LUND
UNIVERSITY

Off to a flying start

- *A study about the long run market performance of VC-backed IPOs in Sweden*

Authors:

Lucas Nicander

Gustaf Jesper Lennart Roland Ström

Examinator: Håkan Jankensgård

Supervisor: Niclas Andrén

Date of submission: 2021-05-28

Seminar date: 2021-06-04

Course: BUSN79, Degree Project in Accounting and Finance

Authors: Lucas Nicander, Gustaf Jesper Lennart Roland Ström

Advisor: Niclas Andrén

Key words: Long run market performance, VC-backed IPO, VC-reputation, VC-backing quality, Swedish VC-industry

Purpose: The purpose of this study is to investigate the long run market performance, defined as three years, of VC-backed IPOs in Sweden to assess the quality of VC-backing for IPOs in the Swedish VC-industry. A further aim is to examine how a VCs reputation affects the quality of VC-backing in the Swedish VC-industry.

Methodology: The econometric methodology is based on measuring long run market performance with *Calendar Time Abnormal Returns* (*CTAR*). Further methodology is based on running an Ordinary Least Squares (OLS) focusing on the relationship between *CTAR* and our main explanatory variable *VC-Reputation*.

Theoretical perspective: We make use of concepts related to VCs and IPOs from previous research in the fields.

Empirical foundation: The sample of this study consists of 73 VC-backed IPOs issued from 2000-01-01 to 2017-12-13.

Conclusions: By observing the long run market performance, defined as three years, of Swedish VC-backed IPOs, we find that this set of new listings overperform the market in the long run. Controlling for *VC-reputation* further shows that backing by more reputable VCs improve long run performance. Therefore, the result of our study indicates a good quality in Swedish VC-backing, which improves with a VCs reputation. These results remain intact after testing the significance of *Buy-and-Hold Abnormal Return* (*BHAR*) and winsorized *CTAR*. Additionally, our result remains intact after rerunning our base regression model with winsorized *CTAR* and *VC-Reputation*.

Acknowledgements: We would like to thank our supervisor Niclas Andrén for valuable guidance and advice during the thesis.

Table of content

1. Introduction

Ritter (1991) documents a long run underperformance of initial public offerings (IPOs) of common stock suggesting that, in the long run, new listings tend to be overpriced. **He** implies that investors tend to be irrationally overoptimistic about a firm's future growth opportunities the first time it issues equity, causing the share price to become overvalued in the aftermarket. However, over time the firm starts showing a public track record that does not correspond to the high expectations, as a consequence the share price drops and the long run underperformance is a fact.

In contrast, Brav and Gompers (1997) show that IPOs backed by a venture capitalist (VC) tend to overperform the market in the long run. A VC is a financial intermediary that specializes in funding for private firms. The presence of a VC is suggested to mitigate the potential overvaluation caused by irrational investors that may lead to a long run underperformance. For example, a VC-backed IPO-firm may have higher institutional shareholdings as institutional investors are a primary source of capital for VCs. This will reduce exposure to irrational investors as they get less room to affect the share price and therefore less room to overvalue the IPO. Apart from mitigating potential overvaluation, VC-backing can contribute to a long run overperformance. For example, a VC can provide monitoring, management, and networks that can impact a portfolio firm and help it overperform in the long run.

The long run performance of IPOs is well-researched in economic literature. There is an agreement on the notion that IPOs tend to underperform in the long run, and it has also been shown to apply to other countries (Loughran and Ritter, 1995; Brav and Gompers, 1997). However, the literature that covers the long run performance of VC-backed IPOs is lacking and mixed. Existing literature mainly focuses on the US and UK where Brav and Gompers (1997) and Levis (2011) finds that VC-backed IPOs overperform the market in the long run. In contrast, Rindermann (2004) shows that VC-backed IPOs underperform the market in the long run in Germany and France, suggesting that there are differences in the quality of VC-backing across VC-industries.

In terms of what can affect the long run performance of VC-backed IPOs, the literature lacks even more. Krishnan, Ivanov, Masulis, and Singh (2011) highlight that a VCs reputation may affect the aftermarket performance of VC-backed IPOs. **The authors** highlight that previous

research shows strong support of that reputation can be a valuable asset for financial intermediaries. A VCs reputation is important to VC-fund investors as well as portfolio firms. Fund investors care about reputation as it shows that a VC is competent at nurturing their portfolio firms and eventually generate returns in exits. Moreover, firms in need of VC-funding tend to prefer affiliating with more reputable VCs in favour of higher financial offers, as they impact their portfolio firms better. Backing by a more reputable VC may imply a stronger aftermarket performance for an IPO and therefore better quality of VC-backing. This is possible due to that a more reputable VC may have better monitoring, management, and networks in addition to being able to back inherently better firms.

A VCs reputation must not necessarily have a positive effect on long run performance. The reputational concerns of a VC may imply an incentive to *grandstand*. This means that VCs take firms public irrespective of if they are inherently strong enough, as they want to establish a reputation of being able to exit through IPOs (Gompers, 1996). As a result, inherently weak firms may be brought to the market and eventually underperform in the long run. Nevertheless, reputation may have a negative effect on the long run performance and the quality of VC-backing for IPOs as the VC may have grandstanded to establish it (Krishnan *et al*. 2011).

At present there seems to be few, if any, published empirical studies examining the long run performance of VC-backed IPOs in Sweden. The Swedish stock markets have a large number of IPOs in relation to country size (Bloomberg, 2017). Sweden also has the second highest VC-market share relative to GDP in Europe, following the UK (SVCA, 2020), and was one of the first VC-markets in Europe. Moreover, Sweden has a financial infrastructure that is beneficial for VCs (SVCA, 2017). Empirical evidence has previously shed light on the long run performance of VC-backed IPOs in other mature and established VC-industries, such as the US and the UK. Given the mixed international evidence of the long run performance of VC-backed IPOs and the incentive to grandstand, it emphasises the need for a refined assessment of the Swedish VC-industry. By focusing on the long run market performance, defined as three years, and the effects of a VCs reputation on long run market performance in Sweden, we can broaden the empirical evidence with findings from another well-established VC-industry. This can give an insight into the quality of VC-backing in the Swedish VC-industry and entail if more reputable VCs increase or decrease the quality in VC-backing.

The outline of the paper is as follows. Section 2 presents previous research, in Section 3 hypotheses for our study are derived, and Section 4 presents our methodology. Section 5

displays descriptive statistics, Section 6 presents and analyses the empirical findings, and Section 7 concludes.

2. Previous Research

2.1 VC-Backing and Long Run Performance - An Introduction

As shown by Ritter (1991), IPOs tend to underperform in the long run as they may become initially overvalued by irrational investors who have overoptimistic expectations about the firm's growth opportunities. The overoptimism can be especially high during *windows of opportunity*. Firms interested in going public want to take advantage of these windows, as they can sell shares at a higher price. Therefore, the volume of IPOs will be higher during windows of opportunity but so will the risk of an IPO becoming overvalued by irrational investors, eventually leading to long run underperformance.

In contrast, Brav and Gompers (1997) suggest that VC-backed IPOs overperform in the long run as it can mitigate a potential overvaluation. First, a VCs' reputational concerns make it important for the intermediary to not become associated with failures in the market. VCs are therefore not willing to hype a stock and cause an overvaluation that leads to underperformance. Second, as aforementioned, a VC-backed IPO-firm may have higher institutional shareholdings as institutional investors are a primary source of capital for VCs. Third, a VCs relationship with top tier national investment banks increases coverage from high quality analysts who follow their firms and thus reduce asymmetric information. Consequently, the reduced asymmetric information reduces the exposure to irrational investors that may overvalue an IPO which later leads it to underperform.

