

INSIDER GAINS AND EXTREME FIRM VALUATION

**INVESTIGATING INSIDER TRADING IN THE CONTEXT OF FIRM
VALUATION IN THE SWEDISH EQUITY MARKET**

GUSTAV JOHANSSON

OSCAR STEIN

Bachelor Thesis
Stockholm School of Economics
2019



Insider Gains in Firms and Extreme Firm Valuation: Investigating Insider Trading in the Context of Firm Valuation in the Swedish Equity Market

Abstract:

Information asymmetry driving insider gains is a widely discussed topic in finance academia. However, extreme firm valuation, often applicable to the premature loss-making firms seen in the today's trend of start-ups, has not been investigated in the context of insider trading. We find, in the Swedish equity market, that insiders in firms with extreme valuation generate excessive returns compared to other firms' insiders, particularly for insider purchases with results below the 1% level. Also, our findings suggest that it's explicitly an extreme valuation generating higher asymmetric information and thus, insider gains. Moreover, extreme firm valuation stands out as a key driver of asymmetric information when testing our results with previous literature's suggestions for sources of asymmetric information. Contributing with new insight about premature start-up firms, we conclude extreme firm valuation to be highly relevant in the context of insider trading.

Keywords:

Insider trading, Extreme firm valuation, Insider gains, Asymmetric information

Authors:

Gustav Johansson (23525)
Oscar Stein (23794)

Tutor:

Jungsuk Han, Associate Professor, Department of Finance

Examiner:

Adrien d'Avernas, Assistant Professor, Department of Finance

Bachelor Thesis

Bachelor Program in Business & Economics

Stockholm School of Economics

© Gustav Johansson and Oscar Stein, 2019

Contents

1.	INTRODUCTION	3
2.	BACKGROUND	6
2.1.	The extent of extreme firm valuation in the Swedish equity market.....	6
2.2.	Swedish equity market and the presence of MTF exchanges	7
3.	THEORETICAL BACKGROUND AND LITERATURE REVIEW	11
3.1.	Theoretical framework.....	11
3.2.	Literature review	11
3.2.1.	Existence of insider gains in the financial markets	11
3.2.2.	Specific sources of asymmetric information driving insider gains	12
3.3.	Study's contribution to existing literature	12
3.3.1.	Illustrative example of study's contribution.....	13
4.	RESEARCH QUESTION AND HYPOTHESIS	15
4.1.	Extreme firm valuations leading to a higher degree of information asymmetry	15
4.1.1.	Valuations not explained by historical financial statements.....	15
4.1.2.	Extreme valuation implies high expectation on uncertain cash flows far away in the future	16
4.1.3.	Equity financed loss-making firms have less financial informativeness.....	17
5.	DATA	18
5.1.	Insider transactions	18
5.2.	Defintion of extreme firm valuation.....	19
5.3.	Return statistics per transaction and type of firm.....	21
6.	METHOD	24
7.	RESULTS	26
7.1.	Insider's gains prior reporting date.....	26
7.2.	Insider's gains from investor's reaction	27
8.	ROBUSTNESS TESTS	30
8.1.	Degree of extreme firm valuation.....	30
8.2.	Firm size and insider gains	31
8.3.	Aboody and Lev's definition for information asymmetry and insider gains.....	32
8.4.	Liquidity and its implications on share price reactions	32
9.	IMPLICATIONS AND CONCLUSIONS	34
9.1.	Conclusion and discussion of findings	34
9.2.	Implications for theory, previous research and practical use	35
9.3.	Weaknesses of the study	36
9.4.	Suggestions on further research	37
10.	REFERENCES	38
11.	APPENDIX.....	40

1. Introduction

Over the past decade, start-ups have become a wide-known phenomenon with innovative companies bringing new services and products to society. Some of the largest companies world-wide, Facebook, Google, Amazon etc., have all in a short amount of time grown from a premature firm to become the global dominants in their respective fields. In search for the next Facebook, the venture-capital industry has ballooned over the past decade. Research has found that the sector has tripled in size over 10 years: in 2008, USD 53bn was invested in start-ups, and by 2018 it was USD 160bn worldwide. During that period, number of deals has more than doubled (Prequin 2018). Sweden, and in particular Stockholm, has in media outlets been called “the start-up capital of Europe” due to its rich number of such firms. In terms of number of start-ups per 1000 employees, Sweden has 20 while the US has 5 (OECD 2016).

A start-up is valued on a different basis than mature firms given little to no sales and often negative earnings. Translating the valuation of a start-up to valuation multiples, such as the well-known Price-to-earnings (“P/E”) or Enterprise value-to-sales (“EV/S”), one could interpret the firm valuation as extreme compared to mature firms. Some may even claim that start-ups are valued on speculation suggesting a potential bubble, similar to the Dot-com-bubble in 2001. Considering the different valuation characteristics, one may argue that there is a difference in asymmetric information about the firms’ value.

In 1985, Kyle presented a model illustrating how insiders take advantage of the asymmetric information between insiders and market participants. With regards to the Kyle model, several cited studies conclude that insider gains exist. Moreover, further research has been conducted to investigate what drives the degree of information asymmetry and thus, insider gains. Aboody and Lev (2000) and Degryse, de Jong and Lefebvre (2013) find R&D and firm size in their respective studies to be a driver of information asymmetry. However, insider gains and information asymmetry have not been investigated from the perspective of extreme firm valuation. Also, one could argue that extreme firm valuation is of particular interest given today’s widespread trend of start-ups which tend to have extreme valuations on the basis of valuation multiples. Conclusively, extreme firm valuation is yet to be investigated and could be an important driver of information asymmetry and thus, insider gains. Our research question and hypothesis are presented below.

Research question: *Do Swedish listed firms with extreme valuations have a greater degree of information asymmetry and thus, higher insider gains, than other Swedish listed firms?*

Hypothesis: *An extreme firm valuation leads to a higher degree of information asymmetry between insiders and market participants regarding the firm’s valuation*

Our hypothesis builds on the following three arguments;

(1) An extreme valuation, as defined in this study (see page 19), implies that the market values something not reflected in a firm's historical financial statements. In general, premature development-oriented firms have extreme valuations as the companies are valued on the basis of their future commercialization of the development projects. Assets that are neither in the balance sheet nor booked at fair value may drive information asymmetry as the investors are not able to derive information about the assets from financial statements or be certain about their future economic benefits. To understand future economic benefits of assets not identified in the financial statements, one may need daily insight of operations and relevant expertise. Also, investors cannot derive information about such asset by looking at another one, e.g. one pharmaceutical candidate is not comparable to other candidates.

(2) If a company has an extreme valuation, not explained by historical financial statements, the valuation implies high expectations on the firm's future cash flows and economic benefits. Common valuation methods, such as the DCF-valuation, incorporate a risk premium in the cost of equity and the cost of debt suggesting that cash flows in the future are more uncertain than cash flows today. Also, research from Smith and Watts (1992) suggests that insiders have superior knowledge to external investors regarding future cash flows thus increasing the degree of asymmetric information when expected cash flows are far away in the future.

(3) A firm with extreme valuation, as defined in this paper, is loss making. Previous research by Hayn (1995) concludes that losses are less informative to investors than profits. The low informativeness of losses with respect to firm valuation supports that loss-making firms have a higher degree of asymmetric information as financial disclosures are less important to investors. Moreover, a profitable firm may take on debt which reduces the information asymmetry to equity investors since creditors are more risk averse and thus, signal to outsiders that the firm can service its debt. Hence, an equity financed firm with negative earnings signals that it has more uncertain operations which may contribute to information asymmetry between insiders and outside investors.

Consequently, insider trading in firms with extreme valuations could have a higher degree of information asymmetry and thus, have higher insider gains.

To answer the research question and test the hypothesis, we start with computing a firm-specific mean raw returns for all insider transactions per each calendar month and firm. The firm-specific mean raw returns are then classified as either a firm with an extreme valuation ("HV") or an other firm ("LV"). Based on the firm-specific mean raw returns, we compute portfolios conditional on type of firm, HV or LV, and also whether the firm's insiders were net purchasing or selling in the given month. In total we have six portfolios, HV_p , HV_s , LV_p , LV_s , HV_p-LV_p and HV_s-LV_s . Moreover, the six portfolios are investigated before and after the reporting date with descriptive statistics, a t-test and an intercept test.

When testing for returns between the transaction and prior reporting date, results do not indicate any excess gains for none of the groups compared to the other. Consequently, we cannot draw any conclusions regarding returns prior reporting. One may argue that

returns prior reporting date are independent of insider trading given the short return interval and strict regulations.

For the returns at the reporting date, insiders in firms with extreme valuations have higher gains than insiders in other firms on purchases at a significance level below 1%. The mean return difference in the $HV_p - LV_p$ portfolio is 1,08% which can be considered as economically large given the return interval of one day. In the intercept test, α for $HV_p - LV_p$ is 1,00% with a significance level below 1%. For sales, findings suggest, at a moderate significance level, that insiders in firms with extreme valuations have higher gains than insiders in other firms. In the intercept test, $HV_s - LV_s$ has a negative α of -0,44% below a 20% significance level. Over the reporting date and one day after, $HV_s - LV_s$ has an α of -0,75% below a 10% significance level.

Moreover, one may argue that the results in the main test could be related to other factors driving asymmetric information. Consequently, the following robustness tests are performed. Firstly, when testing how the extent of extreme firm valuation affects insider gains, we can conclude that a high valuation itself does not give rise to high degree of information asymmetry between insiders and market participants. Instead, our results from this test suggests that it's the presence of extreme valuation, with emphasis on extreme, which increases the degree of information asymmetry resulting in higher insider gains. Secondly, given previous research on firm size and insider gains, we control the main test for firm size and can conclude that firm size has a negligible impact on our results. Thirdly, given the smaller firm size in the group of firms with extreme valuations and thus potential liquidity concerns, we re-run the test with low liquidity firms against high liquidity firms and find liquidity to have a substantially lower impact on asymmetric information and insider gains. Lastly, we compare the main test with Aboody and Lev's (2000) hypothesis on R&D firms and find weaker results than for firms with extreme valuation. Conclusively, we argue our results in the main test to be robust and extreme firm valuation to be a highly relevant driver of asymmetric information and thus, insider gains.

