**Universidade do Minho**
Escola de Economia e Gestão

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# Do venture capitalists help reduce the information asymmetry of IPO firms? Evidence from the USA

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Tese de Mestrado
Mestrado em Finanças

Trabalho efetuado sob a orientação do
**Professor Doutor Gilberto Ramos Loureiro**

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## Direitos de autor e condições de utilização do trabalho por terceiros

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## Statement of Integrity

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration.

I further declare that I have fully acknowledged the Code of Ethical Conduct of the University of Minho.

# Do venture capitalists help reduce the information asymmetry of IPO firms? Evidence from the USA


## Abstract

Startup firms and firms with larger proportion of intangible assets have a tendency for higher levels of information asymmetry. Valuing these firms can be challenging when they decide to perform an Initial Public Offering (IPO) and investors usually react adversely to equity offers issued by companies with larger information asymmetries. Taking this into account, venture capitalists can provide value whenever securities are being issued in capital markets and these investors can have an important role in diminishing the information asymmetry of the firms they support. Considering this, it is expected that firms with lower information asymmetries, have lower surprises around earnings announcements and consequently lower stock price reaction and lower trading volume around this event. Using a sample of 1759 firms from United States of America between 2005 and 2020, I formulate several hypotheses based on stock price and trading volume reactions to earnings announcements. Regarding the hypothesis that firms backed by venture capitalists have lower stock price reactions to earnings announcements in the years following the IPO and the hypothesis that trading volume around earnings announcements is smaller for firms backed by venture capitalists, my findings are inconclusive. Considering stock price reactions to earnings announcements in the years following the IPO and the change in trading volume for venture capitalists with higher reputation, no significant conclusions are obtained. This research contributes to the existing literature of venture capitalists and information asymmetries, and it provides insights to analyze how different venture capitalists affect information asymmetries, since they differ in several aspects.


**Keywords:** Earnings Announcements; Event Study; Information Asymmetry; IPOs; Venture Capital

# Do venture capitalists help reduce the information asymmetry of IPO firms? Evidence from the USA


## Resumo

Empresas startup e empresas com grandes proporções de ativos intangíveis têm uma tendência para maiores níveis de assimetria de informação. Avaliar estas empresas para as tornar públicas nos mercados financeiros pode ser desafiante e os investidores normalmente reagem adversamente a ofertas de capital emitidas por empresas com grandes assimetrias de informação. Desta forma, os capitalistas de risco podem adicionar valor quando ativos financeiros são emitidos nos mercados de capitais e estes investidores podem ter um papel determinante em diminuir as assimetrias de informação das empresas que apoiam. Assim sendo, espera-se que as empresas com menores assimetrias de informação tenham menores surpresas em torno dos anúncios de lucros, e consequentemente menor reação dos preços das ações e menor volume de transações à volta deste evento. Neste estudo uso uma amostra de 1759 empresas dos Estados Unidos da América entre 2005 e 2020, sendo que formulo várias hipóteses baseadas na reação dos preços das ações e do volume de transações aos anúncios de lucros. Relativamente à hipótese de que as empresas apoiadas por capitalistas de risco têm menores reações dos preços das ações aos anúncios de lucros nos anos após a oferta pública inicial (IPO) e à hipótese de que o volume de transações em torno dos anúncios de lucros é menor para as empresas apoiadas por capitalistas de risco, os resultados obtidos são inconclusivos. Considerando a reação do preço das ações aos anúncios de lucros nos anos após a IPO e as alterações no volume de transações nos mercados financeiros para os capitalistas de risco com reputação mais elevada, não foram obtidas conclusões significantes. Este estudo contribui para a literatura existente acerca de capitalistas de risco e assimetrias de informação. Fornece ainda indicações para analisar como diferentes tipos de capitalistas de risco afetam as assimetrias de informação, uma vez que estes investidores diferem em diversos aspetos.


**Palavras-chave:** Anúncios de Lucros; Assimetrias de Informação; Capital de Risco; Estudo de Caso; Oferta Pública Inicial

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# 1. Introduction

Valuing firms with high levels of information asymmetry is not easy. Indeed, it is particularly challenging when these firms decide to do an initial public offering (IPO), since investors tend to react negatively to equity issues by companies with larger information asymmetries (Meggison & Weiss, 1991).

Financial markets are characterized by asymmetric information between corporate insiders and public investors that can lead to underpricing and higher gross spreads in an IPO (Carter & Manaster, 1990; Megginson & Weiss, 1991; Healy & Palepu, 2001; Beyer et al., 2010). Managers of the issuing firm have access to several amounts of inside information about the firm, in particular the internal operations, the economic potential and the corporate governance practiced in the company (Cohen & Dean, 2005) and they know more about the future of a company. However, outside investors do not know as much information as insiders and for that reason they offer lower values for the firm shares. This issue leads to information asymmetries and venture capitalists can provide value whenever securities are being issued in capital markets (Megginson & Weiss, 1991; Cohen & Dean, 2005).

Venture capitalists have an important role in diminishing the information asymmetry in the firms they sponsor, reducing the IPO costs. They have several connections, experience, provide support to management teams and access to institutional investors that can help the IPO to be successful (Megginson & Weiss, 1991; Brav & Gompers, 2003; Gompers et al., 2020). Megginson and Weiss (1991) conclude that firms supported by venture capitalists attract more auditors and underwriters, induce greater interest from institutional investors during the IPO and are able to go public at younger ages comparatively to companies that are not supported by these investors.

According to Megginson and Weiss (1991) markets react favorably to the presence of venture capital (VC) financing in a company since venture capitalists can provide a certification role when a firm decides to go public. Iliev and Lowry (2020) suggest venture capitalists have an advantage to overcoming information asymmetry due to the characteristics listed before. However, their influence goes behind the IPO. Previous literature concludes these investors are major shareholders before the IPO and sometimes remain in the firms they backed for several years after the IPO, enhancing the credibility of the firms' information (Barry et al, 1990; Megginson & Weiss, 1991).

It is important to understand if the firms backed by venture capitalists can certify that the offering price of the issue in an IPO reflects all relevant and available information inside the firm (Megginson & Weiss, 1991). According to Megginson and Weiss (1991), the presence of venture capitalists in a firm that aims to do an IPO, helps maximize the value of the proceeds for the firm, net of underpricing and direct costs.

Indeed, these authors find that firms supported by VC reduces the degree of IPO underpricing. The reputation of venture capitalists is also an important aspect that firms consider when aim to raise capital (Nahata, 2008). It is also relevant to comprehend the impact on information asymmetries after the business has gone public comparatively to firms that were not supported by venture capitalists. Information that is accurate and fair contributes to a well-functioning capital market, helping to enhance economic growth (Bailey et al., 2003).

Bailey et al. (2006) use capital market reactions to earnings announcements to study the role of information asymmetry and differential information processing by investors in evaluating their reactions to these events. They compare the stock price and volume reactions to earnings announcements before and after the U.S. listing and relate these differences to firm, industry, and country level characteristics. According to these authors, the stock price and volume reactions to earnings announcements help infer how the quality of the information environment change after the event. It is expected lower stock price and trading volume reactions when the quality of the information improves.

Bailey et al. (2006) suggest that increase the levels of information disclosure, decreases the information asymmetry that can arise between managers and shareholders and among buyers and sellers of the firm's shares. Indeed, there are several reasons that may lead a firm to choose to decrease information asymmetry. When a firm anticipate future transactions in financial markets related to their capital structure (issuing public debt or equity) or future merger and acquisitions, a lower level of information asymmetry can reduce the company's cost of external financing (Bailey et al., 2006).

Considering the previous literature, I perform an event study to examine the price reaction and trading volume around earnings announcements and analyze if venture capitalists help reduce the information asymmetry of the firms they sponsor and improve the quality of the firm's information. I chose the event study methodology, since it is a widely used framework and event studies around earnings announcements it is a way to test the levels of information asymmetry. Indeed, the higher the variation in the stock price and the higher the variation in the trading volume, the higher the level of information asymmetry. This research has the following research questions: Do IPO firms supported by VC have lower levels of information asymmetry comparatively to other firms? Do firms supported by venture capitalists have lower changes in the trading volume after earnings announcements? Do firms backed by venture capitalists with higher reputation have lower information asymmetries comparatively to venture capitalists with lower reputation? To perform this study, I analyze the stock price reaction to earnings announcements in the years after the IPO, as well as the volume of trading around these events. This study has a sample between 2005 and 2020 of IPOs from United States of America (USA). To the best of my knowledge, my

research will differentiate from the previous literature, by using a sample of IPOs backed by venture capitalists to study information asymmetries.

Previous literature suggests that venture capitalists help to reduce the information asymmetry of the firms they support and provide higher information disclosure. However, there is the possibility to not find evidence that firms supported by VC have lower levels of information asymmetry, and there are several reasons why this can occur. The sample selection only incorporates IPO firms from USA and the sample period includes the financial crisis that is associated to higher levels of volatility and uncertainty in the markets. There are also different types of venture capitalists, but this study did not separate them.

After this introduction, my dissertation is structure as follows. Section 2 presents the literature review about this topic. Section 3 introduces the methodology and the hypotheses tested in this study. Section 4 presents the data used and the sample construction. Section 5 exhibits and discusses the results obtained. In the last section, the conclusions and limitations of my research are provided.

## 2. Literature Review

VC firms pool funds from investors and invest in startups and firms with larger proportions of intangible assets (Megginson & Weiss, 1991; Jain & Kini, 2000; Brealey, et al., 2016; Amini, et al., 2020). Indeed, these companies have high potential to grow, although they are more susceptible to higher levels of information asymmetry (Gompers, 1995). Venture capitalists work with these firms' providing advice, monitorization and helping in their management, since their expertise and knowledge can be valuable in the initial phase of a business (Barry et al., 1990; Jain & Kini, 2000; Brealey et al., 2016). Venture capitalists can have an important role in the development of these companies as well as in the performance of the IPO (Jain & Kini, 2000).

Several studies conclude that markets react favorably to the presence of VC financing at the time of an IPO (Barry et al., 1990; Megginson & Weiss, 1991). Venture capitalists provide several advantages to the firms they support and can partly overcome informational asymmetries that occur mainly in startup companies (Brav & Gompers, 1997). These investors have access to institutional investors and easily can achieve financing for the companies they support (Brav & Gompers, 1997). According to Hochberg (2012) and Celikyurt et al, (2014), these investors improve productivity and the VC backed firms tend to have better corporate governance at the time of the IPO. Hochberg (2012) concludes that venture capitalists have impact on governance and monitoring of firms before the IPO and these effects can be significant for some period after the firm goes public. Indeed, previous literature suggests that companies supported by venture capitalists have lower levels of earnings management and more independent board structures that conduct to better corporate governance comparatively to non-venture-backed firms (Hochberg, 2012).

