2.67	20.24	2.68	2.49*	2.98 ^b	2.62	2.74	2.93	2.43*	2.65	2.26
Nonequity-related services (e.g., advice on M&A, debt)	2.54	13.69	2.51	2.42	2.78	2.40	2.76**	2.18	2.56*	2.41	2.39
Underwriter has a reputation for spinning	1.86	8.54	1.70*	1.58*	2.52 ^b	1.64	2.18***	1.79	1.56	1.70	1.32*

Source: Initial Public Offerings: An Analysis of Theory and Practice James C. Brau and Stanley E. Fawcett, 2006

2.8 Long-run Underperformance

Long run underperformance is the second anomaly in the IPO market. Aggarwal and Rivoli (1990) found evidence of negative abnormal returns in the long run. Ritter (1991) explained that long run underperformance can be conceived by investors as a price pattern that creates opportunities for superior returns. Firms also estimate the negative long run abnormal returns as a cost of raising equity. Furthermore, this pattern raises questions about the efficiency of the market as the phenomenon described is a market anomaly. Finally, the abnormal returns explain the volume variation of IPOs. Ritter (1998) found that long run underperformance occurs mainly in periods when large numbers of IPOs are issued.

2.8.1 Evidence of long run underperformance

Ritter (1991) found negative abnormal returns of approximately 34.5% in three years after the issuance regarding US IPOs in the period 1975 and 1984. Levis (1993), Loughran and Ritter (1995) and How (2000) found similar results in other

markets. Gounopoulos, Nounis and Stylianides (2007) and Thomadakis, Nounis and Gounopoulos (2012) found evidence of the short and long run underperformance across many markets. Other academics also tested the phenomenon coming to the same results as Keloharjuin (1993) and Lee, Taylor and Walter (1996, 1999).

2.8.2 Reasons for long run underperformance

There are many explanations behind the long run underperformance and many academics tried to find the root causes. First, according to one theory the reason for this anomaly has no rational explanation; it is related to the size of the IPO and the initial underpricing and it is referred to as a fad or speculative bubble (Shiller (1990)). Yi (2001) suggested that initial returns are not an important factor in explaining the underperformance phenomenon but the higher the earnings-price ratio a firm has at the time of going public, the better the performance it exhibits in the long run (Loughran and Ritter (1995)). Moreover, Loughran and Ritter suggested that investors, in order to maximize their profit, use time patterns and exploit this window of opportunity creating this phenomenon, an argument contradicted by Ljungqvist (1996). Second, Miller (1977) and Loughran et al (2001) suggested that greater divergence of opinion or uncertainty can generate short-run overvaluation and long-run underperformance. Third, the underwriter and the Venture Capital play an important role in the long run underperformance phenomenon according to Carter et al (1998). IPOs exhibit less negative long run underperformance when more prestigious underwriters are involved in the IPO process. And last, Brav and Gompers (1997) rejected these theories and Barber and Lyon (1997) explained and identified misspecifications about the model used for counting the abnormal returns in the long run.

2.9 "Hot issue" markets

The "*hot issue*" markets phenomenon is the third anomaly in the IPO market and it refers to periods of high initial returns associated with increasing volumes of IPOs issued (Ibbotson, Sindelar and Ritter (1988)). Jaffe and Ibbotson (1975) were first to find that the underpricing phenomenon occurs during particular periods. These periods-waves of IPOs were referred to as "hot issue" markets. Ritter (1984) with his study in U.S IPO market confirmed this pattern and found evidence that it is focused on particular industries. Studies of this anomaly have been made by other academics (Ljungqvist, Nanda, and Singh (2006)) and (Cornelli, Goldreich and Ljungqvist

(2006)). Furthermore, Loughran and Ritter (1995), Helwege and Liang (2004), and Cook, Jarrell and Kieschnick (2003) explained more generally that in hot issue markets companies experience high underpricing and long run underperformance.

2.9.1 Reasons for "Hot issues" markets

Few academics have tried to find the reasons of the existence of the “*hot issue*” market phenomenon. Ritter (1984) suggested that hot issue markets occurs when the risk of the firms change (higher risk results to higher underpricing) and the “changing risk composition” result insignificant changes in initial returns. A second possible explanation, according to Ritter, could be the positive feedback or momentum strategies. This explanation is based on the investors' assumption of positive autocorrelation in initial returns among the IPOs issued as no short selling can take place. Furthermore the hot issue phenomenon may exist as a window of opportunity for investors when there are relative high price multiples for the firms or when the investors are overoptimistic about the young firms.

Ljungqvist, Nanda and Singh (2006) suggested that “hot issue” market is a matter of supply and demand. On the other hand, in the hot issue period, according to Ritter (1991), the increasing volume of IPOs is a result of the firms' conceptions about the market as they find better investment opportunities. This argument was rejected by Loughran et al (1994) who didn't find evidence of increased investments in the periods described. Lowry and Schwert (2002) and Benninga et al (2005), however, argued that firms issue more shares when their cash flows are relative high and this leads to higher price of IPOs.

2.9.2 Cold period, the period of financial crisis

Finally, the period of the Global Financial crisis, can be considered a “*cold period*”, in a general sense, as it has all the appropriate characteristics of the cold market described above. The financial crisis had some considerable effects on IPO underpricing phenomenon so that it can be categorized as a cold period. First, hedge fund investors tried to liquidate their equity positions by selling risky assets in the developed markets causing low demand for stocks and consequently for IPOs (liquidity effect). Second, the uncertainty perceived by investors about the global economy placed a halt in investments in new IPOs. Third, the financial crisis has caused an increase in asymmetric information which is one of the main reasons for underpricing. Forth, the competition among underwriters led to lower demands for

compensation through underpricing. And last, due to diversification practices of investors, new issues were allocated to more investors. All these reasons will be described thoroughly as explanations of underpricing in the following section.

2.10 The Signaling Hypothesis

The Signaling model is another model developed in order to explain the underpricing phenomenon. This model is based on the notion that underpricing IPOs signals that the offerings can be sold later at a higher price. Allen and Faulhaber (1989), Gibratt and Hwang (1989), and Welch (1989), presented signaling models based on asymmetric information hypothesis. In these studies, there are two assumptions: the issuer is the one with superior information about the value of the firm, and the firm is considering future equity issues according to Jegadeesh, Weinstein and Welch (1993). The signaling model studies suggest that a high valued firm tries to send a signal towards investors about its quality and the way to do this is through underpricing. Investors know that only the high quality firms can afford the cost of underpricing (Allen and Faulhaber (1989)). Welch (1989), also argues that the higher the probability that a firm is “good”, the higher the probability that it underprices its offerings. Jegadeesh et al. (1993), also found that the high quality firms that exhibit higher underpricing are more likely to issue large amounts of season equity offerings (SEO) after the IPO. Conversely, the signaling model was rejected by Michaely and Shaw (1994), who found that lesser amount of SEO was issued by firms who underpriced their IPOs more.

2.11 The Principal Agent Model

The flotation methods, especially the book-building method and the valuation process indicate that the investment bank’s role as an underwriter is very important regarding the IPO pricing. According to the principal agent model, the investment bank uses its superior information about market conditions and investor demand, by taking into account the monopsony power hypothesis, in order to underprice the IPO. But what does the underwriter gain by underpricing the IPOs? The underwriter, by underpricing the IPOs uses less effort to allocate shares to investors and cover its marketing costs. However, the issuer is interested in maximizing its revenues from the offering. This conflict of interest between issuer and underwriter was documented by Baron and Homstrom (1980), who also noted that competitiveness among underwriters reduces the underpricing phenomenon. Baron (1982), tried to identify

underwriter's benefit from underpricing creating screening models in which the issuer constructs schedules of contracts for the underwriter. He found that underpricing was the second best optimal. Concluding, as the uncertainty about the value of the firm increases, the underwriter role becomes mandatory and information asymmetry increases. As a result, greater underpricing occurs.

2.12 The Market Feedback Hypothesis

According to the market feedback hypothesis, also named as Information Revelation Theory, investment banks underprice IPOs in the book-building method in order to reveal the investor's information about the demand for the IPO. Initially, the underwriter tries to acquire truthful information about the demand of IPOs in order to set a favorable issuing price. Underwriters have to create a mechanism that guarantees greater returns for the investors who reveal their information. Benveniste and Spindt (1989), Benveniste and Wilhelm (1990), and Spatt and Srivastava (1991) showed that book-building method is that mechanism. The market feedback hypothesis suggests that in the case of excess demand, underwriters must underprice the offerings for which favorable information was revealed in order to ensure that investors have incentive to reveal this information. Benveniste and Wilhelm (1990) and Sherman and Titman (2002) argued that discriminatory allocation of underpriced shares rewards both informed or in other words, aggressive bidders, and uninformed investors, but the expected proceeds are maximized. Moreover, Hanley (1993) and Hanley and Wilhelm (1995) documented that underpricing is caused by the partial adjustment of price where underwriters price upward the offerings only partially in order to compensate the investors who revealed their information. Benveniste and Wilhelm (1990) tested the interaction of this hypothesis with the winner's curse model finding that as underwriters become more informed with the help of the book-building method, information asymmetry is reduced and so does the winner's curse.