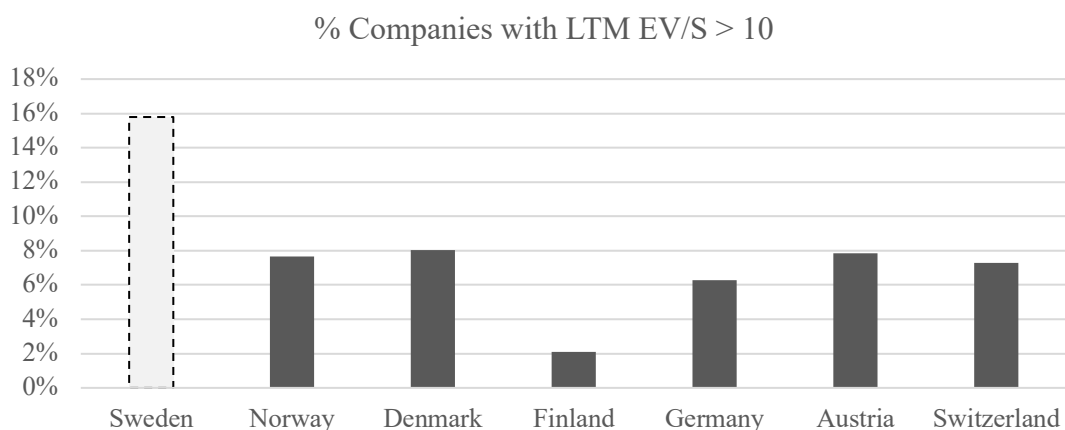
To summarize, our study highlights a new topic in finance research with regards to insider trading. Firstly, we contribute with new research on how extreme firm valuation leads to information asymmetry and consequently, insider gains. No cited paper has investigated insider trading with regards to extreme firm valuation, as defined in this paper. Secondly, given that extreme firm valuation primarily applies to premature firms, we shed light on the widespread start-up trend we see in today's society. In particular, we contribute with relevant insights related to insider trading in start-ups. Moreover, we conclude that insiders in firms with extreme valuations have higher insider gains than other firms in the Swedish equity market at reporting date. We find results to be robust and to explicitly highlight that it's the extreme firm valuation contributing to higher asymmetric information. Conclusively, extreme firm valuation is a key driver of information asymmetry and thus, an important explanatory factor of differences in insider gains. We encourage further research on this topic in the US market for a more thorough understanding.

2. Background

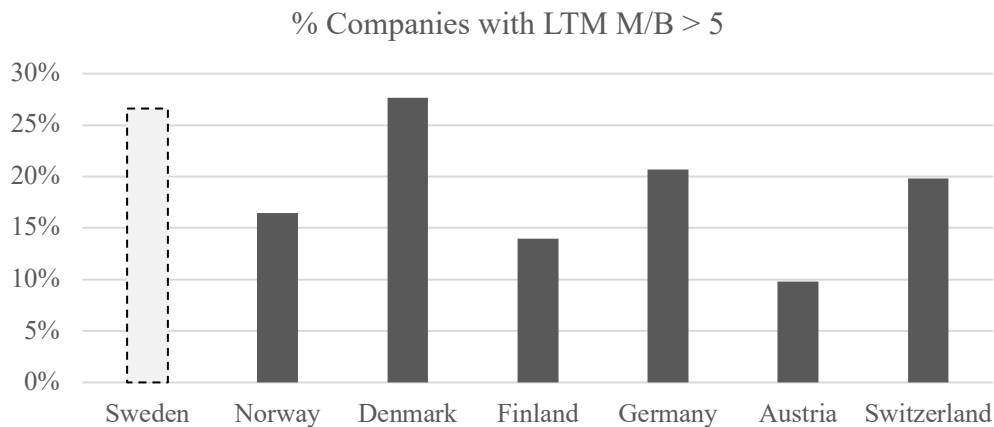
As this study intends to investigate insider trading in Sweden with the hypothesis of extreme firm valuation driving information asymmetry, context is needed to understand the choice of market and topic. We will describe why extreme firm valuation is particularly relevant in the Swedish equity markets, and also elaborate on how the presence and growth of Multilateral Trading Facilities (“MTF”) in Sweden have increased the number of firms with extreme valuations.

2.1. The extent of extreme firm valuation in the Swedish equity market

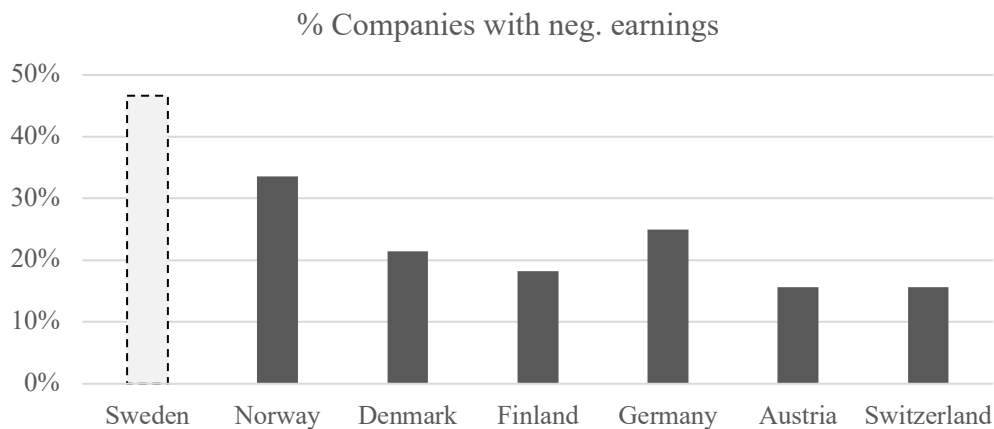
In relation to other equity markets in Europe, the Swedish equity market consists of a larger share of firms with a valuation that could be considered extreme. Graph 1 presents the share of firms in each country’s equity markets with an EV/S ratio above 10. Sweden has the largest share of the selected equity markets with 16% (CapitalIQ). Furthermore, share of firms with an M/B ratio above 5 presents similar results. In graph 2, the Swedish equity market has the second largest share of 27%. Regarding listed firms with negative EBIT, Sweden has the largest share of firms of the selected equity markets with 47% which is presented in graph 3. The graphs shall be considered as illustrative to provide an overview of why Sweden may be an interesting equity market to our study with regards to extreme firm valuation.



Graph 1. % Companies with LTM EV/S>10



Graph 2. % Companies with LTM M/B>5



Graph 3. % Companies with neg. earnings

2.2. Swedish equity market and the presence of MTF exchanges

As of May 2019, the Swedish equity market consists of 993 listed securities divided into 5 stock exchanges (Infront). As seen in graph 4, in comparison to other Nordic regions, Sweden stands out as a country with extraordinary high number of stock exchange listed securities. Also, the overall liquidity in Sweden is substantially higher than in Finland, Denmark and Norway.



Graph 4. # Listed securities and total traded volume

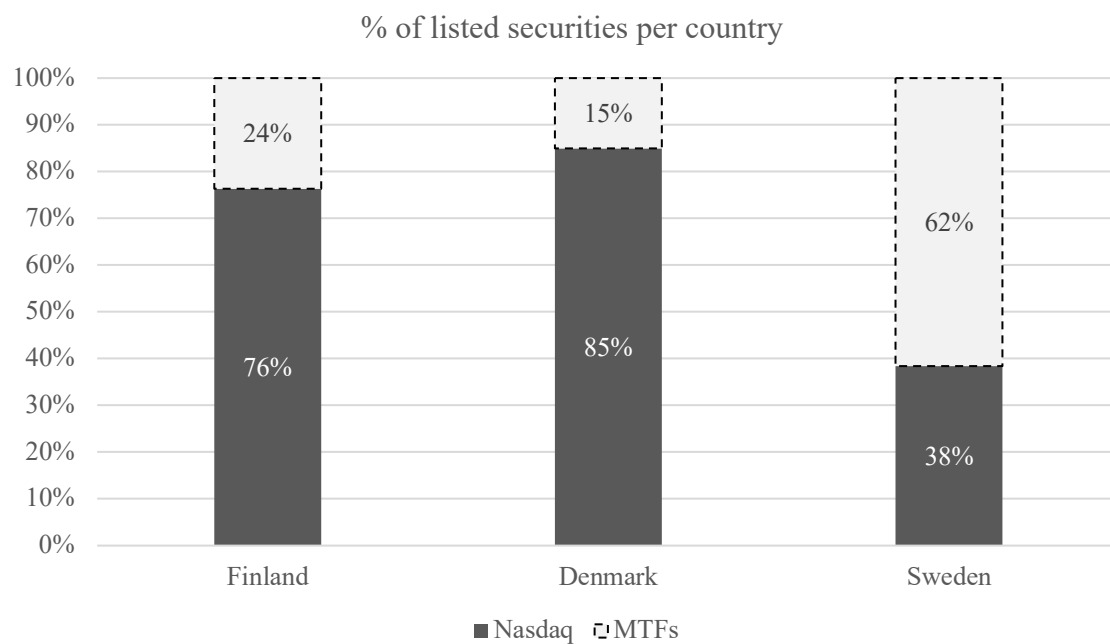
There are two types of stock exchanges, regulated exchanges (Nasdaq Stockholm and NGM Equity) and MTFs (First North Stockholm, Nordic MTF and Spotlight). In the regulated markets, the listed firms must condense to the regulations of Swedish law and the specific marketplace (Riksbanken 2016). Examples of regulations include the size of the firms, information disclosure and business management. On the contrary, the MTFs have a simpler regulatory framework making it cheaper to be listed and more appropriate for smaller firms with poor profitability. As seen below in table 1, firms on MTFs and regulated exchanges have different firm characteristics (CapitalIQ).

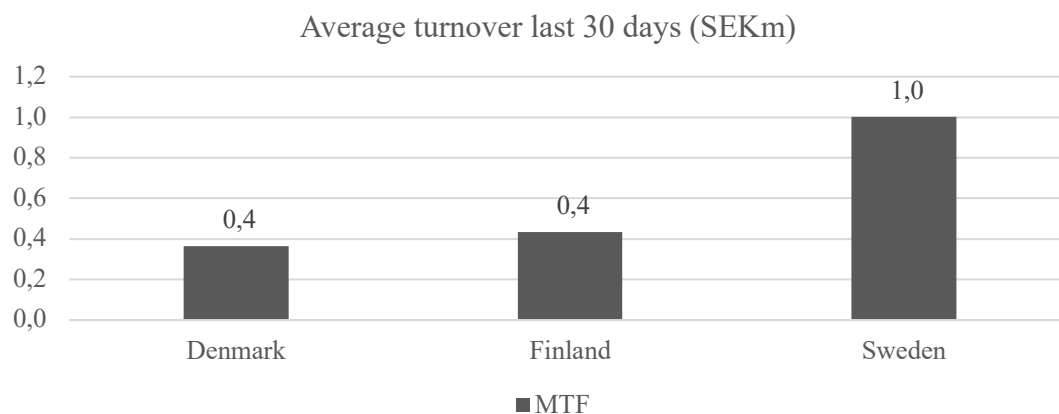
Over the last ten years, the Swedish MTFs have experienced a dramatic increase in number of listed firms driven by a large interest among retail investors. Today, MTF listed securities in Sweden are more than 50% of total stock exchange listed securities. However, this development and stock exchange environment is unique from a Nordic perspective as MTFs have not been established until recently in other Nordic countries. When comparing Sweden to Denmark and Finland, one can see a vast difference in share of MTF listed securities and the liquidity on MTFs. Research on MTF-related topics has been limited to our knowledge.

