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Has Prestige Become Irrelevant?

A study on the change of underpricing and the relationship between underpricing and underwriter reputation after the enactment of the JOBS Act

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Abstract

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Keywords:	IPO, underpricing, JOBS, EGC, underwriter
Purpose:	The purpose of this project is to identify whether the JOBS Act increased the underpricing of Emerging Growth Companies (EGCs) as well as to identify the relationship between underpricing and underwriter reputation after the enactment of the Act
Methodology:	The quantitative method used in this research project is OLS regressions. The dependent variable is underpricing, while the dependent variables are underwriter prestige score, top-tier dummy, offer size, firm age, sales, share overhang, biotech/pharma dummy, tech dummy, financial crisis dummy, JOBS Act dummy, and finally the interaction term between underwriter prestige score/top-tier dummy with the JOBS Act dummy
Thoretical Perspectives:	The theoretical perspectives applied to this project are related to the information asymmetry theories that stem directly from Rock's (1986) winner's curse model. More specifically those theories include ex-ante uncertainty theory, the prestigious underwriter hypothesis, and the indiscriminate underwriting by prestigious underwriters hypothesis.
Empirical Foundation:	This study is based on 600 IPOs of companies with less than $1 billion revenues (later defined as emerging growth companies by the JOBS Act) between 2005 and 2015. Due to the nature of the exogenous legislative effect of the JOBS Act the study focuses solely on the US IPO market.
Conclusions:	The results of our basis models suggest that the JOBS Act increased the underpricing of EGCs. This increase could be attributed to the reduced financial disclosure requirements that the Act introduced, which in turn increased information asymmetry between the firm and prospective investors. We failed to find significance in the relationship between underpricing and the prestige of the underwriter, which could suggest that EGCs have less to gain in terms of underpricing by hiring a prestigious underwriter for their IPO.

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Table of Abbreviations

IPO	Initial Public Offering
VC	Venture Capitalist
SEC	Security and Exchange Commission
HR	Human Resources
IT	Information Technology
IR	Investor Relations
JOBS	Jumpstart Our Business Startups
FAST	Fixing America's Surface Transportation
EGC	Emerging Growth Company
PCAOB	Public Company Accounting Standards Board
OLS	Ordinary Least Squares
EBITDA	Earnings Before Interest Taxes Depreciation and Amortization

Table of Concepts

IPO	An Initial Public Offering (IPO) is the process of a company selling shares for the first time in the public equity markets
Underpricing/First-Day Returns	Underpricing is the phenomenon where the share price of a company increases substantially on the first day of trading
Investment Bank	An investment bank is a financial services company that is primarily focused in providing advisory services to clients (firms and governments) regarding financial transactions such as issuance of debt, equity, as well as mergers and acquisitions and restructurings. Investment banks are also usually involved in trading and brokerage activities.
Underwriter	Generally speaking an underwriter is the party that evaluates and assumes risk for a fee. In the context of IPOs the underwriter is responsible for making sure that the issuing firm satisfies all regulatory requirements. More importantly an IPO underwriter contacts large institutional investors and tries to gauge their interest in the IPO; based on the interest expressed by those investors the underwriter then recommends an offer price.
SEC	The Security and Exchange Commission is the US federal capital markets authority responsible for protecting investors, maintaining fair, orderly and efficient markets, and facilitating capital formation. More specifically the SEC interprets and enforces federal securities law, issues new rules and amends existing ones, oversees the inspection of financial firms (brokerages, investment advisers, and credit rating agencies), oversees private regulatory organizations (such as auditors), and coordinates US securities regulation with federal, state and foreign authorities
SEC Form S-1	The form S-1 is the initial form that is filed by US companies that want to sell securities to the public. In the context of an IPO, a form S-1 is filed before the IPO and it includes information on the business plan, use of proceeds, dilution, as well as financial statements.
Emerging Growth Company	The term “EGC” was introduced by the JOBS Act of 2012. A company qualifies as an EGC if it has total annual gross revenue of less than $1 billion, has issued less than $1 billion in non-convertible debt in the past three years, and is not considered a large accelerated filer.

Contents

1. Introduction

In this chapter we initially present the basic concepts that are key to this research project (IPO, underpricing, underwriter) and then proceed to discuss the problem of underpricing in more specific terms, present the knowledge gap in the literature, and present our research questions. We then conclude with the contributions to the literature of this research projects.

1.1 Background

One of the most important moments in the lifecycle of a company is the time when the firm decides to go public through an Initial Public Offering (IPO). An IPO provides the company with an opportunity to tap the public capital markets for funds that can be subsequently used for investments, while also providing liquidity for the company's shares (Ljungqvist, 2007). When firms go public, they typically use a range of advisors, such as accountants, tax advisors, lawyers as well as one or several investment banks, often called underwriters. Investment banks can advise on many different transactions including mergers and acquisitions, issuance of debt and equity, and restructurings. In the case of issuing and selling equity to the public for the first time, the underwriters are the connecting entity between the issuing firms and the investors who are potential buyers of the issue (PwC, 2017). Usually the company's management alongside their investment banking advisors will go on "roadshow" where they meet with interested investors and give information regarding the company, in an attempt to gauge investor interest in the issue; something that will later assist in setting the price of the issue. Financial economists have been interested in IPOs since the 1970s, and this interest has created a vast amount of literature on the subject of selling public stock for the first time (Ljungqvist, 2007). Early in the IPO literature, economists discovered that the vast majority of issues tended to be underpriced, or in other words, their share price increased substantially on the first day of trading (Logue (1973), Ibbotson (1975)). The problem with underpricing is that companies and shareholders are willingly selling shares to a price below market price, thus leaving money on the table (Ljungqvist, 2007). Underpricing is therefore considered an indirect cost of going public (Divakaruni & Jones, 2019).

When it comes to direct costs, the process of going and staying public can be an expensive affair since firms don't only have to pay the advisors that are involved in the deal (underwriters, lawyers, accountants), but they also have to pay a filing fee to the Security and Exchange

Commission (SEC), a fee to the listing exchange, as well as fees that are specific to each state (PwC, 2017). Once the company has been listed, additional funds will have to be dedicated to reporting, compliance, human resources (HR), information technology (IT), and investor relations (IR) as well as the premiums for liability insurance for directors and officers (PwC, 2017).

In 2012, in an attempt to lower the costs of going and staying public for smaller firms as well as increase the IPO activity, that was suffering since the financial crisis, congress voted into law the Jumpstart Our Business Startups (JOBS) Act (Zeidel et al, 2016). One of the Act's main objectives was to make the process of going and staying public for smaller firms (less than $1 billion in revenues) less cumbersome and costly by reducing the financial disclosure requirements, as well as allowing for confidential filings and communication between firms and institutional investors without the firm having to register with the SEC (Zeidel et al, 2016).

1.2 Problem Discussion and Research Questions

While the decreased regulatory disclosure requirements by EGCs introduced by the JOBS Act were aimed at lowering the costs of going public, they aggravated the information uncertainty problem that is inherent to IPOs (Barth, Landsman and Taylor, 2017). This accompanied by Beatty and Ritter's (1986) theory that suggests that increased ex-ante uncertainty results to higher underpricing, leads us to believe that the JOBS Act increased underpricing, and consequently the indirect costs of going public. Extending on that rationale, the follow-up question is if an EGC can decrease the information asymmetry during an IPO by hiring a prestigious underwriter. Ljungqvist (2007) suggests that a reputable investment bank can function as an information reducing mechanism by acting as a certifier of quality for an issue.

While the literature related to underpricing is extensive, comprehensive, and spans almost five decades, the relatively recent enactment of the JOBS Act has created a new information gap in the literature regarding the certification role of prestigious underwriters during an IPO. This creates an interesting research opportunity, since on one side we have an information asymmetry increasing event (the JOBS Act) and on the other side we have the information reducing mechanism (hiring a prestigious underwriter).

Thus in summary, the purpose of this research project is to examine two things, the second being an extension of the first. First, we shall attempt to examine the effect that the JOBS Act

had on underpricing of EGCs. Second, we shall attempt to quantify the relationship between underpricing and underwriter prestige. Our research questions could be summarized as follows:

1. *What was the effect of the JOBS Act on the underpricing of EGC IPOs?*
2. *What is the relationship between underpricing and underwriter reputation following the enactment of the JOBS Act?*

1.3 Contribution to the Literature

This research project contributes to the existing literature on underpricing by examining two questions. First, we shall examine whether the JOBS Act increased underpricing, consequently increasing the indirect costs of going public for EGCs, which is essentially a test of Beatty and Ritter's (1986) hypothesis of higher ex-ante uncertainty increasing underpricing. Second, we shall examine the already well researched relationship between underpricing and underwriter reputation, but in the presence of the JOBS Act. Since to our knowledge there has not been a research project examining the relationship of underpricing and underwriter reputation in the presence of the JOBS Act, this thesis project fills this literature gap.

The scope of this work also expands beyond just the examination of the relationship of underwriter reputation and first-day returns since our results could assist in both future policy making and financial decision making. First, our findings could assist policy makers in assessing the impact the Act had on the indirect costs of going public, and then take those results into consideration when possible amendments to the Act are discussed. Additionally, policy makers outside the US could use the findings of this project when evaluating the potential costs/benefits of similar deregulating legislations regarding the IPO of smaller firms. Secondly, management teams of smaller firms can find this piece of research useful when debating the choice of underwriter that precedes an IPO, and whether a more prestigious investment bank is the right choice for them.

2. Theoretical Framework

In this section we present the major literature work that has examined the underpricing phenomenon. Underpricing has received major attention from researchers over the years and numerous theories have been developed in an attempt to explain why it occurs. In this chapter we mainly focus on information asymmetry theories, as this is the section of the literature with the most coverage (Ljungqvist, 2007), while we also examine the empirical literature that investigates the relationship between underpricing and underwriter reputation. After the presentation of the theoretical frameworks we proceed to present the major empirical work related to first-day returns and those theoretical frameworks. Finally, we briefly discuss other theories, not relating to information asymmetry, that have been developed in the literature in an attempt to examine the underpricing phenomenon.

2.1 Underpricing as an Information Asymmetry Phenomenon

There are numerous theoretical models that have been developed over time in an attempt to explain why underpricing occurs. Namely they could be divided in asymmetric information, institutional reasons, control considerations, and behavioural models, with information asymmetry models being the most well-established ones (Ljungqvist, 2007).

The most well-known information asymmetry model is Rock's (1986) winner's curse model, which is a version of Akerlof's (1970) lemon market problem applied to the IPO market. According to Rock (1986) underpricing occurs due to the existence of information asymmetries between the three main parties involved in an IPO (issuing firm, underwriter, investors). Rock (1986) assumes that some investors are better informed about the intrinsic value of the company going public than other investors, the issuing firm, and the underwriter. Those informed investors subsequently bid only on attractively priced issues, while their uninformed counterparts bid indiscriminately, which in turn imposes a winner's curse on them. This practically means that the uninformed get all the shares they bid for in unattractive issues, while their demand is crowded by the informed in attractive offerings. In extreme cases the uninformed are allocated 100% of what they bid for in unattractive issues, resulting in negative average returns. If the uninformed expect to make negative average returns then they will stop participating in the market. Consequently, the IPO market would suffer from insufficient demand since the demand of the informed investors is not enough to absorb all shares, even in attractive offerings. Rock (1986) thus concludes that all issues have to be underpriced in order

for the uninformed investors to at least break even and guarantee their participation in the IPO process.

Rock's winner's curse model could be viewed as a model of information heterogeneity amongst investors. Michaely and Shaw (1994) argue that if investor information were to become homogeneous, then the winner's curse disappears and with it the reason to underprice. Beatty and Ritter (1986) hypothesize that the existence of ex-ante uncertainty should increase underpricing. The more uncertain the issue is, the more the investors that will engage in information generation, thus aggravating the winner's curse problem and the required underpricing. This hypothesis has received overwhelming empirical support (Ljungqvist, 2007). Beatty and Ritter (1986) also introduced the equilibrium concept, where an underwriter (investment bank) has a long-term reputation to uphold. This implies that an underwriter cannot underprice an issue too much since it will result in them losing future issuers, while not being able to underprice too little since it would result in them losing potential investors, therefore the equilibrium is upheld. Consistent with Beatty and Ritter's (1986) hypothesis that underwriters force issuers to underprice, work from Nanda and Yun (1997) suggests that the stock value of the underwriter suffers when they underprice too much, whereas moderate levels of underpricing are associated with increases in the stock price. On a similar note, Dunbar (2000) found that investment banks lose market share if they underprice or overprice too much, thus finding support for Beatty and Ritter's (1986) claim.

2.2 Underwriter Reputation as an Information Asymmetry Reducing Mechanism

One of the ways to reduce information asymmetry between the issuing firm and investors is to hire a prestigious underwriter to "certify" the quality of the issue and reduce investor incentives to produce their own information, consequently reducing the winner's curse and underpricing (Booth and Smith, 1986). The empirical evidence examining the relationship between those two variables has been extensive, but also mixed, since they suggest a negative relationship between underpricing and underwriter reputation in the 1970s, 1980s, and early 1990s, but a positive relationship becomes evident in the late 1990s (Ljungqvist, 2007).