Brav and Gompers (1997) also state that VCs can help firms overperform in the long run by impacting them. For example, **the authors** highlight that a VC can put more effective management structures in place. In addition to US evidence, Levis (2011) finds that VC-backed IPOs in the UK overperform in the long run and suggest that it can be a result of VCs ability to impact their portfolio firms. For instance, **he** suggests that a VC may impact a firm as they can improve the firm's corporate governance structure.

In contrast to empirical evidence from the US and UK, Rindermann (2004) shows that VC-backed IPOs in Germany and France underperform in the long run. However, **he** does not imply that a VC may fail to mitigate any overvaluation, which later leads an IPO to underperform.

Instead, **he** emphasises that the results indicate that there are differences in the quality of VC-backing across VC-industries. If VC-backed IPOs underperform such as in Germany and France, the quality of VC-backing may be inferior. In parallel, the quality of VC-backing may be good if VC-backed IPOs overperform such as in the US and UK. Rindermann (2004) suggests that the differences in quality may depend on how well-established and mature the studied VC-industries are. At the time, Germany and France had less established and mature VC-industries than, for example, the US and therefore less experienced VCs. A lower level of experience implies that VCs are more inferior at screening and impacting firms, whilst bringing firms public despite that they might be weak. Compared to more well-established VC-industries where the VCs are more experienced, a lower level of experience may lead the VC-backed IPOs to underperform.

2.2 VC-Experience

Sörensen (2007) suggests that more experienced VCs are better at bringing firms public. A more experienced VC also has better *influence*, implying that they are better at providing management, monitoring, and networks to their portfolio firms. However, **he** also implies that it is difficult to distinguish influence from *sorting* as it remains an econometric challenge. Sorting implies that more experienced VCs will have the possibility to back inherently better firms. Sorting can arise as firms tend to affiliate with more reputable VCs as they prefer to prioritise whose funding they accept rather than how much.

Drawing on the benefits that follow from influence, research has provided illustrations on how monitoring, management, and network may contribute to impact a firm. First, as aforementioned regarding management, VCs may be able to implement more effective management structure (Brav and Gompers, 1997) or improve the corporate governance of their portfolio firms (Levis, 2011). Second, Admit and Pfleiderer (1994) show how a VC can reduce the risk of overinvestment and therefore agency cost through monitoring. **The authors** highlight that a VC can observe private information as well as become involved in subsequent investment decisions. Consequently, this leads to that the VC can reduce agency costs by reducing the risk of overinvestment. Third, in terms of networks, Nahata (2008) suggests that a VC can build more relationships with lawyers, auditors, investment bankers, institutional investors, VC-fund investors, and others who contribute to the portfolio of firms through providing useful services.

2.3 A VCs Reputation - A Product of Grandstanding or Better VC-Backing Quality

As emphasised by Rindermann (2004), less experienced VCs in less established VC-industries tend to only focus on bringing firms public irrespective of if they are inherently strong enough. Consequently, the firms display a long run underperformance. Less experienced VCs that only focus on bringing firms public irrespective if they are inherently strong enough have been conceptualised by Gompers (1996) as grandstanding. **He** shows that reputational concerns for a less experienced VC can make it more inclined to grandstand. VCs establish VC-funds to raise capital used in future investment, where the majority of the returns in these funds are generated through IPOs. Thus, it is critical for future fundraising and securing a future deal flow to establish a reputation of taking firms public. Being unable to take firms public will make it more difficult to raise future capital from VC-fund investors. In contrast, VCs with the ability to bring firms public will find it easier to raise capital.

Krishnan *et al.* (2011) suggest that reputation may have a negative effect on long run performance of IPOs due to that less experienced VCs have an incentive to grandstand. More reputable VCs could have a negative effect on long run performance for an IPO as a less experienced VC may have grandstanded to establish its reputation. However, with more experience and less incentive to grandstand, more reputable VCs may be able to lead to a stronger long run performance for IPOs. **The authors** suggest that this can be attributed to sorting and influence, as more reputable VCs are able to provide better monitoring, management, and networks in addition to being able to back better firms.

3. Hypothesis development

3.1 Hypothesis 1

Given that our study focuses on Sweden, we expect a good quality of VC-backing and therefore that VC-backed IPOs overperform in the long run. Similar to the US and UK, where VC-backed IPOs overperform, Sweden also has a mature and more established VC-industry. Evidence from Rindermann (2004) shows that VCs in less established VC-industries are less experienced. In contrast, VCs in the Swedish VC-industry are more experienced due to the Swedish VC-industry´s maturity. Thus, the VCs may be better at screening, influence, and sorting. We therefore expect good quality of VC-backing in the Swedish VC-industry and derive the following hypothesis:

H1: Swedish VC-backed IPOs overperform the market in the long run

3.2 Hypothesis 2

As VCs in the Swedish VC-industry are more experienced, they should be less inclined to grandstand. More reputable VCs may instead be better at sorting and influence in addition to being less inclined to grandstand. Backing by more reputable VCs should therefore increase VC-backing quality and have a positive effect on long run market performance. Thus, we derive the following hypothesis:

H2: There is a positive relationship between VC-reputation and long run market performance

4. Data and Methodology

4.1 Sample Construction of Swedish VC-Backed IPOs

Our sample consists of VC-backed IPOs issued on all Swedish stock markets between 1st January 2000 to 31st December 2017. As we measure market performance over a period of 36 months, our studied time frame is 1st January 2000 to 31st December 2020. The literature on IPO-performance commonly uses a 36-month aftermarket window as there is little proof of abnormal returns after this timeframe ends (Ritter, 1991). Data for Swedish IPOs that are VC-backed is accumulated from Bureau van Dijk's Zephyr. The initial sample consisted of 77 VC-backed IPOs. However, due to unavailable data the final dataset contains 73 Swedish VC-backed IPOs.

4.2 Defining Venture Capital

There is no consensus in the literature of how VC-backed IPOs are defined. For instance, Levis (2011) defines an IPO as VC-backed if the sponsor at the time of the IPO provided funding in the start-up, development, or expansion phase. In contrast, **he** defines an IPO as private equity (PE)-backed if the sponsor at the time of the IPO provided funding in the later stages of a firm's life cycle. Another strand of the literature does not define VC- and PE-backed IPOs differently. For example, Krishnan *et al.* (2011) define an IPO as VC-backed if the sponsor at the time of the IPO had made investments in any stage of the life cycle.

There are different methods for defining VC-backed IPOs, given the lack of consensus in the literature. It might be problematic to follow the definition that defines an IPO as VC-backed if

the sponsor at the time of the IPO provided capital in the earlier stages of the life cycle. Levis (2011) highlights that PEs and VCs may overlap with their investments. For example, PEs investing in an earlier stage in a firm's life cycle and VCs investing in later stages. Thus, they deviate from **his** original definitions. Additionally, **he** adds that 40% of the sponsors in the sample focus on both types of investments. Hence, this indicates an overlapping nature if choosing to follow Levis (2011) definition.

Another method to define if an IPO is VC-backed has been to look in the directories of the European Venture Capital Association (EVCA). An IPO is considered VC-backed if the firm's sponsor is found in EVCAs directories (Coakley, Hadass and Wood, 2007). EVCA is today known as Invest Europe. Invest Europe themselves states that the name change is inspired by an evolving industry where PE has become important for firms of all sizes (Invest Europe, 2020). Hence, the reason behind the name change contradicts Levis (2011), who suggests PEs are sponsors making investments in the later stages of a firm's life cycle. Furthermore, Wright and Robbie (1998) emphasize that the interpretation of VC has become broader. It tended to refer to new firms but its contribution has started to go beyond this perspective. Hence, VCs may not only focus on earlier stages of the lifecycle and PE may not only focus on the later stages, resulting in the opposition of this terminology.