As shown below in graphs 5-7, one could argue that the high share of firms with valuations that could be considered extreme is unique to Sweden and related to the high activity on Swedish MTFs. Without MTFs with less regulatory requirements, firms, such as start-ups and life science companies, would have a higher entry barrier to become listed. When comparing the firm characteristics between the two types of stock exchanges, as in table 1, one can identify that MTFs have a larger extent of premature development-orientated firms.

Table 1. Differences in firm characteristics between MTFs and Nasdaq

Panel A. Normalized income statement as % of revenue	MTFs	Nasdaq
Sales	100%	100%
Gross profit	38%	37%
EBITDA	-1%	14%
EBIT	-4%	10%
Panel B. Market valuation (SEKm)		
Market value of equity	157	16,404
Net debt (+/-)	38	1,953
Enterprise value	195	18,357
Panel C. Trading multiples		
LTM EV/S	3.1x	1.8x
LTM M/B	2.9x	2.0x
LTM P/E	NM	12.9x

**Graph 5.** % of listed securities per country



Graph 6. Average turnover last 30days (SEKm)



Graph 7. Total turnover last 30 days (SEKm)

3. Theoretical background and literature review

To understand the subject and the fit of this study, theoretical frameworks and previous literature regarding insider trading and information asymmetry will be examined. More specifically, we will review literature touching upon the existence of insider gains and also, how sources of information asymmetry associate with insider gains. Lastly, our fit and contribution to existing theory and literature will be discussed.

3.1. Theoretical framework

The well-known efficient market hypothesis, developed by Fama (1970), suggests insider trading to not result in gains if a market has strong form of efficiency. However, research concludes that strong form of efficiency does not hold in the financial markets. From a Swedish perspective, Shaker (2013) finds that semi-strong or weak form of market efficiency do not hold in Sweden.

Levy and Lazarovich-Porat (1995) describes the “Lemons problem” as described by Akerlof (1970) but in the context of financial markets. They argue that the “Lemons problem” can be mitigated by insiders signalling to outside investors the quality of the firm. From the insider trading perspective, an insider purchase would reveal management’s conviction of the company’s future performance and act as a positive signal to the market mitigating the “Lemons problem”. Insider sales would signal the opposite.

Economic models have been developed describing how insiders maximize profits given their information advantage over market participants. A well-known model, developed by Kyle (1985), presents how insiders takes into account the effect his trading will have on the price of the stock. Given that Kyle model (1985) holds, a firm with higher degree of information asymmetry will experience a greater share price reaction to insider trading than other firms.

3.2. Literature review

3.2.1. Existence of insider gains in the financial markets

Several studies suggest that insider trades yield abnormal returns. One cited study by Seyhun (1986) suggests that insiders gain abnormal returns (1.1% on insider purchases and 0.9% on insider sales in a return interval of 20 days). More recently, Jeng, Metrick and Zeckhauser (2003) find that insiders generate abnormal returns and that the largest return could be found within the first month. However, they find insider sales to not have abnormal returns within the first month. Furthermore, their study investigates M/B and find weak evidence for M/B to drive insider gains. In Lakonishok and Lee’s (2001) study, similar to Jeng, Metrick and Zeckhauser (2003), insider sales is found to have poor predictability of returns. Moreover, Ke, Huddart and Petroni (2002) suggest that

insiders can trade up to two years prior to disclosures of economically significant information which can be exploited to earn abnormal returns.

3.2.2. Specific sources of asymmetric information driving insider gains

Aboody and Lev (2000) argue that R&D activity is a specific source of asymmetric information exploited by insiders to generate abnormal returns. The authors argue that R&D is unique to the firm which increases the information gap between insiders and outside investors. Results from the US market suggest that insiders in firms reporting R&D expenses have larger gains than insiders in firms with no R&D. The mean return difference between transaction and reported date, with an average interval of 25 days, was 0.92% for purchases and -0.6% for sales. On reported date, the mean return difference was 0.16% for purchases and -0.05% for sales.

Furthermore, Frankel and Li (2004) investigates insider trading and information asymmetry. By investigating financial statement information, analyst following and voluntary disclosure, they find insider gains to decrease with increasing financial statement informativeness and increasing analyst following. Consequently, Frankel and Li argues that increasing financial statement informativeness decreases asymmetric information and thus, reduces insider gains.

Moreover, firm size has been a topic of research when studying insider gains. Degryse, de Jong and Lefebvre (2013) find in their study of the Dutch market that managers in small cap companies earn larger returns for purchases than managers in mid and large cap firms. Similarly, Lakonishok and Lee (2001), find that insiders in small firms are better at predicting future returns compared to managers in large firms when purchasing shares.

3.3. Study's contribution to existing literature

Aboody and Lev's (2000) findings on R&D is of particular interest as our studies are similar in terms of comparing insider gains between two groups of firms. Aboody and Lev investigates whether firms with R&D expenditures have higher insider gains than firms with no R&D expenditures. Both firms with little R&D expenses and profitable operations as well as firms with substantial R&D costs and negative earnings are included in the sample of R&D firms. We argue that, given the broad definition in Aboody and Lev's study, some R&D firms' development activities may have little to no impact on firm valuation and thus, a negligible effect on information asymmetry. Consequently, the insider's gains in R&D firms may relate to other sources of information asymmetry than R&D. We intend to be more accurate in terms of defining a group of firms with high information asymmetry rather than a specific item.

Furthermore, Frankel and Li's paper (2004) is relevant for this study. They argue that less informativeness in financial statements is associated with larger insider gains. However, we believe the financial statement informativeness must be put into context of what is relevant to the firm's valuation. Otherwise, we cannot conclude whether the

missing information is increasing the extent of asymmetric information. If the poor financial statement informativeness is of importance for the valuation, it will contribute to a greater degree of asymmetric information. We intend to investigate firms with extreme valuations which are motivated by something not stated in the financial statements, i.e. firms with less financial statement informativeness relevant for the firm's valuation.

Moreover, as described in the introduction of this study, premature loss-making firms with little to no sales have retained increasing amount of attention by investors and media over the past decade. To our knowledge, no cited study has investigated premature loss-making firms in the context of insider trading. We argue that these firms are of interest for research and highly relevant given the widespread start-up trend in society. In this study, we investigate firms with extreme valuations which typically are premature loss-making firms with little to no sales (see table 8, page 21).

Lastly, most reviewed studies on this topic are from the 20th century or early 21st century studying the US market with some exceptions. Limited research on the Swedish market may require input this study intends to provide. Specifically, with regards to this study's topic, the Swedish equity market has a substantially larger share of firms with a valuation that can be considered extreme in comparison to other European equity markets and can thus be a well-suited market for this topic of study (see graphs 1-3, p. 6-7).

3.3.1. Illustrative example of study's contribution

To illustrate how the study complements and contributes to Aboody and Lev's (2000) and Frankel and Li's (2004) research, we provide a high-level example of how our investigated group of firms differ.

Both company A and B have a blood sample service business however, company A has a product development division while company B has an ongoing clinical trial on a pharmaceutical candidate. In Aboody and Lev's study, both companies would be considered as R&D firms given reported R&D expenses.

Table 2. Overview of operations

Business activities	Company	
	A	B
Blood sample services	x	x
Product development	x	
Clinical study on pharmaceutical candidate		x

However, when comparing company A and B's financials, they differ substantially as the clinical study performed by company B is very costly. Also, company B cannot bear debt because of the losses and has therefore a net cash holding in the balance sheet. The pharmaceutical candidate cannot be booked as an asset given the uncertainty regarding

future economic benefits. Frankel and Li would have argued that company B has less financial statement informativeness compared to company A given the missing information about the pharmaceutical candidate.

Table 3. Financials

P&L	A	B
Sales	1 000	1 000
OPEX	-900	-5 000
Net income	100	-4 000
Balance sheet		
Equity	800	800
Net debt/cash (+-)	300	-200

Although the pharmaceutical candidate is non-existent in the balance sheet, it does have a value from a shareholder perspective because of the potential future benefits if succeeding the clinical trials. Consequently, the valuation of company B is substantially higher than company A. In terms of valuation multiples, the valuation of company B looks extreme given the little financial statement informativeness about the pharmaceutical candidate.

Table 4. Market valuation and valuation multiples

Market valuation	A	B
Enterprise value	1 300	7 800
Market value of equity	1 000	8 000
Valuation multiples		
EV/S	1,3x	7,8x
M/B	1,3x	10,0x
P/E	10,0x	NM

Similar to Frankel and Li, the companies with extreme firm valuations, as defined in this study, will lack financial statement informativeness. However, given the valuation context, we will solely investigate the firms which lack financial statement informativeness that is relevant for the valuation.

4. Research question and hypothesis

We hypothesize that companies with extreme valuations are characterized by more information asymmetry than the average listed firm due to; (1) Not possible to value the company on the basis of historical financial statements, (2) Firm valuation is motivated by expectations on cash flows far away in the future with high degree of uncertainty, (3) Equity financed loss-making firms have a higher risk profile and losses have lower financial informativeness than profits, thus leading to a greater extent of information asymmetry. Consequently, insider trading in these firms should result in higher insider gains and will thus be investigated. The study's research question and hypothesis are presented below.

Research question: *Do Swedish listed firms with extreme valuations have a greater degree of information asymmetry and thus, higher insider gains, than other Swedish listed firms?*

Hypothesis: *An extreme firm valuation leads to a higher degree of information asymmetry between insiders and market participants regarding the firm's valuation*

The logic behind the hypothesis is described below.

4.1. Extreme firm valuations leading to a higher degree of information asymmetry

In the data section, we explain how an extreme valuation is defined in this study. Companies with extreme valuations are often equity financed early stage firms with no earnings or booked assets motivating its market value of equity or enterprise value. Instead, the valuation of the firm is based on items, not specified in the financial statements that are expected to result in high future cash flows. In terms of business characteristics, an example of this type of firm, with extreme valuations, could be a development firm such as a life science company conducting medical trials for its pharmaceutical candidate or a clean-tech start-up company with no commercialized product.

4.1.1. Valuations not explained by historical financial statements

An extreme valuation implies that the valuation discounts future cash flows which are not reflected in a firm's historical financial statements. In general, development-oriented firms have extreme valuations as the companies are valued on the basis of their future commercialization of the development projects. Furthermore, today's accounting standards for these companies have certain limits as development expenses are not allowed to be recognized in the balance sheet if the development has a high uncertainty regarding future economic benefits. An example of such standard is the recognition criteria found in IAS 38 regarding intangible assets. Therefore, some activities in a

development-oriented firm which have a value from a shareholder perspective will not show up in the balance sheet. This implies that development-oriented companies will have neither profits nor positive free cash flows and a substantial discrepancy between fair value and booked value of the firm's assets. Consequently, the valuation of these companies will be considered as extreme and thus, difficult to interpret based on the historical financial statements.

