



**LONG-RUN POST-IPO PERFORMANCE OF PRIVATE EQUITY BACKED
COMPANIES – EVIDENCE FROM THE UNITED KINGDOM**

Lappeenranta-Lahti University of Technology LUT

Master's programme of Strategic Finance and Analytics, Master's thesis

2022

Valtteri Ahtiainen

Examiners: Associate Professor Sheraz Ahmed (D.Sc.)

Professor Eero Pätäri (D.Sc.)

ABSTRACT

Lappeenranta–Lahti University of Technology LUT
LUT School of Business and Management
Strategic Finance and Analytics

Valtteri Ahtiainen

Long-run post-IPO performance of private equity backed companies – Evidence from the United Kingdom

Master's thesis

2022

77 pages, 2 figures, 11 equations and 10 tables

Examiners: Associate Professor Sheraz Ahmed and Professor Eero Pätäri

Keywords: Private equity, venture capital, information asymmetries, post-IPO performance, operational performance, market performance

From the early 1950's the role of venture capital (VC) and private equity (PE) have been emerging in developed countries. Discussion of private equity backed companies' performance has also attracted the attention of scholars around the world. While differences between the backed companies and non-backed companies are found, the unambiguous reason remains undefined. Although theories like agency theory and its extension of information asymmetry present reasoning behind the performance related disparity, neither one individually explains the various results.

With a revision of earlier theories and researches the theoretical framework for private equity and venture capital related environment is constructed. Based on the earlier theories an empirical analysis is conducted to examine the performance of backed and non-backed companies. The research sample consists of IPOs listed in the UK markets between 2008 and 2017.

The results suggest that PE/VC backed companies exhibit better accounting-based and market-based performance both in short and long term after an IPO. Previous literature presents similar evidence. Mixed results are found when testing the sample for information asymmetries as some models indicate lower information asymmetry for PE/VC backed companies and others do not.

TIIVISTELMÄ

Lappeenrannan-Lahden teknillinen yliopisto LUT

LUT-kauppakorkeakoulu

Kauppatieteet

Valtteri Ahtiainen

Yksityisten pääomasijoittajien vaikutus listautumisannin jälkeiseen pitkäaikaiseen suorituskyykyyn – Todisteita Yhdistyneistä Kuningaskunnista

Kauppatieteiden pro gradu -tutkielma

2022

77 sivua, 2 kuvaa, 11 yhtälöä ja 10 taulukkoa

Tarkastajat: Apulaisprofessori Sheraz Ahmed, Professori Eero Pätäri

Avainsanat: Yksityinen pääoma, pääomasijoittaminen, epäsymmetrinen informaatio, listautumisanti, suorituskyyky

1950-luvulta alkaen yksityinen pääoma sekä pääomasijoittajien rooli ovat olleet nousussa kehittyneissä maissa. Keskustelu pääomasijoittajien tukemien yritysten suorituskyyvystä on myös herättänyt mielenkiintoa tutkijoiden keskuudessa ympäri maailman. Vaikka eroavaisuuksia pääomasijoittajien tukemien ja tukemattomien yhtiöiden välillä on löydetty, yksiselitteinen syy tämän takana on yhä määrittelemätön. Teoriat kuten päämies-agentti-ongelma ja jatkeena oleva epäsymmetrinen informaatio pyrkivät selittämään taustoja mahdollisten eroavaisuuksien osalta, mutta kumpikaan ei yksin perustele vaihtelevia tuloksia.

Tarkastelemalla aikaisempia tutkimuksia ja teorioita tutkimuksen toereettinen viitekehys pääomasijoittamisen ja yksityisen pääoman asetelmaan muodostettiin. Perustuen aikaisempiin teorioihin empiirinen analyysi toteutettiin tutkimaan eroja tuettujen ja tukemattomien yhtiöiden suorituskyyvyn välillä. Tutkimuksen otos koostuu Yhdistyneiden Kuningaskuntien listautumisanneista vuosien 2008 ja 2017 välillä.

Tulokset osoittavat, että pääomatuetut yhtiöt osoittavat parempaa kirjanpidollista ja markkinapohjaista suorituskyykyä niin lyhyellä kuin pitkällä aikavälillä. Aikaisemmat tulokset kirjallisuudesta osoittavat samankaltaisia tuloksia. Vaihtelevia tuloksia löytyy kun otosta kokeiltiin selittämään epäsymmetristä informaatiota joidenkin mallien indikoidessa tuettujen yhtiöiden vähäisemmästä epäsymmetrisyydestä.

ACKNOWLEDGEMENTS

First of all, I would like to thank my supervisor Sheraz Ahmed for waking my interest of the topic and guiding the writing process with detailed and supportive ideas. I would also like to thank my parents who have supported me throughout my studies all these years. A special acknowledgement goes to K who pushed me over the finishing line with unvarnished motivation and support.

On 31.5.2022 in Vantaa
Valtteri Ahtiainen

Contents

Abstract

Acknowledgements

1	INTRODUCTION	8
1.1	Background.....	8
1.2	Purpose and scope of the study.....	9
1.3	Structure of the thesis	11
2	THEORETICAL BACKGROUND	12
2.1	Private equity	12
2.2	Venture capital	16
2.3	Agency theory	20
2.3.1	Information asymmetries	22
3	LITERATURE REVIEW.....	27
3.1	IPO Underpricing of PE/VC backed companies	27
3.2	Long-run IPO performance of PE/VC backed companies	28
3.2.1	Post-IPO performance in the UK	31
3.3	Research framework and hypotheses.....	33
4	DATA AND METHODS	35
4.1	Sample selection.....	35
4.2	Descriptive statistics and sample overview	36
4.3	Methods	41
4.3.1	Wilcoxon signed-rank test	41
4.3.2	Mann-Whitney u-test	41
4.3.3	Logistic regression model.....	42
4.3.4	Linear regression model	42
4.4	Variable definition	43
4.4.1	Return on assets	43
4.4.2	Operating cash flow ratio	44
4.4.3	Tobin's Q and underpricing	44
5	RESULTS	46
5.1	Operational performance	46
5.2	Market performance	50

5.3	Logistic regression	52
5.4	Regression analysis to determine dependencies	53
5.4.1	Return on assets	54
5.4.2	Cash flow ratio	57
5.5	Regression analysis for information asymmetries	61
6	CONCLUSION	65
	REFERENCES	69

Figures

Figure 1: Stages of funding in a company lifecycle

Figure 2: Logic model of VC/PE funding

Tables

Table 1: Annual IPOs in the London Stock Exchange

Table 2: Industry distribution of IPOs in the London Stock Exchange

Table 3: Summary statistics of PE/VC and non-backed IPOs

Table 4: Return on Assets yearly after an IPO

Table 5: Cash flow Ratio yearly after an IPO

Table 6: Market returns yearly after an IPO

Table 7: Logistic regression of PE/VC status

Table 8: Yearly ROA equations

Table 9: Yearly cash flow ratio equations

Table 10: Underpricing and yearly Q values

1 INTRODUCTION

1.1 Background

During the last decades, the roles of private equity (PE) and venture capital (VC) have been rising in many emerging and developed markets all around the world alongside with other traditional means of financing (Gompers & Lerner 2001). The constant advancement of digitalization and globalization among the startups and growth companies enable new and innovative ways of financing to be established which can be seen in the growth of private equity and venture capitalists' roles in the financial markets. At best venture capitalists can bring competent stakeholders with experience to provide stability and growth to companies which are characterized in literature as small, young, limited in their financing, asymmetrical by information and generally at least mediocre at their levels of risk (Hoshi, Kashyap & Scharfstein 1991; Gompers 1995; Gompers & Lerner 2001). The conventional objective for venture capitalists is often described as an exit which is individual for every project and completely decided by the financier. Generally, the most exercised exit strategies include trade sales and IPOs of which the latter is focused on in this thesis. (Eckermann 2006)

The role of venture capital in companies going public and furthermore in their operating performance in both short and long-term has been the subject of several research papers during the last decades (Jain & Kini 1994, 1995; Mikkelson, Partch & Shah 1997; Krishnan, Ivanov, Masulis & Singh 2011). Most of these studies are however usually restricted to the U.S. markets only as venture capitalists have been operating on average more actively and longer than their European counterparts deriving from the early 1950s (Gompers & Lerner 2001). After the turn of millennium, the subject has become current also in the rest of the world and several studies have been conducted with both differing and equal findings as to those in the U.S. (Wang, Wang & Lu 2003; Coakley, Hadass & Wood 2007; Belghitar & Dixon 2012). The research gap of private equity and venture capital backed companies' performance in the UK markets is especially interesting as it lacks relevant research and is still quite fresh.

Rindermann (2004) studied the UK markets and performance measures of backed companies and found no indication that venture capitalists improved neither operational nor market performance. Bergström, Nilsson & Wahlberg (2006) extended this research and found the long-run operational performance patterns of private equity backed companies in the London Stock Exchange from the 90's to early millennium. Likewise, Levis (2011) and Bessler & Seim (2012) were able to identify differences between companies that had received pre-IPO backing to those which had not. However, the diverse results prove the divergencies of the motive, thus necessitating further research to comprehensively understand the theories.

1.2 Purpose and scope of the study

Despite the UK being smaller than the US in the VC industry, it is supposed to be the closest yet compared to the US markets. While the two countries share similar active stock exchange markets and are both grouped under the Anglo-American common law system, they still differ partly from each other especially in the context of VC and LBO markets (Jelic, Saadouni & Wright 2005). The diverging results of PE/VC studies and the core differences in the two markets constitute the necessity to further study and research the subject. The objective of this study is to narrow the research gap in the UK PE/VC markets and understand the market's reaction to the external financiers in the field.

This thesis continues and extends the earlier works of the academic literature of post-IPO operating performance of VC-backed and non-VC-backed companies in the following one to four-year periods. In addition, the affecting individual factors on the performance are studied with statistical methods to gain deeper understanding of the efficiency of the post-IPO companies and the possible drivers which can have a correlation influencing the performance. As the time period selected in the study is from 2008 to 2017, the results are from recent years and offer updated conclusions on the topic. The timeframe sets the study up for relevant research data and results from the UK markets.

The goals of this thesis can be summarized in two main research questions which are as follows:

- Does PE/VC involvement improve the long-run operational performance of companies after an IPO?
- Is there a relationship with PE/VC backing status and information asymmetries?

The distinction of possible performance differences between PE/VC backed and non-backed companies is challenging as there are numerous different performance related measures used in literature. Based on the earlier academic works of the topic, the measures used in this study are limited to the most common and relevant which offer statistical results. Due to this limitation, no unequivocal and all-encompassing empirical section is feasible.

All the selected variables, measures and methods are derived from earlier studies as they are discovered to be of higher quality when comparing operational performance of companies. Thus, the study does not try to find the underlying reasons on *why* or *how* the PE/VC companies perform better, statistical research is done for finding out *if* they do. Possible commonalities found from the data concerning the differences between backing statuses are analysed and reported.

The first research question is addressed with earlier literature of the topic combined with statistical research methods and their results. As the theoretical framework offers dialogue to the differences between operational performance in different geographical areas, company sizes, time periods and marketplaces, the empirical research conducted recapitulates the theory and statistical results. The theory also proposes what is expected to differentiate between companies with different backing statuses.

1.3 Structure of the thesis

Chapter 1 introduces the topic and presents the research questions which this thesis attempts to answer. In chapters 2 the main concepts and theoretical framework regarding the subject are presented. Chapter 3 consists of earlier research and offers the literature review of the topic. Based on earlier sections and theoretical background the hypotheses are constructed. These are also presented in chapter 3. In chapter 4 the data gathering process with its limitations is described together with the methods of data modelling and estimation. Chapter 5 offers results for the empirical segment whereas chapter 6 concludes the topic and offers conclusion for the research questions and hypotheses.

2 THEORETICAL BACKGROUND

2.1 Private equity

Generally, companies have a few distinct methods to acquire financing. These include alternatives such as bank loans, equity offerings or issuing of debt. In any of these cases, a certain section of criteria is to be met whether it is the financial status and steadiness of the business or profitability and repayment capabilities consequently generating extensively increasing requirements for the company. As the exposure of financing for banks or financial institutions and investors is seen to be extremely high when the financial condition of a company is at least questionable, the opportunity for private equity investors or private equity funds arises. This form of financing is a necessity for start-up companies, firms searching for buyout financing or companies suffering from financial distress (Prowse 2011).

In literature private equity is often described as a large reservoir of currencies which can be conceptually divided into smaller subsections and are managed by individual private equity companies (Gompers & Lerner 2002, 17; Stowell 2013, 315). These subsections are typically separated into buyout funds (BO) and different types of investment strategies which include various forms of capital investments based on their varying profiles for risk, returns and other possible requirements (Mathonet & Meyer 2007, 25). Although the bare concept of private equity is viewed to be complex due to its various forms of implementation Söderblom (2011) claims that certain features can be distinguished from each private equity investment. In this regard, Fenn, Liang & Prowse (1996) describe most of the investments to be in the form of equity and directed in private, unlisted companies. However, other solutions of debt and equity structured investments are also possible. Furthermore, Gilligan & Wright (2014) propose that the eventual goal for all private equity investors is to make a return, which is perceived as an exit objective or strategy in these investments hence establishing limitations in the duration of the operation as also suggested by Bauer, Bilo & Zimmermann (2001) and further separating the core nature of private equity from other investment types (see Cumming 2008).

Buyout refers to an acquirement of a company or a distinguished part of one. A buyout is usually in the form of leveraged buyout or management buyout. Capital investments are generally monetary assistance for firms in their respective life cycles. These capital investment strategies are, for example, growth capital, distressed investments, development capital, mezzanine capital and venture capital (Stowell 2013, 315). In its simplest form private equity is divided into buyout which consists mainly of more mature businesses and venture capital which includes all the other capital investment strategies that are directed for the companies in their earlier stages of development. (Mathonet & Meyer 2007, 25; Söderblom 2011) Buyout and venture capital are used as hyponyms for private equity in this thesis.

Although venture capital and buyouts seem to differ in their core characteristics, they both are deemed to include some fundamental similarities. Gilligan & Wright (2014) and Nikoskelainen & Wright (2007) describe most of the private equity investments to include non-financial advisory assistance regarding to experience, knowledge and information for management and board of directors. Private equity companies also pay close attention to the investees in the long run with monitoring and managing the company to further create value in the investments (Gompers & Lerner 2001).

