LUNDS UNIVERSITET

Master Thesis

Spring 2012

University of Lund

Master Program in Finance

Does more trade equal less return

-Applied on the Swedish stock market

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Abstract

The main purposes in this master´s thesis are to examine *the effect of liquidity on stock returns* but also *measuring the return premium in relation to liquidity* towards the Swedish stock exchange market. In order to test these relationships the Fama and MacBeth (1997) Cross-sectional methodology have been applied. The relationships are tested for two different types of liquidity, the turnover rate and the relative bid-ask spread. Robustness test for the findings have also been performed. The sample consists of Swedish companies listed on Nasdaq OMX, from the time period of 1995-2011 where the data have been collected from DataStream and Nasdaq OMX.

Theoretically liquidity is seen as a risk factor, a cost of trade, and hence rational investors should demand a higher premium for these assets. Furthermore assets which returns are sensitive to changes in liquidity are expected to yield higher returns, due to the risk associated with these assets.

Even though the technical achievements have increased the ease of asset trading and hence lowered the illiquidity of assets, there are still studies which have found a significance of the liquidity and return effect (Amihud and Mendelson (1986), Chan and Faff (2005)). However the evidence is not clear cut, the authors Eleswarapu and Reinganum (1993) and Anderson, Clarkson and Moran (1997) finds a weaker relationship. Even though the empirical results in this thesis are ambiguous, and the fact that our test period and sample size are small, where no clear-cut evidence of premiums are shown the following tendencies have been observed.

In terms of return premium, the following premiums in basis points were observed per 100bp change in sensitivity.

- A liquidity premium, for the relative bid-ask spread, between 210-360bp.
- An illiquidity premium, for the turnover rate, between 72-75bp.
- A liquidity risk premium, for the relative bid-ask spread of 672-760bp.

Keywords: Liquidity and Illiquidity premiums, Fama MacBeth, Fama-French, Swedish stock exchange, CAPM.

Acknowledgement

We would like to express our deep gratitude to our supervisor Jens Forssbaeck for his help and guidance throughout this thesis. In addition, special thanks to our families and friends.

Lund, 24 May 2011

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1. Introduction

In the first chapter we will present all necessary information about this study. At first we will introduce the background, problem discussion and formulation related to the topic. Thereafter the purpose, limitations, target group and outline will be stated.

1.1 Background

The stock trading has increased during the last century and more and more investors turn to the stock market, trying to increase their wealth. The technological achievements such as, computers and internet access, have increased the ease for which asset are traded. Through these achievements the information and access to different capital markets have increased. As a result, the illiquidity of stocks has decreased, although still existent. The reason of investing in the stock market, from an investor's point of view, is to try to maximize their wealth, assuming that investors behave rationally. As the model of investor behavior states, the investors will always choose the investment that maximizes his/her utility when considering different investment opportunities, (Sharpe, 1964). Hence we assume that investors prefer a higher expected future wealth towards a lower value, i.e. that the marginal utility of wealth is positive (Copeland. TE, Weston. JF, Shastri. K (2005). Another assumption we make is that we assume risk aversion for investors, i.e. that investors prefer lower risk to higher risk given the same level of the expected return.

However in order to maximize the wealth and hence the returns of an investor's portfolio, one have to consider several aspects. The stock returns depend on several factors such as the macroeconomic policy, economic climate, specific business environment and so forth. All those aspects contribute to the actual stock return. We are going to examine the factor of liquidity, in order to see if this is a determinant factor that investors have to consider before making their strategy decisions.

More specific, the main purpose in our thesis it to examine if liquidity is priced on the Swedish stock exchange (large, medium and small cap) but also to obtain the return premiums corresponding to the liquidity.

1.2 Problem discussion

The topic, to investigate the relationship between returns and liquidity has been investigated closely by several authors. One of the first to investigate these relationships was Amihud and Mendelson (1986). The measure applied for liquidity in their study was the relative bid-ask spread. In their findings they observed a strong relationship between the return and liquidity on the New York Stock Exchange. The authors did a similar study three years later, in 1989, with the addition to include other variables as well. Although no significance were observed between the variables residual risk and size, they concluded that the expected return are an increasing function of the relative bid ask spread and systematic risk, measured by CAPM. This phenomenon is explained due to the fact that investors demand a higher expected return, for the higher transactions costs associated with an increasing relative bid-ask spread.

Even though, Amihud and Mendelson find a relationship, there are authors that conclude the contradictory or at least observe a weaker relationship than the authors mentioned above. Eleswarapu and Reinganum (1993) used a longer sample period than the previous authors, however they only observe the liquidity affect to be present in January. Another interesting observation that Eleswarapu and Reinganum (1993) find was that they, unlike Amihud and Mendelson, (1986) found evidence of small firm affect even after controlling for liquidity premium. That is, the phenomena observed that small companies have abnormally high returns.

Easley et al (2002) observations are in line with Amihud and Mendelson findings, where they conclude that asymmetric information in regards to trading cost affects the stock and hence are priced. Eleswarapu (1997) investigates the relationship between the spread and stock returns on the Nasdaq, and finds support for the relationship between these factors.

There are other studies that are investigating the same relationship, with the exception that other liquidity measures are used instead of the Bid-Ask spread. When considering turnover rate as a liquidity measure, Datar (1998) finds support for the relationship on the New York Stock Exchange. Brennan, Michael J, Tarun Chordia, Avanidhar Subrahmanyam (1998) concludes a negative pattern of stock return related to their trading volume.

The small firm affect, mentioned above, are suggested to depend on the liquidity affect, where both Stoll and Whaley (1983) and Schultz (1983) find support for this suggestions. Both studies are examined on the US market, where Schultz include both New York Stock Exchange and American Stock Exchange, whereas Stoll and Whaley only take the New York Stock Exchange into consideration. Their conclusion is that small firms, offers a higher abnormal return.

As mentioned above, Amihud and Mendelson (1986), Eleswarapu and Reinganum (1993) Chan and Faff (2005) observe a premium for liquidity. However most of the studies are based on the US-market. This fact seizes our interest into investigate the relationship between returns and liquidity based on the Swedish stock exchange. Furthermore, even though different methods of measuring the liquidity were applied, the previous studies are ambiguous where some authors find liquidity in stock pricings whereas other does not. Amihud (2002) Chordia 2001a, Jones 2001, Bekaert, 2003 conclude that liquidity in fact have an effect on returns and hence can predict future returns. Whereas Eleswarapu and Reinganum (1993) only observe that the liquidity affect is present in January. Anderson, Clarkson and Moran (1997) conclude that liquidity is not statistically significant, when considering the Australian market.

Given that the previous studies are ambiguous in their conclusions, the fact that most of the studies are applied in the U.S and or bigger markets. Our contribution to the applied area is to investigate how the pattern of liquidity effect is in smaller markets, more specific towards the Swedish stock market. Most of the previous studies are investigated before or in the beginning of the 21th century where the technical achievements, which have made trading less complicated, where not as incorporated as they are nowadays. Hence the previous finding might not give an accurate picture of the liquidity effect at this present time, whereas our present investigation will.

1.3 Purpose

The main purpose in this thesis is to examine if liquidity is priced on the Swedish stock market, our secondary purpose is to measure the return premiums corresponding to the liquidity.

1.4 Limitations

Since our time and resources are limited, we had to make some limitation referring to our research implemented. Our data are based on 11 years for each of the five test periods with monthly observations of Stock price, bid and ask price, market-to-book ratios, turn volume and total shares outstanding on Small, Medium, and Large Cap of the Swedish stock exchange. The stocks that lacked any of the data mentioned above got excluded from our sample size. The final sample size ended up to 143 companies where the data was gathered from DataStream and Nasdaq OMX.

1.5 Target group

The main aims of this thesis are to provide information to investors, whether or not to consider liquidity when deciding upon to invest in the Swedish stock market. Furthermore, we target managers to consider the liquidity aspect of their companies stock

1.6 Outline

This thesis consists of the following six chapters:

Chapter one:

In the first chapter we will present all necessary information about this study. At first we will introduce the background, problem discussion and formulation related to the topic. Thereafter the purpose, limitations, target group and outline will be stated.

Chapter two:

The second chapter contains all important information about stock liquidity and illiquidity. Furthermore, models such as CAPM and Fama-French will be explained.

Chapter three:

Here we will state our chosen method and why this research method was applied. In the later part we will explain the model that will be used to obtain the results.

Chapter four:

Chapter four will contain the observed results. Afterwards we will analyze the result and finally present our reflections.

Chapter five:

The final chapter contains a summary of this thesis. Afterwards a discussion about critical reflections and further research suggestions will be presented. Lastly we will discuss practical and theoretical contributions.

2. Theory

In the second chapter we will go through all important information about stock liquidity and illiquidity. In the later part, models such as CAPM and Fama-French, will be explained.

