Liquidity pricing at the London Stock Exchange.

Emmanouil Syniorakis

Student number: 366122

MSc. Economics and Business: Financial Economics.

Erasmus School of Economics, Department of Finance,

Erasmus University Rotterdam.

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Supervisor: Dr. C.M. Lin,

Department of Business Economics

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I would like to dedicate this thesis to my family who were always by my side, believing in me.

Abstract

We use the Fama-MacBeth approach on data of the London stock Exchange in order to identify if liquidity is priced using share turnover as a proxy. The regressions also check the interaction of share turnover with a series of other factors that are believed to be linked to liquidity in the stock market. The same methodology is applied in individual stocks and decile portfolios, where the findings support the view of preferring portfolios over stocks in research papers. Interestingly, we find that the cross sectional excess return of decile portfolios on share turnover, has a significant exposure to each of these factors that are strongly related to liquidity.

Contents

Introduction.

The goal of this paper is to identify the risk premiums of liquidity in stock returns when share turnover is used as a proxy in the case of individual stocks and portfolios. The question around the risk premiums has been one of the strongest research subjects, especially after the World War II, when there have been a lot of theories of what kind of risk is priced or incorporated in expected stock returns.

In general terms, it has been observed that less liquid stocks are the ones with higher returns, meaning that there is a liquidity premium for those equity returns that should be identified and measured. In the present research we are going to use share turnover as a proxy for liquidity in order to estimate the risk premiums of liquidity risk. We are expecting to find that in cross sectional regressions, the stocks that have higher turnover will be the ones with lower expected return.

Still, after so many years of research there are some unanswered questions concerning liquidity because of the different factors that influence liquidity levels. Unfortunately there is no mutual agreement concerning which is the best methodology or proxy. One of the questions this paper is trying to answer concerns liquidity and the equity premiums and the ways that liquidity risk is linked to the asset pricing models through individual stocks or portfolios. Our contribution for the already existing literature is to identify if there is risk premium for liquidity through specific factors and by supporting same time the view of turnover (trading volume) as liquidity measurement and also observe what are the differences in applying the same methodology in stocks and portfolios.

Liquidity is linked to many subjects of finance, it is even considered one of the factors that contribute in creating to what we call in finance today, "limits to arbitrage". Investors in most of the case seem to be reluctant to engage practices and investment strategies which are associated to high transaction costs. Because of this obstacle, the abnormal returns for illiquid stocks and portfolios are a form of compensation to this investors to attract them into taking such a risk.

In our research for liquidity premium, we focus on the London Stock Exchange, one of the most famous and active Stock exchanges in the world with lots of different and diverse stocks listed. While most of the researched are using US data, ours will focus in a different and mostly European market with different characteristics and also different performance during the recent financial crisis.

In order to understand further the multidimensional side of liquidity in stock markets we describe and analyze below the so far known used liquidity measures and proxies of liquidity.

There are have been lots of different indicators that they are used in the financial markets and illustrate and analyze liquidity developments in the finance sector. It is still of question how much each of them contributes to the total liquidity effect. Turnover ratios, bid ask spreads and price impact measure are some of them. It is a very considerable/important question why we have not decided which measurement is the best, the reason for that is that in each case the different market specific factors must be taken in consideration and also theoretically there cannot be a perfect choice. However in this paper we are concerned on how turnover can be useful in measuring liquidity and estimate the additional premiums of risk associated. Using turnover to measure liquidity will also help our findings to be comparable to address the role of liquidity in the international asset pricing.

The turnover is used as a liquidity measurement at first in a single model and also in a more complex model by including more factors so we can check the interaction of the turnover with other variables such as market size, book-to market ratio and cash flow-to-price ratio. The Fama-MacBeth methodology is applied as a two-step methodology which includes time series and cross sectional variation of turnover and other factors.

The theoretical and empirical approach of this paper is partially linked to Shing-yang Hu (1997) point of view and methodology in examining turnover as a measurement of liquidity in the Tokyo Stock Exhchange. Shing-yang Hu finds a significant cross sectional relation between expected return and lagged turnover, however there have been also opposite views that they strongly disagree. For instance three research paper of past literature Gallant, Rossi, and Tauchen, 1992, Hiemstra and Jones 1994 and Rogalski 1978. Shing-yang Hu's (1997) methodology is consistent with Amihud and Mendelson (1986) model in which the turnover measures the investor's trading frequency. According to Amihud and Mendelson model, in equilibrium investors with higher trading frequencies will tend to hold assets that have lower transaction cost and obtain lower expected return. Lower transaction means lower spread and therefore lower expected return for these assets. The link with our way of thinking is that turnover could measure the investor's frequency or their holding period universe, and show a negative relation between turnover and expected return. So while Amihud and Mendelson's methodology is examining the effect of bid ask spread on return we are using turnover instead of spread.

It is true that bid ask spread can be an indication for liquidity, more liquid securities are associated with lower bid ask spreads if we consider the way that market makers try to make profit. However using the bid ask spread as a measurement does not always lead to accurate and reliable results. Werner (2000) shows that the execution cost depends on the order type with prices to move negatively or positively for market orders and floor-order types. Harris and Hasbrouck (1992) and also Petersen and Fialkowski (1994) show that quoted spread is a poor indication of transaction cost. Chen and Kan (1995) have tried to use the same data as Amihud and Mendelson with different test methodologies but they have not succeed in finding a clear trust worthy relation between expected return and the relative bid-ask spread. The results of Chen and Kan (1995) are more consistent with Constantinides (1986) and Chalmers and Kadlec (1998) who has found that transaction costs are not that important determinants in the security markets.

The rest of the paper is organized as follows: Section 2 discussed the already existing of asset pricing and liquidity, Section 3 describes the data set and methodology, Section 4 presents describes the estimated results and Section 5 concludes by summing up the findings and proposes the next step of research in the future.

2. Liquidity

2.1 Asset Pricing and Liquidity.

CAPM is the most used and most criticized asset pricing model. The absence of assumptions about market restrictions, the use of no more than one time periods, are some of the reasons why CAPM has been criticized as an asset pricing model (Jensen, 1972). Still CAPM has been used most, not only there is no better choice for the academic research but also because it easy to use for analysis and also in interpreting the results and compare them with previous research.

According to Cochrane (1999) risk in linked to many different factors, this is maybe a correct justification in why new papers focus on models with more factors. The same happens with liquidity risk, only one factor cannot capture all the systematic risk. Factors that improve our results can be considered of importance in explaining the return. However factors that do not improve our model can lead to errors and misleading especially if the variables are correlated and also the only thing that is achieved is to make the model more difficult and complex to understand. Therefore the choice of extra factors in the asset pricing model we are using should be justified empirically and theoretically to prevent misleading and statistical problems.

Liquidity cannot be easily defined but if we would like to try, we could say that liquidity is the ability of an asset, to transform from the one form to another, meaning stocks to cash and vice versa, without being able to influence the price. As mentioned above we are trying to support the view of using turnover as a liquidity measure. Baker (1996) supports that by using different methodologies and proxies for liquidity we end up also to different results, even by using the same data of a financial market. But why do we care about liquidity. Liquidity is significant element of the investing world and also is strongly affected by the macro economic situation. It can fluctuate over time and the possibility that might decrease in times that investors needs it, is a serious risk factor. From the investors sight it is totally reasonable to care about liquidity levels, since that we are looking for assets that they give a return, net of trading costs, meaning that the less liquid assets should give a higher premium return in compensation of the lower liquidity levels. One very common case of the recent financial crisis, was the case of investors that were holding assets that could not be liquidated without a high cost. So investors that had already faced wealth losses were wishing to have had higher expected returns from holding these illiquid assets, in other words they ask for a liquidity premium.

The question if there is a liquidity risk to be priced has also troubled the academics even though for some the answer is clearly positive. Still, there are studies that are doubting the impact of transaction cost in the asset return because of the fact that it could be relatively small. According to Chalmers and Kadlec (1998), as long as the transaction cost is amortized by the holding period, the impact on the asset return will be small. Chen and Kan (1995) and with Constantinides (1986) have also supported the view that the liquidity premium can be either too small or inconsiderable for asset pricing, this is because of also too small transaction cost.