An example of the above could be a life science company with one pharmaceutical candidate in an ongoing clinical trial. Such pharmaceutical candidate may result in high future cash flows, but the candidate is not allowed to be booked in the balance sheet as its economic benefits are not probable enough, i.e. the risk of not passing the trial is substantial. This life science company would not have any sales, profits or assets in its financial statements motivating its market value of equity or enterprise value. However, the "asset" reflected in the market value is the life science company's pharmaceutical candidate thus reducing financial statement informativeness with regards to firm valuation.

Assets that are not in the balance sheet or not booked at fair value may drive information asymmetry between insiders and equity investors as the investors are not able to derive information from financial statements or be certain about future economic benefits. To understand future economic benefits of such project, one may need insight of daily operations and relevant expertise such as a corporate insider. Furthermore, if assets are not capitalized or booked at fair value, investors will not be able to observe productivity and updates regarding the value of the assets in the financial reports. Investors can't derive information about the ongoing business of one development-oriented firm by looking at another one or at the market it operates in to the same extent as in e.g. manufacturing companies affected by prices of raw materials and global economic activity.

4.1.2. Extreme valuation implies high expectation on uncertain cash flows far away in the future

If a company has an extreme valuation, not explained by historical financial statements, the valuation implies high expectations on the firm's future cash flows and economic benefits. The DCF-valuation, a common valuation method, discounts the company's expected future cash flows with the weighted average cost of capital ("WACC") in order to measure the present value of a firm's future cash flows. The WACC will incorporate a risk premium for the cost of equity and the cost of debt which suggests that cash flows in the future are considered to be riskier than cash flows today. Also, cash flows far away in the future are considered to be riskier than cash flows in the short-term future. Other widely used methods like the payback method favours cash flows generated in the short term. Smith and Watts (1992) argue that corporate insiders have superior knowledge to external investors about the firm's future cash flows. Consequently, high expectations on cash flows far away in the future should increase the extent of information asymmetry.

Lastly, for companies with extreme valuations, the risk profile is relatively idiosyncratic in comparison to mature firms given the uniqueness of firm-specific development

activities. Consequently, investors cannot assess the riskiness of the company by analysing systematic risks.

4.1.3. Equity financed loss-making firms have less financial informativeness

Hayn (1995) investigates informativeness of losses and find losses to be less informative to investors than profits. In her study, it is also stated that many of the loss firms are high-tech growth firms similar to the sample of firms with extreme valuations investigated in this study. The low informativeness of losses with respect to firm valuation could be used as an argument to support why firms with negative earnings have a high degree of asymmetric information as financial disclosures become less important.

Moreover, assuming that the “Pecking order theory” holds, as described by Myers & Majluf (1984), a firm will prefer financing through internal funds and debt over equity. An equity financed firm which cannot fund its operations by internal earnings or by issuing debt must issue equity to finance the operations as a last resort. Since creditors usually are more risk averse than shareholders, a firm with external debt removes part of the information asymmetry which outside investors face. Debt financing would indicate that the firm is able to generate sufficient cash flows to pay back the loan therefore decreasing the degree of asymmetric information. Hence, an equity financed firm with negative earnings signals that it has more uncertain operations which may lead to a higher degree of information asymmetry between insiders and outside investors.

5. Data

5.1. Insider transactions

Insider trading data is gathered from Holdings, a service provided by Modular Finance AB, supplying insider transactions consistent with Finansinspektionen's definition of insiders on the Swedish stock exchanges. In total 76 551 transactions between 1991-2019 are gathered from 761 firms. Insider transactions that are not stock purchases or stock sales, e.g. transactions with options or warrants etc, are excluded since they may be executed with a different motive than an open market share transaction. 2 454 transactions are excluded in the sample of insider transactions because of not being a common stock purchase or sale.

Using Infront's trading terminal, data on closing stock prices for the Swedish stock exchanges are gathered with stock prices over the last 7 200 trading days from 1998 to 2019. Consequently, insider transactions prior 1998 are excluded from the test. If a share misses a closing price at either the transaction date or reporting date, the relevant transaction is excluded from the sample. A closing share price may be missing for various reasons. One reason is that the data source of insider transactions changed the data format from December 2018 which implied difficulties in matching transaction to stock prices. Another reason could be that the transaction occurred in connection to an IPO and therefore lacks a closing share price at the transaction date. Moreover, another reason could be related to liquidity and no traded volumes at the specific dates. If a share trades under poor liquidity, the price reaction may be driven by small trading volumes and hence, the price reaction may not be a representative market reaction. In total, 16 091 transactions are excluded due to transaction occurring prior 1998, changed data format, poor liquidity and other factors. Furthermore, all transactions with more than 60 days between transaction and reporting date are excluded to avoid potential reporting errors. 1 163 transactions are excluded due this rule.

Table. 5 Overview of adjustments to transactions

Data waterfall table	# Transactions
1. # Transactions from holdings	76 551
<i>Non-stock transactions</i>	-2 454
2. # Stock transactions	74 097
<i>Missing stock prices due to transaction prior 1998, liquidity etc</i>	-16 091
3. # Stock transactions with correct stock prices	58 006
<i>More than 60 days between reported and transaction date</i>	-1 163
4. # Stock transactions with correct stock prices and lower than 60 days between reported and transaction date	56 843

For each calendar month and for each firm, we compute a firm-specific mean raw return in order to cluster the insider transactions and avoid overlap in different transactions' returns. The firm-specific mean raw return are averages of all the insider transactions

which occurred during the given month. In total, 17 121 mean raw returns are computed.

5.2. Defintion of extreme firm valuation

Each firm-specific mean raw return is defined as either a firm with extreme valuation (“HV”) or as an other firm (“LV”). S&P CapitalIQ have been used to gather data about firm valuation and earnings. Extreme valuation is defined according to the following. Firstly, to be defined as a firm with extreme valuation, the company must have negative earnings over the last twelve months (“LTM”) in terms of either EBITDA, EBIT or Net income. Secondly, a firm with extreme valuation must have an Enterprise Value / LTM Sales (“EV/S”) and a Market capitalization / LTM Book value of equity (“M/B”) in the respective 4th quartile of the total sample of firm-specific mean raw returns. To summarize, a HV firm has negative earnings and an LTM EV/S and LTM M/B in the 4th quartile of the total sample of firm-specific mean raw returns. We use EV/S to determine that the enterprise value incorporates other items than revenue related operations. For M/B, we use the multiple to ensure the market value reflects something which is not stated in the balance sheet.

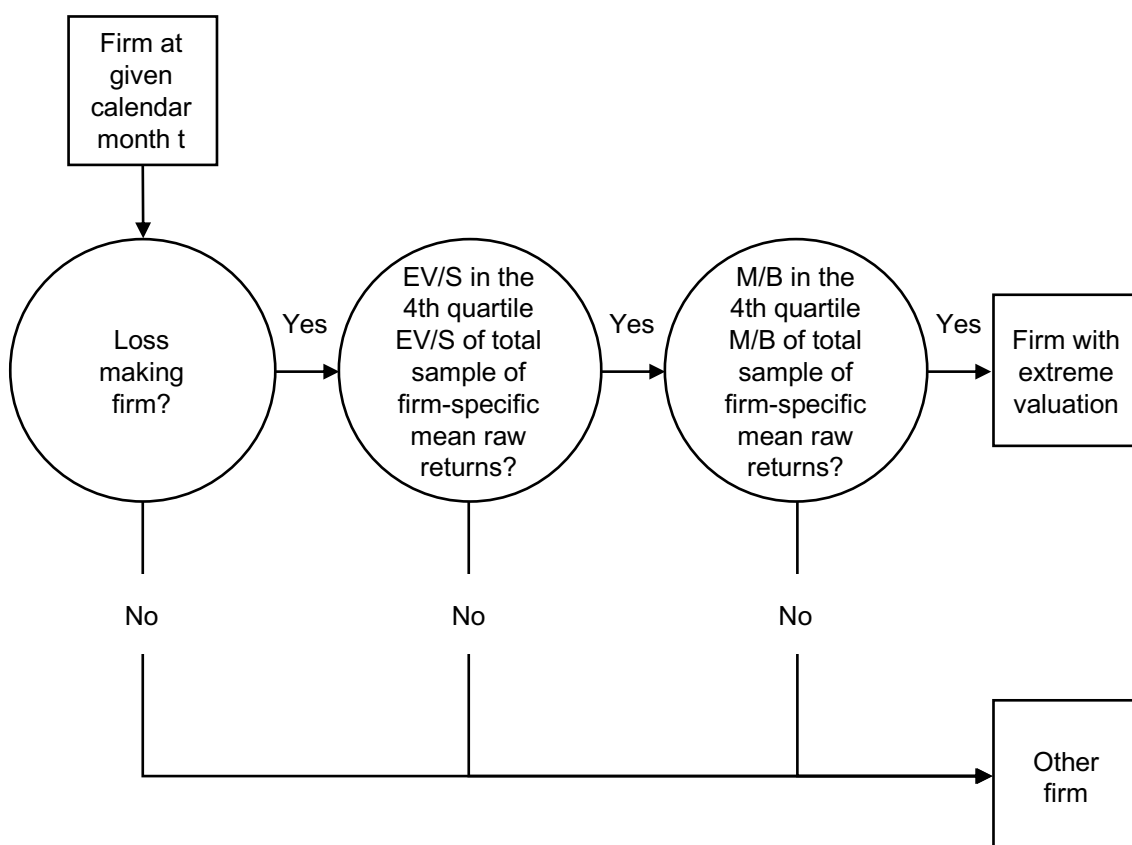


Figure 1. Checklist for defining firm with extreme valuation

Given the sample of insider transactions, there are in total 17 121 firm-specific mean raw returns to be defined as either HV or LV. Of the 17 121, 513 firm-specific mean raw returns are excluded due to missing data from CapitalIQ. In terms of number of

insider transactions, 1 701 transactions are excluded due to missing data. Consequently, the final data set includes 16 608 unique firm-specific mean raw returns defined as either HV or LV including 55 142 insider transactions.

Table 6. Overview of adjustments to transactions	# Transactions
Data waterfall table	
1. # Transactions from holdings	76 551
<i>Non-stock transactions</i>	-2 454
2. # Stock transactions	74 097
<i>Missing stock prices due to transaction prior 1998, liquidity etc</i>	-16 091
3. # Stock transactions with correct stock prices	58 006
<i>More than 60 days between reported and transaction date</i>	-1 163
4. # Stock transactions with correct stock prices and lower than 60 days between reported and transaction date	56 843
<i>No monthly valuation definition (HV or LV) due to lacking data from CIQ</i>	-1 701
5. # Stock transactions with correct stock prices and a monthly valuation definition	55 142

Table 7. Overview of mean raw returns	# Firm-specific mean raw returns
Data waterfall table	
1. # Firm-specific mean raw returns	17 121
<i>Missing data from CapitalIQ</i>	-513
2. # Firm-specific mean raw returns defined as either HV or LV	16 608
# HV mean raw returns	1 034
# LV mean raw returns	15 574

Tables 8-9 below illustrates the difference in firm characteristics between HV firms and LV firms while table 10 displays the top 5 sectors and top 5 primary industries for the two groups and share of the total group's sectors and primary industries. As seen in tables 8-9, HV firms have typical characteristics of a development-oriented firm with negative earnings, high degree of equity financing and large cash holdings. The health care sector is the largest sector for HV firms (50%) while industrials is the most common sector for LV firms (27%). Healthcare industries are dominating the top 5 industry list for HV firms. Furthermore, the distribution of sectors is more condensed in the group of HV firms compared to LV firms.