2.13 Institutional Explanations

Institutional practices play an important role in the underpricing IPOs phenomenon according to Loughran, Ritter and Rydqvist (1994). The reasons for underpricing based on an institutional approach are separated in four categories, the lawsuit avoidance hypothesis, the price stabilization, the tax based motives and the questionable practices of spinning and flipping as presented below.

2.13.1 The Lawsuit Avoidance Hypothesis

The lawsuit avoidance hypothesis was first introduced by Logue (1973), who argued that underpricing was a way to reduce the likelihood of future lawsuits as IPOs showed a long run underperformance. However, Drake and Vetsuypens (1993), Ritter and Welch (2002) found that underpricing does not reduce the probability of lawsuit. Lowry and Shu (2002), contrary to Drake and Vetsuypens, compared this tradeoff between underpricing and litigation risk from a different perspective arguing that less litigation risk requires greater underpricing and firms underprice IPOs to reduce the possibility of being issued. However, they failed to show the magnitude of the relationship between litigation risk and underpricing.

Many studies have showed different results raising questions regarding the validity of the hypothesis. Ritter (1998) and Ibboston et al (1994) suggested that legal liability considerations are a minor reason for the underpricing of IPOs which is considered a very costly way to reduce litigation risks. Moreover, Keloharju (1993) found that underpricing exists regardless of IPO-related litigation and Hughes and Thakorin (1992) argued that when all agents are rational, litigation risk is not a sufficient reason for underpricing. On the other hand, Tinic (1988) and Henslerin (1995), studying underpricing in U.S before and after the 1933 Securities Act regarding disclosure requirements, found evidence that underpricing works as an insurance against lawsuits. Hanley and Hoberg (2012) argued that litigation risks must be hedged and one way to do so is by underpricing the IPOs. Spindler (2010) found that risk factor disclosure is positively related to lawsuits regarding IPOs. Companies that believe they will be sued disclose less and as a consequence face greater underpricing. Therefore, the results are inconclusive as there is no unanimous answer to the question whether lawsuit avoidance is an important or valid reason for IPO underpricing.

2.13.2 Price support

According to Benveniste, Busaba, and Wilhelm (1996) the underwriter has an incentive to raise the offer price of the IPOs as their fees are a percentage of the IPOs gross proceeds. However, informed investors would not participate in the IPO process if the IPOs are overpriced. As a consequence, the underwriters follow a strategy of price support, reassuring investors that the offerings will not be overpriced. Schultz and Zaman (1994) and Hanley, Kumar and Seguin (1993) found evidence of price support while Prabhala and Puriin (1998) argued that there is a

positive correlation between low initial price risk and price support. Fjesme (2011) suggested that price support can reduce the secondary investor return. Chen and Wilhelm (2008) suggested that issuers benefit from price support for two reasons: they can react quickly on new information and price support provides a smooth transition to secondary market.

Price support can take the form of price stabilization (legal) and price laddering (illegal). Price stabilization theory is based on the underwriter's intervention in the aftermarket of the IPO. Jones, Asquith and Kieschnick (1998) documented that almost half US IPOs were supported in the period 1982 and 1983. Ruud (1999) argued that the underwriters do not deliberately underprice the IPOs but they try to find the expected market value of the offering and price it accordingly. Ellis, Michaely and O'Hara (2000) found that underwriters buy back more stocks in cold periods, when there is higher probability of overpriced offerings, than in hot periods. Finally, Hao (2007) suggested that investor price support just reduces the possibility of price decreases after the listing and Griffin et al. (2007) argued that underwriters may use investor price support to improve their reputation.

2.13.3 Tax based motives

Few academics have shown that the underpricing phenomenon is closely related to tax regulations. Even though tax based motives are not enough to explain the underpricing of IPOs, they may explain the cross-section of IPOs returns. First, Loughran, Ritter, and Rydqvist (1994) tested the tax avoidance hypothesis as determinant of the IPO price. Rydqvist (1997) studying the Swedish IPOs found evidence that tax rates on capital gain and underpricing have an obvious negative relation. Taranto (2003) found evidence of tax based motives of underpricing in the US IPOs market. He also argued that the tax advantage of options used as payments to employees is directly related to underpricing. Finally, Peng (2013) showed that the reduction in capital gains tax rates increases the IPO underpricing significantly.

2.13.4 Questionable practices

According to Liu and Ritter (2009), there are four scandals associated with IPOs, the *spinning*, *laddering*, *analyst* conflicts of interest, and the exchange of soft dollar commission business in return for IPO allocations. The relation between underpricing and the first three scandals cited will be presented below.

Analyst lust hypothesis

One of the major post-IPO activities of investment bankers is the analyst research coverage. As a consequence, the analyst participating in this activity plays an important role in the IPO process. Dunbar (2000) and Clarke, Dunbar and Kahle (2003) found that underwriters gain greater IPO market share if they have a reputable analyst. Cliff and Dennis (2004) hypothesized that issuers purchase analyst coverage by giving up greater underpricing. Specifically, the issuer chooses an underwriter with a reputable analyst expecting to compensate the underwriter with greater underpricing. Loughran and Ritter (2002) called this desire for an influential analyst, analyst lust hypothesis and with the spinning hypothesis they are the two elements of the "changing issuer objective function hypothesis". As an underwriter with more market power is associated with greater underpricing, as Hoberg suggested (2003), the same relation occurs between "all-star analysts" and underpricing. Finally, Cliff and Dennis (2004) suggested that "If underwriters do not deliver the expected analyst coverage (conditional on underpricing), the IPO firm is more likely to switch underwriters when it issues shares in its subsequent SEO".

Laddering

Given that IPOs are underpriced, investors buy hot IPOs and resell them in the aftermarket making considerable profits. This practice studied initially by Krigman, Shaw and Womack (1999) and Aggarwal (2003) is called flipping. Flipping is taken into consideration by the underwriters when they price an IPO and has both positive and negative aspects. Underwriters are pleased as active trading generates trading commissions but selling pressure may reduce the price of the offering in the aftermarket especially in "cold" periods. The last effect of flipping forces the underwriter to implement price support practices. One way to stabilize the price is by penalizing flippers, excluding them from future IPO trades. Another way also introduced by Aggarwal is to stimulate demand through short covering or in other words, take a short position by allocating shares in excess of the original amount that has been offered. As already described in the previous section, one of the price support practices is laddering. Laddering is referred to underwriter's price manipulation. Underwriters require investors who received IPO allocations to purchase additional shares in the aftermarket. According to Hao (2007) laddering reduces the underwriter's price support cost and is used in greater extend when there is information momentum (greater demand). As a consequence, laddering increase the money left on the table.

Spinning hypothesis

As mentioned in the previous chapter, spinning refers to allocation of IPOs in specific individuals such as company executives in order to influence them become future clients according to Siconolfi (1997). Although spinning has not been tested empirically due to the lack of data, it has been a subject of interest by many academics (Loughran and Ritter (2004)) and (Maynard (2002)). The positive relation between spinning and underpricing is based on the notion that executives, who receive IPOs as side payments, are not likely to maximize the proceeds from their IPO and consequently underwriters have an opportunity to underprice the IPOs (Griffith (2004)). Liu and Ritter (2009) found evidence that IPOs being subject to spinning, show greater initial returns. According to Liu and Ritter, spinning creates an opportunity cost for the underwriter because it does not have the ability to collect commissions in return for underpriced IPO allocations. As a consequence, underwriters have an incentive to underprice IPOs or attract severely underpriced IPOs.

2.14 The meaning of Ownership and Control

Issuing new shares eventually results in separation of ownership and control. Jensen and Meckling (1976) argued that the "*going public*" process creates an agency problem between directors and non-directors shareholders as well as conflicts of interest between the two (Chen and Strange (2004)). The positive relation between agency cost and underpricing will be presented through two theories, the ownership dispersion hypothesis and the reduction of agency costs.