Private equity funds are equity investments that usually are not for listed companies or addressed in any secondary exchange. General assumptions of PE funds are expected to differentiate from orthodox and generalized equity investments in their risk versus reward ratios. Committing capital to a private equity fund is often also experienced as a blank check underwriting since the LP's (Limited Partners) have very limited authority to influence the GP's (General Partners) decision on which company they are going to finance. This fact combined with the understanding of illiquidity risks and long-term commitments involved in the investment raises questions on why anyone would claim a share in a PE fund.

According to Bance (2004) most common sources of capital in private equity funds come from larger institutions and estimated of 70-80% of capital is observed to originate from them. The institutions include entities such as pension funds,

insurance companies, banks, government agencies and corporate investors. Private investors, funds of funds and academic institutions play much smaller role in the group with their 15% share. It is also noted that in European PE fund markets most of the investors act in the same geographical region as the fund itself and almost 70% of investors are studied to locate in Europe. Bance (2004) also reflects diversification being in its breaking point as the investors prospect other geographical funds to invest in. However, Huss & Steger (2020) challenge the need for diversification as they find contradictory results on earlier studies of buyout fund performance and significant relationship with geographical diversification. They also observe that diversification associates best with the same industrial focus rather than across industries when measuring fund performance.

These funds are around the world generally in the form of limited partnership structures, where a general partner, which is usually the private equity fund manager or private equity firm, receives capital from the limited partners, who are typically institutional investors alongside with some wealthy private individuals. The limited partnership as a legal company form allows for tax benefits by separating each entity's tax position and segregates liabilities between the parties as the limited partner's total liability is the amount they invest (Gilligan & Wright 2014). On the contrary, after the capital is committed to the fund, the limited partners have little to say on how the general partner allocates the collected investment funds. The underlying assumption is however that the general partner adheres to the Limited Partnership Agreement and to the covenants set in it while fulfilling the contractual obligations (Kaplan & Strömberg 2009). Generally, though, the LPs can have a vote on specific preferences such as replacing the GP or changing the partnership agreement somehow, yet there is seldom the need or desire to do so. (Lerner & Schoar 2004)

Generally, PE funds have a contractual life span of ten years with a possible two- or three-year extension. During the contract period the fund manager invests in, works with, and finally sells the stakes of the invested companies. The ten-year period can also be extended if the fund has remaining investments that have not yet been sold by the end of the contract (Jenkinson, Landsman, Rountree & Soonawalla 2020).

After the initial investment period, where the LPs provide the capital for the fund's whole lifetime (also known as *committed capital*), which usually lasts five to six years, the GP is no longer available to use, or *draw down*, any unused capital from LPs and the remaining contract period is dedicated to managing the portfolio and finally the investments are to be realized until the end of the contract and distributed back to the LPs (Stein 2005; Jenkinson et al. 2020). Figure 1 presents the different funding stages of a company in its lifecycle.

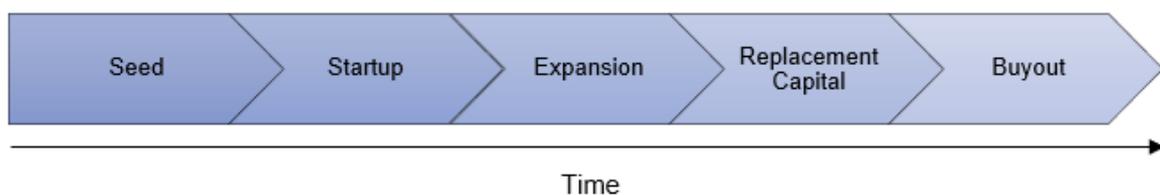


Figure 1. Stages of funding in a company lifecycle

The upside of *ex-ante* (before the event) capital raising is argued by Axelson, Stromberg & Weisbach (2007) to preserve the GP's objectives of good management during good times, yet it leaves the GP with significant liberty to manage the fund wrongly and empty the funds on bad deals if the contract length is ending or no good deals are available. Therefore, a mixture of *ex-ante* and *ex-post* (after the event) capital is mentioned to be the theoretically optimal solution to neutralize the disadvantages of either capital.

Since private equity funds are usually closed-end funds, Stein (2005) reminds of the possibility of managerial misbehaviour which may lead to the fund perishing without an opportunity to liquidate one's investments (see also Gompers & Lerner 2001). Closed-end private equity funds are considered to imply major liquidity risks as the LP's cannot typically exit with ease from the fund at an untimely fashion. Likewise, there is no secondary markets for PE funds' LP stakes and the valuation is seen to be challenging. Valuations of stakes can be done by the GP whereupon problematics arise due to information asymmetries. (Söderblom 2011, Bance 2004) Gilligan & Wright (2014) state that due to the characteristics of a PE fund capital borrowing is almost non-existent rendering a possible bankrupt highly improbable. Along the same lines Axelson et al. (2008) discuss the probability of a fund failing

to be small since GPs are generally governed and monitored thoroughly, receive a comprehensive compensation, and have vested interest of the fund succeeding.

The GP is rewarded during and after the existence of the PE fund. Kaplan & Strömberg (2009) mention three different incentives the GP has from managing and liquidating the fund; annual management fees, *carried interest* which composes of the profits of the fund (usually around 20%) and possible monitoring fees. Metrick & Yasuda (2010) also discuss how successful fund performance can be experienced as “skill” of the GP that usually leads to the equity firm raising a new fund every two to five years. It can be seen as the decisive objective for a new LP to recapitalize a new fund continuously to further its lifetime (e.g., Gompers & Lerner 1996). Accordingly, the new fund may grow or have altered terms leading to larger revenues in extra costs further demonstrating the support of favourable success of the fund (Metrick & Yasuda 2010).

2.2 Venture capital

Mathonet & Meyer (2007, 25) describe the modern terminology for venture capital to be born in the late 1800's and early 1900's as an action for wealthy businessmen in growing economy of America (see Gompers 2007). A milestone of sorts for the field is embodied in the first firm to operate in risk financing instead of a family or a private individual in 1946 when the trailblazing venture fund American Research and Development (ADR) was founded. The purpose of ADR was a reaction to maintain the prosperity of new business boom for continuous employment rise and steady business structure (Bygrave & Timmons 1992, 16-17; Lerner & Schoar 2004). The peak for venture seeking financiers was achieved in the 80's as the field experienced a metamorphosis of sorts and established a steady and firm position among the financing world. Consequently, venture capital achieved its highest values then both in volume and value in 1987 further improving the publicity and interest (Bygrave & Timmons 1992, 27).

During the 80's and the 90's venture capital industry shifted towards limited partnerships as the prevalent organization form. At the time over 80% of the venture

committed capital was committed to limited partnerships. (Gompers & Lerner 1997) The peak of 1987 was later bypassed in 2006 and 2007 when the amount of capital committed to private equity was at its highest levels since the 80's. The record, which was measured in the fraction private equity had of the stock market overall, at almost 1 percent (Gilligan & Wright 2014), and in nominal terms, started to descend after the uncertainty caused by the financial crisis which suggests of strong economic cyclicity of private equity popularity. (Kaplan & Strömberg 2009) The booming growth in private equity during the late 1990's to 2008 ushered the debt markets to develop new forms of derivatives which in essence were merely a vehicle to trade risks as the core, underlying loan was not implemented in them anymore.

The exact definition of venture capital can be hard to determine. This is partially because of the widespread use of the word around the globe with alternating descriptions in each financial region with their own terminology and doctrines. Kleinschmidt (2007) describes this intersection of disparity with the fundamental nature of the word stemming from practicality instead of theoretical research which inevitably leads to varying explanations of an action rather than a theory. Probably most common definitions of the term include financing a private, new, small and growing high-tech company from a pool of reservoir cash with competent fund management in the purpose of capital gain with possible information asymmetries and opaque risks (Cressy 2006; see also Schertler & Tykvová 2010).

VC firms provide financing mainly for companies which are in their start-up or expansion stages. Söderblom (2011) describes high-growth industries to be the primary target of emerging markets and are considered usually to be information technology (IT) or biotechnology companies. A common misconception is that VCs fund only high technology industries and companies (Gompers 1994). Also, not every venture investment is directed for growth-companies but also expansion capital and cash to manage faint periods are considered venture capital. The commonality lies in the detail that most of these investments are made with equity or equity-like instruments no matter the development stage of the investee company although debt can be a part of syndicated transactions. (Söderblom 2011) Trester (1998) argues that VCs typically prefer equity over debt because of asymmetric

information between the parties which could harm the contract if the entrepreneur were to behave opportunistically.

Gompers & Lerner (2002, 133) discussed in the early 2000's that roughly one in three U.S. companies going public had VC-backed funding during the period of 1990 and 2000. In the last 30 years, some of the VC-backed companies have affected the U.S. and global economies greatly – a few to be named are Apple, Amazon, and Facebook. Kaplan & Lerner (2010) observe that in the first decade of the millennium, 60% of all IPOs in the U.S. had some form of VC backing suggesting of strong and healthy industry. Even though the statistics would propose otherwise, only a very little minority, merely 1 in 6000, receives any form of venture capital in their first round of funding. It could be said that while VC funding and initial public offering both are very uncommon events, they are strongly related to one another. Nevertheless, a funded start-up does not guarantee nor require going public, it just raises the likelihood of the event ultimately happening. (Kaplan & Lerner 2010)

Like venture capital, also buyout transactions emerged largely in the 80's U.S. markets expressing similar cyclicity to venture capital, naturally. Following the boom of high-yield debt, junk bond market buyouts peaked in 1988 and busted just few years later due to them defaulting as a result of bankruptcies (Hurduzeu & Popescu 2015). At the time most of the buyouts were described as public-to-private transactions having high portion of debt included in the deals. This led inevitably to many of the deals failing therefore reflecting negatively on private equity deals. (Kaplan & Strömberg 2009)

After the bust of buyout popularity in the 90's, the industry evolved towards favouring medium sized private companies while maintaining a stable growth throughout the dot-com bubble and experiencing a new record high in 2006 and 2007 both in value and quantity of transactions (Kaplan & Strömberg 2009). During this time private company buyouts accounted for over 80% of all transaction value related to buyout transactions but public-to-private buyouts were also on the rise (Gompers, Kaplan & Mukharlyamov 2016). In the U.S. one capital reason for the urge to buy or shift towards private companies derived from the new Sarbanes-Oxley Act, which

increased the costs of being a public company (Hoskisson, Shi, Yi & Jin 2013). While private equity funds had earlier been almost exclusively North American practice, the globalization spread buyouts widely to Europe. In 2004 almost 50% of all worldwide buyout transaction value was generated in Western Europe, particularly in the United Kingdom. The growth in the first decade of the new millennium was abruptly interrupted by the global financial crisis in 2008 and the industry has not yet returned to its former peak. (Wood & Wright 2009; Hoskisson et al. 2013).

Where venture capital is principally targeted for young, growth companies, buyouts usually happen with more mature and established companies with no limitations of them being private or public. Buyouts are directed towards businesses or business units and generally include the acquisition of majority control of the target companies' equity capital. As this transaction is usually expensive, the buyout process adopts a large amount of outside debt with fractional portion of own equity (Huss & Zimmermann 2018; Nikoskelainen & Wright 2007). This process is called a leveraged buyout (LBO) and Kaplan & Strömberg (2009) document that a leveraged buyout is usually financed with 60 to 90% of debt instruments which can be acquired from banks or other debt offering institutions. This ratio between equity and debt automatically results in the dramatic change of the firm's post-LBO risk profile (Berkovitz, Feldhütter & Vig 2020). Consequently, a slight increase in the firm value would lead to significant returns for the equity-holders. However, the largest average returns were experienced in the first boom of buyouts in the 80's and have since decreased considerably. (Cao & Lerner 2009)

Using debt financing to leverage the buyout process creates naturally obligations to pay interest and other fees related to acquiring the debt. As a result of the buyout transaction, the targeted company is expected to pay the economic price utilizing the future cash-flow of its own business ventures (Cumming & Zambelli 2009; Gilligan & Wright 2014). This creates pressure for the buyout company's management to not waste money as they must produce the contractual interest payments in future cash flows (Kaplan & Strömberg 2009). Hoskisson et al. (2013) argue that high leverage is also an effective strategy of compliance for the managers

to achieve these commitments through active leading in strategic decisions and supervising the board (see Wright 2013).

From its earliest iterations the term has evolved from a family investing into a growing local business to its current form of complexity and inaccurate description of financial action. Throughout the years the concept has nevertheless remained virtually the same which encapsulates its core meaning; daring to finance the risky and minor. In this thesis the term venture capital is used in the context of the original, American version of investment strategy of allocating capital from the funds for growth companies with a certain level of risk and calculated objective of returns. This strategy also includes a natural exit strategy for the financier typically in the form of an initial public offering or through mergers and or acquisition (M&A) (Cumming & Dai 2010).

2.3 Agency theory

The rationale behind the existence of VC firms also stems from agency theory. The theory derives from agency problems, in which cooperating parties have differing goals with various work assignments leading to unagreed levels of risk. Agency theory attempts to construe the agency relationship between two entities, the principal who assigns the tasks, and the agent who executes the determined task. In the context of VC financing this can more precisely be described as the principal-agent theory. (Eisenhardt 1989)

Agency theory is designated to understand and provide answers in two relevant problems in a principal-agent relationship. Problems with agencies usually arise when the goals and objectives between the parties differ, and when the principal cannot or is virtually unavailable to confirm the actions of the agent. With VCs the principal-agent problem is rather complex as the VC commonly represents both parties as the outsider and insider, the principal, and the agent. Also, as the founder/owner of the start-up companies generally stay in a managerial position in the company, they also can have both traits of the principal-agent relationship

(Sapienza & Gupta 1994). In this context the VC is presumed as the principal and the entrepreneur as the agent.

Sapienza et al. (2000) document that the boards of venture capital-backed companies include both the insiders (founders) and the outsiders (investors), and consequently differ from the common situation. Since the VCs generally stay on the boards of the backed companies, they have vested interest and power to stay active in the venture after the initial round of funding. Sahlman (1990) writes that VCs have similar interests with the stockholders making their involvement in the board also suitable based on agency theory. Also, as the VCs compensation in many cases is dependable on the company's performance, they have an incentive to further monitor and guide the board by staying active (Fried, Hisrich & Bruton 1998).

Agency theory suggests that in the environment of venture-backed companies many interest related issues are likely to emerge between the principal-agency parties. Many of these problems are characterized to be connected to managerial opportunism which arises from the lack of managerial ownership, but the core of experienced agency problems goes far beyond that (Bruton et al. 2000). Sapienza et al. (2000) describe some problems to be related in firm valuation, allocation of resources and exit timing. The authors also mention that while agency risks are always present, they act dynamically throughout the venture differing in severity of conflicts thus making the agency theory less viable to explain agent behavior perfectly. Arthurs & Busenitz (2003) argue that agency theory is useful only before the VC decides to pursue with investment after which it becomes more limited in its explaining power (see also Cable & Shane 1997). After the initial VC investment, the entrepreneur is often observed not to act like an agent hypothesized by agency theory thus rendering its theoretical use trivial in such context.