Table 8. Financials per type of firm

Normalized income statement % of revenue	HV	LV
Revenue	100%	100%
Gross profit	57%	33%
EBITDA	-8%	13%
EBIT	-51%	10%
Balance sheet ratios		
Cash % of assets	16%	12%
D/E	1,0	2,4
L/E	1,7	4,9

Table 9. Valuation per type of firm

Market valuation (SEKm)	HV	LV
Market value of equity	1 188	21 192
Net debt	78	269
Enterprise value	1 267	21 461
Trading multiples		
LTM EV/S	13,0x	1,4x
LTM M/B	8,0x	2,2x
LTM P/E	NM	15,2x

Table 10. Sector and industry split per type of firm

Top 5 sectors per type of firm (% of mean raw returns)	
HV	LV
Health Care (50%)	Industrials (27%)
Information Technology (23%)	Information Technology (16%)
Industrials (18%)	Consumer Discretionary (14%)
Materials (6%)	Health Care (11%)
Consumer Discretionary (1%)	Financials (9%)
Top 5 industries per type of firm (% of mean raw returns)	
HV	LV
Health Care Equipment (20%)	Real Estate Operating Companies (8%)
Biotechnology (17%)	IT Consulting and Other Services (5%)
Electronic Equipment and Instruments (11%)	Industrial Machinery (4%)
Pharmaceuticals (8%)	Electronic Equipment and Instruments (4%)
Industrial Machinery (7%)	Health Care Equipment (4%)

5.3. Return statistics per transaction and type of firm

Table 11 disclose descriptive return statistics of insider transactions per type of firm. Purchase and sale transactions are separated into different time periods to disclose changes in number of insider transactions. Of the 55 142 transactions, 2 863 are made

by insiders in HV firms which is fewer than the 52 279 transactions made by insiders in LV firms. Furthermore, the table suggests that the number of insider transactions have increased in recent years.

Panel B of the table provides the average return per type of firm prior the reporting date while Panel A illustrates average return at the reporting date. Prior reporting date return statistics are inconsistent. Insiders in HV firms seem to gain less than LV firms on purchases prior reporting but gain more than LV firms on sales. (For sale transactions, negative stock returns imply a positive gain for insiders) In Panel B, one can note that return statistics at reporting date are in line with our hypothesis with insiders in HV firms earning on average higher gains for both purchases and sales. However, the difference in return for sales is substantially smaller than difference in return for purchases. However, these initial findings should be seen as descriptive and not as any results since the insider transactions are not aggregated by firm and month and also not controlled for any known risk factors, such as specific firm bias.

Table 11. Descriptive return statistics

Panel A. Number of transactions			Panel B. Return from transaction prior reporting date				Panel C. Return from at reporting date			
HV		LV	HV		LV		HV		LV	
Year	# trans	# trans	Purchases	Sales	Purchases	Sales	Purchases	Sales	Purchases	Sales
1999	10	627	-0,8%	-0,9%	2,3%	4,9%	2,4%	-1,7%	0,1%	0,1%
2000	52	2 115	4,9%	3,8%	0,4%	0,8%	-0,8%	-0,4%	0,3%	0,1%
2001	35	1 852	2,0%	-2,4%	0,9%	-0,1%	1,3%	1,1%	0,1%	-0,8%
2002	10	1 586	-2,9%	-0,7%	0,8%	-0,2%	1,3%	1,4%	-0,2%	-0,4%
2003	27	1 703	-0,8%	0,9%	0,5%	0,3%	1,0%	-6,2%	0,4%	-0,3%
2004	101	1 761	-6,1%	-2,2%	0,4%	0,1%	2,6%	-0,1%	0,2%	0,1%
2005	81	1 920	1,9%	1,3%	0,3%	0,2%	1,3%	0,5%	0,4%	0,2%
2006	122	2 680	-0,4%	-0,3%	0,1%	0,0%	-0,2%	-0,9%	0,1%	0,0%
2007	149	2 960	-0,6%	-1,9%	0,1%	-0,2%	-0,6%	0,3%	0,3%	-0,2%
2008	106	2 456	-1,0%	-5,5%	-0,1%	0,1%	0,4%	-1,3%	0,1%	-0,7%
2009	53	2 171	0,9%	0,1%	1,2%	-0,5%	-0,3%	1,3%	0,3%	0,4%
2010	119	2 113	-0,1%	-1,6%	0,4%	0,2%	0,2%	1,9%	0,5%	-0,1%
2011	130	2 365	1,5%	0,9%	-0,1%	-0,3%	-0,2%	-0,6%	0,3%	-0,3%
2012	98	2 016	0,9%	0,5%	0,1%	-0,1%	0,7%	-1,4%	0,5%	-0,1%
2013	133	2 185	0,4%	0,7%	0,3%	0,4%	2,7%	-1,5%	0,4%	0,1%
2014	259	2 736	-0,2%	-1,9%	0,3%	0,1%	2,5%	-0,3%	0,5%	0,0%
2015	187	3 380	3,1%	0,7%	0,2%	-0,4%	1,0%	-0,5%	0,1%	0,1%
2016	277	4 594	0,6%	-1,2%	-0,1%	0,0%	2,5%	0,9%	0,4%	-0,2%
2017	473	5 508	-1,5%	-0,4%	0,2%	0,1%	2,0%	0,2%	0,3%	-0,2%
2018	441	5 551	-1,4%	-0,5%	0,1%	-1,9%	2,6%	-0,4%	0,4%	0,3%
Total/Average	2 863	52 279	-0,4%	-0,6%	0,3%	-0,1%	1,5%	-0,2%	0,3%	-0,1%

6. Method

The method in this study is based on Aboody and Lev's paper. Four portfolios of firm-specific mean raw returns are constructed for each month conditional on the firm being a HV or LV firm and also depending on the firm's insiders were net purchasers or sellers in the specific month. For example, for January 2018, HV_p is the average return for all HV firms whose insiders were net purchasers during January 2018. Likewise, LV_p in January 2018 is the average return for all LV firms whose insiders were net purchasers during January 2018. If a portfolio for any given month includes less than 3 individual firms, the portfolio for that month is excluded from the test to avoid bias towards specific firms and potentially misleading price reactions from poor liquidity.

- 1) HV_{pt} , firms with extreme valuation where insiders were net purchasers of stocks during a given calendar month t
- 2) LV_{pt} , firms with no extreme valuation where insiders were net purchasers of stocks during a given calendar month t
- 3) HV_{st} , firms with extreme valuation where insiders were net sellers of stocks during a given calendar month t
- 4) LV_{st} , firms with no extreme valuation where insiders were net purchasers of stocks during a given calendar month t

When plotting the observations in a histogram diagram, one could argue that the sample of observations is normally distributed. To test the hypothesis and answer the research question, we conduct a t-test to see whether the difference between the calendar-time portfolio returns of HV and LV deviates significantly from 0. A higher t-value suggests a greater standard deviation separating the sample mean from 0. The t-test is run with 87 observations for insider purchases and 63 for insider sales.

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \quad (1)$$

H_0 = The calendar-time portfolio returns of HV and LV are equal
 H_1 = The calendar-time portfolio returns of HV and LV deviates from 0

Moreover, an intercept test using Fama and French's three-factor model (1993) is performed to examine whether insiders in HV firms gain more than those in LV firms. The independent variable is the difference between calendar-time portfolio returns in HV and LV firms. The regression is run over 65 observations for insider purchases and 47 observations for insider sales each calendar month. Number of observations in the intercept test is lower due to missing Fama and French factors post January 2017. The dependent variables are the three Fama and French factors i.e. market return, size and book-to-market ratio. The Fama and French's factors (1993) are gathered from the Swedish House of Finance.

We will run the t-test and the regression on insider's return between the transaction date and the day prior reporting date and also run the two tests on insider's return from the

market's reaction on the reporting date. Tests will also be performed between for the return over one and three days after reporting date. The interval between the transaction date and the day prior reporting date is on average 4,4 days. If investigating longer return periods, one would need to consider that other factors than insider trading to have a substantial impact on stock returns. In this study, we aim to insulate the insider transactions' impact on the return to determine how the effect from the insider trading differs between the two groups of firms. Given the large difference between the two groups' firm characteristics and the valuation aspects of this test, it is possible that long-term return performance differs substantially between the two groups independent of insider trading.

$$HV_{pt} - LV_{pt} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + \delta SMB_t + \sigma_p HML_t + \varepsilon_p \quad (2)$$

$HV_{pt} - LV_{pt}$	= Return from going long in a portfolio with firms with extreme valuation and short in other firms in months where insiders in firms were net purchasers.
$R_{mt} - R_{ft}$	= Market excess return in a given calendar month. Market return equals the monthly SIXRX index and the risk-free rate equals 1 month Swedish T-bills
SMB_t	= Difference in return in equally weighted portfolio of small stocks and an equally weighted portfolio of large stock in a given calendar month t
HML_t	= Difference in return in equally weighted portfolio of stocks with high book-to-market and an equally weighted portfolio of stocks with low book-to-market in a given calendar month t

7. Results

7.1. Insider's gains prior reporting date

Table 12, Panel A presents univariate results of mean return from transaction date to one day prior reporting date for HV, LV and HV – LV portfolios. For insider purchases, HV and LV have a similar mean return of -0,02% and 0,07% respectively. For insider sales, HV's insiders have lower gains on average than LV with a mean return at 0,36% compared to 0,04%. No t-test suggests any of the group of firms to have higher gains than the other.

Furthermore, an intercept test using the Fama and French three factor model is used to see whether the insider purchases or sales generate any excess return. The intercept tests suggest insider purchases to not result in excessive returns for neither HV nor LV firms. For insider sales, the test suggests with an α at 0.88% to a 10% significance level that insiders in LV firms earn excessive returns compared to insiders in HV firms.