An IPO is an important event for a company and there are several benefits for a firm that becomes public. Carter and Manaster (1990) suggest an IPO is the first attempt by private firms to raise capital in a public equity market. Some of the reasons for this action are related to the possibility for the company to diversify their sources of financing and reduce its borrowing costs. Indeed, venture capitalists bring positive outcomes when they perform an IPO. These outcomes can be the ability to go public earlier, reduced underpricing, higher long-run operating and investment performance as well as higher probability of surviving for a longer period compared to similar non-VC backed IPO firms (Jain & Kini, 2000). Other important reasons are related to easily raise cash, reward the managers performance through stock options, create a public market price and enhance the reputation of the firm (Brealey, et al., 2016).

According to Megginson and Weiss (1991), the support of venture capitalists in companies that perform an IPO contributes to lower the total costs of going public and to maximize the net proceeds to the offering firm, helping to reduce information asymmetries comparatively to firms not supported by VC. Venture capitalists impose restrictions to managers and increase external monitoring of corporate agency problems. This monitoring can be considered an addition mechanism to control management and it aims to avoid the use of the firm's cash to pursue the managers own interest and investing in projects with negative net present value (Amini et al., 2020).

Previous evidence concludes that corporate managers have an incentive to conceal or delay the revelation of adverse information to sell equity for a higher price (Megginson & Weiss, 1991). The rational outside investors are aware of these incentives, and they will offer lower average prices for firm's securities, unless they trust the IPO price is credible and already reflects all relevant private information (Megginson & Weiss, 1991; Bailey et al., 2006). Brav and Gompers (1997) and Megginson and Weiss (1991) suggest that venture capitalists can have an important certification role to reduce information asymmetry problems. High information asymmetry increases the costs to raise equity, since rational investors expect that on average these firms are overvalued, and investors require a higher return to hold shares of companies with greater private information (Easley & O'Hara, 2004).

Venture capitalists provide several benefits to firms that aim to go public, nevertheless there are also some costs these companies must be willing to accept. These investors do not fund each company that asks for financing. They provide important services including capital, managerial and technical expertise, access to other specialists and a certification role previously mentioned. However, they require high rates of return and their presence in a firm is costly. Their investments are structure to shift a big part of the business risks to the entrepreneurs through contractual clauses. Taking this into account, only the companies that will benefit most from the presence of venture capitalists in their business will be able to accept to incur in such costs (Megginson & Weiss, 1991).

However, there is the possibility to not find evidence that firms supported by VC have lower levels of information asymmetry. Indeed, different industries also have associated different volatilities (Li & Mohoney, 2011), and this can be associated to more uncertainty in some industries supported by VC funds. Tykvová and Walz (2007) suggest that VC is too heterogeneous and a simple comparison between firms supported by VC and firms not supported by VC is not sufficient to reach significant conclusions. It

can be necessary to divide the group of venture capitalists in different types to see how different venture capitalists affect information asymmetries.

### 2.1 Benefits for firms supported by VC

As previously stated, one reason for firms to perform an IPOs is to allow venture capitalists to cash out and recover their investment in a firm (Gompers & Lerner, 1997). In this case, the venture capitalists can sell shares and receive the return, leaving the control of the business for the original entrepreneurs (Brealey, et al., 2016). Taking this into account, venture capitalists can exit by performing an IPO and invest their assets in other firms that need their funds and experience to evolve and then going public (Jain & Kini, 2000).

Several studies focus on the impact that venture capitalists have in the firms they supported. Celikyurt et al. (2014) conclude venture capitalists can have a significant role in mature firms after their IPO and these companies exhibit a positive effect on innovation and investment policies when a venture capitalist director is present in their board. Brav and Gompers (1997) suggest that firms supported by venture capitalists outperform non-venture-backed firms over a five-year period. Gompers and Lerner (1997) also conclude that firms supported by VC have better long-term performance. Taking this into account, it can take some years after the IPO for the venture capitalists fully exit from a company and sell all their shares (Paeglis & Veeren, 2013). In fact, the returns that venture capitalists get are determined by the stock price at the time they sell their shares. Considering this, venture capitalists have incentives to reduce information asymmetries and guarantee that good corporate governance systems are implemented in the firms they support (Hochberg, 2012).

Jain and Kini (2000) suggest the presence of VC in firms improve the survival rate of the firms after the IPO comparatively to non-venture-backed firms. Venture capitalists can introduce several benefits to firms they support, since they provide higher levels of R&D expenditures, greater analyst coverage and access to more prestigious investment banks (Jain & Kini, 2000). Jain and Kini (1999) find that IPOs marketed by underwriters with higher reputation tend to reveal superior performance after the IPO comparatively to IPOs promoted by less prestigious underwriters. Considering this, reputable underwriters provide valuable services that can lead to an increase in firm value and reduce information asymmetries in the market.

The Information Asymmetry Hypothesis claims that VC participation in financing firms after the IPO is an efficient solution to informational problems, helping the companies to exploit investments that increase

the value of the firm (Iliev & Lowry, 2020). According to Gompers and Lerner (1997), venture capitalists help to overcome information asymmetries that create capital constraints for startup companies. Taking this into account, the advantages that venture capitalists bring to firms allow them to be less sensitive to cash flows and grow quickly than non-venture-capital firms (Gompers & Lerner, 1997).

Previous literature suggests that venture capitalists plan their exits from companies due to their limited life on the businesses and the contracts established by venture capitalists include provisions regarding exits (Paeglis & Veeren, 2013). However, not always these expert investors leave a company after the IPO and they can retain equity in the firms they supported after the firm becomes public for several years (Hochberg, 2012; Paeglis & Veeren, 2013). Indeed, venture capitalists can be present on the board of directors after the IPO, continue to provide access to capital, and help to enhance firms' performance in the long run (Brav & Gompers, 1997). This is an advantage for firms supported by VC comparatively to other companies, and it can help to reduce information asymmetries.

Another important benefit of venture capitalists is related to their certification role. An IPO has a component of information asymmetry, since the potential investors have lower knowledge comparatively to the firm owners (Carter & Manaster, 1990) and information asymmetry produces a context for opportunistic behaviors (Cohen & Dean, 2005). Taking this into account, previous literature suggest that insiders can have incentives for misrepresentation and omission of important information at the time of an IPO (Megginsson & Weiss, 1991). Considering this, potential investors can have some difficulties in believing that accurate information has been disclosed by firms when they perform an IPO (Downes & Heinkel, 1982). However, if a third party has invested and has capital in a company, it can be negatively affected by false disclosures (Megginson & Weiss, 1991). In this case, the presence of third parties in a firm can convince outside investors that credible information is reflected in the price of an IPO. Brav and Gompers (1997) and Megginson and Weiss (1991) suggest that venture capitalists can be the third party which certification provided can bring value in an IPO and these investors have an important role to prevent adverse selection and reduce information asymmetry problems of the type highlighted by Akerlof (1970). Venture capitalists provide a certification role in the public market and this certification role can be seen in lower underpricing in the first day the stock is traded. Indeed, investors are more willing to invest in firms supported by VC than similar firms that are not supported by VC (Gompers & Lerner, 1997).

Another way that guarantees a credible certification is when venture capitalists retain their shares after the IPO, since they only can profit from opportunistic behaviors if they sell shares in the IPO for a higher price, that does not reflect all the available and relevant information. Megginson and Weiss (1991) and

Gompers and Lerner (1997) conclude that venture capitalists are not using the IPO as an opportunity to cash out and realize a return on their investment, because a majority of venture capitalists tend to retain a significant number of shares in the corporations they invested after the IPO.

Other studies conclude that venture capitalists have strong incentives to build a credible reputation, since they help companies become public in a regular basis and they want to get access to the IPO market with advantageous terms (Megginson & Weiss, 1991; Nahata, 2008). The success related to the IPO helps to improve the reputation of the VC firm and it is a relevant factor to attract additional capital to venture firms (Jain & Kini, 2000). The venture capitalists' reputational concerns are important at the time of an IPO (Gompers, 1996) and an increased number of failures associated with a certain VC fund can damage their reputation and their ability to bring firms public in the future.

Megginson and Weiss (1991) and Nahata (2008) argue that venture capitalists that invest in firms that achieve success, create a greater reputation for themselves. The reputation of venture capitalists is central to attract potential investors and is useful to create stable relationships with entrepreneurs, investment banks, and others institutional investors (Megginson & Weiss, 1991; Nahata, 2008; Krishnan et al., 2011). According to Jain and Kini (2000), the support of venture capitalists of IPO firms guarantees to the institutional investors that the firm was adequately supervised, financed and is ready to go public. Venture capitalists' reputation and connections between venture capitalists and institutional investors are important reasons to explain the support of institutional investors to VC-backed IPO firms (Jain & Kini, 2000).

Krishan et al. (2011) and Croce and Ughetto (2019) find that superior long-run performance of companies supported by more reputable VC firms can be due to superior venture investment selectivity or superior post-IPO of portfolio firms. Therefore, more reputable VC firms select better-quality portfolio firms and consequently they have better long-run performance. Considering this, more reputable VC firms provide more valuable advisory and monitoring services to the companies they supported (Krishnan et al., 2011). VC firms with higher reputation attract more entrepreneurs and raise funds more easily.

### 2.2 Venture capitalists and information asymmetries in financial markets

Managers have more information than investors about firms and this information asymmetry can lead to inefficiencies in capital markets (Healy & Palepu, 2001; Beyer et al., 2010). Indeed, information asymmetries generate an adverse selection problem among the investors (Fernando et al., 2018) and

create trading frictions leading consequently to lower liquidity in the financial markets (Leuz & Verrecchia, 2000).

First of all, it is important to understand the differences between information asymmetry and information dissemination. According to Duarte et al. (2008), information can be public and require costs and time to interpret it in order to become clear to outside investors. Considering this, the investors with less financial literacy cannot be able to form signals about the value of the firm that are useful for their trading decisions. When the information can easily be translated into signals about the firm value, there is a decrease in information asymmetry, since the firm is making public disclosures that investors can interpret and consider in their decisions (Duarte et al., 2008). However, if the information provided by the company is difficult to interpret by all the outside investors and costly to translate into signals about the value of the firm, there is only an increase in information dissemination. Some investors will take advantage of this information, while the others cannot understand the information release and will not use it in their expectations to form the price of a company (Duarte et al, 2008). These two concepts can happen simultaneously if some information is easy to interpret, while other announcements require more effort and skills to be understood.

