



LUND UNIVERSITY
School of Economics and Management

Master Thesis 2011

Do list-changes create Abnormal Returns:
*Evidence from the Swedish and Norwegian stock
markets*

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ABSTRACT

- Title:** Do list-changes create Abnormal Returns: *Evidence from the Swedish and Norwegian stock markets.*
- Seminar dates:** 2011-06-01 – 2011-06-03
- Course:** BUSM26, Degree Project in Finance – Master level, 15 ECTS
- Authors:** Peter Arnström and Kristoffer Hess Haugsöen
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- Key words:** Event study, Cumulated Abnormal Returns, liquidity, list-change, Efficient Market Hypothesis, Investor Base, Exposure, Wilcoxon Signed Rank Test
- Purpose:** The main purpose of this thesis is to examine the stock price effect when a company moves from their current listing to a more prestigious trading list.
- Methodology:** We gathered our sample of 58 list upgrades from the Swedish and Norwegian stock markets for the period 1997-2011. To capture any changes in stock value we conduct an Event study and we use the market model to estimate normal return. Furthermore; the sample is divided into sub-samples to try to capture specific effects.
- Theoretical perspective:** The theoretical framework involves previous studies on market efficiency, liquidity and effects if list-changes.
- Results:** We observe tendencies towards positive abnormal returns on the first day of trading after the list-change, but the change is not statistically significant.
- Conclusions:** As our results are not statistically significant we cannot conclude that a list-change has any effects on the value of a company.

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1. Introduction

The chapter provides a background to the thesis, problem formulation, as well as purpose and work limitations for the study. The introduction aims to give the reader a comprehensive understanding of the subject and the phenomena the essay shall deal with and how we have been thinking about our problems and questions.

To be able to go public a company must choose which one of the numerous trading places and lists they should join. These lists have different requirements depending on which “status” or “prestige” the list in question has. The most prestigious lists often have a voluminous list of requirements to fulfill before a possible registration and the smaller/less-prestigious lists are often easier to enter. For example in Sweden; to be listed on the more prestigious OMX Stockholm, *Stockholmsbörsen*, the applying companies are obligated to meet certain listing requirements based on European standards and EU directives for stock exchanges.

Smaller and newer companies are often unable to satisfy these demands, and therefore less demanding market places have been created, to enable these kind of companies to enter the stock markets and make their shares tradable for investors. One example of this is OMX First North, a *Multilateral Trading Facility* owned by NASDAQ OMX. A listing on OMX First North is often a first step towards being listed on the “main list” on the Swedish stock market, *Stockholmsbörsen* or OMX Stockholm. The companies on First North are typically small and relatively young companies experiencing high growth or high growth potential and want an opportunity to attract additional investors.

Over time the business climate will change and companies on e.g. OMX First North might now fulfill the requirements of being listed on the more prestigious and liquid OMX Stockholm, while at the same time some companies on OMX Stockholm might no longer meet the high requirements for their current listing. This would mean that we have companies that either could be upgraded or should be downgraded from their present listing. Motives for a list transfer might be to gain additional public exposure or to increase a firm’s prestige. A change to a more prominent list could be management’s way of signaling a positive view on the company’s future activities and performance¹. This scenario creates a very interesting situation and raises the question: what happens with the stock price when this change of

¹ McConnell & Sanger, 1984, *A trading Strategy for New Listings on the NYSE*

listing is realized? In our essay we aim to answer how the stock price reacts to the possible increase liquidity and increased exposure it experiences when the stock is upgraded.

One interesting aspect associated with list changes is a firm's *Investor Base*. It states that being listed on a more prestigious list will most likely widen the firm's investor base since many institutional investors, pension funds and other equity funds are prohibited to invest in companies listed on smaller lists or on MTFs. Hence an "up-listing" should be associated with more potential investors, wider *investor base* and therefore higher liquidity in the stock.

During the 21th-century the influence of the stock's location on the stock market has experienced a greater interest and gotten more space in research than before. The aim has been to answer whether being listed on a more prestigious listing creates *shareholder value*. We have found somewhat similar studies on the French, Israelian and Chinese markets but not on any of the Nordic markets.

Bacmann et al (2002) conducted a similar study on the French stock market for the years 1989-1999, examining how the exchange listing affects the stock price both at the announcement of the list change and at the list change itself. They find evidence that the list transfer is associated with positive abnormal returns, both at the announcement and at the transfer. They also find that the liquidity and that the informational status of the firm is improved after the transfer². Their findings are in line with *Amihud et al (1997, 1999)* who examined the phenomenon on the Japanese stock market and *Muscarella and Piwowar (2001)* who has conducted similar studies.

We therefore find it interesting to see how our result compares to the result of previously conducted studies.

1.1 Problem discussion

As discussed above a listing on the main stock market of a country of course have more requirements on the company when it comes to providing information about the firm's activities to the market, accounting policies, ownership structure, etc. Yet it provides an even greater exposure to investors and a further indication that the company is running a well-functioning profitable business. Thus, one could assume that the companies listed on the main

² J.F. Bacmann, M. Dubois and C. Ertur, 2002, *Valuation effects of listing on a more prominent segment of the stock market: Evidence from France*

stock market in general would be more interesting for large groups of shareholders and investors and that the shares, therefore, should be experiencing greater liquidity and a greater demand than the shares listed on e.g. MTFs like OMX First North.

If this assumption is consistent with reality, it should mean that the stocks that go from being listed on OMX First North to OMX Stockholm should be characterized by higher returns initially (i.e. the price of the stock should rise in connection with the new listing), and until the buying pressure, initiated by the list change, has subsided.

In the case of a downgrade this would mean that a company that once fulfilled the requirements for e.g. a listing on OMX Stockholm no longer does, and one might argue that (depending on the specific case of course) this specific company now is doing worse than before, or at least is suffering a significant setback. The event that a company is downgraded from one list to a less prestigious list is naturally not as common as the opposite but it does occur quite frequently and thus pose the question whether it is possible to detect any significant abnormal returns in this case. The case of a company being downgraded is interesting but will not be considered further in our study as we had problem finding sufficient data.

1.2 Purpose

The purpose of this paper is to examine, using the methodology embodied in an *Event Study*, the short-term returns for companies who change trading-list and to compare this return with the returns expected by the company if no list-change had occurred. Furthermore, this is in order to examine whether the event that a stock changes listing can be used as a clear signal to buy the stock, i.e. as a trading strategy.

We also intend to separate our sample into different sub-samples to try to find country-specific, industry-specific and size-specific effects. To try to explain any deviations from the normal return we aim to investigate changes in liquidity and other explanatory variables.

1.3 Research question

Is it possible to detect significant abnormal returns for a given company's stock when they enter a new, more prominent trading-list?

Our null hypothesis for the study is:

$$H_0: \mu=0$$

$$H_1: \mu>0$$

Where μ is the observed return in excess of the expected return

1.4 Limitations

In order to fulfill our purpose with this paper, we have access to information on all listings and de-listings as well as changes between OMX First North, NGM Equity, Nordic MTF, Aktietorget and OMX Stockholm, *Stockholmsbörsen*, as well as information about all list-changes on the Swedish stock market prior to the First North and OMX Nordic stock exchanges, such as A-listan and O-listan, for the years 1996-2011. Additionally we have similar information about the Norwegian stock market and its different exchanges; Oslo Börs and Oslo Axxess for the years 1996-2011. In order to calculate comparable returns to use in the *event study* we obtain daily stock price data for all the stocks that match our criteria, i.e. a company which have switched between trading-lists upwards and can show stock price data for at least one year prior to the list-change. All in all our study is limited to the stock markets of Sweden and Norway and the years 1996-2011.

1.5 Thesis outline

1. Introduction

Here we introduce the reader to the problem and give an explanation to why we find our subject interesting to conduct a study on. We also give a short presentation on some of the essential concepts present in the study, as well as presenting the purpose and limitations of the study.

2. Background

Here we present information about the stock markets in Sweden and Norway, the different exchanges and MTFs present in the countries and information about list-changes.

3. Theoretical framework

In this section we describe the theories on which we base our study, such as the *Effective Markets Hypothesis* and *Liquidity* and how these relate to our study. We also give a presentation of previous research conducted on the same research area.

4. Methodology

The scientific methods used in the study are presented to give the reader a clear picture on how we choose to carry out our study. We describe e.g. *Event Studies* and how to measure return and liquidity changes.

5. Empirical findings

We present our processed data: CAR for the entire sample, liquidity changes as well as the results for our different sub-samples.

6. Analysis

Here we present the analysis performed on the processed data with respect to the theories presented earlier in the paper.

7. Conclusion

The most interesting findings in our study are presented and we provide suggestions on future research on the subject.

2. Background

This segment is supposed to provide the reader with relevant background knowledge about the stock markets and the different trading platforms available in Sweden and Norway as well as the authors ranking of the trading lists.

2.1 Nordic stock markets and trading facilities

For our study we choose to focus on the Swedish and the Norwegian stock markets. We added the Norwegian stocks in order to expand our sample, and Norway was a good expansion of the sample due to that the Swedish and Norwegian stock markets are well integrated and hence we should see homogenous reactions.

NASDAQ OMX who owns and runs the major stock exchanges in Sweden, Denmark, Finland and Iceland dominates the Nordic stock market. The independent company Oslo Börs runs the stock market in Norway.

Swedish stock market

As mentioned the Swedish stock market is dominated by OMX Stockholm, or *Stockholmsbörsen* as it is normally referred to as. OMX Stockholm is by definition a stock exchange since it fulfills all requirements for a stock exchange in Sweden, or a *regulatory market*, set up by the Swedish Financial Supervisory Authority (*Finansinspektionen*). Parallel to *Stockholmsbörsen* there exist two other stock exchanges, *Nordic Growth Market* and *Burgundy* (Burgundy will not be considered further in our study), and several *Multilateral Trading Facilities* (MTFs)³. The main difference between a formal Stock Exchange and an MTF is the rules and requirements that apply to both the trading facility itself and to the companies listed on the platform. These requirements concern for example the number of owners and the size of the company. There are currently four MTFs present on the Swedish stock market: OMX First North (owned by NASDAQ OMX), Nordic MTF (owned by NGM), Aktietorget and Burgundy (owned by Burgundy stock exchange).

³ Finansinspektionen: <http://www.fi.se/Konsument/Fragor-och-svar/Borser-och-aktiehandel/#N2>

The trading platforms and the trading software used by the stock exchanges and the MTFs are more or less the same or of the same standard and performance. OMX Stockholm and OMX First North use the same platform and software⁴ and so do NGM Equity and Nordic MTF. Therefore, the effects we find do not depend on the trading systems and software of the exchanges and MTFs.