Besides defining a measurement of liquidity we care of understanding if liquidity can be used for expected returns. The asset pricing research has shown that the expected returns are cross sectional correlated and liquidity has proven to be a possible variable that can explain the dynamics of expected returns. Pastor and Stambaugh (2001) has shown by using the already known then 3-factor model of Fama and French that by adding an additional factor of liquidity and identify if liquidity can be used for forecasting expected returns. According to Pastor and Stambaugh (2003) one of the dimensions of liquidity is linked with the temporary price changes within the order flow. Fama and French (1993) 3-factor model has also been used by Brennan and Subrahmanyam (1996), who tried to connect market microstructure and asset pricing in order to understand if there is a link between return and illiquidity. Their main conclusions was that, there is indeed a premium related with both the fixes and the variable element of the cost of transacting. However their findings are not consistent with A&M paper, there is a convex relation between the cost of transacting and the state variable that is introduced in their model. This can be because the Fama and French model is incapable of capturing all the risk variables. They also check about seasonality just like Eleswarapu and Reignanum (1993) who found a positive liquidity premium for January, but they find no significant seasonal patterns.

Brennan, Chordia and Subrahmanyam (1998) and also Chordia, Subrahmanyam and Anshuman (2001) tried to differ by not using again the Fama and French (1993) model but by forming a new model consisted by book-to-market ratio, firm size, the stock price, lagged returns and the dividend yield. Their methodology moves in another direction from the classical Fama and French model. Initially Brennan, Chordia and Subrahmanyam (1998) showed that there is a negative relation of average returns and liquidity by using as a proxy the dollar trading volume. Chordia, Subrahmanyam and Anshuman (2010) tried to move to the next level by identifying the relation of average returns with second moments of liquidity, the variability of trading activity after controlling for factors such as book-to-market and momentum effects, price levels and dividend yields.

2.2. Liquidity proxies

There are different methods of measuring the liquidity level and moreover if liquidity is able of explaining the cross section of expected returns. Most of the proxies used are distinguished between trade based and order based. The past literature has tried to link each of the proxies to at least one of the four dimensions of liquidity, which are: i) the trading quantity, ii) the trading speed, iii) the cost and iv)the price impact. Additionally, the most common trade based proxies for identifying liquidity are: the stock turnover, the bid-ask spread, the illiquidity ratio, the return reversal and also the standardized turnover.

The Stock Turnover.

Generally the use of turnover has been included in the framework and model of Fama and French. Datar, Naik and Radcliffe (1998) have also used turnover as a proxy for liquidity. In their paper, turnover is defined as the rate of the number of shares traded (trading volume) divided by the number of shares outstanding for each stock, considering it as a logical measurement of liquidity. In simple words a high share turnover implies how quickly a dealer will be able to change his position. The rationale of using stock turnover as a liquidity proxy in Datar, Naik and Radcliffe (1998) paper is based in two things. First, both Shing-Yang Hu (1997) and Datar, Naik and Radcliffe's research used Amihud and Mendelson theoretical approach to support the selection of stock turnover. According to A&M have shown that under the assumption of equilibrium, liquidity is linked to trading frequency. Based on that view, instead of examining liquidity levels, something that is difficult to identify, we use as a proxy for liquidity, the stock turnover. Second, we can have easily access to data of stock turnover rates by monthly frequency and in that order have the ability to examine the liquidity levels for a great number of stocks for very long periods. Lakonishok and Lev (1987) have used turnover as a liquidity measure in examining stock splits. Brennan Chordia and Subrahmanyam (1998) and also Chordia, Subrahmanyam and Anshuman (2010)used among others, share turnover as proxy for liquidity, since they did not have access to access to bid-ask spreads data. One more recent paper that uses turnover is Chan and Faff (2003), in which it is examined if the cross-sectional variability in stock returns can be justified by liquidity. They are using Fama and French factors in Australian data to check if liquidity is priced. Their results show that there is indeed a negative relation between stock returns and share turnover. They even check whether this is is valid when for book to market, size, stock beta and momentum using the cross-sectional regression approach of Fama and MacBeth (1973).

The Bid- Ask Spread

It is fair to say that bid-ask spread is maybe the most common used proxy for liquidity measurement. Mainly in a security's transaction the ones that provide liquidity are the market makers through the roles of the counterpart of a transaction. In exchange market makers buy at a low bid price Pb and sell at a higher ask price Pa. So normally the difference Pa - Pb is what we call the bid-ask spread, or in other words the trading cost. Low bid-ask spreads are usually associated with more liquid securities and vice versa. One of the first papers that tried to examine the issue of liquidity use as proxy for the trading cost the bid-ask spread, Demsetz (1968) followed by Tinic (1972) and Benson and Hagerman (1974) who find additionally a positive relation of trading activity and liquidity and a negative relation between trading activity and spreads/volatility. The following years has been given more attention in examining what is the relation of securities with high spreads (high volatility) and expected return. It is a fact that the research of Amihud and Mendelson has been in center of attention by proving a positive relation between expected stock return and bid-ask spread. Besides Amihud and Mendelson, Eleswarapu and Reinganum (1993) has also used bid-ask spreads to answer the question if there is a seasonal pattern in liquidity premium. They try to differentiate from A&M by not ignoring a possible size effect which could happen by excluding smaller in size firms.

Liquidity ratio

Liquidity ratio is also known as Amivest measure of liquidity. It is the ratio of the stock's daily volume to sum of the absolute return. Some of the researchers that used this approach, were Amihud (1997) and also Berkman and Eleswarapu (1998).

Illiquidity ratio

It was introduced by Amihud (2002) as the ratio of absolute stock return to its dollar return, suggesting that the expected stock excess return are not constant but are partially a premium for changes in market illiquidity. The data for obtaining the illiquidity ratio can be easily accessed from time series stock data. Moreover it is shown by Amihud (2002) that illiquidity influences more small firm stocks than bigger in size firm stocks. This implies that variations over time in the small firm effect in because of, in some extent, changes in liquidity.

Return Reversal

According to Pastor and Stambaugh (2003) one of the dimensions of liquidity is linked with the temporary price changes within the order flow. They construct their liquidity factor by examining the relation of the excess stock market return with a constant factor which is the previous day's return multiplied with the dollar volume and the sign of the previous day return. The signed volume is used as a proxy for the most recent available order flow, implying that in case of great buy order, the stock price will increase, but the very next day we will have a return reversal because the stock will not be very liquid in the end. The greater the coefficient, the higher the possibility to have a reversed return when the liquidity is lower.

Standardized Turnover

One more proxy for identifying the levels of liquidity is the standardized turnover, used by Liu (2006). This kind of proxy shows us that liquidity consists a serious source of risk. The standardized turnover unlikely the above proxies for liquidity is linked with another dimension of liquidity, the trading speed dimension. Moreover standardized turnover is consistent with the already findings related to the existing literature on methodologies in liquidity proxies and has a greater forecasting ability than them. This proxy is adjusted for the number of zero daily trading volume over the prior months. The days of zero trading volume helps in having a continuous trading scheme and take in account if there was any difficulty in realizing an order. Moreover for a security, a day without trade tells us about the degree of illiquidity at that point.

Besides the trade based proxies there are also some other proxies used that are order based. While trade based proxies are connected to actual trades and information, the order based proxies (Chollete et al., 2007) are showing the potential trading activity and are depending on information about orders. The use of order based proxies (absolute spread, relative spread, and amortized spread) requires the access to high frequency data such as intraday data. Relative spread is the absolute spread after we divide it with the midpoint of the bid and ask price, in order to have the spread in terms of the stock price. The absolute spread is the difference between the ask and bid price. Both of them, the relative spread and the absolute spread are considered order based measurements. While the third measurement, the amortized spread can be considered both order based and trade based and is defined as (Chalmers and Kadlec (1998)) the relative spread multiplied by the share turnover, so we can take in consideration the trading frequency of shares. These two kind of proxies for liquidity are not strongly correlated according to Cholette (2007) and Aitken and Comerton-Forde (2003)

Table 1. Liquidity measures and dimensions

Dimensions	Width	Depth	Immediacy	Resiliency	More
Order Based	Absolute spread				
	Amortized spread				
	Relative spread				
Trade Based	Amortized spread	Trading volume	Turnover(shares	Liquidity ratio	Liu measure
		Value	Turnover(NOK)	Amihud measure	Size
			Zero trade ratio	Amivest measure	

There are also some other concepts related to liquidity, knows as dimensions. Lee, Mucklow and Ready (1993) and Dong, Kempf and Yadavpointed (2007) pointed that is needed also to take in consideration other dimensions of liquidity such as market depth and resiliency. Besides market depth there is also the breadth and the resilience of the market that affect liquidity in a certain amount. There are four factors related to liquidity and these are:

The Width: Shows a market with a little changed bid ask spreads, so you can buy an asset at a price with low deviation from the original price. A market with high tightness is a market with high trading activity and plenteous liquidity.