VC funds build several connections with relevant institutional investors (Gompers & Lerner, 1997) and these connections are important when firms aim to perform an IPO. Venture capitalists can influence market intermediaries such as institutional investors, investment bankers and analysts (Jain & Kini, 2000). Indeed, certain activities and outcomes are more dependent on intermediaries as bankers and analysts for efficient implementation than venture capitalists. Taking this into account, venture capitalists through intermediaries can implement actions in order to achieve the success of the IPO.

Venture capitalists can attract investment bankers with higher reputation to the firms they backed. According to Jain and Kini (1999), the bank generates information about the company that helps to reduce information asymmetry and increase firm's value (Jain & Kini, 1999). Considering this, investment bankers with higher reputation are more likely to be involved with new issues and successful IPOs (Jain & Kini, 1999), and these financial intermediaries are selected in expectation of better services in areas such as pricing. Carter et al. (1998) suggest investment bankers with higher reputation are associated with higher quality services and lower short-run underpricing (Carter et al., 1998; Jain & Kini, 2000).

Post-IPO research coverage is also important, since positive analyst reports help to increase demand for the stock of the IPO firms (Jain & Kini, 2000). According to Jain and Kini (1999) larger analyst coverage is associated with superior investment performance of IPO firms and monitoring by analysts provide

managers with incentives to pursue strategies and decisions to maximize the value of the firm. Taking this into account, IPO issuers tend to ensure high quality research coverage of their firm after the IPO.

Venture capitalists can induce higher quality analysts to follow their companies and these analysts will produce higher information about a company, and consequently lowering information asymmetries between the firm and investors (Brav & Gompers, 1996; Jain & Kini, 1999). Indeed, analysts' coverage is relevant to IPO issuing firms, since they are new in the capital markets and relatively unknown (Jain & Kini, 2020), and the value of the IPO firms can be enhanced when investors become aware of them (Michaely & Womack, 1999). Jain and Kini (1999) conclude that a higher amount of analysts following a stock is associated with superior operating and investment performance of IPO firms.

Womack (1996) studies the ability of analysts to predict or influence stock prices. Indeed, stock prices are significantly influenced by analysts' recommendations, not only at the immediate time of the announcement but also in the following months (Womack, 1996). Considering this, an important event once a firm is listed on a stock market is earnings announcements. Price reaction and trading volume around earnings announcements are applied to evaluate the impact of an informational event on the capital markets (Fernando et al., 2018). The stock price reaction to this event reflects a variation in the average belief of investors about the value of the stock (Fernando et al, 2018), and the trading volume captures the aggregate response of the market (Abdel-Meguid et al., 2019).

According to Kim and Verrecchia (1997), the average price movement in response to an earnings announcement is proportional to the level of additional information presented in the information release. There will be small stock price reactions to the earnings announcement if the information asymmetry between the firm and the market prior to the earnings release is lower and vice-versa. More analyst coverage also improves the information environment of the firm and the earnings announcements become more predictable.

The information releases make investors to reconsider their expectations due to information asymmetry and consequently change the trading volume (Beaver, 1968; Diamond & Verrecchia, 1991; Kim & Verrecchia, 1994). According to Bailey et al. (2006), investors with more accurate private information make smaller revisions to their expectations regarding the firm's value comparatively to investors with less precise private information. Another explanation for changes in trading volume regarding earnings announcements is that investors interpret public announcements in different ways (Bailey et al., 2006). Kim and Verrecchia (1994) conclude the volume reaction to earnings announcements is an increasing function of the magnitude of the price reaction and the level of

information asymmetry among investors. Considering this, determining how the trading volume reacts to earnings announcements can be useful to infer the quality of the information (Bailey et al., 2006).

To sum up, stock price reactions and trading volume to earnings announcements depend on the information of the public announcement, the quality of the pre-announcement information, the cost of information acquisition, the differences in investors' beliefs and the level of private information asymmetry (Kim and Verrecchia, 1994; Bailey et al., 2006).

## 3. Hypotheses and Methodology

In this section, I develop the hypotheses of study and explain the methodology that I use in my research.

Previous evidence highlights the role of information asymmetry and the differences in information processing by investors in the stock price and trading volume reactions to public information announcements (Diamond & Verrecchia, 1991; Kim & Verrecchia, 1994). According to Sponholtz (2008), earnings announcements can contain information that is relevant to the stock market and the market appears to react efficiently to this information.

Earnings announcements possess informational value, since information change according to expectations about the outcome of an event and future returns of a stock (Beaver, 1968). Beaver (1968) study the investors reaction to earnings announcements reflected in the price movements and trading volume of stocks in the weeks around the event. These reactions will be lower when the quality of information provided in the financial markets is better.

Based on the literature reviewed above, in particular in Bailey et al. (2006), I formulate the following hypotheses.

**Hypothesis 1:** Stock price reactions to earnings announcements in the years following the IPO are smaller for firms supported by venture capitalists.

My first hypothesis focuses on how the level of information asymmetry of IPO firms supported by venture capitalists affects the stock price around earnings announcements. According to Bailey et al. (2006), the magnitude of price reaction depends on the average change in investors' beliefs. This depends on the degree of the surprise and the precision of the announcement relative to the average precision of the investors' information.

Previous literature suggest that firms sponsored by venture capitalists tend to have lower levels of information asymmetry (Megginson & Weiss, 1991). Taking this into account, I expect small stock price reactions to earnings announcements due to lower information asymmetry between firms backed by venture capitalists and the market.

**Hypothesis 1a:** Stock price reactions to earnings announcements in the years following the IPO is lower for VC backed firms with more reputation.

The quality of the information environment can be better for VC backed firms comparatively to firms not supported by VC. This can result in lower costs of capital, lower costs of information acquisition and more analysts covering the stock (Bailey et al., 2006). According to Shu et al. (2011), firms supported by venture capitalists with higher reputation outperform firms backed by lower reputation venture capitalists. Indeed, this conclusion supports the idea that venture capitalists signaling the quality of the firm and consequently reduce the adverse selection problems for IPOs. Taking this into account, I expect that firms backed by higher reputation venture capitalists have lower stock price reaction to earnings announcements and lower information asymmetries in the years following the IPO.

**Hypothesis 2:** Trading volume around earnings announcements is smaller for firms backed by venture capitalists.

The same rationale can be applied to trading volume around earnings announcements. According to Bailey et al. (2006), the trading volume are proportional to the magnitude of the associated price reaction and the level of information asymmetry or different beliefs across investors. Considering that higher volume of trading prior to earnings announcements is associated with higher information asymmetry, I expect smaller volume of trading for firms supported by venture capitalists in the years following the IPOs.

**Hypothesis 2a:** The change in trading volume is lower for companies supported by venture capitalists with more reputation.

VC backed firms can attract more analysts and firms with higher reputation can attract even more analysts to follow their companies. Venture capitalists with better reputation are expected to add more value to their companies based on their superior ability to select, monitor, and manage their ventures (Tykvová & Walz, 2007). Taking this into account, I expect lower trading volume and consequently lower information asymmetry for firms backed by venture capitalists with higher reputation. I also expect the market to react positively to high reputation VC, as well as the firms in which venture capitalists with higher reputation invested to experience higher performance after their IPOs and lower information asymmetries (Lee et al., 2011).

### 3.1 Methodology

In this subsection, I present the methodology I use to conduct the event study. An event study measures the impact of a specific event on the value of a company and these studies assume the market immediately incorporates any new information about the firm (MacKinlay, 1997).

Previous studies support the hypothesis that earnings announcements convey useful information for firm valuation (MacKinlay, 1997). Considering this, the event is the earnings announcements and I use different event windows, specifically [-1,1], [-2,2] and [-5,5], to capture the effects of earnings announcements on the stock price and on the trading volume.

To perform this study, I define the estimation window, over which the parameters of the normal model returns are estimated, and I also define the post-event window. The estimation window is important to estimate the expected stock price if the event does not occur. In this study I use an estimation window with the interval of [-255, -25] with respect to the earnings announcement day.

I compute the estimates for the normal performance model and the abnormal returns. The abnormal returns are defined as the difference between actual returns and normal returns over the event window (MacKinlay, 1997). The abnormal returns can be used to understand if there is any information content in the earnings announcements and how quickly the market reacts and adjust to the new information (Sponholtz, 2008).

I use one-factor model that assumes a linear relation between the market return and the stock return. The market model is estimated over the estimation window using Ordinary Least Squares (OLS) and this model is computed as follows:

$$R_{i\tau} = \alpha_i + \beta_i R_{m\tau} + \varepsilon_{i\tau} \quad (1)$$

Where $R_{i\tau}$ is the stock returns on security *i* and $R_{m\tau}$ is the market portfolio for period $\tau$. $\varepsilon_{i\tau}$ is the residuals, $\alpha_i$ and $\beta_i$ are the parameters of the market model. The S&P 500 index is used for the market portfolio.

The abnormal return for firm *i* is given by equation (2), where the predicted return is $\hat{\alpha}_i - \hat{\beta}_i R_{m\tau}$:

$$AR_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau} \quad (2)$$

$\tau$ can assume different values and it is equal to 0 at the time of the announcement.

The abnormal return observations must be aggregated in order to make inferences about the earnings announcements. Taking this into account, the cumulative abnormal return (CAR) is given by:

$$CAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{i\tau} \tag{3}$$

As previously mentioned, I use three window lengths and the CARs are computed for each one. According to MacKinlay (1997), observations must be aggregated over the event window and across all firms and considering there is no overlap of the event windows across companies to imply that the abnormal returns and the CARs will be independent across securities.

Another important measure to analyze the previous hypotheses is the trading volume. Abnormal trading volume captures the aggregate response of the market, and it is a good proxy for cross investor asymmetry (Fernando et al., 2018). This measure can be defined as the difference between trading volume and the mean of the daily volume for the stock over the pre-announcement window (Fernando et al., 2018).