Prior to 2006 *Stockholmsbörsen* was separated by two lists; *A-listan* and *O-listan*. *A-listan* was the main list and held the biggest and most liquid stocks, while *O-listan* held less frequently traded stocks. These lists also had differing requirements on the amount of separate owners in the listed companies and had different rules of taxation. After 2006 the lists were replaced by a new system which divided the listed companies into segments based on the market value of the companies. The segments are *Large Cap*, market value over 1 billion Euro, *Mid Cap*, between 150 million Euro and 1 billion Euro and *Small Cap* for market values below 150 million Euro.

2.2 Listing requirements

The rules and requirements for listing on NASDAQ OMX Nordic applies to all stock exchanges run by OMX and thus apply the stocks listed on OMX Stockholm, *Stockholmsbörsen*. The rules are based on European standards for stock exchanges and are rigorous enough to ensure that the companies listed on OMX Stockholm does not jeopardize the status of OMX Stockholm as being the leading and most prestigious stock exchange in the Nordic region. To be listed on *Stockholmsbörsen* the company must for instance publish a *prospectus* to the public prior to the listing, pass a *legal examination* and be approved by the *listing committee* of the OMX⁵.

The MTFs in Sweden also have different requirements for the companies that are applying for listing. These requirements are naturally less demanding than for a proper stock exchange and consist mainly of equity value requirements, liquidity and requirements regarding a minimum number of individual stockholders in the companies. The primary requirement on the companies that is to be listed is the company's ability to generate profit. If the company

⁴ NASDAQ OMX: <http://www.nasdaqomx.com/listingcenter/firstnorth/fnormm/?languageId=1>

⁵ NASDAQ OMX: Rules and regulations: Issuer Rules 2011

cannot show its profitability then the company is required to show that it has sufficient financing to maintain its daily business activities⁶.

Turnover

The trading platform with the highest daily turnover, i.e. highest liquidity, on the Swedish stock market is OMX Stockholm. It is natural since OMX Stockholm is most prestigious and lists the largest Swedish companies and has the highest quantity of listed companies. OMX First North, as being the most well-known and prominent of the MTFs, has the highest daily turnover of the smaller lists in Sweden.

Table 2.1

<i>List</i>	<i>Min. number of shareholders</i>	<i>Min. equity value</i>	<i>Min. percentage of shares publically owned</i>	<i>Daily turnover</i>
OMX Nordic	500	1 M Euro	25%	26350 MSEK
First North	*	*	10%	97 MSEK
NGM Equity	300	*	10%	3.73 MSEK
Nordic MTF	*	*	10%	0.72 MSEK
Aktietorget	200	*	10%	23 MSEK
A-listan	*	300 Mkr	25%	12430 MSEK
O-listan	500	*	10%	2443 MSEK

This table sums up the requirements and the daily turnover for the different Swedish listings.

Norwegian stock market

The Oslo Börs is the only regulatory admitted stock exchange, i.e. the only formal stock exchange in Norway. It was founded as early as 1819 as the Christiania Börs. Oslo Börs is the owner of the MTF called Oslo Axess, which is a Norwegian equivalent to the MTF OMX First North in Sweden. As seen the Norwegian stock market consists of considerably fewer market places to trade and list company stocks on. The basic rules for publically listed stocks in Norway are similar to the rules in Sweden, i.e. requirements on public ownership and market value. The rules and requirements on Oslo Axess is naturally less demanding than on the more prominent Oslo Börs.

⁶ NASDAQ OMX: Rules and regulations: Issuer Rules 2011

Listing requirements⁷

The listing process on Oslo Börs is quite similar to the process on OMX Stockholm, with the requirement of releasing a prospectus and going through a careful due diligence screening to be approved and listed on the stock exchange. The procedure is the same, in principle, but obviously with less harsh requirements to be approved for listing on Oslo Axess.

Turnover

Since the Norwegian stock market consists of only one proper stock exchange and one MTF the Oslo Börs has as expected the highest daily turnover among the two.

Table 2.2

<i>List</i>	<i>Min. number of shareholders</i>	<i>Min. equity value</i>	<i>Min. percentage of shares publically owned</i>	<i>Daily turnover</i>
Oslo Börs	500	300 MNOK	25%	7522 MNOK
Oslo Axess	100	8 MNOK	25%	91 MNOK

This table explains the listing demands and the daily turnover for Oslo Börs and Oslo Axess

2.3 Ranking the lists

Since we examine the stock price behavior when a stock change listing to a more prominent list we have to rank the exchanges and MTFs to be able to recognize an *up-listing*. On the Norwegian stock market, this is an easy task since it consists of only one exchange and one MTF. The Swedish stock market consists of two formal stock exchanges and three MTFs and hence we need to rank these. Our ranking is based on how well known the list is, how the requirements for listing look and on how liquid the market is, i.e. how large the daily turnover is. Proper stock exchanges are higher ranked than MTFs in general, but we consider the MTF First North as being higher ranked than the stock exchange NGM Equity. We base this on the fact that First North has a higher daily turnover, more listed companies and is more known to

⁷ Oslo Börs: Regulations 2011

the general public. More rigorous requirements for listing also indicate a more prestigious list. Naturally, managers strive to list their stock where there is most liquidity and the largest investor base, hence higher turnover indicates higher ranking.

Table 2.3

<i>Trading list ranking Sweden</i>	
P r e s e n t	OMX Stockholm
	First North
	Aktietorget
	NGM Equity
	Nordic MTF
P a s t	A-listan
	O-listan

Table 2.4

<i>Trading list ranking Norway</i>
Oslo Börs
Oslo Axess

2.4 Motives for companies to change lists

There are several relevant reasons or motives for management and owners of a company to work for being listed on a prominent and highly liquid exchange or MTF. Companies expect and hope that moving the trading in their stock from a less prestigious trading list to a more renowned and major list will maximize the exposure of the company's stocks to all kinds of investors and that it will increase the liquidity in the company's stock. The fact that a company is traded on a major stock exchange might work as a signal of quality to investors. A company will also in most cases widen the *investor base* of the company when changing to a better list, due to the fact that you get more exposure but more importantly due to the fact that rules and regulations surrounding institutional investors and mutual funds might prohibit these to invest on smaller stock lists. Companies that are listed on more liquid and prestigious trading lists get more attention and space in media and are followed by more stock analysts, which further leads to increased exposure to possible investors. Getting more medial space and being followed by a numerous number of analysts will decrease the information asymmetry problem⁸.

⁸ K. Baker, G. Powell, D. Weaver, 1999, Does NYSE Listing Affect Firm Visibility?

Prestige is another important motive for management to pursue a high listing for the company's stock⁹. For a company it might be of great importance to be listed on a major stock exchange like OMX Stockholm or London Stock Exchange.

⁹ B. Dharan, D Ikenberry, 1995, *The Long-Run Negative Drift of Post-Listing Stock Return*

3. Theoretical framework

In the following chapter we present and describe the various theories on which we have based the analysis of our processed data on. First we present the Efficient Market Hypothesis, which is of great relevance in the presence of abnormal returns. We also discuss what effects liquidity has on stock returns and we present previous research on the subject.

3.1 Efficient market hypothesis

Fama (1960) first developed the famous and widely used theory of market efficiency. The EMH is the theory that states that prices of financial assets (Stocks, options etc.) follows a stochastic process, i.e. is randomly moving from day to day without any predetermined pattern. It also states that all publicly and privately available information is embodied in the asset price, i.e. the market price of an asset is the result of the collective analysis of all investors active in the market. This means that no investor can systematically and continuously beat the market return at a given risk, since the price movements are impossible to predict.

When formulating the EMH a few assumptions has to be made, first of all we assume utility maximizing agents. That is, all investors strive to obtain the maximum level of return for a given level of risk. Secondly, we assume that all agents have rational expectations. The basis for the theory is that the market participants as a whole always sets the right price; even if individual investors might over-price or under-price an asset, these biases is random and normally distributed and thus the overall effect of the bias is assumed to be zero. This means that no investor can exploit the price change with certainty and continuously achieve abnormal returns. *Fama developed three levels of market efficiency: weak-form efficiency, semi-strong-form efficiency and strong-form efficiency.*

The first level of market efficiency, *weak-form efficiency*, means that future price movements cannot be predicted using historical price analysis, i.e. an investor cannot systematically achieve excess returns by analyzing historical prices or other historical variables with e.g. technical analysis. The *weak-form efficiency* still suggests that certain forms of fundamental analysis might be able to generate excess returns, meaning that the price changes are

influenced only by fundamental information that is not yet available to the market. This would mean that when new fundamental information becomes available to the public, it drives the stock price slowly in a certain direction, hence insiders and quickly adjusting investors would be able to somewhat predict future price movements and exploit these.

Semi-strong-form market efficiency suggests, just as weak-form efficiency, that no systematic excess return can be obtained by historical analysis but it also suggests that no excess return can be obtained by fundamental analysis. The theory declares that when new information gets released into the market the price of the asset adjusts instantly and without biases towards a new equilibrium market price. This happens so rapidly that no fundamental analysis can be used to confidently produce excess returns. Only insiders or other investors with access to private information will be able to use this information to predict the future asset price movements with certainty.

Strong-form efficiency states that none of the three: technical analysis, fundamental analysis and insider information can provide excess return with certainty. This suggests that all available information, public and private, are reflected in the current asset prices. This would also suggest that all private information would be made accessible to the public; otherwise, insiders would be able to exploit the market.

The real-world market would be hard to match perfectly to any of the suggested *forms* of market efficiency, but presumably it would lie somewhere between *semi-strong* and *strong form*. Economists and researchers throughout the years have criticized the EMH both empirically and theoretically. The fact that investors rush to particular stocks or sectors and by that build speculative bubbles based on, in most cases, irrational expectations about future performance without real concern about underlying value, is a contradiction towards the EMH. Bubbles often burst and triggers irrational and frenetic selling of assets that in many cases instead leads to undervaluation of assets.

EMH is also criticized on the fact that there exist fund managers and investors who constantly seem to out-perform the market. One of the critics, and one of the most successful investors of all time, Warren Buffett, means that according to the EMH the only reason for some investors to always beat the market would be luck, and this, he claims, is unrealistic. Although; if we assume normally distributed expectations and therefore normally distributed pricing around a stock price mean we would expect that some random investors always will beat the market by pure luck (for lack of a better expression).

However, to conclude; one could say that even though the EMH does not go perfectly hand in hand with reality it still gives a good and reasonable theoretical foundation for testing financial hypotheses, e.g. the performance of a certain investor.

In our case, where we test whether the movement from a less prominent exchange list to a more prominent list can trigger abnormal returns, we assume that *semi-strong* market efficiency is present and an investor will not be able to take advantage of the list-change since the price of the asset would immediately adjust to the new setting. The insiders of the specific company will most likely be aware of the upcoming rise in the listing hierarchy; hence, they will be able to make use of this opportunity if it is legally possible. If the list change is announced some time in advance to the actual change, one would assume that the investors will lower the expected risk of the stock, hence raise the price. Knowing that the stock will move to a market with more liquidity and therefore the stock will be considered less risky, i.e. the market price of the stock will change at the announcement.