2.14.1 The Ownership Dispersion Hypothesis

Dolvin (2013), by using a practical example, suggested that underpricing overstates the wealth lost by pre-IPOs owners. As the cost is low, naturally underpricing can be used by managers as a mean to retain control of the company, based on dispersion theory. The way this is done is described by Brennan and Franks (1997) who argued that underpricing results in excess demand which attracts numerous investors. Thus the oversubscription gives the manager the discretion of prioritizing the allocation of IPOs to numerous investors so that they will not have controlling power over the firm (Booth and Chua (1996)). As a consequence the control remains to pre-IPO owners. In the agency problem context, ownership dispersion leads also to low monitoring (Shleifer and Vishny (1986)), reduces the

probability of hostile takeovers (Grossman and Hart (1980)), gives certain signals about the value of the firm and improves liquidity (Booth and Chua (1996)). Brennan and Franks made specific arguments about the relation between underpricing and ownership dispersion targets. Conversely many academics argued that ownership dispersion is not a "means to retain control". Zingales (1995) argued that managers just try to sell their controlling shareholdings at a higher price sometime after the IPO. Mikkelsen, Partch and Shah (1997) also found that the majority of directors sell their shares through the IPO process. Other studies suggested that underpricing is not just a means of ownership dispersion. For example, Field and Karpoff (2002) reported that takeover defenses or non-voting stocks are the main ways used by controlling shareholders when they aim to retain control. However, even if there are studies indicating that the ownership dispersion theory is not valid, the positive relationship between initial underpricing and ownership dispersion has been confirmed by Booth and Chua (1996).

2.14.2 Reduction of Agency Costs

According to Brennan and Franks (1997), managers try to maximize their own utility by entrenching their control benefits. As has already been cited, managers retain control by allocating shares to small subscribers. Hermalin and Weisbach (1988) argued that "managerial entrenchment occurs when managers gain so much power that they are able to minimize gross proceeds in order to serve their own benefits, creating agency costs. However, when managers have large stake in the firm, they try to minimize these agency costs. Stoughton and Zechner (1998) and Pagano and Roell (1998) observed that when IPOs are allocated to a large outside investor who can monitor managerial action, the value of the firm increases. In order to attract such a large investor, the issuer has to give incentives to the investor in the form of underpricing. Agency costs imposed to outside investors are reduced via better monitoring and takeover bids from large investors (Shleifer and Vishny (1986)), and (Grossman and Hart (1980)). Finally, Pagano and Roell argued that the owner, allocating shares to a large external investor, faces the cost of over-monitoring. In order to minimize agency costs and the cost of over-monitoring an optimal dispersion of share ownership must be achieved.

2.15 Behavioral explanations

The behavioral explanations of underpricing refer to the behavioral theories of rational or irrational investors and issuers who are subject to behavioral bias. As a consequence, they put pressure on the price of IPOs and significantly contribute to the underpricing phenomenon. Three behavioral theories will be presented, the bandwagon hypothesis, the investor sentiment and the prospect theory and mental accounting.

2.15.1 The Bandwagon Hypothesis

Leinbenstein (1950) defines the bandwagon effect as "the extent to which the demand for a commodity is increased due to the fact that others are also consuming the same commodity". In financial theory the commodity cited is the Initial Public Offering and the demand is tested using the over-subscription ratio. Welch (1992) argued that investors are interested not only in their information about the IPO but also in other investors' demand for the offering. This behavior creates a cascade effect among investors. Bikhchandani, Welch and Hirshleifer (1992) argued that investors behavior is not irrational. Taking into account the decision of others is a part of a reasonable imitation process, which they called informational cascades. In the context of bandwagon hypothesis, the issuer has an incentive to underprice the IPOs in order to attract the first investors so that subsequent investors will follow irrespective of their own information. In the book-building method, there is no bandwagon effect as the information about the demand of the IPO is not public. Moreover, when the information about the demand of the IPO is free, the informational cascades creates informational disadvantage for the underwriter. If investors know that there is weak demand for the IPO, they understand the underpricing of the IPO as an act of desperation (Ritter (1998)). Yong (2011) tested the Malaysian IPOs market and argued that informed investors' interest in an IPO, compared to uninformed investors' interest, increases the bandwagon effect, which results in higher underpricing.

2.15.2 Investor Sentiment

Sentiment has been widely used to explain the investment decisions of irrational investors. Ljungqvist, Nanda, and Singh (2006), in their study they make two assumptions. First, there are two types of investors, the rational, such as

institutions, and the irrational or sentiment. Second, short sales are restricted. The issuer initially allocates IPOs to rational investors who eventually sell their shares to the sentiment investors. Sentiment investors buy these shares as they are overoptimistic about the prospects of the IPOs. Loughran, Ritter, and Rydqvist (1994) argued that firms “go public” during periods of excessive optimism, known as “hot markets” (Ritter (1984)). Because hot markets can end prematurely due to changes in sentiment, rational investors who hold the IPOs face an important risk. Issuers underprice their offerings in order to compensate rational investors for this risk. Baker and Stein (2004) suggested that when overconfident investors receive private signals, they tend to overweigh them and this leads to “sentiment shocks”. Shleifer and Vishny (1997) suggested that such pattern may persist if the cost of arbitrage is too high and has larger effects when valuations are difficult to arbitrage (Baker and Wurgler (2006)). Campbell and Rhee (2008) argued that underpricing is higher for overvalued IPOs compared to undervalued IPOs, which is in accordance to investor sentiment theory presented. Oehlerer, Rummerra and Smith (2005) found evidence from the German IPO market that investor sentiment rather than ex-ante uncertainty causes the underpricing phenomenon.

2.15.3 Prospect Theory

Prospect theory is based on a descriptive model of decision making under risk that was developed by Kahneman and Tversky (1979). The model explains how people behave but not how they should behave. Based on the prospect theory, Loughran and Ritter (2002) tried to explain why issuers rarely get upset about leaving money on the table. They suggested that prospect theory assumes that issuers care about the change in their wealth and not the level of wealth. Larger wealth gain on the retained shares from the initial abnormal returns overcompensate issuers for the wealth loss of “leaving money on the table”. Hanley (1993) found evidence that an upward revision in the offer price (partial adjustment) is related to higher first day returns. As it has already been cited, (Benveniste and Spindt (1989)) information-acquisition model explain this positive relation between upward revision and underpricing. In this context, Loughran and Ritter argue that underwriters and controlling shareholders may prefer underpricing. When the controlling shareholder discovers that his wealth has been considerably increased due to the first day return, he doesn't care about the money left on the table. Meanwhile, when underwriters choose a lower offer price, they reduce their marketing cost as they find clients easier and increase their revenues indirectly as investors overpay commissions in order to

have access in the initial public stock offerings.

Table 2.4
Probable factors of Underpricing

Explanations for underpricing	Studies
Investors' reluctance to sell	Kaustia (2004)
Investors are reluctant to realize losses	Fullbrunn, Nicklisch and Neugebauer (2014)
Underwriter warrants	Logue (1973)
Rising Stock markets between the fixing of the offer price and the first trading day	Ritter (1984)
Inexperience of the parties involved in an initial offering	Uhlir (1989)
Regulatory constraints	Ibbotson, Sindelar and Ritter (1994)
Political motives	Ibbotson, Sindelar and Ritter (1994)
Changes in market conditions in the period between the official date of the prospectus announcement (or offer price date) and the listing date of an IPO	Loughran et al. (1984), Chowdhry and Sherman (1996)

2.16 Summary

The reasons behind the underpricing phenomenon in the IPO market were described and analyzed extensively based on the existing academic literature. The existing theories, however, have little consistency in findings across different studies and a single theory cannot completely explain the underpricing phenomenon. Moreover, several studies indicate that there are several contradictions among the academic research, as well as several unsubstantiated theories, false or delusive data used in studies and temporary explanations based on coincidence. Loughran and Ritter (2004), tried to explain the differences in underpricing during certain periods. They examined three hypotheses for the change in underpricing, the changing risk composition hypothesis, the changing issuer objective function hypothesis and the realignment of incentives hypothesis. The first two reasons were already explained in previous sections of the chapter while the last one is based on Ljungqvist and Wilhelm (2003), who suggested that the managers of issuing firms acquiesced in leaving money on the table during the 1999-2000 bubble period.