We have chosen to refer to an IPO as VC-backed regardless of when the sponsor at the time of the IPO made the investment. Defining VC-backed IPOs as firms having received capital early in their life cycle is deemed inappropriate. VCs do not only tend to refer to new firms anymore. The evolving industry may also be shown by Levis (2011) results, which show that PEs and VCs overlap. Hence, as boundaries have become increasingly blurry and there may be an overlapping nature, it would be more difficult to construct a sample using this definition. Consequently, the sample would run a higher risk of becoming incorrectly classified.

4.3 Defining Long Run Performance

It is possible to measure the long run performance by either measuring the market performance or the operating performance of a given firm. We chose to use the long run market performance. Rindermann (2004) suggests that using market performance of a firm gives a less misleading picture than operational performance. **He** emphasizes that since the value of a firm is related to expectations of future operational performance it is adequate to measure how the value-

added potential of being VC-backed is received by the market, as this information is public and thus processed instantly, even in a market with a low form of efficiency.

4.4 Measuring Long Run Market Performance

Fama (1998) suggests that there is no perfect way of measuring long-run market performance as the *bad-model problem* is always present. **He** describes the bad-model problem in two steps. First, no asset pricing model or expected return proxy can completely describe the expected returns of a sample. All common asset pricing models and proxies for deriving expected returns have systematic problems in describing returns of small stocks. Second, all samples produce systematic deviations from the asset pricing model or expected return proxy's predictions, therefore inhabiting an element of chance. Both aspects of the bad-model problem are further emphasized by a long return horizon. Fama (1998) suggests that the choice of performance measure can mitigate the bad-model problem. Buy-and-Hold Abnormal Return (BHAR), Cumulative Abnormal Return (CAR), and Calendar-Time Abnormal Return (CTAR) are the most commonly used measures of performance. Mitchell and Stafford (1999) as well as Fama (1998) suggest that CTAR mitigates the bad-model problem more than BHAR by requiring monthly rebalanced portfolios. BHAR compounds the problems of explaining returns of small stocks that all expected return models have. A similar problem exists for CAR, which accumulates the same problem (Fama, 1998). Hence, we have chosen to use *CTAR* as our measure of long-run performance.

4.5 OLS

We run an OLS to test the relationship between our dependent variable and our main explanatory variable. The assumptions of our OLS-model are found in Appendix D[1].

$$\begin{aligned} CTAR = \ & \beta_0 \ + \ \beta_1 \, VC \ Reputation + \ \beta_2 \, Underwriter \ Reputation \\ & + \ \beta_3 \, Ln \ Offer \ Size + \beta_4 \, Ln \ Issuer \ Age \\ & + \ \beta_5 \, Issuer \ Market \ Capitalization + \beta_6 \, Issuer \ M/B \\ & + \ \beta_7 \, Offer \ Price \ Revision + \ \beta_8 \, Underpricing + \ \varepsilon_i \end{aligned}$$

4.6 Calculating our Dependent Variable - CTAR

Our dependent variable *CTAR* is calculated in line with Mitchell and Stafford (1999). First, a monthly event portfolio and its monthly returns is needed[2]. To construct the monthly event

[1] See Appendix C for variable description
[2] See Appendix A for monthly event portfolio construction

portfolio, we include VC-backed IPOs from its month of listing and rebalance the portfolio every time an IPO reaches its 36-month anniversary or before if it is delisted. In line with Mitchell and Stafford (1999) we have dropped empty portfolios and have excluded months without any observations. The monthly event portfolio was value-weighted, which mitigates the bad-model problem that suggests that all asset-pricing models and expected return proxies have problems explaining the average returns on small stocks. If equal-weight portfolio returns are used instead, we would risk overweighting the value of small stocks and increase the bad-model problem (Fama, 1998).

The monthly CTAR for a sample firm is then calculated as the monthly return of the event portfolio it is included in less the expected return on the monthly event portfolio (equation (5))[3]. This is done for every month a sample firm is included in the event portfolio. The expected return on the event portfolio is proxied by the Fama and French (1993) three factor regression's intercept. Ultimately, the CTAR for a sample firm is obtained by summarizing all monthly CTARs for the sample firm and averaging it by the number of months the firm is in the monthly event portfolio (equation (6))[4].

4.7 Main Explanatory Variable - VC-Reputation

VC-Reputation is our main explanatory variable and to construct it for a given sample firm, we follow Krishnan *et al*. (2011). *VC-Reputation* for an IPO is based on the backing VCs past market share of their backed IPOs in our sample. This is defined as the VCs cumulated gross proceeds exclusive overallotment, of their backed IPOs in the sample three years prior to the IPO, divided by the total gross proceeds exclusive overallotment in the sample in the prior three years to the IPO. The reputation measure captures a VCs prior IPO success. This is believed to improve a VC's reputation as it is the most glamorous exit and shows that a VC is successful in guiding a firm from private to public. Moreover, it also creates attention that increases the VCs visibility in the market.

For IPOs with more than one VC-investor, our study focuses on the lead VC to measure reputation. The lead VC firm is the one with the largest venture investment in the firm at the IPO date. Krishnan *et al*. (2011) emphasize that lead VCs tend to continue holding board seats and shares post-IPO and may therefore provide greater post IPO-nurturing. Hence, focusing on

[3] See Appendix C for equation
[4] See Appendix C for equation

the lead VC firm may allow us to capture the effect of greater post IPO-nurturing on the long run performance of VC-backed IPOs to a greater extent.

There are alternative methods to construct a VC-reputation measure. Nahata (2008) measures *VC-Reputation* as the total gross proceeds exclusive overallotment of the IPOs a VC backs in relation to the total gross proceeds exclusive over allotment in **his** sample. However, our study uses a three-year moving window prior to the IPO, as Krishnan *et al.* (2011) suggest it avoids a strong bias against less experienced VC firms that may be inherent in Nahata's (2008) measure. Using a three-year moving window prior to the IPO, considers all implications of reputation to a greater extent as it takes more consideration to grandstanding. Apart from measuring our chosen method differently, using alternative measures of *VC-Reputation* is also possible. Lee and Wahal (2004) use the number of IPOs a VC has backed and VC-age while Gompers and Lerner (1999) use capital under management. However, Krishnan *et al.* (2011) and Nahata (2008) show that these are not consistent, robust predictors of VC and portfolio firm performance. Hence, we have chosen to not use these measures of reputation in our study.

4.8 Control Variables

In addition to VC-reputation, the OLS includes control variables that are commonly used in the literature. The control variables are *Issuer Age*, *Offer Size*, *Underwriter Reputation*, *Underpricing*, *Offer Price Revision*, *Issuer Market Capitalization* and *Issuer Market-to-Book (M/B)*. Following Krishnan *et al.* (2011), *Underpricing*, *Offer Price Revision*, *Issuer Market Capitalisation* and *Issuer M/B* are control variables for firm quality. These are used to distinguish the effect of sorting from *VC-Reputation* so that it can capture the effect of influence to a greater extent. To further distinguish between these two factors, instrumental variables (IV) could have been used in line with Krishnan *et al.* (2011). However, we cannot use **the authors** IVs as the databases available to this study do not have the necessary data. For example, an IV can be if the VC is an early-stage investor, which there is no accessible data for. Bureau van Djik's Zephyr is used when collecting data for *Offer Size*, *Underwriter Reputation*, *VC-Reputation*, *Issuer Market Capitalization* and *Offer Price Revision.* However, Zephyr sometimes lacked the necessary data needed for these variables whereby IPO-prospectuses have been used as a complement. Lastly, Bureau van Dijk's Orbis has been used to collect data for *Issuer Age* and *Issuer M/B.*

Offer Size is defined by Carter, Dark, and Singh (1998) as the gross proceeds of an IPO and is logarithmized using the natural log. Any exercised overallotment is subtracted from gross proceeds. *Offer Size* is used when examining long run IPO-performance, as it is argued that larger offers are made by financially stronger and more established firms going public. Hence, larger *Offer Size* should have a positive impact on the long run IPO-performance.