In our study we focus on *semi-strong market efficiency* which is what can be assumed to be present in modern financial markets¹⁰.

3.2 Liquidity

To be able to discuss the advantages and disadvantages of being on a more liquid trading-list we first of all need to define the properties of a highly liquid asset. In a liquid market you can quickly convert e.g. the stock to cash without causing any price changes. When this is not the case you classify the asset as non-liquid, this adds another risk dimension to the asset, this risk is called *liquidity risk*.

Therefore, we can observe at least two effects of this increase (decrease) in liquidity: first of all the stock price could be adjusted up (down) due, to a lower (higher) liquidity risk would influence the total risk of the asset and therefore the expected return of the asset would decrease (increase). This is consistent with the theory of negative correlation between stock liquidity and returns. If liquid stocks have lower required return as they have one risk less,

¹⁰ E. Fama, 1970, *Efficient capital markets: A review of theory and empirical work* Annual Meeting of the American Finance Association New York, N.Y. December, 28-30, 1969 (May, 1970), pp. 383-417

they will trade at a premium. We can also see that an upward (downward) shift in the liquidity can open up for numerous of new investors, which on a short-term horizon could give an even higher (lower) price.

Generally, stocks are highly liquid, but small stocks on less prestigious trading-lists can entail the risk for the seller to need to wait to be able to sell their assets. Therefore; the status of the list the stock is being traded on influence the size of the *liquidity risk* associated with the stock. Hence a list-change could influence the asset price positive and vice versa.

According to *Fang et al* stocks with high liquidity outperform less liquid stocks measured by the book-to-market ratio. In the investigation *Fang et al* divide the book-to-market ratio into three parts; price-to-operating earnings ratio, leverage ratio, and operating return on assets ratio. They find that companies with high liquid stocks generally have higher operating return on asset and have lower leverage but the price-to-operating earnings are the same. Another perspective that is put forward by *Holmstrom and Tirole* (1993) is that liquidity gives informed investors the possibility to hide their trading on private information and profit from this disguise.

We conclude that stock liquidity improves firm performance through an effect where liquidity stimulates the entry of informed investors who make prices more informative to stakeholders. Liquidity also improves firm performance by increasing the efficiency of performance-sensitive managerial compensation.

Investors enter the stock market to be able to profit from the price gains. *Maug* (1998) concludes that liquid stock markets tend to give more effective corporate governance than illiquid. Another causal mechanism through which liquidity may tie management to *shareholder value maximization* is that management's compensation should be tied to the stock price; an increased liquidity increases the cost of opportunistic behavior of managers by the fact that informed investors might sell the stock.

You can argue that liquidity might also affect firm value in a way that is change the discount rate. If the marginal investor values liquidity as *Holmstrom and Tirole* argues in their paper from 2001 then illiquid stocks should be traded at a discounted price¹¹.

¹¹ V. Fang et al, 2009, *Stock market liquidity and firm value*

Liquidity's influence on expected return

Pastor and Stambaugh (2001) investigate the influence a change in the liquidity of a stock has on the expected stock returns. They perform a regression with the expected stock returns as the dependent variable and the liquidity as one of the explanatory variables. They find that the slope coefficient of the liquidity variable has a negative correlation with the expected returns. This implies that when the liquidity increase the expected return would decrease, this is in line with the theory than an increase in the stocks liquidity should adjust up the price which will decrease the expected return.¹²

3.3 Investor Base

In 1987 Merton addressed the American Financial Association and said:

“Ceteris paribus,...an increase in the relative size of the firm's investor base will reduce the firm's cost of capital and increase the market value of the firm. Thus,...managers of the firm have an incentive to expand the firm's investor base.”

He presented a model based on the fact on that information is expensive and therefore investors limit the number of shares in their portfolio to those they have “knowledge” of¹³. The theory that investor`s hold a less than perfect diversified portfolio, empirically *Blume et al.*(1975) show that investors rather have very poorly diversified portfolios. Their study investigate the tax-year of 1971 and find that 34.7 % hold only one dividend paying stock, the study only include dividend paying stocks but according to *Levy* (1978) this concludes that most investors holds a very limited number of assets in their portfolio. The Federal Reserve concludes this and show that the average number of assets held is 3.4. This has many complications of the theory of perfect markets assumed, for instance the CAPM-model, but in this thesis, we focus on the effect this have on the risk premium.¹⁴

The fact that investors' portfolios are imperfectly diversified will mean that they demand a higher risk premium to be compensated for this excess risk. Therefore a larger *investor base* leads to lower required return and a higher stock price. An increase of the firm's investor

¹² L.Pastor, R.Stambaugh. *Liquidity risk and expected stock returns*

¹³ Y. Amihud, H. Mendelson, J. Uno, 1999, *Number of shareholders and stock prices: Evidence from Japan*

¹⁴ H. Levy, 1978, *Equilibrium in an imperfect market: a constraint on the number of securities in the portfolio*

base, the number of investors holding the stock, also has a positive effect on the stocks liquidity. *Benston and Hagerman* (1974) presents a negative correlation between the number of owners and the size of the stocks bid-ask spread, which implies that more owners increase the liquidity and hence lowers *liquidity risk*. In addition to this; illiquidity causes the investors to require compensation for the cost associated with this problem. These effects conclude that increasing the number of investors who is able to hold a stock is value-creating.

Amihud et al. (1999) test these statements by investigating the Japanese stock market. The reason for choosing the Japanese market is because it has properties that make it possible to test whether there is an increase in the *investor base*. This is due to the fact that Japanese companies can decide their own minimum trading unit (MTU), which is the minimum number of shares that required to be traded at each trade. If this MTU is large, the minimum price for each trade will be high; hence small investors can face difficulties to invest in that specific stock as odd-lot trading is not allowed. Therefore a decrease in the company's MTU should increase the price of the stock as it opens up for more investors. Another method for the Japanese companies to reach new investors is to split the stocks during periods of high prices. *Mukherji et al* (1997) finds evidence for the positive effect of stock splits as they find that the number of owners typically increases after the split and positive abnormal returns occurs.

There are different ways for a firm to increase their *investor base* and one example is listing on a different exchange: in a paper from 1994 *Kadlec and McConnel* examine the price change of a firm's stock that transfers from NASDAQ Stock Exchange to the New York Stock Exchange. They find that the stock price increase, but they also state that this increase can be related to other effects than the broadened *investor base*. This is why the Japanese market structure is so interesting; by observing when firms change their MTU, *ceteris paribus*, it is possible to isolate the effect of the change in *investor base* as there is no change in market microstructure. In a study by *Amidhud et al.* they test the statement from *Merton* that an increase in a firm's *investor base* should lower the required return and therefore increase the stock price of the firm. In addition, they test if this is tied to a liquidity effect. They find that almost all of the decreasing of the firms' MTU result in an increase in the number of shareholders of that company. They also find a significant positive relationship between the investor base and the value of the firm. According to *Merton* the benefits of a larger *investor base* influence the corporate finance policies; examples of this are that underwritten stock offerings have a larger positive effect on the size of the *investor base* than right offerings.

This could be an explanation of that firms' often choose the more expensive alternative of underwriting¹⁵.

3.4 Previous research

Our area of research was touched upon as early as 1937 when *G. Maxwell Ule* wrote a paper about the price movements of newly listed stocks that previously have been traded *over-the-counter*. He did not include list changes but was rather focusing on listings of previously unlisted stocks. When examining these changes he e.g. examined the effects of reaching a broader market, which is an effect of interest of our study. He finds that in an "up-market" the newly listed stocks outperform their previous average from the *over-the-counter* period. *Ule* conclude that listing has created significantly higher returns compared to the previous returns from when the stock was traded *over-the-counter*. When the market index shift downward the listing lead to greater losses, which probably could be tied to that a listing increase the price volatility. *Ule* discusses that the brokers and speculators tended to react positively to a fact of a stock being shifted from being traded *over-the-counter* to being listed. This is probably also an effect of the increased volatility of the stock price¹⁶.

More recently *Bacmann, Dubois and Ertur* (2002) published an article in *European financial management: "Valuation effects of listing on a more prominent segment of the stock market: Evidence from France"*. Where they perform an event study on changes from less prestigious lists the more prestigious list *Marché à règlement mensuel (RM)*. They use a quite complex multifactor model to calculate the normal returns and they assume that stocks reacts slowly to new information so the abnormal returns are estimated using a delayed market factor. They find that the stock prices increases abnormally at both the announcement day but also around first trading day at the new list. These findings are consistent with previous research by *Amihud et al* (1997) and *Muscarella and Piwowar* (2001).

¹⁵ Y. Amihud, H. Mendelson, J. Uno, 1999, *Number of shareholders and stock prices: Evidence from Japan*

¹⁶ G. Maxwell Ule, 1937, *Price movements of newly listed common stocks*

Bacmann et al. discusses three explanations of the abnormal returns:

1. *Changes of the firm fundamentals*

Research done by *Grammatikos and Papaioannou* (1986) discuss that this kind of list change could be a positive sign of future profits and this should adjust the stock price upwards but in this study they find no significance for these statements

Assets that are traded on less liquid markets tend to be more volatile, which will lead to investors demanding higher expected return. If we assume that the cash flows will be unchanged by the list change, the lower market risk would imply higher asset prices. A price change depending on this effect should occur at the announcement; surprisingly *Bacmann et al.* find that the systematic risk actually increases, but the result is not significant. What they do observe is that the *beta-distribution* is skewed to the right which implies that a few assets experience a large increase in the market risk when changing list.

2. *Change listing, investor base and shadow costs*

Shadow cost is measured by the additional expected return for a stock/asset owned by a limited number of investors. *Bacmann et al.* estimate the *shadow cost* by first assuming that the investors who know about the stock by taking the number of analyst who follow the firm. In the next step they consider the firm that is attracting the most analysts at that specific time is known by all investors. The study shows that the shadow costs are negative, confirming the increased exposure by the list change. They also find a significant negative correlation between the CAR and the *shadow cost*.

3. *Change listing and liquidity*

There have been several studies done where they have examined if any liquidity changes occur when the securities change from their current trading list to a more prestigious one. *Amihud et al.* and *Muscarella and Piwowar* document large changes in the stock liquidity around the change of trading list. In the study by *Bacmann et al.* the lists involved in the study; *Marcé au Comptant*, *Second Marché* and *Marché à Règlement Mensuel* all use the same trading mechanism which make it possible to examine the effect of the increased liquidity as it is possible to sort out the effect the liquidity change will have on the stock price. *Bacmann et al.* finds that the daily relative volume across all of the firms in the study increases from 0,026 % to 0,041 % after the transfer to RM.

Bacmann et al. also performed a cross-sectional regression to test whether any of these specific variables influence the cumulated abnormal returns in a significant way. They test if either the informational content of the change, the increased liquidity (change in trading volume and market depth) or the *shadow cost* (change in the size of the *investor base*) has a significant effect on the CAR. The regression show that the *shadow cost* is a significant explanation of the observed CAR. The other two hypotheses about the influence of liquidity and the informational content have no significant impact on the cumulated abnormal returns¹⁷.