The Depth: Is the ability to buy or sell an asset without changing the quoted price. A similar amount of orders on the bid and ask side should not lead to any changes on the quoted price. Depth is both linked to liquidity and the trading volume.

Immediacy: is linked with the time that a transaction takes to be completed. The shares are less frequently traded are also the ones that take longer to carry out the process. Therefore the ones that are executed faster are also considered the liquid ones.

Resiliency: The amount that the quoted price changes when we buy or sell the asset. According to Dong, Kempf and Yadavpointed (2007) resiliency depends on how fast the pricing errors that are caused by uninformative orders, are eliminated through the competitive actions of value traders, dealers and other market participants.

Each of these four dimensions liquidity is linked to one or more aspects of liquidity. The spread change or in another words the transaction cost declares the width dimension. The fact that the market is not symmetrically informed leads to less frequent transactions for some particular shares, influencing in that way the width and also the immediacy of the shares. Therefore, there is not absolute answer, which dimension is linked with which source of liquidity. Moreover, there is also the case that we can characterize an asset illiquid or not depending on which dimension we are taking in consideration. In terms of width an asset could be considered liquid but this might not be the case for Immediacy where it could be considered illiquid because the transaction takes too long to be executed. This is consistent with the view that only one factor or source of premium priced cannot explain the variations in asset prices and also consistent with the conclusion of Amihud (2002) that in order to estimate correctly the liquidity risk more than one factors should be considered.

2.3. Liquidity models

Different liquidity proxies implies also lots of different liquidity models to be used in the so far literature. Most of these models are using the classic CAPM and by following the example of Fama and French (1992), they are adding different factors until they find the right combination for a liquidity measure. Amihud and Mendelson (1986), Eckbo and Norli (2002) and also Acharya and Pedersen (2005) are some of them. The conclusions from these studies show that the liquidity is premium exists and that the explanatory power of the asset pricing models is increased by adding proxies for liquidity.

Using the cross-sectional regression approach of Fama and MacBeth (1973) and having time-series findings, make this paper related to the literature regarding the time varying conditional mean. Moreover using turnover as liquidity measurement by using data from London Stock Exchange FTSE100, the conclusions will contribute in presenting new evidence, just like Shing-yang Hu (1997) did, on the time-varying conditional mean, implying that a change in trading turnover is able to change the expected stock return. Few of the papers that try to explain the rationality of stock price movements are Campbell 1987, Campbell and Hamao 1992, Campbell and Shiller 1988, and Fama and French 1988. However we are not going to analyze the already existing literature on this subject because gets out of the field of our subject.

Stocks and Portfolios.

Since that we are testing our methodology both in individual stock and portfolios of stocks, we can consider that our research is contributing to the already existing literature in this matter. Most of the practitioners in finance prefer using portfolios instead of individual stocks, because in this way they consider the procedure less time consuming and accurate in estimating and presenting significant results. In a few words they think the portfolios more efficient for academic research. However, there is also the easily understandable opinion that by forming portfolios you intervene in the samples and you do not allow information that are incorporated in the stock prices to be expressed in betas and therefore have greater standard errors in your regressions. Some of the most characteristic papers that have used portfolios instead of stocks are of course Fama and MacBeth (1973) and also Black, Jensen and Scholes (1972). The ones that resisted to the movement of this methodology achieved also in proving their methodology, such as Litzenberger and Ramaswamy (1979).

3. Data and Methodology.

One of the goals of this paper is to identify the risk premiums of liquidity in stock returns when shares turnover is used as a proxy, but also to support the view of share turnover as liquidity measurement by using data from London Stock Exchange FTSE100, the conclusions will contribute in presenting new evidence in how to incorporate liquidity elements in asset pricing, just like Shing-yang Hu (1997) did, implying that a change in trading turnover is able to change the expected stock return.

3.1. London Stock Exchange.

The London Stock Exchange was founded in 1801, 213 years ago. It is fourth biggest Stock Exchange in the world and the biggest in Europe by market capitalization of US $3.266 trillion. There are 2,864 companies listed through the five FTSE indexes (FTSE100, FTSE250, FTSE SmallCap, FTSE All-share index). FTSE 100 index in which we are focusing our concern is usually used by stock brokers, large investors, financial experts and the media as a representative index of the stock market. The companies that are listed in the Stock Exchange are varying in characteristics, the smaller companies have value of less one million pounds, while the bigger ones maybe even more than 90 million pounds.

3.2. Data Sample.

We use monthly returns of securities included in FTSE100 of London Stock Exchange, examining the period 1990-2012. Compustat Global is used for identifying the FTSE 100 Index Constituents and after obtaining the SEDOL codes of the additional stocks we use Thomson Reuters Datastream provided by the Erasmus University Library Data stream laboratory for obtaining the raw data of stock prices. The raw stock prices that were selected concern the monthly data of the period January 1990 to December 2012.

However, the initial sample of returns and number of shares traded and shares outstanding for FTSE100 constituents had to be limited in the number of shares traded for each of the stocks during the years 1990-2002, because of lack of data and in order to avoid statistical errors and multicollinearity problems. Throughout the period of 2002-2012 we are examining the sample of 149 stocks in terms of return and number of shares traded and outstanding by monthly frequency. The monthly excess returns and the stock turnover (trading volume) were calculated by using simple Excel programming and then Stata for the regressions.

The share turnover is simply defined as the ratio of the shares traded (trading volume) to the shares outstanding for each of the month of the period 2002-2012. Additionally, we also work with the log of turnover, which help us reduce the impact of outliers and make the higher skewed distributions less skewed and also helps in making the data more comparable to other papers.

In order to make our model of liquidity more dynamic and also check the interaction of turnover with other factors believed to be linked with liquidity. We include Market Size, Book-to Market ratio and also Cash Flow to Price ratio for UK market, which are obtained from the online database Kenneth's French website.

3.3. Methodology.

The goal of this paper is to identify the risk premiums of liquidity in stock returns, and more particularly if share turnover is priced as a liquidity measurement by using data from London Stock Exchange FTSE100 from 1990 to 2012.

We use a similar approach as in the case of Shing-yang Hu (1997) who applied his methodology in Japan Stock Exchange and found a significant cross sectional relation between expected stock return and lagged turnover. What distinguishes our methodology from the Shing-yang Hu's (1997) is the order of applying the two step approach of Fama-MacBeth and also what kind of variables we are using. In contrast to that paper are first step in the time series regressions for each firm and the second step includes the cross sectional regressions for each month of that period.

We examine if liquidity is priced through share turnover, by using a relation of return of the constituents of FTSE100 index and share turnover. In order to accomplish that we use a previously tested and trustworthy methodology of Fama-MacBeth which has been used from other well-known papers such as Fama and French (1992) and Miller and Scholes (1982)

Fama-MacBeth methodology has been used not only for identifying the exposure to a specific factor but also is suggested as a method of estimating when you know that the residuals are probably correlated and OLS regressions will not give trustworthy results. The Fama-MacBeth gives standard error prices and estimates close to the actual ones, this is also what Petersen (2005) shows with his simulation of OLS and Fama-MacBeth in the same data. Moreover, Petersen (2005) confirms that by using Fama-MacBeth, the serial correlation of the residuals is almost equal to zero.

Regression Method.

For the regressions we are using both individual stocks returns and examine what is the relation of those with turnover ratio, and also portfolios which are formed based on share turnover ratios.

The Fama-MacBeth regressions are applied to the share turnover in two stages. We are using the excess return of each share, having as benchmark the index itself. The beta we are using as an input is the share turnover beta following Shing-yang Hu approach stating, that market beta is not able to explain the cross sectional relation of stock return and share turnover.

Regressions on Individual stocks.