Table 12. Results from transaction and reporting date

Panel A: Univariate results from transaction									
	Insider Purchases					Insider Sales			
	Mean	95% Conf. Interval	t	# obs		Mean	95% Conf. Interval	t	# obs
HV	-0,02%	-0,58%	0,54%	87		0,36%	-0,56%	1,28%	63
LV	0,07%	-0,64%	0,20%	87		0,04%	-0,21%	0,28%	63
HV _{tran} -LV _{tran}	-0,09%	-0,65%	0,47%	-0,32	87	0,33%	-0,50%	1,16%	0,79 63

Panel B: Three-factor Model						
	α	$R_{mt} - R_{ft}$	SMB_t	HML_t	$Adj. R^2$	# obs
Insider Purchases						
HV _{ptran} -LV _{ptran}	-0,02%	0,01	0,09	0,14	-0,03	65
t-statistic	0,06	-1,14	-5,56	-0,54		
Insider Sales						
HV _{stran} -LV _{stran}	0,88%	-0,40	0,245	0,106	-0,07	47
t-statistic	1,71	-2,66	1,67	0,50		

The above results are different from what Aboody and Lev (2000) conclude about R&D firms. However, one could argue that our tests are difficult to compare as the number of days between transaction date and the day prior reporting date is substantially different. The insider transactions in this study have on average 4,4 days between transaction and reporting date while Aboody and Lev have on average 25 days. Moreover, results in the intercept tests are inconsistent for purchases and sales.

7.2. Insider's gains from investor's reaction

Table 13, Panel A presents univariate results of mean return from closing share price on the day prior reporting date to the closing share price on the reporting date. For insider purchases at the reporting date, HV has a higher mean return than LV at 1,46% compared to 0,38%. Also, the difference in return between HV and LV is positive with 95% confidence in an interval of 0,55% to 1,61%. The t-test suggests that insiders in HV firms have higher gains than insiders in LV firms to a statistical significance level below 0.1%. Also, the mean return difference of 1,08% is economically large given the return interval of one day.

For insider sales at reporting date, HV has lower mean return than LV with an average return of -0,18% compared to 0,00%. The 95% confidence interval for the difference in return between HV and LV is not below 0. However, for sales, the statistical strength and return difference increases at the days after reporting date. At one day after reporting date, insider selling shares in HV firms have a higher gain of 0,72% compared to insiders in LV firms. This difference is negative below a 5% significance level. To summarize, the direction of the results for sales are in line with the hypothesis but the statistical significance is varying and not completely conclusive.

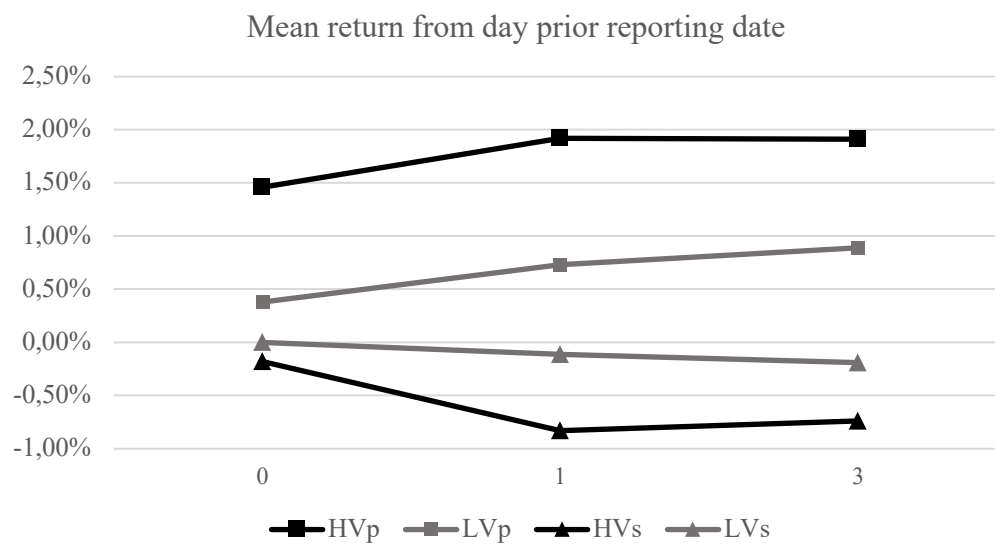
Moreover, in the intercept test, the mean return difference between HV and LV for purchases have a significantly positive and economically large α of 1,00% ($t = 3,01$, significant at the 1% level). For insider sales, the mean return difference between HV and LV have a negative α of -0,44% below a 20% statistical significance level ($t = -0,98$).

Table 13. Results from reporting date

Panel A: Univariate results from reported										
	Insider Purchases, # obs = 87					Insider Sales				
	Mean	95% Conf.Interval	t	# obs		Mean	95% Conf.Interval	t	# obs	
HV _{+0days}	1,46%	0,94%	1,98%		87	-0,18%	-0,82%	0,45%		63
LV _{+0days}	0,38%	0,27%	0,50%		87	0,00%	-0,17%	0,17%		63
HV _{+0days} − LV _{+0days}	1,08%	0,55%	1,61%	4,04	87	-0,18%	-0,82%	0,45%	-0,58	63
HV _{+1day}	1,92%	0,27%	3,58%		87	-0,83%	-1,62%	-0,04%		63
LV _{+1day}	0,73%	0,58%	0,89%		87	-0,11%	-0,37%	0,15%		63
HV _{+1day} − LV _{+1day}	1,20%	-0,4%	2,78%	1,49	87	-0,72%	-1,57%	0,12%	-1,70	63
HV _{+3days}	1,91%	0,92%	2,90%		87	-0,74%	-1,79%	0,30%		63
LV _{+3days}	0,89%	0,65%	1,14%		87	-0,19%	-0,49%	0,11%		63
HV _{+3days} − LV _{+3days}	1,02%	0,02%	2,01%	2,03	87	-0,56%	-1,59%	0,48%	-1,07	63

Panel B: Three-factor Model						
	α	$R_{mt} - R_{ft}$	SMB_t	HML_t	$Adj. R^2$	# obs
Insider Purchases						
HV _{+p0days} − LV _{+p0days}	1,00%	-0,028	0,251	-0,007	0,048	65
t-statistic	3,01	-0,37	2,37	-0,05		
HV _{+p1days} − LV _{+p1days}	1,31%	0,161	0,200	0,067	-0,037	65
t-statistic	1,21	0,65	0,58	0,15		
HV _{+p3days} − LV _{+p3days}	0,88%	0,030	0,131	-0,106	-0,037	65
t-statistic	1,40	0,21	0,66	-0,42		
Insider Sales						
HV _{+s0days} − LV _{+s0days}	-0,44%	0,089	0,009	0,106	-0,051	47
t-statistic	-0,98	0,69	0,07	0,57		
HV _{+s1days} − LV _{+s1days}	-0,75%	-0,043	-0,961	-0,419	0,070	47
t-statistic	-1,31	-0,26	-0,59	-1,78		
HV _{+s3days} − LV _{+s3days}	-0,76	-0,005	0,445	-0,033	-0,068	47
t-statistic	-1,03	-0,02	0,21	-0,11		

Graph 8 describes mean return for each portfolio with number of days from reporting date on the x-axis. When analysing the mean return over time for all portfolios, one can see an economically large difference between the HV and LV portfolios. For LV, the average price reaction on the reporting date is almost the same for both insider sales and insider purchases while the difference between insider purchases and sales is vast for the HV portfolios. Note, this graph should be considered illustrative to the results above.



Graph 8. Mean return from day prior reporting date

8. Robustness tests

8.1. Degree of extreme firm valuation

To test how the extent and degree of extreme firm valuation affects returns on the reported date, we compute three portfolios based on three groups of companies; Extreme Valuation Firms (“HV”), Medium High Valuation Firms (“MV”), and Low Valuation Firms (“LV”). We use the same definition for HV firms as in the main test. MV firms are defined as firms with an EV/S and M/B in the 3rd quartile of the sample of firm specific mean-raw returns. LV firms include all firm-specific mean raw returns not defined as HV or MV firms.

Table 14. Results from reporting date

Panel A: T-test						
	Insider Purchases			Insider Sales		
	Mean	t	# obs	Mean	t	# obs
<i>HV – LV</i>	1,12%	4,25	87	-0,22%	-0,69	63
<i>HV – MV</i>	0,89%	2,92	87	-0,06%	-0,18	61
<i>MV – LV</i>	0,34%	3,00	200	-0,06%	-0,58	184

Panel B: Intercept test						
	Insider Purchases			Insider Sales		
	α	t	# obs	α	t	# obs
<i>HV – LV</i>	1,03%	3,17	65	-0,46%	-1,05	47
<i>HV – MV</i>	0,80%	2,13	65	-0,36%	-0,71	45
<i>MV – LV</i>	0,35%	2,72	178	-0,06%	-0,53	162

As seen in the table 14, HV firms stand out in comparison to both LV and MV firms. For purchases, insiders in HV firms have a higher average gain than LV and MV firms of 1,12% and 0,89% respectively. Moreover, for sales, the results are stronger for HV firms compared to LV and MV where the intercept test suggests HV firms to have higher insider gains than both LV and MV firms with an α of -0,46% ($t = -1,05$) and -0,36% ($t = -0,71$) respectively.

Given the low return difference for purchases of 0,34% between MV and LV firms, one could argue that a high valuation itself does not give rise to information asymmetry between insiders and market participants. Instead, it's the presence of extreme valuation, with emphasis on extreme, which suggests a high degree of information asymmetry. As discussed in the hypothesis section, one explanation could be that market participants find it difficult to value a firm which cannot be valued with conventional valuation method.

8.2. Firm size and insider gains

Several studies, such as Degryse, de Jong and Lefebvre (2013) and Lakonishok and Lee (2001), conclude that insiders in smaller firms tend to experience higher gains than insiders in larger firms. When comparing the firm characteristics between HV and LV firms, as seen in table 9 page x, one notable difference between the groups is the size of the firms in terms of market capitalization. One may argue that the difference in insider gains in the main test could be related to firm size and not to the presence of extreme firm valuation. Consequently, we will re-run the test but with group of LV firms controlled for firm size. We compute two LV firm variables; one group labelled LVSF which includes LV firms with the same average market capitalization as HV firms (SEK 1 188m) and one group labelled LVLF which includes the other LV firms. I.e. HV firms and LVSF firms have the same average market capitalization.

Table 15. Market capitalization per group of firms

Variable	Average market capitalization (SEKm)
HV	1 188
LVSF	1 188
LVLF	54 791

Table 16. Results from reporting date

Panel A: T-test						
	Insider Purchases			Insider Sales		
	Mean	t	# obs	Mean	t	# obs
<i>HV – LVSF</i>	0,86%	3,14	87	-0,19%	-0,56	63
<i>HV – LVLF</i>	1,42%	5,37	87	-0,29%	-0,89	63

Panel B: Intercept test						
	Insider Purchases			Insider Sales		
	α	t	# obs	α	t	# obs
<i>HV – LVSF</i>	0,78%	2,27	65	-0,54%	-1,13	47
<i>HV – LVLF</i>	1,31%	4,05	65	-0,40%	-0,89	47

In table 16, one can observe that HV firms have higher insider gains than both LVSF and LVLF firms at 0,86% and 1,42% respectively. For insider purchases, the results are statistically significant at a 1% level. The intercept test suggests HV firms to have higher insider gains than both groups for purchases and sales where the sales results have moderate statistical significance. For sales, one can note that HV – LVSF has a higher α compared to HV – LVLF with a greater statistical significance.