I compute the abnormal trading volume applying the method from Tkac (1999). According to Tkac (1999), there is a theoretical prediction that market-wide trading converts into trading each asset considering its relative value in the market. Taking this into account, an empirical implication is formulated in terms of turnover ratios. Turnover ratios are predicted to be similar across firms and equal to the market turnover ratio each period where $TO_{i\tau}$ is the turnover in firm $i$ at time $\tau$ and $TO_{m\tau}$ is the market turnover at time $\tau$.

$$TO_{i\tau} = \frac{\$ \text{ value traded}}{\$ \text{ value outstanding in stock } i} \tag{4}$$

$$TO_{m\tau} = \frac{\$ \text{ value traded}}{\$ \text{ value outstanding in the market}} \tag{5}$$

The market model for abnormal trading volume is:

$$TO_{i\tau} = \alpha_i + \beta_i TO_{m\tau} + \varepsilon_{i\tau} \quad (6)$$

Where $TO_{i\tau}$ is the turnover in firm $i$ at time $\tau$ and $TO_{m\tau}$ is the market turnover at time $\tau$. $\varepsilon_{i\tau}$ is the residuals, $\alpha_i$ and $\beta_i$ are the parameters of the market model.

The abnormal trading volume (AV) is computed in equation (7):

$$AV_{i\tau} = TO_{i\tau} - \alpha_i - \beta_i TO_{m\tau} \quad (7)$$

The cumulative trading volume (CAV) is presented in equation (8):

$$CAV_i(\tau_1, \tau_2) = \sum_{\tau=\tau_2}^{\tau_2} AV_{\tau i} \quad (8)$$

To mitigate the effect of outliers, several variables are winsorized at the 1% and 99% levels prior to further processing and testing the hypotheses (Bailey et al., 2006).

### 3.2 Models and variables specification

In this subsection, I present the models and variables related to firm-specific and industry-level characteristics that I use to conduct my dissertation.

Based on the research of Bailey et al. (2006), key explanatory variables to testing the previous hypotheses are the number of analysts that follow the firm at the time of earnings announcement, the dispersion of analysts' forecasts and the absolute earnings surprise. The absolute earnings surprise is a measure of information precision, and it is important to explain the absolute abnormal returns in the event window (Bailey et al., 2006).

Firm characteristics such as total sales, total assets, book-to-equity, market value, sales growth, and leverage are also important to include in the models (Bailey et al., 2006). The total assets are a measure of firm size, and the sales growth is considered a proxy for growth opportunities in the company.

My regressions are based on Bailey et al. (2006); the dependent variable is the absolute cumulative abnormal return for the first hypothesis. For this hypothesis, I test stock prices reactions to earnings announcements in the years following the IPO for firms supported by venture capitalists. The regression is the following:

$$|CAR(\tau_1,\tau_2)| = \alpha_0 + \alpha_1 analysts_{i,t} + \alpha_2 dispersion_{i,t} + \alpha_3 surprises_{i,t} + \alpha_4 lnassets_{i,t-1} + \alpha_5 salesgrowth_{i,t} + \alpha_6 VC_{i,t} + \eta + \omega + \mu_t \quad (9)$$

Where $|CAR(\tau_1,\tau_2)|$ is the dependent variable that represents the absolute cumulative abnormal return for a specific event window. The variable "$analysts_{i,t}$" is the number of analysts that follows the firm at the time of the earnings announcements; the variable "$dispersion_{i,t}$" is the cross-sectional standard deviation of the analysts' forecasts; the variable "$surprises_{i,t}$" is the absolute value of the difference between actual earnings and the mean analyst forecast; "$\mathrm{lnassets_{i,t-1}}$" is the logarithmic of the total assets in the firm in the previous year; "$\mathrm{salesgrowth_{i,t}}$" is the percentage change in net sales; "$VC_{i,t}$" is a dummy variable, which is equal to 1 for VC-backed firms and 0 otherwise. The regression also includes fixed effects, represented by $\eta$ (year) and $\omega$ (industry), in order to control for differences among these variables.

The regression that I estimate to test the hypothesis 1a is similar to the first one. In this hypothesis I test the stock price reaction to earnings announcements in the years following the IPO for firms supported by venture capitalists with higher reputation. I include the variable "$\mathrm{highreputation_{i,t}}$" and following the methodology of Krishnan et al. (2011), this variable is a dummy variable, which is equal to 1 if the past market share of VC-backed IPOs is above the median. IPO market share is computed as venture capitalists' dollar market share of all venture-backed IPOs in the previous year. I include the interaction between the variables "$VC_{i,t}$" and "$\mathrm{HR_{i,t}}$" to captures the effect of higher reputation venture capitalists.

$$|CAR(\tau_1,\tau_2)| = \alpha_0 + \alpha_1 analysts_{i,t} + \alpha_2 dispersion_{i,t} + \alpha_3 surprises_{i,t} + \alpha_4 lnassets_{i,t-1} + \alpha_5 salesgrowth_{i,t} + \alpha_6 VC_{i,t} + \alpha_7 HR_{i,t} + \alpha_8 VC_{i,t} \times HR_{i,t} + \eta + \omega + \mu_t \quad (10)$$

The hypotheses 2 and 2a can be tested with similar models than the previous ones. However, the dependent variable is the absolute cumulative trading volume.

# 4. Data

## 4.1 Data Collection

My initial sample consists of USA VC-backed IPOs and USA non-VC-backed IPOs from January 1st, 2005, through January 1st, 2020. I chose this period and this market to have sufficient data for analysis and to enhance the probability of producing robust results.

I obtain details about firms supported by VC and non-supported by VC in the USA from SDC Platinum. I restrict the sample of firms using the following criteria: the original IPOs, VC supported firms and non-VC firms, the filling date, the SEDOL, the SIC code and respectively the description, and the proceeds must be available. Following prior literature (Bailey et al., 2006; Krishnan et al., 2011), I exclude observations from IPOs not listed on U.S. exchanges, IPOs of foreign corporations and IPOs with less than one million dollars in proceeds. Firms related to financial sectors whose Standard Industry Classification (SIC) codes are between 6000-6999 are excluded, because their accounting figures are ruled by special statuary requirements.

The accounting and financial data are obtained from Refinitiv Eikon DataStream. The initial number of events of earnings announcements is collected from this database and since the frequency of earnings announcements varies across firms, I use earnings announcement at the annual frequency (Bailey et al., 2006). I use yearly date frequencies for all the variables, except for the stock price returns, market returns, trading volume and total volume market index which are daily date frequencies. All monetary variables are measured in U.S. dollars (USD). All firm-related variables are winsorized at 1% and 99% of its distribution in order to reduce the effect of outliers. All variables are described in Appendix A.

## 4.2 Summary statistics

In this subsection, I present the descriptive statistics of my study for the total sample, for firms supported by venture capitalists and firms not supported by venture capitalists. The events sample contains 7867 earnings announcements from 1759 different companies considering the selection criteria mentioned before. In this sample, 939 firms are not supported by VC and 820 firms are supported by VC.

The following tables provide summary statistics for the data used in this study, for all the firms and by splitting the sample in firms supported by VC and firms not supported by VC.

Panel A of Table 1 shows the number of earnings announcements in the sample by industry (SIC code). As we can see, the sample contains different types of industries, however the more significant are the manufacturing and services industries, that together account over 71% of the sample. This table also exhibits the distribution of earnings announcements by industry for firms supported by venture capitalists and the other firms. This sample includes more earnings announcements from firms not supported by VC (4312) comparatively to earnings announcements from firms supported by VC (3555).

***Table 1. Descriptive statistics for Earnings Announcements***

The sample includes earnings announcements made by firms backed by VC and firms non-backed by VC from USA between 2005 and 2020. Data are obtained from Refinitiv Eikon Datastream and SDC Platinum and then merged. I exclude financial firms (SIC codes between 6000 and 6999). Panel A represents the number and percentage of events by industry according to the two-digit SIC code. Panel B exhibits the number and percentage of earnings announcements by year for firms backed by VC and firms non-backed by VC in the sample.

*Panel A: Distribution of the Earnings Announcements by industry*

| | **Total** | | **Non-VC** | | **VC** | |
|---|---|---|---|---|---|---|
| **Industry** | **#EA** | **%EA** | **#EA** | **%EA** | **#EA** | **%EA** |
| Mining | 622 | 7,91 | 609 | 14,12 | 13 | 0,37 |
| Construction | 94 | 1,19 | 90 | 2,09 | 4 | 0,11 |
| Manufacturing | 3427 | 43,56 | 1370 | 31,77 | 2057 | 57,86 |
| Transportation & Public Utilities | 746 | 9,47 | 624 | 14,47 | 122 | 3,43 |
| Wholesale Trade | 176 | 2,24 | 154 | 3,57 | 22 | 0,62 |
| Retail Trade | 542 | 6,89 | 466 | 10,81 | 76 | 2,14 |
| Services | 2256 | 28,7 | 995 | 23,08 | 1261 | 35,47 |
| Public Administration | 4 | 0,05 | 4 | 0,09 | 0 | 0,00 |
| **Total** | **7867** | **100** | **4312** | **100** | **3555** | **100** |

*Panel B. Distribution of Earnings Announcements by year for firms non- backed by VC and firms backed by VC*

| | Total | | Non-VC | | VC | |
|---|---|---|---|---|---|---|
| **Year** | **#EA** | **%EA** | **#EA** | **%EA** | **#EA** | **%EA** |
| 2005 | 67 | 0,85 | 51 | 1,18 | 16 | 0,45 |
| 2006 | 179 | 2,28 | 120 | 2,78 | 59 | 1,66 |
| 2007 | 294 | 3,74 | 179 | 4,15 | 115 | 3,23 |
| 2008 | 293 | 3,72 | 176 | 4,08 | 117 | 3,29 |
| 2009 | 279 | 3,55 | 167 | 3,87 | 112 | 3,15 |
| 2010 | 313 | 3,98 | 193 | 4,48 | 120 | 3,38 |
| 2011 | 431 | 5,48 | 254 | 5,89 | 177 | 4,98 |
| 2012 | 503 | 6,39 | 285 | 6,61 | 218 | 6,13 |
| 2013 | 592 | 7,53 | 335 | 7,77 | 257 | 7,23 |
| 2014 | 750 | 9,53 | 409 | 9,49 | 341 | 9,59 |
| 2015 | 828 | 10,52 | 445 | 10,32 | 383 | 10,77 |
| 2016 | 797 | 10,13 | 420 | 9,74 | 377 | 10,60 |
| 2017 | 793 | 10,08 | 420 | 9,74 | 373 | 10,49 |
| 2018 | 862 | 10,96 | 434 | 10,06 | 428 | 12,04 |
| 2019 | 886 | 11,26 | 424 | 9,83 | 462 | 13,00 |
| **Total** | **7867** | **100** | **4312** | **100** | **3555** | **100** |

Panel B of Table 1 summarizes the number of earnings announcements events in the sample by year and by firms supported by VC and firms not supported by VC in the USA. The number of earnings announcements increases over the years, and 2019 is the year with more events in this sample. We can conclude that the most active year is 2019 representing 11,26% of events. The last 5 years together represent approximately 53% of the earnings announcements. In the opposite direction is the first 5 years of the sample, that represents approximately 14% of the events. At the beginning of the period of analysis, there are 51 earnings announcements made by firms not supported by venture capitalists and 16 events made by firms backed by VC. Along the years, the earnings announcements increased in general. In 2019, the firms supported by VC made more earnings announcements than firms not backed by VC and the tendency inverted comparatively to the initial year of analysis.