The first step, includes a time series regression for all the stocks of FTSE100 index individually, to investigate if there are fluctuations in the systematics' risk part. In other words we estimate the share turnover betas for each of the constituents. We take the average estimates from the time series regression of each stock.

In the second step, we use the share turnover betasβ_t, obtained from the first step to run the cross sectional regressions for each month of the period we are examining.

The first regression model used is:

$$r_{t,i} = \alpha_1 + \beta_t TURN_{t-1,i} + e_{t,i} \qquad (1)$$

$$r_{1,t} = \alpha_1 + \beta_1 TURN_1 + e_{1,t}$$

$$r_{2,t} = \alpha_2 + \beta_2 TURN_2 + e_{2,t}$$

$$\vdots$$

$$r_{n,t} = \alpha_{n,t} + \beta_n TURN_n + e_{n,t}$$

In the above formula $r_{i,t}$ is the excess average monthly return for stock i, in month t, $TURN_{i,t}$ is the stock's i turnover traded at month t (trading volume) divided with the number of shares outstanding at that month t, and $e_{t,i}$ is the error term.

We are also interested in checking the link of turnover with other variables (model 2) such as book to market ratio and cash flows to price ratio. For that reason we run second regression including the additional factors obtained by the Kenneth's French website.

We include three different factors besides the monthly share turnover, these are: market size, book to market ratio and cash flow (earnings minus depreciation) to price ratio. It is well proved that market size is a significant factor in addressing the level of returns, Fama and French (1992) and also among others Lakonishok, Shleifer and

Vishny (1994). The book-to-market ratio, according to the model is the available book value of the equity divided with the additional market value. Fama and French and Chan, Hamao and Lakoniskok (1991) support the view that stocks with lower book-to-market ratio will give also lower returns. As for the cash flow-to-price ratio is defined as, the most recent earnings plus depreciation as stated in the financial statements, at the end of the month for each company. According to Chan, Hamao and Lakonishok (1991) cash flow-to-price ratio is an overlooked valuation indicator in the academic research, stocks with higher to cash flow-to-price ratio are supposed to have higher returns. In this paper, due lack of access to we are using already estimated factors of market size, book-to-market and cash flows-price ratio that are generated from the Kenneth R. French-Data Library.

$$r_{i,t} = a + \beta_{TURN} TURN_{i,t} + \beta_{MKT} MKT_{\iota,t} + \beta_{BM} BM_{i,t} + \beta_{CP} CP_{i,t} \quad (2)$$

We have the choice of including or not the market beta. There are studies in US (Basu 1977 and Banz 1981) and Japanese (Shing-yang Hu 1997) data have shown that market beta cannot explain the cross- sectional stock returns. The answer for UK data is in question about that matter, in our research we will assume that same counts for our case, in order that our results are comparable with other papers that examine the same topic.

Regressions on Decile Portfolios.

We also create decile portfolios of the stocks with criterion the share turnover. The portfolios are ten in number, equally weighted and each of them are calculated by rebalancing every month the stocks with highest turnover.

The first decile includes the stocks with the 10% most liquid stocks, measured with share turnover, and the tenth decile contains additionally the 10% less liquid stocks of FTSE100 index for the period we are examining.

It is interesting to see the descriptive statistics of these portfolios as well as the results of the estimations by applying the Fama-MacBeth two step procedure. The factors we are using are also the same in this case, we are using already estimated factors of market size, book-to-market and cash flows-price ratio that are generated from the Kenneth R. French-Data Library.

$$r_{i,t} = a + \beta_{MKT} MKT_{\iota,t} + \beta_{BM} BM_{i,t} + \beta_{CP} CP_{i,t} + e_{i,t} \quad (3)$$

The first step similarly to the stock returns case, includes time series regressions equal to the number of portfolios. If we would like to present the above equation more simply we could write for step 1:

$$r_n = F\beta_n + e_n$$

The r_n is the vector which contains the returns, F is the matrix of all the factors we include where all the first column is 1, β_n is a vector with dimensions (n+1)x1 and contains the factor's betas with the first row to be the intercept α, and e_n is the vector of the error elements.

The second step which addresses the premiums of the exposure to each of the factors used, is again a series of cross sectional regressions equal to the number of the months we include.

$$r_{i,t} = a_t + \beta_{MKT\ i}\gamma_{MKT\ \iota,t} + \beta_{BM\ i}\gamma_{BM\ i,t} + \beta_{CP\ i}\gamma_{CP\ i,t} + e_{i,t} \qquad (4)$$

Or otherwise in a more simplified form:

$$r_n = \hat{\beta}\ \gamma_n$$

In this case r_n is the vector nX1 which contains the average portfolio returns, $\hat{\beta}$ is the vector with factor betas with dimensions nX(n+1) and the first column equal to 1, and the γ_n is of course the vector of the exposures to the factors with dimensions (n+1)X1 with the first row filled in with the intercept coefficients.

In the case of the decile portfolios, we are checking also for one more factor besides the three already mentioned above. It is have been supported that liquidity pricing is strongly related to factor that is connected to the size of firms. Fama and French (1992) introduced this kind of factor simply as the the size factor or SMB (small minus big)

The difference of "small" and "big" is associated to the difference between portfolios of small stocks and portfolios of big stocks with the same ratios of book-to-market.

As a size factor we are using the SMB factor which corresponds to the European markets as it is constructed in the Kenneth's French website. The index we are using is a representative index of European markets after all.

We are running two different models that include the size factor in order see if there is difference in the explanatory power of the specific variable and also of the model. In the first case we add to the equation (4) one more additional factor of size (SMB), turning the model to a four factor equation of market size (MKT), size(SMB), book-to-market (BM) and cash flow-to-price (CP), as it is presented in equation (5)

$$r_{i,t} = a + \beta_{MKT}MKT_{\iota,t} + \beta_{SMB}SMB_{i,t} + \beta_{BM}BM_{i,t} + \beta_{CP}CP_{i,t} + e_{i,t} \qquad (5)$$

Our regression models include one more case, where we replace the market size factor with the size factor as it is introduced from the Fama and French framework.

$$r_{i,t} = a + \beta_{SMB}SMB_{i,t} + \beta_{BM}BM_{i,t} + \beta_{CP}CP_{i,t} + e_{i,t} \qquad (6)$$

For evaluating the statistical performance, for starters the importance of each model is assessed based on the R^2 and the adjusted R^2, but we also check other factors and parameters of the estimation such the significance and the t-statistics. Of course Fama-MacBeth is not the only methodology for estimating multifactor models. Instead of having a panel data approach like ours, we could choose to use OLS estimations, that are seemed more traditional and for asset pricing models. Our approach is more consistent with panel data rather than OLS for the reason that we do not add the factors directly to the cross sectional stage.

4. Descriptive Statistics of variables.

It would be really unrealistic to assume that our variables, excess return, share turnover, market size, book-to-market and cash flow-to price are related linearly.

It is common in large datasets the existence of outliers which because of the very high values can influence a lot the regression results. For that reason we apply a normalization of the variables by applying logs in share turnover with use of logarithms. Applying logarithmic transformation helps also in eliminating heteroskedasticity in the regressions. (Appendix 1.)

As it is shown in Table 2. by applying logs in share turnover we get prices of Skewness and Excess Kurtosis closer of the ones of normal distribution. Same happens for the rest of the factors market size, book to market and cash flow-to-price ratio, the logarithmic transformation gives prices of skewness and excess kurtosis closer to zero.

Table 2. Logarithmic transformation of variables

Variables	Skewness		Excess Kurtosis	
	with LN	without LN	with LN	without LN
Share Turnover	1,75	18,77	2,23	430,48
Market Size	-	-0,75	-	0,77
Book-to-Market	-	-0,32	-	2,79
Cash Flow-to-Price	-	-0,49	-	0,59

In Appendix 1. There is also a plot illustration (Figure 1 & 2) of the difference in distribution before and after logarithmic transformation for share turnover. For that reason is also interesting to see the difference in the regression result between the two models of normalized and not normalized variables.

Table 3. Shows the Summary statistics for each variable we are using in the regressions. The positive kurtosis for share turnover indicates a “peaked” distribution compared to how a normal distribution kurtosis looks like. The standard deviation is the greatest for the share turnover, indicating that the variation from the mean is relatively greater compared to the other variables, and specially compared with the Log(share turnover).