The main hypothesis attempting to explain the change in the sign of the relationship suggests that investment banks started to underprice IPOs opportunistically in an attempt to enrich themselves or their investment clients (Loughran and Ritter, 2004). An extension of this hypothesis suggests that banks lowered their IPO selection criteria, resulting in a higher average

risk profile and thus underpricing (Ljungqvist, 2007). Habib and Ljungqvist (2001) suggest that issuers do not choose their underwriters randomly, nor do banks randomly agree on the IPOs they will underwrite. Instead, they argue that issuers choose their underwriter based on the underpricing they expect to suffer. A practical example of that would be that a firm that is easy to value has less to gain from a prestigious underwriter, while a high-risk issuer will suffer substantial underpricing in the absence of a prestigious investment bank (Ljungqvist, 2007). When taking this into consideration, Habib and Ljungqvist (2001) find evidence that the relationship between underpricing and underwriter reputation is negative even in the 1990s. Loughran and Ritter (2004) found results that contradict Habib and Ljungqvist's (2001) claims, and instead argued that prestigious investment banks started underwriting younger and riskier firms in the 1990's, thus resulting in a positive relationship between first-day returns and underwriter reputation.

2.3 Empirical Evidence on Underpricing

Ibbotson (1975) was among the first to examine underpricing; by examining 2650 offerings that took place in the 1960s. He found that the vast majority of issues were underpriced and hypothesized that either issues were underpriced or that investors overvalued IPOs systematically. Ritter (1984) examined the hot market of the early 1980s, extending from January 1980 to March 1981, where he found his sample to have an average underpricing of 48.4% which is a far cry from the average underpricing of 16.3% that was observed in the IPOs in the longer total period between 1977 and 1982 with a total of 1075 issuing firms.

Studying the effect that the dot-com bubble had on underpricing, Ljungqvist and Wilhelm (2003) examined the underpricing that occurred in IPOs during 1999 and 2000, and argued that those astronomical underpricing figures can be partially attributed to the market changes that occurred in pre-IPO ownership structure and insider selling behaviour, which in turn reduced the key decision-makers incentives to reduce underpricing. The sample that the authors examined consisted of 2178 IPOs between 1996 and 2000 and they found evidence that suggests that the high underpricing values seen during the dot-com bubble could be partially explained by market changes in the pre-IPO ownership structure and insider selling behaviour. Pre-IPO ownership were half the previous level which meant that there was large fragmentation in the ownership of the issuing firms. Additionally, the secondary sales of shares by insiders (especially CEOs) declined sharply. Thus, according to the authors, these changes could

partially explain the increased underpricing of that period, since key decision makers had decreased incentives to limit underpricing.

As shown in previous research, underpricing has a tendency to change over time (Ljungqvist, 2007). Loughran and Ritter (2004) examined a sample of 6391 IPOs over the period between 1980 and 2003. The authors argue that the increase in underpricing can be attributed to the risk composition of the firms going public, since the average age of the firms going public was significantly lower during the dot-com bubble, compared to the 1980s and 1990s. The authors argue that the underpricing that occurred in the 1980s was a result of information asymmetry, while the underpricing that occurred during the internet bubble is a result of analyst coverage (paying analysts indirectly through underpricing) and side payments to CEOs and venture capitalists (VCs). Furthermore, they found evidence that underwriter reputation had a negative relation to underpricing in the 1980s, but a positive relationship in the 1990s, and attempted to explain that by arguing that top tier bankers started taking client firms during the 1990s that were younger and riskier, thus resulted in higher first-day returns. Jones & Swaleheen (2010) examined 6320 IPOs from 1980 to 2003 and found evidence that were in line with Loughran and Ritter's (2004) results. Further elaborating on the subject of different underpricing levels, Helwege and Liang (2004) attempted to identify how hot/cold IPO markets affect the characteristics of firms going public, such as in the nature of the business, age of the industry, or their desire to change the ownership structure of the firm. The authors examined 6419 IPOs between 1975 and 2000 and found evidence that suggests that hot and cold IPO markets do not reflect a special type of firm going public, which is against theoretical models that state that hot and cold markets attract different types of firms

2.4 Empirical Evidence on the Relationship between Underpricing and Underwriter Reputation

Logue (1973) divided his sample in two subsamples of IPOs underwritten by prestigious and non-prestigious underwriters but failed to find satisfactory results that would explain the behaviour of underwriters. Ritter (1984) while examining 1075 IPOs between 1977 and 1982 noticed that natural resources companies during a hot period of IPOs were at the mercy of exploitative underwriters, as they were the companies that suffered high underpricing over that period, suggesting that underwriters took advantage of their need for capital. A year later, Beatty and Ritter (1986) examined 545 issues and found strong evidence for the IPO market

equilibrium, suggesting that prestigious investment banks cannot underprice too much, since that would make them lose business from future issuers, nor too little, since they would lose future subscribing investors.

Building on the certification hypothesis theory of Booth and Smith (1986), Carter & Manaster (1990) examined the relationship between the underwriter's reputation and the degree of underpricing. After examining 501 issuing firms between 1979 and 1983, they found evidence that suggest that prestigious underwriters would only underwrite high quality firms, thus the underpricing would be lower, while the opposite was found to be true among less prestigious underwriters. Michaely and Shaw (1994) examined 947 IPOs between 1984 and 1988 and found support for the adverse selection models that attribute underpricing to information asymmetries while also finding support that prestigious underwriters decrease information asymmetry and thus underpricing. Carter, Dark and Singh (1998) expanded their sample between 1979 and 1991 where they examined the short-term and long-term performance of 2292 IPOs. They found strong evidence that suggested that IPOs underwritten by prestigious investment banks present less negative short-run and long-run returns.

Habib and Ljungqvist (2001) examined 1376 IPOs between 1991 and 1995, and suggested that the choice of underwriter is endogenous, and that underpricing is a function of the incentives of firm insiders to reduce underpricing. Chen and Mohan (2002) examined 806 offerings between 1990 and 1992 and found evidence that was in line with previous theory, suggesting that lower prestige investment banks often underwrite lower quality IPOs that suffer from higher underpricing. Loughran and Ritter (2004) found evidence that supported the indiscriminate underwriting hypothesis, since they found that prestigious underwriters are related to higher underpricing.

2.5 Institutional, Control, and Behavioural Theories

While information asymmetry theories have received the majority of the attention of researchers, resulting in an extensive literature that spans over 40 years, there are three additional categories of theories that attempt to explain why underpricing occurs. In this section we briefly present the major institutional, ownership and control, and behavioural theories that have been developed over the years.

2.5.1 Institutional Theories

The main institutional hypotheses and theories that attempt to explain the underpricing phenomenon are the lawsuit avoidance hypothesis, price stabilization theory, and the tax advantages theory (Ljungqvist, 2007). The main idea behind the lawsuit avoidance hypothesis, which is rather specific to US investors, is that companies underprice their offerings in order to avoid lawsuits from disappointed investors down the line (Logue, 1973; Ibbotson, 1975; Ljungqvist, 2007). The price stabilization theory suggests that underwriters stabilize the price of the issue at after-market trading when an issue is in danger of trading below its offer price (Ruud, 1993). According to Ljungqvist (2007) this kind of "price manipulation" is actually legal in many countries, including the US. Finally, the tax advantage theory suggests that company insiders, depending on their tax situation, might prefer low or high underpricing (Ljungqvist, 2007). Taranto (2003) points out that managers might be incentivized to underprice the issue due to the two-step phase that employee/managerial stock option holders pay tax in the US; first when they exercise the option they pay tax on the difference between strike price and fair market value, and second when they eventually sell the stock they pay tax on the difference between the sale price and fair market value. The second step is therefore a capital gains tax that is deferred until the sale of the stock, thus potentially creating incentives for managers to underprice. Ljungqvist (2007) argues that institutional explanations can be a second order driver of underpricing, rather than the main reasons for it.

2.5.2 Ownership and Control Theories

In the ownership and control literature that attempts to explain underpricing there are two major theories which are also opposed to each other (Ljungqvist, 2007). First, Brennan and Franks (1997) argue that managers can entrench themselves by strategically allocating small amounts of shares to shareholders. A double free-rider problem arises, since the largely fragmented shareholder base means less monitoring from the part of shareholders and a reduced threat of a hostile takeover (Grossman and Hart, 1980). The second dominant theory of ownership and control formulated by Brennan and Franks (1997) where they argue that agency costs are ultimately borne by the owners of the company due to lower IPO proceeds and lower market value of the shares. If the managers have large enough stakes in the company, agency costs will outweigh the private benefits that they would get through entrenchment, thus they are incentivized to increase monitoring by allocating large blocks of shares to institutional investors (Stoughton and Zechner, 1998).

2.5.3 Behavioural Theories

The increased underpricing of the late 1990s led many researchers to doubt whether information asymmetry, institutional, and ownership and control theories could explain the astronomical underpricing figures at the time, and instead argued for the presence of irrational investors who systematically overvalue new issues (Ljungqvist, 2007). Welch (1992) argued that information cascades form during IPOs where investors base their bids on the earlier bids of other investors, resulting in very popular issues when initial sales are successful since later investors assume that initial investors had favourable information. Another interesting behavioural theory is the assumption of the presence of irrational investors. Ljungqvist, Nanda, and Singh (2004) assume that some investors hold favourable views for the issuing firm, so the issuer attempts to capture as much of that perceived excess value by strategically holding back stock in inventory in order to keep the price up. Finally, Loughran and Ritter (2002) combine a reference-point preference with Thaler's (1980) mental accounting theory, where they focus on irrational decision-makers rather than investors. Loughran and Ritter (2002) argue that insiders are not bothered by underpricing (or leaving money on the table) due to the wealth gains on their retained shares. While behavioural theories introduce interesting approaches to the underpricing problem, Ljungqvist (2007) argues that behavioural literature is still in its infancy.

3. The Jumpstart Our Business Startups (JOBS) Act of 2012

In this section we present a detailed summary of the JOBS Act that was introduced in 2012, with a focus on the lifting of regulatory and disclosure barriers for smaller companies (or Emerging Growth Companies as they are referred to in the Act). We additionally mention Titles II and III, which contributed to the facilitation of financing in the private markets. We then proceed to present the amendments to the Act that were introduced in 2015 through the FAST Act. Then we continue by presenting recent literature that is concerned with the effects of the JOBS Act both in the public as well as private markets. Finally, based on the theoretical framework and the JOBS Act chapters we present our hypotheses and research questions.

3.1.1 Title I of the JOBS Act

During the financial crisis of 2008, the US IPO market saw a sharp decline in the number of new issues, with only 21 issues in 2008 and 41 issues in 2009, while it took the market 4 years to reach the pre-financial crisis IPO levels (based on summary statistics by Ritter, 2020). In an

attempt to increase public and private market activity, create more jobs, and fuel economic growth, Congress introduced the Jumpstart Our Business Startups Act (JOBS) Act in 2012 (Zeidel et al, 2016).

The Jumpstart Our Business Startups (JOBS) Act of 2012 was introduced in order to encourage the funding and growth of smaller businesses by lifting restrictions in their financing (Zeidel et al, 2016). The JOBS Act was signed into law by Barack Obama on April 5th of 2012 and was designed to make the process of going public easier and more attractive for smaller companies (Dambra, Field and Gustafson, 2014). The Act introduced the term of the Emerging Growth Company (EGC) and defined it as a company with less than $1 billion in revenues in its most recent fiscal year, less than $1 billion in nonconvertible debt in the past three years, and not being a non-accelerated filer under the Security and Exchange Commission (SEC) reporting regulation (Dambra, Field and Gustafson, 2014). As long as an issuer maintains the requirements described above, then it could maintain its EGC status for five years following its IPO (Dambra, Field and Gustafson, 2014).

A company classified as an EGC could take advantage of several provisions that were made available by the JOBS Act. More specifically Dambra, Field and Gustafson (2014) classify the provisions and implications of Title I of the JOBS Act as follows:

Title I: Testing-the-waters provisions: After the JOBS Act enactment, EGCs could engage in communications with institutional investors in order to gauge their interest without having to file a publicly disclosed statement with the SEC. This provision provides benefits to both the issuing firm as well as interested investors. The issuing firm can gauge the interest of investors and subsequently the prospects of the issue, while on the other hand investors have more time to evaluate the issue and perform due diligence before the road show begins.

Title I: Confidential filing: The JOBS Act allowed EGCs to file a confidential draft of their IPO form for review by the SEC, and if the company decided to move forward with the IPO then it had to publicly file the IPO filing no late than 21 days before the roadshow begins. This provision allowed the company to protect itself from private information that might have leaked to competitors if the filing was public.