Furthermore, several studies have been made about differences in underpricing among certain groups of IPOs. Mogilevsky and Murgulov (2012), tried to explain the reason for the different initial returns among private equity-backed,

venture capital-backed and non-sponsored IPOs. According to their results, private equity-backed IPOs experience a significantly lower level of underpricing than venture capital backed or non-sponsored IPOs. Loughran and Ritter (2004) explained this phenomenon using a corruption hypothesis known as spinning. They suggested that Venture capitalists are inclined to corruption and search for underwriters with a history of underpricing due to side payments. An article on Pensions & Investments (Private equity and venture capital-backed IPOs down in Q1) shows that even though US firms use mainly venture capital as exit strategy, the last year alternative options were followed. Another important separation of firms is based on industry characteristics. Ritter (1984) and Gajewski and Gressein (2006) used industry as a variable that affects underpricing and Jaffe and Ibbotson (1975) found that high value firms generate less underpricing. Ritter also found evidence that younger firms are associated with higher risk and as a consequence higher underpricing. These finding and many others were induced to several studies as proxies/variables in order to back the theoretical explanations analyzed.

Chapter 3

Data Collection and Methodology

3.1 Introduction

The aim of this chapter is to present the data sources and characteristics of IPOs obtained and describe the methodology used to explain the underpricing phenomenon in the United States during the Global Financial Crisis. Generally, the appropriate background of the IPOs used will be presented and discussed in order to proceed to the results and the empirical analysis presented and interpreted in the next chapter.

3.2 Data Sources

The data used consist of U.S IPOs listed in American Stock Exchanges (NASDAQ, NYSE), in the period during the Global Financial Crisis (2007-2009). The data gathered for each issue include the firm's name, offer date, year of company's founding, business description, issue type description, filling date, type of security, Market place - Exchange of Listing, target market, currency, offer price, total number of shares offered in this Market secondary shares offered in this Market, shares offered – sum of all Markets, stock price at close of first trade, underpricing, book-runners, lead managers, number of book-runners, total assets in the year prior to going public, total debt in the year prior to going public, sales per share in the year prior to going public, earnings per share in the year prior to going public. The data were collected from Thomson One database, DataStream, prospectuses and Jay Ritter's database.

The Table 3.1 shows specifically the sources of each type of data already mentioned and their use while Table 3.2 presents the criteria used in order to acquire the IPOs for this study. The Table 3.3 shows the number of IPOs initially acquired by Thomson One and the number of excluded IPOs due to misclassification in order to reach the total IPOs used in this study.

Table 3.1
Data Sources

Sources, data obtained, use of sources and data purposes. The sources of data are presented. The data are separately presented according to their source, the use of their source and their purpose in this study. The use of the source is separated between sources used to obtain data and sources used to verify them. The data purposes are separated between data used to identify the IPOs that are used in this study and data used in order to conduct the analysis of underpricing.

Sources	Data Obtained	Use of source/Data purposes
Thomson One	Firm's name, issue type, date of admission to trading new shares, target market, Exchange of Listing, total shares offered, industry classification, offering price, date of admission to trading new shares, filling date, lead Manager/Underwriter	Obtain data/IPO identification/Data used in the analysis
DataStream	Stock unadjusted price, total assets in the year prior to going public, total debt in the year prior to going public, offering price, sales per share in the year prior to going public, earnings per share in the year prior to going public	Obtained data/Data used in the analysis
Jay Ritter's Database	Underwriter's reputation ranking	Obtained data/Data used in the analysis

Table 3.2
Data from Thomson One

Request	Operator	Description
Database	Include	Common Stock
Issuer Nation (Code)	Include	United States
Issue Type	Include	IPO
Dates: Issue Date	Between	01/01/2007 to 12/31/2009
Listing: All Exchanges of Issue	Include	United States
Target Market	Include	United States

Table 3.3
Final number of Data used

During the data verification procedure followed, the IPOs that were misclassified by the Thomson One/DataStream databases were excluded. The term misclassified is given to IPOs that do not meet the appropriate criteria included in the search in Thomson One database. The firms that were not listed in the American Market, or their currency were not the American dollar, or they were closed end funds/trusts, or issues that were not common/ordinary stocks (mainly debt issues) are considered misclassified. The misclassified IPOs may include different stock allocations of the same firm computed as more than one IPO and are also miscalculated. For the IPOs remaining, the "different stock allocations of the same firm computed as more than one IPO" are excluded.

Selection process	Number of IPOs
Firms obtained by Thomson One/DataStream databases	174
Less: IPOs misclassified	(29)
Total IPOs	145

3.3 IPOs characteristics

Table 3.4 presents the distribution of the data (145 U.S. IPOs) by year, in terms of the number of offers, number of shares, gross proceeds and market capitalization. Ritter (1991) used first this terms of distribution in order to show that IPOs are not evenly distributed over the years of his sample. In the same way, the table below shows that only 13 IPOs (considering the criteria in Table 3.4) occurred in 2008 and 29 occurred in 2009, which is a strong indicator about the volume of the upcoming Global Financial Crisis. The period from January 2007 to December 2009 is the initial part of the period of the Global Financial Crisis and only a small number of firms went public in the U.S. During 2007, 103 IPOs occurred reaching a total number of 145 U.S IPOs. As it is expected the larger number of Shares Offered takes place in 2007 with the amount of 956.8 million shares. The total number of Shares Offered in our sample is 2,105.9 million shares. In terms of gross proceeds, the highest volume was reported in 2008 when 21,577.77 million dollars of gross proceeds were reported through 607.6 million shares offered. The total amount of Gross Proceeds for the same period is 44,922.15 million dollars, which represents the 2,105.9 million shares. Inspection of the table shows that market capitalization is higher than gross proceeds for the year of 2007 with 15,901.23 million dollars. This happened due to the underpricing of the IPOs (except for 2008 and 2009 when gross proceeds exceed market capitalization for a small number of IPOs presented these years; these IPOs

were overpriced).

Table 3.5 presents the distribution of the data by industry classification based on the Thomson One macro-industry classification. In case there are few IPOs in an industry, the IPOs are classified as "other". Ritter (1991) showed that U.S companies going public for the period 1975-1994 were not evenly distributed over all industries. In the same way, the table below shows that for the estimated period of January 2007 to December 2009, high technology is heavily represented by reaching the percentage of almost 32% (46 observations) of the total number of firms included in the sample, and health care takes the second place by having almost 23% (33 observations) of the total number of firms included in the sample. Then consumer products and services follows with almost 10% (14 observations), industrials with almost 9% (13 observations) and energy & power with almost 8% (11 observations). Regarding to gross proceeds by sector, the largest percentage corresponds to the financial industry, with very large differences in relation to the other sectors, by reaching 40.61% of total gross proceeds. Then, high technology industry follows with the percent of 16.6% of total gross proceeds of the sample. In the same context, we can see substantial industry differences regarding the mean and median gross proceeds of financial industry (mean: \$4560.60 million, median: \$186.00 million). As for the results of all sectors, with regard to gross proceeds, the mean is \$309.81 million and the median is again significantly lower to \$107.90 million. We also observe other significant differences on age. Specifically, while the mean age of the firms is approximately 19 years and the median 10 years, firms belong to material industry are extremely older (mean: 100.8 years, median: 110 years). On the other hand, telecommunication, health care and high technology, have respectively mean: 9.3, 10, 10.5, median: 8, 9, 8, much younger than other industry's firms.

Table 3.4

Frequency of IPOs, Number of Shares Offered, Gross Proceeds and Market Capitalization

Year	Number of IPOs	Number of Shares Offered (millions)	% of Total	Gross Proceeds (millions)	% of Total	Market Capitalization (millions)	% of Total
2007	103	956.8	45.43	14,243.14	31.71	15,901.23	59.13
2008	13	607.6	28.85	21,577.77	48.03	4,348.98	16.17
2009	29	541.6	25.72	9,101.2	20.26	6,643.0	24.70
Total Sample	145	2,105.9	100.00	44,922.15	100.00	26,893.19	100.00

Note: Source Thomson One and DataStream, 2017, the values are presented in thousands dollars

Calculations: Gross Proceeds are calculated by multiplying the Offer Price with the Total Number of Shares Offered

Market Capitalization is calculated by multiplying the Closing Price at first trading day with the Total Number of Shares Offered

Table 3.5
Mean and Median Gross Proceeds and Age of 145 IPOs categorized by industry

Industry	Number of IPOs	Sum of Gross Proceeds (millions)	% of Gross Proceeds	Mean of Gross Proceeds (millions)	Median of Gross Proceeds (millions)	Age Mean	Age Median
Consumer Products and Services	14	2209.7	4.92	157.84	101.61	17.6	11.00
Energy and Power	11	3686.1	8.21	335.10	152.50	29.9	10.0
Financials	4	18242.4	40.61	4560.60	186.00	25.5	28.0
Healthcare	33	4047.2	9.01	122.64	70.00	10.0	9.0
High Technology	46	7456.3	16.60	162.09	98.75	10.5	8.0
Industrials	13	2492.8	5.55	191.75	113.90	21.2	17.0
Materials	5	1502.7	3.35	300.54	150.59	100.8	110.0
Media and Entertainment	5	2576.2	5.73	515.24	532.00	27.0	22.0
Retail	9	1916.9	4.27	212.99	132.00	29.3	20.0
Telecommunications	4	662.2	1.47	165.54	162.38	9.3	8.0
Others	1	129.8	0.29	129.80	129.80	53.0	53.0
All Sectors	145	44922.2	100.0	309.81	107.90	19.0	10.0

Note: Source Thomson One and DataStream, 2017

3.4 Methodology

3.4.1 Methods of underpricing

Two methods are used in this study for the calculation of the initial returns of the IPOs, the "Raw Initial Returns" (Eckbo et al, 2007) and the "Market Adjusted Initial Return" (Logue, 1973). These methods are the most popular ones in academic literature and alternative methods have not significant differences from these two.