¹⁷ J.F. Bacmann, M. Dubois, C. Ertur, 2002, *Valuation effects of listing on a more prominent segment of the stock market: Evidence from France*

4. Methodology

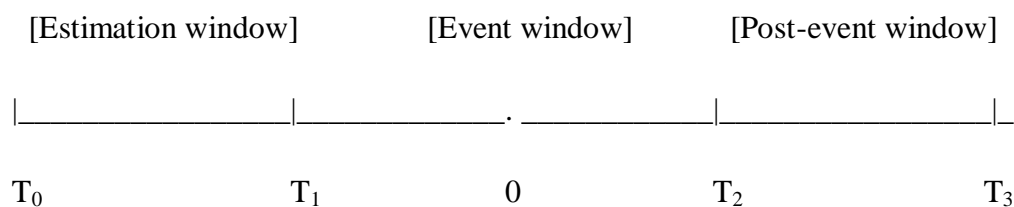
Presented in the following part are the methodological approaches we employ when processing the retrieved data. We describe how we conduct an Event Study, which is the foundation for our study, and what testing we perform on our sample.

4.1 Event Study¹⁸

An event study is used to measure the influence a specific economic event has on the value of a company, this influence is measured on how the event affects the price of an asset. This kind of study is useful since we assume rational markets; hence we believe that this effect should be observable immediately in the value of the company. This makes it possible to measure the impact of a specific event using relative small samples of observations.

The events can be of many kinds: mergers and acquisitions, different announcements of macro variable changes, issues of new debt to completely different fields like law: in how a regulation climate influences the company value and in legal responsibility questions in how large the damage has been etc.

We start by dividing the time horizon into three parts; the estimation window, event window and post-event window. The event date is defined as $t=0$ and in our case the event day will be the first day of trading at the new list. The estimation window and event window should generally not overlap each other to avoid that that the event influences the normal returns.



¹⁸ J, Campbell, A, Lo, A MacKinlay, 1997, *The econometrics of financial markets*

Event studies have, as mentioned, been used widely and the structures can differ a lot but the analysis can be defined as having seven steps:

1. *Event definition*

The first step is to define the event that is of interest and for which the asset prices should be examined: the so called *event window*. For example, like in our case, we want to see how a change in the listing of a stock will influence the price of the stock at the first day of trading at the new list. But in practice the event window is usually expanded to the days around the announcement to be able to capture all the effects the event can have on the stock price.

2. *Selection criteria*

After having determined the event of interest we decide which selection criteria to use to determine which companies that should be included in the analysis. The criteria may impose some restrictions depending on the data availability and to avoid any biases in the selection.

3. *Measuring normal and abnormal returns*

The normal return is defined as the return that would be expected if the event did not occur, $E[R_{it}^n]$, where R_{it}^* is the return at time t for company i and Ω_{it} is the conditioning information available for the normal performance model. There are different ways to define what normal returns are and we will discuss three different models; Constant-mean return model, Market model and multifactor model.

Constant mean return model

Using this model we assume that the mean of the asset is constant over time with some disturbance term. This is the most simplified model but empirically it often gives the same result as more complicated models. This insensitivity to the model choice can be an indicator that more complex model does not reduce the variance of the abnormal return.

$$R_{it} = \mu_i + \varepsilon_{it} \tag{1}$$

$$E[\varepsilon_{it}] = \mathbf{0} \text{ and } Var[\varepsilon_{it}] = \sigma_{\varepsilon_i}^2 \tag{2}$$

This result in the expected normal return defined as: $E\{R_{it}^*|\Omega_{it}\} = \hat{\mu}_i$ (3)

When using daily observations you usually use nominal return, when applying this to monthly data you can use both excess- and nominal return.

Market model

With this model we assume a stable linear relationship between the market return and the specific asset return.

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (4)$$

$$E[\varepsilon_{it}] = 0 \quad \text{and} \quad Var[\varepsilon_{it}] = \sigma_{\varepsilon_i}^2 \quad (5)$$

According to theory this should reduce the variance of the abnormal return due to that we remove the variation that is tied to market return, which should increase the possibility of observing the effect that the event has on the asset price (return). The advantage we would get from using this model compared to others will depend on the size of R^2 . The greater the fit, the larger the reduction of the variance in the abnormal return will be. This model defines the expected normal return as:

$$E[R_{it}^*|\Omega_{it}] = \hat{\alpha}_i + \hat{\beta}_i R_{mt}^* \quad (6)$$

Where the estimations of α_i and β_i is calculated using OLS on the observations from the estimation window. The market model has a simplified model called the *adjusted market model* where we would assume that $\alpha_i = 0$ and $\beta_i = 1$. In other words the normal return will be the same as the market return during the event window. But the advantage is that we would not need an estimation period, which could solve a problem with lack of data. This model is often used to estimate the under-pricing of an IPO.

Multifactor model

A multifactor model is based on the same stable linear-relationship as the market model is based on but with the addition that we can have different and multiple factors that explain the normal return of an asset. For example we can include industry indexes, firm specifics and

different macro-variables to further improve our model to receive an even higher R^2 - value and further lower the variance in the abnormal return. Assume the following K -factor model:

$$R_{it} = \alpha_i + \sum_{k=1}^K \beta_{ik} R_{kt} + \varepsilon_{it} \quad (7)$$

$$E[\varepsilon_{it}] = \mathbf{0} \text{ and } Var[\varepsilon_{it}] = \sigma_{\varepsilon_i}^2 \quad (8)$$

Where R_{kt} is the return on an additional factor. This model expected normal return is defined as:

$$E[R_{it}^* | \Omega_{it}] = \alpha_i + \sum_{k=1}^K \tilde{\beta}_{ik} R_{kt}^* \quad (9)$$

The parameters are estimated using OLS on the K -factor model above.

Abnormal return

The abnormal return is defined as the difference between the actual observed return and the normal return using the most suitable of the models we have discussed above.

$$\varepsilon_{it}^* = R_{it} - E[R_{it}^* | \Omega_{it}] \quad (10)$$

If all of the OLS assumptions hold; the estimates will be both consistent and efficient. We can define normal returns in matrix notation as (example for the market model):

$$\mathbf{R}_i = \mathbf{X}_i \boldsymbol{\theta}_i + \varepsilon_i \quad (11)$$

Where \mathbf{R}_i is an $(L_1 * 1)$ vector of returns from the estimation window for event I , \mathbf{X}_i is an $(L_1 * 2)$ matrix containing a vector of ones in the first column to represent the intercept and where $\boldsymbol{\theta}_i$ is the $(2 * 1)$ parameter vector representing α and β .

$$\tilde{\boldsymbol{\theta}}_i = (\mathbf{X}_i' \mathbf{X}_i)^{-1} \mathbf{X}_i' \mathbf{R}_i \quad (12)$$

$$\tilde{\sigma}_{\varepsilon_i}^2 = \frac{\mathbf{1}}{L_2 - 2} \tilde{\varepsilon}_i' \hat{\varepsilon}_i \quad (13)$$

$$Var[\hat{\theta}_i] = (X_i' X_i)^{-1} \sigma_{\varepsilon}^2 \quad (14)$$

$$\hat{\varepsilon}_i^* = R_i^* - X_i' \hat{\theta}_i \quad (15)$$

Where R_i^* is an $(L_2 * 1)$ vector of returns from the event window. The abnormal returns will be jointly normally distributed with a zero conditional mean and the conditional covariance matrix, V_i

$$(\varepsilon_i^{i*}) | X_i^{i*} \sim N(0, V_i) \text{ where } V_i = I \sigma_{\varepsilon_i}^2 + X_i' (X_i' X_i)^{-1} X_i \sigma_{\varepsilon_i}^2 \quad (16)$$

4. Estimation procedure

When the normal performance model has been chosen, the parameters of that specific model must be estimated using the data from the estimation window. Usually, if possible, you use the period prior to the event, e.g. like in our study where we use daily returns from the year prior to the event, approximately 252 observations.

5. Testing procedure

Use the estimated parameters from step 4 and calculate the abnormal returns, in the next step we should perform tests on the abnormal returns. It is important to define a null hypothesis and to aggregate the abnormal returns from the companies in the study.

Aggregation of abnormal returns

To be able to draw any conclusion and perform inference of the events influence on the returns, the abnormal returns must be aggregated across time and assets. To aggregate the abnormal returns we define cumulative abnormal return (CAR) for asset i from s_1 to s_2 where

$T_1 < s_1 \leq s_2 \leq T_2$. Then we can define CAR as:

$$\widehat{CAR}_i(s_1, s_2) \equiv \gamma' \hat{\varepsilon}_i^* \quad (17)$$

Where γ' is an $(L_2 * 1)$ vector of ones in the positions from $s_1 - T_1$ to $s_2 - T_2$

$$Var[\widehat{CAR}_i(s_1, s_2)] = \sigma_i^2(s_1, s_2) = \gamma' V_i \gamma \quad (18)$$

Under H_0

$$\widehat{CAR}_i(s_1, s_2) \sim N\left(0, \sigma_i^2(s_1, s_2)\right) \quad (19)$$

Then we can perform a test of the null hypothesis for security i by using the standardized cumulative abnormal return (SCAR)

$$SCAR_i(s_1, s_2) = \frac{\widehat{CAR}_i(s_1, s_2)}{\sqrt{\sigma_i^2(s_1, s_2)}} \sim t(L_1 - 2) \quad (20)$$

When aggregating abnormal returns over time we assume that there is no correlation between the abnormal returns for the various assets. This assumption usually hold when no clustering is present, in other words when the event windows do not overlap each other. If this assumption is breached it will lead to some problem but we can handle this by adjusting the inference.

The average CAR is defined as below

$$\overline{CAR}(s_1, s_2) = \frac{1}{N} \sum_{i=1}^N \widehat{CAR}_i(s_1, s_2) \quad (21)$$

$$Var[\overline{CAR}(s_1, s_2)] = \frac{1}{N^2} \sum_{i=1}^N [\sigma_i^2(s_1, s_2)] \quad (22)$$

$$\overline{CAR}(s_1, s_2) \sim N\left(0, \overline{\sigma^2}(s_1, s_2)\right) \quad (23)$$

This makes it possible to test the null hypothesis:

$$J_1 = \frac{\overline{CAR}(s_1, s_2)}{\sqrt{\overline{\sigma^2}(s_1, s_2)}} \sim N(0,1) \quad (24)$$

The average SCAR _{i} is defined as:

$$\overline{SCAR}(s_1, s_2) = \frac{1}{N} \sum_{i=1}^N SCAR_i(s_1, s_2) \quad (25)$$

Assuming that the event windows do not overlap $\overline{SCAR}(s_1, s_2)$ will be normally distributed

with zero mean and variance $\frac{L_2 - 2}{N(L_1 - 4)}$. We can test the significance of the null hypothesis using the following test:

$$J_2 = \left(\frac{N[(L)_1 - 4]}{L_2 - 2} \right)^{1/2} \overline{SCAR}(s_1, s_2) \sim N(0,1) \quad (26)$$

The tests above have some different features, J_2 is the most appropriate test if the abnormal return are constant over time, due to that it gives more weight to assets with lower variance in the abnormal returns. If the true abnormal returns are higher for assets with higher volatility the best way to go is to give each CAR the same weight which J_1 does. Even though the differences in the result is not that sensitive to which test you use since the variance of the CARs' is similar across assets.