Table 3. Summary statistics for the whole sample

Variable	Mean	Median	Max	Min	St. dev.	Skewness	Kurtosis
Excess return	0,01	0,00	1,66	-0,71	0,10	0,53	10,29
Share Turnover	0,01	0,00	2,85	0,00	0,10	18,77	430,48
Market Size	0,34	1,10	9,43	-12,72	4,11	-0,75	0,77
Book-to-market	0,45	1,11	23,64	-22,61	6,03	-0,32	2,79

Cash Flow-to-Price	0,56	1,08	14,02	-16,82	5,43	-0,48	0,59
SMB	-0,20	-0,28	12,91	-21,52	4,62	-0,31	3,36
Log(Share Turnover)	-8,28	-9,06	1,05	-14,47	3,18	1,75	2,23

Even though that the extra factors (Market Size, Book-to-Market, Cash-Flow to Price) we are using are obtained from Kenneth's French website and not from raw data, we include them in the summary statistics table as part of our models and variables that we are using. The negative skew of these variables is indicating their distribution is higher than normal, in a normal distribution the skew is equal to zero. This is also proved by the fact that the mean is lower than the median. While for the rest of the variables, where there is positive skew (asymmetrical distribution lower than the normal one) with their means to be higher from the medians.

4.2. Decile Portfolios.

Besides the regression results there is an interest in identifying and presenting what is the relation to turnover when it comes to decile porfolios. Therefore we have created 10 different portfolios of stocks which are rebalanced every month. The 1st decile contains the 10% most liquid stocks based on share turnover, while the 10th decile contains the 10% least liquid stocks. The portfolios are equally weighted and rebalanced every month. Figure 3 in Appendix 2. Shows these decile portfolios' return, which is not increasing or decreasing steadily. According to Amihud -Mendelson and also Shing-yang Hu (1997) the premiums in returns should be depicted such as a concave function of the turnover. In our case this is not so clear, although we see that the turnover increases until the 9th decile and then decreases.

Table 4. Deciles on Share Turnover.

	High	2	3	4	5	6	7	8	9	Low
Mean	-0,077	-0,082	-0,081	-0,075	-0,110	-0,134	-0,108	-0,088	-0,091	-0,060
Median	0,018	0,019	0,019	0,016	0,011	0,002	0,020	0,022	0,016	0,011
Max	4,996	9,143	7,709	8,088	13,000	10,244	9,366	13,878	14,932	7,341
Min	-0,590	-0,882	-1,008	-0,794	-0,753	-0,858	-0,895	-0,810	-0,953	-0,567
St. dev.	0,684	1,002	1,017	1,038	1,402	1,250	1,121	1,616	1,813	0,983
Skewness	4,705	6,565	5,296	5,494	7,236	6,186	5,890	6,779	7,022	5,435
Kurtosis	25,772	52,731	32,202	34,385	59,084	41,828	40,595	49,953	51,444	32,429

Note. For all the 10 portfolios, the portfolio formation months are in between 05/02-12/12. At the end of each month all FTSE100 firms are allocated to ten portfolios base on their decile breakpoints formed from sorts on share turnover

Table 4. Above summarizes the descriptive statistics for the decile portfolios on share turnover. The mean even for the least liquid portfolio is negative, standard deviation from is low which is really favorable for the regressions and the same counts for skew magnitude across all the portfolios, the more liquid and the less liquid ones. Kurtosis

though shows really high numbers indicating a peaked distribution around the mean compared to the normal distribution.

In the Appendix we also include a small number of graphs that are showing some characteristics of these decile portfolios. For instance Figure 4 of appendix 2 shows exactly how the least liquid portfolios outperform the more liquid ones, this difference in performance is interpreted as a liquidity premium for the less liquid stocks. The difference in performance between the two accrual portfolios of liquidity, d1 and d2, becomes more observable end of 2009 and after. It is easily understandable why this could be linked to the financial crisis. Liquidity risk was one of the most main factors which collapsed the system, since the immediate demand for cash from creditors in the banking system also influenced the non-financial business need for liquidity.

5. Regression Results.

The Null hypothesis that is supporting our methodology and model can be expressed as:

Ho: Liquidity premium is not priced in excess return in the London Stock Exchange, by using share turnover as a proxy

And relatively to the factors we are using:

H1: There is no link of share turnover liquidity premium with Market size, book-to-market and cash flow-to-price ratio.

H2: The liquidity pricing is not linked to size factor (Small minus Big).

The above null hypothesis summarizes our goal throughout the estimation and the methodology we are following.

5.1. Regression results on stock returns.

The results that are reported below are part of the second step of regression, of the cross sectional regression using as an input the share turnover beta we obtained from the time series regressions. There two models, one and two, which correspond additionally to the already mentioned equations (1) and (2).

At first sight of our estimation results we cannot reject the null hypothesis we set earlier. Taking in consideration the R^2 and the R^2 adjusted for the explanatory power of the models. There are no levels of R squared or R squared adjusted that are pointing any difference or making one of the models better. Table 5 summarizes the R squared and adjusted R squared for the whole sample and also the average for each of the years from 2002 to 2012. The greatest in magnitude of R squared is only 9.4%

However the R squared and R squared adjusted are not the only ones that matter. Table 6 and 7 below is summarizing the statistics for our coefficients of Share Turnover and Intercept. Looking at the annual average of each of these variables, at first sight there are p-values with results marginally significant in 20% level for both the share turnover and intercept coefficients. For a clear picture of the models it is provided in the appendix additional table of the variables and their statistics in monthly basis. While on average for each of the years we do not distinguish significant estimates, the monthly estimates show significance levels in 5%, 11% and also 20%.

Table 5. Model Fitting

Year	Average	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
R^2												
Model 1 (no LN)	0,078	0,076	0,079	0,071	0,046	0,039	0,082	0,013	0,012	0,064	0,091	0,067
Model 1 (with LN)	0,012	0,018	0,066	0,093	0,064	0,051	0,058	0,010	0,023	0,018	0,089	0,021
Model 2 (no LN)	0,064	0,061	0,041	0,071	0,039	0,027	0,071	0,094	0,010	0,046	0,085	0,063
Model 2 (with LN)	0,013	0,018	0,073	0,081	0,057	0,048	0,053	0,013	0,026	0,023	0,011	0,027
R^2 adjusted												
Model 1 (no LN)	0,011	0,008	0,012	0,003	0,022	0,029	0,014	0,059	0,050	0,003	0,024	0,004
Model 1 (with LN)	0,039	0,097	0,014	0,013	0,016	0,029	0,022	0,024	0,015	0,096	0,009	0,014
Model 2 (no LN)	0,004	0,007	0,027	0,003	0,028	0,040	0,004	0,027	0,034	0,021	0,018	0,005
Model 2 (with LN)	0,055	0,010	0,008	0,001	0,023	0,032	0,028	0,052	0,018	0,015	0,032	0,019

The significance of share turnover beta is almost equal in both of models 1, of ''with LN" and "without LN". Only 5% of the all the beta coefficients seem to be significant in 5% level. In model 2 the results a little bit more optimistic, model 2 "with LN" shows 11% of the beta coefficients to be significant. Still this percentage is not enough to influence the average p-value when we calculate annually the probabilities in the table below.

The intercept on the other hand shows more not only more significant results but greater coefficients. For model 1 we have on average for both cases "with LN" and "without LN" 65% of our p-values to be significant in 5% level. Same counts for the second model's intercepts.

We also cannot find a lot of elements that would support the view that significant results are associated with negative or positive coefficients. The reasons why exactly, even though we are using 4 different models with different approaches around turnover, our results are not the expected will be discussed later in the discussion section.