Although agency theory has gained the support of many scholars its deficiencies are well recognized. In literature agency theory is mentioned to be usually relevant only when there are significant conflicts of interest between principals and agents in a manner that agent opportunism is probable and where bounded rationality is present (Eisenhardt 1989). The idea of goal incongruence between parties is almost

required for agency theory to be applicable in the VC-entrepreneur relationship. Fried et al. (1998) find in their study that agency theory was able to explain greater company performance with greater VC ownership but only to a certain limit which indicates that the theory has a limit. The authors also present institutional theory to have some explaining power over the matter and cannot comprehensively differ the two.

Instead of agency theory, Arhurs & Busenitz (2003) discuss the possibility of stewardship theory, which similarly to agency theory places recognition on setting similar objectives for the VC (principal) and entrepreneur (steward) but also mention it to be problematic since it emphasizes the role of the entrepreneur (steward) too much. Cable & Shane (1997) criticize agency theory for the lack of social context between parties which regularly leads to cooperation. The authors also mention that not always are the relationships between VCs and entrepreneurs hierarchical and like managerial opportunism also the principal can defect with their strategies.

2.3.1 Information asymmetries

As an extension to agency theory, the information flows between parties are a concern. In a state where every party can obtain the same homogenous information without limitations, a symmetrical or evenly distributed information flows freely, and the observations and conclusions are drawn in a similar manner. It is argued that in all financing related ventures asymmetries with information distribution are present and the theoretical balance cannot be achieved. (Eckermann 2006) This circumstance leads to informational asymmetry. Unevenly distributed information may be situational and undeliberate or intentional and pursued by the other party.

Amit, Brander & Zott (1998) describe information asymmetry with two distinct and major forms. The first one is called "hidden information", which consists of uneven and unjust dividing of information that can be exploited by the other party. Thus, the informed side of the agreement has the incentive to falsely represent the concealed information, which could lead to the funding of unsatisfactory and weaker projects. Especially in high-tech industries this hidden information is extremely hard to be

comprehensively researched. This distortion of information could lead to the phenomenon of adverse selection, where the markets are filled with poor or low-quality projects as the differences between the good and the bad projects are hard to distinguish.

The other problem with asymmetrical information is described by Amit et al. (1998) as “hidden action”. This can be observed in a situation where one party cannot perfectly monitor and legally verify the actions of the other party. The situation can lead to unethical and immoral practices since the temptation to flee from the agreed deal might present excessively or the informed party may act out of self-interest despite the costs being high to the other party. This circumstance of risk increasing behavior is described and known in literature as moral hazard.

As established in section 2.2, venture capital is typically, or at least presumed to be, directed towards seed-stage high technology companies who seek to expand their business. When most of the assets are intangible and technologies and business models are presumed incipient, extreme levels of asymmetrical information are present. The abstruse information requires specialized attributes of risk assessment that no ordinary financial institution is prepared to offer. This is usually where VCs thrive in. (Joshi & Subrahmanya 2015)

Provided that adverse selection and moral hazard can be perceived in almost all investment related environments, they seem to be particularly pronounced and intensive with entrepreneurial finance, such as VC financing. Quite similarly, MacIntosh (1994) asserts information asymmetries to be fundamental and paramount especially in the VC sector of funding. Sahlman (1990) presents that contracting practices indicate of the information asymmetries between the VCs and entrepreneurs. Amit, Glosten & Muller (1990) discover that when information asymmetries are robust, the skilled entrepreneurs can invest in information that truly reflects their skill level. This suggests that the information allocation problem is not only something for the VCs to consider of but also the entrepreneur plays a key role in distributing reciprocal information.

VCs act in the private markets as financial intermediaries. These intermediaries play a crucial role in information production because they generally have more skill and can gather the required information with lower costs than an individual investor. Usually, the business qualities are accessed by the VCs actions of screening, contracting, and monitoring (Kanniainen & Keuschnigg 2004). VCs conduct a thorough due diligence process which targets to acquire information about the markets the company operates in, the core business of the company, and the quality of the entrepreneur or the start-up team. This process can at best alleviate the asymmetrical information and risks concerning the productivity of the funded company. (Berger & Udell 1998)

Barry (1994) emphasizes especially the pre-investment screening stage of VC investing to be crucial in reducing the adverse selection problems (see also Kanniainen & Keuschnigg 2004). During the initial proposal screening Fried & Hisrich (1994) discuss of six different steps in which the venture is possible to be discarded before any funding is approved if it proves to be of low-quality. They also find that referrals and referral networks in the VC framework further remove the adverse selection problem suggesting that economies of scope apply also in the VC industry.

Lerner (1994) proposes of investment syndication deals (i.e., co-investing with one or more other VCs) to reduce the information asymmetry related issues in the VC context. Identical ideas were also presented by Lockett & Wright (2001) who argue that as the venture capital investment is seen as an illiquid investment, it can lead to diversification problems with the lower-quality investments. The true risk of the investment can become clear only after the initial investment is made with the acquirement of hidden and less biased information. Syndication deals can therefore act as a risk sharing tool with the co-investors. Barry (1994) describes these deals to be a collective judgement of the industry to further bear the decisions of investing.

Because moral hazard related problems arise only after the initial investment is granted, they can be surmounted for instance with active monitoring and screening, staging of the investments, and contracting (Amit et al. 1990). Similarly, also

Gompers (1995) presents that staged investments with the possibility to abandon the project in addition with active monitoring of the VC can play a crucial role in mitigating the risks of moral hazard (see also Berger & Udell 1998; Sahlman 1990). Contracting deals are essential in situations where information is not perfectly mutual with both parties. Fried & Hisrich (1994) suggest that during the initial screening before any investments are made contractual rules and regulations are agreed upon. As the information can be considered lopsided, the VCs negotiate the terms of the relationship to address the possible moral hazard problems arising after the investment. Sahlman (1990) finds that usually these contracts allocate the majority of failure's risk for the entrepreneur, which can demoralize the weaker entrepreneurs of even seeking VC funding.

Information asymmetries are also observed in private equity funds and in the behavior of the general partners. Brown, Gredil & Kaplan (2018) argue the general partners to manipulate reported returns, especially in the case of poor-performing funds. As the frequent objective for GP's is presumed to raise a new fund, they may have an incentive to affect the valuation of the earlier fund. These are observed to be either too aggressive or cautious. Particularly before the intervention of Financial Accounting Standards Board in 2009 the GPs were discreet with their portfolio valuation methods. Brown et al. (2018) found that while underperforming general partners overvalued their funds the comparably best fund managers acted vice versa.

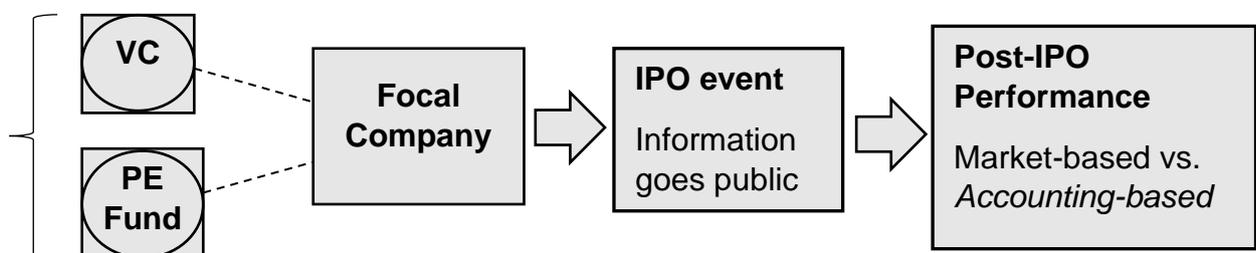


Figure 2. Logic model of VC/PE funding

Figure 2 summarizes the written theory of agency theory and its extensions of information asymmetry and moral hazard. The logic model consists of the two

operatives in the field, private equity funds and venture capitalists and their information/capital flows to the focal company (the dotted lines). When the focal company decides of an IPO the hidden information goes public. The post-IPO performance is usually measured by the market-based or accounting-based performance of which the latter one is the core of this thesis.

3 LITERATURE REVIEW

In the context of initial public offerings, extensive research has been made during the recent decades. These studies have, however, focused mainly on short-run performance rather than long-run effectivity. Especially IPO underpricing has been a well-known phenomenon which has gathered the attraction of many researchers.

3.1 IPO Underpricing of PE/VC backed companies

One broadly studied subject in the field has been the underpricing theory in the initial public offering and the relationship with VCs. The studies investigate extensively the different variables in an underpricing situation of the IPO. As there are many differing views and theories from around the world there are also various results, and no unequivocal answer can be found.

Belghitar & Dixon (2012) discuss the probability of diverse information between the issuer and the investors of the company's value. The issuers can be seen to withhold crucial information and further delay partial adverse information to drive the stock prices higher. While a rational investor anticipates and prepares for such events, a venture capitalist could act as a dependable intermediary throughout the process, thus steering the IPO at its appropriate value. Francis & Hasan (2001) write that generally in the IPO literature underpricing is derived from premarket information asymmetries and the abnormal initial returns act as a compensation of sorts for the investors. VCs are seen as certifiers in the IPOs and their ability to resolve information asymmetries can be comprehended as their ability to successfully bring the funded company public.

How does the VCs participation in the process then affect the underpricing? Mixed views are found in empirical studies. Gompers (1994) presents that as the VCs are expected to participate in multiple IPOs during their lifetime, they are considered professional and trustworthy in accurately pricing the stock also partly because they often are members of the board. Because successful IPOs attract more coverage

and business, it is usually in the VCs best interest to offer the stock at a lower price leaving money at the table and gaining the occurred offset back in the future. This motive is also discussed later in a paper by Gompers (1996) with the term “grandstanding”, which indicates that generally VCs are more inclined to endure underpricing in order to maintain the accomplished reputation for possible future ventures and fund raising. Elston & Yang (2010) later express based on the grandstanding hypothesis that venture capitalists are listing younger companies public and thus allowing even greater underpricing and wrongly suggesting of good performance (see also Wang et al. 2003; Gompers 1996).

Bradley, Kim & Krigman (2015) found in their study that the top VCs systematically underprice their IPOs as their first day returns were observed to be double than the non-backed IPOs, respectively. The existing theories of underpricing are not comprehensive to fully understand the phenomenon. Some scholars found the underpricing to significantly increase the information momentum around the issue, which directly affects the demand curve of the issued stock (Aggarwal, Krigman & Womack 2002). Research also indicates that the IPO price is not cared *per se*, only after the lockup-period ends and the increased all-star analyst coverage has been established post-IPO are the VCs ready to liquidate their investments (Cliff & Denis 2004; Liu & Ritter 2011). Critics of the VC industry advocate the VCs interest to differentiate from the other stakeholders during and after the IPO process. Some allegations to artificially inflating the IPO value have also been made which could have resulted irrevocably fueling the dotcom bubble in the early millennium (Morsfield & Tan 2006).

3.2 Long-run IPO performance of PE/VC backed companies

In the last few decades, the interest in literature has shifted from IPO underpricing and momentary excess returns towards long-run performance and profound understanding of venture capitalist’s role in the funded companies. The earlier works of Ritter (1991) established a groundwork for the demand of long-run performance scrutinization of IPOs as he reported a severe underperformance in the IPO following three-year period. Also, Loughran and Ritter (1995) argue that issuing

companies underperform considerably when comparing to the non-issuing companies for the next seven years after the IPO. Gompers & Lerner (2003) conducted a comprehensive study spanning from 1935 to 1972 to fully understand the relationship between IPOs and underperformance. Their results indicate that much of the examined performance is solely dependent of the selected methodology; some models estimate an underperformance while others indicate of superior performance. They also argue that deficiencies of consistency and absent logical reasoning behind the underperformance are at question rendering the IPO effect at least questionable.

One of the earlier studies of the PE/VC field is Brav & Gompers' (1997) research of long-run underperformance of IPOs with and without venture capital support in the US markets. They find that in the period between 1975 and 1992 PE/VC backed IPOs perform better than their non-backed counterparts when observing the equal returns during the five-year period. They report that especially the low book-to-market companies suffer from underperformance compared to similarly sized venture-backed firms and suggest the reasons to be related to general market conditions in the 80's and investor sentiment.

Similar to Brav & Gompers (1997), Jain & Kini (1995) discovered that VC backed IPOs exhibit better operating performance in the long run compared to non-backed IPOs and report the market consensus to understand and recognize the venture capitalist's role in adding value to the post-IPO monitoring. The results indicate that VC backed IPOs significantly outperform the non-backed even when controlling for offering size and industry. The superior performance could especially be measured in a few operating cash flow-related measures. In recent literature it is often presupposed that as the venture capitalists provably stay longer and more active in their invested companies they are expected to outperform and generate abnormal returns even in the long run (Belghitar & Dixon 2012). Morsfield & Tan (2006) found that VC monitoring associated with the earnings management is partially resulting in the exceptional post-IPO market performance and accounting-based performance of VC-backed companies. Furthermore, VC participation is stated to

signal quality of the firm which in turn is hypothesized to increase interest in VC backed IPOs.

Meggison & Weiss (1991) argue that while venture backing leads to significantly lower initial returns, the presence of VC lowers the costs of an IPO. Based on their research reputable VCs operate on the markets repeatedly attracting higher-quality underwriters and extensive institutional coverage while alleviating information asymmetries resulting in reduced total costs (see Nahata 2008). Reputation in this context can be characterized according to Hsu (2004) as experience, data gathering prospects, stakeholder network and direct board assistance. Especially the more prestigious underwriters are studied to have less underperformance compared to the markets in the post-IPO following three years and the initial short-run underpricing is lower (Carter et al. 1998).

Sorensen (2007) finds that on average experienced VCs are more likely to successfully bring their funded companies public with their influence and sorting capabilities. The results also suggest that good VCs have a positive influence on the companies thus creating a continuum for future IPOs and funded firms. Krishnan et al. (2011) support the view of VCs reputation to have positive coalescence with the long-term performance after the IPO. The more reputable VCs are observed to stay more active in the corporate governance after the IPO with continued support which affects the performance. Particularly the reputation measure of past market share of the VC is observed to coherently relate to both pre- and post-IPO performance positively. Older, and more reputable VCs support the theory of grandstanding as they are found to operationally outperform younger VC firms who tend to bring younger companies public prematurely (Wang et al. 2003).