To summarize, the robustness test controlling for firm size indicates that firm size has an impact on insider gains given the results in table 16. However, the difference in insider gains between HV and LV firms is still statistically significant and economically large when controlling the group of LV firms for firm size. Conclusively, we argue that the main test's results are not fully explained by difference in firm size.

8.3. Aboody and Lev's definition for information asymmetry and insider gains

Given the similarities between this study and Aboody and Lev's study, we re-run Aboody and Lev's test with R&D as a specific source of asymmetric information. All firms which disclose R&D expenses are defined as R&D firms ("RD") while other firms are defined as No R&D firms ("NORD"). The results are presented in table 17 and 18 in the appendix.

Similar to our test, no statistically significant returns are found in the interval between transaction and the day prior reporting date.

Moreover, for insider purchases, the return difference at the reporting date is higher for RD firms in comparison to NORD firms and the result is statistically significant at the 1% level. This is similar to the main test, however, the difference in return between RD and NORD firms is lower than the difference between HV and LV firms. The difference is economically large considering that we test the return on the reporting date. For insider sales, the intercept test suggests RD firms to have lower insider gains than NORD firms at a statistically significance level below 15%. In a comparison, the main test suggests that HV firms have higher returns for insider sales than LV firms at moderate statistically significance level. Conclusively, the results suggest that Aboody and Lev's findings still hold but only for purchases. Also, R&D as a source of information asymmetry is not as relevant as extreme firm valuation when investigating the Swedish equity market.

8.4. Liquidity and its implications on share price reactions

One potential weakness in the test could be poor liquidity causing misleading price reactions. In the case of poor liquidity, one specific trade may have a large impact on the share price and that price reaction may not be representative for the stock market. However, poor liquidity can also be a reason for information asymmetry given that poor liquidity indicates a low public interest around the share.

Considering the difference in firm size between HV and LV firms in the main test, one may argue that the results could be explained by lower liquidity for HV firms. In order to test how liquidity affects the results, we re-run the test and group the firm-specific mean raw returns based on the firm's liquidity. For all firm-specific mean raw returns, we calculate an average turnover based on the daily volume and closing share price at the reported date of the insider transactions. If a firm-specific mean raw return has a turnover in the 1st quartile of all firm-specific mean raw returns, then the firm will be defined as a Low Liquidity ("LL") firm. Other firms are defined as High Liquidity ("HL") firms. All firm-specific mean raw returns with an average turnover below SEK 487 235 is defined as LL. The results are presented in table 19 and 20 in the appendix.

Between the transaction and reporting date, the mean return difference between LL and HL firms is negative for insider purchases. For insider sales, the mean return difference between LL and HL firms is negative. The direction of the results for insider purchases and sales is not consistent and the statistical significance is poor.

Furthermore, at the reporting date, the mean return difference for purchases between LL and HF firms is positive at 0,31% with a statistical significance level below 5%. In comparison to the main test, the mean return difference is substantially lower considering the short return interval. For insider sales, the mean return difference between LL and HL firms is positive and the statistical significance is poor.

To summarize, the test with LL and HL firms suggests that liquidity has an impact on insider's gains only when insiders purchase shares. However, the mean return difference between LL and HL firms is smaller than the difference between HV and LV firms. Also, for insider sales, the results are in the opposite direction compared to the main test and do not show any relevant statistical significance. Conclusively, it is likely that liquidity has a negligible effect on the main tests' results.

9. Implications and conclusions

9.1. Conclusion and discussion of findings

This paper investigates insider gains in firms with extreme valuation compared to other firms in the Swedish equity market. Since firms with extreme valuation, as defined in this study, cannot be valued on historical financial statements, have uncertainty regarding future cash flows and less financial informativeness from negative earnings, the degree of information asymmetry is argued to be higher compared to other firms. Consequently, we hypothesize that extreme valuations lead to a higher degree of information asymmetry and thus, generate higher returns on insider transactions than other firms.

When testing for returns between the transaction and reporting date, results do not indicate any excess gains for none of the groups compared to the other. Consequently, we cannot draw any conclusions regarding returns prior reporting. One could see similar non-results in the robustness tests between transaction and reporting date. Hence, we believe that returns prior reporting is of less importance and may not be related to the insider trading. One plausible explanation of the non-results could be that insiders are not allowed to trade prior disclosure of non-public information. Another explanation could be that the compared groups have different stock performance independent of insider trading which could reflect in returns prior reporting date.

To corroborate the hypothesis, we provide evidence that insider returns at the reporting date is higher for firms with extreme valuation compared to other firms. The results are both statistically significant and economically large, in particular for insider purchases but also to some extent for insider sales. The weaker results for sales are in line with previous research. Results suggest that extreme valuation leads to a higher degree of information asymmetry. Furthermore, we find that excessive insider returns are explicitly related to extreme valuation rather than a moderately high valuation. In the robustness test, one can identify that HV firms have higher returns than both MV and LV firms and the difference is economically large. Conclusively, we argue that it's the presence of extreme valuation, with emphasis on extreme, that creates a high degree of information asymmetry and thus, resulting in higher insider gains. Moreover, when controlling for firm size in the group of LV firms, we can conclude that firm size is not particularly relevant for the main tests' result. Hence, we argue our results in the main test to be robust and primarily explained by the extreme valuation in the group of HV firms.

Furthermore, when re-running the test with Aboody and Lev's (2000) suggestion (R&D) and liquidity, we find results to be in the similar direction as in the main test to a decent statistical significance. However, the results from the R&D and liquidity robustness tests are solely statistically significant for purchases and not for sales. Compared to the robustness tests, firms with extreme valuations stand out with substantially higher insider gains at reporting date, primarily for purchases but also for sales. Hence, we conclude extreme firm valuation to be a key driver of asymmetric information.

The weaker statistical significance and return difference for sales is in line with previous research where both Jeng, Metrick and Zeckhauser (2003) and Lakonishok and Lee (2001) argue insider sales to have weaker predictability of returns. Less significant results for sales could be related to varying reasons for why an insider purchases shares compared to why an insider sells shares. An old saying in the financial markets may give an insight in how the markets perceive insider sales vs purchases:

“There are many possible reasons to sell a stock, but only one reason to buy.”

Regardless if the above quote holds, our results and previous research suggest insider sales to have a lower signalling value to the equity market than insider purchases which is in line with previous research. Another potential explanation for the weaker statistical significance could be lack of sufficient data and observations.

9.2. Implications for theory, previous research and practical use

Regarding theoretical frameworks, implications and similarities can be found. The results are in line with the Kyle-model (1985) given that higher insider returns are caused by a higher degree of asymmetric information. Moreover, our results reject the strong form of efficiency formulated by Fama (1970), which is in line with previous research. Furthermore, our results illustrate the “Lemon’s problem”, as explained by Akerlof (1970) and Levy and Lazarovich Porat (1995), in the context of insider trading mitigating information asymmetry between insiders and market participants.

When comparing our results to previous literature on specific sources of asymmetric information, we find several contributions and implications. Jeng, Metrick, and Zeckhauser (2003) find weak evidence for M/B as a driver of asymmetric information and insider gains. This contrasts to our study as we conclude valuation, specifically extreme firm valuation, to be a particularly important driver of asymmetric information. Furthermore, our robustness investigates whether our findings relate to Degryse, de Jong and Lefebvre’s (2013) or Aboody and Lev’s (2000) findings. Extreme firm valuation seems to generate information asymmetry to a greater extent than firm size given an economically large return difference in the main test when controlling for firm size. In the R&D test, the gains for R&D firms are substantially lower compared to those for HV firms in the main test. Conclusively, we contribute with new findings, considering previous literature, suggesting extreme firm valuation to be a key driver of asymmetric information.

Moreover, our study investigates a new topic in finance academia with regards to insider trading. Firstly, we contribute with new research on how extreme firm valuation leads to information asymmetry and consequently, insider gains. No cited paper has investigated insider trading with regards to extreme firm valuation, as defined in this paper. Secondly, given that extreme firm valuation primarily applies to premature firms, we shed light on the widespread start-up trend we see in today’s society. In particular, we contribute with relevant insights related to start-ups and insider trading.

In terms of practical use, potential trading strategies is a discussion of interest given the strong results concluding higher insider gains for firms with extreme valuations than other firms. A trading strategy with trading in the same direction as insiders in HV firms and the opposite direction to insiders in LV-firms may generate decent returns. However, this study has clustered insider transactions on a monthly firm-basis which would not be the case for a potential trading strategy going long and short on specific insider transactions. Also, there are limitations making it difficult to implement such trading algorithm. Firstly, assuming that the price reaction occurs instantly at the reporting of the insider transaction, the trading algorithm would have to execute the trade faster than other market participants. Secondly, given that the firms defined as HV firms are smaller and have less liquidity, a large share of the return for HV firms may be reduced by the spread between bid and ask in the order book. Thirdly, less liquidity and lower number of insider transactions for the group of HV firms will limit the scalability of a potential trading strategy.

9.3. Weaknesses of the study

Weaknesses regarding the study can be found in the number of data points used to compute the observations in the statistical tests. Sweden's equity market is relatively large compared to the size of the country. However, it is a small market compared to the US, where most previous studies have been performed. Also, some data points were excluded due to missing data from data providers making the sample smaller than the original data set. A greater data set would likely improve the statistical significance and may have generated a different result. Given the small sample, the results may be sensitive to changes when including or excluding certain transactions or mean raw returns.

In order to generate a decent sample size, observations are computed between 1998-2018 (1998-2016 in intercept test). Compared to other studies, the long period of the sample is both a strength and weakness when computing the results. On the positive side, a longer time-period will mitigate bias to different market cycles, e.g. this study includes transactions during the recent bull market but also during the financial crisis in 2008-09. On the negative side, a long time-period does also include insider trades under different regulations and market circumstances.

Furthermore, our main test and robustness tests suggest extreme firm valuation to be a key driver of asymmetric information. However, we cannot be certain that extreme firm valuation is the key contributor to higher asymmetric information and higher insider returns. The R&D and the firm size robustness tests also suggest that R&D and firm size are associated with asymmetric information and insider gains. To what degree extreme firm valuation, R&D, and firm size, are correlated and how much they contribute to information asymmetry on a stand-alone basis may be difficult to examine. Further research is required in this field for more thorough understanding of specific drivers of asymmetric information.

9.4. Suggestions on further research

For further research, we suggest that insider trading in different industries should be investigated. E.g. life science and biotech firms could be of particular interest given the high share of life science firms in the group of HV firms, as seen in table 10.

Secondly, we believe that the concerns in this study with a small data set could be resolved by performing a similar research on the US market. A similar study in the US would likely contribute to a more thorough understanding of insider trading and extreme firm valuation.

Thirdly, another method to define firms with extreme valuation could be to use equity betas. A company with a high equity beta may imply that the equity market finds it difficult to value the company given the higher volatility.