2.1 Definition of liquidity and illiquidity

There are different definition of liquidity, Amihud (2005) define asset liquidity as how easy an asset can be sold immediately after the purchase, without a price loss and without incurring transaction costs. While Mainelli (2007) state that liquidity is dependent on the probability an asset can be converted into an expected amount of value within an expected amount of time. Fermandez (1999) state that an asset with high liquidity will only have a small price affect during a large transaction. Keynes (1971) states that an asset is more liquid if it is more certainly realizable at a short notice without incur an extra cost.

In an efficient market the market makers have access to all available public information about all traded assets and hence there will be no possibilities to gain excess returns. In order to increase the profit the investors needs to increase the risk. If the market makers are operating on a less efficient market more informed traders will buy undervalued assets and gain abnormal returns. More informed investors that are trading with private information have the possibility to trade beyond the equilibrium until the exogenous shock disappears and equilibrium is restored (Brunnermeier and Pedersen, 2005).

The asset pricing models, Sharpe (1964) and Lintner (1965) Capital Asset Pricing Model (CAPM) are assuming a frictionless market, where all assets can be traded at a zero cost at all time and where assets with an identical future cash flow have identical prices. A market with those properties would be infinitely liquid. But market friction is a fact, the difference in bid and ask price confirm that the market contains some friction (Brunnermeier and Pedersen, 2005).

A rational investor should consider the ability to sell the investment, cost of trade in the future and future sales price reduction. Those considerations that should be made by the investor will affect the future cash flows of the asset. Since liquidity affects future cash flows, it must be take into consideration regards asset pricing (Damodaran, 2005). The quote from Damodaran (2005) describes the cost of illiquidity as the cost of buyer's remorse:

"When you buy a stock, bond, real asset or a business, you sometimes face buyer's remorse, where you want to reverse your decision and sell what you just bought. The cost of illiquidity is the cost of this remorse"

2.2 Illiquidity drivers and theoretical implication

In the world asset market all investors have to face the following trading costs for all asset; brokerage cost, bid ask spread, price impact and opportunity cost (Damodaran, 2006 and Tinic, 1972). During the 21st century Jones (2002) concluded that brokerage cost have declined steadily since the 1970´s and that they are normally less than 0.1 percent of the traded volume in 2000. The intention behind the bid-ask spread is to compensate the dealer for costs related to order processing, informed traders and inventory (Gårdängen, 2005). The opportunity costs is the risk of value depreciation and the search cost of finding a party that is offering you a more favorable price. Investors always have to switch one trading cost for another (Weill, 2002 and Vayanos and Wang, 2007)

2.3 Different types of liquidity measures

In this part we will present the most common proxies for liquidity, illiquidity and the costs of illiquidity.

2.3.1 The bid-ask spread

The bid-ask price is the difference between the bid price and the ask price of an asset. The bid-ask spread occurs when rational market makers compensate them self for inventory risk, transaction costs, and information asymmetry. A mispriced market with a too high bid price or a too low ask price will increase the risk that the dealer will be left in a situation with large long position, if the bid price is too high, or a short position if the ask price is too low. There is always a risk for information asymmetry or fluctuation in inventory value and for these risks, the investors require a compensation (Damoradan, 2005).

2.3.2 Amihud's ILLIQ-measure

Liquidity is the probability for an investor to sell an asset direct after the purchase without making any price loose. A good measure of illiquidity is the sensitivity of price in relation to the traded volume (Amihud 2002).

2.3.3 The turnover rate

One of the most common used measures for liquidity is the turnover rate of a stock. Turnover rate is the number of shares traded over a specific time period divided by the total shares outstanding on the market (Amihud, 2002).

2.4 CAPM and Fama-French Three Factor Model

In order to analyze the market efficiency we consider the excess returns yielded by the zero cost strategies as a compensation for holding risky assets in the winner and loser portfolios (Campbell, Lo, Mackinlay, 1997). We apply the Sharpe (1964) and Lintner (1965) Capital Asset Pricing Model.

CAPM: $R_{jt} - R_{ft} = \alpha + \beta(R_{mt} - R_{ft}) + \varepsilon_t$

In the Capital asset pricing model R_{jt} is the expected monthly return of a portfolio at time t, while the R_{ft} is the risk free rate. R_{mt} stands for the return on market portfolio and ε_t is just an error term. The α and β are parameters that should be estimated. The β is used as a measure of risk. The monthly returns are regressed in excess of the risk free rate ($R_{jt} - R_{ft}$) on the market risk premium ($R_{mt} - R_{ft}$).

Fama and French (1996) clarified that average returns also could be related to other factors such as size company and book-to-market value. The CAPM risk factor solely would not be able to capture these average-return anomalies.

Fama-French three factor model: $R_i\text{-}R_f = \alpha_i + \beta_i(R_m\text{-}R_f) + \gamma_i SMB + \delta_i HML + \varepsilon_i$

The β, γ and δ represent the sensitivities of returns (Ogden, Jen & O'Connor, 2002). In the equation above the market risk premium is (R_M – R_f). The Small minus big capitalization stocks, SMB, is the spread of returns between small and big portfolio of stocks. High minus low value stocks, HML represents the spread in the returns between high book-to-market and low book-to-market stocks (Fama-French, 1996). Significant positive γ would indicate that the size of the stock in the portfolio can explain the abnormal returns and a significant positive δ is an indication on the influence of the value factor on the abnormal returns.

2.5 The Efficient Market Hypotheses

According to the efficient market hypotheses the stock price should reflect all public information available for the investors in time t (Fama, E.F., 1970). The price will be hard to predict if it depends on the change in available information of the market makers, because of the Random Walk. During an efficient market the profit that has been made because of information will not exceed the marginal cost (Fama, E.F., 1991). It would not be possible to gain any excess return without increasing the risk (Malkiel, 2003), since the price will be adjusted quickly when the information becomes public (Campbell, J.Y., Lo, A.W. & Mackinlay, A.C., 1997). There are three different levels, dependent on price adjustment to relevant information, of the efficient market hypothesis (Fama, E.F., 1970):

Weak form efficiency: When only the past public information available reflects the security price, thus the price will only be dependent on historical information (Fama, E.F., 1970).

Semi-strong efficiency: In a market with semi-strong efficiency the asset price will be incorporate with all past and new public available information (Fama, E.F., 1970).

Strong form efficiency: Here the security price will incorporate with all value added information known to any market makers. With other words the security price reflects both the public and private information (Fama, E.F., 1970).

The efficient market hypotheses have been criticized in the 21^{st} century; the opposition claims that security prices are partially predicted. The oppositions claim with help of behavior in finance that excess profits that are made depends on historical information and different valuation methods.

The proponent of the efficient market hypotheses propose that, if abnormal returns are achievable, there will not be any future possibility of exploring profits after it has been discovered by the market makers (Malkiel, B.G, 2003).

2.6 Behavioral finance

Some studies find evidence against traditional views, that all asset prices reflect the information according to the semi-strong efficiency of the efficient market hypotheses (Daniel, K., Hirshleifer, D. & Subrahmanyam, A., 1998). In behavioral finance one applies finance and social science to clarify the market anomalies and how market makers form their beliefs (Shiller, R.J, 2003).

Under and over reaction to publicly information are two variables that could explain abnormal returns. It has been shown that during a short time period the price of securities may under react to all available information. The current information on the market enables the market makers to make future forecasts of positive returns. During longer time period there is evidence that overreaction exists. The overreaction hypothesis of positive information will end up with overvalued securities on the market. The consciences of this overvaluation will vanish since it is mean reversion. According to behavioral finance discussed above, abnormal returns can be made by exploring the advantages of under reaction and overreaction without taking on bigger risks (Barberis, Shleifer & Vishny, 1998).

According to Pilbeam. K (2006) during more risky and volatile times investors tend to move their investments from small currency regimes to bigger ones. The reason is that it is more risky to invest money in smaller currencies regimes due to the exchange risk.

3. Methodology

Under this section, the method chosen and the reason behind this will be stated. In the later part we will explain the model that will be used to obtain the results.

3.1 Data selection

The data are gathered from DataStream and Nasdaq OMX. The theory has been collected from several scientific articles in order to give a good overview of the subject chosen. Relevant books and journals have been used throughout the thesis.

3.2 Sample selection

A total of 143 companies were observed in our thesis, where the companies' monthly return, bid–ask spread, market to book ratio, turn over volume and shares outstanding were gathered. The data contains of monthly observations, of all of the variables mentioned above, during 1997-2011. Since our purpose is to see the affects of liquidity on the Swedish stock market our sample consist of only companies in the Swedish stock market, more specific 61 On Large cap, 34 in medium and 48 on small cap. Furthermore in order to get a more representative result, the companies which lacked information on the variables mentioned above, were excluded from our sample size. That is, our initial sample was 254 and hence 111 companies were excluded.