While the research of VC-backed IPO performance has been diverse in the US, in European context only recently more interest has been focused on the topic. Although the UK and the US share similar common law system, the VC industry is far more prosperous in the US, in market capitalization size, in total activity and especially in the long-standing difference of fund performance which is more than twice in the US (Arundale 2017). Nonetheless, as the UK VC market is larger than

the rest of Europe combined, it presents opportunities and research substance similar to the US. (Levis 2011)

3.2.1 Post-IPO performance in the UK

Earlier works of Rindermann (2004) in the European growth stock markets demonstrate the necessity to further extend the research of VC operations in the UK as the results indicate of no remarkable difference in performance between VC-backed companies and non-backed firms in either operating performance or market performance. Bergström et al. (2006) extended the research to the London Stock Exchange and examined the UK markets between 1994 and 2004 and discovered long-run patterns to indicate of better performance in the PE-backed companies compared to non-backed ones albeit the variations between years and industries were considerable. They find that large volume years of IPOs are the most underperforming which implies windows-of-opportunity hypothesis to be consistent in the VC environment during the time period.

Similarly, Coakley et al. (2007) discover these high-volume years to have complementary attributes in the general consensus of the markets such as market bubbles. Related developments were also found by Levis (2011), who studied the PE-backed companies in the UK during 1992 and 2005 discovering PE-backed firms to outperform the non-backed companies in all time horizons after the IPO in operating and market performances. The PE-backed companies presented modest first day returns though they were generally already larger in assets and more profitable. Comparable results throughout the 90's and early millennium in the UK markets were also found by Bessler & Seim (2012), who found VC-backed IPOs to generate positive and superior returns in the IPO following three years and significantly outperform a large group of non-backed IPOs.

Contrary to these results, Belghitar & Dixon (2012) detail that VC-backed IPO or not, they both underperform the carefully constructed market portfolio in the long run and VC-backing does not seem to affect the performance in any way after the initial minor underpricing gap. Belghitar & Dixon (2012) also allege that in the UK the VC

actions are more likely to happen in the forms of management buy-ins or management buyouts (MBO) which can be considered less risky whereas in the US the VC industry concentrates principally in unestablished seed stage companies. Jelic et al. (2005) studied in their paper the UK MBOs exiting through IPOs and found that VC-backed MBOs were less underpriced initially than MBOs without VC backing. In the long run there were no significant differences between the performance of the MBOs. Nonetheless, the IPOs backed by more prestigious VC firms appeared to be better long-term investments than the ones backed by less distinguished VCs which correlates with the reputation related results in the US markets (Carter et al. 1998; Nahata 2008).

Recent studies have stirred discussion on methods of measuring the operating performance. Especially the effects of industry and sample selection are argued to effect significantly on the calculation and thus in the results. Chen & Liang (2016) discuss many earlier seminal papers (Jain & Kini 1995; Megginson & Weiss 1991) to include such biases in the removal of potential non-VC backed companies and in technology orientated VC markets the lack of industrial return-on-asset (ROA) measurements. As the authors included these deficiencies in their research, the results were found contrarian than the frequent assumptions in the US markets indicating of inferior performance with the VC-backed companies in the long-run compared to the non-backed ones.

As established, the PE/VC involvement has both positive and negative results when discussing the post-IPO performance of a company. While the reasons concerning good or poor performance vary the general consensus appears to be in favor of PE/VC backing and performance measures. This applies to both accounting-based and market-based performance. Similarly, the assumption here is that PE/VC backed companies present better performance statistics compared to the non-backed companies. This is due to the fact that PE/VC entities are hypothesized to decrease informational asymmetry, have a competitive edge in market information, have an expertise of growth-companies, and transfer information and capital to the selected company. In other words, the general partners and venture capitalists are

screening the potential “winners” and thrust the growth even further with their involvement.

3.3 Research framework and hypotheses

Earlier research and theoretical literature attempt to explain the differences between PE/VC backed and non-backed companies and their accounting-based and market-based performance of the post-IPO period. While the profound reasons on why PE/VC involvement affects the performance can be difficult to pinpoint this thesis attempts to construe if there are statistical differences between the companies of different backing statuses. After evaluating the approaches presented in literature review hypotheses for this thesis are formulated. These hypotheses are presented below.

H1: PE/VC backed companies outperform the non-backed companies in their accounting-based performance

H2: PE/VC backed companies outperform the non-backed companies in their market-based performance

The first two hypotheses are formulated to further explain the differences between performance measures and backing status. Since both accounting-based and market-based performance are often observed to reach higher levels with venture backed companies, the presumption here is that during the time period between 2008 and 2017 similar results are found. These hypotheses also give support to the research question presented in chapter 1.2. Similarly, information asymmetries are surmised to be lower with companies that have an external financier pre-IPO as the third hypothesis argues.

H3: PE/VC backed companies present lower information asymmetries than non-backed companies

The first two performance related hypotheses (H1 and H2) are examined with statistical tests including validation of median differences between populations and logistic regression models. From the applied statistical methods, a distinction between company performance can be gathered and compared. In extension to these models, also linear regression is found suitable for analyzing the independent variable's effect to the dependent variable. With linear regression more profound results of the explanatory factors can be distinguished. The same models and methods are also used to analyze the third hypothesis (H3). With a statistical comparison between median values, logistic regression, and linear regression comprehensive evidence should be formulated to either support or reject the hypothesis.

4 DATA AND METHODS

4.1 Sample selection

This thesis concentrates on the long-run operating performance measures of PE/VC sponsor-backed companies after their initial public offerings in the UK stock markets, mainly in the London Stock Exchange (LSE) Official List (main market) and in the Alternative Investment Markets (AIM) for small and medium sized companies. The Specialists Fund Market (SFM) was excluded from the thesis since the marketplace is dedicated for closed-end investment funds. The stock exchanges were selected following the earlier studies of Levis (2011) and Coakley et al. (2007) who included the growth markets in addition to the main stock exchange. Consequently, a more all-encompassing picture is to be formed of the IPO markets with less dispose towards small company bias.

A total of 665 United Kingdom based companies were listed in the UK Main Markets and Alternative Investment Markets during the time period between January 2008 and December 2017. The data of yearly issues and IPOs were gathered from the London Stock Exchange new issues and IPOs reports which are available on their website. To verify the validity of IPO data Refinitiv's Thomson One database IPO filings were used. From the total sample a final dataset of 305 individual IPOs was comprised. The filtering process was executed with similar guidelines of earlier papers by Coakley et al. (2007) and Espenlaub, Gregory & Tonks (2000) by excluding the IPOs that were found to be foreign-based, other than new company listings, financial companies, equity instruments or real estate investment trusts (REITs) as well as companies which had no financial information for the majority of the required years or were privatized and/or delisted during the survey period.

Venture capital or private equity backing status was first observed from the Thomson One database and further verified from the company IPO prospectus which is required to state the majority shareholders at the time of the offering. VC-backing was defined present if the holdings of a venture capital or private equity fund/company were over 3% of the stock. The VC companies found in the

prospectus' were cross-referenced to the European Venture Capital Association (Invest Europe) listings of registered members to verify the validity.

Financial data, such as earnings before interest and taxes (EBIT), return on equity and total assets of the companies was gathered from Thomson One database of financial information. Additionally, Eikon Datastream was used to gather time series data of market prizes and market value of the companies. IPO sizes in terms of market capitalization and prices were collected from the prospectuses and LSE new issues datasheet, in addition to grouping numbers by industry and sectors. The industry classification groupings are collected from the analytics and benchmarks providing FTSE Group, a company wholly owned by the London Stock Exchange Group.

4.2 Descriptive statistics and sample overview

The summary statistics table 1 represents the yearly IPO activity in the UK during the time period of 2008 and 2017. From the table can be seen the yearly distribution between the two marketplaces, Main Market and Alternative Investment Market. The most active public offering year by volume was observed to be 2014 with 66 new total listings. From 2008 to 2011 only 59 companies in total were listed in the UK markets. The lower market activity is hypothesized to derive from the 2008 global financial crisis which reduced the activity in financial markets with both supply and demand shocks simultaneously. This hypothesis is supported by Guney & Iqbal-Hussein (2012) who argue that in the UK markets issues of equity evidently happen during "hot" market situations when the window of opportunity is observed by the managers. These windows of opportunity are pursued by managers since they are found to raise more capital compared to "cold" market situations.

Year	All	PE/VC	NB	AIM (PE/VC)	Main Market (PE/VC)
2008	11	0	11	11	0
2009	2	0	2	1	1
2010	23	9	14	16 (6)	7 (3)
2011	23	6	17	19 (4)	4 (2)
2012	22	4	18	19 (4)	3 (0)
2013	34	13	21	26 (8)	8 (5)
2014	66	27	39	42 (11)	24 (16)
2015	36	20	16	14 (1)	22 (19)
2016	37	15	22	27 (8)	10 (7)
2017	51	24	27	37 (15)	14 (9)
Total	305	118	187	212 (57)	93 (61)

Table 1 reports the annual initial public offerings in the two London Stock Exchange marketplaces, Alternative Investments Markets, and the UK Main Markets. Numbers in parentheses represent the annual sponsor-backed IPOs in the two marketplaces.

Once global financial markets started to recover the IPO markets followed and began to stabilize and later prosper. On average 31 companies listed yearly on either marketplace during the time period between 2008 and 2017 where the majority of listings happened in the latter part of the period. Between 2013 and 2017 the average yearly IPOs arose to 45.

In total 305 new IPO listings were executed during the time period of which the major share of 212 were realized in the AIM marketplace and the rest 93 in the Main Markets. However, the differences between the numbers of PE/VC backing were significant between the two marketplaces. In the Main Markets nearly 66% of new IPOs were in fact backed whereas in AIM only about 27% had a former financial backing. This trend has been constant throughout the time period as the Main Market is observed to have the majority of yearly IPOs financially backed, only three years was the percentage identified to be lower than 50.

In 2015 and 2016 only three companies were listed on the Main Markets without preliminary funding. On average almost 50% of all IPOs listed on Main Markets were PE/VC backed, whereas on the AIM the average is only 24%. From these results a

conclusion of upward trajectory on the IPO markets in general and furthermore PE/VC funded IPOs can be drawn. This observation supports the earlier studies where backed companies are on average more profitable than their non-backed counterparts before the initial public offering. This trend is also seen with later results and statistics in this thesis.

The IPO activity by industry and furthermore FTSE specified sector is presented in table 2. The largest industry by volume and new listing activity is found to be Consumer Services sector with 66 total new IPOs throughout the time frame. Similarly, the Consumer Services sector is also the most active on sponsor backed IPOs with 37 backed listings. Also, the Consumer Goods appear high on the backed companies' list. The results indicate a clustering of sponsor-backed IPOs to the Consumer sector. According to BVCA (2018) the use of primary proceeds in PE/VC companies go to debt repayments and general purposes for the corporate whereas with non-backed companies the proceeds are allocated towards expansion and future acquisitions. Thus, the differences between industries are related to their profile of funding and cash needs for different activities.

Industry	All	PE/VC	NB	Issue size, average (GBX)	Market Cap, total (£ million)
Oil & Gas	21	7	14	315.5	3114.4
Basic Materials	29	7	22	231.7	40917.2
Industrials	49	18	31	135.8	18122.6
Consumer Goods	30	15	15	119.6	8280.8
Health Care	34	11	23	125.6	9277.4
Consumer Services	66	37	29	183.6	28483.5
Telecommunications	5	2	3	116.2	520.4
Utilities	7	1	6	109.9	1975.3
Financials	23	11	12	217.1	13769.3
Technology	41	9	32	114.4	5105.5
Total	305	118	187		129566.5

Table 2 composes the industry-based mean and total values between backed and non-backed companies.

The least VC/PE funding was found in the Utilities sector with only 14% of all IPOs having a backing status. When comparing market capitalizations Basic Materials is found to be the largest industry with almost a third of the total market capitalizations on all sectors and with the second largest average issue size. These results are however largely biased since they include the largest IPO ever conducted in the UK markets, Glencore International IPO of 36,34 billion pounds. Without Glencore, the basic materials industry had market capitalizations in total of 4572 million pounds. Lowest market capitalization by sector is telecommunications with only 520 million pounds as the sector had only 5 companies listed throughout the period.

On average, the Oil & Gas sector appeared to present the largest average issue prices with 315.52GBX whereas Utilities had the lowest initial IPO listing price, 109.9GBX. All sectors combined had an average issue value of 167.62GBX.

	Mean			Median		
	PE/VC	NB	Diff.	PE/VC	NB	Diff.
Market Cap (£ million)	535.7	356.8	178.9	199.62	52.53	147.09
New Money Raised (£ million)	134.3	77.4	56.9	49.7	10.6	39.1
Issue Size (GBX)	180.5	159.5	21	160	100	60
Total Assets (£ million)	168.38	62.72	105.66	101.8	18.9	82.9
Underpricing	0.07	0.08	-0.01	0.047	0.056	-0.009
Tobin's Q	2.1	3.8	-1.7	1.31	2.51	-1.2

Table 3 presents the mean and median values and their differences of backed and non-backed companies for the whole sample.

Likewise, market capitalizations appear to be larger with companies that had a former backing status (table 3). The mean market capitalization of backed companies was found to be 535,7 million whereas the non-backed companies had a mean of 356,7 million. These averages are also biased with Glencore. Without the Glencore outlier the average non-backed IPO market capitalization is 162,2 million which is 373,5 million less than backed companies.

Similar results are also found when observing the differences in original issue size in Penny Sterling. By this measure, the backing status have non-backed companies beat in both mean and median values, respectively. Results of issue size and marketplace indicate that most PE/VC backed companies list to the UK Main Market and are by all values larger initially.

When observing the mean values from the left side panel, differences between backing status are found across. Likewise, the median values in the right-side panel share identical results. PE/VC backed companies are larger in market cap size and issue size, raise more new money, have bigger reservoir of assets, are less underpriced and have a lower Q ratio. Average market cap size for a backed company is 535 million pounds, and the median value is at a 200 million level. Especially the median value is distinctly larger than NB companies at almost four times the size as the measure is less prone for outlier observations. Similarly, with new money raised the PE/VC companies display larger median and mean values.

When comparing first day underpricing and Q ratios, these also indicate that PEVC backed companies perform better. Generally, the goal is to price the IPO issue correctly, so no money is left at the table. On average, first day underpricing and Q ratio are lower for backed companies which in this case can be interpreted as a positive sign. When comparing the median value of underpricing only slight difference of -0.009 is observed whereas with the Q ratio a larger difference is present with a value of -1.2. Based on the table, PE/VC firm IPOs were more accurately priced initially, and their stock was less overvalued.