Issuer Age is defined by Krishnan *et al*. (2011) as a firm's year of going public minus its founding year. The variable is logarithmized using the natural logarithm of one plus *Issuer Age* to reduces skewness. *Issuer Age* is suggested to act as a proxy for more established firms. For example, such firms are believed to have a more seasoned management team, more tangible assets, and a more well-established customer base. A higher *Issuer Age* should therefore have a positive impact on the long run IPO-performance.

The Megginson & Weiss (MW) measure has been used for *Underwriter Reputation*. Following Carter, Dark and Singh (1998), the MW-measure is defined as an underwriter's relative market share. **The authors** define market share as the underwriter's underwritten gross proceeds in their sample in relation to all underwriters underwritten gross proceeds in their sample. To construct the MW-measure, our study defines the total market size as the total SEK-amount underwritten in the sample. Consequently, each underwriter's total underwritten SEK-amount in the sample is put in relation to this. Chemmanur and Fulghieri (1994) argue that higher underwriter reputation should reduce the probability of underwriters marketing lower quality firms. Consequently, higher underwriter reputation is believed to have a positive impact on long run IPO-returns, as they underwrite higher quality firms. It is also possible to use other measurements of *Underwriter Reputation*. For example, Carter, Dark and Singh (1998) also use the Carter-Manaster (CM) as well as the Johnson and Miller (JM) measure but highlight that their processes are more tedious. Our study does not define *Underwriter Reputation* as the main explanatory variable. Hence, the MW-measure has been selected to avoid the tedious processes of alternative measures as we focus on VC-reputation as our main explanatory variable.

Underpricing is defined as the first day return of an IPO measured from its offer price to its first day closing price. It is a sign of high firm quality as Welch (1989) suggests high quality firms underprice their IPOs to get higher prices in seasoned offerings. Lower quality firms will

not be able to imitate this as the market will interpret the quality of the firm and create less underpricing, thus creating a signalling cost.

Offer Price Revision is defined by Hanley (1993) as the percentage increase in the final offer price from the midpoint between the low and high prices from the initial IPO filing. A higher *Offer Price Revision* should reveal valuable information about the firm. Thus, a higher *Offer Price Revision* should signal higher firm quality and thus, produce higher long run performance.

Issuer Market Capitalization is defined by Brav and Gompers (1997) as the offer price multiplied by the total number of shares post-IPO. Firms with higher market capitalization tend to have more institutional shareholdings, which may signal higher firm quality.

Finally, *Issuer M/B* is supposed to measure the growth opportunities of a firm and is measured as of the IPO day (Krishnan *et al*. 2011). Higher *Issuer M/B* may imply more growth opportunities and therefore higher firm quality.

4.9 Robustness Checks

The combination of using calendar time portfolios and a small sample, in our case 73 firms, inhabits the problem of making some of the monthly portfolio's return attributable to a few firm's returns. Additionally, different performance measures have different inherent problems. By testing our sample with an additional performance measure, we can test the robustness of our results. Hence, we chose to also measure the performance of our sample by using Buy-and-Hold Abnormal Return (BHAR). When measuring the long-term performance by BHAR, the sample set is not divided into portfolios. Instead, every sample firm's buy-and-hold abnormal return is calculated by differencing the actual returns of a stock against the market return over a period of time, in our case 36 months (equation (7))[5].

Additionally, as outliers could have affected our results, we winsorize the dependent variable, *CTAR*, and our main explanatory variable, *VC-reputation*. After this, we run a one sample t-test if the mean *CTAR* is different from zero and rerun our base OLS-model. Winsorizings are made on the 1% and 99% level.

[5] See Appendix C for equation

5. Descriptive Statistics

5.1 Summary Statistics

Table 1 - Summary Statistics

Variable	Mean	Median	Max	Min	SD	N
CTAR (%)	0.004	0.007	0.013	-0.020	0.007	73
Issuer Age (years)	32.192	17.000	139.000	0.000	34.454	73
Offer Size (MSEK)	1339.989	750.000	6020.970	3.000	1425.926	73
Underwriter Reputation (%)	0.215	0.233	0.473	0.000	0.139	73
VC-Reputation (%)	0.028	0.000	0.558	0.000	0.102	73
Underpricing (%)	0.156	0.089	1.473	-0.169	0.283	73
Issuer Market Capitalization (MSEK)	4732.481	2433.210	79227.550	4.685	9770.707	73
Offer Price Revision (%)	0.022	0.000	0.113	0.000	0.034	73
Issuer M/B	5.287	2.650	151.100	0.020	17.497	73

Table 1 presents descriptive statistics for our sample, excluding the VC-backed IPOs with no available data. The final sample consists of 73 VC-backed IPOs in Sweden from 1st January 2000 to 31st December 2017. The dependent variable *CTAR* has a range between 1.3% and -2% with a standard deviation of 0.7%. The mean is 0.4% and the median is 0.7%. Our main explanatory variable *VC-Reputation* ranges from 55.8% to 0% with a standard deviation of 10.2%. The mean *VC-Reputation* is 2.8% and the median is 0%.

The mean *Issuer Age* is 32.2 years with a median of 17 years. The mean *Offer Size* is SEK 1339.9 million and the median is SEK 750 million. The average *Underwriter Reputation* is 21.5 % with a median of 23.3 %. The mean *Issuer Market Capitalization* is SEK 4732.5 million and the median is SEK 2433.2 million. The average *Offer Price Revision* is 2.2% with a median of 0%, respectively. The average *Underpricing* is 15.62% while the median is 8.9%. Finally, the mean *Issuer M/B* of the issuer is 5.287 while the median is 2.65.

5.2 Pearson's Correlation Matrix

Table 2 - Pearson's Correlation Matrix

Variable	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
(a) CTAR	1								
(b) Issuer Age	0.628	1							
(c) Offer Size	-0.144	0.470	1						
(b) Underwriter Reputation	0.100	0.251	0.701	1					
(d) VC-Reputation	0.216	0.219	0.169	0.087	1				
(e) Underpricing	0.167	-0.140	-0.211	-0.216	-0.037	1			
(f) Issuer Market Capitalization	-0.150	-0.069	0.285	0.304	0.018	-0.046	1		
(g) Offer Price Revision	-0.065	0.086	0.297	0.120	-0.144	-0.147	-0.006	1	
(h) Issuer M/B	0.021	-0.102	-0.191	-0.213	-0.062	0.523	-0.052	-0.070	1

Table 2 describes Pearson's correlation matrix of all variables used in the study. None of the variables is correlated above 0.8. This indicates that our variables do not suffer from any form of multicollinearity. Thus, multicollinearity does not impair our ability to draw inferences from our results. Furthermore, the correlation of *Underwriter Reputation* and *VC-Reputation* is 0.087. This indicates that our chosen VC-reputation measure is not only acting as a proxy for underwriter reputation.