6. Empirical result

Here you should have a presentation of the empirical result together with the presentation of the inference and diagnostics. Studies with a low number of observations can have problem with that a few companies influence the result strongly, which is important to acknowledge to not drawing any incorrect conclusions.

7. Interpretation and conclusion

Does the empirical result lead to any insight of the specific event influence the asset returns?

Cross-sectional model

Sometimes the abnormal returns can be tied to some variable that is specific to that firm. To be able to capture and analyze this relationship we can use the following OLS-regression:

$$y = ZB + \eta \quad (27)$$

Where y is an vector of cumulative abnormal returns, Z is an firm specific matrix of characteristics with the first column containing ones to represent the intercept and B is a parameter vector.

Inference with clustering

Previous we have assumed that the correlations between the individual assets are equal to zero. This is not a strong assumption as long as the event windows do not overlap each other.

But when the event windows do overlap, the covariances between the abnormal returns may differ from zero. This problem can be eased in two ways: First the abnormal returns can be used to form a portfolio. The second way to handle the clustering problem would be to analyze the abnormal returns without aggregating them, this would cause problem in drawing general conclusions though.

4.2 Defining the event window

When defining the event window we need to take into consideration what affects the purpose of what the thesis is to examine. The idea behind this thesis is to study the reaction of the stock price mainly depending on the change of the exposure and liquidity associated with a list-change. To be able to capture these effects the event window should be concentrated around the first day of trading on the new list.

We chose to use two different event windows: The first one contains only the first trading day, the reason for this is to try to capture the imminent effect of the broadening of the *investor base*. In the second event window we chose to add two days additional trading days after the list change, this give us an event window of the three first trading days at the new list. This is to capture the effect of the increased exposure the new list have given the stock, to capture any further effects of the increased *investor base* and also; as empirically list changes have increased the liquidity of the stock after the list change.

4.3 Data sample

For our study we collect data about list-changes mainly from the exchanges and MTF's own statics and publications, e.g. NASDAQ OMX's publishing of *corporate actions* during the years in our time span, from 1996-01-01 to 2010-12-31. Here we find information about all list changes, including all listings and de-listings. Similar publications can be found on the other exchanges in Sweden and on Oslo Börs and Oslo Axess. From this sample we collect the stocks that fit our criteria; the stock should have made a list-change "upwards" and has available stock price data for at least one year prior to the list-change. We end up with 58 stocks, 46 Swedish and 12 Norwegian, which fulfill our requirements.

4.4 Calculating returns

We use logarithmic returns in our study, which is calculated with the formula

$$R_i = \ln\left(\frac{S_t}{S_{t-1}}\right) \quad (28)$$

Where R_i is the one day return for a certain stock, S_t is the stock price today and S_{t-1} is the stock price one day prior. The main reasons for using logarithmic returns in finance is that is mathematical convenient and that the returns are time additive.

The return for our benchmark index for the Swedish companies is *Affärsvärldens generalindex*, *AFGX*, and is calculated in the same manner as the stock returns. We choose *AFGX* because our sample contains many small companies and if we were to use the *OMXS*-index we would have faced problems as our regressions probably would have received a very low R^2 -value, as the *OMXS*-index only have companies listed on *OMX* and not stocks from less prestigious lists. *Affärsvärldens generalindex*, is more a more general index over how the overall Swedish stock market performs. For our Norwegian sample we use the *Oslo BX*-index, which reflects the performance of all stocks listed on *Oslo Börs*. This index is processed in the same manner as the Swedish indexes.

$$R_m = \ln\left(\frac{I_t}{I_{t-1}}\right) \quad (29)$$

Liquidity

To be able to determine whether we can observe an increase in the stocks liquidity, we first of all need to define a measure to compare the periods before and after the list-change. We have chosen to define the liquidity in terms of daily turnover volume. We compared the average daily turnover volume based on one year observations of the stocks trading volume prior to the change to and compared it to the average daily turnover of the week after the list-change. We choose this estimation period to mitigate the risk of receiving spurious results, as many of

the stock where very ill-liquid. We will perform a simple t-test and a Wilcoxon signed rank test to perform inference on the possible liquidity change.

Market values

When separating the companies in our sample according to *market value* we use the market value at the time of the list-change. This data is collected from ThomsonReuters DataStream.

Since our sample consists of stocks from both Sweden and Norway we use a fixed exchange rate (NOK/SEK=1, 15) when calculating the Norwegian firms' values into SEK.

We chose to divide our sample into three groups, based on market value: *Small-size companies* with a market value below 100 MSEK, *medium-size companies* with a market value between 100 MSEK to 1 BSEK and *large-size companies* with a market value over 1 BSEK. The reason for these segments was because it fitted our sample well and gave us three groups with about the same number of companies in each.

4.5 Methodological problems

Problems with daily data in an Event Study

An event study is a test of the market efficiency; persistent abnormal returns after the event day are inconsistent with the efficient market hypothesis. *Brown and Warner* (1984) conclude that simple methods based on the market model are in most cases relatively powerful.

When conducting an Event Study using daily data there are three issues that need to be addressed:

Non-normality: Empirically we observe that daily returns for individual stocks are not normally distributed but rather they have a distribution that is characterized by fatter tails.

Non-synchronous trading and estimation of market model parameters: When stock returns and the returns on the market index are observed in different intervals the estimators generated by OLS are both biased and inconsistent. According to a study done by *Scholes and Williams* (1977) the bias become more severe using daily returns instead of monthly and to

mitigate the problem academics have used a various number of techniques to estimate the parameters.

Estimation of variance: There are several issues associated to the estimation of the variance; first of all as a consequence of the non-trading the daily returns could be serial dependent. The second issue is that there can be cross-sectional dependence. Third and last there is a stationarity in the daily variances, evidence show that the variance of the stock returns tends to increase around certain events e.g. financial reports and volatility clustering. This problem could be mitigated by taking log-returns which is more likely to be stationary.¹⁹

Model problems

We choose to use the market model to define the normal returns for the stocks in our sample. This is a simplified model and using a multifactor model with firm specific variables would probably get us a higher R^2 -value when estimating the regression parameters. But the market model has previously been shown provide sufficient results and have been as good as the more complex multifactor models in explaining stock movements.

Problems that can occur if the model used does not fit are that our estimations of normal returns are incorrect and this would in turn mean that our estimations of abnormal returns are incorrect as well. When using such a small event window as we have chosen to do we are very exposed to other events occurring on that specific day. This problem means that the abnormal returns are not only affected by the new listing but additionally by other firm specific events occurring in connection with the event.

We would be faced with these problems even if the event window was wider, but the effects of it probably have a larger influence on the result when the event window contains a low number of trading days. Another problem found in our data is that some of the stocks are not traded every day which mean that we get a zero return for that period. This might, as discussed above, result in the case that the parameters estimated using OLS may be biased and inconsistent; this means that the estimations of normal return are incorrect.

¹⁹ Brown and Warner, "Using daily stock returns – The case of event studies", Journal of Financial Economics, vol. 14, issue 1, 1985, pp. 3-31

Problems with explanatory variables

Since a list-change is not associated with any changes to the fundamentals of a company you have trouble finding adequate company specific factors to use as explanatory variables in the regression. The list-change is instead associated with changes in the markets view of the company with increased exposure, broader investor base and increased liquidity. Hence to make a factor-regression we need a way of measuring these factors and how they have changed with the list-change. Liquidity can be measured in many ways, but an easy approach is to measure the daily turnover of a specific stock and compare this for the period before and after the up-listing of the stock. The other two variables are much harder to define a measure for; hence we will not be able to formally examine how these factors have changed in connection to the list-change. We tried to get hold of data of how the number of shareholders in a specific stock changed around the event but faced problems as such data is not publically available.

Sample problem

To be able to get a sample of stocks that has changed trading list we turned to the different stock exchanges and MTFs in Sweden and Norway. All trading platforms keep a record of changes to their list; hence we were able to assemble this data based on first hand information.

When processing the collected data we found that the number of observations of downgraded companies was too few to be able to draw any significant conclusions. We therefore continued our study with only the stocks that have been upgraded. When using the market model and when we have specified our event window we need to specify our market index and get observations of this and one year historical stock data. We collected the stock price data from ThomsonReuters Datastream, *Affärsvärldens generalindex* was collected from Affärsvärlden and the index for the Norwegian stock market was retrieved from ThomsonReuters Datastream. A problem with the data received from Datastream is that not all non-trading days are removed from the sample; instead we can see this as a trading day with zero return. This gave us some problem with the fit of the regression when estimating alpha and beta.

Problem with non-trading

In our case the problem of less liquid stocks that is not being traded every day further increase the problem discussed above, and this increases the number of observations with zero returns. Non-synchronous trading also causes asymmetric portfolio cross-autocorrelations²⁰

With the smallest company we have faced problems when retrieving sufficient information for the study. This because the smallest companies on the less liquid lists are not required to provide the public with information to the same extent as companies listed on the formal stock exchanges like OMX Stockholm. This information asymmetry has also given us problem in our research as relevant information has not been available.

4.6 The Wilcoxon signed-rank test

This test is an alternative to the *Pitman test*, where you measure the signed ranks of the absolute deviations rather than the deviations from the mean. The assumptions that are made are that the distribution is symmetric and preferably continuous. These assumptions do that in theory it is impossible for two values in the sample to match each other. But in practice this could happen and then we must modify the test so that it allows for when observations are tied.

The first step in the test is to define the null hypothesis $H_0: \theta_0 = 0$, where θ_0 is the expected mean. Then you calculate the absolute deviations from the mean and sort them in ascending order and assign them with ranks; 1 for the smallest deviation and n for the largest. After having sorted the deviations and assigned them a rank you attach a negative sign to the deviations that are negative. Next, you should sum up the ranks for the negative and respectively for the positive deviations. If the assumed mean are true the sum of the different ranks should be fairly equal.

This could be a way to solve problems with outliers as the actual size of the deviations are replaced with a rank, so therefore you still take them under consideration but the effect non-realistic size of them are minimized²¹.