Title I: Reduced financial statements disclosure: Following the enactment of the Act, EGCs had to present 2 years of audited financial statements and selected financial data in their IPO registration statement, in contrast to the pre-JOBS period where they had to file 3 years of audited financial statements and 5 years of selected financial data. The practical benefits of this provision can be summarized as a reduction of the direct costs of going and remaining public, since the issuing firm could avoid accounting costs that are related with internal audits and preparation of financial statements.

Title I: Reduced compensation disclosure: In the pre-JOBS Act regulatory environment, companies had to disclose the compensation for five named executives. EGCs are required to disclose the compensation for only three executives, an outstanding equity awards table, and a director compensation table. Additionally, EGCs are not required to disclose any relations between executive compensation and firm performance.

Title I: Auditor attestation opt-out: EGCs are not required to have an auditor attestation of internal controls, after the implementation of the JOBS act.

Title I: Future accounting standards opt-out and PCAOB rulings: Under the provisions of the JOBS Act, EGCs are not required to comply with new or revised accounting rules and standards until they affect private companies. Additionally, EGCs can choose to not comply with future rules implemented by the Public Company Accounting Standards Board (PCAOB).

Title I: Executive compensation vote opt-outs: EGCs can also elect not to have shareholders vote on various aspects of executive compensation as required by the 2010 Dodd-Frank Act.

3.1.2 Titles II and III of the JOBS Act

Contributing to Title I which focused on the lifting of the regulatory burden of EGCs that intended to go public, Title II and III of the JOBS Act contributed to the facilitation of private financing for firms. More specifically:

Title II: Rule 506: Rule 506 was amended to allow for public advertising of an issue, while the company did not have to register with the SEC as long as had less than 2000 shareholders. In practise companies could raise an unlimited amount of money in the private markets, while

being able to publicly advertise it to institutional investors, and not having to register with the SEC as long as they had less than 2000 shareholders (Robbins, 2013).

Title III: Crowdfunding: Title III of the JOBS Act was named the Capital Raising Online While Deterring Fraud and Unethical Non-Disclosure Act (also known as CROWDFUND Act) and allowed small companies and entrepreneurs to sell limited amounts of equity to a large number of investors through various internet platforms, such as social media (Stemler, 2013).

3.2 Fixing America's Surface Transportation (FAST) Act of 2015

On December 4, 2015 President Obama signed the Fixing America's Surface Transportation (FAST) Act, also known as JOBS Act 2.0, and despite its name it introduced several new provisions regarding new capital formation and the reduction of the regulatory burden on companies, in an attempt to increase the IPO activity of EGCs (Canter, Skadden, Arps, Slate, Meagher & Flom LLP,, 2015).

Kanter et al (2015) summarize the new provisions as follows:

- Reduction of the days that the public filing has to happen before the roadshow begins from 21 to 15, thus allowing more flexibility for companies when evaluating the date of the IPO
- An EGC could "lock-in" its EGC status when filing for a confidential IPO review even if its revenues exceeded $1 billion during the time of the review of the filing, thus allowing the company to take advantage of the decreased financial statement requirements that EGCs have
- Omission of financial statements for certain historical periods when filing for an IPO
- Facilitation of resales of securities to accredited investors without having to register with the SEC
- Facilitations for smaller reporting companies by allowing them to file for an IPO without being yet incorporated
- Reductions in the disclosure requirements of smaller public companies

3.3 JOBS and Investor Confidence Act of 2018

On July 17, 2018, the "JOBS and Investor Confidence Act" (also known as JOBS Act 3.0) was passed by the US House of Representatives, and it introduced 32 individual bills (Ising et al, 2018). While the act was passed in the House of Representatives and then handed to the Senate,

the bill is currently considered "dead" since the Senate never voted on it (S. 488 — 115th Congress: JOBS and Investor Confidence Act of 2018, 2018).

3.4 Effects of the JOBS Act on Public and Private Markets

3.4.1 Effects of the JOBS Act on Public Markets

One of the main reasons that led to the implementation of the JOBS Act was the downward trend of IPOs that had been persisting in the US IPO market since the 1990's. The years leading up to the dot-com bubble bursting were the years with the highest IPO activity in the US public capital markets.

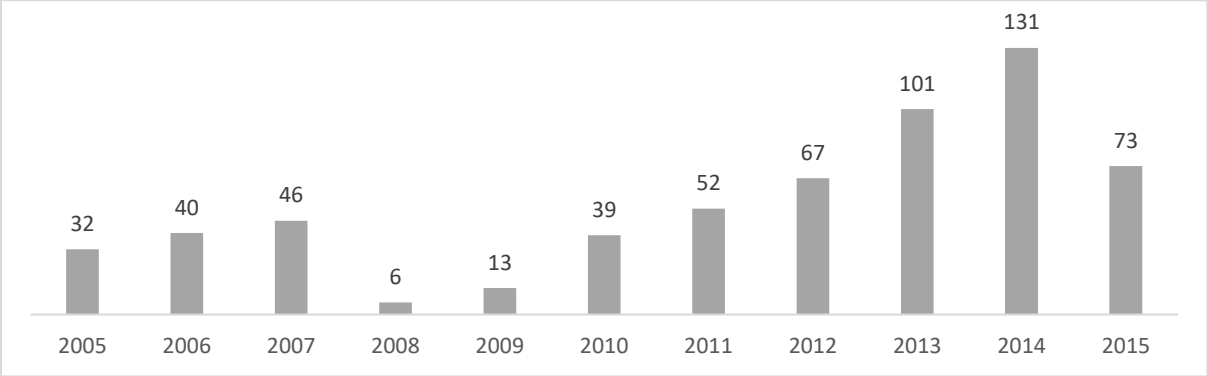

Figure 1: EGC IPOs per Year (Source:Zephyr)

Due to the relatively recent enactment of the Act and its subsequent amendment, there has been a rather limited but yet very interesting literature on the effects that the Act had on issuance costs, quality of the firms going public, and the sectors mostly benefited from the Act's provisions. Dambra et al (2014) found evidence that suggest that the JOBS Act increased the number of IPOs by 21 per year on average, with increased activity amongst smaller firms and firms with high-disclosure costs such as biotechnology and pharmaceuticals. Barth, Landsman, and Taylor (2017) examined the effect of the Act on information uncertainty during IPOs and found support that suggested that information uncertainty increased, IPOs attracted investors that rely more on private information, and that EGCs are led to provide additional post-IPO disclosures in an attempt to reduce information uncertainty. Chaplinsky, Weiss Hanley and Moon (2014) attempted to examine if the JOBS Act did indeed reduce the costs of issuance for EGCs, and found that the direct cost of issuance were lower but underpricing, an indirect cost of issuance, was significantly higher for EGCs compared to other firms.

Divakaruni and Jones (2019) also found evidence that suggests that the JOBS Act actually raised the costs of going public, as well as evidence that the Act made it easier for firms of lower quality to enter the capital markets. The finding that lower quality firms are incentivized to go public are further reinforced by the findings that most of those EGCs used the proceeds from the IPO to pay down debt and management, rather than invest in the company (Divakaruni and Jones, 2019). The authors suggest that the Act has created a separating equilibrium, with some firms more likely seeking capital in the public markets while the rest are financed in the private markets (Divakaruni and Jones, 2019).

3.4.2 Effects of the JOBS Act on Private Markets

Besides the lifting of regulatory barriers in an attempt to lower the issuance costs of EGCs, the JOBS Act had a profound effect on how the private markets function through the implications of Title II and III. Bauguess, Gullapalli, and Ivanov (2018) examined the effects of the Act on private markets and found evidence that showed that private placements had exceeded public offerings, with 2017 having $1.8 trillion raised in the private markets. Additionally, they found that capital raising in the private markets was correlated with public market performance, suggesting that private investments are cyclical. Finally, they argued that the Act had achieved its objective of facilitating financing for smaller firms, since the median size of offerings for non-financial issuers was less than $1 million.

The findings of Bauguess, Gullapalli, and Ivanov (2018) further reinforce the suggestion of Divakaruni and Jones (2019) that the increased availability of capital in the private markets, paired with the reduced disclosure requirements for EGCs that decide to go public, contribute to a separating equilibrium where lower quality firms decide to go public, while others decide to remain private.

3.5 Hypotheses Development

As mentioned above in detail, the JOBS Act reduced the disclosure requirements and made it easier for many firms to get access to public capital markets. Barth, Landsman and Taylor (2017) argue that the reduced disclosure requirements increased the ex-ante uncertainty of those EGC issues. Thus, we can formulate our first hypothesis as follows:

H1: *The JOBS Act increased the underpricing of EGCs*

This hypothesis is in line Beatty and Ritter's (1986) work where they argue that ex-ante uncertainty increases underpricing. Beatty and Ritter also argue that when investors produce their own information, thus become informed, the winner's curse problem is aggravated and underpricing should increase in order to guarantee the participation of the uninformed investors. Additionally, Chaplinsky, Weiss Hanley, and Moon (2017) found evidence that are in line with this hypothesis.

Linking H1 with past empirical evidence suggesting that the relationship between underpricing and underwriter's reputation is positive we can formulate our second hypothesis:

H2: *The relationship between underwriter reputation and underpricing is positive in EGC IPOs*

Consistent with the more recent literature that examined the relationship between underpricing and underwriter reputation (Beatty and Welch, 1996) and consistent with Loughran and Ritter's (2004) hypothesis that banks underprice strategically to enrich themselves (through trading commissions) and their investment clients (through underpricing) as well as the hypothesis that investment banks lowered the criteria for selecting IPOs, therefore increasing the average risk of IPOs (Ljungqvist, 2007).

Finally, we can link the two hypotheses mentioned above in order to formulate our third and final hypothesis:

H3: *The JOBS Act increased the magnitude of the relationship between underpricing and underwriter reputation*

Consistent with Beatty and Ritter's (1986) theory about increased ex-ante uncertainty and the recent empirical evidence that support a positive relationship between underpricing, we expect that relationship to be have a higher economic magnitude once the JOBS Act was enacted. Consistent with Ljungqvist's (2007) hypothesis that prestigious investment banks started underwriting IPOs indiscriminately, thus raising the average risk profile of issues, we hypothesize that this behaviour was aggravated after the enactment of the Act.

Finally, the research question of this project thus could be formulated as follows:

1. *Did the JOBS Act increase the first-day returns of Emerging Growth Company IPOs?*
2. *What is the relationship between underpricing and underwriter reputation following the enactment of the JOBS Act?*

4. Methodology

In this chapter we present the methodology used in this research project. We first present the econometric method that we chose, and then go into details regarding our variables and the rationale behind selecting them.

4.1 Econometric Method

The quantitative method we are using for this research project is Ordinary Least Squares (OLS) regressions. Wooldridge (2012) argues that OLS multiple regressions is an appropriate empirical tool, as well as being useful for generalizing relationships between variables. Wooldridge (2012) defines the OLS assumptions as follows:

1. *Linearity:* This assumes that all the explanatory variables have a linear relationship with the dependent variable
2. *Random sampling of observations:* This assumes that that the sample has been randomly selected randomly
3. *No collinearity among the regressors:* Multicollinearity is defined as the high correlation amongst explanatory variables
4. *The conditional mean of the error term value is zero:* This assumes that the error term is normally distributed
5. *Homoscedasticity:* Homoscedasticity is the constant variance of the error term *u* with any value of the explanatory variables.

Due to the nature of our research project, which examines IPOs over a period of 11 years, the data used are pooled cross-sectional data. The selection of our explanatory variables is similar to Carter and Manaster (1990), Habib and Ljungqvist (2001), Ritter and Loughran (2004), Dimovski, Philavanh and Brooks (2010) and Divakaruni and Jones (2019).

In this study we use two similar econometric models, with the only difference between them being that the first one utilizes the score of the underwriting investment bank (as described in Chapter 3), while the second one uses a top-tier investment bank dummy instead (underwriters ranked 8.0 and above). On those two basic models we first introduce the JOBS Act Dummy (models 1.2 and 2.2) then introduce an interaction term between the underwriter score/top-tier dummy and the JOBS Act dummy (models 1.3 and 2.3).