Table 2 presents the descriptive statistics of the main accounting and financial variables that I use in my research to determine the stock price reactions and trading volume around earnings announcements.

***Table 2. Summary statistics of main accounting and financial variables***

Table 2 provides descriptive statistics of firms' attributes around earnings announcements events. The data are retrieved from Refinitiv Eikon DataStream. The variables' currency is the thousands of USD. Only the market value is in millions of USD. Each observation corresponds to a firm-year from 2005 to 2020. I exclude financial firms from my sample and winsorized variables at 1% and 99% of the distribution. Panel A shows summary statistics for the full sample. Panel B exhibits the summary statistics for firms not supported by VC and for firms supported by VC. Panel C reports the median values, by industry group, of the main variables used in this study. All variables are defined in Appendix A.

**Panel A: Summary Statistics for the full sample**

| VARIABLE | N | MEAN | MEDIAN | SD |
|---|---|---|---|---|
| Forecasts | 6779 | -.268 | 0.521 | 6.991 |
| Earnings | 9346 | .647 | 0.000 | 1.34 |
| Earnings Surprise | 6294 | 2.329 | 0.505 | 9.996 |
| Total Assets | 10871 | 1385930.5 | 312601.000 | 3062919 |
| Log Total Assets | 10869 | 12.633 | 12.653 | 1.92 |
| Market Value | 10125 | 1360.967 | 424.950 | 2738.353 |
| Book Value | 10372 | 6.483 | 3.618 | 25.842 |
| Book Market | 6567 | .046 | 0.007 | .218 |
| Total Debt | 10758 | 568461.09 | 32087.000 | 1451772 |
| Leverage | 10755 | .307 | 0.219 | .394 |
| Total Sales | 11306 | 886041.98 | 214994.000 | 1831158.6 |
| Sales Growth | 10032 | 58.296 | 16.290 | 191.525 |
| Analysts | 6803 | 7.498 | 6.000 | 5.867 |
| Dispersion | 17197 | 1.834 | 0.429 | 7.345 |

**Panel B: Summary statistics for VC-backed versus non-VC backed firms**

**Firms not supported by VC**

| VARIABLE | N | MEAN | MEDIAN | SD |
|---|---|---|---|---|
| Forecasts | 3862 | .975 | 1.059 | 4.97 |
| Earnings | 5424 | .879 | 0.280 | 1.434 |
| Earning Surprise | 3600 | 1.636 | 0.488 | 8.111 |
| Total Assets | 6313 | 2015950.9 | 644353.000 | 3643228 |
| Log Total Assets | 6313 | 13.143 | 13.376 | 2.025 |
| Market Value | 5864 | 1534.521 | 469.510 | 2965.318 |
| Book Value | 5965 | 9.035 | 5.071 | 26.085 |
| Book Market | 3836 | .048 | 0.008 | .226 |
| Total Debt | 6238 | 911107.68 | 208824.500 | 1790984 |
| Leverage | 6237 | .393 | 0.354 | .385 |
| Total Sales | 6561 | 1302685.3 | 455410.000 | 2163893.9 |
| Sales Growth | 5898 | 41.947 | 11.050 | 161.13 |
| Analysts | 3884 | 7.244 | 6.000 | 5.545 |
| Dispersion | 9454 | 1.523 | 0.440 | 6.401 |

**Firms supported by VC**

| VARIABLE | N | MEAN | MEDIAN | SD |
|---|---|---|---|---|
| Forecasts | 2917 | -1.913 | -0.049 | 8.727 |
| Earnings | 3922 | .326 | 0.000 | 1.121 |
| Earning Surprise | 2694 | 3.255 | 0.549 | 12.003 |
| Total Assets | 4558 | 513328.73 | 151531.500 | 1637577.6 |
| Log Total Assets | 4556 | 11.925 | 11.929 | 1.502 |
| Market Value | 4261 | 1122.121 | 377.100 | 2370.688 |
| Book Value | 4407 | 3.029 | 2.625 | 25.101 |
| Book Market | 2731 | .042 | 0.007 | .205 |
| Total Debt | 4520 | 95578.48 | 3338.000 | 451895.13 |
| Leverage | 4518 | .188 | 0.038 | .375 |
| Total Sales | 4745 | 309941.49 | 79297.000 | 971421.43 |
| Sales Growth | 4134 | 81.621 | 27.295 | 225.963 |
| Analysts | 2919 | 7.835 | 6.000 | 6.254 |
| Dispersion | 7743 | 2.214 | 0.421 | 8.338 |

**Panel C: Median values of the main variables for the full sample by industry**

| Industry | SIC code | Analysts | Dispersion | Earnings surprise | Log Assets | Sales Growth |
|---|---|---|---|---|---|---|
| Mining | 10-14 | 5.00 | 0.598 | 0.626 | 13.190 | 13.040 |
| Construction | 15-17 | 6.00 | 0.319 | 0.664 | 13.650 | 15.275 |
| Manufacturing | 20-39 | 5.00 | 0.542 | 0.879 | 11.748 | 8.215 |
| Transportation & Public Utilities | 40-49 | 6.00 | 0.392 | 0.403 | 13.963 | 12.210 |
| Wholesale Trade | 50-51 | 5.00 | 0.477 | 0.343 | 13.470 | 12.030 |
| Retail Trade | 52-59 | 8.00 | 0.356 | 0.340 | 12.993 | 11.410 |
| Services | 70-89 | 7.00 | 0.343 | 0.415 | 12.435 | 20.080 |
| Public Administration | 91-98 | 3.50 | 0.191 | 0.843 | 12.912 | 9.310 |

Panel A of Table 2 exhibits summary statistics regarding the main variables used in this study for all the firms. Considering this, the statistics for all the firms in the sample show that the average firm in this study has 1385.9 millions of USD in total assets and 886 millions of USD in total sales. Regarding the sales growth the mean is 58.296% and the median is only 16.290%. The positive level of sales growth indicates that in this sample period the average evolution of sales level is increasing. The book value has a mean of 6.483 thousands of USD and a median of 3.618 thousands of USD with a standard deviation of 25.842. The market value has a mean of 1360.967 million dollars. The book to market ratio exhibits a mean of 0.046 and a median of 0.007. This mean is close to the median and considering that, this variable has a low standard deviation. The average absolute earnings surprise is 2.329, but the median is only 0.505 which indicates some dispersion in this variable.

Panel B of Table 2 reports summary statistics for firms not supported by VC and firms supported by VC in order to make a comparison between these companies. These statistics show that firms supported by venture capitalists are smaller than firms not supported by VC (Total Assets). In comparing the firms supported by VC and firms not supported by VC, it appears that firms supported by venture capitalists have more growth opportunities measure by past sales growth. Regarding mean sales, firms supported by VC have lower values of sales comparatively to firms not supported by VC. However, firms supported by VC have a mean sales growth rate significantly higher. Firms supported by VC are less levered (Leverage) than firms not supported by VC. The number of analysts following a firm is higher for firms supported by VC, although this difference is not significant. The absolute value of Earnings Surprise is higher for firms supported by VC.

Panel C of Table 2 shows the median values by industry groups of the main variables applied in this study. The most frequent industries in this sample are manufacturing and services. The services industry has high median values for sales growth and analysts, that are important independent variables applied in this research. The number of analysts is higher for services industry and the retail trade industry. The manufacturing industry exhibits the lowest median of sales growth in this sample. The median dispersion is higher for mining industry and the earnings surprise have a higher median value for manufacturing industry.

# 5. Results

## 5.1 Univariate Analysis

CARs are used to measure the impact that earnings announcements have on firms since they represent the investors' reaction to the event. I expect to find positive/negative reactions to earnings announcements and for that I perform several regressions.

I start by performing a univariate analysis regarding the absolute CARs for three different event windows, respectively [-1,1], [-2,2] and [-5,5]. Table 3 presents the results of the event study around the announcement day for 6517 observations. This table also reports the difference in means between firms non-backed by VC and firms backed by VC.

The immediate effect of this event is statistically different from zero for all the event windows computed. These statistically significant positive market reactions reveal that investors perceived the earnings announcements as a positive surprise. The mean absolute CAR for a 3-day event window is 7,56%, for a 5-day event window is 8,57% and for a 11-day event window is 10,52%. However, it is difficult to reach important conclusions from this table. Indeed, to evaluate the ability that venture capitalists have to improve the quality of firms' information, it is important to evaluate other variables.

***Table 3. Absolute Cumulative Abnormal Returns – Univariate Analysis***

The table presents the mean absolute cumulative abnormal returns around earnings announcements date for the full sample and three different event windows. Firms are split between firms non-supported by VC and firms supported by VC, considering the presence of at least one venture capitalist in the company. The absolute CARs are winsorized at 1% and 99% of the distribution. The estimation window is the interval [-255, -25]. A t-test is performed to conclude if the mean absolute CARs are statistically different between the two groups of firms. The differences obtained are reported in absolute terms. All variables are defined in Appendix A. *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level.

| | | | | **Differences in means** |
|---|---|---|---|---|
| **Event-window** | **Total Sample** | **NonVC** | **VC** | **\|NonVC - VC\|** |
| [-1,1] | 0.0756*** | 0.0682*** | 0.0847*** | 0.0170*** |
| [-2,2] | 0.0857*** | 0.0766*** | 0.0970*** | 0.0188*** |
| [-5,5] | 0.1052*** | 0.0942*** | 0.1187*** | 0.0236*** |
| Observations | 6,517 | 3,593 | 2,924 | |

Regarding the difference in means between firms non-backed by VC and firms backed by VC, I use a t-test for the differences in means between the two groups. Considering the results obtained, we can conclude that exist differences in means for these firms.

Another important measure to analyze and achieve different conclusions is the trading volume. Abnormal trading volume captures the aggregate response of the market, and it is a good proxy for cross investor asymmetry (Fernando et al., 2018). I performed a univariate analysis as the previous one and thereafter I perform regressions on several explanatory variables

Table 4 presents the results of the event study around the announcement day for three different event windows, respectively [-1,1], [-2,2] and [-5,5]. In this table, I also include the differences in means, to conclude if the absolute CAVs are statistically different between firms non-backed by VC and firms backed by VC.