Table 6. Model 1: Fama-MacBeth Regression results on stocks for each year.					
		without LN		with LN	
Year	Average Statistics	Share Turnover	Intercept	Share Turnover	Intercept
Average	coef.	0,00021	0,00833	-0,00612	0,00883
	t-stat	0,27176	1,57984	-0,18042	1,23417
2002	Beta	-0,000478	0,00910	0,00978	0,00886
	t-stat	-0,50097	2,02848	0,15396	0,50831
2003	Beta	0,00029	0,00637	-0,01505	0,00817
	t-stat	0,33639	0,05398	-0,41304	0,18697
2004	Beta	0,00001	0,00815	-0,01199	0,00960
	t-stat	-0,04827	1,76451	-0,35826	1,76297
2005	Beta	-0,00002	0,00898	-0,00376	0,00911
	t-stat	0,01712	2,44832	-0,11788	1,33746
2006	Beta	0,00015	0,01220	-0,00978	0,01367
	t-stat	0,19819	2,55533	-0,35556	2,34447
2007	Beta	0,00049	0,00641	-0,00315	0,00728
	t-stat	0,66842	1,40285	-0,14959	1,32925
2008	Beta	-0,0001	-0,00634	-0,01550	-0,00483
	t-stat	-0,02913	0,12742	-0,20526	0,27431
2009	Beta	0,000052	0,02435	-0,00896	0,02519
	t-stat	0,53806	1,54573	-0,31236	1,35483
2010	Beta	0,00048	0,00874	0,00211	0,00684
	t-stat	0,68473	1,30849	-0,07791	0,73857
2011	Beta	0,00068	0,00456	-0,01425	0,00447
	t-stat	0,87553	2,06388	-0,30608	1,63462
2012	Beta	-0,00004	0,00936	0,00856	0,00873
	t-stat	-0,00827	2,22883	0,26879	1,86220

Therefore we cannot reject the null hypothesis Ho for neither of the models applied, which states that there is not a liquidity pricing in excess return when we use share turnover as liquidity proxy. Using stocks and not portfolios lead us for both models, as it is presented in Tables 6 and 7, we are led to non-significant results in majority with great p-values. Also the t-stats are relatively small, below one in most of the cases, and easily we could describe them as randomly signed positively and negatively.

Table 7. Model 2: Fama-MacBeth Regression results for each year.					
		without LN		with LN	
Year	Average Statistics	Share Turnover	Intercept	Share Turnover	Intercept
Avrg.	coef.	-0,00114	0,00840	-0,00609	0,00877
	t-stat	0,3204	1,29610	0,11462	1,30350
	p-value	0,43156	0,12079	0,43483	0,10673
2002	Beta	-0,00291	0,00894	0,00909	0,00899

	t-stat	-0,3736	0,6246	0,11462	1,66955
2003	Beta	0,000168	0,00646	-0,01793	0,00823
	t-stat	0,2806	-0,3695	-0,43951	0,19607
2004	Beta	0,00070	0,0081	-0,01041	0,00939
	t-stat	0,0943	1,7607	-0,00350	0,01276
2005	Beta	0,000045	0,0089	-0,00180	0,00895
	t-stat	0,1005	1,4962	-0,00366	0,00792
2006	Beta	0,000144	0,0122	-0,00585	0,01332
	t-stat	0,3123	1,6999	-0,20755	2,29066
2007	Beta	0,000301	0,0066	-0,00256	0,00721
	t-stat	0,5802	1,4285	-0,11048	1,32167
2008	Beta	-0,000092	-0,0063	-0,02607	-0,00426
	t-stat	-0,1353	0,1241	-0,32979	0,30604
2009	Beta	0,000284	0,0245	0,00153	0,02441
	t-stat	0,4028	1,5626	-0,17060	1,30700
2010	Beta	0,000257	0,0089	0,00427	0,00671
	t-stat	0,5433	1,3480	-0,04947	0,76117
2011	Beta	0,000418	0,0048	-0,02183	0,00485
	t-stat	0,7751	2,1107	-0,46703	1,69030
2012	Beta	-0,000114	0,0094	0,00960	0,00874
	t-stat	-0,1845	2,2474	3,2166	1,89966

5.2. Regression results on portfolios.

In the case of the regressions on decile portfolios, the estimates are keeping up more with the already existing literature in terms of share turnover as a proxy of liquidity and the existence of liquidity premium in the market. It is also important that in order to limit heteroskadasticity in our test, given that heteroskadasticity is a characteristic of cross sectional regressions. For that reason Heteroskedasticity Autocorrelation Consistent estimators for standard errors and Covariance have been applied. More particularly, Newey and West is chosen, while for the weights Bartlett kernel function is used.

As it is also depicted in table 8 below, the coefficient of determination, R^2, in this case ranges from very low even negative -45% to extremely high numbers of 95% for 2012.

In general terms the most of the R^2 estimates are showing a goof fit of the model annually from 05/2002 to 12/2012. Same counts for R^2 adjusted which gives lowest estimates of 3% and greatest 96%.

The significance of the coefficient matches in almost all the cases the high prices of fitting of the model (R^2). More particularly, the low R^2 prices are associated with non-significant coefficients for all the factors and the intercept. In almost all of these cases of non-significant coefficients there are there is negative sign for the factors and positive for the intercepts. Moreover there is only one case, where intercept and factors have the same sign in their coefficients.

While for the well fitted models with high R^2, we have positive and significant coefficients for the factors and negative for the intercept. The variable that presents the less significant coefficients is the intercept, a fact that makes enhances the explanatory power of the factors.

Table 8. Regression results on portfolios of model: $r_{i,t} = a_t + \beta_{MKT\,i}\gamma_{MKT\,\iota,t} + \beta_{BM\,i}\gamma_{BM\,i,t} + \beta_{CP\,i}\gamma_{CP\,i,t} + e_{i,t}$

	2002-2012	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
R2	0,789	0,030	0,760	0,185	0,363	0,760	0,713	0,197	0,296	0,767	0,860	0,967
R2 Adjusted	0,684	0,455	0,640	0,222	0,044	0,641	0,570	0,205	0,057	0,651	0,789	0,951
Intercept	0,033	-0,003	0,008	0,016	0,003	0,017	0,001	0,009	0,005	-0,291	-0,287	-0,204**
t-stat	0,791	-0,098	1,025	2,535	0,349	0,772	0,347	-1,235	0,735	-0,982	-0,956	-3,591
$\gamma_{MKT\,t}$	1,689*	-0,291	2,314	0,186	-2,213	-1,896*	-0,936**	4,172	-1,066	3,975*	2,237*	1,986**
t-stat	2,860	-0,144	2,269	0,205	-1,277	-2,915	-5,857	1,091	-2,166	3,142	2,874	5,722
$\gamma_{BM\,t}$	-0,273	-0,128	2,358	0,610	-2,096	-2,312*	-0,598*	4,473	-1,919	4,732*	2,610**	2,980**
t-stat	-0,049	-0,454	2,394	0,892	-1,320	-2,793	-3,163	1,874	-1,426	2,805	3,611	9,137
$\gamma_{CP\,t}$	1,437	-0,288	0,621	1,043	-1,258	-3,184**	-1,269**	4,352	-0,689	4,830*	2,557*	3,091**
t-stat	0,505	-0,232	0,303	0,750	-0,754	-4,526	-4,503	0,890	-0,741	3,008	2,883	1,133

Note. * denotes significant p- value 0.01 to 0.05, **Very significant p-value < 0.01

Taking in consideration the R^2 and the significance of the coefficients we can easily reject the null hypothesis H_o and H1. This means that our model proves that there is a liquidity pricing in the relation of excess returns and share turnover ratio. Moreover the interaction of share turnover with the factors of Market Size, Book to Market ratio and Cash Flow to Price ratio is significant, liquidity information are incorporated into these factors. The year or 2012 is significant for the all the coefficients with negative intercept and positive coefficient for the factors. However the signs of the factors are not stable throughout the significant estimates. Normally we would be expecting the coefficient of the cash flow-to-market factor to have positive sign, because of the also positive relation between return and firms with high cash flow-to price ratios. However the significant estimates are both positive and negative.

From the perspective of t-statistics our numbers are favorable in rejecting the null hypothesis. The t-stats of the average slopes for each of the factors used are in majority a greater than one and positive, achieving in this way to support the conclusion that there is statistically link between the share turnover portfolios and each of these explanatory factors.

Looking at the overall sample of the monthly regressions of return in 2002-2012 there is the proof that Market size matters more in explaining the excess returns compared to the other two factors. The Market size coefficient (slope) is equal to 1.68, significant, with a t-statistic of 2.86. Market's size slope is statistically superior from the book-to-market's slope, which gives an insignificant coefficient from p-values perspective and also a relatively low t-statistic of -0.04. The same counts for the Cash Flow-to Price slope which even though that present a positive t-statistic, is not that great to be considered important and also is not considered significant from p-value's point of view.