(1.1) $$Underpricing_i = \beta_0 + \beta_1 Underwriter\ Score_i + \log(Offer\ Size_i) + \beta_3 EBITDA_i + \beta_4 Firm\ Age_i + \beta_5 Sales_i + \beta_6 \log(Offer\ Price_i) + \beta_7\ Share\ Overhang_i + \beta_8\ Pharma\ Dummy_i + \beta_9\ Tech\ Dummy_i + \beta_{10}\ Financial\ Crisis\ Dummy_i + u_i$$

(1.2) $$Underpricing_i = \beta_0 + \beta_1 Underwriter\ Score_i + \log(Offer\ Size_i) + \beta_3 EBITDA_i + \beta_4 Firm\ Age_i + \beta_5 Sales_i + \beta_6 \log(Offer\ Price_i) + \beta_7\ Share\ Overhang_i + \beta_8\ Pharma\ Dummy_i + \beta_9\ Tech\ Dummy_i + \beta_{10}\ Financial\ Crisis\ Dummy_i + \beta_{11}\ JOBS\ Act\ Dummy_i + u_i$$

(1.3) $$Underpricing_i = \beta_0 + \beta_1 Underwriter\ Score_i + \log(Offer\ Size_i) + \beta_3 EBITDA_i + \beta_4 Firm\ Age_i + \beta_5 Sales_i + \beta_6 \log(Offer\ Price_i) + \beta_7\ Share\ Overhang_i + \beta_8\ Pharma\ Dummy_i + \beta_9\ Tech\ Dummy_i + \beta_{10}\ Financial\ Crisis\ Dummy_i + \beta_{11}\ JOBS\ Act\ Dummy_i + \beta_{12}\ Underwriter\ Score_i * JOBS\ Act\ Dummy_i + u_i$$

(2.1) $$Underpricing_i = \beta_0 + \beta_1\ Top\ Tier\ Dummy_i + \log(Offer\ Size_i) + \beta_3 EBITDA_i + \beta_4 Firm\ Age_i + \beta_5 Sales_i + \beta_6 \log(Offer\ Price_i) + \beta_7\ Share\ Overhang_i + \beta_8\ Pharma\ Dummy_i + \beta_9\ Tech\ Dummy_i + \beta_{10}\ Financial\ Crisis\ Dummy_i + u_i$$

$$(2.2)\ Underpricing_i = \beta_0 + \beta_1\ Top\ Tier\ Dummy_i + \log(Offer\ Size_i) + \beta_3 EBITDA_i + \beta_4 Firm\ Age_i + \beta_5 Sales_i + \beta_6 \log(\ Offer\ Price_i) + \beta_7\ Share\ Overhang_i + \beta_8\ Pharma\ Dummy_i + \beta_9\ Tech\ Dummy_i + \beta_{10}\ Financial\ Crisis\ Dummy_i + \beta_{11}\ JOBS\ Act\ Dummy_i + u_i$$

$$(2.3)\ Underpricing_i = \beta_0 + \beta_1\ Top\ Tier\ Dummy_i + \log(Offer\ Size_i) + \beta_3 EBITDA_i + \beta_4 Firm\ Age_i + \beta_5 Sales_i + \beta_6 \log(\ Offer\ Price_i) + \beta_7\ Share\ Overhang_i + \beta_8\ Pharma\ Dummy_i + \beta_9\ Tech\ Dummy_i + \beta_{10}\ Financial\ Crisis\ Dummy_i + \beta_{11}\ JOBS\ Act\ Dummy_i + \beta_{12}\ Top\ Tier\ Dummy_i * JOBS\ Act\ Dummy_i + u_i$$

After the data was collected, Excel was used to sort the data as well as to fill in missing values. Then the data was imported into STATA where all analysis was conducted, including summary statistics, OLS regressions and robustness checks.

4.2 Variables

In this section we define and argue the selection of our explanatory variables, as well as present the second hypothesis related to this research project. The variables have been selected after a comprehensive review of the previous literature, thus in every section describing each variable we additionally reference previous literature.

4.2.1 First-Day Returns/Underpricing

Our dependent variable is underpricing/first-day returns and according to Ritter (1991) underpricing is defined as the difference between the offer price and the closing price of the first day of trading, divided by the offer price:

$$Underpricing = \frac{(\ First\ Day\ Closing\ Price - Offer\ Price)}{Offer\ Price}$$

4.2.2 Underwriter Reputation

The reputation of the lead underwriter is our main explanatory variable and is vital in answering our research question. As Ljungqvist (2007) shows the relationship between underpricing and the prestige of the underwriting investment bank was negative in the 1970s, 1980s and early 1990s.

There have been numerous works in the past that have utilized this variable to explain why underpricing occurs and why underpricing varies between issues (Loughran and Ritter, 2004), Habib and Ljungqvist, 2001; Carter and Manaster, 1990; Booth and Smith, 1986). We used Ritter's updated underwriter rankings that can be found on his website. Ritter and Loughran (2004) explain their methodology as follow: They start with the Carter and Manaster (1990) methodology, where they look at the prospectus of each issue, at the section where all the underwriters and syndicate members are listed. In that section the lead underwriters are listed first, co-lead underwriters follow, and finally come the other syndicate members. Highest prestige underwriters appear first, meaning that these underwriters are allocated more shares to sell, thus if an underwriter is assigned a 9.0 (in the 0-9 scale) it means that it has consistently appeared on the top of the page.

Following the publication of his 2004 work with Loughran, Ritter has been updating his underwriter reputation list, using the methodology described above. Underwriter scores therefore change based on the timeframe examined, for this reason, we assign the corresponding ranking of the investment bank based on the year of the IPO. To our knowledge there has not been any research work that links the relationship of underpricing and underwriter reputation to the JOBS Act, but based on the findings of Loughran and Ritter (2004) we expect this variable to have a positive relationship with underpricing, due to the fact that underwriter's in the late 1990s started underwriting IPOs indiscriminately in an attempt to enrich themselves, thus increasing the average risk profile of IPOs and thus underpricing (Ljungqvist, 2007).

4.2.3 Top-Tier Underwriter Dummy

In the second model, we will use a Top-Tier dummy instead of the underwriter's score consistent with Ritter and Loughran's (2004) methodology. They consider underwriters with a rank of 8.0 and 9.0 to be prestigious national underwriters and they will be assigned the value

of one, while underwriters below the rank of 8.0 will be assigned a zero. For the reasons mentioned above, we expect this variable to have a positive relationship with first-day returns.

4.2.4 Log (Offer Size)

All the past empirical literature that we have examined has used the offer size as an explanatory variable (namely Carter and Manaster, 1991; Habib and Ljungqvist, 2001; Loughran and Ritter, 2004). Previous literature has found this variable to have a negative relationship with underpricing (Carter and Manaster, 1990; Carter, Dark and Singh, 1998) but Divakaruni and Jones (2019) found a positive and statistically significant relationship of this variable and underpricing. For this reason, we expect this variable to have a positive relationship with underpricing.

4.2.5 Earnings Before Interest Taxes Depreciation and Amortization (EBITDA)

Consistent with the methodology of Divakaruni and Jones (2019), EBITDA (Earnings before Interest, Tax, Depreciation and Amortization) is used both as a measure of the profitability of the issuing firm as well as a quality control variable in order to test whether the quality of EGCs going public did indeed deteriorate following the implementation of the JOBS Act. Habib and Ljungqvist (2001) consider EBITDA to be a risk proxy, meaning that a higher EBITDA would suggest lower underpricing, thus having a negative relationship with our dependent variable. Since some EBITDA values in our sample are either 0 or negative, we do not use the natural logarithm and instead maintain the original value.

4.2.6 Firm Age

Consistent with the methodology of Carter and Manaster (1991), Habib and Ljungqvist (2001), and Loughran and Ritter (2004), this variable is a proxy for risk since a firm that has been operating for longer is perceived to be less risky than a start-up. To our knowledge all the past literature examining underpricing includes this variable in their regressions. Consistent with Loughran and Ritter's methodology firm age is defined as:

$$Firm\ Age = 1 + (IPO\ Year - Incorporation\ Year)$$

Similar to EBITDA, firm age is a proxy for risk suggesting a negative relationship between firm age and underpricing.

4.2.7 Sales

Consistent with the methodology of Habib and Ljungqvist (2001) we include the sales of the issuing firm of the issuing firm in our list of explanatory variables. Due to the presence of EGCs without sales, we do not use the natural logarithm of this variable and instead maintain its original values. This variable constitutes another proxy for risk since higher sales imply a lower risk company, thus we expect a negative relationship between sales and underpricing. Due to the fact that our sample contains firms with no revenue, we were unable to use the natural logarithm of this variable and instead maintained its original value.

4.2.8 Log (Offer Price)

According to Fernando, Krishnamurthy and Spindt (1999), offer price can be seen as a proxy for risk. The authors suggest that companies do not decide on the offer price arbitrarily and find evidence that suggest that higher offer prices lead to higher institutional ownership. Thus, according to the authors, underpricing needs to reflect the future monitoring costs of institutional investors, meaning that a pooling equilibrium situation arises where higher offer prices lead to higher underpricing. Additionally, the authors also suggest that the offer price indicates that the firm will remain viable after 5 years. Furthermore, Dimovski et al (2010) use offer price as an explanatory variable. Based on the rationale expressed by Fernando, Krishnamurthy and Spindt (1999) higher offer prices lead to higher institutional interest in the IPO that subsequently leads to higher underpricing, thus we expect this variable to have a positive relationship with underpricing.

4.2.9 Share Overhang

Ritter consistently uses this variable, which is defined as the ratio of retained shares divided by the shares offered.

$$Share\ Overhang = \frac{Retained\ Shares}{Shares\ Floated}$$

Loughran and Ritter (2004) argue that high percentage of ownership of shares by insiders' functions as a signal for investors that the firm going public is of higher quality since insiders maintain a share in the business even after the IPO. Since the share overhang ratio can be a relatively counterintuitive variable, in table 2 we demonstrate some examples of retained and floated shares with their corresponding share overhang ratio.

Retained Shares	Floated Shares	Share Overhang
90,00%	10,00%	9,00
80,00%	20,00%	4,00
70,00%	30,00%	2,33
60,00%	40,00%	1,50
50,00%	50,00%	1,00
40,00%	60,00%	0,67
30,00%	70,00%	0,43
20,00%	80,00%	0,25
10,00%	90,00%	0,11

Table 1*: Share Overhang Ratio Examples*

Loughran and Ritter (2004) found share overhang to have a positive relationship with underpricing, due to the positive signal that is associated with the high retainment of shares by insiders. Consequently, we too expect a positive relationship between share overhang and first-day returns.

4.2.10 Biotechnology/Pharmaceutical Dummy

Consistent with the methodology of Divakaruni and Jones (2019) this variable takes the value of 1 if the company is involved in the biotechnology or pharmaceutical sector. The purpose of including a specific variable for biotech/pharma EGCs is important in our opinion since Dambra et al (2014) argue that biotech and pharma companies are more likely to go public using the EGC provisions due to the high disclosure costs that they traditionally have. While there is not a particular research project that looks specifically at the relationship between biotech/pharma firms and the underpricing that occurs in their IPOs after the implementation of the Act, Dambra et al (2015) find that the Act increased the number of biotech/pharma firms going public since those firms have traditionally higher disclosure costs (which the Act lowered). Due to the higher volume of such IPOs we expect this variable to have a positive relationship with underpricing.

4.2.11 Technology Dummy

Consistent with the methodology of Loughran and Ritter (2004) and Divakaruni and Jones (2019) we include a dummy variable that takes the value of 1 in the case an issuer is related to technology products and services. This variable serves as a control for risk since technology companies are more likely to be young and unprofitable and consequently underpriced

(Loughran and Ritter, 2004). Based on the rationale and findings of Ritter and Loughran (2004) we expect this variable to have a positive relationship with underpricing.

4.2.12 Financial Crisis Dummy

Liu and Ritter (2011) examined the first-day returns of IPOs between 1993 and 2008, and used a dummy to control for the dot-com bubble. Similarly, we shall include a dummy variable that takes the value of 1 if an issue took place between December 2007 and the June 2009 (U.S. National Bureau of Economic Research, 2010), and 0 for any other period before or after the mentioned timeframe. Due to the decreased IPO activity that occurred during the financial crisis, we expect this variable to have a negative relationship with underpricing due to the decreased demand for IPOs.

4.2.13 JOBS Act Dummy

Consistent with the methodology of Divakaruni and Jones (2019) this dummy takes the value of 1 if an issue took place after the JOBS Act became active (April 6, 2012) and 0 for the issues before that date. According to our 1st hypothesis which states that the decreased disclosure regulation for EGCs introduced for EGCs increased the ex-ante uncertainty of those IPOs, we expect underpricing to have a positive relationship with the JOBS Act variable.

4.2.14 Underwriter Score/Top-Tier Dummy * JOBS Act Dummy

In order to quantify the relationship between underpricing and underwriter reputation after the implementation of the JOBS Act, we introduce the interaction term between underwriter reputation and the JOBS Act dummy. Wooldridge (2012) suggests that interaction terms are used when the magnitude of an explanatory variable depends on another variable. Thus, in an attempt to quantify the effect of the JOBS Act on the relationship between underpricing and underwriter reputation, we introduce the interaction term. There has not been any previous research, at least to our knowledge, examining the relationship between underwriter reputation, underpricing and the JOBS Act. We expect this variable to be positively related to underpricing.

4.3 Data Collection

We sourced our data from Bureau van Dijk's Zephyr database, where we searched for IPOs conducted in the US for the period between 2002 and 2019. The database suffers from incompleteness in important variables for our study, which subsequently led to the elimination of observations from the sample. Furthermore, we have limited the scope according to prior

research and best practice methods. Mainly, we have sorted out any IPO that was listed on an OTC-exchange, while also removed any companies belonging to a US-SIC code which is affiliated with finance or utility industries. Out of the 3715 observations these two limitations reduced the IPOs to 2047 observations. Furthermore, we left out 1026 observations missing data related to IPO dates, founding dates, the value of the offering, revenue data, offer price, first day closing data and lead underwriter data. We also found out that the Zephyr database had very limited data on any IPO from 2017 and later, with the majority lacking data on essential variables. Furthermore, we found that Ritter's ranking was last updated 2015 and does not have underwriter ranking for any year after 2015. We therefore decided to further limit our sample to the period from 2005 to 2015 which lead to a removal of 254 observations. This also enabled the examination of the exogenous effect the JOBS Act had in the direct period following and preceding its implementation.