3.3 Potential errors

As mentioned above, only firms that have remained active during the entire sample period were included. Hence we experience the same survivor bias issue as previous researches, which might lead to that the effect of liquidity becomes exaggerated. Since only the active small illiquid stocks that are well performing are included, whereas the small illiquid stocks that were yielding negative returns until there liquidation were excluded since they were no longer active. Also recently listed firms are excluded due to their lack of information. This might lead to that the obtained return premiums for less liquid stocks will be exaggerated.

However our data set has not been limited to major securities, thus all shares for a company have been included. The reasoning behind this approach is that the liquidity between different share classes often differs and thus, also, the expectation of the returns between these stocks. By including different share classes, this approach can provide support for pricing of liquidity.

3.4 Validity and reliability

In order to make trustworthy statistical conclusion the data have been statistical tested to be BLUE. Historical stock data have been collected from DataStream. Considering this thesis reliability, DataStream are widely used in the professional and academic world thus, we can argue that our data is sufficient. The data was also crosschecked with Nasdaq OMX to further strengthen the reliability concerning the data. The methods applied are a common and frequent approach applied in previous studies, hence our results are comparable with earlier findings. However in order to draw trustworthy results and conclusions, different robustness tests of the results have been preformed. As presented earlier, liquidity measures are only proxies, due to the fact that liquidity is an imprecise concept with dimensions. Our choice of liquidity measure has been considered and the applied measures were one of the most common used in previous research. Thus enabling us to do comparable results and, but also these measures gathered most data and hence the largest sample size. These actions should enable the validity and reliability of this study to be sufficient.

3.5 Data

In order to achieve our purpose we needed data on the monthly frequency for the stock price, the bid-ask spread, market-to-book ratio, market capitalization, data on the traded volume, the number of shares outstanding and the total return index. Where, for the risk-free rate, one month STIBOR will be used. Since we have monthly data, the STIBOR will be as following

$$R_{f\ month} = (1+R_{f,year})^{1/12} - 1 \qquad (1)$$

The data was collected from both DataStream and Nasdaq OMX, between the time periods of 1997-2011. To get as fair results as possible, all companies which lacked sufficient data on our different variables, mentioned above, was deleted. Our total data sample, after the elimination was 143.

3.6 Fama- MacBeth (1973)

As mentioned in the introduction, a cross sectional multiple regression will be applied in order to measure the effect on liquidity and the pricing of liquidity. The first step stone in the applied methodology is the Fama and MacBeths (1973). They developed a method which estimated the parameters for different asset pricing models, such as betas and risk premiums of a risk factor that might determine asset prices. The method imposes a two-step procedure where, in the first step, the betas are estimated for each asset. Second step is to carry out a regression for all asset returns, given each time period, on the estimated betas in the first step. This procedure will enable us to extract the risk premium for each of the risk factors observed. When the betas for all assets have been estimated, the regression is run for each time period t.

$$R_{it} = \gamma_0 + \gamma_1\beta_i + \varepsilon_i \qquad (2)$$

Where

R_{it} stands for the excess return on stock *i* at time t, over the risk free rate of return

β_i is the estimated beta of stock *i*

When this is done, the two gammas, γ_0 and γ_1 are estimated by the following formulas:

$$\hat{\gamma}_j = \frac{1}{T}\sum_{t=1}^{T}\hat{\gamma}_{jt},\ j = 0, 1. \qquad (3)$$

The variance of the parameters estimates are given by:

$$\hat{\sigma}_{\gamma t}^2 = \frac{1}{T(T-1)}\sum_{t=1}^{T}\left(\hat{\gamma}_{jt} - \hat{\gamma}_j\right)^2,\ j = 0, 1. \qquad (4)$$

And

$$\hat{\sigma}_{\gamma t}^2 = \frac{1}{T(T-1)}\sum_{t=1}^{T}\left(\hat{\gamma}_{jt} - \hat{\gamma}_j\right)^2,\ j = 0, 1. \qquad (5)$$

The expected value of γ_0 should be zero, whereas, the market risk premium, γ_1 , should be significantly higher than zero. In order to test this, the standard t-test will be carried out through:

$$t(\hat{\gamma}_j) = \frac{\hat{\gamma}_j}{\hat{\sigma}_{\gamma j}}, \; j = 0, 1. \quad (6)$$

However, due to the fact that the betas are not market observed but rather estimated, the Fama-MacBeth methodology imposes an errors-in-variables problem when testing for CAPM. This issue can be minimized through two alternatives ways, either by the formation of portfolios (introduced by Fama-MacBeth) or by adjusting the variance of the final estimates explicitly, (Shanken 1992). Both of the alternative solution will be carried out through

$$\hat{\sigma}^{2^*}_{\gamma j} = \hat{\sigma}^2_{\gamma j}\left(1 + \frac{(\hat{\mu}_m - \hat{\gamma}_0)^2}{\hat{\sigma}^2_m}\right) \quad (7)$$

The formula above will be applied when adjusting the variance, to eliminate the issue with error-in-variables in the t-statistics.

The, Jagannathan and Wang (1996), method for goodness of fit measures (r^2)

$$R^2_C \frac{\sigma^2_{C,\bar{R},i} - \sigma^2_{C,\bar{\varepsilon}\,l}}{\sigma^2_{C,Ri}} \quad (8)$$

$\bar{\varepsilon}_i$= The average residual for portfolio *i*.

3.6.1 Applying Fama-MacBeth to obtain effect of liquidity on stock returns

In order to see if illiquidity attracts a return premium on the Swedish stock market, we have to extend the Fama-MacBeth methodology to include more factors than just the market premium. Similar to Amihud and Mendelson (1986) a four factor CAPM will be applied to explain the cross section of return. The three risk factors will be the one proposed by Fama and French (1993), i.e. the excess return on the market, SMB and HML portfolio and the forth factor will be the measure of liquidity used.

The three risk factor sensitivities of Fama and French, for each portfolio *i* for each time period t, will be estimated in the following regression. However, the estimation is going to be applied on portfolio of stocks.

$$R_{it} - R_{ft} = \alpha_i + \beta(R_{Mt} - R_{ft}) + s_i SMB_t + h_i HML_t + \varepsilon_{it} \quad (9)$$

After having estimated the three factor sensitivities above, the threes sensitivities are used as an initial step in the OLS regression of the Fama-MacBeth procedure, seen bellow, together with the liquidity measure. To obtain the liquidity the average of the liquidity measure over the preceding period (t-1) is estimated.

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1 \hat{\beta}_i + \gamma_2 \hat{s}_i + \gamma_3 \hat{h}_i + \gamma_4 LIQ_{it} + u_{it} \qquad (10)$$

It should be noticed that the sign of liquidity γ_4 depends on the measure of liquidity used. When applying the bid-ask spread the sign should be positive, a more illiquid asset requires a higher return. Contradictory, when the turnover rate is used as a liquidity measure, the sign should be negative since the less liquid the portfolio is, the higher required return should be. $\gamma_1$to $\gamma_3$are the risk premium used. After this initial step has been estimated the second step of the Fama-MacBeth framework, to obtain each estimate of the gammas by averaging the time series of each parameter, can be undertaken. The tests for data, mentioned above, such as Shanken (1992) are also calculated to correct for unbiased data.

3.6.2 Applying Fama-MacBeth to obtain effect of liquidity risk on stock pricing

Our second objective is to obtain the relationship between liquidity risk and stock returns. To obtain this objective the following regression for the four factor sensitivities is being applied.

$$R_{it} - R_{ft} = \alpha_i + \beta_i \left(R_{Mt} - R_{ft}\right) + s_i SMB_t + h_i HML_t + I_i LIQ_{it} + \varepsilon_{it} \qquad (11)$$

This regression differs from the above, since in the estimation of portfolio characteristic, the illiquidity measure is already included. Hence, the sensitivities of illiquidity for a portfolio will be included in the first- step regression of Fama-MacBeth, discussed above, in order to analyze liquidity as a risk factor.

These four obtained sensitivities are than used in the initial procedure of the Fama-MacBeth.

$$R_{it} - R_{ft} = \gamma_{0t} + \gamma_1 \hat{\beta}_i + \gamma_2 s_i + \gamma_3 h_i + \gamma_{4t} l_i + u_{it} \qquad (12)$$

In the regression above, we have another risk premium,γ_{4t}. Since these parameters track the risk exposure of the portfolio, the higher sensitivities towards one of the parameters, the higher should the expected return for the portfolio be. Also, the same test statistic as in the sub-chapter above will be applied for this regression as well.

3.7 Market portfolio

The market portfolio applied will consist of the value weighted returns of all stocks in the data sample. The same method will be applied for the test portfolios but also for the liquidity measures. Even though we apply the value-weighted portfolio, there are previous studies that have used the equal weighting methodology. However given the fact that the Large Cap stands for most of the market value of the Swedish stock exchange comparing to the Mid and Small Cap, an equally weighted portfolio could undermine the large stocks fraction of investor's wealth, that is that small companies have assigned weights that are too high. If that is the case the result of the effect of liquidity and liquidity risk in stock pricing might be overstated, since small companies are more illiquid than larger ones.