All in all, the private equity backed firms are larger in every Pound Sterling related measure during the 2008 to 2017 period indicating of generally larger IPOs in terms of capital. With underpricing and Q measures lower values can be seen positive as lower underpricing and Q indicate lower asymmetrical information. However, the differences between underpricing levels are minor.

4.3 Methods

For recent studies the most dominant operational performance measures used are the ROA and cash flow values. Especially the median values for these measures are considered more robust since they are less prone for outlier observations, whereas with mean values some skewness may be observed with extreme cases. For data robustness check a few statistical approaches were implemented to the study. In this case the yearly median values are tested with Wilcoxon Signed-rank test and the differences between median values are tested with Mann-Whitney u-test.

4.3.1 Wilcoxon signed-rank test

In a case where normal distribution is not present or needed, a nonparametric alternative to Student's t-test is the signed-rank test. The Wilcoxon signed-rank test with this case attempts to present deductions of the median in one population and its variables must be of at least in an ordinal scale. With its basic and normal form, the test aims to explain the one population's deviation from a hypothesized value, generally from zero. This parameter sets up the null hypothesis to be: H_0 ; population median = 0. If the test value is observed to be less than the critical value, the hypothesis is rejected, and the median values are statistically measured not equal to zero. The Wilcoxon signed-rank test is deployed for every yearly median value dataset in this thesis and the results of the p values are reported in the tables. (Beatty 2018)

4.3.2 Mann-Whitney u-test

Similar to Wilcoxon Signed-rank test, also Mann-Whitney u-test implies the presumption of nonparametric measures. The nonparametric methods are found to be powerful alternatives to their parametric counterparts and Mann-Whitney is one of the most applied tests when comparing median values between samples. The strength of nonparametric tests is that they are addressed without restrictions in data distribution. Especially the non-normality concern which relates to many other

statistical tests is not present and data with different ranges of distribution is available to use. (Liu & McKean 2015)

The basic assumption in a Mann-Whitney test is that the sample's medians are equal. This is presented with null hypothesis as follows: H_0 ; the distribution between the two population samples is equal. (Beatty 2018)

4.3.3 Logistic regression model

When attempting to statistically analyze the differences between performance measures of PE/VC backed and non-backed companies, a logistic regression is applied. The model is more suitable for cases, where the dependent variable is observed to be categorically scaled. Since the dependent variable in this case is PE/VC backing status (0 or 1), a normal linear regression model cannot be utilized as the dichotomous variable would lead to interpretation trouble with unreliable results and the fundamental assumptions (homoscedasticity and normality of errors) of linear regression would be violated (O'Connell 2006). The null hypothesis of a logistic regression is that all of the coefficients in the model are equal to zero, or in other words none of the independent variables are statistically significant in predicting the dependent variable.

In the interest of understanding the performance measures the binary variable of PE/VC backing status is positioned as the dependent variable. Thus, with logistic regression, the complex relationships of the variables can be predicted. Basically, the model is predicting on whether the observed value is located in the dependent variable's zero or one category.

4.3.4 Linear regression model

In order to go even further in the analysis and examine the underlying reasons of which measure (variable) affects the other, a linear regression model is also chosen to be examined. Where the logistic regression predicts on whether the backing status has a significance, the linear regression attempts to answer to which

variables are observed to affect the performance measures and how much. Therefore, the operating performance measures and underpricing proxies are chosen to be the dependent variables which are explained by the control variables. To be precise, the selected model is therefore a multivariate linear regression model, and it is used to approximate the reasoning behind the population. (Olive 2017) Like logistic regression, also linear regression model has a null hypothesis which states that all of the independent variable's coefficients are equal to zero. Therefore, none of the predictor variables have a statistical significance in estimating the response variable.

4.4 Variable definition

4.4.1 Return on assets

The first measure of long-run operating performance in this thesis is selected to be ROA, the measure of return on assets. As it has been throughout the years been the single most dominant measure for estimating operating performance it was also selected to be implied in this research paper (Coakley et al. 2007; Krishnan et al. 2011; Jain & Kini 1994; Chen & Liang 2016).

Return on assets in its simplest form is calculated by dividing the company's EBIT (earnings before interest and taxes) with the average of the total assets in previous and current period. It should be noted that this differs from the standard way of ROA calculation as it uses EBIT instead of net income. By using EBIT, the measure for operating performance is argued to be less prone to capital structure since it does not include the effects of possible interests. Jain & Kini (1994) mention this measure to be especially specific in measuring how the company has utilized its assets in most efficient way.

$$ROA = \frac{EBIT}{Average\ Total\ Assets}$$

(1)

The changes in ROA measures are observed with median values as it has been documented that the mean values appear to be skewed and are observed to be particularly sensitive to outlier observations. For example, with this paper an extreme IPO size outlier affects the mean values drastically thus demonstrating the need for median values and comparison with them. Barber & Lyon (1996) argue that nonparametric tests for median values were found coherently more powerful due to outlier observations and advocate the utilization of such measures.

4.4.2 Operating cash flow ratio

The other operating performance measure applied is described as cash flow ratio which consists of operating cash flows and the two-period average of total assets. Coakley et al. (2007) define the cash flows from operating activities to be more reliable than net income or EBITDA and hence return on asset ratios since operating cash flows are hypothesized to be less inclined to manipulation. Cash flow ratios as operational performance measures are seen to be especially beneficial when measuring for the company present value since cash flows act as the main component in these valuations.

$$CF \text{ Ratio} = \frac{\text{Cash Flow from Operating Activities}}{\text{Average Total Assets}}$$

(2)

4.4.3 Tobin's Q and underpricing

Another measure this thesis applies in the empirical section is Tobin's Q ratio, or simply Q. The ratio was made renowned by James Tobin (1969) in his earlier seminal works where he determines the Q to consist of the company's market value and the replacement cost of the firm's capital stock. Companies with higher Q ratios are found in empirical research to have greater possibilities for growth (Tobin & Brainard 1968) and indicate of superior performance in management with the assets

given (Servaes 1991). In this thesis the Q is also used as a proxy for informational asymmetries as the market value and total asset value are expected to behave in similar trends. Especially the first year Q presents possible asymmetries in information between companies with different backing status. In its simplest form the Q ratio is calculated as shown below:

$$Q = \frac{\textit{Market Value}}{\textit{Average Total Assets}}$$

(3)

There can be many reasons why IPO issue is underpriced as explained earlier in chapter 3.1. These can be related to the underwriter's issue pricing related compensation, tempting appearance for investors, market conditions and so forth. Cumming & Johan (2008) argue that PE/VC backed IPO is expected to be correctly priced as the VC's incentive is for a successful exit after the IPO event. Similarly, as PE/VC backed company is assumed to be superior compared to non-backed company, Loughran & Ritter (2004) present the possibility of underpricing to stem from riskier IPOs. We can presume information asymmetry to have interconnectional factors to risk and therefore underpricing. Underpricing is also selected to explain the possible differences with backing status and information asymmetry. The first day underpricing is calculated as follows:

$$\textit{Underpricing} = \frac{\textit{First day closing price}}{\textit{IPO offer price}}$$

(4)

5 RESULTS

5.1 Operational performance

When comparing the median values of return on assets yearly between PE/VC backed and non-backed companies, the table 4 composes the results. Median values are proposed to be presented instead of mean values because the total sample's possible outliers skew the mean values more drastically than median values. Thus, with possible outlier observations the median values are selected for more robust analysis.

All of the median ROA values were statistically tested with Wilcoxon Signed Rank test. The test statistics vary with PE/VC backing status and different years. NB companies are found to be statistically significant every year with at least 10% confidence level and even p levels of under 0.01. PE/VC backed companies' respectable values appear significant in only two years with p levels of 0.05. Differences between medians were tested with Mann-Whitney test. The test is an alternative to t-test when comparing nonparametric median values between two samples.

When looking at the results it should be considered that the ROA values can differ considerably when comparing different industries as they could have varying capital structures. Differences between industries are found in literature to affect the ROA measures and should therefore be adjusted by industry (Barber & Lyon 1996). However, as the focal point in this thesis is to gain an understanding of PE/VC's impact on operational performance no adjustments were made to any of the operational performance measures based on the company's industry.

Table 4 Return on Assets yearly after an IPO

<i>Return on Assets</i>	PE/VC	NB	Diff
Year 1	4.922% (0.018)**	1.42% (0.077)*	3.502% (0.253)
Year 2	6.339% (0.015)**	-0.597% (0.004)***	6.936% (0.02)**
Year 3	4.956% (0.302)	-2.554% (0.001)***	7.51% (0.019)**
Year 4	3.779% (0.296)	-2.405% (0.002)***	6.184% (0.018)**

The table represents the median annual Returns on assets after the IPO event. Year 1 is the first year after the IPO, year 2 is the second and so forth. Numbers in parentheses are the p-values for each observed median. PE/VC and NB p values derive from Wilcoxon Signed-rank tests and the p values for difference is obtained from Mann-Whitney u-test.

* indicates significance of $p < 0.10$

** indicates significance of $p < 0.05$

*** indicates significance of $p < 0.01$

PE/VC backed companies appear to have a larger median value for every year after the IPO event varying between 3.778% and 6.339%, whereas NB companies present values between -2.554% and 1.42% at the similar period. These results indicate that based on solely the median ROA values yearly the PE/VC backed companies have outperformed the non-backed alternatives throughout the four-year time period. Especially the negative ROA values for NB companies are interesting as they suggest that only in the first year these companies are able to be profitable in relation to their total assets. From the second year onwards, the median values deteriorate still and only in the final year appear to show a slight increase. However, the mostly negative results for NB ROA values indicate of faint operational performance when comparing to the similar time period's PE/VC backed ROA values.

At the similar time period, PE/VC status' impact appears to have an effect on the operational performance as the percentages are positive. The highest value of 6.339% is observed in the second year after which the values begin to descend and reach the lowest value of 3.779% in the last year. From the results it could be argued that PE/VC backed companies are more efficient in creating cash flow from

operating systems with their total assets. Thus, the sponsor-backed companies have outperformed their non-backed counterparts systematically during the time period after their initial IPO when analyzing the median values.

In the first year the ROA difference between PE/VC and non-backed companies is found to be 3.502% which is the lowest difference in the examined data. The largest difference between median values is 7.51%, which is observed to be the third year. In the fourth year the difference is still present, although it decreases 1.3 percentage points from the previous year, but still being quite significant at 6.184%. As mentioned above, the considerable difference between PEVC and NB ROA numbers stems from the NB measures as they decrease below zero. Differences between years 2 to 4 indicate of statistical significance with p-values between 0.018 and 0.02.

Table 5 presents the main findings from cash flow ratio after the company was listed with differences between PEVC backed companies and non-sponsored companies. This table also advocates that private equity plays a role with the operational performance after an initial IPO. The results are very similar to table 4 where PE/VC backed companies have positive returns throughout the period and reach the highest value in the second year. Also, with cash flows the ratios start to decrease after the second year. These results are not however surprising as the two ratios are comparative with each other deriving from similar line items in the financial statement. The yearly ratios are significant with confidence limits of 10% and even 1% excluding the first-year NB observation.

With cash flow ratios the sponsor-backed companies' values are more stable and remain around 6% after the decrease whereas NB companies gradually get inferior year-by-year ending in -3.609%. This is also visible with the diff values as they get greater reaching the largest gap in the fourth year. Likewise, as the yearly difference grows larger, the p-values decrease from 0.012 to 0.003 indicating of strong statistical significance based on the Whitney-Mann test. NB entities were found to have a positive cash flow ratio only in the first year. The declining trend expresses that the three years after the first IPO year are not profitable when comparing the

cash flows from operational activities to total assets and observing the NB companies.

Table 5 Cash flow Ratio yearly after an IPO

<i>Cash flow Ratio</i>	PE/VC	NB	Diff
Year 1	6.301%	1.125%	5.176%
	(0.013)**	(0.110)	(0.119)
Year 2	7.432%	-1.318%	8.749%
	(0.052)*	(0.004)***	(0.012)**
Year 3	5.974%	-2.26%	8.574%
	(0.07)*	(0.003)***	(0.009)***
Year 4	6.001%	-3.609%	9.61%
	(0.058)*	(0.002)***	(0.003)***

The table represents the median annual Cash flow ratios after the IPO event. Year 1 is the first year after the IPO, year 2 is the second and so forth. Numbers in parentheses are the p-values for each observed median. PE/VC and NB p values derive from Wilcoxon Signed-rank tests and the p values for difference is obtained from Mann-Whitney u-test.

* indicates significance of $p < 0.10$

** indicates significance of $p < 0.05$

*** indicates significance of $p < 0.01$

From the dataset it can be concluded that both return on asset and cash flow ratio values are significantly inferior when comparing them between private equity backed companies to their non-backed counterparts. The tables demonstrate that median values are throughout the timeframe positive when company has received external capital and information flows in their pre-IPO period. Contrary to this observation, the non-backed companies present positive values only in the first year after which starting to gradually worsen and reaching the lowest values in the last observed period. It would be interesting to identify which year these values turn positive as the declining trend is obvious and persistent with botch cases. Both ROA and cash flow ratio measures support the first hypothesis of market-based performance being better with backed companies.

5.2 Market performance

When comparing with earlier literature, also market based performance with private equity backed companies has been a widely researched area. Especially the first-day returns, underpricing and short-term market returns have been in the scope for PE backed companies in comparison with non-backed companies. (Carter et al. 1998; Hsu 2004; Nahata 2008). Since the market-based performance is presented also in the hypotheses section as a subsidiary hypothesis, this chapter replies to that occasion and offers results to the presumption. Table 6 presents the results from yearly market returns between PE/VC backed and non-backed companies.

<i>Market returns</i>	PE/VC	NB	Diff
Year 1	1.796% (0.595)	7.311% (0.242)	-5.515% (0.675)
Year 2	-6.309% (0.072)*	-10.047% (0.067)*	3.738% (0.783)
Year 3	-3.248% (0.811)	-10.063% (0.045)**	6.815% (0.166)
Year 4	2.041% (0.073)*	-11.429% (0.144)	13.47% (0.004)***

The table represents the median annual market returns after the IPO event. Year 1 is the first year after the IPO, year 2 is the second and so forth. Numbers in parentheses are the p-values for each observed median. PE/VC and NB p values derive from Wilcoxon Signed-rank tests and the p values for difference is obtained from Mann-Whitney u-test.