We found that the database in some cases had adjusted the first-day trading price for later stock splits, but not the offer price which lead to extreme observations of underpricing. Thus, we manually audited every observation left from our sample and we adjusted the prices for the stock splits or otherwise faulty data. Sources we used were IPO prospectuses, news articles and stock split press releases. We found that 82 observations were incomplete and lacked data and it was mainly IPOs from the period preceding the financial crisis which had limited available information online. Furthermore, we limited the sample to fit the conditions for an Emerging Growing Company, meaning that they should have revenues below $1 billion on the year preceding its IPO. In total we were left with 600 observations of which 250 belonged to the period before the JOBS Affect was in effect (January 2005 to April 2012) and 350 in the period following it up to end of 2015. We believe that the necessary omitting of a large amount of observations can be a drawback, however, it is not uncommon that the final sample is substantially smaller than the first in IPO underpricing (Carter, Dark & Singh, 1998).

4.4 Limitations of the Research Project

Regarding the limitations of this research project, we believe that the main limitations were linked to the database, since Zephyr was in many cases missing several key values for each IPO, which forced us to take out a large number of IPOs. This project is also missing the commonly used dummy variable of Venture Capitalist (VC) backed IPOs, which could in turn offer further insight on the first-day returns experienced by EGCs. Although in theory Zephyr does provide the ability to view if and which VC funds had invested before the IPO, practically

the database gives no information regarding VCs during an IPO since this data is missing from the database. Due to time constraints we thought that it would be unwise to source the data for the VC backed dummy manually, thus we elected to proceed without it.

A potential limitation as well as an opportunity for further research is the fact that the underwriter prestige variable assigned to an IPO corresponds to the lead underwriter with the highest prestige score. While this methodology has been used extensively in the literature that examines the relationship between underwriter prestige and first-day returns, we think that it can be improved. We suggest that the underwriter prestige score linked to an IPO could be a weighted average of the scores that have been assigned to the investment banks (through the Carter and Manaster methodology (1990)) that participated in the syndicate, with the weights being assigned based on the allocation of shares in the issue. We believe this methodology to be superior since it accounts for both the size of the syndicate, as well as the prestige of the syndicate members. We do acknowledge though that such a methodology would be painfully time consuming, since we assume that the researcher has to individually look into each IPO's S-1 form in order to assign the weights to the syndicate members, and that is the main reason why we elected to proceed with the simplified methodology that has been used by numerous researchers in the past.

Finally, this research project took into consideration IPOs that took place until the end of 2015, which practically suggests that we have not captured the effect of the amendments that were introduced to the JOBS Act (in December 2015) through the FAST Act. This means that this project captures only the effects of the initial version of the JOBS Act and not the cumulative effect after the FAST Act amendments.

5. Data and Descriptive Statistics

In this section we present the summary statistics of our sample, as well as comment on those summary statistics and comparing it to summary statistics of comparable papers.

5.1.1 Descriptive Statistics

In table 2 we have summarized the main statistics from our sample. As previously mentioned, a total of 600 companies, classified as EGCs were included in our sample.

	Mean	Median	St.Dev	Min	Max	N
Underwriter Score	7,9	8,5	1,5	1,0	9,0	600
Underpricing (%)	17,92%	10,33%	30,58%	-58,00%	206,67%	600
Offer Size (thousand $)	147 640	98 850	171 056	2 200	1 820 000	600
Offer Price ($)	14,19	14,00	5,58	4,00	45,00	600
Firm Age (Years)	7	7	5	1	52	600
Share Overhang	3,73	2,77	4,53	0,00	67,03	600
Sales (thousand $)	142 399	67 641	204 484	0	995 090	600
EBITDA (thousand $)	14 865	-8	80 345	-981 354	558 111	600

Table 2*: Sample Summary Statistics*

The average underpricing in our sample was 17.92% with a median of 10.33%, suggesting a left skewness in the sample. The standard deviation was 30.58% suggesting a high variation in first-day returns. Our statistics are similar to those of Chua (2012) who found an average underpricing of 19.4% and Loughran and Ritter (2004) who had an average underpricing of 18.7% in the period between 1980 and 2003. Jones & Swaleheen (2010) also had an average underpricing of 18.7% in the period 1980 and 2003. The highest underpricing in our sample was observed at a first day return of 206.67% while the lowest observation saw a decrease of 58.00% in the stock price on the first day of trading. The underwriter score scaled from 1 to 9 and saw underwriters on all scales of the spectrum. The average IPO was underwritten by an underwriter with a score of 7.9. The median was 8.5 which was expected as high ranked underwriters underwrote the most IPOs. The standard deviation was relatively low at 1.5. Regarding the offer size, or the value of the IPO, there was a large standard deviation of $171 million, with the lowest observation seen at $2.2 million and the highest at $1.820 million. The average offering was $147.6 million and the median was $98.9 million, suggesting a left skewness in the sample. The offer price had an average of $14.19 dollars and a median of $14, suggesting a normally distributed sample. The standard deviation was $5.58, the smallest observation was $4 and the largest $45.

Additionally, we have divided the total sample into two sub samples, one before the JOBS Act in April 2012 and one after. Shown in table 3, the pre-JOBS Act sample has 250 observations. The average underpricing in the subsample was 15.18% with a median of 9.85% which is lower than those of the total sample. The standard deviation was 27.51% and the sample had the lowest first day return of –58.00% and the highest of 199.33%.

	Mean	Median	St.Dev	Min	Max	N
Underwriter Score	7,9	8,5	1,5	1,0	9,0	250
Underpricing (%)	15,18%	9,85%	27,51%	-58,00%	199,33%	250
Offer Size (thousand $)	144 887	97 125	149 080	2 200	1 000 000	250
Offer Price ($)	13,36	13,00	5,10	4,00	45,00	250
Firm Age (Years)	7	7	6	1	52	250
Share Overhang	4,05	2,93	5,50	0,00	67,03	250
Sales (thousand $)	142 336	80 220	178 795	0	948 340	250
EBITDA (thousand $)	14 216	6 847	87 537	-981 354	386 972	250

Table 3*: Summary Statistics of pre-JOBS Sample*

For the sample of IPOs that took place after the JOBS Act was enacted, shown in table 4, the average underpricing increased by over four percentage points to 19.87% compared to the sample before the JOBS Act. The median underpricing was also slightly higher at 10.93%.

The average age of the firms which went public where the same in each subsample sets with an average and median of 7 years. The median is consistent with the statistics from Chua (2012) and Jones & Swaleheen (2010) who both had a median of 7. Surprisingly, the average firm age is the same as the median, where Chua (2012) and Jones & Swaleheen (2010) had an average of 15.7 years and 15.2 years respectively. We assume that our firm age median is lower due to us examining EGCs; firms that are smaller and consequently younger.

In table 3 we have summarized the statistics of the post-JOBS sample. The offer sizes were slightly higher in the sample after the JOBS Act, with an average of $149 million compared to $144 in the period before. Comparing the share overhang between the two subsamples, the average share overhang was higher in the pre-JOBS Act sample at 4.05 compared to 3.51 in the sample after. This suggests that the retained shares after the IPO was lower in the period after the JOBS Act. Relating to the revenue of the firms going public, the average was $14.2 million in the period preceding the JOBS Act, compared to $15.3 million post JOBS Act. The median was $80.2 million pre-JOBS Act and $60.1 million after. The standard deviation was higher for the period following the JOBS Act at $221 million, compared to $178 million before.

	Mean	Median	St.Dev	Min	Max	N
Underwriter Score	7,9	8,5	1,5	2,0	9,0	350
Underpricing (%)	19,87%	10,93%	32,50%	-40,31%	206,67%	350
Offer Size (thousand $)	149 606	99 338	185 348	4 000	1 820 000	350
Offer Price ($)	14,78	15,00	5,84	4,00	44,00	350
Firm Age (Years)	7	7	5	1	30	350
Share Overhang	3,51	2,65	3,67	0,00	47,78	350
Sales (thousand $)	142 444	60 132	221 265	0	995 090	350
EBITDA (thousand $)	15 329	-3 734	74 912	-165 041	558 111	350

Table 4: *Summary Statistics post-JOBS*

As seen in the Appendix: Table 1 we have summarized the underwriters based on their average underpricing and number of IPOs underwritten as well as the average score of the underwriter from 2005-2015. A total of 60 different underwriters underwrote IPOs in our sample. The average score was 6, while the average score (calculated as the average score of the underwriter between 2005 and 2015) was 7.89. This is consistent with Chua (2012). The top 5 underwriters in terms of number of IPOs underwritten together represent over 60% of the IPOs in the total sample. Their average underpricing was 21.15% which is higher than the average in both sample sets. Only Deutsche Bank and William Blair & Co in the top 5 have an average underpricing that is lower than the average underpricing in the total sample.

6. Empirical Results

In this section we present the results of our study, followed by an analysis that tries to link said results with past theories and empirical evidence.

Before we procced to present our results, we restate our hypotheses as seen on Chapter 3:

H1: *The reduced disclosure requirements for EGCs that were introduced by the JOBS Act: Title I increased the ex-ante uncertainty of an issue, thus expected underpricing increased*

H2: *The relationship between underwriter reputation and underpricing is positive in EGC IPOs*

H3: *The JOBS Act increased the magnitude of the relationship between underpricing and underwriter reputation*

6.1 OLS Assumptions

Six regressions were performed, three on each model, in an attempt to quantify the relationship between underpricing and underwriter reputation on EGCs after the enactment of the JOBS Act. The first two regressions correspond to the basis models (without the JOBS Act dummy), in the next two we have introduced the JOBS Act dummy, and in the final two we introduced the interaction term of underwriter score/top-tier dummy and JOBS Act dummy. Before we present the results of our regressions, we briefly discuss how we ensured that all of the five assumptions of OLS were met.

6.1.1 Linearity

As mentioned in the methodology chapter, linearity is defined as the dependent variable having a linear relationship with all the explanatory variables (Wooldridge, 2012). In order to test for linearity, we used STATA to plot the residuals on all the non-dummy variables that are used in our model, and then fitted a line on the plot in order to assess whether linearity does hold (University of Utah, 2020). In Appendix: Graph 1 we can see that the relationship between the residuals and the explanatory variables does hold.

6.1.2 Random Sampling

Another assumption of OLS regressions is that observations have been randomly picked from the population (Wooldridge, 2012). Wooldridge (2012) argues that one of the convenient characteristics of cross-sectional data is that we can assume that it has been obtained by random sampling from the population.

6.1.3 Multicollinearity

Before we proceeded with our regressions, an attempt was made to test for multicollinearity amongst the independent variables. In the table 5 we can see two interesting pairs of correlation; offer size and offer price have a correlation of 0.73, and EBITDA has a correlation of 0.74 with sales. In order to avoid the problems of reliability that come with multicollinearity, we elected to remove EBITDA and offer price from the initial list of variables. While some of the past literature has made use of EBITDA and offer price, those variables are not as common in the literature as sales and offer size (see Carter and Manaster, 1990; Habib and Ljungqvist, 2001; Loughran and Ritter, 2004).

Correlation Table

	Underpricing	Underwriter Score	Log(Offer Size)	Log(Offer Price)	EBITDA	Firm Age	Sales	Share Overhang	Pharma Dummy	Tech Dummy	Financial Crisis Dummy	JOBS Act Dummy
Underpricing	1.0000											
Underwriter Score	0.0812	1.0000										
Log(Offer Size)	0.0640	0.5119	1.0000									
Log(Offer Price)	0.2112	0.4705	0.7341	1.0000								
EBITDA	-0.0577	0.0944	0.4612	0.2613	1.0000							
Firm Age	0.0187	-0.0200	-0.1003	-0.1132	-0.0435	1.0000						
Sales	-0.0611	0.1028	0.4048	0.2192	0.7428	-0.0055	1.0000					
Share Overhang	0.1497	0.0313	-0.0336	0.0412	0.1276	0.0423	0.0795	1.0000				
Pharma Dummy	-0.0721	-0.0857	-0.2511	-0.2020	-0.0832	0.0596	-0.0832	-0.0478	1.0000			
Tech Dummy	0.1516	0.1021	-0.0393	-0.0179	-0.1022	0.0477	-0.1204	0.1103	-0.2149	1.0000		
Financial Crisis Dummy	-0.0109	0.0254	-0.0112	-0.0064	0.0031	-0.0244	-0.0245	0.1593	-0.0296	0.0864	1.0000	
JOBS Act Dummy	0.0695	0.0036	0.0538	0.1303	0.0109	0.0137	0.0459	-0.0639	-0.0469	-0.1027	-0.2000	1.0000

Table 5: *Correlation Table*

6.1.4 Zero Conditional Mean

The zero conditional mean assumption states that the expected value of the error term has an expected value of zero given any value of the explanatory variables (Wooldridge, 2012). According to Brooks (2008) if a constant term is present in the model, then this assumption cannot be violated.