10. References

Articles

- Aboody, David, and Baruch, Lev, 2000, Information asymmetry, R&D, and insider gains, *Journal of Finance* 6, 2747-276
- Akerlof, George, 1970, The Market for “Lemons”: Quality Uncertainty and the Market Mechanism, *The Quarterly Journal of Economics* 84, 488-500
- Degryse, Hans, de Jong, Frank, and Lefebvre, Jérémie, 2014, An Empirical Analysis of Legal Insider Trading in The Netherlands, *De Economist* 162, 71-103
- Fama, Eugene, 1970, Efficient Capital Markets: A Review of Theory and Empirical Work, *Journal of Finance*, 25 (2): 383-417
- Fama, Eugene, and French, Kenneth, 1993, Common risk factors in returns on stocks and bonds, *Journal of Financial Economics* 33, 3-56
- Frankel, Richard and Li, Xu, 2004, Characteristics of a firm’s information environment and the information asymmetry between insiders and outsiders, *Journal of Accounting and Economics* 37, 229-259
- Hayn, Carla, 1995, The information content of losses, *Journal of Accounting and Economics* 2, 125-153
- Jeng, A. Leslie, Metrick, Andrew and Zeckhauser Richard, 2003, Estimating the returns to insider trading: a performance-evaluation perspective, *The review of Economics and Statistics* 85(2), 453-471
- Ke, Ben, Huddart, Steven and Petroni, Kathy, What insiders know about future earnings and how they use it: Evidence from insiders trade, *Journal of Accounting and Economics*
- Kyle, Albert, 1985, Continuous auctions and insider trading, *Econometrica* 6, 1315-1335
- Lakonishok, Josef, and Lee, Inmoo, 2001, Are insider trades informative? The review of *Financial Studies* 14, 79-111
- Levy, Haim and Lazarovich-Porat, Esther, 1995, Signaling Theory and Risk Perception: An Experimental Study, *Journal of Economics and Business*, 47, 39-56
- Myers, Stewart C. and Majluf, Nicholas S., 1984, Corporate Financing and Investment Decisions When Firms Have Information That Investors do Not Have, *Journal of Finance* 13, 187-221
- Seyhun, Nejat, 1986, Insiders’ profits, costs of trading, and market efficiency, *Journal of Financial Economics* 16, 189-212
- Shaker, Abu Towhid Muhammad, 2013, Testing the Weak-Form Efficiency of the Finnish and Swedish Stock Markets, *European Journal of Business and Social Sciences* 2, 176-185
- Smith, Clifford W., Watts, Ross L., The Investment Opportunity Set and Corporate Finance, Dividend, and Compensation Plans, *Journal of Financial Economics* 32, 263-292

Reports

- OECD, 2016, Calvino, Criscuolo and Menon, No country for young firms?
- Riksbanken, 2016, Den svenska finansmarknaden, 53-58
- Preqin, 2018, 2019 Preqin Global Private Equity and Venture Capital

Internet sources

Finansinspektionen, 2019, (Online). Available at www.finansinspektionen.se ,

Accessed: February 2019

IFRS, 2019, (Online). Available at www.ifrs.org , Accessed: February 2019

Svenska Dagbladet, 2017, (Online), Insidebrotten ökar kraftigt: "Väldigt allvarligt",

Accessed: April 2019

11. Appendix

Definition and legislation

Insiders are defined according to Finansinspektionen as individuals within, or in close connection to a company that may possess information not known by the general public. Examples of insiders may be CEO, CFO, CRO, Vice President, board member, resigned executives and connected family members. (Finansinspektionen)

Violation of current legislation regarding insider trading in Sweden is determined by Finansinspektionen. An insider trade is regarded as illegal if an individual in a management position use non-public information to purchase or sell shares in a listed company. However, what is non-public information from a legal point of view is often difficult to define. Despite roughly 100 reported illegal insider trades to The Swedish Economic Crime Authority in 2016, only four were prosecuted and two cases were convicted (SvD 2018).

Robustness tests

8.3 Aboody and Lev's definition for information asymmetry and insider gains

Table 17. Results between transaction and reporting date

Panel A: Univariate results from transaction									
	Insider Purchases					Insider Sales			
	95%				95%			#	
	Mean	Conf.Interval	t	# obs	Mean	Conf.Interval	t	obs	
RD	0,46%	0,13%	0,79%		226	-0,02%	-0,41%	0,37%	189
NORD	0,30%	0,15%	0,46%		226	0,06%	-0,19%	0,31%	189
RD _{tran} -NORD _{tran}	0,16%	-0,14%	0,45%	1,03	226	-0,08%	-0,05%	0,36%	-0,36 189
Panel B: Three-factor Model									
	α	R_{mt} $-R_{ft}$	SMB_t	HML_t	$Adj. R^2$	# obs			
Insider Purchases									
RD _{ptan} -NORD _{ptan}	0,144%	-0,016	0,006	-0,056	0,009	204			
t-statistic	0,86	0,55	0,20	-1,64					
Insider Sales									
RD _{stran} -NORD _{stran}	-0,136%	0,06	-0,006	-0,076	0,001	169			
t-statistic	-0,55	0,12	-0,13	-1,51					

Table 18. Results from reporting date

Panel A: Univariate results from reported									
	Insider Purchases					Insider Sales			
	Mean	95% Conf.Interval	t	# obs		Mean	95% Conf.Interval	t	# obs
RD+0days	0,58%	0,43%	0,74%		226	0,02%	-0,27%	0,32%	189
NORD+0days	0,39%	0,30%	0,48%		226	-0,12%	-0,26%	0,01%	189
RD+0days – NORD+0days	0,19%	0,03%	0,35%	2,37	226	0,15%	-0,19%	0,48%	0,87 189
RD+1day	0,80 %	0,56%	1,05%		226	-0,00%	-0,35%	0,34%	189
NORD+1day	0,62%	0,47%	0,76%		226	-0,16%	-0,32%	-0,01%	189
RD+1day – NORD+1day	0,18%	-0,06%	0,43%	1,48	226	0,16%	-0,23%	0,55%	0,82 189
RD+3days	1,19%	0,81%	1,58%		226	-0,20%	-0,72%	0,31%	189
NORD+3days	0,89%	0,69%	1,10%		226	-0,15%	-0,39%	0,09%	189
RD+3days – NORD+3days	0,30%	-0,05%	0,65%	1,67	226	-0,05%	-0,59%	0,49%	-0,19 189

Panel B: Three-factor Model						
	α	$R_{mt} - R_{ft}$	SMB_t	HML_t	$Adj. R^2$	# obs
Insider Purchases						
RD+p0days – NORD+p0days	0,216%	-0,009	0,196	0,007	-0,005	204
t-statistic	2,44	-0,57	1,19	0,4		
RD+p1days – NORD+p1days	0,18%	-0,001	0,676	0,041	0,0219	204
t-statistic	1,31	-0,05	2,70	1,47		
RD+p3days – NORD+p3days	0,26%	0,038	0,060	0,028	0,0032	204
t-statistic	1,34	1,09	1,65	0,70		
Insider Sales						
RD+s0days – NORD+s0days	0,205%	-0,029	-0,017	0,083	-0,010	169
t-statistic	1,08	-0,80	-0,51	0,22		
RD+s1days – NORD+s1days	0,19%	0,021	0,008	0,090	0,011	169
t-statistic	0,85	0,51	0,20	2,05		
RD+s3days – NORD+s3days	-0,08%	0,7790	0,139	0,141	0,020	169
t-statistic	-0,29	1,35	0,26	2,30		

8.4 Liquidity and its implications on share price reaction

Table 19. Results between transaction and reporting date

Panel A: Univariate results from transaction										
	Insider Purchases					Insider Sales				
	Mean	95% Conf.Interval		t	# obs	Mean	95% Conf.Interval		t	# obs
LL	0,21%	-0,01%	0,53%		217	-0,15%	-0,67%	0,38%		182
HL	0,32%	0,18%	0,46%		217	-0,12%	-0,33%	0,96%		182
LL _{tran} -HL _{tran}	-0,10%	-0,42%	0,22%	-0,63	217	-0,03%	-0,60%	0,53%	0,12	182
Panel B: Three-factor Model										
	α	$R_{mt} - R_{ft}$	SMB_t	HML_t	$Adj. R^2$	# obs				
Insider Purchases										
LL _{ptran} -HL _{ptran}	-0,14%	0,059	0,021	0,003	-0,013	195				
t-statistic	-0,81	0,19	0,62	-0,07						
Insider Sales										
LL _{stran} -HL _{stran}	-0,02%	0,002	1,47	0,83	0,002	161				
t-statistic	-0,08	0,03	1,78	0,94						

Table 20. Results from reporting date

Panel A: Univariate results from reported									
	Insider Purchases					Insider Sales			
	Mean	95% Conf.Interval	t	# obs		Mean	95% Conf.Interval	t	# obs
LL+0days	0,71%	0,45%	0,97%	217		0,04%	-0,34%	0,43%	182
HL+0days	0,37%	0,29%	0,44%	217		-0,08%	-0,19%	0,03%	182
LL+0days – HL+0days	0,34%	0,09%	0,60%	2,65	217	0,12%	-0,27%	0,51%	0,60 182
LL+1day	1,00%	0,63%	1,37%	217		-0,20%	-0,64%	0,25%	182
HL+1day	0,62%	0,50%	0,75%	217		-0,19%	-0,35%	-0,02%	182
LL+1day – HL+1day	0,38%	0,00%	0,75%	2,00	217	-0,01%	-0,50%	0,48%	-0,03 182
LL+3days	1,14%	0,69%	1,58%	217		-0,17%	-0,71%	0,38%	182
HL+3days	0,96%	0,74%	1,18%	217		-0,21%	-0,48%	0,06%	182
LL+3days – HL+3days	0,17%	-0,28%	0,62%	0,76	217	0,04%	-0,52%	0,60%	0,15 182

Panel B: Three-factor Model						
	α	$R_{mt} - R_{ft}$	SMB_t	HML_t	$Adj. R^2$	# obs
Insider Purchases						
LL+p0days – HL+p0days	0,38%	0,013	0,058	0,054	0,013	195
t-statistic	2,65	0,54	2,13	1,69		
LL+p1days – HL+p1days	0,42%	0,014	0,097	0,060	0,015	195
t-statistic	2,02	0,38	2,41	1,27		
LL+p3days – HL+p3days	0,25%	-0,029	0,157	0,061	0,045	195
t-statistic	0,99	-0,66	3,31	1,09		
Insider Sales						
LL+s0days – HL+s0days	0,01%	0,461	0,097	0,118	0,014	161
t-statistic	0,34	1,11	1,74	1,96		
LL+s1days – HL+s1days	-0,04%	0,011	0,158	0,105	0,015	161
t-statistic	-0,14	0,21	2,27	1,40		
LL+s3days – HL+s3days	0,04%	-0,276	0,264	0,112	0,058	161
t-statistic	0,13	-0,48	3,40	1,34		