* indicates significance of $p < 0.10$

** indicates significance of $p < 0.05$

*** indicates significance of $p < 0.01$

When comparing with earlier results between PE/VC and non-backed companies, the results share similarities, but also differences are present. The first-year median returns are substantially larger with non-backed companies with a difference of 5.515 percentage points and a value of 7.311%. This indicates that in short-term returns with a time span of one year after an IPO event, the non-backed companies are found to be better investments than PE/VC backed companies. The result also

indicates of more correctly priced IPO issue with PE/VC backed companies as the NB companies exhibit larger returns.

As with earlier results, also market returns appear to start diminishing in the second year with NB firms. However, also PE/VC backed returns revert to negative values and drop 8.1 percentage points from the first year ending in -6.309%. Still, the decrease in NB companies market returns is extremely radical, as the total drop from the first year is around 17 percentage points. After the second-year decrease, the PE/VC backed companies present increasing returns, however still staying negative. Only in the fourth year the returns turn back to positive. The fourth year also represents the largest observed difference with 13.47 percentage points. This is due to the NB companies market returns as they continue to decrease ending in a value of -11.429%. The fourth-year value is especially interesting as the first-year market returns indicate of positive and better returns when comparing to PE/VC backed companies. It is also intriguing that the NB returns appear to decrease throughout the observed period and show no sign of turning positive.

To conclude the results of market performance it can be argued that PE/VC backed companies outperform the NB companies in the long run. While both populations slump to negative values, only backed companies are able to present positive returns in long term. When comparing the market return sample with operational performance similarities are found with NB companies as the two performance measures move parallel to each other with decreasing values. However, with backed companies the operational performance appears to reach the highest values in the second year, whereas with market returns the same year is found to be the poorest. These results partially support the second hypothesis of PE/VC backed companies outperforming the non-backed companies. Nonetheless, some discussion is needed as the short-term returns are better without sponsor backing.

5.3 Logistic regression

For evaluating the statistical relationships between a dichotomous dependent variable and the performance and underpricing measures a logistic regression is found to be the best fitting match. The model is constructed with PE/VC backing status as the dependent variable of which the independent variables of ROA, cash flow ratio, underpricing and Q ratio try to predict. Thus, the equation is formulated as follows:

$$\ln\left(\frac{P}{1-P}\right) = a + \beta_1ROA1 + \dots + \beta_4ROA4 + \beta_5CFRatio1 + \dots + \beta_8CFRatio4 + \beta_9Q1 + \dots + \beta_{12}Q4 + \beta_{13}Underpricing \quad (5)$$

Table 7 composes the logistic regression results.

Table 7 Logistic regression of PE/VC status					
PE/VC					
ROA1	-17.688 (0.044)**	CFRatio1	26.942 (0.057)*	Q1	-0.482 (0.090)*
ROA2	16.768 (0.109)	CFRatio2	-14.782 (0.356)	Q2	-0.79 (0.150)
ROA3	1.935 (0.457)	CFRatio3	2.204 (0.718)	Q3	1.169 (0.063)*
ROA4	-0.971 (0.666)	CFRatio4	0.430 (0.931)	Q4	-0.295 (0.508)
Constant	0.782 (0.242)	Underpricing	6.482 (0.158)	χ^2	26.304 (0.015)**

The numbers with variables are the unstandardized beta and their significance levels in parentheses. Chi-square value indicates the goodness of the total model fit.

* indicates significance of $p < 0.10$

** indicates significance of $p < 0.05$

*** indicates significance of $p < 0.01$

When observing the ROA measures and their impact to the model, only the first year indicates of any statistical significance with a p value of 0.044. The results also

indicate that the predicted ROA measures with backed companies have lower returns. These results conflict with table 4 where PE/VC companies had better ROA values. After the first year, also these results indicate of better performance for backed companies, although not with statistical significance and slowly decreasing after the second year. Likewise, with cash flow ratio the first-year predictions are significant with confidence limit of 10%. Contrary to the ROA measures, the second year for cash flow ratio predicts the worst performance of the period and the first year is predicted the best with backed companies. The third year is observed to generate positive values but decrease for the fourth year.

The underpricing variable indicates of higher predictions with PE/VC firms. As the assumption was that the general partner and venture capitalist price the issues more correctly, this result shows opposite outcomes. However, earlier literature also mentions that the financiers systematically underprice their issues which may be the observed effect here (Bradley et al. 2015). The result offers no support for the third hypothesis.

Comparison between Q ratios reveals that with backed companies three years in the time period are observed to be less with PE/VC backing. Interestingly, the third year predicts a higher value and with statistical significance. As the majority of years are observed to indicate lower overvaluing of PE/VC companies, a partial support is found for the third hypothesis. However, some caution is to be considered as the Q ratio does not directly indicate of information asymmetries.

From the results table it can be seen that the goodness of the model fit was observed to be statistically significant with a p value of 0.015 and a Chi-square value of 26.304. Thus, the model was able to predict the outcomes of independent variables with a binary categorization to backed and non-backed with statistical potency.

5.4 Regression analysis to determine dependencies

To gain a further understanding of the underlying dependencies between PE/VC status and long-run operational performance a linear regression method was

selected to be implemented in the study. With multivariate linear regression the factors of operational performance can be studied case-by-case for every year and their respective ROA and cash flow ratio values. Linear regression model offers statistical results which assist in analyzing the relations between variables.

5.4.1 Return on assets

The regression models are executed for every year with ROA being the dependent variable and IPO year, sector number, issue size in market capitalization, issue size in Penny Sterling and PE/VC status being the independent variables. In addition, an extended version of the same regression model is executed with the same independent variables and adding the previous year's ROA value. As overfitting is always a possibility with linear regression models no more control variables were selected.

With the ROA values yearly are expected to be highly correlated, the latest value is assumed to include the earlier year (and the year before) ROA value's explanatory power. The regression models described are as follows:

Return on assets equation 1:

$$ROA_t = \beta_0 + \beta_1 year + \beta_2 industry + \beta_3 sizeMCAP + \beta_4 sizeGBX + \beta_5 PEVC \quad (6)$$

The ROA equation 1 is used for examining the PE/VC status' impact on the yearly ROA values with control variables. The aim is to comprehend whether the earlier backing status has a significant role in the ROA values, so we can understand the possible relationship between operational performance and earlier company funding. When adding earlier ROA measures to the model as described earlier, the 1st equation translates to the following:

Return on assets equation 2:

$$ROA_t = \beta_0 + \beta_1 year + \beta_2 industry + \beta_3 sizeMCAP + \beta_4 sizeGBX + \beta_5 PEVC + \beta_6 ROA_{t-1} \quad (7)$$

Table 8 displays the linear regression analysis results from the ROA equation 1. The first year ROA was found to be statistically significant with PE/VC backing status on a significance level of 5%. This observation can be interpreted that ROA value is expected to be higher if PE/VC status is higher. However, the low R squared value indicates of a powerless predicted model as the variance in the regression is only explained by nearly 3 percent. Similarly, the F value does not confirm the whole model to be significant on any confidence levels under 10%.

In the ROA2 regression similar results were found with the first ROA model where the backing status is of significant value. With this model, the F value is 2.187 which was found to include statistical significance for the whole model in the confidence limits of 10%. ROA3 regression does not include any explanatory power from any of the independent variables and was considered to have the highest variance. The last regression had the highest F value, R squared value and the greatest number of statistically significant independent variables being the best overall model of the period. From the table can be seen that the variable “year” appears to have some impact in estimating the ROA value for the fourth year. None of the other independent variables were observed to include any significance in any of the linear models.

Table 8 Yearly ROA equations								
ROA	ROA1		ROA2		ROA3		ROA4	
	Eq1	Eq1	Eq2	Eq1	Eq2	Eq1	Eq2	
Constant	14.887 (0.550)	30.584 (0.151)	8.143 (0.549)	7.211 (0.700)	-9.214 (0.458)	-31.79 (0.093)*	-16.241 (0.188)	
Industry	0.000 (0.979)	0.004 (0.679)	0.007 (0.181)	0.000 (0.981)	-0.007 (0.204)	0.008 (0.290)	0.011 (0.038)**	
Year	-0.007 (0.546)	-0.015 (0.148)	-0.004 (0.545)	-0.004 (0.695)	0.005 (0.457)	0.016 (0.095)*	0.008 (0.191)	
SizeMCAP	0.000 (0.363)	0.000 (0.259)	0.000 (0.496)	0.000 (0.339)	0.000 (0.936)	0.000 (0.130)	0.000 (0.208)	
SizeGBX	0.000 (0.256)	0.000 (0.272)	0.000 (0.632)	0.000 (0.373)	0.000 (0.989)	0.000 (0.215)	-0.000 (0.003)***	
PEVC	0.119 (0.032)**	0.120 (0.013)**	0.040 (0.191)	0.062 (0.142)	-0.008 (0.772)	0.089 (0.036)**	0.38 (0.163)	
ROA_{t-1}			0.682 (<0.001)***		0.663 (<0.001)***		0.820 (<0.001)***	
F	1.522 (0.183)	2.187 (0.056)*	73.73 (<0.001)***	0.881 (0.494)	53.695 (<0.001)***	2.902 (0.015)**	61.629 (<0.001)***	
R^2	0.029	0.041	0.643	0.017	0.568	0.061	0.631	

The numbers with variables are the unstandardized beta and their significance levels in parentheses. Eq1 references to the first presented equation and Eq2 is the second equation. F values are the results of ANOVA tests for the regression models and numbers in parentheses are the p-values.

* indicates significance of $p < 0.10$

** indicates significance of $p < 0.05$

*** indicates significance of $p < 0.01$

ROA equation 2 results are also found in table 8 (Eq2 columns). This model extends the first equation by factoring in the lagged value of operating performance. The results are similar to the first equation but with much higher F values and R square values. This indicates that the most explanatory power derives from the earlier year's operational performance measure. As the total variance in the models is explained by higher proportion, the PE/VC backing status does not appear to have any statistical significance in any of the years. By adding the ROAt-1 variable in the equation the overall fit of the model is higher and denotes that the variable in question improves the total fit of the whole regression.

All equation 2 models are found to be statistically significant with $p < 0.01$ levels. Identically the single most efficient independent variable was the lagged value $ROA(t-1)$ as they all are significant in the 1% margin in every tested model. Interesting results are however found in the fourth year ROA values as the industry and issue size in Penny Sterling appear to include some significance, even with p values of 0.003. These are unique observations as the equation 1 indicates of no such connection in any of the tested regression models. It can be interpreted that the initial IPO issue offering size does affect the fourth-year return on asset values.

When comparing the values in table 8 with earlier results in this thesis similarities are found across. The second year appears to prevail with highest values in terms of medians and regressions. Identically, values and estimates begin to diminish and turn negative in the last year. All in all, the fourth year indicates the worst operational performance measures and challenges the assumption of long-run performance.

5.4.2 Cash flow ratio

Like the ROA equations, also cash flow ratio was used as a dependent variable to understand the possible relations with PE/VC status to operational performance. The same control variables were selected also with these regressions to gain results of similar and restricted model. The linear regression models used are as follows:

Cash flow ratio equation 1:

$$CFRatio_t = \beta_0 + \beta_1 year + \beta_2 industry + \beta_3 sizeMCAP + \beta_4 sizeGBX + \beta_5 PEVC \quad (8)$$

The equation includes the same control variables IPO year, industry, IPO market capitalization size, IPO issue size in Penny Sterling and PE/VC backing status. The objective is to find which variables have an impact on yearly cash flow ratio measures. When adding the variable for earlier period cash flow ratio measure, the equation translates into following:

Cash flow ratio equation 2:

$$CFRatio_t = \beta_0 + \beta_1 year + \beta_2 industry + \beta_3 sizeMCAP + \beta_4 sizeGBX + \beta_5 PEVC + \beta_6 CFRatio_{t-1} \quad (9)$$

In table 9 is presented the results from cash flow ratio regression models. The independent variable CFRatio appears to reach the highest levels at year two after which they begin to diminish eventually turning negative at the last year in the period. This observation is similar to tables 4 and 5, which reflect cash flow ratio to increase after the first year and then decreasing or remaining stationary depending on the backing status.

When comparing the cash flow ratio regression models to the ROA models, similarities are found from the two tables and results. Especially PE/VC backing status' variable indicates of equivalent results. Similarly, none of the other control variables indicate of any measurable significance throughout the four-year period excluding the fourth-year results in ROA regression model where some variables were found to include minor predictive force.

From the table it is clear that PE/VC variable is considered to include some explanatory power to the regression model in every year during the four-year post-IPO period. Though the significance levels are only at the 10% and 5% levels varying between 0.036 and 0.093, the cash flow ratios are expected to be higher if the company had former financial backing. These results are also in line with earlier ROA models where the second year expresses highest ROA expected value after which a declining trend is distinctly found.

When looking at the F values and R squared values, these too share similarities with the ROA equations as the regressions had the same control variables. Lower F value can be interpreted that the given model is not statistically able to explain the

independent variable's estimation and the model does not appear to have capabilities of reliable predictivity. Only in the second year the regression model displays of some predictive power, however, only at a 10% level. R squared results are almost identical to the ROA model results as they remain around 3% on average throughout the time period with values between 0.027 and 0.034.

Table 9 Yearly cash flow ratio equations

<i>CFRatio</i>	CFRatio1		CFRatio2		CFRatio3		CFRatio4	
	Eq1	Eq1	Eq1	Eq2	Eq1	Eq2	Eq1	Eq2
Constant	9.793 (0.687)	26.755 (0.191)	16.443 (0.171)	8.665 (0.592)	1.258 (0.877)	-8.262 (0.636)	-5.997 (0.510)	
Industry	-0.005 (0.595)	0.002 (0.829)	0.007 (0.238)	-0.002 (0.753)	0.004 (0.253)	-0.003 (0.654)	-0.004 (0.261)	
Year	-0.005 (0.682)	-0.013 (0.188)	-0.008 (0.170)	-0.004 (0.588)	-0.001 (0.874)	0.004 (0.640)	0.003 (0.510)	
SizeMCAP	0.000 (0.324)	0.000 (0.273)	0.000 (0.620)	0.000 (0.229)	0.000 (0.583)	0.000 (0.202)	0.000 (0.611)	
SizeGBX	0.000 (0.195)	0.000 (0.143)	0.000 (0.448)	0.000 (0.145)	-0.001 (0.088)*	0.000 (0.646)	-0.001 (0.584)	
PEVC	0.104 (0.056)*	0.095 (0.041)**	0.020 (0.462)	0.062 (0.093)*	0.014 (0.441)	0.081 (0.036)**	0.003 (0.898)	
<i>CFRatio</i> _{t-1}			0.707 (<0.001)***		0.933 (<0.001)***		0.662 (<0.001)***	
F	1.523 (0.183)	1.966 (0.084)*	100.328 (<0.001)***	1.548 (0.175)	152.873 (<0.001)***	1.488 (0.208)	101.021 (<0.001)***	
R ²	0.027	0.034	0.692	0.028	0.797	0.03	0.695	

The numbers with variables are the unstandardized beta and their significance levels in parentheses. Eq1 references to the first presented equation and Eq2 is the second equation. F values are the results of ANOVA tests for the regression models and numbers in parentheses are the p-values.