6.1.5 Heteroscedasticity

Consistent with Wooldridge (2012) we perform a White test for both models in order to determine whether the homoscedasticity assumption holds. Table 6 shows the results of the White test for both models, where we see that the p-value is equal to 0.29 and 0.48 in model 1 and model 2 respectively, thus we fail to reject the null hypothesis of homoscedasticity. Consistent with Wooldridge (2012) we deal with heteroscedasticity by using heteroscedasticity-robust standard errors in our regressions.

Model 1			
1.1	chi2(40)	=	44.15
	P-value	=	0.3005
1.2	chi2(48)	=	52.87
	P-value	=	0.2915
1.3	chi2(55)	=	69.89
	P-value	=	0.0852

Model 2			
2.1	chi2(39)	=	38.29
	P-value	=	0.5021
2.2	chi2(47)	=	46.61
	Prob > chi2	=	0.4888
2.3	chi2(53)	=	61.64
	Prob > chi2	=	0.1944

Table 6: White Tests

6.2 Model 1

Table 7 contains the regressions of our two models. We ran three regressions for each model: the basic models, then added the JOBS dummy, and finally added the interaction term, where we interact the respective underwriter prestige variable to the JOBS Act dummy. For models 1 and 3 we shall be briefly commenting on the coefficients, but after this chapter when we refer to basic models, we refer to models 2 and 4 (the models that include the JOBS Act dummy).

	Model 1			*Model 2*		
	(1)	(2)	(3)	(1)	(2)	(3)
	Underpricing	*Underprcing*	*Underpricing*	*Underpricing*	*Underpricing*	*Underpricing*
Underwriter Score	-0.00211	-0.00249	-0.0119			
	(0.0104)	(0.0104)	(0.0165)			
Top-Tier Dummy				0.00744	0.00761	0.00481
				(0.0318)	(0.0315)	(0.0412)
Log(Offer Size)	0.0794***	0.0792***	0.0792***	0.0751***	0.0745***	0.0744***
	(0.0183)	(0.0179)	(0.0180)	(0.0191)	(0.0187)	(0.0188)
Firm Age	0.00240	0.00242	0.00243	0.00239	0.00240	0.00240
	(0.00205)	(0.00203)	(0.00204)	(0.00207)	(0.00206)	(0.00206)
Sales	-1.85e-07***	-1.81e-07***	-1.86e-07***	-1.84e-07***	-1.81e-07***	-1.81e-07***
	(5.72e-08)	(5.62e-08)	(5.67e-08)	(5.73e-08)	(5.63e-08)	(5.67e-08)
Share Overhang	0.00908***	0.00913**	0.00874**	0.00901***	0.00905**	0.00902**
	(0.00347)	(0.00355)	(0.00370)	(0.00347)	(0.00355)	(0.00359)
Biotech/Pharma Dummy	-0.0284	-0.0220	-0.0221	-0.0304	-0.0242	-0.0243
	(0.0426)	(0.0428)	(0.0430)	(0.0429)	(0.0431)	(0.0435)
Tech Dummy	0.0686**	0.0752**	0.0748**	0.0666**	0.0730**	0.0729**
	(0.0310)	(0.0309)	(0.0307)	(0.0307)	(0.0306)	(0.0305)
Financial Crisis Dummy	-0.0913**	-0.0611	-0.0564	-0.0920**	-0.0620	-0.0616
	(0.0432)	(0.0449)	(0.0449)	(0.0435)	(0.0452)	(0.0451)
JOBS Act Dummy		0.0523**	-0.0768		0.0522**	0.0487
		(0.0248)	(0.162)		(0.0248)	(0.0501)
*Underwriter Score * JOBS Act Dummy*			0.0163			
			(0.0198)			
*Top-Tier Dummy * JOBS Act Dummy*						0.00489
						(0.0576)
Constant	-0.759***	-0.789***	-0.712***	-0.730***	-0.758***	-0.755***
	(0.199)	(0.200)	(0.240)	(0.215)	(0.216)	(0.226)
N	600	600	600	600	600	600
R-squared	0.059	0.078	0.080	0.059	0.078	0.080

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Table 7: *Regression Table*

6.2.1 Model 1 – Regression 1

The first column of the regression table demonstrates the regression of the first basic model (without the JOBS Act dummy nor the interaction term). We shall comment briefly on this model. The main explanatory variable of underwriter score has low statistical significance, alongside firm age, and biotech/pharma dummy. Offer size is statistically significant at the 1% level, with a positive relationship to underpricing, suggesting that 1% increase in the offer size increases underpricing by 7.94%. We were unable to use the natural logarithm of sales to make our coefficient interpretation easier since there are observations in the sample with zero sales. Instead, table 8 shows the magnitude on underpricing on several different dollar amounts of sales. Sales has strong statistical significance at the 1% level, and has a negative relationship with underpricing, which suggests that an increase in $100 million in revenues would decreases underpricing by 1.85%.

Share overhang too has strong statistical significance at the 1% level, and positive relationship with underpricing suggesting that a one-point increase in the share overhang ratio results to an increase of 0.9% in first-day returns. The tech dummy variable is statistically significant at the 5% level with a positive relationship to underpricing which suggests that tech firms on average experience 6.9% higher underpricing. Finally, the financial crisis dummy demonstrates strong statistical significance at the 5% level and a negative relationship with underpricing, suggesting that on average issues during the financial crisis experienced less underpricing by 9.13%.

Model 1			**Model 1**			**Model 1**		
Regression 1			*Regression 2*			*Regression 3*		
Increase in Sales ($)	**Underpricing**	**Underpricing (%)**	**Increase in Sales ($)**	**Underpricing**	**Underpricing (%)**	**Increase in Sales ($)**	**Underpricing**	**Underpricing (%)**
1 000	-0,000000185	0,0000%	1 000	-0,000000181	0,0000%	1 000	-1,86E-07	0,0000%
10 000	-0,00000185	-0,0002%	10 000	-0,00000181	-0,0002%	10 000	-0,00000186	-0,0002%
100 000	-0,0000185	-0,0019%	100 000	-0,0000181	-0,0018%	100 000	-0,0000186	-0,0019%
1 000 000	-0,000185	-0,0185%	1 000 000	-0,000181	-0,0181%	1 000 000	-0,000186	-0,0186%
10 000 000	-0,00185	-0,1850%	10 000 000	-0,00181	-0,1810%	10 000 000	-0,00186	-0,1860%
100 000 000	-0,0185	-1,8500%	100 000 000	-0,0181	-1,8100%	100 000 000	-0,0186	-1,8600%
1 000 000 000	-0,185	-18,5000%	1 000 000 000	-0,181	-18,1000%	1 000 000 000	-0,186	-18,6000%

Model 2			**Model 2**			**Model 2**		
Regression 1			*Regression 2*			*Regression 3*		
Increase in Sales ($)	**Underpricing**	**Underpricing (%)**	**Increase in Sales ($)**	**Underpricing**	**Underpricing (%)**	**Increase in Sales ($)**	**Underpricing**	**Underpricing (%)**
1 000	-0,000000184	0,0000%	1 000	-0,000000181	0,0000%	1 000	-1,81E-07	0,0000%
10 000	-0,00000184	-0,0002%	10 000	-0,00000181	-0,0002%	10 000	-0,00000181	-0,0002%
100 000	-0,0000184	-0,0018%	100 000	-0,0000181	-0,0018%	100 000	-0,0000181	-0,0018%
1 000 000	-0,000184	-0,0184%	1 000 000	-0,000181	-0,0181%	1 000 000	-0,000181	-0,0181%
10 000 000	-0,00184	-0,1840%	10 000 000	-0,00181	-0,1810%	10 000 000	-0,00181	-0,1810%
100 000 000	-0,0184	-1,8400%	100 000 000	-0,0181	-1,8100%	100 000 000	-0,0181	-1,8100%
1 000 000 000	-0,184	-18,4000%	1 000 000 000	-0,181	-18,1000%	1 000 000 000	-0,181	-18,1000%

Table 8: *Increase in Sales Scenarios*

6.2.2 Model 1 – Regression 2

Once we introduce the JOBS Act dummy, we see that the relationship between underwriter reputation and underpricing remains both statistically and economically insignificant. Offer size on the other hand is statistically significant at the 1% level, suggesting that an increase of 1% in the offer size leading to an increase in first-day returns of 7.92%.The effect of the firm age on first-day returns is statistically insignificant, alongside the biotech/pharma dummy and financial crisis dummy.

Sales are statistically significant at the 1% level, as well as being marginally economically significant, where an increase of $1 million in sales decreases underpricing by 0.0181% on average. In other words, an EGC with $100 million more in revenues is expected to experience less underpricing by 1.81% on average. Share overhang is statistically significant at the 5% level, with an increase of 1 unit in share overhang leading to a decrease in first-day returns of 0.91%. Share overhang can be a relatively counterintuitive measure to interpret, thus Table 2 in the methodology chapter presents various scenarios of ownership structures and the corresponding share overhang ratio. According to Ritter and Loughran (2004) the higher the share overhang ratio, the more positive the signal to the market since insiders maintain a high stake in the company.

The technology dummy is statistically significant at the 5% level, with technology firms experiencing on average 7.52% higher underpricing than other EGCs. Finally, the JOBS dummy is statistically significant at the 5% level with a positive effect on first-day returns of the magnitude of 5.23% on average.

6.2.2 Model 1 – Regression 3

In the third regression of Model 1 we introduce the interaction term Underwriter Score * JOBS Act Dummy in an attempt to quantify the change in the relationship between underpricing and underwriter score after the enactment of the JOBS Act. The statistical significance of underwriter's prestige remained unchanged. Offer size economic and statistical significance did not change at all, while sales too maintained their high statistical significance while the magnitude was slightly affected downward suggesting a decrease in underpricing of 1.86% per $100 million increase in revenues on average. Share overhang too maintained its high significance levels but the magnitude decreased to 0.87% per one-unit increase of the share overhang ratio.

The pharma dummy remains statistically insignificant and similarly, the tech dummy does not change significantly (goes to 7.48% from 7.52%) and maintains its high statistical significance at the 5% level. Similar to the tech and pharma dummies, the financial crisis dummy maintains its statistical significance. The JOBS Act dummy loses its high statistical significance once we introduce the interaction term. Finally, the interaction term is statistically insignificant.

6.3 Model 2

As previously mentioned, model 2 replaces the underwriter score with a dummy for all underwriters with a score of 8 or above on the scale, named "Top Tier Dummy".

6.3.1 Model 2 – Regression 1

Similar to the regressions of the first model, the top-tier dummy has no statistical significance. Offer size is statistically significant at the 1% level with a positive sign, suggesting that an increase of 1% in the offer size increases underpricing by 7.51%. Similar to model 1 firm age, and the biotech/pharma dummy have no statistical significance.

Sales demonstrate strong statistical significance (1% level) with a negative sign that suggests that an increase of $100 million in sales would decrease underpricing by 1.84%. Share overhang is also statistically significant at the 1% level, with the expected positive sign, but with a rather low economic magnitude of 0.9% increase on underpricing for each one-point increase in the ratio. Similar to model 1, the tech dummy maintains its strong statistical significance at the 5% level, with a positive sign that suggests that tach firms experience on average 6.66% higher underpricing. Finally, the financial crisis dummy is statistically significant at the 5% level with a negative sign that suggests that during the financial crisis firms experienced 9.2% less underpricing.

6.3.2 Model 2 – Regression 2

Similar to the first regression of model 2, the top-tier dummy has no statistical significance. Firm age and the biotech/pharma dummy maintain their statistical insignificance while the financial crisis dummy loses its strong statistical significance once we introduce the JOBS Act dummy. Offer size shows the largest change in economic magnitude at 7.45% higher

underpricing per 1% increase the offer size, compared to 7.92% in model 1 with a continuously high significance at the 1% level. The tech dummy is statistically significant at the 5% level once we introduce the JOBS Act dummy, with a positive relationship to underpricing which suggests that tech firms were underpriced by 7.3% on average. The JOBS Act dummy is statistically significance at the 5% level, with a positive relationship to underpricing that suggests that firms were underpriced by 5.22% more on average after the enactment of the Act.

6.3.2 Model 2 – Regression 3

In this final regression the low statistical significance of the top-tier dummy, firm age, biotech/pharma dummy, and financial crisis dummy does not change compared to the last regression. Offer size maintains strong statistical significance and sign, and experiences no significant change in the magnitude. The same can be said about sales, share overhang and the tech dummy. Similar to model 1 the JOBS Act loses its statistical significance once we introduce the interaction term, while the interaction term itself shows no statistical significance either.