***Table 4. Absolute Cumulative Abnormal Volume – Univariate Analysis***

The table presents the absolute cumulative abnormal trading volume around earnings announcements date for the full sample and three different event windows. Firms are split between firms non-supported by VC and firms supported by VC, considering the presence of at least one venture capitalist in the company. The absolute CAVs are winsorized at 1% and 99% of the distribution. The estimation window is the interval [-255, -25]. A t-test is performed to conclude if the mean absolute CAVs are statistically different between the two groups of firms. The differences obtained are reported in absolute terms. All variables are defined in Appendix A. *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level.

| | | | | **Differences in means** |
|---|---|---|---|---|
| **Event-window** | **Total Sample** | **NonVC** | **VC** | **\|NonVC - VC\|** |
| [-1,1] | 2.4141*** | 2.2849*** | 2.5624*** | 0.3570*** |
| [-2,2] | 2.5221*** | 2.4250*** | 2.6335*** | 0.3164*** |
| [-5,5] | 3.7258*** | 3.7077*** | 3.7465*** | 0.1513*** |
| Observations | 5,257 | 2,808 | 2,449 | |

The univariate analysis exhibits statistically significant values at 1% level for the three event windows analyzed. This analysis is univariate, and it is complemented with a multivariate analysis to test whether the different variables have any different impacts on the results. Regarding the difference in means between firms non-backed by VC and firms backed by VC, we can conclude that exist differences between the firms.

## 5.2 Multivariate Analysis

In this subsection, I include several variables in order to get their impacts in the dependent variables and reach conclusions regarding information asymmetry. Previous studies suggest that variables like the number of analysts, the absolute earnings surprise, total assets, sales growth and dispersion are important to include in this analysis (Bailey et al., 2006). Considering the study of Bailey et al. (2006), several specifications are estimated for different event windows around the earnings announcement event.

Table 5 exhibits a multivariate analysis wherein the dependent variable is the absolute CAR. Regarding hypothesis 1, it is expected that firms supported by venture capitalists have lower levels of stock price reaction in comparison to firms not supported by venture capitalists, since we expect venture capitalists to reduce information asymmetries among investors. However, the results obtained regarding the VC variable are inconclusive and not the expected.

Taking into account the previous results, the variable regarding VC is important to give answers to hypothesis 1. Considering these results, VC is statistically significant for model (3) at 5% level. The coefficient is positive and statistically significant. The positive and statistically significant coefficient on VC of 0.0089 for model (3) can be compared with the constant of 0.1101. Considering this, firms supported by venture capitalists experience an increase of 8,1% relatively to the benchmark firms. These results suggest that stock price reaction is higher for firms supported by VC, indicating that there is evidence that implies that when venture capitalists support a firm, the absolute CAR increase.

These results are weak and inconclusive. Previous literature suggest that venture capitalists have incentives to reduce information asymmetries and improve the quality of firms' information (Gompers & Lerner, 1997; Hochberg, 2012). Other studies reinforce the importance of institutional and information quality in explaining returns volatility (Bailey et al., 2006). Considering this, it is expected the stock price to decrease. However, I hypothesize some explanations to explain an increase in the stock price reaction. The increase in stock price for firms supported by VC can be due to uncertainty about the future of the firm when it becomes public even if it is supported by venture capitalists. Indeed, there is high uncertainty around VC investments (Cochrane, 2005) and investors can take this into account in their investment decisions.

***Table 5. Absolute Cumulative Abnormal Returns – Multivariate Analysis***

This table exhibits the results to hypothesis 1 for three different event windows. VC is a dummy variable that equals the value of one if the IPO firm is supported at least by one venture capitalist. All firm-level data is retrieved from Refinitiv Eikon DataStream. The variables are winsorized at 1% and 99%. The estimation window is the interval [-255, -25]. The regressions incorporate year and industry fixed effects. Heteroskedasticity robust *t-statistics* in parentheses. All variables are defined in Appendix A.

*** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **VARIABLES** | **CAR [-1,1]** | **CAR [-1,1]** | **CAR [-2,2]** | **CAR [-2,2]** | **CAR [-5,5]** | **CAR [-5,5]** |
| $Analysts_t$ | 0.0006** | 0.0006** | -0.0005* | -0.0003 | -0.0007** | -0.0006* |
| | (2.23) | (2.40) | (-1.66) | (-1.02) | (-1.98) | (-1.87) |
| $Dispersion_t$ | -0.0000 | -0.0000 | -0.0004** | -0.0004** | -0.0004 | -0.0004 |
| | (-0.11) | (-0.11) | (-2.18) | (-2.28) | (-1.53) | (-1.56) |
| $Earnings\ Surprise_t$ | 0.0001 | 0.0001 | 0.0004*** | 0.0004*** | 0.0004** | 0.0004** |
| | (1.01) | (1.01) | (2.87) | (2.94) | (2.17) | (2.19) |
| $Log\ assets_{t-1}$ | -0.0037*** | -0.0037*** | -0.0042*** | -0.0054*** | -0.0079*** | -0.0084*** |
| | (-3.15) | (-3.48) | (-2.95) | (-4.27) | (-4.72) | (-5.60) |
| $Sales\ Growth_t$ | 0.0000 | 0.0000 | -0.0000* | -0.0000* | -0.0000 | -0.0000 |
| | (0.45) | (0.46) | (-1.86) | (-1.76) | (-0.07) | (-0.04) |
| VC | 0.0001 | | 0.0089** | | 0.0035 | |
| | (0.03) | | (2.22) | | (0.72) | |
| Constant | 0.0732*** | 0.0734*** | 0.1101*** | 0.1278*** | 0.1789*** | 0.1858*** |
| | (4.60) | (5.11) | (5.39) | (6.99) | (6.83) | (7.75) |
| Observations | 2,763 | 2,763 | 2,763 | 2,763 | 2,763 | 2,763 |
| R-squared | 0.109 | 0.109 | 0.100 | 0.098 | 0.064 | 0.064 |

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Another explanation is related to differences between the different types of VC funds. Indeed, there are several types of venture capitalists, like independent, corporate, and public VC, young and experienced VC, international and national VC (Tykvová & Walz, 2007). Considering this, different venture capitalists differ considerably in their objectives, experience and governance structures and these differences can have significant impacts regarding information asymmetries. The investors can take these differences into account, and I hypothesize this as a possible explanation for the higher stock price reaction found in the previous results. To conclude, this sample includes the financial crisis period. This can have impacts in

the results due to the negative impact of investor sentiment about investing in new firms that perform an IPO in financial markets.

In the previous results several variables are statistically significant at different levels and for different event windows. The logarithmic of the assets in the previous year is statistically significant at 1% level for all the event windows. This means that an 1% increase in total assets, decrease the absolute CAR, ceteris paribus. The coefficient of absolute value of earnings surprise is positive and statistically significant for models (3) and (4) at 1% level, and it is also positive and significant for models (5) and (6) at 5% level. This can suggest that the sensitivity of absolute CARs to earnings surprise has a positive impact in the dependent variable.

After performing an analysis regarding the absolute CAR, I present the results that I obtain from a multivariate analysis regarding the absolute CAV as a dependent variable in Table 6. Indeed, several studies focus on trading volume, since it reflects the average change in investors' expectations revisions due to information asymmetry (Bailey et al., 2006). Regarding hypothesis 2, it is expected that firms supported by venture capitalists have lower levels of trading volume in comparison to firms not supported by venture capitalists, since we expect venture capitalists to reduce information asymmetries among investors.

The results exhibit that the variable VC is statistically significant for model (5). The coefficient is negative indicating that there is evidence that when venture capitalists support a firm, the absolute CAV decrease. The negative and statistically significant coefficient on VC of -0.6126 in model (5) represents a 5.6% lower absolute CAV than that for benchmark firms. This means a decrease in volatility as expected. These findings are consistent with the idea that firms with higher institutional quality and better information environment are important to explain the trading volume reactions and display lower volatility around earnings announcements (Bailey et al., 2006). However, there is no clear evidence to not reject the hypothesis 2.

***Table 6. Absolute Cumulative Abnormal Volume – Multivariate Analysis***

This table exhibits the results for hypothesis 2 for three different event windows. VC is a dummy variable that equals the value of one if the IPO firm is supported at least by one venture capitalist. All firm-level data is retrieved from Refinitiv Eikon DataStream. The variables are winsorized at 1% and 99%. The estimation window is the interval [-255, -25]. The regressions incorporate year and industry fixed effects. Heteroskedasticity robust *t-statistics* in parentheses. All variables are defined in Appendix A. *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| **VARIABLES** | **CAV [-1,1]** | **CAV [-1,1]** | **CAV [-2,2]** | **CAV [-2,2]** | **CAV [-5,5]** | **CAV [-5,5]** |
| $Analysts_t$ | -0.0183 | -0.0203* | -0.0200 | -0.0261** | -0.0168 | -0.0338** |
| | (-1.55) | (-1.80) | (-1.59) | (-2.41) | (-0.92) | (-2.23) |
| $Dispersion_t$ | 0.0241*** | 0.0240*** | -0.0116 | -0.0118 | 0.0016 | 0.0009 |
| | (2.95) | (2.95) | (-1.30) | (-1.32) | (0.10) | (0.06) |
| $Earnings\ Surprise_t$ | -0.0205*** | -0.0206*** | 0.0106 | 0.0104 | 0.0205 | 0.0199 |
| | (-4.47) | (-4.51) | (1.27) | (1.23) | (1.25) | (1.20) |
| $Log\ assets_{t-1}$ | -0.2661*** | -0.2574*** | -0.4849*** | -0.4588*** | -0.6632*** | -0.5905*** |
| | (-4.47) | (-4.44) | (-6.78) | (-7.38) | (-5.83) | (-5.86) |
| $Sales\ Growth_t$ | 0.0005 | 0.0005 | -0.0001 | -0.0000 | -0.0012* | -0.0011* |
| | (1.20) | (1.21) | (-0.15) | (-0.09) | (-1.86) | (-1.71) |
| VC | -0.0733 | | -0.2191 | | -0.6126* | |
| | (-0.36) | | (-1.04) | | (-1.88) | |
| Constant | 4.9738*** | 4.8515*** | 7.4781*** | 7.1124*** | 10.8941*** | 9.8718*** |
| | (5.33) | (5.34) | (6.82) | (7.20) | (7.06) | (7.25) |
| Observations | 1,501 | 1,501 | 1,501 | 1,501 | 1,501 | 1,501 |
| R-squared | 0.108 | 0.108 | 0.115 | 0.114 | 0.118 | 0.115 |

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

To conclude, several variables are statistically significant at different levels and for different event windows. The absolute CAV is significantly and negatively related to the absolute earnings surprise for models (1) and (2). The number of analysts is negative and statistically significant for all the regressions performed. The coefficient of logarithm of assets is negative and statistically significant for all the models, which means that absolute CAVs are explained in part by the degree of assets. The coefficient for sales growth is negative and statistically significant for models (5) and (6). This means that an increase of 1%

in sales, decrease the absolute value of trading volume in 0.12% for model (5) and decrease the absolute value of trading volume in 0.11% for model (6), ceteris paribus.