6. Results and Analysis

6.1 VC-Backing Quality

Table 3 - One-sample t-test of CTAR

Variable	Mean	Standard error	SD	P> | t |	[95% conf. Intervall]	
CTAR	0.004***	0.001	0.007	0.000	0.002	0.006

Robust standard errors

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

Table 3 shows a statistically significant One-sample t-test of if the mean *CTAR* is different from zero. This indicates that VC-backed IPOs in Sweden overperform in the long run with average monthly abnormal returns of 0.4%. Thus, we can reject the null in *Hypothesis 1.*

As Swedish VC-backed IPOs tend to overperform in the long run, it indicates that there is good quality of VC-backing in the Swedish VC-industry. It may be the level of experience among VCs that contributes to the quality of VC-backing. In contrast to Rindermann (2004), we study

a more established and mature VC-industry with more experienced VCs. By being more experienced, the VCs can have better influence, sorting, and screening.

Following Rindermann (2004) and Sörensen (2007), the more experienced VCs can get the chance to back better firms through screening and sorting. By having better screening abilities, the VC can make better investment decisions and therefore back better firms that overperform in the long run. Through sorting, they can also get the chance to sponsor inherently better firms that overperform in the long run. This is made possible as firms tend to affiliate with more experienced VCs in favour of higher financial offers.

In line with Sörensen (2007), more experience also implies better influence. Better influence can lead to better monitoring, resulting in a reduction in agency costs. In line with Admati and Pfleiderer (1994), the VC can reduce the risk of overinvestment pre-IPO. This may help a firm avoid making bad investment decisions while still remaining privately held, which may positively affect the firm in the long run. If the VCs do not exit at the IPO, they can continue to provide monitoring, which reduces the risk of overinvestment and bad investment decisions post-IPO. This can continue to benefit the firm in the long run. Moreover, influence also implies better management. As suggested by Levis (2011) and Brav and Gompers (1997), the VC can equip the firm with effective management structures and corporate governance structures which can help it overperform. Given that the VC does not exit at the IPO, they can continue to provide management post-IPO as well. This may imply continued valuable advisory that can improve decision-making and create value for the firm in the long run.

6.2 A VCs Reputation - Improved VC-Backing Quality

Table 4 - OLS-Results

	Model 1	Model 2
Variable	**CTAR**	**CTAR[1]**
ln Issuer Age (years)	-0.000	-0.000
	(0.001)	(0.001)
ln Offer Size (MSEK)	-0.002**	-0.002**
	(0.001)	(0.001)
Underwriter Reputation (%)	0.026***	0.026***
	(0.007)	(0.007)
VC-Reputation (%)	0.020***	
	(0.004)	
Underpricing (%)	0.006*	0.006*
	(0.003)	(0.003)
Issuer Market Capitalization (MSEK)	-0.000**	-0.000**
	(0.000)	(0.000)
Offer price revision (%)	0.018	0.018
	(0.025)	(0.025)
Issuer M/B	-0.000	-0.000
	(0.000)	(0.000)
VC-Reputation[1] (%)		0.020***
		(0.004)
Constant	0.034***	0.034***
	(0.013)	(0.013)
Observations	73	73
R-squared	0.228	0.228

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
[1] *Winsorized*

As evident from OLS-model 1 in Table 4, our main explanatory variable *VC-Reputation* is statistically significant. This indicates that backing by more reputable VCs have a positive effect on long run performance for VC-backed IPOs in Sweden, which increases the quality of VC-backing. Hence, we can reject the null in *Hypothesis 2*. Furthermore, as displayed by OLS-model 2 in table 4, winsorizing *VC-Reputation* and *CTAR* and rerunning the OLS makes no difference to the statistical significance. The results suggest that our main explanatory variable is robust after adjusting for outliers.

The positive sign implies that VCs in the Swedish VC-industry may not be inclined to grandstand to establish their reputation. Instead, it implies that backing by more reputable VCs can increase the quality of VC-backing through sorting and influence as explained earlier. Even though we control for firm quality, the effects of sorting cannot be completely distinguished from influence. The VCs in the Swedish VC-industry may be less inclined to grandstand as they are more experienced. They may therefore have less incentive to show that they can bring firms public. Having less incentive to grandstand may imply that the VCs already have established relationships with VC-fund investors. As the VCs are more experienced, they may already have better networks as suggested by Sörensen (2007). According to Nahata (2008), this can include better and more established relationships with VC-fund investors. These investors can provide capital which secures a deal flow and consequently create less incentive to grandstand.

As seen in Table 4, all our control variables except *Issuer Age, Offer Price Revision,* and *Issuer M/B* are statistically significant in both OLS-models. *Issuer Age, Offer Size,* and *Issuer M/B* show unexpected signs. However, this is in line with previous research. For example, Krishnan *et al*. (2011) shows that the sign can vary depending on the choice of dependent variable. Additionally, our sample is small which may also affect the outcome of signs.

6.3 Robustness Test - BHAR

Table 5 - One-sample t-test of BHAR

Variable	Mean	Standard error	SD	P> | t |	[95% conf. Intervall]	
BHAR	0.256*	0.147	1.259	0.087	-0.038	0.549

Robust standard errors

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

Table 5 displays a statistically significant One-sample t-test of if the mean *BHAR* is different from zero. This indicates that VC-backed IPOs in Sweden show positive average abnormal monthly returns even when testing with another measure of long run performance.

6.4 Robustness test - Winsorized CTAR

Table 6 - One-sample t-test of winsorized CTAR

Variable	Mean	Standard error	SD	P> | t |	[95% conf. Intervall]	
CTAR	0.004***	0.001	0.007	0.000	0.002	0.006

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

Table 6 displays a statistically significant One-sample t-test of if the winsorized mean *CTAR* is different from zero. This indicates that VC-backed IPOs in Sweden show positive average abnormal monthly returns even after adjusting for outliers.

6.5 Comparing Results when Dividing the Sample

Table 7 - One-sample t-tests for the Divided Sample

Panel A: One-sample t-test (2000-01-01 to 2008-12-31)

Variable	N	Mean	Standard error	SD	P> | t |	[95% conf. Intervall]	
CTAR	22	-0.006***	0.001	0.006	0.000	-0.008	-0.003

Panel B: One-sample t-test (2009-01-01 to 2017-12-31)

Variable	N	Mean	Standard error	SD	P> | t |	[95% conf. Intervall]	
CTAR	51	0.008***	0.000	0.003	0.000	0.007	0.009

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

Our sample is divided into two halves based on the date of the VC-backed IPOs. Panel A includes IPOs issued between 1st January 2000 to 31st December 2008. Panel B includes issues between 1st January 2009 to 31 December 2017. This allows for the assessment of how a less mature, experienced, and established Swedish VC industry may influence our results. Similar to Rindermann (2004), we find that when running a One-sample t-test for Panel A, there is a statistically significant negative average monthly *CTAR*. In contrast, when running a One-sample t-test for Panel B, we find significant positive average monthly *CTAR*. This suggests that our result may be explained by the fact that the Swedish VC-industry has become more mature and established over the 21st century and that the VCs have grown more experienced. It is also notable that the panels show that the number of VC-backed IPOs has more than doubled over the two time periods. This may indicate that VCs become better at taking firms public as they grow more experienced as suggested by Sörensen (2007).

Panel A and Panel B of table 7 indicate that VC-backing quality increases as VC-industries become more mature and established. Hence, it may support the argument made by Rindermann (2004) who means the VC-backing quality can be inferior in less mature and established VC-industries, as the VCs may be less experienced. Our results in Panel A in table 7 may be explained by the fact that the VCs in the Swedish VC-industry were less experienced during the first decade of this century. Consequently, the VCs in the Swedish VC industry's ability to screen, influence, and sort may have been more inferior. For example, more inferior sorting and screening expertise may lead to that the VC backs inherently worse firms that underperform in the long run and therefore impairs VC-backing quality. Moreover, in terms of influence, more inferior monitoring may lead to a higher risk of overinvestment and therefore poor investment decisions that can hurt the firm in the long run.