6.4 Robustness Checks

In an attempt to verify the replicability of our research methodology we performed several robustness checks and realized that the coefficients of the explanatory variables related to our research questions (JOBS Act dummy, underwriter score/top-tier dummy, Underwriter Score/top-tier dummy * JOBS Act dummy) do not change in any significant way.

More specifically table 2 of the Appendix presents the coefficients of those variables in the main model (identical to the regression table presented above), in models where we use different sets of variables, in models where we use different time periods, and in cases where variables are replaced by variables that measure something quite similar (Sales replaced by EBITDA and Share Overhang replaced by percentage of shares floated).

The JOBS Act dummy in the 2 basic models (without the interaction term) maintain high statistical significance (at the 5% level) in all those different scenarios and the magnitude fluctuates between 5.21% and 6.94%. Only in the case where we use a sample between 2008-2015 the statistical significance of this variable increases to the 1% level. The underwriter score and top-tier dummy in the basic models maintain their low statistical significance. Once we introduce the interaction terms in the models the JOBS Act dummy loses its statistical

significance, the underwriter score/top-tier dummy maintain their low statistical significance, and the interaction terms remain statistically insignificant, much like in the basic models.

7. Discussion and Analysis

This chapter discusses and analyses the results from the regressions and relates it to our hypotheses, as well as previous theories and empirical evidence. In the first part of this chapter we focus on the variables associated with our main hypotheses, then we elaborate on the control variables that had strong statistical significance. Note that when we refer to "basic models", we refer to Model 2 and 4 from the Methodology chapter (models that include the JOBS Act dummy).

7.1 Main Explanatory Variables

7.1.1 JOBS Act and Underpricing

As described in the empirical results chapter, our basic models (without the interaction terms) found evidence that we can reject the null hypothesis and accept our hypothesis regarding the ex-ante uncertainty increase after the enactment of the Act. The JOBS Act dummy saw statistical significance at the 5% level and had a coefficient of 0.0523, meaning that EGCs experienced an average 5.23% higher underpricing after the JOBS Act than similar companies before. The economic magnitude of the JOBS Act in our sample is less comapred to the results of Divakaruni & Jones (2019) who tested 772 IPOs between 2008 and 2017. We could assume that the difference in results is likely due to the different methodology that Divakaruni and Jones (2019) (2SLS).

Based on Beatty and Ritter's (1986) theory on ex-ante uncertainty, we could argue that the decreased disclosure requirements introduced by the JOBS Act increased the ex-ante uncertainty of an issue, thus increased underpricing. Additionally, this result is consistent with the work of Barth, Landsman and Taylor (2017), where they argue that the JOBS Act increased information uncertainty in the IPOs of EGCs, consequently increasing underpricing. More specifically Barth, Landsman and Taylor (2017) argued that the post-JOBS Act IPOs attracted more investors that rely on private information when assessing an IPO. This, framed within the

ex-ante uncertainty theory (Beatty and Ritter, 1986) would suggest that those investors would require a compensation for the costs they incurred in order to produce said private information. This compensation would come in the form of higher underpricing. Thus, our basic model results are in line with both economic theory, as well as recent empirical research on the subject.

An afterthought on those results that goes beyond the objectives of this research project is the indirect way that the JOBS Act might have aggravated underpricing. Titles II and III of the Act are not related to public markets regulation but allowed for larger private equity issues as well as crowdfunding. This accompanied by a prolonged period of low interest rates in the US suggest that there was ample private funding available for companies (that could classify as EGCs if they had decided to go public) (Blundell-Wignall, 2007). This rationale would support Divakaruni and Jones (2019) argument that lower quality firms started going public after the Act was put in place. The implication of this argument is that an EGC is automatically sending a negative signal to the market just by deciding to go public, since it has already probably been unsuccessful in raising capital in the private markets. Tying this to the argument presented by Landsman, Barth and Taylor (2017) which suggests that uncertainty is higher for firms with higher disclosure costs, we could argue that there is a choice between disclosure costs and underpricing. A firm with high-disclosure costs may choose to either incur direct disclosure costs and reduce uncertainty (thus reduce underpricing), or not incur those costs and pay for the increased uncertainty indirectly through underpricing. These arguments fall outside the initial scope of this project, but could provide a basis for future theory formulation and empirical research.

7.1.2 Underwriter Reputation and Underpricing

As mentioned in chapter 2, previous literature has found interesting results on the effect on underwriter reputation and underpricing during the years. Loughran & Ritter (2004) found evidence on how a prestigious underwriter would reduce underpricing in the 1980s, but changed to the opposite in the late 1990s. The main explanation for this was that underwriters previously only underwrote IPOs that were of high quality to uphold their reputation, while in the late 1990s the prestigious underwriters started underwriting indiscriminately in order to maximise earnings, thus resulting in a positive relationship between underpricing and underwriter reputation (Ljungqvist, 2007). We expected that the relationship between underwriter reputation and underpricing would be positive and would additionally increase in magnitude with the introduction of the Act. Our results do not show any statistical significance

for underwriter reputation in any of the two models. Having such low significance could suggest that the selection of underwriter in the post-JOBS world is not as important as it used to be. This point could be further reinforced by Barth, Landsman and Taylor (2017) who suggest that the JOBS Act attracted more investors that rely on private information in the IPO market. This would imply that the certifying role of prestigious underwriters is greatly exaggerated in the EGC environment since EGC IPOs cater to investors that rely on non-public information when performing due diligence. This accompanied by the argument of negative signalling, where an EGC sends a negative signal to the market just by deciding to go public in a period of excessive capital availability in the private markets, would render the certifying role of an underwriter even less significant.

This sense of "certification skepticism" by investors ties directly to Loughran and Ritter's (2004) hypothesis which argues that prestigious underwriters started to underwrite lower quality IPOs in the 1990s to maximize cash flows. In that same paper Loughran and Ritter (2004) argued that the potential future effect of this strategy would be losing valuable long-term reputation. With the benefit of retrospect, we see that as underwriters started underwriting IPOs indiscriminately, investors started scrutinizing closely even IPOs underwritten by prestigious underwriters. This may also explain how the underwriter's reputation effect on IPO underpricing after the 1990s turned positive. Furthermore, we believe that underwriter reputation becomes even less important in the US since the underwriter discount (or the percentage of proceeds that the underwriter well receive upon completion of the IPO) clusters around 7% (Westenberg, 2012). In practical terms this would mean that even if an EGC decided to go with a less prestigious underwriter, the cost of the IPO wouldn't change significantly, assuming that the size of the issue remains constant. This in turn makes the choice of the underwriter a rather straight forward choice since most companies would go with a top underwriter (even though the certification effect is negligible) because of fees being similar across the board. This argument is further reinforced by our summary statistics, where we see that 4 banks (all of them with scores of 8 and 9) underwrote 55% of the sampled IPOs. In summary, we argue that in EGC IPOs underwriter prestige is not as important as someone might initially have thought, but still the most prestigious investment banks take the lion' share of the EGC IPOs due to IPO fees being similar across the board.

An additional thought is that reducing underpricing might not be the top criterion when firms select an underwriter. A firm might choose an underwriter based on other criteria such as sector

knowledge, network of prospective investors, personal relationships of management with investment bankers, and geography of the firm's headquarters (and the investment banks that have offices there or in the vicinity). This, accompanied by the theories that suggest that firm management is more concerned with the stock price upon the stock lock-up expiration date (rather than on the first day of trading), renders the choice of an underwriter a rather complex procedure (Aggarwal, Krigman and Womack, 2002). Consequently, suggesting that reduced underpricing might be a consideration for firms when choosing underwriters, but it is not the only one and in some cases it might not be as important.

7.2 Control Variables

When examining some of the control variables that we used in our model, we can draw some interesting conclusions. First the offer size has a very strong statistical significance (at the 1% level) and a positive relationship with underpricing, where 1% increase in the offer size underpricing increases between 7.44% and 7.92% (depending on the model). This is contradicting to several previous works (namely Carter and Manaster, 1990; Carter, Dark and Singh, 1998) as well as Beatty and Ritter's (1986) theory of ex-ante uncertainty (assuming that larger offerings imply larger firms that subsequently are less risky). The work from Divakaruni and Jones (2019), which looked at EGC underpricing, finds very similar results with offer size having a negative relationship with underpricing, being statistically significant at the 1% level, and an increase in 1% of the offer size leading to an increase in underpricing of 7%. While an interesting relationship, we believe that the offer size does not say the entire story regarding the risk or quality profile of the firm.

Rather, we believe that a better proxy for the risk profile and the quality of the firm going public is the share overhang ratio, since according to Loughran and Ritter (2004) a high share overhang ratio (or in other words a high retainment of shares by insiders) can act as a signal for the quality of the issuing firm. The positive signal would then lead to a higher demand for the IPO, thus leading to higher first-day returns. Our results suggest a positive relationship between share overhang and underpricing, with strong statistical significance (at the 5% level), but with a relatively low magnitude that suggests that a one-point increase in the ratio leads to a decrease in underpricing between 0.87% and 0.91% for model 1 and 2 respectively. The sign of this relationship is consistent with Loughran and Ritter (2004), but the magnitude is not. We could argue that the positive signal of a high share overhang ratio exists in IPOs of EGCs is being

neutralized by the negative signaling of going public during a period when private capital is abundant, suggesting a lower quality firm.

The coefficients associated with sales have statistical significance at the 1% level, with a decrease in first-day returns of –1.81% to –1.86% (depending on the model) per $100 million increase in sales on average. In other words, an EGC with $1 billion in revenues is expected to experience 18.1% less underpricing than an EGC with no revenues. Based on the standard deviation of sales in our sample of $204 million, this would mean a change in underpricing of +/–3.7%. This is consistent with Chua (2012) where he finds support that there is a negative relationship between sales and underpricing. In the context of EGCs, it appears that this relationship can lead to relatively large differences in underpricing. Based on Beatty and Ritter's (1986) theory, lower sales could signal increased uncertainty for prospective investors, thus forcing the company to underprice significantly to appeal to those investors. Ljungqvist (2007) suggests that businesses that are hard to value, have to underprice significantly. Subsequently lower sales can lead to underpricing due to the relative immaturity of the business as well as the complexity of the assumptions needed to value such an issue. Additionally, investors seem to be demanding a rather hefty discounts for firms with no revenues when they are compared to firms that threading on the limit of being considered EGCs (having $1 billion in revenues) since on average firms with $1 billion in revenues were underpriced by 18.1%-18.5% less than firms with no revenues.

This argument leads us to the tech dummy, which had a positive relationship with underpricing, and strong statistical significance at the 5% level, that suggested that tech firms experienced 7.29%-7.52% higher underpricing than other firms on average. While outside the scope of this research project, some interesting explanations that date back to literature conducted during the dot-com bubble argue that increased underpricing among tech firms is a result of decreased incentives by insiders to decrease underpricing, due to them being more concerned with the stock price at the stock lockup expiration date (when they could sell their shares) rather than at the IPO (Aggarwal, Krigman and Womack, 2002). Additionally, Loughran and Ritter (2004) argue that during the dot-com bubble underwriters were unwilling to price issues at the price that the market was willing to pay, thus resulting in severe underpricing. While we cannot in any way assume that the underpricing of tech firms that occurred after the enactment of the JOBS Act is similar to the underpricing during the dot-com bubble, we believe that the explanations provided by Loughran and Ritter (2004), as well as Aggarwal, Krigman and

Womack (2002) provide reasonable theories for why tech-firm related underpricing might occur.

8. Conclusion

8.1 Summary and Discussion

This research project attempted to examine two things. First, we attempted to examine whether the JOBS Act increased the first-day returns experienced by firms with less than $1 billion in revenues (EGCs). Second, we attempted to quantify the sign and magnitude of the relationship between first-day returns and the reputation of the underwriting investment bank. The sample included 600 US IPOs between 2005 and 2015, collected by Bureau van Dijk's Zephyr database. The quantitative methodology used was OLS regressions.

Two similar base models were employed with the only difference between them being that one used the entire scale of underwriter reputation (1-9 with 1 being the less prestigious underwriter while 9 being the most prestigious), while the other one used a top-tier dummy (taking the value of 1 if an underwriter was rated 8 and above in the scale). Building on these two basic models, we then added an interaction term between underwriter reputation and the JOBS Act dummy. Based on previous literature regarding the effects of the JOBS Act and the relationship between underpricing and underwriter's reputation we hypothesized that the JOBS Act did increase underpricing due to the decreased disclosure requirements leading to higher ex-ante uncertainty regarding an IPO. We additionally hypothesized that the relationship between underwriter reputation and first-day returns was positive. In the basic models we found strong statistical significance (5% level) for the JOBS Act dummy, suggesting that indeed the Act increased the underpricing experienced by EGCs. We argue that the increase in underpricing following the implementation of the Act can be a result of two things. First, the increase in information uncertainty due to the lower disclosure requirements, and second to the negative signal related to going public during a period where private capital is abundant.