The Raw Initial Return (RAW) is the return between the offer price and the price on the first day of trading of the shares on the secondary market and is calculated as follows:

$$RAW_{i,t} = \frac{P_{i,1} - P_{i,0}}{P_{i,0}}$$

The Market Adjusted Initial Return (MAIR) is calculated by subtracting the return of the market from the raw initial return. The return of the market is calculated between the period of the offering date of the IPO and the admission date. It is calculated as follows:

$$MAIR_t = \frac{P_{i,1} - P_{i,0}}{P_{i,0}} - \frac{MI_{i,1} - MI_{i,0}}{MI_{i,0}}$$

Explanation of variables:

$P_{i,0}$ =IPO offer price at the date of the offer "0" for the company "i"

$P_{i,1}$ =Closing price of IPO of company "i" at the end of the first day of trading

$MI_{i,0}$ = S&P 500 index at the date of the offer of company 'i'

$MI_{i,1}$ = S&P 500 index at the end of the first day of trading of company 'i'

Raw Initial Return method is mostly used for markets that there is no time lag between the date of the offering and the admission date. The Market Adjusted Return method is used in order to take into consideration changes in market conditions in the period of this time lag.

3.4.2 Regression variables

Several studies provide empirical evidence of the theoretical explanations of underpricing by using several proxies. The proxies used, the basic hypothesis and their expected signs are presented below.

1. Firm age (AGE)

Continuous Variable-Company characteristics Variable

Hypothesis:

There is a negative relationship between the age of the firm and the degree of underpricing of the IPOs.

Rational:

Age is used as a measure of ex ante uncertainty and investors optimism. Older companies are less risky due to longer information history. Less risky firms require lower underpricing.

Empirical studies using this (or comparable) proxy:

Beatty and Ritter (1986), Ritter (1991), Kim, Krinsky and Lee (1993), Lowry, Officer and Schwert (2010), Ljungqvist and Wilhelm (2003), Megginson and Weiss (1991), Ritter (1984), Clarkson and Merkey (1994), Gounopoulos (2003), Kiyamaz (2000), Uddin (2000), Arosio et al.(2000), Ljungqvist and Wilhelm (2003)

Computation:

"AGE" equals the logarithm of (one plus) the number of years since the firm was founded, measured at the time of the IPO.

$$AGE = \ln(1 + \text{Firm Age})$$

2. Gross Proceeds (LGP)

Continuous Variable-Offering characteristics Variable

Hypothesis:

There is a negative/positive relationship between the Gross Proceeds from the issue and the degree of underpricing of the IPOs.

Rational:

Negative: The smaller offering indicates riskier company. As a consequence, more risky firms increase the ex-ante uncertainty for the offering and more underpricing is required.

Positive: The higher the offering, the more underpricing is required so that there is small probability of failure.

Empirical studies using this (or comparable) proxy:

Miller and Reilly (1987), McGuinness (1992), Barry and Brown (1984), Ritter (1991)

Computation:

"LGP" equals the natural logarithm of Gross Proceeds of the offering. Gross Proceeds are calculated by multiplying the Offer Price with the Total Shares Offered.

$$\text{LGP} = \ln(\text{Offer Price} \times \text{Total Shares Offered})$$

3. Secondary shares (SEC)

Dummy Variable-Offering characteristics Variable

Hypothesis:

There is a negative/positive relationship between the existence of secondary/existing shares offered and the degree of underpricing of the IPOs.

Rational:

Negative: Managers that sell a greater proportion of their own stake in the firm in the form of Secondary Shares, increase their wealth by maximizing the proceeds of the IPOs. As a consequence, they desire the minimum underpricing possible.

Positive: Selling existing shares is a signal of exit strategy that creates ex-ante uncertainty and underpricing is required to attract investors.

Empirical studies using this (or comparable) proxy:

Aggarwal, Krigman and Womack (2002), Brau and Fawcett (2006a), Habib and Ljungqvist (2001), Kim, Palia, and Saunders (2005)

Computation:

Firms who have listed secondary shares have a dummy variable of "1" and those who do not have secondary shares have a dummy variable of "0".

4. Number of Underwriters (NUW)

Continuous Variable-Offering characteristics Variable

Hypothesis:

There is a negative relationship between the number of Underwriters and the degree of underpricing of the IPOs.

Rational:

A higher number of underwriters is associated with lower risk offerings. Lower initial returns are expected due to lower risk.

Empirical studies using this (or comparable) proxy:

Loughran and Ritter (2004), Liu and Ritter (2011), Aggarwal, Krigman and Womack (2002)

Computation:

"NUW" equals the natural logarithm of the number of Underwriters for each offering.

$$\text{NUW} = \ln(\text{number of Underwriters})$$

5. Underwriter's Reputation (UWR)

Dummy variable- Offering characteristics Variable

Hypothesis:

There is a negative relationship between the Underwriter's reputation and the degree of underpricing of the IPOs.

Rational:

Prestigious underwriters are associated with lower risk offerings. Lower initial returns are expected due to lower risk.

Empirical studies using this (or comparable) proxy:

Carter and Manaster (1990), McGuinness (1992), Uddin (2000), Loughran and Ritter (2004), Beatty and Ritter (1986), Tinic (1988), Michaely and Shaw (1994)

Computation:

Reputable underwriters have a dummy variable of "1" and non-reputable underwriters a dummy variable of "0". (The ranking of the IPOs has already been discussed). Reputable underwriters are considered those who have 8 or higher ranking (Loughran and Ritter, 2004) based on Ritter ranking of Underwriters.

6. Total assets (ASSETS)

Continuous Variable-Company characteristics Variable

Hypothesis:

There is a negative relationship between the total assets of the firm and the degree of underpricing of the IPOs.

Rational:

Total assets are considered an indicator of the size of the firm. Larger firms are less risky due to their larger informational resources and result in lower uncertainty about their future. Consequently, lower underpricing is required to attract investors.

Empirical studies using this (or comparable) proxy:

Loughran and Ritter (2004), Lee, Taylor and Walter (1999), Brau and Fawcett (2006a),

Mogilevsky and Murgulov (2012), Lee and Masulis (2006)

Computation:

"ASSETS" equals the Natural logarithm of firm's total assets the year before listing.

$$\text{ASSETS} = \ln(\text{total assets})$$

7. Total Debt (LD)

Continuous Variable-Company characteristics Variable

Hypothesis:

There is a positive relationship between the total debt of the firm the year prior to the offering and the degree of underpricing of the IPOs.

Rational:

The greater the issuer's debt, the less financial information the firm discloses which results to underpricing. Moreover, firms with more debt are considered risky higher underpricing is required.

Empirical studies using this (or comparable) proxy:

Kim, Krinsky and Lee (1993), Kim, Palia, and Saunders (2005), Leone, Rock and Willenborg (2007)

Computation:

"LD" equals the natural logarithm of (one plus) the Total Debt the year before listing.

$$\text{LD} = \ln(1+\text{total debt})$$

8. Sales per Share

Continuous Variable-Company characteristics Variable

Hypothesis:

There is a negative relationship between the amount of sales per share of the firm the year prior to the offering and the degree of underpricing of the IPOs.

Rational:

Firms with high amount of sales per share are less risky due to their larger informational resources and result in lower uncertainty about their future. Consequently, lower underpricing is required in order to attract investors.

Empirical studies using this (or comparable) proxy:

Loughran and Ritter (2004), Brau and Fawcett (2006a), Mogilevsky and Murgulov (2012)

Computation:

Sales per Share, equals the natural logarithm of (one plus) the amount of sales per share the year prior to the firm's listing.

$$\text{Sales per Share} = \ln(1 + \text{Sales per Share})$$

9. Earnings per Share

Continuous Variable-Company characteristics Variable

Hypothesis:

There is a negative relationship between the amount of earnings per share of the firm the year prior to the offering and the degree of underpricing of the IPOs.