²⁰ D. Bernhardt, R. Davies, *The impact of nonsynchronous trading on differences in portfolio cross-autocorrelations*

When the number of observations are larger than 20 ($N > 20$) we assume that the sum of the ranks is approximately normally distributed, then you use the smallest of the summed ranks and calculate the p-value to test the null hypothesis²²

4.7 Validity

The validity of the study is considered high given that we employ commonly recognized methods (Event study), which incorporate commonplace measures for return, abnormal return liquidity etcetera. Our data is sufficient to measure the stock price effects associated with a list change and give a statistically significant result; hence we consider our study to be of high validity.

4.8 Reliability

Reliability sets of to measure how trustworthy the results of a study can be considered, hence in our study, where we use historical stock price data from a reliable source (ThomsonReuters DataStream), qualitative data over list changes from reliable sources (NASDAQ OMX and the other exchanges and MTFs in our study) and process this data accordingly to conventional theories and methods we can consider the reliability as high. Since the stock price data and data over list-changes we use in our study is historical and withdrawn from reliable and commonly used sources it ought to not be influenced by randomness and temporary effects. We therefore consider the data processing to be the only part of the study where we can raise doubt about the reliability of the study, and this insecurity is based on the risk of mistakes from our side when processing the data.

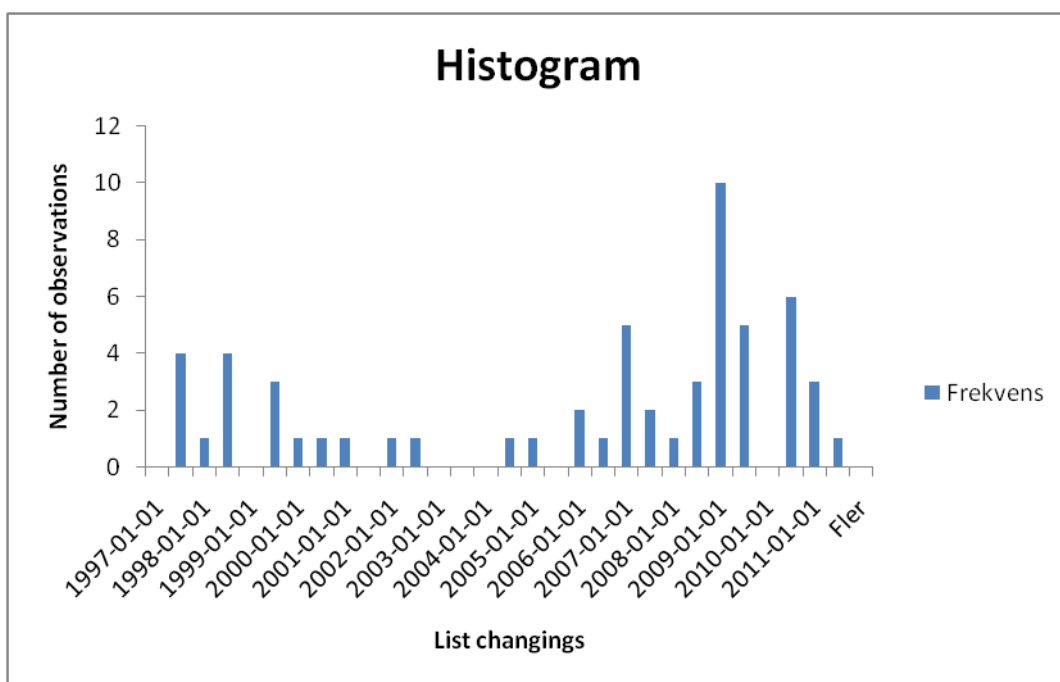
²¹ P. Sprent & N. Smeeton, 2001, *Applied nonparametric statistical methods*
²² http://www.fon.hum.uva.nl/Service/Statistics/Signed_Rank_Test.html

5. Empirical findings

In this segment we present the results of our study, along with tests and results for our sub-samples. The results are the foundation of our following analysis.

First of all we conclude that as no event windows overlap, therefore we have no problem with event-clustering when calculating the CAR.

The histogram below shows a time-line of when the list-changes occur, and we observe that the list-changes cluster around the turn of the year 2008. For a list of the companies and event days in our study, see appendix.



Downgraded companies

As explained before we did not find enough observations on the companies that had been downgraded to perform statistical tests, but we still wanted to examine what happened with the downgraded companies after the list change. Out of the sample of Swedish companies that were downgraded 25 % have defaulted. 50 % of the companies have been the subject of a takeover, and consequently only 25 % of the companies still exist as an independent company. There are of course numerous explanations for how these companies have

developed but it can be seen as a signal that something is wrong when a stock is downgraded to a lesser trading list. On the Norwegian stock market the evidence is not as strong as we cannot find that any of the downgraded companies has gone bankrupt as of today. But we can observe that the number of downgraded companies that has been taken over by other companies is 25 %, which is less than in Sweden but still a considerable amount.

5.1 Abnormal returns

Result of the Wilcoxon signed rank test

To test the null hypothesis from the Wilcoxon signed rank test we performed the test as described above: First with only the first trading day taken into consideration and we got a result where the positive ranks were well over the negative ranks. This could be an indication that our null hypothesis, that the abnormal returns are equal to zero, could be rejected. To verify this statistically we test the null hypothesis but we receive a p-value interval over 0.2 which means that we cannot reject the null hypothesis.

Finally we perform the same test for the event study with the two following trading days included. Here we observe a slightly smaller deviation between the positive and negative ranks with an overweight for the negative ranks. Also in this case we cannot reject the null hypothesis as the p-value is equal to 0.345.

For the complete result of the Wilcoxon test, see appendix.

One-day event window

Our result from the event study shows indications of positive abnormal return for the companies in our sample. The abnormal return is on average around 0.387 % above normal return for the stocks, with a P-value of 0.175. Hence we cannot statistically conclude that an upwards list-change is associated with a higher return than expected considering historical returns based on the previous listing. Our empirical result indicates that the abnormal returns occur on the first trading day on the new list, which indicates that the trading location itself has an effect on the stock movements, i.e. the effect is not only present when the list-change is

announced but also when it actually occurs. This in turn means that an investor could invest in a stock one or a few days before a known list-change occurs and receive higher risk-adjusted return than implied by the stocks price on the old list. In our case there is a clear abnormal price movement on the first trading day on the new trading list, even though the list change have been known to the public in average a week in advance of the actual list change.

Three-day event window

When adding the two days that follow immediately after the listing on the new trading list we observe that the average CAR decreases notably in comparison to the first trading day. The average CAR for the stocks in our sample is -0,039% (with a p-value of 0.44) which is a drastic downturn from the return on the first trading day on the new list.

Result separated by country

When looking at the CAR:s where we have separated the companies for the individual counties, we receive the result depicted below.

<u>Country</u>	<u>Norway</u>	<u>Sweden</u>
CAR	-0,273%	0,571%
P-value	To few obs.	0,0941

Here we can observe that the Swedish stocks react more positively and we get a lower p-value when the Norwegian companies are excluded. This make it possible the confirm positive abnormal at a 10 % significance level for the stocks in the Swedish sample.

When looking at the three day event window we see the same trend as we have observed in previous test; the abnormal returns decrease notably, and we can also see that the p-value of the Swedish stocks´ CAR increases.

<u>Country</u>	<u>Norway</u>	<u>Sweden</u>
CAR	-0,868%	0,185%
P-value	To few obs.	0,2422

Results separated by market capitalization

We see below that medium size companies have the strongest positive reaction to a list-change, while large-size actually has a negative response to the list-change.

	<u>Market Cap.<100M</u>	<u>100<Market Cap.<1000M</u>	<u>Market Cap>1000M</u>
CAR	0,540%	1,199%	-0,000681779

When adding two more days to the event window we see that small and medium size companies still has a positive reaction, but it declines in extent. Interestingly the reaction from the larger companies increases in magnitude, and is still negative.

	<u>Market Cap.<100M</u>	<u>100<Market Cap.<1000M</u>	<u>Market Cap>1000M</u>
CAR	0,291%	0,224%	-0,2815

Results separated by industry

Shown below is the CAR for the different industries which the companies are divided in. Unfortunately many of the industries consist of too few firms and because of this we cannot draw to many conclusions from it. Although we can comment on the tendencies we see in our sample. When observing the one-day event window we see that the technology sector has a pretty strong negative abnormal return in connection with the list-change, while the energy sector, the mining sector and the general retailers has a notable positive abnormal return.

<u>Industry</u>	<u>CAR</u>
Support Services*	3,3705%
Energy	1,0573%
Real Estate*	0,2086%
Mining	1,3651%
General Retailers	1,6596%
Industrials*	0,2428%
Investment*	-0,9816%
IT	-0,4735%
Agricultural*	-0,7102%
Chemistry*	0,0563%
Consulting*	4,9868%
Medical*	1,4248%
Shipping*	1,9424%
Restaurant*	2,8717%
Gambling*	-0,4361%
Security*	3,1260%
Technology	-3,0257%
Telecommunications*	1,1350%
Tobacco*	2,1611%
Entertainment*	0,1440%

** This sign means that the sub-sample consists of three or fewer companies, and therefore we should be very careful to draw any general conclusions*

The results from the three-day event window are quite different compared to the shorter event window. Technology keeps producing negative returns, although not as large as on the first trading day. Energy and mining starts producing negative returns contrary to the results on the first trading day. The general retailers sector continues to have a positive average CAR, but it is notably lower for the wider event window.

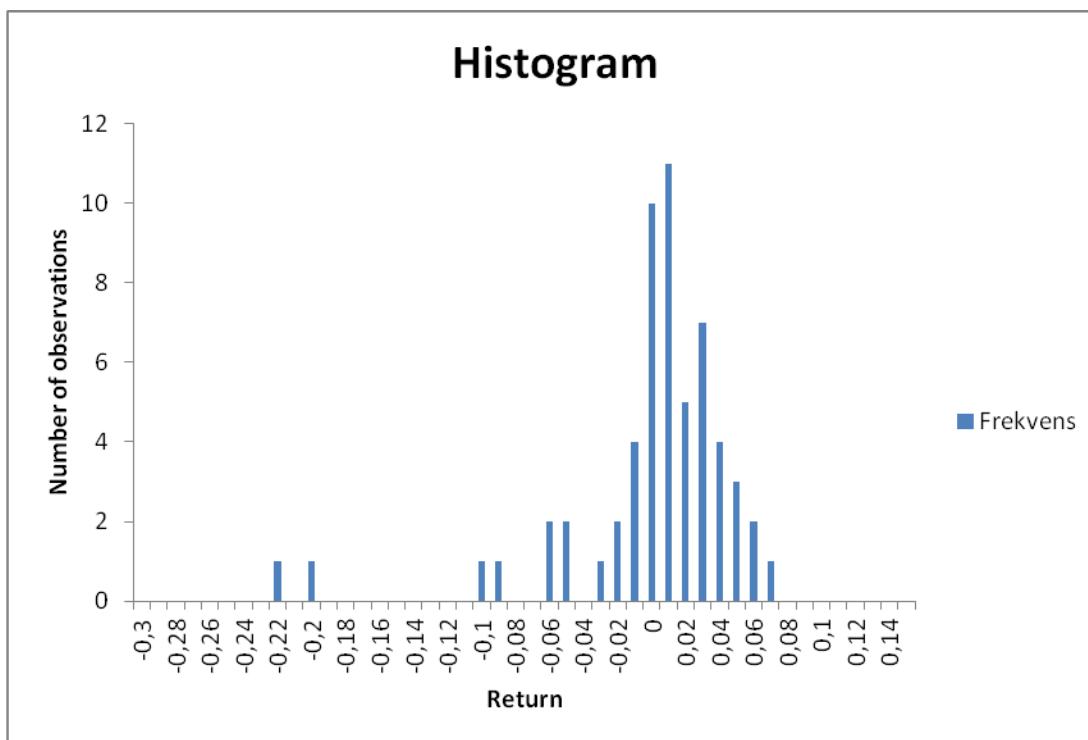
<u>Industry</u>	<u>CAR</u>
Support Services*	0,8634%
Energy	-0,7218%
Real Estate*	-0,1484%
Mining	-1,9728%
General Retailers	0,3991%
Industrials*	0,0595%
Investment*	-0,4922%
IT	-0,6292%
Agricultural*	0,7243%
Chemistry*	-2,5859%
Consulting*	3,1898%
Medical*	0,5842%
Shipping*	1,1734%
Restaurant*	1,9565%
Gambling*	-1,6025%
Security*	0,9300%
Technology	-0,1188%
Telecommunications*	0,0343%
Tobacco*	1,6356%
Entertainment*	0,9207%