These analyses provided mixed evidence and in general not support the hypotheses that venture capitalists help to reduce the information asymmetry of the firms they backed, at least regarding the quality of information about earnings announcements.

### 5.3 Higher Reputation Venture Capitalists

Reputation of the firm and the reputation of their affiliates is a valuable intangible asset in markets where the quality is uncertain and information is asymmetric (Lee et al., 2011; Shu et al., 2011). Market participants several times rely on third parties as signals of firms' quality and potential (Carter & Manaster, 1990; Megginson & Weiss, 1991). Indeed, high reputation venture capitalists are third parties that provide several advantages to a firm, improving their operating activities and implementing corporate strategies that improve the firms' performance (Jain & Kini, 2000; Lee et al., 2011). Taking this into account, high reputation venture capitalists can reduce information asymmetry.

Considering this, I use reputation of venture capitalists as a proxy for the unobservable capabilities and the future performance of the firm (Rindova et al., 2005), since venture capitalists have a financial and reputation interest to see the firms they support to succeed, and they are more willing to invest time and resources to make a firm successful (Lee et al., 2011). There are several proxies of VC reputation. I use the market share in total IPO proceeds in the preceding year as a proxy of VC reputation (Krishnan et al., 2011). To obtain the high reputation measure, I start by compute the market share for each VC fund that invested in the IPO firm and afterwards I identify the VC funds that have the market share above the median in the previous year.

In this subsection, I present the results of the regressions that I obtain to test the hypothesis 1a and the hypothesis 2a. These models are similar to the previous ones, however, I include the interaction between VC and high reputation venture capitalists (VC*HR) to test the stock price reactions to earnings announcements, as well as the trading volume, in the years following the IPO for firms supported by venture capitalists with higher reputation.

I use the same approach as before. I start by obtain the results for the absolute CAR as a dependent variable and afterwards the results for absolute CAV. I expect that firms backed by venture capitalists with higher reputation have lower stock price reaction to earnings announcements as well as lower trading volume, and consequently lower information asymmetries in the years after the IPO, comparatively to firms supported by ventured capitalists with lower reputation.

Through the analysis of the results of Panel A of Table 7, the interaction between the variable VC and HR is statistically significant for model (3) at 10% level. The coefficient is negative indicating that there is evidence that when venture capitalists with higher reputation support a firm, the absolute CAR decrease.

As mentioned before, VC backed firms can attract more analysts and firms with higher reputation can attract even more analysts to follow their companies. Taking this into account, I expect lower trading volume and consequently lower information asymmetry for firms backed by venture capitalists with higher reputation. Regarding Panel B of Table 7, which reports the results of absolute CAV for firms supported by high reputation venture capitalists over the same event windows, it is not possible to conclude that firms supported by venture capitalists with higher reputation have lower information asymmetry. The results are inconclusive.

***Table 7. High Reputation Venture Capitalists Analysis***

These tables exhibit the absolute CAR and the absolute CAV for high reputation venture capitalists. All firm-level data is retrieved from Refinitiv Eikon DataStream and it is in thousands of USD. The variables are winsorized at 1% and 99%. The estimation window is the interval [-255, -25]. The regressions incorporate year and industry fixed effects. Heteroskedasticity robust *t-statistics* in parentheses. Panel A exhibits the results to hypothesis 1a for three different event windows. Panel B exhibits the results to hypothesis 2a for three different event windows. All variables are defined in Appendix A. *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level.

**Panel A: Absolute Cumulative Abnormal Returns – High Reputation VC Analysis**

| VARIABLES | (1) CAR [-1,1] | (2) CAR [-2,2] | (3) CAR [-5,5] |
|---|---|---|---|
| $Analysts_t$ | 0.0008 | 0.0001 | -0.0001 |
| | (1.04) | (0.09) | (-0.05) |
| $Dispersion_t$ | -0.0006 | 0.0009 | -0.0006 |
| | (-0.79) | (0.96) | (-0.75) |
| $Earnings\ Surprise_t$ | 0.0002 | -0.0003 | 0.0017** |
| | (0.31) | (-0.38) | (2.28) |
| $Log\ assets_{t-1}$ | -0.0059 | -0.0032 | -0.0095* |
| | (-1.53) | (-0.71) | (-1.73) |
| $Sales\ Growth_t$ | 0.0000 | 0.0000 | 0.0000** |
| | (0.26) | (0.56) | (2.01) |
| VC | -0.0012 | 0.0088 | 0.0083 |
| | (-0.08) | (0.61) | (0.41) |
| HR | 0.0059 | -0.0081 | 0.0076 |
| | (0.77) | (-0.97) | (0.60) |
| VC*HR | -0.0190 | 0.0127 | -0.0323* |
| | (-1.38) | (0.85) | (-1.70) |
| Constant | 0.1096** | 0.0629 | 0.2105** |
| | (2.01) | (0.92) | (2.51) |
| Observations | 352 | 352 | 352 |
| R-squared | 0.252 | 0.263 | 0.217 |

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

**Panel B: Absolute Cumulative Abnormal Volume – High Reputation VC Analysis**

| VARIABLES | (1)<br>CAV [-1,1] | (2)<br>CAV [-2,2] | (3)<br>CAV [-5,5] |
|---|---|---|---|
| $Analysts_t$ | -0.0744** | -0.0545* | -0.0235 |
| | (-2.44) | (-1.73) | (-0.46) |
| $Dispersion_t$ | 0.0381*** | -0.0300* | 0.0004 |
| | (2.60) | (-1.76) | (0.01) |
| $Earnings\ Surprise_t$ | -0.0203** | 0.0278 | 0.0429 |
| | (-2.25) | (1.53) | (1.52) |
| $Log\ assets_{t-1}$ | -0.0743 | -0.2233 | -0.6886** |
| | (-0.45) | (-1.53) | (-2.44) |
| $Sales\ Growth_t$ | 0.0011 | -0.0006 | -0.0013 |
| | (1.49) | (-1.30) | (-1.58) |
| VC | 0.0184 | -0.2138 | -0.8729 |
| | (0.03) | (-0.41) | (-0.87) |
| HR | 0.0730 | -0.8060** | 0.1624 |
| | (0.17) | (-2.09) | (0.36) |
| VC*HR | 0.5404 | 0.7153 | 0.4439 |
| | (0.88) | (1.24) | (0.57) |
| Constant | 3.1997 | 2.9448 | 10.9268** |
| | (1.49) | (0.99) | (2.15) |
| Observations | 335 | 335 | 335 |
| R-squared | 0.303 | 0.240 | 0.307 |

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Several studies focus on higher reputation venture capitalists. Tykvová and Walz (2007) conclude in their study that German investors were not able to completely recognize the value-added and certification role of venture capitalists with higher reputation. According to Lee et al. (2011), the value that a high reputation venture capitalist can add to a company depend on its length of involvement with the firm, since early involvement in a company generates greater opportunities to success. The geographic distance between venture capitalists and the firms they support can also affect the degree of VC involvement in the company. Indeed, if venture capitalists are closer geographically to a firm, it is easier for them to supervise and influence the development of a firm (Lee et al., 2011).

### 5.4 Correction for endogeneity in decision to be supported by VC

In this subsection, corrections for endogeneity are made, since the decision to a firm become supported by venture capitalists can be endogenously determined. Indeed, if endogeneity is present in the sample, inferences obtained through classical statistical approaches can have associated a selection bias problem (Bailey et al., 2006). Cochrane (2005) finds large and volatile returns for IPOs when there is not a correction for selection bias.

In Table 8, I use a standard two-equation Heckman model for absolute CAR and absolute CAV in order to evaluate the potential impact of selection bias (Bailey et al., 2006). Model 1 presents a probit regression to model the propensity to be supported by VC. Model 2, 3 and 4 presents the cross-sectional regressions with the inclusion of the inverse-Mills ratio ($\lambda$) for all the event windows. This ratio is an explanatory variable to obtain self-selection bias.

***Table 8. Effects of self-selection bias on absolute cumulative abnormal returns and absolute cumulative abnormal trading volume***

Specification 1 is a probit regression of the probability that a firm is supported by VC using fundamental variables. The dependent variable is the dummy Venture Capital and assumes the value one when firms are supported by venture capitalists. The inverse-Mills ratio ($\lambda$) is computed from the probit model. This ratio is used in the second-stage Heckman's (1979) model regressions for absolute CAR and absolute CAV in specifications 2, 3 and 4. In Panel A, model 2 exhibits the CAR for an event window [-1, 1], model 3 exhibits the CAR for an event window [-2, 2] and model 4 exhibits the CAR for an event window [-5, 5]. In Panel B, model 2 exhibits the CAV for an event window [-1, 1], model 3 exhibits the CAV for an event window [-2, 2] and model 4 exhibits the CAV for an event window [-5, 5]. All the models incorporate year and industry fixed effects. All variables are defined in Appendix A. *** Significant at the 1% level, ** Significant at the 5% level, * Significant at the 10% level.