3.8 Fama-French three factors

Below the variables included in the Fama-French three factors model are presented:

- Excess market return
- SMB
- HML

Where excess market return is the Return on the market i.e. all stock on Swedish stock market subtracted by the risk free rate return (R_m-R_f), which in this case is the one-month STIBOR. SMB is the small minus big capitalization stocks, SMB, is the spread of returns between small and big portfolio of stock. HML is high minus low value stock, which represents the spread in the returns between high book-to-market and low book-to-market stocks.

3.9 Measure of Liquidity

As mentioned in the first chapters, we are going to use two different measures of liquidity, more precisely the Bid ask spread, which measures the direct effect, and hence this factor will be an explanatory variable in this thesis. Our second measure of liquidity will be the Turnover rate and used as proxy for illiquidity. The turnover rate is a common factor which is applied by other authors Anderson, et.al (1997) and it is a good proxy for liquidity, since trading activity gives signal of depth.

Bid-Ask spread:

To obtain the relative bid ask spread, we use the following formula, formed by Amihud and Mendelson (1986):

$$S_{it} = \frac{P_{Bid,it} - P_{Ask,it}}{0{,}5(P_{Bid,it} + P_{Ask,it})} \qquad (13)$$

Turnover rate:

The turnover rate is given by the following equation:

$$\text{TRit} = \frac{1}{3}\sum_{j=1}^{3} \frac{\text{Volume i,t−j}}{\text{Shares it}} \qquad (14)$$

3.10 Work procedure

To obtain our result, we are following the procedure applied of Amihud and Mendelson (1986). We will have five periods, where we have divided our data into eleven overlapping periods. For each period a five year beta have been estimated, including a five year portfolio formation period and finally a one year cross section test period. These periods, which will lead to our result, will be discussed in detail below.

Beta estimation:

We will use 5 years of beta calculations (60 months), to estimate the beta coefficients for all stock. These coefficients for all stocks will be estimated through time series OLS regression of basic CAPM relation.

$$R_{jt} - R_{ft} = \hat{\alpha}_j + \hat{\beta}_j\left(R_{Mt} - R_{ft}\right) + \varepsilon_{jt} \quad t = 1, \ldots.,60. \qquad (15)$$

$R_{j\,t}$= The return on stock *j* in month *t*,

R_{ft} = The return on the risk free asset in *t*,

R_{Mt} = The return on the market portfolio in month *t*,

$\hat{\beta}j$ = The estimated beta for stock *j*,

3.10.1 The portfolio formation period

Since we want to obtain the effect of liquidity on stock returns and the pricing of liquidity risk we have to apply two different methodologies that differ slightly. The liquidity measure that have been used when determine the direct effect of liquidity on stock returns, does not enter into the factor sensitivity regression. However, when detecting the pricing of liquidity risk, it will. These different approaches will be discussed below.

3.10.1.1 Portfolio parameter estimation for detecting the effect of liquidity on stock returns

The first step in the portfolio parameter estimation is to classify all stock in the sample into portfolios, based on their liquidity and beta, for each year of each portfolio parameter estimation period. The next step is to estimate the parameters i.e. factor sensitivities, for each portfolio. When the following sensitivities are estimated they will be applied on the Fama and MacBeth (1973) approach to control for other factors that might explain the cross-section of returns.

$$R_{it} - R_{ft} = \alpha_i + \hat{\beta}_i\left(R_{Mt} - R_{ft}\right) + \hat{s}_i SMB_t + \hat{h}_i HML_t + \varepsilon_i \qquad (16)$$

Where,

Rit = the return on portfolio *i* in month *t*,

Rft = the return on the risk free asset in *t,*

RMt = the return on the market portfolio in month *t,*

SMBt = the return on the SMB portfolio in month *t,*

HMLt = the return on the HML portfolio in month *t,*

LIQ_{it}= the estimated beta for portfolio *i,*

$\hat{\beta}_i$= the estimated sensitivity on the excess return on portfolio *i* to the return on the SMB portfolio.

$\hat{s}_i$ = the estimated sensitivity of the excess return on portfolio *i* to the return on the HML Portfolio

$\hat{h}_i$= the estimated sensitivity of the excess return on portfolio *i* to the return on the HML Portfolio

3.10.2 Portfolio parameter estimation when investigating the pricing of liquidity risk

To obtain the effect of liquidity risk in stock pricing, the liquidity obtained for each portfolio, will be included in the portfolio parameter estimation period, to estimate the sensitivities of each portfolio towards changes in its level of liquidity.

$$R_{it} - R_{ft} = \alpha_i + \hat{\beta}_i\left(R_{Mt} - R_{ft}\right) + \hat{s}_i SMB_t + \hat{h}_i HML_t + \hat{l}_i LIQ_{it} + \varepsilon_i \quad (17)$$

Where,

Rit = the return on portfolio *i* in month *t,*

Rft = the return on the risk free asset in *t,*

RMt = the return on the market portfolio in month *t,*

SMBt = the return on the SMB portfolio in month *t,*

HMLt = the return on the HML portfolio in month *t,*

LIQ_{it}= the estimated beta for portfolio *i,*

$\hat{\beta}_i$= the estimated sensitivity on the excess return on portfolio i to the return on the SMB portfolio.

$\hat{s}_i$ = the estimated sensitivity of the excess return on portfolio i to the return on the HML Portfolio

$\hat{h}_i$= the estimated sensitivity of the excess return on portfolio i to the return on the HML Portfolio

$\hat{I}_i$= the estimated sensitivity of the excess return on portfolio *i* to the liquidity on portfolio *i*

Through the previous five years of data, the four factor sensitivities will be estimated at end of each year. In order to have the factor sensitivities available for each of the five test periods.

In order to estimate the effect of market liquidity risk, we will take the value-weighted liquidity of all stocks and enter this in the regression above. After this procedure we will be able to estimate the return premium of individual stocks in relation to market liquidity. Thus the more sensitivity the portfolios are to market liquidity the higher expected return should be, since investors sees the sensitivity as a risk.

3.10.3 Test period

Finally the test period can be undertaken, after having obtained the sensitivities described above. The first step of the Fama MacBeth, (1973) the cross-section regression can be started. As for the portfolio estimation periods, we will have two different methodologies in the test period, in order to test for the direct effect of liquidity and influence of liquidity risks on stock returns.

3.10.3.1 Testing the cross-sectional influence of liquidity on stock returns

For each month of each test period (12 months), we estimate the five gammas in the cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + \gamma_3\hat{h}_i + \gamma_4 LIQ_{it} + u_{it} \qquad (18)$$

We will obtain 12 observations for each parameter of each test period, thus times series will consist of 60 observations toward each of the gammas.

Thereafter the second step of the Fama-MacBeth can be applied to these time series by averaging each time series of gamma estimates as explained in our methodology part.

3.10.3.2 Testing the cross-sectional effect of liquidity risk on stock returns

For each month of each test period, five gammas are estimated in the cross-sectional regressions:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + \gamma_3\hat{h}_i + \gamma_4\hat{\hat{l}}_i + u_{it} \qquad (19)$$

As stated above, we will obtain 12 observations for each parameter of each test period, thus times series will consist of 60 observations toward each of the gammas.

The 1-4 gammas are estimate risk premiums. The last gamma is thus the premium for liquidity risk.

3.10.4 Portfolio construction

We are going to form 3x3 liquidity and beta portfolios. The first step is to rank all stocks by their liquidity and divide them into three equal groups. The second step is to rank the stocks, from the three groups gathered in the first step, by their betas which are than divided into three new sub-groups. We will than end up with a total of nine portfolios. In order to test our result we will perform robustness test, where the formation of portfolios will be, only, towards betas of equal size. These 9 portfolios, will be applied the same tests for the value weighted 3x3 portfolios.

3.11 Statistical Properties

In order to make trustworthy statistical conclusion and increase the validity one need to do some statistical test for the data. It is crucial for the OLS to define the data as BLUE (Best Linear Unbiased Estimator), this means that the data showing the lowest mean squared error. If we would end up with a significant heteroskedasticity and/or autocorrelation the results will not be BLUE. In order to get it BLUE we have to make some adjustments for the data, otherwise our results would not be reliable.

3.11.1 Autocorrelation

In order to test if we have autocorrelation in our data we will apply a Durbin-Watson test.

3.11.1.1 Durbin-Watson statistics

We will test the null hypothesis that our errors are serial independent to the presence of first order autocorrelation, which is in line with Durbin J. and Watson G.S. (1951).

$$d = \frac{\sum(e_t - e_{t-1})}{\sum e_t^2} \qquad 0 < d \leq 4 \qquad (20)$$

e_t is the residual at time t. We have a positive serial correlation if d>1. If d<3 we have a negative autocorrelation. A common rule is that if d=1 there is no autocorrelation.