Table 8 - OLS for Panel A and Panel B

	Model 1	Model 2
Variable	**CTAR**	**CTAR**
ln Issuer Age (years)	-0.002	-0.000
	(0.001)	(0.001)
ln Offer Size (MSEK)	0.001	-0.001
	(0.001)	(0.001)
Underwriter Reputation (%)	-0.014	-0.003
	(0.015)	(0.007)
VC-Reputation (%)		0.007**
		(0.003)
Underpricing (%)	0.002	0.002*
	(0.003)	(0.001)
Issuer Market Capitalization (MSEK)	-0.000	0.000
	(0.000)	(0.000)
Offer price revision (%)	-0.003	0.013
	(0.029)	(0.016)
Issuer M/B	-0.001**	-0.000**
	(0.000)	(0.000)
Constant	-0.004	0.021**
	(0.009)	(0.009)
Observations	22	51
R-squared	0.614	0.239

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

When rerunning our OLS with Panel A, OLS-model 1 in table 8 shows we cannot provide any results on how *VC-Reputation* affects the quality of VC-backing as there are no observations for this variable. The issues during the period are fewer and the use of a three-year moving window implies that no measures of past IPO issuances can be made. Moreover, as previously discussed, less experienced VCs are not as good at bringing firms public, which may explain this. Therefore, we cannot say anything about grandstanding in this case. In panel B, an estimate for the coefficient of *VC-Reputation* in OLS-model 2 in table 8 shows we instead have VCs that issue more IPOs within the 3-year window, suggesting that a VC becomes better at issuing IPOs as they grow more experienced. It also shows a statistically significant positive relationship between *VC-Reputation* and *CTAR*. Hence, this implies that the reasoning made about VC-reputation in *"6.2"* can be applied.

6.6 Alternative Explanations

According to previous research on IPOs, any new listing may be subject to a long run underperformance. Our results are in line with Brav and Gompers (1997) who emphasise that VCs can be effective in mitigating the potential overvaluation that underlies an underperformance. This effectiveness can be called into question given that Rindermann (2004) finds that VC-backed IPOs underperform in the long run. We argue that the effectiveness in mitigating a potential overvaluation that leads to a long run underperformance is dependent on VC-backing quality. What separates our study from Rindermann (2004) is that we study an established and mature VC-industry where the VCs are experienced. This can increase the quality of VC-backing as it leads to better influence.

In terms of better influence, it includes better networks that can increase the effectiveness in mitigating a potential overvaluation. In line with Brav and Gompers (1997), the VCs' relationships include institutional shareholders and investment banks that can mitigate potential overvaluation. By being more experienced, the VCs may foster better networks that include better relationships with institutional shareholders and investment bankers. Therefore, the more experienced VCs in the Swedish VC industry can have higher institutional shareholdings that help mitigate the effect of irrational investors. Moreover, they can have better relationships with top tier investment banks and have coverage by more high-quality analysts. This also reduces exposure to irrational investors and mitigates a potential overvaluation that may lead to a long run underperformance. Less experienced VCs may have worse relationships with investment banks and institutional investors. Consequently, this reduces the effectiveness in

mitigating a potential overvaluation. The experience of the VC can therefore be crucial in avoiding a long run underperformance as it may include better networks which can help explain why overperformance can occur due to VC-backing quality.

7. Conclusion

This study has investigated the quality of VC-backing in the Swedish VC-industry and the relationship between the quality of VC-backing and VC-reputation. By observing the long run performance of Swedish VC-backed IPOs, we find that this set of listings overperform the market in the long run. Controlling for VC-reputation further shows that backing by more reputable VCs improve long run performance. Therefore, the results from our study indicate a good quality in Swedish VC-backing, which improves with a VCs reputation. These results remain intact after testing the significance of BHAR and after rerunning our OLS with winsorized *CTAR* and *VC-Reputation*.

By presenting evidence of the long run performance of VC-backed IPOs and how it is affected by its reputation in Sweden during the last two decades, our study contributes to the limited research in the area and expands its international dimension. It shows that findings from the US can be transferred to other European regions than the UK. The common denominator between Sweden, the UK, and the US is that all are mature and established VC-industries. Rindermann (2004), studies less established and mature VC-industries and finds that the quality of VC-backing is poor as the IPOs underperform. After dividing our sample, we also find indications that the quality of VC-backing was inferior when the Swedish VC-industry was less mature and established. Our result may indicate that the difference lies in how mature and established a VC-industry is, as the level of experience may vary and therefore the quality of VC-backing. Moreover, from a practical point of view, investors with an interest in Swedish IPOs may stand to gain from our findings. Our results may help investors to derive a successful IPO-investment strategy. For example, investors can construct a portfolio of IPOs backed by more reputable VCs. Apart from benefitting investors, our findings may also be of value for firms looking for VC funding. For example, picking more reputable or experienced VCs may add more value to a firm.

There are two limitations to our study. First, we do not consider if the VC stays after the IPO. A VC must not necessarily exit at an IPO and one or more VC members may also continue to

stay on the portfolio firm's board. Hence, the effect of influence may continue to have an effect post-IPO. The drivers of VC-backing quality post-IPO may thus interfere with the drivers of VC-backing quality pre-IPO in our study. Second, we cannot separate if the VC-backing quality is due to the fact that a VC may back inherently better firms and/or if they are better at influencing their firms. According to Sörensen (2007), trying to separate these aspects remains an econometric challenge for studies in this field. We are only able to separate influence from sorting to a greater extent in *VC-Reputation*, but the lack of IVs still keeps the bias of sorting in the variable. Both the long run overperformance of VC-backed IPOs and the positive effect of VC-reputation therefore imply that we cannot solely attribute VC-backing quality to either sorting or influence. Consequently, both limitations hinder us from being more accurate in the analysis.

In terms of future research, an interesting topic would be to draw on this study and aim to separate between the quality of VC-backing pre- and post-IPO and/or influence and sorting. This may give a more accurate insight into how VC-backing quality is determined. For example, one can investigate if greater VC-involvement post-IPO is associated with a stronger long run performance. Further research could also aim to re-examine VC-industries where VC-backed IPOs have previously been found to underperform such as in Germany and France. According to theory, more experienced VCs may lead to a better long run performance. This may make results dependent on when in a VC-industries lifecycle a study is conducted in. Hence, as the latest known published empirical evidence on these VC-industries is documented in 2004, it emphasises a need for a refined assessment. The life cycles of the VC-industries have come further and therefore also the general level of experience which may improve the quality of VC-backing and long run performance. This may also test the robustness for if good VC-backing quality can depend on VC-industries being established and mature.

References

Admati, A. R. and Pfleiderer, P. (1994) 'Robust Financial Contracting and the Role of Venture Capitalists', *The Journal of Finance*, 49(2) pp. 371-402.

Aytug, H., Fu, Y. and Sodini, P. (2020) 'Construction of the Fama-French-Carhart four factors model for the Swedish Stock Market using the Finbas data', Available online: https://data.houseoffinance.se

Bloomberg. (2017). Nordic listings on Path to New Record Year Amid Swedish IPO Boom. Available online: https://www.bloomberg.com/news/articles/2017-05-08/nordic-listings-on-path-to-new-record-year-amid-swedish-ipo-boom [Accessed 24 May 2020]

Brav, A. and Gompers, P. A. (1997) 'Myth or Reality? The Long-Run Underperformance of Initial Public Offerings: Evidence from Venture and Nonventure Capital-Backed Companies', *The Journal of Finance*, 102(5) pp. 1791-1821.