** This sign means that the sub-sample consists of three or fewer companies, and therefore we should be very careful to draw any general conclusions*

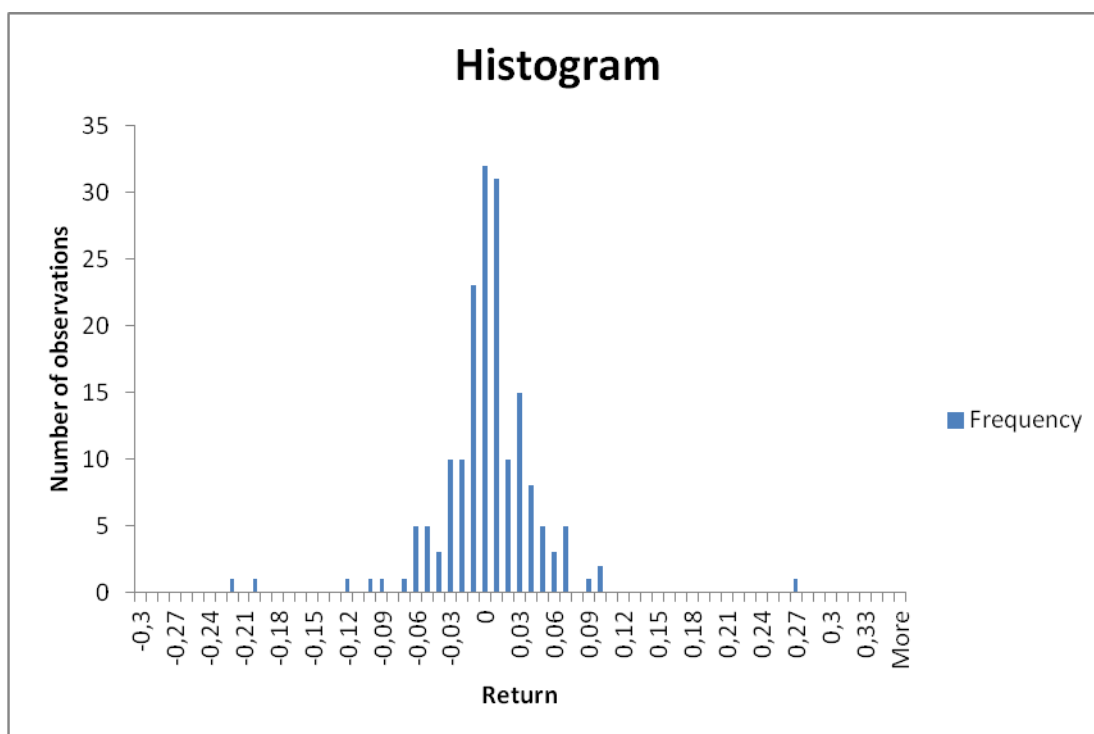
Distributions of the returns

Depicted below is the distribution of the abnormal returns from the event study with the first trading day at the new list as the event window. We conclude that the distribution is skewed to the left (-1.003) with the largest area placed to the right side of the expected mean of zero. We also observe an excess kurtosis of 1.67.

This may imply that we have positive abnormal returns. This result imposes that abnormal returns are not normally distributed hence we cannot use the standard normal distribution, which the literature propose, when performing inference.



The histogram below depicts the distribution of the abnormal returns when we have extended the event window to the three trading days. Here we can observe that the distribution is more like a student's t-distribution with small skewness (-0.08066) and large excess kurtosis (11.42997), therefore we cannot use the standard normal distribution in this case either.



5.2 Liquidity

In our examinations of how the liquidity changes in connection with the list-change our results indicate that the daily liquidity increases dramatically for the week following the list change. Our results indicate that daily liquidity more than doubles on average (133 %) for the stocks in our sample, and this result is significant on a 10%-level. The reason why we did not find a more significant result is due to the very high variance in the sample.

<u>Change in liquidity</u>	<u>T-stat</u>	<u>P-value</u>	<u>Wilcoxon P-value (interval)</u>
133%	1.539	0.0651	P-value>0.2

Outliers

In the event study where only the first trading day is included we observe that we have three outliers that are substantially larger than the rest of the sample. Therefore we want to investigate what factors, in excess of the list change, that can explain these large deviations. The three companies are *Central Asia Gold* (CAG), the biotechnology company *PROBI* and the energy company *Tatura*:

In CAGs case we find a possible explanation: As they entered the new list they needed to make sure that their stock price would fulfill the requirement of a minimum price. To fulfill this demand they were needed to increase the number of shares outstanding. The large negative return is likely a reaction to this change.

PROBI issued additional equity on the first day on the new trading-list and this is most likely the explanation for the large negative return on the event day.

Tatura was the subject of a reversed takeover so therefore the first trading day is the subject of many different effects e.g. if investors consider the takeover to be value creating. Hence Tatura's list-change is largely affected by other factors than just the list change and therefore we cannot point out a single factor that created the large negative return.

We exclude these outliers from the calculation of CAR.

6. Analysis

In this part of the thesis we discuss and analyze our empirical results in accordance to the theories taken into account in our study.

We find an indication of positive abnormal return in the first trading day. When applying the Wilcoxon signed rank test on our sample we first find indications that there can be positive abnormal returns present. But when performing a hypothesis test we cannot reject the null hypothesis that no abnormal returns are present. To further test our results we conduct a one-sided t-test, we chose to use the t-distribution despite that literature states that the CAR should be standard normal-distributed. The reason for this is that when we examine the distribution of our observations we find excess kurtosis which we want to capture by using the t-distribution. The t-test shows that we cannot reject the null hypothesis. Therefore we cannot statistically conclude that a list-change is associated with positive abnormal returns on the first day of trading, but we have a slight tendency towards it as the P-value is quite moderate.

When observing the histogram over the one-day abnormal return we see that the distribution is clearly skewed to the left, meaning that most of the observations are located to the right of the expected mean of zero. This can be interpreted as a sign of that larger would have given us significance in the observed abnormal returns.

When looking at the results from the wider three-day event window we find that the average daily CAR turns negative, -0.0394 %. There can be several reasons for this downturn, e.g. that generally investors tend to overreact on news and therefore this can be seen as an adjustment for the overreaction on the first trading day. It could also be a sign that insiders chose to profit from the initial increase in the stock price; hence they chose to sell stocks during the following days. Our empirical result from the three-day event window further supports our theory that the effect of the list-change should appear on the first day of trading. Looking at the histogram over the three-day event window we observe that it is much less skewed from the mean of zero than the one-day window, which further indicates that the price effect is present on the first trading day.

To explain the tendency towards a positive abnormal return on the first trading day we examine if the liquidity in the stocks change. In our empirical findings we present a dramatic increase in liquidity for the period after the list-change, the result is not insignificant with a P-

value of 0.0651. This result is in line with the findings of *Bacmann et al* which states that liquidity should increase in connection with a list upgrade. This propensity is probably caused by increased exposure and a broadening of the *investor base*. Especially the effect of the broader investor base should, according to theory, have its immediate effect on the first day of trading on the new list. This increased liquidity combined with positive abnormal return could also be in line with *Merton's* theories of that increased liquidity decreases the total risk of the asset and therefore the stock price should increase and the expected return should decrease.

To further analyze our results we separated the data into sub-samples to find any specific effects. First we separated the sample into two sub-samples with Swedish and Norwegian stocks in separate groups. Interestingly we find that the abnormal returns for the two samples has opposite directions where the Swedish stocks shows a strong positive tendency and the Norwegian stocks has negative returns for the one-day event window. Unfortunately the Norwegian sample is too small to perform significance testing on, but the CAR for the Swedish stocks is significant on a 10 %-level. The explanation for the differing results for the two very similar countries cannot be ensured, but a possible explanation could be that investment rules for large and institutional investors might differ between the countries, and therefore the *investor base* effect might be less present in Norway. But as this is not legislative rules, but rather internal rules specific to each investor itself, this is not possible to determine.

For the three-day event window we see similar tendencies as we have observed previously. The effect of the two additional trading days is contrary to the first one with negative returns, the CAR for the Swedish companies are still positive but much less significant with a P-value of 0.2422.

In an additional test we divided our sample into three parts according to their market capitalization. The most interesting part we find in this study is that medium size companies have such large positive abnormal return in comparison to the other two groups. Our own thoughts on this matter is that a large company probably already fulfills the demands of the institutional investors, hence a list-change from *O-listan* to A-listan does not broaden the *investor base* in any dramatic way. The small companies would probably still struggle to fulfill the demands of the institutional investors as they move from the least prominent lists to a somewhat more prominent list. Therefore it is most likely that the medium size companies will move from not being a possible investment to being an investment opportunity for the institutional investors.

When dividing the stocks into sub-samples according to their industry it is very hard to draw any conclusions at all as the number of observations in each sector is very low. But still we see some tendencies that stocks in the technology sector react negative to a list change and that general retailers react positively to it.

When discussing our results in the perspective of the *Efficient market hypothesis* we find tendencies that the effect of the list-change should be observable on the first day of trading when the *investor base* is broadened. One might argue that the effect of the list-change should be present on the announcement of the list-change, but due to the fact that *investor base* is not effected until the actual list change this is in line with our empirical findings. Since our findings shows a tendency towards that the price adjustment of the list-change does not occur until the actual list-change is executed, an *insider* of a company could make money on buying stocks prior to the list-change and selling immediately after the first trading day on the new list. This in turn would imply a *semi-strong efficient market*.