Rational:

Firms with high amount of earnings per share are associated with lower risk offerings. This leads to lower uncertainty about their future and higher number of optimistic investors.

Consequently, lower underpricing is required in order to attract investors.

Empirical studies using this (or comparable) proxy:

Loughran and Ritter (2004), Lee, Taylor and Walter (1999), Lee and Masulis (2006)

Computation:

Earnings per Share, equals the natural logarithm of (one plus) the amount of sales per share the year prior to the firm's listing.

$$\text{Earnings per Share} = \ln(1 + \text{Earnings per Share})$$

3.4.3 Descriptive Statistics and Correlation Matrix of Variables

The descriptive statistics for the variables described above are summarized in Table 3.6 while the correlation matrix is presented in Table 3.7.

3.4.4 Estimating regression

In order to empirically explain the underpricing phenomenon in the U.S. (RAW will be used as initial return), univariate and multiple regressions will be constructed using the STATA₁₄ program. The method used will be the Ordinary Least Squares (OLS) method due to its simplicity and its use in several empirical studies regarding the underpricing of IPOs. The OLS regression is a linear regression model which is consistent when the proxies used are exogenous and there is no multicollinearity. It is optimal when there is no heteroscedasticity and serial correlation. Even though the

regression method is important in order to conduct our research, no extent explanation will be provided. However some assumption of the OLS must be discussed.

First, the assumption that the explanatory variables are independent of the error term may not hold in our study. This problem may occur due to an omitted explanatory variable that may be correlated to the regression variables and captured by the error term (correlated to the error term). However this is a problem to almost all the studies concerning the underpricing phenomenon. Second, heteroscedasticity may be observed, in our regression tests for heteroscedasticity will be conducted (Breusch- Pagan-Godfrey test choice in STATA). Third, the assumption that the error terms have a zero conditional mean is dealt with by using a constant in our regression. Finally, the data size used for the regression is far greater than the number of variables used and as there are no time series but cross sectional data used, autocorrelation will not be an issue.

An indicative multiple regression is presented below:

$$RAW = c + \beta_1 \times AGE + \beta_2 \times LGP + \beta_3 \times SEC + \beta_4 \times NUW + \beta_5 \times UWR + \beta_6 \times ASSETS + \beta_7 \times LD + \beta_8 \times SALESperShr + \beta_9 \times EPS + \varepsilon$$

Where $RAW = (P_i - P_0) / P_0$,

$AGE = \ln(1 + AGE)$ the natural log of the total of one plus the age of the company in years on the listing date,

$LGP = \ln(\text{Gross Proceeds})$ natural logarithm of the number of shares offered at the offer price,

$SEC = \text{Secondary Shares}$ (1 for secondary shares and 0 for non secondary shares),

$NUW = \ln(\text{Number of Underwriters})$ the natural log of the total number of underwriters by unique parents,

$UWR = \text{Underwriters reputation}$ (1 for reputable underwriters and 0 for non reputable),

$ASSETS = \ln(\text{Total number of Assets})$ natural logarithm of the total number of assets,

$LD = \ln(\text{Total Debt})$ the natural log of the total debt,

$SALESperShr = \ln(\text{Sales per Share})$ the natural log of the total number of sales per share,

$EPS = \ln(\text{Earnings per Share})$ the natural log of the total amount of earnings per share.

Table 3.6
Descriptive Statistics for Dependent and Independent Variables

Statistics	RAW	AGE	LGP	SEC	NUW	UWR	ASSETS	LD	SALESperShr	EPS
Mean	0.0985	2.5180	18.6520	0.5172	0.5401	0.8403	12.1723	7.7414	1.5837	0.0724
Median	0.0653	2.3026	18.4967	1	0.6932	1	11.8720	9.1051	1.3800	0.1354
Maximum	0.8704	5.0689	23.6061	1	1.9459	1	17.0404	15.4282	5.0322	1.5063
Minimum	-2.4278	1.0986	15.6718	0	0	0	9.4676	0	0	-2.9957
Stand. Dev.	0.2792	0.8265	0.9419	0.5014	0.4833	0.3676	1.4426	4.9859	1.0910	0.6460
Skewness	-4.7463	0.9573	1.3737	-0.0690	0.3670	-1.8577	0.8953	-0.4894	0.5899	-1.3608
Kurtosis	47.8656	3.6300	8.1468	1.0048	2.4257	4.4510	3.7043	1.8788	2.7140	8.0725

Note: 145 observations of U.S. IPOs used in STATA₁₄

Table 3.7
Correlation Matrix

	RAW	AGE	LGP	NUW	UWR	ASSETS	LD	SALESperShr	EPS
RAW	1.0000								
AGE	-0.0759	1.0000							
LGP	0.0064	0.3094	1.0000						
NUW	-0.0853	0.2284	0.5959	1.0000					
UWR	0.0659	-0.0461	0.3161	0.1691	1.0000				
ASSETS	-0.0326	0.3967	0.7457	0.4810	0.2303	1.0000			
LD	-0.1389	0.3677	0.3600	0.3916	-0.1274	0.5413	1.0000		
SELESperShr	-0.1856	0.5739	0.2018	0.2761	-0.0634	0.3601	0.4128	1.0000	
EPS	-0.2361	0.4075	0.2082	0.1671	-0.0885	0.3416	0.2265	0.5222	1.0000

Note: 145 observations of U.S. IPOs used in STATA₁₄

Chapter 4

Results

4.1 The Degree of Raw and Market Adjusted Underpricing

The degree of RAW under year classification is presented in Table 4.1. The mean of Raw Initial Returns (RAW) is equal 73.78% for 2007, which is the largest due to the size of the sample for that year (103 observations for IPOs). The following years 2008, 2009 the mean of Raw Initial Returns is equal to 6.09% and 20.13% respectively. However, these years only 42 IPOs have been offered. Positive initial returns are observed for all of the three years of this research. With approximately 79.12% of the positive Raw initial returns for 2007, with 72 positive observations, in 2008 this percent drops to 5.49% for just 5 observations and finally in 2009 the same percentage of positive Raw initial returns goes to 15.38% with 14 observations. On the other hand, the table also represents the negative number of observations for Raw initial returns as well as the percentages of them. For the Raw negative column we have percentages only for two out of three years of the research. In 2007, the percentage of negative Raw initial returns is 78.13%, with 25 observations occurred and finally in 2008 we have 7 observations corresponds to 21.88%. For the year 2009 there are no observations with negative Raw initial returns. In Table 4.2 descriptive statistics of RAW are provided and in Table 4.3 summary statistics for all, dependent and independent variables also provided.

Table 4.1
RAW initial returns under year classification

Year	Number of IPOs	RAW initial returns	RAW mean	RAW positive	%	RAW negative	%
2007	103	14.5656	73.78%	72	79.12%	25	78.13%
2008	13	1.2018	6.09%	5	5.49%	7	21.88%
2009	29	3.9741	20.13%	14	15.38%	0	0.00%
Total Sample	145	19.7414	100.00%	91	100.00%	32	100.00%

Note: Source Thomson One, DataStream, 2017

Table 4.2
Descriptive Statistics for RAW initial returns

Variable	Mean	Median	Maximum	Minimum	Stand. Dev.	Skewness	Kurtosis
RAW	13.62%	6.75%	1.387778	-0.9117647	25.20%	1.1947	8.9069

Note: In order to compute the data, we used STATA₁₄

Table 4.3
Summary Statistics for dependent and independent variables

Variable	Mean	Std. Dev.	Min	Max
RAW	0.1068	0.3379	-2.4278	0.8704
AGE	2.5543	0.7767	1.0986	5.0689
LPG	18.7377	0.9363	16.9071	23.6061
SEC	0.6207	0.4880	0	1
NUW	0.6081	0.5051	0	1.9459
UWR	0.8161	0.3897	0	1
ASSETS	12.2922	1.350795	10.0660	17.0404
LD	8.0607	4.885778	0	14.8373
SALESperShr	1.7079	0.9983	0	4.1578
EPS	0.0725	0.6497	-2.9957	1.5063

Note: In order to compute the data, we used STATA₁₄

4.2 Underpricing presented under different categories

In the following tables, the degree of underpricing with "RAW" technique will be presented under certain classification criteria based on academic literature and the variables used for the regression equations. The presentation is not used for explanation purposes. It rather provides only a picture of the relationship between certain variables and underpricing without demonstrating the explanatory significance of these variables that will follow in the next section of this study.