3.11.2 Heteroskedasticity

The statistical test will be invalid if var(et) $\neq \sigma^2$, i.e. variance of error is not constant and finite (Brooks, C., 2008). We will use the statistical White test to control if the residual variance is constant, i.e. if var(et)= σ^2. We will test the null hypotheses for absence of heteroskedasticity against the existence of heteroskedasticity (White, H., 1980).

3.11.3 Skewness

The skewness is defined as:

$$\gamma_1 = E\left[\left(\frac{x-\mu}{\sigma}\right)^3\right] = \frac{\mu^3}{\sigma^3} \qquad (21)$$

To detect our distribution of stock returns we will measure the skewness. The skewness measure the asymmetry of the probability distribution of stochastic variable (Gujarati, D. (2006).

3.11.4 Kurtosis

Kurtosis measures the shape of the probability distribution. It can be clarify the fatness of the distribution´s tails. The excess kurtosis, fourth standardized moment minus 3, is defined as:

$$\gamma_2 = \frac{\mu^4}{\sigma^4} - 3 \qquad (22)$$

For a normal distribution, the excess kurtosis should be zero, which means that he kurtosis would be three. Positive excess kurtosis indicated a distribution with a fat tails and a higher peak around its mean, leptokurtic distribution. Negative excess kurtosis indicates a thinner and a lower peak around its mean, a so called platykurtic distribution (Gujarati, 2006).

3.11.5 Normality

A Jarque-Bera test is use to control if the returns are normal distributed. The null hypothesis tests out if skewness and excess kurtosis are jointly equal to zero.

$$JB = \frac{n}{6}\left(\gamma_1^2 + \frac{1}{4}\gamma_2^2\right) \qquad (23)$$

In order to obtain balanced panels with complete data, only firms that have remained active throughout the entire sample period were included. This may cause a survivor bias, since it is likely that firms facing bankruptcy have a different capital structure than the firms in the sample used. Since any firm included must have a history of at least eight years of data, young and recently listed firms are underrepresented in the sample, which may also affect capital structure characteristics in the sample.

3.12 Hypothesis testing

In the following section we are going to state our hypothesis corresponding to the estimated gammas, which will be obtained through our regression. Since we want to measure the direct relationship between liquidity and stock return, and the pricing of liquidity risk, we are going to apply two cross-sectional tests and hence the following statement of hypothesis will be split in two parts.

3.12.1 The relationship between liquidity and stock return

The model used to obtain the following objective is stated below. The model will be violated is the intercept term γ_0 turns out to be significantly different from zero.

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1 \hat{\beta}_i + \gamma_2 \hat{s}_i + \gamma_3 \hat{h}_i + \gamma_4 LIQ_{it} + u_{it} \quad (24)$$

The gammas are tested against a two-sided alternative and hence our hypothesis is the following:

The $H_{o:}$ $\gamma_0 = 0$ Respective, $H_{A:}$ $\gamma_0 \neq 0$

The other three gammas are risk premiums, as explained above each of the risk premium, theoretically, attracts premiums. Where a higher required return of a portfolio is demanded when the portfolio is sensitive to any of the risk factors, the higher sensitivity towards any risk factor, the higher excess return is required. Given this relationship our null hypothesis is that these return premiums is significantly higher than zero, where as the alternative is that they are not significantly larger than zero. As stated bellow:

$H_{o:}$ $\gamma_J > 0$, j = 1,... 3 Respective, $H_{o:}$ $\gamma_J \leq 0$, j = 1,... 3

The last gamma represents the liquidity measure used. By using the turnover rate, the gamma will measure the effect of liquidity on stock returns, where as the bid ask spread will measure the illiquidity on stock returns. Hence, according to theory, there should be a negative relationship between turnover rate and stock return, less liquid portfolio should equals higher return, and a positive relationship for bid-ask spread and stock returns, more illiquid, equals higher required return. Since the theory predicts a relationship between the liquidity measures applied and the stock returns, the-test will be one-sided and hence the hypothesis for gamma four:

Form measure of illiquidity, turnover rate:

$H_{o:}\ \gamma_4 > 0$ Respective, $H_{A:}\ \gamma_4 \leq 0$

For measure of liquidity, bid-ask spread:

$H_{o:}\ \gamma_4 < 0$ Respective, $H_{A:}\ \gamma_4 \geq 0$

3.12.2 Determination of pricing of liquidity

The model used to obtain the following objective is stated below. As mentioned before, the same relationship applies for this model, i.e. violation of the model if the intercept term γ_0 turns out to be significantly different from zero.

$$R_{it} - R_{ft} = \gamma_{0t} + \gamma_1 \hat{\beta}_i + \gamma_2 s_i + \gamma_3 h_i + \gamma_{4t} l_i + u_{it} \qquad (25)$$

The gammas are tested against a two-sided alternative and hence our hypothesis is the following for intercept term γ_0:

$H_{o:}\ \gamma_0 = 0$ Respective, $H_{o:}\ \gamma_0 \neq 0$

The same implication for the risk factors, mentioned above, applies for the pricing of liquidity. However, in this model liquidity is a risk factor and thus we have four gammas.

$H_{o:}\ \gamma_J > 0,\ j = 1,\ldots 4$ Respective, $H_{o:}\ \gamma_J \leq 0,\ j = 1,\ldots 4$

4. Empirical Results & Analysis

Chapter four will contain the observed results. Afterwards we will analyze the results and finally present our reflections.

In this chapter we will present our objective with this thesis, our first purpose is to determine relationship between stock returns and liquidity on the Swedish stock market. Our secondary purpose is to determine the effect of the liquidity risk on the Swedish stock market.

Since we investigate two objectives our results will be presented in two split parts, where we first are going to present our first purpose, with respect to the two different liquidity measures used, i.e. bid-ask spread and turnover rate. Thereafter our secondary purpose will be presented with the same presentation methodology.

To give a benchmark to our findings but also investigate the evidence of the CAMP and Fama French three factor, we are first going to present the application of these models where as finally a presentation of our main method applied, the four factors CAPM. All of the methods will follow the same cross sectional approach, to give as reliable comparisons possible.

4.1. Simple CAPM

The result of the simple CAPM towards our portfolios is presented below, where both the liquidity measures are taken into consideration and where a cross sectional regression is carried out for each test.

Table 1, Regression of CAPM for both the 3x3 weighted portfolios and beta portfolios

A further explanation of the variable, $\hat{\beta}_i$, are stated in the methodology chapter.

3x3 portfolios with respect to beta and:

Bid-ask spread	$\hat{\gamma}_0$	$\hat{\gamma}_1$
Estimated value	-0,01533[3]	0,0048[3]
Standard error	0,0109	0,0017
Turnover rate	$\hat{\gamma}_0$	$\hat{\gamma}_1$
Estimated value	-0,0166[3]	0,0071
Standard error	0,0094	0,0029
Beta	$\hat{\gamma}_0$	$\hat{\gamma}_1$
Estimated value	-0,01573[3]	0,0066
Standard error	0,0111	0,0024

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level.

Where $\hat{\gamma}_0$ and $\hat{\gamma}_1$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1 \hat{\beta}_i + u_{it}$$

From the table above, one can clearly see that the standard CAPM does not hold, for the given data and methodology applied in this thesis. As mentioned earlier, the intercept term $\gamma_0$should be zero, in order to not violate the model. However, contradictory the intercept term is significantly larger than zero for each of the tests, and hence our null hypothesis for $\gamma_0$is rejected. According to CAPM, our portfolio formation has underperformed to our benchmark index. As conclusion we can state that there is something the CAPM does not capture.

4.2 Fama French three factor CAPM

As mentioned in the beginning of the chapter, we will now present the result of the Fama and French three factor CAPM towards our portfolios, where both the liquidity measures are taken into consideration and where the same cross sectional regression, as on the other test, are applied.

Table 2, Regression towards our 3x3 and beta portfolios, with respect to the Fama-French three factors

A further explanation of the variables, $\hat{\beta}_i$, $\hat{s}_i$ and $\hat{h}_i$ are stated in the methodology chapter.

3x3 portfolios with respect to beta and:

Bid-ask spread	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$
Estimated value	0,0038	-0,1178	0,09636	0,01123[3]
Standard error	0,0090	0,1852	0,3447	0,0595
Turnover rate	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$
Estimated value	0,0070	-0,2203	0,02225	0,0110
Standard error	0,0087	0,1708	0,3345	0,1499
Beta	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$
Estimated value	0,0216	0,3564	-0,0996	0,0192[3]
Standard error	0,0429	0,9670	0,2006	0,0921

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level.