Brooks, C. (2014) *Introductory Econometrics for Finance*. 3rd edn. Cambridge: Cambridge University Press. ISBN: 10.1017/CBO9781139540872.

Carter, R. B., Dark, F. H. and Singh, A. K. (1998) 'Underwriter Reputation, Initial Returns, and the Long-Run Performance of IPO Stocks', *The Journal of Finance*, 53(1), pp. 285–311.

Chemmanur, T. J. and Fulghieri, P. (1994) 'Investment Bank Reputation, Information Production, and Financial Intermediation', *The Journal of Finance*, 49(1) pp. 57-79.

Coakley, J., Hadass, L. and Wood, A. (2007) 'Post-IPO Operating Performance, Venture Capital and the Bubble Years', J*ournal of Business Finance & Accounting*, 34(9), pp. 1423-1446.

Fama, E. F. (1998) 'Market efficiency, long-term returns, and behavioral finance', *Journal of Financial Economics*, 49 (3) pp. 283-306.

Fama, E. F. and French, K. R. (1992) ‘The Cross-Section of Expected Stock Returns’, *The Journal of Finance*, 47(2), pp. 427–465.

Fama, E. F. and French, K. R. (1993) ‘Common risk factors in the returns on stocks and bonds’, *Journal of Financial Economics*, 33(1), pp. 3–56.

Gompers, P. A. (1996) ‘Grandstanding in the venture capital industry’, *Journal of Financial Economics*, 42(1), pp. 133–156.

Gompers, P. A. and Lerner, J. (1999) ‘The really long-run performance of initial public offerings: the pre-Nasdaq evidence’, *The Journal of Finance.* 54 (4), pp. 1355-1392. Available online: https://www.jstor.org/stable/3648214

Hanley, K. W. (1993) ‘The underpricing of initial public offering and the partial adjustment phenomenon’, 34 (1) pp. 231-250.

Invest Europe. (2020). The voice of private capital.
Available online: https://www.investeurope.eu/about-us/who-we-are/ [Accessed 13 May 2020]

Krishnan, C. N. V., Ivanov, V. I., Masulis, R. W., Singh, A., K. (2011) ‘Venture Capital Reputation, Post-IPO Performance, and Corporate Governance’, J*ournal of Financial and Quantitative Analysis*, 46(5), pp. 1295–1333.

Lee, P. M. and Wahal, S. (2004) ‘Grandstanding, certification and the underpricing of venture capital backed IPOs’, *Journal of Financial Economics*, 73(2), pp. 375–407.

Levis, M. (2011) ‘The Performance of Private Equity-Backed IPOs’, *Financial Managemen*t, 40(1), pp. 253–277.

Loughran, T. and Ritter, J. R. (1995) ‘The New Issues Puzzle’, *The Journal of Finance*, 50(1), pp. 23–51.

Mitchell, M. L. and Stafford, E. (1999) ‘Managerial decisions and long-term stock price performance’, *The Journal of Business*, 73(3), pp. 287-329

Nahata, R. (2008) ‘Venture capital reputation and investment performance’, *Journal of Financial Economics*, 90(2), pp. 127–151.

Riksbanken. (n.d.). Treasury bills.
Available online: https://www.riksbank.se/sv/statistik/sok-rantor--valutakurser/forklaring-till-serierna/svenska-marknadsrantor/ [Accessed 1 May 2020]

Rindermann, G. (2004) ‘The performance of venture-backed IPOs on Europe's new stock markets. Evidence from France, Germany and the UK’, *Advances in Financial Economics*,10 (1), pp. 231–294.

Ritter, J. R. (1991) ‘The Long-Run Performance of Initial Public Offerings’, *The Journal of Finance*, 46(1), pp. 3–27.

SVCA. (2017). Swedish Private Equity Market: A footprint analysis.
Available online: https://www.svca.se/rapporter/swedish-private-equity-market-footprint-analysis/ [Accessed 11 May 2020]

SVCA. (2020). Economic Footprint of Swedish Private Equity.
Available online: https://www.svca.se/rapporter/economic-footprint-of-swedish-private-equity/ [Accessed 11 May 2020]

Sörensen, M. (2007) ‘How Smart Is Smart Money? A Two-Sided Matching Model of Venture Capital’, *The Journal of Finance*, 62(6), pp. 2725-2762.

Welch, I. (1989) ‘Seasoned Offerings, Imitation Costs, and the Underpricing of Initial Public Offerings’, *The Journal of Finance*, 44(2), pp. 421–449.

Wright, M. and Robbie, K. (1998) ‘Venture Capital and Private Equity: A Review and Synthesis’, *Journal of Business Finance Accounting*, 25(56), pp. 521–570.

Appendix A – Constructing the Monthly Event Portfolio

Following Mitchell and Stafford (1999), we construct value-weighted monthly event portfolios. We include VC-backed IPOs from its month of listing and rebalance the portfolio every time an IPO reaches its 36-month anniversary or before if it is delisted. In line with Mitchell and Stafford (1999) we have dropped empty portfolios and have excluded months without any observations.

To construct the monthly event portfolio, the following steps have been taken:

1. Data on every sample firm's market capitalization and Return Index (RI) was accumulated from Datastream.
2. To calculate each included event firms' weight in the monthly event portfolio, its market capitalisation is divided by the total market capitalisation of all the included event firms in the monthly event portfolio.
3. The actual monthly returns of each sample firm in the event portfolio were calculated as the monthly percentage change of RI.
4. Each included event firm´s actual monthly return in the event portfolio is weight-adjusted by multiplying its actual monthly return with its weight from step 3.
5. All weight-adjusted actual monthly returns are summarized for all included event firms in the monthly event portfolio in a month.
6. The sum from step 6 is the return on the monthly event portfolio.

Appendix B – Fama and French (1993) regression

We have used a Fama and French (1993) three factor regression to derive the event portfolio's expected return (equation (1))[6]. We ran this regression using data from Swedish House of Finance (SHoF) in addition with the monthly returns from our event portfolios explained in Appendix A. However, SHoF does not have available data expanding over the year 2020 and therefore we calculated the variables ourselves using the same method as SHoF. Data for calculating the small-minus-big (SMB), high-minus-low (HML) and market return factors for 2020 for every firm in the same stock market segments as the data from SHoF, was collected from Datastream. The dataset was first divided in two SMB-portfolios sorted on market equity (ME), with a breakpoint at the 80th percentile. Second, the data in the two SMB-portfolios is divided into three HML-portfolios each based on their book-to-market ratio (BE/ME), where the breakpoints are the 30th and 70th percentiles. The three portfolios within the <80th percentile SMB-portfolios are marked as Small-Growth (SG), Small-Neutral (SN) and Small-Value (SV), measured by BE/ME. The three portfolios within the >80th percentile is Big-Growth (BG), Big-Neutral (BN) and Big-Value (BG), sorted by BE/ME. Monthly SMB and HML returns are calculated according to equations (2) and (3)[6], respectively. The risk-free rate was proxied by the rate of one-month Swedish Treasury bills, this data was collected from Riksbanken (n.d). The monthly risk-free rate was calculated by equation (4)[7]. As a proxy for market return, we used the monthly change in SIX Return Index, which is a dividend including index of all stocks listed on the Stockholm Stock Exchange (Aytug, Fu and Sodini, 2020).