Table 4.4 presents Raw Initial returns under industry classification. High Technology and Healthcare Sectors exhibit the highest RAW of 39.53% and 20.33% respectively, while Consumer Products and Services Sector exhibit the third higher RAW of 11.50%. It must be cited that these three sectors, even though they have a quiet big difference in their Raw Initial Returns, concerning to High Technology and Healthcare Sectors, their Age average is quiet close around 10 years, while Customer Products and Services' Age average is a lot higher at almost 18 years. The higher Age average belongs to Materials' Sector (around 100 years), while the smaller Age average is observed to the Sector of Telecommunications (around 9 years). The greatest volatility is observed in the Media and Entertainment sector with 60.29%.

In Table 4.5, some of the variables used are categorized based on academic literature. Specifically, most of the variables are classified based on their median. The variable classification is explained at the beginning of the table and is based mostly on Loughran and Ritter (2004), Gounopoulos (2003), Florio and Manzoni (2002).

The most important observations based on this table are: In Panel A, the volatility of underpricing "RAW" is much higher for younger firms (30.45%) than old firms (21.79%). In Panel B, IPOs with higher Gross Proceeds exhibit higher underpricing and volatility. In Panel C, most of the sample's firms had issued secondary shares and thus have higher percentage of Raw Initial Returns (59.44%) in contrary to the no-secondary shares (40.56%), while their volatility is at 25.81% and 24.53% respectively. In Panel D, the greater number of firms (117) had less than three underwriters, while only 28 firms had more than 2 underwriters. In Panel E, the greater number of firms (121) seems that they had reputable underwriters, while only 23 firms had no-reputable underwriters.

Table 4.4
Raw Initial Returns under Industry classification

Sector	Number of IPOs	%	RAW	%	Volatility	AGE Average	AGE Median
Consumer Products and Services	14	9.66	2.269817061	11.50%	16.72%	17.64	11
Energy and Power	11	7.59	1.177278055	5.96%	11.35%	29.91	10.00
Financials	4	2.76	0.366339713	1.86%	10.05%	25.50	28.00
Healthcare	33	22.76	4.01322278	20.33%	21.11%	9.97	9.00
High Technology	46	31.72	7.804064787	39.53%	31.91%	10.52	8.00
Industrials	13	8.97	1.581239304	8.01%	22.61%	21.23	17.00
Materials	5	3.45	0.25125	1.27%	11.24%	100.80	110.00
Media and Entertainment	5	3.45	1.625050505	8.23%	60.29%	27.00	22.00
Retail	9	6.21	0.537210674	2.72%	9.36%	29.33	20.00
Telecommunications	4	2.76	0.0675	0.34%	3.38%	9.25	8.00
Others	1	0.69	0.048461538	0.25%	.	53.00	53.00
All Sectors	145	100.00	1.794675856	100.00%	16.41%	30.38	17

Note: Source Thomson One, DataStream, 2017

Table 4.5**Raw Initial Returns under certain variable classification**

For the total 145 U.S. IPOs used in this study, certain groups have been formed. In Panel A companies are separated between young and old based on Loughran and Ritter (2004). In Panel B, C, IPOs have been grouped based on their median gross proceeds and secondary shares (Loughran and Ritter (2004), Gounopoulos (2003), Florio and Manzoni (2002)). In Panel D, E, IPOs have been grouped based on their number of underwriters, underwriters rank.

Panel A: Raw Initial Returns under AGE classification				
AGE group	Number of IPOs	RAW	%	RAW volatility
≤8 years	52	8.318288266	42.14%	30.45%
>8 years	93	11.42314615	57.86%	21.79%

Panel B: Raw Initial Returns under Gross Proceeds classification				
Gross Proceeds	Number of IPOs	RAW	%	RAW volatility
< Median	72	1296.289	47.93%	43.35%
≥ Median	73	1408.248	52.07%	86.88%

Panel C: Raw Initial Returns under Secondary Shares Classification				
Shares	Number of IPOs	RAW	%	RAW volatility
Secondary	75	11.73522	59.44%	25.81%
No-Secondary	70	8.006217	40.56%	24.53%

Panel D: Raw Initial Returns under Number of Underwriters Classification				
Number of Underwriters	Number of IPOs	RAW	%	RAW volatility
≥3 Underwriters	28	2.123413	10.76%	35.13%
≤2 Underwriters	117	17.61802	89.24%	22.14%

Panel E: Raw Initial Returns under Underwriters Classification				
Underwriters rank	Number of IPOs	RAW	%	RAW volatility
Reputable	121	1.41855	7.19%	15.62%
No-Reputable	23	18.3229	92.81%	26.43%

Note: Source Thomson One, DataStream, 2017

4.3 Cross sectional Regression results

4.3.1 Univariate regression results

In Table 4.6 the univariate regression results are presented. Test for the significance of each variable has been conducted, by using of robust selection. As it can be observed from the following table 4.6 of the Univariate Regression (using the robust function), only one out of nine variables used in our sample is statistically significant. The Ln of total debt (LD) is negative and statistically significant at 5% level of significance, in our sample with coefficient of 0.1666 and t-statistic of -2.30, which means that this variable (LD) is significant enough for this sample. The p-value of LD ($0.023 < 0.1$) determines the level of significance of the variable. First, p-value should be less than 0.1 or 10% in order to be statistically significant at 10% level of significance. If p-value is less than 0.05 or 5%, then the variable is statistically significant at 5% level of significance, in addition to 10% which is already included. Finally, if p-value is less than 0.01 or 1%, then the variable is statistically significant at 1% level of significance, in addition to 5% and 10% that are already included.

4.3.2 Multivariate cross-sectional regression results

In Table 4.7a multivariate regressions (by two) have been conducted. Model 1 is a regression for the AGE and the LGP variables where AGE variable seems to be statistically significant at 10% level of significance. Model 2 combine AGE and SEC variables, Model 3 is a regression for AGE and NUW variables, Model 4 combine AGE and UWR, Model 5 is a regression for AGE and ASSETS variables, Model 6 combine AGE and LD variables where LD variable seems to be statistically significant at 5% level of significance. Model 7 is a regression for AGE and SALESperShr variables and Model 8 combine AGE and EPS variables. In Table 4.7b multivariate regressions (by two) have been conducted again. The pair of LGP and LD in Model 5 is statistically significant at 10% and 1% level of significance for each variable respectively. In Table 4.7c, Model 4 has the LD variable which is statistically significant at 5% level of significance. The Model 1, in Table 4.7d, has a statistically significant variable (UWR) at 10% level of significance, and in Model 3, LD variable is also significant at 5% level of significance. In Table 4.7e, the UWR variable in Model 1 and Model 3, is statistically significant at 10% level of significance. The LD variable is statistically significant at 5% level of significance in Models 2 and 5. Finally, in Table 4.7f, the LD variable is statistically significant at 5% level in Model 1.

Table 4.6
Univariate Regression

Its row of the table represents a regression of Raw Initial Returns with a constant and a variable. The table represents the coefficient for its regression and the t-statistics (in parentheses), by using the Robust selection. In order to compute the data, we used STATA₁₄.

Variables	Coefficient t-statistic (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
AGE	0.1639 (-1.30)								
LGP		0.0045 (0.30)							
SEC			0.0896 (0.38)						
NUW				0.1195 (-0.67)					
UWR					0.0515 (1.51)				
ASSETS						0.1926 (-0.66)			
LD							0.1666 (-2.30) **		
SALESperShr								0.1423 (-1.13)	
EPS									0.1142 (-1.12)

Note: *, **, *** significance at 10%, 5%, and 1% respectively

Table 4.7a

Multivariate Regression (by two)

Its row of the table represents a regression of Raw Initial Returns with two variables and a constant. The table represents the coefficient for its regression and the t-statistics (in parentheses), by using the Robust selection.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
constant	-0.1149627	0.1569521	0.1706411	0.1177658	0.1752403	0.1740811	0.1389515	0.0842918
AGE	(-1.69) *	(-1.43)	(-1.33)	(-1.26)	(-1.12)	(-0.20)	(0.10)	(0.34)
LGP	(0.97)							
SEC		(0.53)						
NUW			(-0.55)					
UWR				(1.42)				
ASSETS					(-0.07)			
LD						(-2.26) **		
SALESperShr							(-1.13)	
EPS								(-1.08)

*Note₁: *, **, *** significance at 10%, 5%, and 1% respectively,*

Note₂: 145 observations of U.S. IPOs used in STATA₁₄.