**Panel A: Effects of self-selection bias on absolute cumulative abnormal returns around earnings announcements**

| | (1) | | (2) | (3) | (4) |
|---|---|---|---|---|---|
| **Probit model** | **VC** | **Heckman model** | **CAR [-1,1]** | **CAR [-2,2]** | **CAR [-5,5]** |
| Market Value$_t$ | 0.0001*** | Analysts$_t$ | 0.0017*** | 0.0003 | -0.0002 |
| | (7.30) | | (5.05) | (0.83) | (-0.54) |
| Total Assets$_t$ | -0.0000*** | Dispersion$_t$ | 0.0001 | -0.0004** | -0.0001 |
| | (-2.92) | | (1.31) | (-2.18) | (-0.55) |
| Total Sales$_t$ | -0.0000*** | Earnings Surprise$_t$ | -0.0001* | 0.0003** | 0.0002 |
| | (-3.55) | | (-1.75) | (2.02) | (1.34) |
| Leverage$_t$ | -0.3931*** | Log assets$_{t-1}$ | -0.0087*** | -0.0064*** | -0.0088*** |
| | (-8.39) | | (-4.75) | (-2.80) | (-3.33) |
| Book Market$_t$ | -0.6466*** | Sales Growth$_t$ | -0.0000 | -0.0000*** | -0.0000 |
| | (-3.80) | | (-1.05) | (-3.90) | (-0.48) |
| Analysts$_t$ | 0.0254*** | VC | 0.0050* | 0.0067* | 0.0070* |
| | (10.57) | | (1.75) | (1.95) | (1.75) |
| Dispersion$_t$ | 0.0127*** | $\lambda$ | 0.0095*** | 0.0014 | 0.0026 |
| | (2.62) | | (2.80) | (0.35) | (0.57) |
| Earnings Surprise$_t$ | 0.0043** | Constant | 0.1596*** | 0.1581*** | 0.2086*** |
| | (2.46) | | (8.25) | (6.55) | (7.39) |
| Log assets$_{t-1}$ | -0.1859*** | | | | |
| | (-12.99) | | | | |
| Sales Growth$_t$ | 0.0002* | | | | |
| | (1.88) | | | | |
| Observations | 2,753 | Observations | 2,753 | 2,753 | 2,753 |
| Pseudo R-squared | 0.291 | R-squared | 0.018 | 0.023 | 0.031 |
| Actual Prob. | 0.396 | | | | |

Robust z-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

**Panel B: Effects of self-selection bias on absolute cumulative abnormal volume around earnings announcements**

| | (1) | | (2) | (3) | (4) |
|---|---|---|---|---|---|
| **Probit model** | **VC** | **Heckman model** | **CAV [-1,1]** | **CAV [-2,2]** | **CAV [-5,5]** |
| Market Value$_t$ | 0.0000*** | | | | |
| | (4.32) | Analysts$_t$ | -0.0247 | -0.0021 | 0.0284 |
| Total Assets$_t$ | -0.0000** | | (-1.41) | (-0.12) | (1.06) |
| | (-2.52) | Dispersion$_t$ | 0.0207*** | -0.0108 | 0.0159 |
| Total Sales$_t$ | -0.0000** | | (2.61) | (-1.40) | (1.22) |
| | (-2.10) | Earnings Surprise$_t$ | -0.0233*** | 0.0043 | 0.0157 |
| Leverage$_t$ | -0.3892*** | | (-5.57) | (0.54) | (1.13) |
| | (-4.66) | Log assets$_{t-1}$ | -0.1328 | -0.5081*** | -0.9110*** |
| Book Market$_t$ | -0.2693 | | (-1.33) | (-4.83) | (-5.38) |
| | (-0.94) | Sales Growth$_t$ | 0.0004 | -0.0002 | -0.0007 |
| Analysts$_t$ | 0.0307*** | | (0.83) | (-0.54) | (-1.19) |
| | (8.37) | VC | 0.0668 | -0.1844 | -0.2969 |
| Dispersion$_t$ | 0.0052* | | (0.44) | (-1.11) | (-1.23) |
| | (1.93) | λ | -0.2975 | 0.1571 | 0.9089*** |
| Earnings | | | (-1.51) | (0.78) | (2.74) |
| Surprise$_t$ | 0.0066 | | | | |
| | (1.42) | Constant | 4.3622*** | 8.7444*** | 13.5510*** |
| Log assets$_{t-1}$ | -0.1578*** | | (4.17) | (7.63) | (7.41) |
| | (-8.52) | | | | |
| Sales Growth$_t$ | 0.0000 | | | | |
| | (0.46) | | | | |
| Observations | 1,487 | Observations | 1,487 | 1,487 | 1,487 |
| Pseudo R-squared | 0.243 | R-squared | 0.036 | 0.071 | 0.071 |
| Actual Prob. | 0.430 | | | | |

Robust z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results of Panel A of Table 8 suggest that the likelihood of firms being supported by VC depends positively on the market value, the number of analysts following the firm, the dispersion and the earnings surprises. The total assets, the total sales, the book-to-market ratio, the leverage and the logarithm of assets in the previous year are negatively significant to explain the likelihood of a firm to be supported by VC. The variable VC is now positive and statistically significant for every event window, while in the Table

5, it is only positive and statistically significant for event window [-2, 2]. The second-pass Heckman regression estimates exhibit that the coefficient for λ is positive and statistically significant for the event window [-1, 1], indicating the presence of an upward selection bias toward the coefficient on VC in absolute CAR.

Panel B of Table 8 repeats these models for absolute CAV. These results suggest that the likelihood of firms being supported by VC depends positively on the number of analysts following the firm and the dispersion. However, the likelihood of firms being supported by VC depends negatively on total assets, total sales, leverage and the logarithm of assets in the previous year. Regarding the Heckman model, the coefficient on λ is positive and statistically significant for an event window [-5, 5], indicating the presence of an upward selection bias toward the coefficient on VC in absolute CAV. The variable VC is not statistically significant for any event window, while in the Table 5, it is positive and statistically significant for event window [-5, 5]. Considering this, the coefficient for specification (4) become insignificant, indicating that the earlier findings are attributable to the selection bias. This analysis is limited by the variables chosen to represent the selection bias, however it can be seen some sensitivity in the results to the selection-bias correction.

# 6. Conclusions

My research analyses the impact that venture capitalists can have in IPO firms to reduce asymmetric information in financial markets. This is an important topic of study, since startup firms and firms with larger proportion of intangible assets have a tendency for higher levels of information asymmetry. Indeed, valuing these firms can be challenging when they decide to perform an IPO and investors usually react adversely to equity offers issued by companies with larger information asymmetries, resulting several times in higher underpricing. Taking this into account, venture capitalists can help reduce the information asymmetry problems of IPO firms and help these companies to succeed at the time they become public.

To perform this study, I use a sample of 1759 firms, which 939 firms are non-backed by venture capitalists and 820 firms are backed by venture capitalists between January 2005 to January 2020. Following the study of Bailey et al. (2006), I formulate several hypotheses based on stock price reactions to earnings announcements and the reaction of trading volume to these events.

My dissertation makes several contributions to existing research in VC and information asymmetries in financial markets. Previous literature suggests that venture capitalists help to reduce the information asymmetry of the firms they support and provide higher information disclosure, however I do not find evidence that firms supported by VC have lower levels of information asymmetry. My findings reject the hypothesis that firms backed by venture capitalists have lower stock price reactions to earnings announcements in the years following the IPO. Indeed, the results obtained are the opposite and inconclusive. The reasons why this occurred can be various. My sample includes the financial crisis in the period analyzed and this can lead to higher levels of volatility for firms due to the uncertainty lived in the financial markets. Another justification is that different industries also have associated different volatilities (Li & Mohoney, 2011), and this can be associated to more uncertainty in some industries supported by VC funds. Another possible explanation is provided by Tykvová and Walz (2007) that suggest that VC is too heterogeneous and a simple comparison between firms supported by VC and firms not supported by VC is not sufficient to reach significant conclusions. Further studies can divide the group of venture capitalists in different types to see how different venture capitalists affect information asymmetries. Indeed, it would be interesting to investigate with detail the actual explanations for these findings. Regarding the hypothesis that trading volume around earnings announcements is smaller for firms backed by venture capitalists, my results go in this direction. However, there is not clearly evidence about these results. Considering stock price reactions to earnings announcements in the years following

the IPO and the change in trading volume for venture capitalists with higher reputation, no significant conclusions are obtained. This study provided mixed evidence, however in general it does not support the hypotheses analyzed.

The conclusions of this study have several limitations. The sample selection only incorporates IPO firms from USA. Another limitation is related to the variables chosen to perform this research, as well as the sample period. There are also different methods and tests that could have been implemented to improve the robustness of my results. Indeed, there is the possibility that analyzing stock price/volume reaction to earnings announcements cannot be the best way to study information asymmetries for younger firms, growing firms and companies that performed an IPO recently, since these firms have more uncertain cash flows even backed by VC.

Besides these limitations, there are several opportunities for further research to extend the current study and address some of its limitations. First, it can be interesting to compare firms supported by VC and firms not supported by VC in a longer period of analysis, for different countries and different industries. Moreover, further research can study how different types of venture capitalists affect information asymmetries, since VC funds differ in several aspects. To conclude, future studies can analyze if early involvement by high reputation venture capitalists and lower geographic distance between venture capitalists and the firms they support, improves the likelihood that a new firm will become a successful public company.

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## Appendix – Definitions and respective DataStream Mnemonics

| Variable | Definition and DataStream Mnemonic | Source |
|---|---|---|
| **Firm – level** | | |
| *Abnormal returns* | The residuals from a market model using the local market index. | Datastream |
| *Abnormal trading volume* | The residual from the volume model proposed by Tkac (1999). | Datastream |
| *Actual Earnings* | Current earnings (EPS). | Datastream |
| *Analyst forecast* | Median analyst earnings forecast (EPS1FD12). | Datastream |
| *Analysts* | The number of analysts that follows each firm (EPS1NE). | Datastream |
| *Assets* | Sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets (WC02999). | Datastream |
| *Book value* | The book value per share (WC05476). | Datastream |
| *Book-Market Ratio* | The book value of equity divided by the market value of equity, | Datastream |
| *Cumulative abnormal returns (CARs)* | Absolute value of cumulative abnormal returns over a three-day windows [-1, 1], a five-days windows [-2, 2], and an eleven-days windows [-5, 5]. | Datastream |
| *Debt* | Sum of long and short-term debt (WC03255). | Datastream |
| *Dispersion* | Standard deviation of analyst' forecasts. | Datastream |
| *Earnings announcements* | Earnings announcements dates. | Datastream |
| *Earnings Surprise* | Absolute value of difference between actual earnings and the mean analyst forecast. | Datastream |
| *Leverage* | Total debt (short-term plus long-term debt) divided by total assets. | Datastream |
| *Market value of equity* | Share price multiplied by the number of ordinary shares (MV). | Datastream |

| | | |
|---|---|---|
| *Sales* | Net sales or revenues (WC01001). | Datastream |
| *Sales Growth* | Percentage change in sales over a one-year period (WC08631). | Datastream |
| *VC* | Firm supported by venture capital. | SDC Platinum |
| **Industry – level** | | |
| *SIC Code* | 4-digit Standard Industrial Classification (SIC) code. | SDC Platinum |