Table 9. Fama and French (1993) regression

Variable	Coefficient	Standard error	t	P> | t |	[95% conf. Intervall]	
Rm-Rf	1.095***	0.095	11.500	0.000	0.908	1.283
SMB	0.544***	0.142	3.840	0.000	0.265	0.823
HML	-0.0597	0.145	-0.410	0.680	-0.345	0.023
Intercept	0.009**	0.004	2.100	0.037	0.001	0.017

Robust standard errors

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

Table 9 displays our Fama and French (1993) regression, the intercept that we use as a proxy for monthly expected return on the monthly event portfolio when calculating CTAR, show statistical significance at the five-percent level.

[6,6,7,] Equations can be seen in Appendix C.

Appendix C – Equations

(1) Fama and French (1993) Regression

$$(R_i) - R_f = \alpha + \beta_1\left[(E(R_m) - R_f\right] + \beta_2 E(SMB) + \beta_3 E(HML) + \varepsilon_i$$

Where:

(R_i) = The monthly return on the monthly event portfolio

R_f = The monthly risk-free rate

α =The monthly average abnormal return on the portfolio of event firms

$E(R_m)$ =The expected market return

$E(SMB)$ =The expected return of the small minus big firms

$E(HML)$ = The expected return of high book-to-market minus low book-to-market

(2) Monthly SMB Portfolio Return

$$SMB = \left(\frac{R_{SG} + R_{SN} + R_{SV}}{3}\right) - \left(\frac{R_{BG} + R_{BN} + R_{BV}}{3}\right)$$

Where:

SMB = Represents the size premium in the Fama and French (1993) regression

R_{SG} = Return of the Small-Growth portfolio

R_{SN} = Return of the Small-Neutral portfolio

R_{SV} = Return of the Small-Value portfolio

R_{BG} = Return of the Big-Growth portfolio

R_{BN} = Return of the Big-Neutral portfolio

R_{BV} = Return of the Big-Value portfolio

(3) Monthly HML Portfolio Return

$$HML = \left(\frac{R_{SV} + R_{BV}}{2}\right) - \left(\frac{R_{SG} + R_{BG}}{2}\right)$$

Where:

HML = Represents the value premium in the Fama and French (1993) regression

R_{SV} = Return of the Small-Value portfolio

R_{BV}= Return of the Big-Value portfolio

R_{SG} = Return of the Small-Growth portfolio

R_{BG}= Return of the Big-Growth portfolio

(4) Monthly Risk-free Rate

$$R_{f\,(t_{monthly})} = R_{f\,(t_{daily})} * number\ of\ days\ in\ the\ given\ month$$

Where:

$R_{f\,(t_{daily})}$ = The risk-free rate, proxied by one-month Swedish treasury bills

(5) Monthly Calendar Time Abnormal Return for a Sample Firm

$$CTAR_{i(month)} = R_{i(month)} - E(R_{i(month)})$$

Where:

$R_{i(month)}$ = Monthly return on the monthly event portfolio

$E(R_{i(month)})$ = Expected monthly return on the monthly event portfolio

(6) Average Monthly Calendar Time Abnormal Return for a Sample Firm

$$\frac{\sum CTAR_{i(month)}}{number\ of\ months\ in\ event\ portfolio}$$

Where:

$\sum CTAR_{i(month)}$= The sum of monthly Calendar Time Abnormal Returns of asset i

(7) Buy-and-Hold Abnormal Return

$$BHAR_{it} = \left|\prod_{t=1}^{T}(1 + r_{i(t)}) - 1\right| - \left|\prod_{t=1}^{T}(1 + r_{m(t)}) - 1\right|$$

Where:

$r_{i(t)}$ = the return of asset i at time t

$r_{m(t)}$ = the market return at time t

(8) OLS-model

$$CTAR = \beta_0 + \beta_1\, VC\ Reputation + \beta_2\, Underwriter\ Reputation + \beta_3\, Ln\ Offer\ Size + \beta_4\, Ln\ Issuer\ Age + \beta_5\, Issuer\ Market\ Capitalization + \beta_6\, Issuer\ M/B + \beta_7\, Offer\ Price\ Revision + \beta_8\, Underpricing + \varepsilon_i$$

Where:

CTAR

The Calendar Time Abnormal Returns (CTAR) of our sample.

VC Reputation

A VC's market share of all VC-backed IPOs in the prior three years. Defined as the gross proceeds minus overallotment for any backed IPO in the prior three years to the backed IPO in the sample divided by the total gross proceeds minus overallotment for all IPOs in the prior three years to the backed IPO.

Underwriter Reputation

Calculated by the Megginson & Weiss-measure and is defined as an underwriter's relative market share. The market share is the underwriter's total underwritten gross proceeds in our sample in relation to all underwriters' total underwritten gross proceeds in our sample.

Ln Offer Size

Defined as the gross proceeds of an IPO minus overallotment. *Offer Size* is logarithmized using the natural log.

Ln Issuer Age

Defined as a firm's year of going public minus its founding year. The variable is logarithmized using the natural logarithm of 1 + the issuers age to reduce skewness.

Issuer Market Capitalization

The implied market capitalization of the issuer defined as the offer price multiplied by the total number of shares post-IPO.

Issuer M/B

The issuers market-to-book ratio at the time of the IPO.

Offer Price Revision

Defined as the percentage increase in the final offer price from the midpoint between the low and high prices from the initial IPO filing.

Underpricing

The return of the first day of trading. Calculated as the percentage change in closing price and offer price.

Appendix D – OLS assumptions

Previous studies measure long run performance and what might affect it with an ordinary least squared (OLS) model (Ritter (1991); Krishnan *et al.*, 2011). Our study therefore also uses an OLS-regression model to measure *CTAR* and how *VC-reputation* may affect it. An OLS-regression is effective in establishing the relationship between explanatory variables, control variables and a dependent variable. However, a set of assumptions must be fulfilled for the OLS-regression to hold. These follow below (Brooks, 2014):

1. The error have a zero mean

This is fulfilled if the model has an intercept in the y-axis (Brooks, 2014).

2. The variance in the errors is constant and finite over all values of x

This implies that homoscedasticity holds. If not, this does not hold, there is heteroskedasticity. To handle potential heteroskedasticity, we include robust standard errors in the OLS-regression model (Brooks, 2014).

3. The errors are linearly independent of one another

This means that the covariance between the error terms should be zero. If not, the error terms are autocorrelated over time. However, we do not need to test for this as our OLS-regression model uses cross-sectional data. (Brooks, 2014)

4. There is no relationship between the error and its corresponding x variate

The covariance between an independent variable and its error term should be zero. If assumption 1 holds, assumption 4 will automatically hold (Brooks, 2014).

5. The error term is normally distributed

The Central Limit Theorem stipulates that approximate normal distribution can be assumed if the sample has over 30 observations (Brooks, 2014). As our sample has 73 observations, we assume that the error term is approximately normally distributed.

If assumptions 1 through 4 hold, the OLS-estimators are the Best Unbiased Linear Estimators (BLUE). Moreover, assumption 5 is required to make valid inferences about the population parameters from the estimated sample parameters. Apart from these assumptions, the OLS-regression is also not allowed to suffer from multicollinearity. If independent variables are highly correlated, multicollinearity is present. There is *perfect multicollinearity* and *near multicollinearity*. Perfect multicollinearity exists when two or more independent variables are perfectly correlated. Near multicollinearity is present when two or more independent variables have a non-negligible but not perfect relationship. The latter is more likely to occur in practice. Near multicollinearity can be defined as a situation where the correlation between two variables reaches 0.8 to 0.99 (Brooks, 2014). To test for multicollinearity, we construct a correlation matrix (Table 2). If multicollinearity is present and/or any of assumptions 1-5 does not hold it could impair our ability to draw inference from our results.