Table 4.7b
Multivariate Regression (by two)

Its row of the table represents a regression of Raw Initial Returns with two variables and a constant. The table represents the coefficient for its regression and the t-statistics (in parentheses), by using the Robust selection.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
constant	0.0194	-0.2924	0.1080	-0.2949	-0.3753	-0.1334	-0.3209
AGE							
LGP	(0.23)	(1.55)	(-0.19)	(1.04)	(1.72) *	(0.89)	(1.22)
SEC	(0.36)						
NUW		(-0.98)					
UWR			(1.63)				
ASSETS				(-1.08)			
LD					(-2.96) ***		
SALESperShr						(-1.32)	
EPS							(-1.19)

*Note₁: *, **, *** significance at 10%, 5%, and 1% respectively,*

Note₂: 145 observations of U.S. IPOs used in STATA₁₄.

Table 4.7c

Multivariate Regression (by two)

Its row of the table represents a regression of Raw Initial Returns with two variables and a constant. The table represents the coefficient for its regression and the t-statistics (in parentheses), by using the Robust selection.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
constant	0.1103	0.0471	0.1893	0.1590	0.1331	0.1398
AGE						
LGP						
SEC	(0.41)	(0.25)	(0.42)	(0.30)	(0.58)	(-0.70)
NUW	(-0.68)					
UWR		(1.57)				
ASSETS			(-0.68)			
LD				(-2.25) **		
SALESperShr					(-1.27)	
EPS						(-1.10)

*Note₁: *, **, *** significance at 10%, 5%, and 1% respectively,*

Note₂: 145 observations of U.S. IPOs used in STATA₁₄.

Table 4.7d

Multivariate Regression (by two)

Its row of the table represents a regression of Raw Initial Returns with two variables and a constant. The table represents the coefficient for its regression and the t-statistics (in parentheses), by using the Robust selection.

Variables	(1)	(2)	(3)	(4)	(5)
constant	0.0721	0.1462	0.1692	0.1534	0.1305
AGE					
LGP					
SEC					
NUW	(-0.77)	(-0.51)	(-0.16)	(-0.52)	(-0.41)
UWR	(1.75) *				
ASSETS		(-0.15)			
LD			(-2.48) **		
SALESperShr				(-1.20)	
EPS					(-1.14)

*Note₁: *, **, *** significance at 10%, 5%, and 1% respectively,*

Note₂: 145 observations of U.S. IPOs used in STATA₁₄.

Table 4.7e
Multivariate Regression (by two)

Its row of the table represents a regression of Raw Initial Returns with two variables and a constant. The table represents the coefficient for its regression and the t-statistics (in parentheses), by using the Robust selection.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
constant	0.1870	0.1195	0.0879	0.0834	0.0382	0.1112	-0.0674
AGE							
LGP							
SEC							
NUW							
UWR	(1.78) *	(1.43)	(1.72) *	(0.58)			
ASSETS	(-0.98)				(0.80)	(0.21)	(0.50)
LD		(-2.25) **			(-2.26) **		
SALESperShr			(-1.09)			(-1.14)	
EPS				(-1.07)			(-1.09)

*Note₁: *, **, *** significance at 10%, 5%, and 1% respectively,*

Note₂: 145 observations of U.S. IPOs used in STATA₁₄.

Table 4.7f

Multivariate Regression (by two)

Its row of the table represents a regression of Raw Initial Returns with two variables and a constant. The table represents the coefficient for its regression and the t-statistics (in parentheses), by using the Robust selection.

Variables	(1)	(2)	(3)
constant	0.1745	0.1642	0.1659
AGE			
LGP			
SEC			
NUW			
UWR			
ASSETS			
LD	(-2.04) **	(-1.26)	
SALESperShr	(-0.54)		(-0.96)
EPS		(-1.02)	(-0.83)

*Note₁: *, **, *** significance at 10%, 5%, and 1% respectively,*

Note₂: 145 observations of U.S. IPOs used in STATA₁₄.

Table 4.8
Multivariate Regression (all variables)

Its row of the table represents a variable of Raw Initial Returns' regression, with all variables and a constant. The table represents the coefficient, the standard error by using of robust selection, the t-statistic, the p-value, the 95% confidence and the interval for each variable.

RAW	Coefficient	Standard Error (Robust)	t-statistic	p-value	95% Confidence	Interval
AGE	0.0285	0.0261	1.09	0.279	-0.0236	0.0805
LGP	0.0252	0.0572	0.44	0.661	-0.0887	0.1390
SEC	-0.0570	0.0594	-0.96	0.340	-0.1753	0.0613
NUW	-0.0519	0.0897	-0.58	0.564	-0.2305	0.1266
UWR	-0.0013	0.0944	-0.01	0.989	-0.1892	0.1866
ASSETS	0.0258	0.0694	0.37	0.711	-0.1124	0.1639
LD	-0.0100	0.0090	-1.11	0.269	-0.0278	0.0079
SALESperShr	-0.0262	0.0318	-0.82	0.413	-0.0895	0.0372
EPS	-0.1129	0.1412	-0.80	0.427	-0.3940	0.1683
constant	-0.5527	0.6904	-0.80	0.426	-1.9274	0.8221

Note₁: *, **, *** significance at 10%, 5%, and 1% respectively,

Note₂: 145 observations of U.S. IPOs used in STATA₁₄.

The Table 4.8 represents the linear regression by using all the available variables for the specific sample. It can be observed that none of the variables is statistically significant at any level of significance. Even if we exclude variables with high correlation as LGP with ASSETS (0.7457) from the correlation table above, the sample still do not has high explanatory power. This can be also observed by the R squared which is quite low (R-squared = 0.0889). This means that the available variables explain only the 8.9% of the variation for underpricing. As for the probability of F, it is equal to 0.3626, which is bigger than 0.1, thus we cannot reject the Null Hypothesis.

Finally, it has to be mentioned that the model is not without its implication. As already explained, even though there is no high explanatory power in this model, there is probably an omitted variable as there are several variables in the academic literature that were not include. Furthermore, all the variables have been concluded assuming that there is no endogeneity problem. Specifically, Loughran and Ritter (2004) consider the underwriters' choice as endogenous, but did not find substantially altered results when they controlled the endogeneity of the underwriters' choice.

4.4 Discussion of results

Base to this study, the degree of underpricing in U.S. IPOs listed in American Stock Markets and estimated by Raw initial returns during the period "January 2007 - December 2009" is 1.7946, and even though no academic publications have been made testing the initial underpricing of U.S. IPOs in this period, based on publications of quarterly IPOs performances in the United States, our result is quite close. It is obvious, by past academic publications, that the underpricing phenomenon during the Global Financial Crisis is decreased. This reduction may be due to stricter regulations which reduce ex ante uncertainty (Zingales, 2012), the reduced interest in IPOs from investors and the reduced number of IPOs listed, as explained in previous chapter.

This study's findings about the reasons of underpricing, lead us to the conclusion that the most important variable for this period of crisis is the Ln of the total debt variable, for the total of 145 firms' IPOs. The 145 observations are not a large number of IPOs tested in a period general changes in the market. Only by extending the years of observation, someone can test the overall changes in the underpricing phenomenon due to the Global Financial Crisis. In this context, even more years of observations are required in order to compare the phenomenon between the periods prior and after the Global Financial Crisis.

Chapter 5

Summary and Conclusion

In this thesis we tried to document the reasons of underpricing during the Global Financial Crisis in the U.S. The Ln of the total debt for each of the firms listed in the American stock Exchanges during the global financial crisis period, have been found the most important reason of underpricing. Furthermore, the variables of age, gross proceeds, secondary shares, number of underwriters, underwriters reputation, total assets, sales per share and earnings per share, were not found important reasons of underpricing. The important variable tested as reason of underpricing exhibit different levels of significance when regressed together. The level of underpricing is 1.7946 during the period "January 2007 – December 2009" It is worth to mention again that the larger number of IPOs is occurred the first year of our sample (2007) and is equal to 103. On the other hand, due to the Global Financial Crisis, the number of firms issued IPOs the next years is dramatically decreased to 13 for 2008 and 29 for the last year of 2009.

In order to enhance and explain the empirical findings of this study, a theoretical presentation of the reasons to go public, the timing, volume and drawbacks of the IPOs was initially conducted. A thorough discussion of anomalies related to IPOs was also considered imperative. Finally, the theoretical presentation of the reasons of underpricing based on academic literature was presented in order to surround and explain the main part of the empirical study. Even though the existing literature covers a substantial part of the reasons of underpricing, new studies must be conducted due to constant changes in the market of IPOs.

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