Table 9.Estimates on Portfolio Regression model $r_{i,t} = a + \beta_{MKT} MKT_{\iota,t} + \beta_{SMB} SMB_{i,t} + \beta_{BM} BM_{i,t} + \beta_{CP} CP_{i,t} + e_{i,t}$

	2002-2012	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
R2	0,921	0,254	0,764	0,319	0,363	0,848	0,715	0,397	0,405	0,872	0,862	0,968
R2 Adjusted	0,857	-0,343	0,576	-0,227	-0,146	0,727	0,488	-0,085	-0,072	0,770	0,751	0,942
Intercept	0,100*	0,009	0,008	0,037	0,004	0,021	0,001	-0,017	0,012	-0,028	-0,191	-0,192*
t-stat	2,779	0,734	0,878	1,187	0,268	0,860	0,571	-1,384	1,369	-0,101	-0,436	-3,381
γMKT t	-0,334	3,515	2,654	1,310	-2,229	-1,641	-0,940*	6,983	-1,910	0,897	2,292	1,813
t-stat	-0,469	1,579	2,270	0,807	-1,126	-3,633	-4,588	2,140	-2,072	0,599	2,626	2,631
γSMB t	-0,986**	-2,110	-0,600	-1,333	0,283	0,551	0,225	0,006	-0,801	-2,413*	-0,637	-0,131
t-stat	-4,262	-1,966	-1,725	-0,617	0,425	1,931	1,011	0,012	-0,749	-5,403	-0,410	-0,485
γBM t	-1,226	7,403	2,657	-0,422	-2,099	-1,634	-0,554	8,911	-1,519	-0,598	2,725*	2,755*
t-stat	-0,441	1,849	2,471	-0,406	-1,194	-1,636	-1,983	2,807	-1,423	-0,263	3,332	3,307
γCP t	-0,748	5,234	1,002	2,308	-1,268	-2,293	-1,237*	6,851	-3,181	-0,126	2,478	2,890*
t-stat	-0,416	1,813	0,530	1,222	-0,679	-3,194	-3,795	1,714	-1,935	-0,059	2,472	3,895

Note. * denotes significant p- value 0.01 to 0.05, **Very significant p-value < 0.01

Besides the three factors of Market size, book-to-market and cash flow-to-price, we also add one more factor which is believed to have a strong connection with liquidity. This factor we are adding is the well-known factor of size (SMB) as introduced from Fama and French (1992). It will be interesting to see how the size factor interacts with liquidity portfolios and also with the rest of the factors included in the model.

Table 9. Above shows the results of these regressions. The R^2 and R^2 adjusted estimates are more in number above 70%, supporting in that way the statistical power of this model over the initial model of table 8. The maximum R^2 reaches 96% for the year of 2012, and the smallest in magnitude 25% for the year of 2002. The high R^2 and R^2 adjusted does not always match the significance of the coefficients, for instance the high R^2 and R^2 adjusted of the year 2006 (84% and 72% additionally) do not give significant coefficients of the factors.

The size factor which is the element that makes the difference compared to the previous regressions, seems to be significant in more than one cases with coefficient of negative sign, which basically makes sense based on the negative relation of return and liquidity. Therefore we are rejecting hypothesis Ho, H1 and H2. What is also important to notice, is the fact that there is no case where all the factors have significant estimates. The year of 2012 presents significant coefficients for most of the variables with high t-statistics but not for SMB, and also when SMB has a significant coefficient with high t-statistic there is no significance for the other factors.

We also try to replicate the initial model of table 8. But with the difference that we replace the market size factor with the size factor of SMB to see if there is still the same of explanatory power. The following table below Table 10. Summarizes the estimates of these regressions.

Table 10. Estimates on Portfolio Regressions $r_{i,t} = a + \beta_{SMB}SMB_{i,t} + \beta_{BM}BM_{i,t} + \beta_{CP}CP_{i,t} + e_{i,t}$

	2002-2012	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
R2	0,916	0,208	0,689	0,318	0,271	0,834	0,603	0,300	0,270	0,501	0,798	0,968
R2 Adjusted	0,874	-0,188	0,534	-0,023	-0,093	0,750	0,404	-0,050	-0,095	0,251	0,696	0,951
Intercept	0,098*	0,007	0,004	0,037	-0,008	0,013	0,001	-0,010	0,006	-0,195	0,187	-0,189*
t-stat	3,435	0,757	0,466	1,462	-1,327	1,264	0,231	-1,031	0,642	-0,767	0,519	-3,085
γSMB t	-1,096**	-1,658	-0,824**	-1,395	0,457	0,413	-0,078	-0,089	-0,651	0,446	1,222	-0,140
t-stat	-1,060	-1,276	-3,806	-1,120	0,618	1,514	-0,383	-0,178	-0,608	1,394	0,619	-0,591
γBM t	-0,733	5,971	1,579	-0,463	-1,653	-1,952*	-0,845**	6,178	-1,412	6,469*	2,458*	2,671**
t-stat	-0,285	1,331	1,480	-0,645	-1,166	-3,610	-4,412	2,111	-0,683	2,819	2,843	6,765
γCP t	-0,446	5,010	-0,673	2,358	-0,838	-2,326	-1,416**	5,782	-0,217	6,317*	1,878**	2,826**
t-stat	-0,315	1,644	-0,301	1,763	-0,562	-3,409	-4,666	1,332	-0,150	2,991	3,788	5,881

Note. * denotes significant p- value 0.01 to 0.05, **Very significant p-value < 0.01

The results of this second model where the size factor is introduced and in this case replaces the market size factor, do not differentiate much from the results of table 9. We do have relatively same levels of R^2 and R^2 adjusted. Also the year of 2012 is again the one which presents the strongest statistically results with high t-statistics for almost all the factors but not for SMB. The size factor SMB shows significant and negative coefficients and also high negative t-statistics for the overall sample regressions. Even when the estimates are not significant, are still negative in majority for the SMB coefficient.

5.3. Robustness.

Fama-MacBeth methodology constitutes a really unique case among the different asset pricing methodologies of the existing literature. The reason is because gives more accurate estimates and standard errors than other regression methods such as OLS. In our case we included in our regressions Newey-West tests, which allows us to get adjusted standards errors. Even though that Fama-MacBeth is proved to give accurate estimates, we wanted to be sure for the quality of the regressions and that is why we include the Newey-west Standard Errors which was initially used for calculating the residual's correlation.

In the case of the overall sample in the portfolios, the standard error estimated by the Newey-West is equal to 0.026 the series of regressions in portfolios (equation Table 8.) Also the autocorrelation among the residuals varies -0.004 to maximum 0.211 with average 0.051 There is no need for us to apply alternative approached such as Roger standard errors (White test), for the reason that according to Petersen (2005) when there are no lags these two methods give the same results.

When the size factor is included in the model (Table 9.) the standard error is decreased to 0.018, also the autocorrelation's variation is decreased, 0.00 to maximum price 0.08. Finally for the case where we replace the market size factor with the size factor we get slightly but still lower standard error 0.016 and the autocorrelation of standards errors shows maximum price 0.06.

6. Conclusion.

The existing literature about liquidity pricing follows lots of different methodologies and also uses as well different approaches for measuring liquidity. One of the most trustworthy proxies that has been is share turnover ratio. Through our research we tried to address the liquidity premium for less liquid stocks of the FTSE100 index. We apply the two step approach of Fama-MacBeth methodology both to individual stocks and decile portfolios formed on share turnover. The results between these two cases differ not only in estimates but also in significance and general outcome.

In the case of individual stocks, the constituent stocks of FTSE100 index has been used in 4 different models of share turnover and also share turnover and other factors. There has not been any significant result that can be signing the pricing of a liquidity premium and the negative relation between return and turnover even for the less liquid individual stocks, not even when we tried to normalize the models and clear from outliers. The standard errors of the models have been really big in magnitude and the signs of the coefficients were more random than following a specific pattern. One of the reason why failed to show the relation we were expecting can be possibly exactly because we applied this approach on individual stocks and not portfolios as the Fama McBeth methodology has initially introduced.