* indicates significance of $p < 0.10$

** indicates significance of $p < 0.05$

*** indicates significance of $p < 0.01$

When adding the earlier year cash flow ratio to the regression model, it appears to include a significant amount of explanatory power to the whole model and its goodness of fit. As before, the table 9 also presents the regression model results

with years two to four (in columns marked with Eq2). These are again almost identical to ROA regression equation 2.

The second year is observed to reach the highest estimate and statistically significant independent variable is throughout the period $CFRatio(t-1)$ with confidence limits of 1%. Based on the results table the impact of PE/VC status is again dissipated for every year and almost no impact is observed to derive from earlier financial backing. Likewise, no other control variables are capable to estimate the operational performance with cash flow ratio measures with statistical significance. In the third year a lower issue size appears to have a minor impact to the cash flow ratios but not in statistically significant terms with 10% confidence limits.

Declining trend is noticeable after the second year and estimates fall into negative values again in the last observed year indicating of weak ability to generate cash flows systematically in the timeframe. As before, the model is found to explain the major portion of variance between the variables with F values being over 100 and R square values in the 0.7 to 0.8 region and being of statistical significance in the 1% limits.

To conclude the results from operational performance measure regressions it can be argued that the most impact is found from the earlier year's respective measure. These results hold with both of the cases, ROA, and cash flow ratios. This is no surprise as the t-1 measure entails every earlier period's explanatory power and rarely a large fluctuation is observed with subsequent periods. With t-1 measures added to the model, the total fit of the models is also increased by a major margin.

When observing the regressions without t-1 variables the PE/VC status indicates of minor significance with some of the years. Especially the second year is identified to include some estimative potency with both ROA and $CFRatio$ models. Also, the fourth year is found to have low p-values denoting of statistical significance with the variables. With the results it can be concluded that although the PE/VC status appears to have some significance to the model and variable estimations the effect

is removed when adding another, more explanatory variable to the model. Without t-1 measures in the model there are statistical indications of PE/VC involvement and greater operational performance in every observed year after the IPO event.

5.5 Regression analysis for information asymmetries

In order to examine the possible informational asymmetries, linear regression was also applied. The hypothesis is that PE/VC backed companies indicate a lower level of informational asymmetries as the experienced GP's and managers are able to price the IPO event more accurately than non-sponsored IPOs. Also, the venture capitalist's incentive for a successful IPO can be seen as a factor similarly to the general partners, where positive exits generate possibilities for future private equity funds. Regression analysis was conducted to test the hypothesis where Tobin's Q and first day underpricing were used as the proxies for information asymmetry.

The linear regression model was constructed equal to the ROA and cash flow ratio models where underpricing and Q ratio were applied as dependent variables and the same control variables were selected to be included in these equations. With first day underpricing the regression equation is constructed as shown below.

First day underpricing equation:

$$\text{Underpricing} = \beta_0 + \beta_1 \text{year} + \beta_2 \text{industry} + \beta_3 \text{sizeMCAP} + \beta_4 \text{sizeGBX} + \beta_5 \text{PEVC} \quad (10)$$

Similarly, the Q ratio was implemented into the equation with yearly values. The goal is to understand the PE/VC backing status' significance between years with independent observations and regression models. Thus, the persistency of long-run information asymmetry can be tested statistically. Also, the Q ratio gives a comparative estimate of market performance to total assets which discloses the possible undervaluing or overvaluing of the company. When adding the dependent Q term, the regression model equation transforms as shown below.

Q ratio equation:

$$Q_t = \beta_0 + \beta_1 \text{year} + \beta_2 \text{industry} + \beta_3 \text{sizeMCAP} + \beta_4 \text{sizeGBX} + \beta_5 \text{PEVC} \quad (11)$$

Regression model results are presented in table 10. With first day underpricing (1st day UP) no statistically significant variables are found. Results suggest that PE/VC status has some predictive potency and that backed companies were able to price the initial public offering more accurately than non-backed companies (beta coefficient -0.019). As the p levels are high no conclusive results can be drawn that the results hold compared to presumptions when analyzing their statistical power. The results do not support the third hypothesis of information asymmetries between PE/VC and non-backed companies when observing only the first day underpricing variable.

The first year Q ratio regression is found to include two statistically significant variables, IPO size in market capitalization and PE/VC status. Market capitalization size indicates that the larger IPOs have higher Q ratios in the first year after the initial IPO event. This can be interpreted that deriving from theory informational asymmetry is more present at the first-year interval when market capitalization size is larger. The result holds at 5% confidence level.

Likewise, in the first year PE/VC status variable is observed to be of statistical significance. Based on the results the Q ratio is estimated lower when the firm had PE/VC activity before the IPO event with beta coefficient of -2.365. This projection is also present throughout the time period but only in the first year are the results explicitly statistically significant with confidence limits of 1%. First year Q ratio regression model is also found to be the best model in estimating the dependent variable with F value of 2.834 and p value of 0.02. Slightly above 13% of the model's dependent variable Q's variance is thus predicted by the selected variables as the R squared value indicates.

Table 10 Underpricing and yearly Q values

<i>Underpricing</i>	1 st day UP	Q1	Q2	Q3	Q4
Constant	-0.222 (0.971)	-139.012 (0.694)	-678.788 (0.638)	-431.803 (0.800)	-302.307 (0.017)**
Industry	0.001 (0.768)	0.119 (0.412)	-0.437 (0.462)	-0.446 (0.522)	0.025 (0.625)
Year	0.000 (0.960)	-0.071 (0.688)	0.341 (0.634)	0.219 (0.796)	0.151 (0.016)**
SizeMCAP	-0.000 (0.551)	0.002 (0.022)**	0.000 (0.795)	0.000 (0.829)	-0.000 (0.402)
SizeGBX	-0.000 (0.317)	-0.001 (0.536)	-0.001 (0.806)	-0.001 (0.857)	0.000 (0.335)
PEVC	-0.019 (0.180)	-2.365 (0.002)***	-3.662 (0.266)	-3.827 (0.320)	-0.448 (0.116)
F	0.727 (0.604)	2.834 (0.020)**	0.387 (0.858)	0.293 (0.916)	2.221 (0.053)*
R ²	0.013	0.133	0.007	0.005	0.040

The numbers with variables are the unstandardized beta and their significance levels in parentheses. 1st day UP is the first day underpricing value and Q values represent the yearly Q ratios after the IPO event. F values are the results of ANOVA tests for the regression models and numbers in parentheses are the p-values.

* indicates significance of $p < 0.10$

** indicates significance of $p < 0.05$

*** indicates significance of $p < 0.01$

Interestingly, in the fourth-year variable “year” appears to have explanatory power with p value of 0.016. This result is equal to table 6 where ROA value in the last observed year displays some significance in estimation with variable “year”. With a parameter estimate of 0.151 the fourth year after an IPO event implies higher Q values and thus, more differences with information allocation.

As the PE/VC backed IPO sizes were observed to be generally larger than their non-backed counterparts, the results are somewhat conflicting. Although the companies with PEVC backing status demonstrate lower asymmetries in information based on Q value in the first year, they are also surveyed to issue the shares at higher market cap value (table 3). From the table it can be summarized that while issue size affects

the information asymmetry, also the backing status has an effect. Therefore, it can be derived that lower market capitalization with PE/VC backed companies indicate of the most accurately priced IPOs.

6 CONCLUSION

Although the terms of private equity or venture capital have been presented since the early 1900's, only in the last few decades the field of private equity and venture capital has been largely researched area with various implications of different geographics, time periods and marketplaces. Since there have been conflicting study results and no identical conclusions can be drawn across the research papers, the need for updated and relevant study is seen needed. As the time period selected in this thesis is from 2008 to 2017, the most recent results are gained from the UK markets.

Previous literature on private equity and venture capital describes the complexities on measuring long-run, post-IPO operational performance. Especially the holistic role of a private equity fund or venture capitalist is perceived to be challenging to determine. As these entities are often perceived to only act as the financier, their underlying capabilities to contribute to the longer run performance, market or accounting based, are especially difficult to pinpoint. Although literature offers explanations for PE/VC involvement and long-run performance, the studies are found to conflict with one another, and complex results are discovered. Deriving from the presented hypotheses 1 and 2, and the statistical methods applied in the thesis, the research question of *“Does PE/VC involvement improve the long-run operational performance of companies after an IPO?”* can be reflected.

The results of this study suggest that during the time period of 2008 to 2017, the private equity or venture capital backed companies performed better than non-backed companies in the long run when observing their operational and market performance. Also, judging by the results of operational performance, PE/VC backed companies present better values in both short term and long-term periods. These outcomes support the research by Levis (2011), who finds that between 1992 and 2005 sponsor-backed companies outperform the non-backed firms in all time horizons, have greater assets initially and postulate lower underpricing.

When connecting the previous studies to the results obtained in this study, some conclusions can be drawn. Equivalent results to this thesis of long-run performance are found in the UK markets by Bergström et al. (2006), Coakley et al. (2007) and Bessler & Seim (2012). Brav & Gompers (1997) and Jain & Kini (1995) found that with earlier financial backing the companies exhibit better operating performance in the long run. They merit this difference to the general market consensus of understanding the PE/VC's involvement also in the post-IPO period. Based on their view, the PE/VC's attendance in the IPO event is seen to signal positive characteristics of the company. Similarly, as this study compares the performance values between backed and non-backed companies and does not attempt to explain the underlying profound reasons for differences, the explanation of PE/VC involvement acts indicatively in an equivalent manner. The results denote that throughout the observed time period, PE/VC backed companies present higher ROA and cash flow ratio values every year and are found to be partially statistically significant when explaining operational performance.

While the research question is presented to gain an understanding of the longer-term performance, also the shorter period after an IPO can be analyzed. Especially the second year appears to be significantly better with backed companies when comparing results of the median values and regression models. Although the ROA and cash flow ratio measure differences grow larger yearly when comparing by backing status, the highest performance is found to be the second year. Nevertheless, as the gap between performance measures is larger with every observed year, it can be concluded that companies with PE/VC backing status have considerably and statistically performed better. These findings also support both of the performance related hypotheses:

H1: PE/VC backed companies outperform the non-backed companies in their accounting-based performance

H2: PE/VC backed companies outperform the non-backed companies in their market-based performance

Underpricing is generally found greater with smaller firms and the results support the hypothesis of size effect suggested by Switzer (2010). Possible reason is presented by Lowry, Officer & Schwert (2019), who find that smaller companies with minor market capitalizations are more difficult to price and thus present more underpricing compared to bigger IPOs. As established earlier in section 4.2, the non-backed companies are both smaller in market capitalization size and initial issue size which substantiate the theory behind earlier results. Conflicting results with underpricing are found when predicting the logistic regression as PE/VC backed companies were found to have larger estimated values. Linear regression model confirms that underpricing is not found statistically significant when controlling by sponsor backing status. On the contrary, the estimates of Q indicate that the first year after an IPO event backed companies presented lower values. This result holds with every observed year. However, as the results do not indicate statistical significance, no comprehensive support for the third hypothesis is found.

H3: PE/VC backed companies present lower information asymmetries than non-backed companies

The results together with the third hypothesis also aspire to answer the second research question presented: *“Is there a relationship with PE/VC backing status and information asymmetries?”*. Since underpricing and Q ratio were utilized as proxies to explain information asymmetries, no significant support is found between PE/VC and non-backed companies. While the statistics do indicate differences between backing statuses, no permanent significance is found. Especially the linear regression results for underpricing and yearly Q ratios were found to present values which were presupposed. However, as the estimates are not found statistically significant the robustness of the results is unsatisfactory.

The current research presented limitations which should be accounted for future research. As mentioned earlier, the focus based on literature is shifting towards industry-adjusted or altogether adjusted measures especially when comparing operational performance measures. When the industry-effect is not controlled, the performance measures are mixed together and industries with normally higher (or

lower) measures are included in the sample. To gain a profound understanding of the PE/VC involvement, also the characteristics of a PE fund, general partner or venture capitalist should be evaluated. For example, earlier literature mentions that the VC's age and reputation can have a significant impact when comparing the financiers together. Similarly, the form of funding can also be extended to include leveraged buyouts or management buyouts as the core substance in research.

REFERENCES

- Aggarwal, R., Krigman, L. & Womack, K. (2002) Strategic IPO underpricing, information momentum, and lockup expiration selling. *Journal of Financial Economics* 66, 1, 105-137.
- Amit, R., Glosten, L. & Muller, E. (1990) Entrepreneurial ability, venture investments and risk sharing. *Management Science* 36, 10, 1233-1246.
- Amit, R., Brander, J. & Zott, C. (1998) Why do venture capital firms exist? Theory and Canadian evidence. *Journal of Business Venturing* 13, 6, 441-466.
- Arthurs, J. & Busenitz, L. (2003) The Boundaries and Limitations of Agency Theory and Stewardship Theory in the Venture Capitalist/Entrepreneur Relationship. *Entrepreneurship Theory and Practice* 82, 2, 145-162.
- Arundale, K. (2017) Exploring the Difference in Performance Between UK/European Venture Capital Funds and US Venture Capital Funds. PhD Dissertation. Adam Smith Business School, University of Glasgow. Glasgow, United Kingdom.
- Axelson, U., Strömberg, P. & Weisbach, M. (2009) Why Are Buyouts Levered: The Financial Structure of Private Equity Funds. *The Journal of Finance* 64, 4, 1549-1582.
- Axelson, U., Jenkinson, T., Strömberg, P. & Weisbach, M. (2008) Leverage and Pricing in Buyouts: An Empirical Analysis. *IDEAS Working Paper Series from RePEc* 2008.
- Bance, A., (2004) Why and How to Invest in Private Equity? *EVCA Investors Relations Committee Paper*.
- Barber, B. & Lyon, J. (1996) Detecting abnormal operating performance: The empirical power and specification of test statistics. *Journal of Financial Economics* 41, 359-399.
- Bauer, M., Bilo, S. & Zimmermann, H. (2001) Publicly Traded Private Equity: An Empirical Investigation. *WWZ/Department of Finance Working Paper No. 5/01*.