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$ and $\hat{\gamma}_3$have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + \gamma_3\hat{h}_i + u_{it}$$

The output from the Fama-French shows two significant findings. For the Beta and Bid-ask spread portfolio, the HML estimation is significant at a 10 % level. According to the table above, for each unit of sensitivity of the, the HML portfolio are priced at an annualized premium of 14,3 % whereas for the bid ask, a premium of 25,6% is observed. However all of the other parameters are insignificant and the model above does not say much about the risk factors and the premiums estimated seems to be exaggerated.

4.2.1 The cross-sectional relationship between liquidity and stock returns.

The following table summarizes the 3x3 portfolio formation and gives an overview of the tendency between the relationship of excess return and the relative bid-ask spread for each portfolio.

Table 3, Indication of relationship, with respect to bid-ask spread as liquidity measure

Bid-Ask Spread		L			M			H	
Beta	L	M	H	L	M	H	L	M	H
$R_i - R_f$	-0,001	-0,0005	-0,0031	-0,0112	0,0011	0,0029	0,0047	0,0040	0,0023
Bid-Ask	0,0022	0,0182	0,0150	0,0106	0,0153	0,0143	0,0207	0,0319	0,0206

Without considering for other variables the table gives slightly tendency of relationship between the following.

The combined excess return for the Bid-ask spread, which was the first criteria for our portfolio formation, follows a pattern where the portfolios with the lowest spread has the lowest combined return. Thereafter the medium portfolio, and finally the portfolio with highest spread observe the highest excess return as anticipated. Also three out of four of the highest excess returns are observed in the portfolio with the highest spread. Even though we see a tendency towards that higher spread indicates a higher excess return, we also observe that two of the highest spread portfolio observes the lowest excess return within their portfolio return. These findings were not in according to the theory.

Table 4, The direct effect of the relative bid ask spread of the 3x3 portfolios towards portfolio excess return, while controlling for the market risk, SMB and HML

A further explanation of the variables, $\hat{\beta}_i$, $\hat{s}_i$ and $\hat{h}_i$ are stated in the methodology chapter, and LIQ is our relative bid-ask spread of the portfolio *i*.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$
Estimated value	0,0069	0,01947	0,0706[2]	0,0132[2]	0,0710
Standard error	0,0325	0,0303	0,0481	0,0279	0,2500

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,6971***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + \gamma_3\hat{h}_i + \gamma_4 LIQ_{it} + u_{it}$$

This time the liquidity measure, bid ask spread, is included$\hat{\gamma}_4$, however the coefficient is not significant. The SMB and HML parameters on the other hand are significant on a 5% level.

Given our portfolio formations, and methodology applied we cannot observe any significance on the liquidity measure used and hence the bid ask spread does not explain the returns. No relationship can be found between liquidity and stock returns on the Swedish stock market.

Table 5, Indication of relationship, with respect to turnover rate as liquidity measure

Turnover rate		L			M			H	
Beta	L	M	H	L	M	H	L	M	H
$R_i - R_f$	-0,0091	-0,0014	-0,0067	0,0020	-0,00371	0,0003	-0,0008	-0,0050	0,0083
Turnover	0,0389	0,0178	0,0232	0,0381	0,0390	0,0540	0,1835	0,2061	0,1869

The following table summarizes the 3x3 portfolio formation and gives an overview of the relationship between the excess return and the spread for each portfolio.

The implications of the table above are that, we observe the same pattern as before where the lowest liquidity portfolios have the lowest excess return and at the same time the highest spread exhibits the highest combined return. However, only one of the highest spread portfolios within each portfolio has the highest return within each portfolio. Another remarking observation is that one of the highest spread portfolios actually has the lowest return.

Table 6, The direct effect of the turnover rate of the 3x3 portfolios towards portfolio excess return, while controlling for the market risk, SMB and HML

A further explanation of the variables, $\hat{\beta}_i$, $\hat{s}_i$ and $\hat{h}_i$ are stated in the methodology chapter, and LIQ is our relative turnover rate of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$
Estimated value	-0,0139	-0,0258	0,0160[3]	0,0047	0,0487
Standard error	0,0171	0,0168	0,0328	0,0146	0,0380

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,7981***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + \gamma_3\hat{h}_i + \gamma_4 LIQ_{it} + u_{it}$$

The result above show the same result as for when the relative bid ask spread was used as a liquidity measure, i.e. no significant relationship between the turnover rate and the stock portfolio returns can be observed. Furthermore we observe a positive estimate of the turnover rate, even though this estimate should be significantly lower than zero to be in line with theory. The only significant coefficient is the SMB, on a 10 % level.

Although our table 5 implies a tendency between the turnover rate and portfolio return, this tendency is not significant according to the table and hence no negative relationship between the variables can be found.

4.3 Test for robustness

In the following section the three factor CAPM is tested towards both of the liquidity measures applied, the distinguish from the previous test is that the following test only includes our beta portfolios and hence are not formed as the previous one´s 3x3. This is done in order to check the robustness of our findings. Another test will be done, where the Fama-French factors will be excluded.

Table 7, The direct effect of the relative bid ask spread of the beta portfolio towards portfolio excess return, while controlling for the market risk, SMB and HML

A further explanation of the variables, $\hat{\beta}_i$, $\hat{s}_i$ and $\hat{h}_i$ are stated in the methodology chapter, and LIQ is our relative bid-ask spread of the portfolio *i*.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$
Estimated value	0,0015	0,0461	-0,0652	0,0704[2]	0,2951[3]
Standard error	0,0096	0,0122	0,0205	0,0941	0,2218

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,7629***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + \gamma_3\hat{h}_i + \gamma_4 LIQ_{it} + u_{it}$$

When only considering the beta in our portfolio estimation, we observe two significant variables. Both the HML coefficient and our Liquidity measure are significant and hence larger than zero on the 5 %, and 10 % level, indicating a positive relationship between the coefficient and returns. According to the table above, if the spread increases by 100 bp, the required return increases, 7,04bp for HML and 29,51bp for LIQ monthly. That is, a premium of 0,84 % and 3,6 % respectively. However, one has to consider that the results are not robust to the portfolio formation criteria, and hence the results are not definitive. In the following table we are going to see if these findings are consistent when we are excluding the Fama-French factors.

Table 8, The direct effect of the relative bid ask spread of the beta portfolio towards portfolio excess return, while controlling for the market risk

A further explanation of the variables, $\hat{\beta}_i$, are stated in the methodology chapter, and LIQ is our relative bid-ask spread of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$
Estimated value	0,0011	0,9782	0,1766[2]
Standard error	0,0069	0,0055	0,1397

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,7118***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$ and $\hat{\gamma}_2$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2 LIQ_{it} + u_{it}$$

As seen, the premium for our liquidity measure is sensitive with the presence of the Fama-French factors. The premium is estimated to 2,1 %, 210bp for each increase in relative spread.

As mentioned in the introduction of this subchapter, we will follow up with the same regression as the above, with the exception of the turnover rate used as liquidity measure.

Table 9, The direct effect of the turnover rate of the beta portfolios towards the portfolio excess return, while controlling for market risk, SMB and HML

A further explanation of the variables, $\hat{\beta}_i$, $\hat{s}_i$ and $\hat{h}_i$ are stated in the methodology chapter, and LIQ is our relative turnover rate of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$
Estimated value	0,0071	0,0053	-0,0069	0,0523	-0,0626[2]
Standard error	0,0111	0.0112	0,0155	0,087	0,0648

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,6760***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + \gamma_3\hat{h}_i + \gamma_4 LIQ_{it} + u_{it}$$

These findings are similar to the previous result in when bid-ask spread was considered. The beta portfolios, contradictory to the 3x3 portfolios, find a statistically significant negative relationship between the turnover rate and the expected return. These findings are consistent with the theory, and according to result above the required return from investors would be 75bp when the turnover rate from an asset decreases with 100bp.

Similar to the previous test by leaving out Fama-French factors with respect to relative bid-ask spread, a similar test are presented for the turnover rate.

Table 10, The direct effect of the turnover rate of the beta portfolio towards portfolio excess return, while controlling for the market risk

A further explanation of the variables, $\hat{\beta}_i$, are stated in the methodology chapter, and LIQ is our relative turnover rate of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$
Estimated value	0,0107	0,0634	-0,0586[2]
Standard error	0,0116	0,0841	0,0319

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,3182***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$ and $\hat{\gamma}_2$, have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1 \hat{\beta}_i + \gamma_2 LIQ_{it} + u_{it}$$

By leaving out the Fama-French factor, we still observe a significant negative relationship between the returns and the liquidity measure. Although the coefficient is lower, we will still observe a premium of 72bp.

4.4 The cross-sectional relationship between liquidity risk towards stock characteristics

In the following section we are going to investigate our second purpose, i.e. if liquidity is priced on the Swedish stock market. In order analyze this effect we are going to apply a four factor CAPM. In the first tests, relative bid ask spread will be seen as a stock characteristic, later on the turnover rate will be applied for the same tests.