We found no statistical significance in either of the models regarding the relationship between underwriter reputation and underpricing. We conclude that prestigious underwriters are not as effective at reducing underpricing in EGC IPOs, due to two reasons. First, the indiscriminate underwriting that started in the late 1990's reduced the impact of the certification effect that

underwriters once had, and second EGC IPOs attract investors that rely on private information, which renders the certification effect of prestigious investment banks even less effective. While top-tier underwriters get the lion's share of the IPO market even though they are not as effective in reducing underpricing, we believe that this is due to the standardized 7% of the proceeds that firms have to pay to the vast majority of underwriters. Thus, they are left with little choice when deciding on the underwriter if we assume that the offer size remains constant. In practical terms that would mean that a firm would rather have Morgan Stanley (score of 9) take their shares public than William Blair (score of 7), even though Morgan Stanley might not reduce underpricing as much, since the fee paid will be either the same or of negligible difference.

8.2 Further Research

This research project has examined the effects that the JOBS Act had on the underpricing of EGCs till 2015, a time period where only the initial version of the Act was active. Following December 2015, the FAST Act introduced some amendments to the JOBS Act (see Chapter 3) that further lowered the disclosure requirements of EGCs that decide to go public. Further research could look into the cumulative effect of underpricing for both the JOBS and FAST Acts, as well as the difference in underpricing that occurred after the FAST Act was put in place. Using the same rationale of this research project, further research could elaborate on the effect of underwriter reputation on underpricing of EGC IPOs following the implementation of the FAST Act.

Since the implementation of the JOBS Act had implications not only for the public markets, but also for the private markets (namely allowing for crowdfunding and larger private equity issues without having to register with the SEC) further research could elaborate on how the higher availability of capital in the private markets affected the underpricing experienced by EGCs that decided to go public, as well as examining the separating equilibrium that Divakaruni and Jones (2019) suggest that has been created by the JOBS Act, suggesting that lower quality firms are more likely to go public after the implementation of the Act.

Another suggested research topic would be the examination of choice of costs that occurs in IPOs of firms with high disclosure costs. Based on the findings by Barth, Landsman and Taylor (2017) that suggest that more firms with traditionally higher disclosure costs started going public following the implementation of the JOBS Act, we suggest that there is a relationship between disclosure costs and underpricing for this kind of EGCs, where the firm can either

choose to incur costs pre-IPO in order to reduce information asymmetry or suffer higher underpricing (therefore paying for said information asymmetry indirectly). A future research project could attempt to shed light on the relationship between those two variables and then examine how firms choose between one or the other.

Finally, a more comprehensive method for measuring the reputation of the underwriting syndicate could be formulated, instead of just taking into consideration only the reputation of the lead underwriter. This implies that the researcher would allocate a prestige score to the issue based on the weighted average of all the underwriters that participated in the IPO, with the weights being assigned based on the amount of stock that each underwriter was assigned, while individual investment banks are allocated a prestige score using the Carter and Manaster (1990) methodology.

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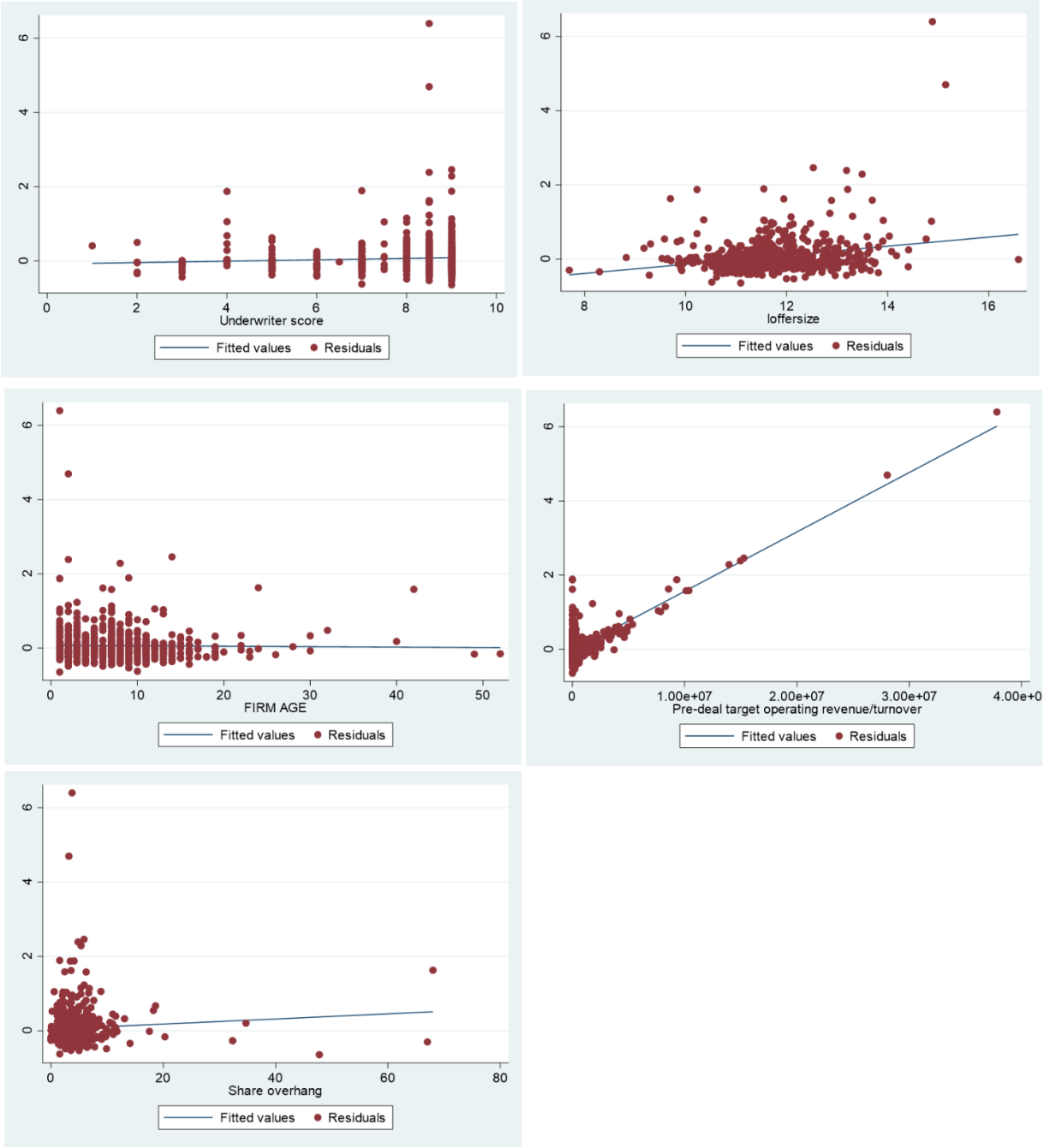
Appendix

Appendix Table 1: *Underwriter Summary Statistics*

IPOs per Underwriter			
Lead Underwriter	**Frequency**	**Percentage of IPOs**	**Average Undepricing**
JP Morgan	129	21,50	20,98%
Deutsche Bank AG	87	14,50	16,37%
Morgan Stanley	63	10,50	28,00%
Bank of America Corporation	52	8,67	24,04%
William Blair & Company LLC	34	5,67	16,38%
Goldman Sachs Group Inc.	24	4,00	19,90%
Citigroup Inc.	18	3,00	6,13%
Needham & Company LLC	18	3,00	9,43%
Lazard	12	2,00	4,67%
Roth Capital Partners	12	2,00	12,52%
Oppenheimer & Company Inc.	11	1,83	4,46%
Raymond James Financial Inc.	9	1,50	20,21%
Stifel Nicolaus & Company Inc.	9	1,50	4,24%
Merrill Lynch	8	1,33	7,32%
Robert W Baird & Company Inc.	7	1,17	37,99%
Thomas Weisel Partners Group Inc.	7	1,17	41,39%
JMP Securities LLC	5	0,83	1,29%
Aegis Capital Corporation	4	0,67	0,12%
Barclays plc	4	0,67	22,74%
CIBC World Markets Inc.	4	0,67	15,13%
Feltl and Company Inc.	4	0,67	50,21%
Jefferies & Company Inc.	4	0,67	19,03%
Ladenburg Thalmann & Company Inc.	4	0,67	2,80%
MDB Capital Group LLC	4	0,67	63,72%
Maxim Group LLC	4	0,67	-12,53%
Simmons & Company International Ltd	4	0,67	-7,65%
Wells Fargo Securities LLC	4	0,67	1,34%
Cowen & Company	3	0,50	-11,60%
Credit Suisse First Boston Corporation	3	0,50	16,24%
Friedman Billings Ramsey & Co Inc.	3	0,50	23,13%
RBC Capital Markets Corporation	3	0,50	-0,33%
Rodman & Renshaw LLC	3	0,50	16,27%
SG Cowen	3	0,50	12,79%
AG Edwards & Sons Inc.	2	0,33	28,00%
Barclays Capital plc	2	0,33	1,31%
Cantor Fitzgerald & Company Inc.	2	0,33	-1,03%
Lehman Brothers	2	0,33	47,18%
Morgan Keegan & Company Inc.	2	0,33	14,89%
Pacific Crest Securities LLC	2	0,33	12,55%
Piper Jaffray	2	0,33	47,30%
Stephens Inc.	2	0,33	31,62%

UBS	2	0,33	11,30%
Wedbush Morgan Securities Inc.	2	0,33	21,37%
Allen & Company Inc.	1	0,17	-58,00%
BB&T Capital Markets	1	0,17	16,67%
BMO Capital Markets Corporation	1	0,17	10,33%
Bear Stearns & Co Inc.	1	0,17	-41,69%
CE Unterberg Towbin LLC	1	0,17	20,71%
Chardan Capital Markets LLC	1	0,17	-14,40%
DA Davidson & Company	1	0,17	40,89%
Dawson James Securities Inc.	1	0,17	-31,00%
First Albany Capital Inc.	1	0,17	2,25%
Gilford Securities Inc.	1	0,17	39,09%
Joseph Gunnar & Company LLC	1	0,17	6,20%
Renaissance Securities (Cyprus) Ltd	1	0,17	-25,60%
Royal Bank of Canada	1	0,17	25,00%
Societe Generale SA	1	0,17	-18,60%
SunTrust Banks Inc.	1	0,17	0,00%
TD Securities Inc.	1	0,17	0,00%
WestPark Capital Inc.	1	0,17	5,00%
Total	**600**	**100**	

Appendix Figure 1: *Linearity Graphs*



Appendix Table 2: Robustness Table

Robustness Table

		+/- Variables				Different Time Period		Replacing Variables	
	Base Model	Group 1	Group 2	Group 3	Group 4	2010-2015	2008-2015	Shares Floated *instead of* Share Overhang	EBITDA *instead of* Sales
Model 1without Interaction Term									
JOBS Act Dummy Coefficient	0.0523**	0.0522**	0.0541**	0.0527**	0.0517**	0.0610**	0.0694***	0.0525**	0.0537**
Underwriter Score Coefficient	-0.00249	-0.00189	-0.00145	0.0176	-0.00182	-0.0000259	0.00107	-0.00553	-0.00350
Model 1 with Interaction Term									
JOBS Act Dummy Coefficient	-0.0768	-0.0763	-0.0532	-0.0775	-0.133	0.0655	0.0752	-0.0402	-0.0667
Underwriter Score Coefficient	-0.0119	-0.0113	-0.00926	0.00809	-0.0153	0.000419	0.00162	-0.0122	-0.0123
Underwriter Score * JOBS Act Dummy	-0.0768	-0.0763	-0.0532	-0.0775	-0.133	0.0655	0.0752	-0.0402	-0.0667
Model 2 without Interaction Term									
JOBS Act Dummy Coefficient	0.0522**	0.0521**	0.0540**	0.0539**	0.0516**	0.0609**	0.0693***	0.0522**	0.0535**
Top-Tier Dummy Coefficient	0.00761	0.00679	0.00842	0.0584	0.0175	-0.00253	-0.000956	-0.00552	0.00270
Model 2 with Interaction Term									
JOBS Act Dummy Coefficient	0.0487	0.0490	0.0598	0.0482	0.0371	0.0775	0.0787	0.0619	0.0552
Top-Tier Dummy Coefficient	0.00481	0.00423	0.0131	0.0538	0.00568	0.0149	0.00863	0.00222	0.00404
Top-Tier Dummy * JOBS Act Dummy Coefficient	0.00489	0.00448	-0.00822	-0.00802	0.0205	-0.0224	-0.0127	-0.0136	-0.00232

Variable List

Group 1	*Group 2*	*Group 3*	*Group 4*
Underwriter Score	Underwriter Score	Underwriter Score	Underwriter Score
Offer Size	Offer Size	Sales	Offer Size
Sales	Firm Age	Firm Age	Sales
Share Overhang	Share Overhang	Share Overhang	Firm Age
Pharma Dummy	Pharma Dummy	Pharma Dummy	Pharma Dummy
Tech Dummy	Tech Dummy	Tech Dummy	Tech Dummy
Financial Crisis Dummy	Financial Crisis Dummy	Financial Crisis Dummy	Financial Crisis Dummy
JOBS Dummy	JOBS Dummy	JOBS Dummy	JOBS Dummy