- Barry, C. (1994) New Directions in Research on Venture Capital Finance. *Financial Management* 23, 3, 3-16.
- Beatty, W. (2018) Decision Support Using Nonparametric Statistics. [e-book]. [Accessed 26.5.2022].
- Belghitar, Y. & Dixon, R. (2012) Do venture capitalists reduce underpricing and underperformance of IPOs? *Applied Financial Economics* 22, 1, 33-44.
- Berger, A. & Udell, G. (1998) The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. *Journal of Banking & Finance* 22, 6, 613-673.
- Bergström, C., Nilsson, D. & Wahlberg, M. (2006) Underpricing and Long-Run Performance Patterns of European Private-Equity-Backed and Non-Private-Equity-Backed IPOs. *The Journal of Private Equity* 9, 4, 16-47.
- Berkovits, Y., Feldhütter, P. & Vig, V. (2020) Leveraged buyouts and bond credit spreads. *Journal of Financial Economics* 135, 3, 577-601.
- Bessler, W. & Seim, M. (2012) The performance of venture-backed IPOs in Europe. *Venture Capital* 14, 4, 251-239.
- Bradley, D., Kim, I. & Krigman, L. (2015) Top VC IPO Underpricing. *Journal of Corporate Finance* 31, 186-202.
- Brav, A. & Gompers, P. (1997) Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Backed Companies. *The Journal of Finance* 52, 5, 1791-1821.
- Brown, G., Gredil, O. & Kaplan, S. (2018) Do private equity funds manipulate reported returns? *Journal of Financial Economics* 132, 267-297.
- Bygrave, W. & Timmons, J. (1992) *Venture Capital at Crossroads*. Harvard Business Press, Boston.
- British Venture Capital Association, BVCA (2018) *The UK Private Equity IPO Report*. BVCA Special paper.

- Cable, D. & Shane, S. (1997) A Prisoner's Dilemma Approach to Entrepreneur-Venture Capitalist Relationship. *Academy of Management Review* 22, 1, 142-176.
- Cao, J. & Lerner, J. (2009) The performance of reverse leveraged buyouts. *Journal of Financial Economics* 91, 2, 139-157.
- Carter, R., Dark, F. & Singh, A. (1998) Underwriter Reputation, Initial Returns, and the Long-Run Performance of IPO Stocks. *The Journal of Finance* 53, 1, 285-311.
- Chen, H. & Liang, W. (2016) Do venture capitalists improve the operating performance of IPOs? *International Review of Economics and Finance* 44, 291-304.
- Cliff, M. & Denis, D. (2004) Do Initial Public Offering Firms Purchase Analyst Coverage with Underpricing? *The Journal of Finance* 59, 6, 2871-2901.
- Coakley, J., Hadass, L. & Wood, A. (2007) Post-IPO Operating Performance, Venture Capital, and the Bubble Years. *Journal of Business Finance & Accounting* 34, 9&10, 1423-1446.
- Cumming, D. (2008) Contracts and exits in venture capital finance. *The Review of Financial Studies* 21, 5, 1947-1982.
- Cumming, D. & Dai, N. (2010) Fund size, limited attention and valuation of venture capital backed firms. *Journal of Empirical Finance* 18, 1, 2-15.
- Cumming, D. & Johan, S. (2008) Information asymmetries, agency costs and venture capital exit outcomes. *Venture Capital (London)* 10, 3, 197-231.
- Cumming, D. & Zambelli, S. (2009) Illegal buyouts. *Journal of Banking & Finance* 34, 2, 441-456.
- Cressy, R. (2006) Venture Capital. *The Oxford Handbook of Entrepreneurship* Ch. 14, ed. M. Casson OUP.
- Eckermann, M. (2006) Venture Capitalists' Exit Strategies under Information Asymmetry: Evidence from the US Venture Capital Market. [e-book]. [Accessed 28.5.2022].
- Eisenhardt, K. (1989) Agency Theory: An Assessment and Review. *Academy of Management Review* 14, 1, 54-74.

Elston, J. & Yang, J. (2010) Venture capital, ownership structure, accounting standards and IPO underpricing: Evidence from Germany. *Journal of Economics and Business* 62, 6, 517-536.

Espenlaub, S., Gregory, A. & Tonks, I. (2000) Re-assessing the long-term underperformance of UK Initial Public Offerings. *European financial management: the journal of the European Financial Management Association* 6, 3, 319-342.

Francis, B. & Hasan, I. (2001) The Underpricing of Venture and Nonventure Capital IPOs: An Empirical Investigation. *Journal of Financial Services Research* 19, 2, 99-113.

Fried, V. & Hisrich, R. (1994) Toward a Model of Venture Capital Investment Decision Making. *Financial Management* 23, 3, 28-38.

Fried, V., Hisrich, R. & Bruton, G. (1998) Strategy and the Board of Directors in Venture Capital-Backed Firms. *Journal of Business Venturing* 13, 6, 493-503.

Gilligan, J. & Wright, M. (2014) Private Equity Demystified: An Explanatory Guide. *ICAEW Corporate Finance Faculty* 3rd Ed. London.

Gompers, P. (1994) The Rise and Fall of Venture Capital. *Business and Economic History* 23, 2, 1-14.

Gompers, P. (1995) Optimal Investment, Monitoring, and the Staging of Venture Capital. *The Journal of Finance* 50, 5, 1461-1489.

Gompers, P. (1996) Grandstanding in the venture capital industry. *Journal of Financial Economics* 42, 1, 133-156.

Gompers, P. & Lerner, J. (1997) An analysis of compensation in the U.S. venture capital partnership. *Journal of Financial Economics* 51, 1, 3-44.

Gompers, P. & Lerner, J. (2001) The venture Capital Revolution. *Journal of Economic Perspectives* 15, 2, 145-168.

Gompers, P. & Lerner, J. (2002) The Venture Capital Cycle. [e-book]. [Accessed 27.5.2020].

Gompers, P. & Lerner, J. (2003) The Really Long Performance of Initial Public Offerings: The Pre-Nasdaq Evidence. *The Journal of Finance* 58, 4, 1355-1392.

Gompers, P., Kaplan, N. & Mukharlyamov, V. (2016) What do private equity firms say they do? *Journal of Financial Economics* 121, 3, 449-476.

Guney, Y. & Iqbal-Hussein, H. (2012) Capital Structure and IPO Market Timing in the UK. University of Hull Working Paper.

Hoshi, T., Kashyap, A. & Scharfstein, D. (1991) Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups. *The Quarterly Journal of Economics* 106, 1, 33-60.

Hoskisson, R., Shi, W., Yi, X. & Jin, J. (2013) The Evolution and Strategic Positioning of Private Equity Firms. *Academy of Management Perspective* 26, 1, 22-38.

Hsu, D. (2004) What Do Entrepreneurs Pay for Venture Capital Affiliation? *The Journal of Finance* 59, 4, 1805-1844.

Hurduzeu, G. & Popescu, M-F. (2015) The history of junk bonds and leveraged buyouts. *Procedia Economics and Finance* 32, 1268-1275.

Huss, M. & Steger, D. (2020) Diversification and Fund Performance – An Analysis of Buyout Funds. *Journal of Risk and Management* 13, 136.

Huss, M. & Zimmermann, H. (2018) The Pricing of Liquidity Risk in Buyout Funds- A Public Market Perspective. *Schmalenbach Business Review* 70, 3, 285-312.

Jain, B. & Kini, O. (1994) The Post-Issue Operating Performance of IPO Firms. *The Journal of Finance* 49, 5, 1699-1726.

Jain, B. & Kini, O. (1995) Venture Capitalist Participation and the Post-issue Operating Performance of IPO Firms. *Managerial and Decision Economics* 16, 6, 593-606.

Jelic, R., Saadouni, B. & Wright, M. (2005) Performance of Private to Public MBOs: The Role of Venture Capital. *Journal of Business Finance & Accounting* 32, 3&4, 643-683.

- Jenkinson, T., Landsman, W., Rountree, B. & Soonawalla K. (2020) Private Equity Net Asset Value and Future Cash Flows. *The Accounting Review* 95, 1, 191-210.
- Joshi, K. & Subrahmanya, M. (2015) Information Asymmetry Risks in Venture Capital Investments: Strategies of Transnational Venture Capital Firms in India. *South Asian Journal of Management* 22, 2, 36-60.
- Kanniainen, V. & Keuschnigg, C. (2004) Start-up investment with scarce venture capital support. *Journal of Banking & Finance* 28, 8, 1935-1959.
- Kaplan, S. & Lerner, J. (2010) It Ain't Broke: The Past, The Present, and Future of Venture Capital. *Journal of Applied Corporate Finance* 22, 2, 36-47.
- Kaplan, S. & Strömberg, P. (2009) Leveraged Buyouts and Private Equity. *The Journal of Economic Perspectives* 23, 1, 121-146.
- Kleinschmidt, M. (2007) Venture Capital, Corporate Governance, and Firm Value. [e-book]. [Accessed 2.11.2019]. doi: 10.1007/978-3-8350-9428-4
- Krishnan, C., Ivanov, V., Masulis, R. & Singh, A. (2011) Venture Capital Reputation, Post-IPO Performance, and Corporate Governance. *Journal of Financial Quantitative Analysis* 46, 5, 1295-1333.
- Lerner, J. (1994) The Syndication of Venture Capital Investments. *Financial Management* 23, 3, 16-28.
- Lerner, J. & Schoar, A. (2004) The illiquidity puzzle: theory and evidence from private equity. *Journal of Financial Economics* 72, 1, 3-40.
- Levis, M. (2011) The Performance of Private Equity Backed IPOs. *Financial Management* 40, 1, 253-277.
- Liu, R. & McKean, J. (2015) Robust Rank-Based and Nonparametric Methods. [e-book]. [Accessed 26.5.2022].
- Liu, X. & Ritter, J. (2011) Local underwriter oligopolies and IPO underpricing. *Journal of Financial Economics* 102, 3, 579-601.
- Loughran, T. & Ritter, J. (1995) The New Issues Puzzle. *The Journal of Finance* 50, 1, 23-51.

- Loughran, T. & Ritter, J. (2004) Why Has IPO Underpricing Changed Over Time. *Financial Management* 33, 3, 5-37.
- Lowry, M., Officer, M. & Schwert, W. (2010) The Variability of IPO Initial Returns. *The Journal of Finance* 65, 2, 425-465.
- MacIntosh, J. (1994) Legal and Institutional Barriers to financing Innovative Enterprise in Canada. School of Policy Studies, Queen's University, Discussion Paper 94-10.
- Mathonet, P-Y. & Meyer, T. (2007) J Curve exposure: managing a portfolio of venture capital and private equity funds. [e-book]. [Accessed 2.11.2019].
- Meggison, W. & Weiss, K. (1991) Venture Capital Certification in Initial Public Offerings. *The Journal of Finance* 46, 3, 879-901.
- Metrick, A. & Yasuda, A. (2010) The Economics of Private Equity Funds. *The Review of Financial Studies* 23, 6, 2303-2341.
- Mikkelson, W., Partch, M. & Shah, K. (1997) Ownership and operating performance of companies that go public. *Journal of Financial Economics* 44, 3, 281-307.
- Morsfield, S. & Tan, C. (2006) Do Venture Capitalists Influence the Decision to Manage Earnings in Initial Public Offerings? *The Accounting Review* 81, 5, 1119-1150.
- Nahata, R. (2008) Venture capital reputation and investment performance. *Journal of Financial Economics* 90, 2, 127-151.
- Nikoskelainen, E. & Wright, M. (2007) The impact of corporate governance mechanisms on value increase in leveraged buyouts. *Journal of Corporate Finance* 13, 4, 511-537.
- Olive, D. (2017) Linear Regression. [e-book]. [Accessed 29.5.2022].
- O'Connell, A. (2006) Logistic Regression models for ordinal response variables. [e-book]. [Accessed 29.5.2022].
- Prowse, S. (2011) Economics of the Private Equity Market. *Economic Review – Federal Reserve Bank of Dallas* 3rd Quarter, 21-34.

Rindermann, G. (2004) The Performance of Venture-Backed IPOs on Europe's New Stock Markets: Evidence from France, Germany, and the U.K. *Advances in Financial Economics* 10, 231-294.

Sahlman, W. (1990) The structure and governance of venture-capital organizations. *Journal of Financial Economics* 27, 2, 473-521.

Sapienza, H. & Gupta, A. (1994) Impact of Agency Risks and Tax Uncertainty on Venture Capitalist – CEO Interaction. *Academy of Management Journal* 37, 6, 1618-1632.

Sapienza, H., Korsgaard, A., Goulet, P. & Hoogendam, J. (2000) Effects of agency risks and procedural justice on board processes in venture capital-backed firms. *Entrepreneurship & Regional Development* 12, 4, 331-351.

Schertler, A. & Tykvová, T. (2010) Venture capital and internationalization. *International Business Review* 20, 4, 423-439.

Servaes, H. (1991) Tobin's Q and the Gains from Takeovers. *The Journal of Finance* 46, 1, 409-419.

Sorensen, M. (2007) How Smart is Smart Money? A Two-Sided Matching Model of Venture Capital. *The Journal of Finance* 62, 6, 2725-2762.

Stein, J. (2005) Why Are Most Funds Open-End? *The Quarterly Journal of Economics* 120, 1, 247-272.

Stowell, D. (2013) Investment Banks, Hedge Funds, and Private Equity. [e-book]. [Accessed 2.11.2019].

Switzer, L. (2010) The behaviour of small cap vs. large cap stocks in recession and recoveries: Empirical evidence from the United States and Canada. *North American Journal Economics and Finance* 21, 3, 332-346.

Söderblom, A. (2011) Private Equity Fund Investing: Investment Strategies, Entry Order and Performance. PhD Dissertation. Stockholm School of Economics.

Tobin, J. & Brainard, W. (1968) Pitfalls in Financial Model Building. *The American Economic Review* 58, 2, 99-122.

Trester, J. (1998) Venture capital contracting under asymmetric information. *Journal of Banking & Finance* 22, 6, 675-699.

Wang, C., Wang, K. & Lu, Q. (2003) Effects of venture capitalists' participation in listed companies. *Journal of Banking & Finance* 27, 10, 2015-2034.

Wood, G. & Wright, M. (2009) Private equity: A review and synthesis. *International Journal of Management Reviews* 11, 4, 361-380.

Wright, M. (2013) Private equity: Managerial and policy implications. *Academy of Management Perspectives* 27, 1, 1-16.