Table 11, The cross sectional effect of the relative bid ask spread sensitivity of the excess return on the 3x3 portfolios towards portfolio excess return, while controlling for the market risk, SMB and HML

A further explanation of the variables, $\hat{I}_i$, is stated in the methodology chapter, and $\hat{I}_i$ is our relative bid-ask spread of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$
Estimated value	0,0149	-0,1202	0,0035[2]	0,0116	0,0048 [3]
Standard error	0,0166	0.0184	0,0352	0,0595	0,0153

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,5672***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + \gamma_3\hat{h}_i + \gamma_4\hat{I}_i + u_{it}$$

When applying the four factor CAPM we can see that the two significant factors are observed, SMB and liquidity factor. The SMB parameter are significant larger than zero at a 5 % level whereas liquidity is significant on a 10 %. The premium for the two factors are 4,2 % and 5,9 % respect, both according to theory. However, the four factor CAPM provides no significant premiums regards to the other factors.

Table 12, The cross sectional effect of the relative turnover sensitivity of the excess return on the 3x3 portfolios towards portfolio excess return, while controlling for the market risk, SMB and HML

A further explanation of the variables, $\hat{I}_i$, is stated in the methodology chapter, and $\hat{I}_i$ is our relative turnover rate of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$
Estimated value	-0,0139	-0,0047	-0,2586	0,0016	-0,0203
Standard error	0,0171	0.0262	0,0168	0,0280	0,0148

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,6981***

Where$\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1 \hat{\beta}_i + \gamma_2 \hat{s}_i + \gamma_3 \hat{h}_i + \gamma_4 \hat{I}_i + u_{it}$$

As opposite to the relative bid ask spread in the previous test, we cannot see any significance for the observed factors in our four factor CAPM, hence no premium can be concluded.

4.5 The cross-sectional relationship between liquidity risk, towards market characteristics

In the following part the liquidity will be seen as a market characteristic, instead of a stock characteristic as the case were for the previous tests above.

Table 13, The cross-sectional effect of the market relative bid-ask spread sensitivity of the excess returns of the excess return on the 3x3 portfolios towards portfolio excess return, while controlling for the market risk, SMB and HML.

A further explanation of the variables, $\hat{I}_i$, is stated in the methodology chapter, and $\hat{I}_i$ is our relative bid ask spread of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$
Estimated value	0,0081	-0,0015	-0,0708	0,0123	-0,0005
Standard error	0,0146	0,0184	0,0244	0,0367	0,0216

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,2618***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + \gamma_3\hat{h}_i + \gamma_4\hat{I}_i + u_{it}$$

When considering the effect of market liquidity risk on returns, no significant risk premiums are found, neither for liquidity risk or the other factors.

Table 14, The direct effect of the market turnover rate sensitivity of the excess returns of the excess return on the 3x3 portfolios towards portfolio excess return, while controlling for the market risk, SMB and HML

A further explanation of the variables, $\hat{I}_i$, is stated in the methodology chapter, and $\hat{I}_i$ is our relative turnover rate of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$
Estimated value	0,0146	-0,0019	-0,0242	0,0205	0,0214
Standard error	0,0256	0,0196	0,0177	0,0242	0,0240

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,2734***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + \gamma_3\hat{h}_i + \gamma_4\hat{I}_i + u_{it}$$

We observe the same result as for the bid-ask spread in the previous section, that no premium for the risk factors are found for the given significance levels. The result for our two tests, with respect to market liquidity on excess return, does not provide any premium for the turnover rate.

4.6 Portfolios formation with respect to beta

In the following tests our portfolio formation will only consist of individual stock betas, in order to see if the result deviates from our 3x3 portfolio formation. The test will be applied for both the bid-ask spread and the turnover rate.

Table 15, The cross-sectional effect of the relative-bid ask spread sensitivity of the excess returns of the beta portfolio towards the portfolio excess returns while controlling for markets risk, SMB and HML

A further explanation of the variables, $\hat{I}_i$, is stated in the methodology chapter, and $\hat{I}_i$ is our relative bid ask spread of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$
Estimated value	0,0029	0,0417	-0,1608	0,0068[2]	0,0063 [3]
Standard error	0,0076	0,0115	0,0056	0,0084	0,0019

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,7642***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + \gamma_3\hat{h}_i + \gamma_4\hat{I}_i + u_{it}$$

When applying this portfolio formation, the results imply that both the HML and liquidity risks are priced which is in accordance with the theory. HML is significant from a 5 % level and liquidity on a 10 % level, where HML shows a premium of 8,4 % whereas liquidity measure impose a 7,8 % premium.

In the table below we are excluding the Fama-French factors in order to see if the findings above are sensitive to the presence of these factors.

Table 16, The cross-sectional effect of the relative-bid ask spread sensitivity of the excess returns of the beta portfolio towards the portfolio excess returns while controlling for the markets risk

A further explanation of the variables, $\hat{I}_i$, is stated in the methodology chapter, and $\hat{I}_i$ is our relative bid ask spread of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$
Estimated value	0,0019	0,0072[2]	0,0056[3]
Standard error	0,0080	0.0071	0,0034

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,5139***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$ and $\hat{\gamma}_2$, have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1 \hat{\beta}_i + \gamma_2 \hat{s}_i + u_{it}$$

We can see that this table indicates the same result as the previous, that the pricing of the relative bid ask spread is significant at a 10 % level. Another finding is that we have a significant market risk premium. The result implies a 6,9 % premium for the liquidity measure and a 8,9 % premium for the market risk.

Table 17, The cross-sectional effect of the turnover rate sensitivity of the excess returns of the value-weighted beta portfolios towards portfolio excess returns while controlling for markets risk, SMB and HML

A further explanation of the variables, $\hat{I}_i$, is stated in the methodology chapter, and $\hat{I}_i$ is our relative turnover rate of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$
Estimated value	-0,0024	0,0335	-0,0465[2]	0,0430[1]	0,0050
Standard error	0,0104	0,0123	0,0871	0,0093	0,0139

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,3636***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1 \hat{\beta}_i + \gamma_2 \hat{s}_i + \gamma_3 \hat{h}_i + \gamma_4 \hat{I}_i + u_{it}$$

When applying the turnover rate as liquidity measure, we cannot significantly show pricing of liquidity risk. Also, contradictory to theory, we observe a significant negative relationship between the returns and the SMB portfolio. On the other hand, we can observe significant premiums attached to the HML portfolio which is in accordance with theory.

A test were we exclude the Fama-French factor will be shown below, this is tested to see if the relationship that liquidity risk is not priced, holds even with the absence of the Fama-French factors.

Table 18, The cross-sectional effect of the turnover rate sensitivity of the excess returns of the beta portfolios towards portfolio excess returns while controlling for markets risk

A further explanation of the variables, $\hat{I}_i$, is stated in the methodology chapter, and $\hat{I}_i$ is our relative turnover rate of the portfolio i.

	$\hat{\gamma}_0$	$\hat{\gamma}_1$	$\hat{\gamma}_2$
Estimated value	-0,0074	0,0075	0,0080
Standard error	0,0041	0,0084	0,0250

[1] Significance at 1 % level, [2] Significance at 5 % level, [3] Significance at 10 % level. ***R^2 = 0,3256***

Where $\hat{\gamma}_0$, $\hat{\gamma}_1$ and $\hat{\gamma}_2$, have been estimated through the following cross-sectional regression:

$$R_{it} - R_{ft} = \gamma_0 + \gamma_1\hat{\beta}_i + \gamma_2\hat{s}_i + u_{it}$$

The regression above does not prove any significant premiums for the risk factors. As in the presence of Fama-French factors above, no evidence for pricing of turnover rate towards the beta portfolios can be found.

4.7 Summery of findings

In this part we will present our main findings from our empirical investigation.

4.7.1 Effect of liquidity on stock returns

Trying to detect the effect of liquidity on stock returns, we approached two different measures of liquidity, the relative bid-ask spread and the turnover rate. The tests were applied in two different portfolio formations, one 3x3 weighted portfolio and one weighted only toward the betas.

Our findings is that we could not statistically prove evidence of the liquidity effect on stock returns, neither for the bid-ask spread nor the turnover rate, with respect to our 3x3 liquidity and beta portfolios. The findings are robust with or without the presence of Fama-French factors and thus the results were not in line with the theory.

When changing portfolio criteria's and only consider the beta, the findings differ. Given this formation we observe significance for the liquidity effect on stock return for both of the liquidity measures applied. These results are also robust with or without the presence of the Fama-French factors.

4.7.2 Return premium with respect to liquidity measure

Measuring the return premium in relation to liquidity, gave ambiguous result depending on the different methods applied. In terms of turnover rate, we could not conclude any significant premium for liquidity risk. These findings were also robust to the weighting convention, the beta portfolios and the presences/absence of Fama-French Factors.