But since our findings only shows tendencies towards a positive abnormal return on the first trading day, and does not show significant results, we cannot reject that the market is efficient.

7. Conclusion

In this last chapter we give some last concluding remarks along with proposals for future research that can be done in the area of list changing

This thesis focus on examining the effects a list change to a more prominent segment of the stock market has on the value of the company. The obtained results show that we cannot find significant abnormal returns the first days on the new list. This is consistent with the efficient market hypothesis as all of the effects a list change imposed should already be worked in the price on the announcement day. Therefore we can conclude that an investor cannot construct any investment strategy based on our study. We also observe a large shift in the liquidity immediately after the change which is significant on the 10 %-level, which is consistent with theory.

But we believe that if we would have had the possibility to collect additional observations we should be able to find significant positive abnormal return on the first trading day at the new list. The reasons for this is the shape of the distribution of the abnormal returns and that the effect of the increased investor based not be captured at the announcement due to that the less prestigious list itself is the reason for many large investors is not able to invest in the stock.

7.1 Future research

This is a very interesting research area were more can be examined, we have found only a very limited number of studies that touch upon what really happen when a stock change listing. More specifically what happens when a stock get downgraded to a less prestigious list, the aim of this thesis was examine this case too, but problems in data collection stopped us from getting any significance in that case as the number of observations was too low. We have actually not found any studies that investigate that event, it would be very interesting to find out if this could confirm the finding of that a listing on a more prestigious list create value, in other words a downgrade should destroy value.

Our study focus on the Swedish and Norwegian markets and we think that more can be done on the Nordic markets to include Finnish and Danish companies to see if we can confirm the positive abnormal return with a larger sample, also using a more complex model, rather than the market model. A more complex multifactor-model like the one used in *Bacmann et al.* could probably explain the normal return better than our market model. Examples of explanatory variables that can be used in the multifactor-model are book-to-market ratio, market capitalization and business cycle (if the company is cyclical).

One other interesting factor that can be evaluated is to perform a cross-sectional regression to examine if the abnormal returns can be significantly explained by some variable, as *Bacmann et al.* found that the only significant explanation of the abnormal returns produced by a change to a better list is the larger investor base the change creates.

Finally there would be interesting to investigate the connection we found between a “negative” list change and bankruptcy and primary takeovers.

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Web-sites

Wilcoxon signed rank test:

http://www.fon.hum.uva.nl/Service/Statistics/Signed_Rank_Test.html

Finansinspektionen:

<http://www.fi.se/Konsument/Fragor-och-svar/Borser-och-aktiehandel/#N2>

OMX:

<http://www.nasdaqomx.com/listingcenter/firstnorth/fnormm/?languageId=1>

Regulations: <http://nasdaqomx.com/listingcenter/nordicmarket/rulesandregulations/>

List changes: <http://nordic.nasdaqomxtrader.com/newsstatistics/corporateactions/Stockholm/>

Oslo Börs:

Regulations: <http://www.oslobors.no/Oslo-Boers/Regelverk>

List changes: <http://www.oslobors.no/Oslo-Boers/Statistikk/Listeendringer>

NGM:

Regulations: <http://www.ngm.se/> → Dokument → NGM-börsen → Medlemmar → Medlemsregler

List changes: <http://www.ngm.se/> → Dokument → Nordic MTF → Listförändringar

Aktietorget:

Regulations: <http://www.aktietorget.se/CompanyTerms.aspx>

List-changes: <http://www.aktietorget.se/QuoteStatistics.aspx>

9. Appendix

Below is a table presenting our sample and the date for the firm-specific event day.

<u>Company</u>	<u>Event day</u>
Kenor	1997-01-02
ARK	1997-02-19
HiTec	1997-03-20
Swedish Match	1997-05-09
Stento	1997-07-22
Hydralift	1998-01-02
Securitas	1998-02-06
Öresund	1998-02-20
B&B Tools	1998-03-12
Solstad	1999-01-14
Agresso	1999-03-19
Avenir	1999-06-25
EDB	1999-08-26
Vmetro	2000-05-02
Norman	2000-07-03
DiffChamb	2001-11-19
SmartEq	2002-02-14
Inwarehouse	2004-02-16
Probi	2004-12-02
Ratos	2005-07-05
Stille	2005-11-28
PA Resources	2006-06-19
AarhusCarlshamn	2006-09-11
Uniflex	2006-11-01
Strand Interconnect	2006-11-15
SRAB	2006-12-14
Rejler	2006-12-18
BjörnBorg	2007-05-07
Alliance Oil	2007-05-23
SAGAX	2007-10-08
Nordic Service Partner	2008-01-15
Morphic	2008-03-04
Swedol	2008-06-12
ITAB	2008-07-08
Nordic Mines	2008-07-18
Firefly	2008-10-29
CATECH	2008-11-10
Generic Sweden	2008-11-17
Tatura	2008-11-20
Paradox	2008-11-24
Tretti	2008-12-01
3L Systems	2008-12-08
Medirox	2008-12-11
NET Entertainment	2009-01-13
Electra	2009-06-01
AllTelecumminications	2009-06-15
Black Earth Farming	2009-06-22
Corem	2009-06-25
Formpipe	2010-01-19
Ework	2010-02-18
Chemel	2010-05-03
Cellavision	2010-05-31
OddMolly	2010-06-21
Oasmia	2010-06-24
Central asia gold	2010-07-19
Trigon Agri	2010-12-08
Avega	2010-12-16
Commodity Quest	2011-01-17

Wilcoxon signed rank test for the one-day event window

RANK	AB. Return	RANK	AB. Return	RANK	AB. Return
1	0,0001239	21	0,0063076	41	0,0317993
2	-0,0001757	22	-0,0112038	42	0,0337051
3	-0,0003667	23	0,0113496	43	0,0343253
4	0,0005627	24	-0,012111	44	-0,039119
5	-0,0012213	25	0,0132191	45	0,0404043
6	0,0014399	26	0,013947	46	0,0427073
7	-0,0014417	27	0,0145508	47	0,0498683
8	0,0016957	28	0,0154287	48	0,050959
9	-0,001753	29	-0,0181911	49	-0,0529013
10	-0,0018685	30	-0,0184337	50	0,0537138
11	0,002084	31	0,0201422	51	-0,0560906
12	-0,0023555	32	-0,0206037	52	-0,063802
13	0,0033386	33	0,021611	53	-0,0679178
14	0,0040926	34	0,0243839	54	0,0695611
15	-0,004361	35	0,0252183	55	-0,0902079
16	0,004477	36	0,0255004	56	-0,1043505
17	0,0045397	37	0,0287173	57	-0,2044474
18	-0,0050095	38	-0,0287386	58	-0,2244439
19	0,0061335	39	0,0296485	Sum negative rank	733
20	-0,0062737	40	0,0312596	Sum positive rank	960
				P-value	>0,2

Wilcoxon signed rank test for the three-day event window

RANK	AB. Return	RANK	AB. Return	RANK	AB. Return	RANK	AB. Return	RANK	AB. Return	RANK	AB. Return	RANK	AB. Return	RANK	AB. Return	RANK	AB. Return
1	0,0124%	21	0,2324%	41	0,5053%	61	0,9792%	81	1,4551%	101	-2,1180%	121	-3,0949%	141	-4,3011%	161	6,6664%
2	-0,0176%	22	-0,2355%	42	-0,5354%	62	-0,9952%	82	1,5429%	102	2,1214%	122	3,1260%	142	-4,5784%	162	-6,6698%
3	-0,0367%	23	-0,2760%	43	0,5539%	63	-1,0289%	83	-1,5760%	103	2,1611%	123	3,1799%	143	4,7533%	163	-6,7918%
4	0,0466%	24	-0,2910%	44	-0,5994%	64	-1,0683%	84	-1,5829%	104	2,2278%	124	3,2314%	144	4,7719%	164	6,9561%
5	0,0563%	25	0,2960%	45	0,6133%	65	-1,0771%	85	-1,6171%	105	2,2500%	125	3,3237%	145	-4,8449%	165	-7,1114%
6	-0,0786%	26	-0,3040%	46	0,6242%	66	-1,0786%	86	1,6477%	106	-2,3285%	126	-3,3268%	146	4,9868%	166	8,4334%
7	-0,1049%	27	0,3310%	47	-0,6274%	67	-1,0825%	87	-1,6677%	107	2,3999%	127	-3,3301%	147	5,0959%	167	-9,0208%
8	-0,1162%	28	0,3339%	48	0,6308%	68	-1,1204%	88	-1,6816%	108	2,4384%	128	3,3705%	148	-5,2281%	168	9,2879%
9	-0,1221%	29	-0,3651%	49	0,6786%	69	1,1295%	89	-1,8033%	109	2,5201%	129	-3,4265%	149	-5,2733%	169	9,3578%
10	-0,1267%	30	0,3658%	50	-0,6807%	70	1,1350%	90	-1,8131%	110	2,5218%	130	3,4325%	150	-5,2901%	170	-10,4351%
11	-0,1271%	31	0,3802%	51	0,6820%	71	-1,2111%	91	-1,8191%	111	2,5500%	131	-3,5252%	151	-5,2914%	171	-12,5260%
12	-0,1328%	32	0,4093%	52	-0,7016%	72	1,2166%	92	-1,8434%	112	-2,5606%	132	-3,5838%	152	5,3714%	172	-20,4447%
13	0,1440%	33	-0,4251%	53	0,7062%	73	1,2313%	93	-1,8581%	113	-2,6207%	133	-3,6698%	153	5,5332%	173	-20,4444%
14	-0,1442%	34	-0,4361%	54	0,7174%	74	-1,2927%	94	-1,9253%	114	-2,6898%	134	-3,6886%	154	-5,6091%	174	26,2241%
15	0,1610%	35	0,4477%	55	-0,7690%	75	1,3219%	95	-1,9543%	115	2,7077%	135	-3,7356%	155	-6,0651%		
16	0,1696%	36	0,4540%	56	-0,7861%	76	1,3395%	96	2,0142%	116	-2,7372%	136	3,8416%	156	6,0876%	Sum negative rank	8155
17	-0,1753%	37	0,4544%	57	-0,8125%	77	-1,3701%	97	-2,0249%	117	2,8717%	137	3,8903%	157	6,0881%	Sum positive rank	6984
18	-0,1868%	38	0,4764%	58	0,8933%	78	1,3947%	98	-2,0276%	118	2,8720%	138	-3,9119%	158	6,1998%		
19	0,2084%	39	0,4775%	59	-0,9055%	79	-1,3954%	99	-2,0604%	119	-2,8739%	139	4,0404%	159	-6,3802%	P-value	0,345
20	0,2133%	40	-0,5009%	60	-0,9366%	80	-1,4507%	100	2,0671%	120	2,9649%	140	4,2707%	160	-6,6498%		