On the other hand the relative bid ask spread with respect to the 3x3 portfolio, shows significance of a risk premium. When considering the weighting convention, the result was however, contradictory and no premium was observed. When the portfolio formation was only toward beta, we observed, significance on the premium, where the results are robust both with the presence and absence of Fama-French factors.

4.8 Analysis

As stated above, when applying our 3x3 portfolio formations we do not find any evidence of liquidity effect for our liquidity measures. This indicates that either there is no liquidity effect, or that there is something that our formation and approach does not capture. When only taking beta portfolio into consideration we however find significance for liquidity effect and thus it implies that the 3x3 portfolio formation does not grasp the effect, and that our results becomes ambiguous. Our small sample size is likely to cause these findings, but furthermore the relative small time period could be an explaining factor for the observed results.

The difference where the relative bid-ask spread found tendency to a premium in some approaches whereas the turnover rate did not find any at all, could be explained by that investor does not behave rationally. Thus, they do not require a premium for a more illiquid assets or does not consider the turnover rate to be as important determine as the relative bid ask spread.

Given these findings one could conclude that investors does not behave rationally since they do not get/demand a compensation for holding and investing in less liquid stocks compared to the more liquid ones. Also another explanation might be that small investors, with absence of experience, do not consider trading costs when deciding upon investments, compared to experienced ones.

Another aspect that is of importance is the fact that during our sample period several crises have occurred, which might have affected our results. As K Pilbeam (2006) states, investors tends to, during crises, move their capital from small currencies too big and more stable currencies since the smaller currencies are associated with larger risks. According to Niemeyer (1994a) half of the trading in Swedish stocks takes place outside of Sweden, hence these foreign investors might move their capital to more stable currencies during the crises.

As our findings indicates, i.e. ambiguous and failed robustness test for results, this study might be another evidence of that the CAPM does not work as intended. However by assuming that the CAPM indeed work as intended, the implications are that the Swedish

Stock Exchange does not appear to be efficient. Thus lack of market efficiency and hence prices do not reflect all information.

Our findings suggest that the trading costs do not seem to determine stock returns, which is in accordance with the CAPM. However, as stated previously, CAPM assumes that there is no trading cost which is not the case in reality. Thus, to conclude or support that the market in fact is efficient, one should find return premiums that reflect the level of liquidity, since the prices should reflect the available information.

Furthermore a possible explanation for the findings that no premium can be detected, might be that the transaction costs on the Swedish stock market are so low that they do not have any impact. Jones (2000) states that the trading costs have declined steadily and was normally less than 0,1 percent of the traded volume in 2000, also the technical achievements have made trading more easily during the last years. When taking these two factors into consideration, it might imply that the impact of illiquidity is small or none.

The findings that no liquidity premium can be found goes in line with Eleswarapu and Reinganum (1993) Anderson, Clarkson and Moran (1997) however as we find a tendency to liquidity premiums for some approached the findings also go Amihud and Mendelson (1986), Eleswarapu and Reinganum (1993) Chan and Faff (2005) that an illiquidity premium exists. To conclude, our findings, as previous research, are ambiguous.

There are some potential explanations to our observation, however we have to take into account that our time period are short and that our sample size is small as stated above. These factors might contribute to our vague results. Considering liquidity risk on the Swedish Stock Market, we observe that the turnover rate as proxy is not attracting premium, whereas there are tendency for the relative bid ask spread to attract a premium, although the findings are not robust.

4.9 Data descriptions

The Durbin-Watson test show that no autocorrelation exist. Our Stock data have constant and low variance of errors, which indicates that that there is no problem with heteroskedasticity. Our Skewness is -0,0506 which is indicates that we have a very small left-skewed distribution. We have a small positive excess kurtosis and thus this positive excess kurtosis indicates a distribution with a fat tails and a higher peak around its mean, which is called leptokurtic distribution. According to our Normality test we can conclude that our data is normal distributed (Appendix A). Our statistical test shows that the data can be considered BLUE and therefore we can confirm that our results are reliable.

5. Conclusion

The final chapter contains a summary of this thesis. Afterwards there will be a discussion about critical reflections and present further research suggestion. Lastly we will discuss practical and theoretical contributions.

5.1 Our main conclusions

Our purpose with the thesis was, as stated in the introduction, to examine if liquidity is priced on the Swedish stock Exchange and to measure the return premium with relation to liquidity. In order to measure these effects, two different liquidity measures have been applied, the relative bid-ask spread and the turnover rate. The Fama and MacBeth cross sectional methodology have been approached in order to investigate our intentions, where portfolios have been divided into liquidity and thereafter betas to form a 3x3 portfolio. In order to tests the robustness of our findings, tests have been made applying only beta to our portfolio estimations, but also by the presence and absence of Fama-French factors.

According to theory and articles, mentioned in the first chapters, illiquidity and liquidity should be treated as risk and hence have premiums attached to them. However, empirically, the premiums attached to liquidity have not been seen in each case.

When investigating our first purpose, *the effect of liquidity on stock returns*, following conclusions can be made.

Considering the 3x3 portfolios no liquidity premium for neither the turnover rate nor the relative-bid ask spread was observed. The same conclusions were drawn when applying our robustness test where we excluded the Fama-French factors. However the results differ when considering the beta portfolios. Applying only betas in the portfolio showed significance for both of the liquidity measures used, where the relative bid-ask spread observed a 29,51bp increase for relative 100bp increase in spread, which is a 3,6 % premium whereas the turnover rate imposes a 75bp increase. These finding were robust the presented and absence of Fama-French factors, and the result were in line with the accordance of theory.

For our second purpose, *to measure the return premium*, following conclusion can be made.

In terms of our 3x3 portfolio, no liquidity risk premiums with respect to the turnover rate were observed. These findings were also robust to the weighting convention. Contradictory, a liquidity risk premium for the relative bid ask spread was observed with a premium of 5,9 %. However, these findings were not shown in our weighting condition where no detection could be found. When focusing on the beta portfolios, the turnover rate did not observe any premium, neither did the robustness test when excluding the Fama-French factors. However the findings for the relative bid ask spread in the beta portfolio where robust, thus a premium was observed when excluding the Fama-French factors.

There are several possible explanations to our result, that no clear cut evidence of liquidity premiums was observed. The relative small Swedish market and the volatile time period might make investors preferring bigger markets during crises as Pilbeam (2006) state. Thus, even though the investors find the investment to be desirable, they might be reluctant to invest due to the exchange rate risk associated with Sweden. The relative small trading cost and the technical achievements might be an explanation to our findings (Jones 200). Another reason might be that investors behave irrationally and does not demand a premium for less liquid assets or that that small investor does not consider the trading costs when deciding upon investments.

We have to keep in mind that these findings provide ambiguous evidence, that the findings are not robust and that the evidence is not strong. However the findings can be seen as indications of return premiums and a further investigation with more data and longer time period would give a more reliable indication of the relationship.

5.2 Critical reflection

In this theses we applied the value-weights approach, one could argue that this approach may lead to biased results. The reason is that, when excluding stocks due to their lack of information these stocks tend to be illiquid stocks of small companies. If this is the case, then assessing a value-weighting approach to the portfolios might result that the large companies' gets higher weight, and hence do not capture the real effect of liquidity costs and risks.

Another interesting thing might be to use other proxies for liquidity measures, mentioned in the theory part. These results could than have been crosscheck with our findings to get a more robust test.

Our time period chosen are quite volatile, where financial crises are included. Obviously these troubled times could have affected our results. Also a longer time period with a higher sample size would provide more trustworthy results, perhaps by including more markets.

5.3 Further studies

In further studies, it would be interesting to include the whole Scandinavian stock exchange to see the affect of liquidity. Furthermore it would be interesting to see a comparison between sectors, trying to locate if some sectors exhibit a higher return premium in relation to liquidity than others. Also it would be interesting to apply one of the alternative liquidity measures in order to see if there deviate from our findings.

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Appendix A:

Table 4

Total R-Square	0,7697
Durbin Watson	1,4408
Jarque-Bera	9,4321
White test	46,1810

Table 6

Total R-Square	0,7981
Durbin Watson	1,2254
Jarque-Bera	8,7480
White test	41,8867

Table 8

Total R-Square	0,7118
Durbin Watson	1,2356
Jarque-Bera	8,7825
White test	42,7103

Table 9

Total R-Square	0,6660
Durbin Watson	1,6740
Jarque-Bera	9,6432
White test	45,9584

Table 11

Total R-Square	0,5672
Durbin Watson	1,4026
Jarque-Bera	9,1539
White test	34,0341

Table 12

Total R-Square	0,6981
Durbin Watson	1,4408
Jarque-Bera	8,3685
White test	41,9867