For that reason we were also interested to see if using share turnover decile portfolios will give some more trustworthy results that match the already existing literature. In other words by using decile portfolios of share turnover we wanted to see if we have an efficient market where the information about liquidity seem to be incorporated in the portfolio returns, in terms that the proxy we are using for liquidity works well. We do find significant results who contribute in non-rejecting the null hypothesis set, that liquidity premium is not priced in the London Stock Exchange. Based on our results it seems that liquidity is priced by using share turnover as a measurement but even if we our using a multifactor model of share turnover portfolios with factors such as market size, book to market ratio and cash flow to price ratio to be significant.

The regressions of the decile portfolios include also two more models compared to the ones applied on individual stocks. We form two more models where the factor of size (SMB) is introduced. In the last model applied we remove the market size factor which has been included for the previous ones. The goal of this was to check is the explanatory power of the models differ when we remove the market size factor from the model.

The models where size factor (SMB) is included are statistically stronger to the previous ones, implying that size factor is indeed linked to liquidity through a negative relation with return of the portfolios.

What is common through these three models of factors applied in the decile portfolios is that through the years 2007 to 2009, when the financial crisis began in the European financial markets, there is no any strong explanatory power neither for three models, while 2012 is the year where all three of them present the highest statistical performance.

One of the reason why portfolios has been preferred so far, are the non-diversified estimation errors. In the case that the individual stocks were also giving trustworthy results we would be able to apply more tests and be more flexible in our methodologies, but unfortunately this doesn't happen neither in our case. The differences in the estimated results between portfolios and individual stocks are supporting what the already existing literature has been choosing to do the past years by preferring portfolios and not stocks.

The main message of our results is that, the results even though only in the case of portfolios are encouraging using data of UK, liquidity premium is priced through the liquidity factors, facts that are supporting the view of using share turnover as a dynamic and easily adaptable liquidity proxy

It is certain that there is much more research to be done in how to quantify liquidity using asset pricing. It is also true that liquidity has lots of different dimensions, a fact that states the need to use more than one models to measure the impact and the additional premiums on stock prices. The results from those different models of liquidity should be compared and combined, with final goal the creation of models that can predict returns.

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Appendix.

Appendix 1.

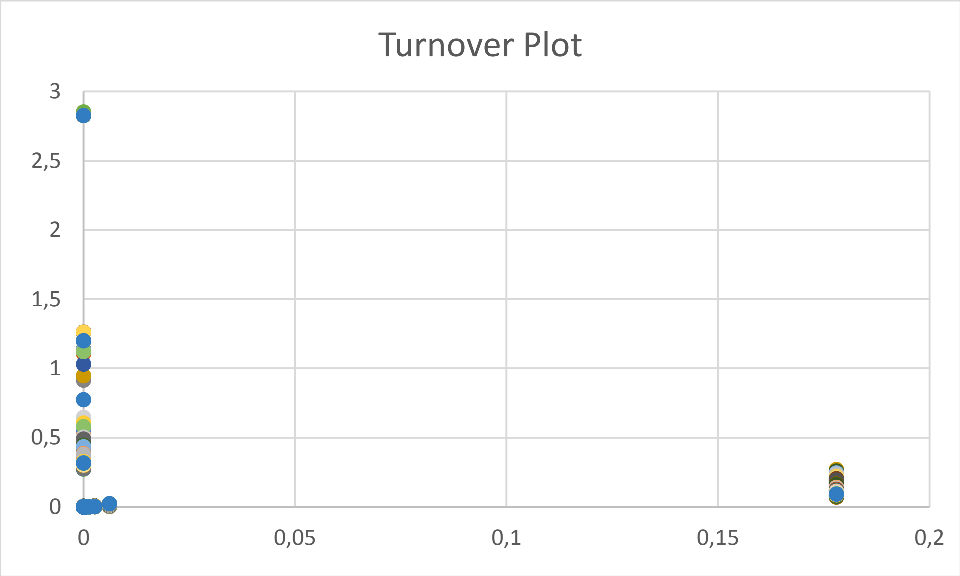

Figure 1. And Figure 2, shows the difference in distribution in share turnover plot before and after logarithmic transformation for share turnover.

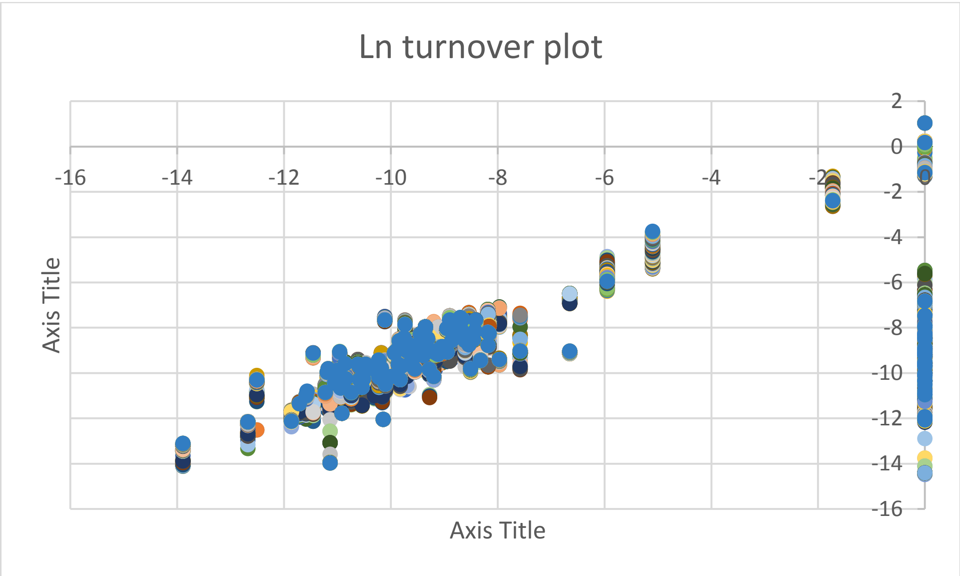

Figure 2.

Appendix 2.

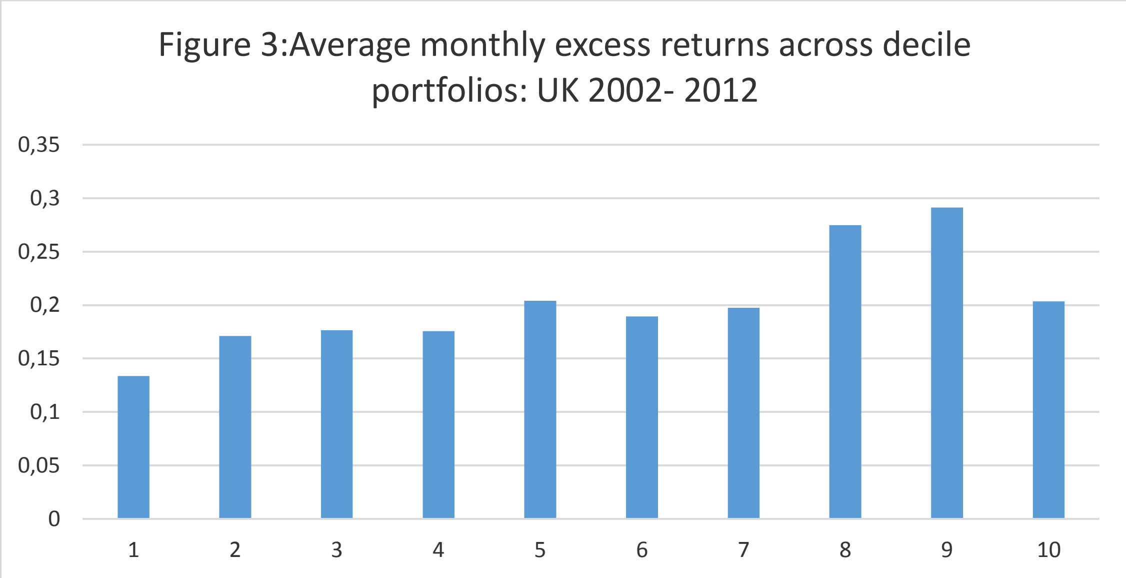

Figure 3. Shows deciles based on share turnover portfolios, which are not increasing or decreasing steadily. According to Amihud -Mendelson and also Shing-yang Hu (1997) the premiums in returns should be depicted such as a concave function of the turnover. In our case this is not so clear, although we see that the turnover increases until the 9th decile and then decreases.

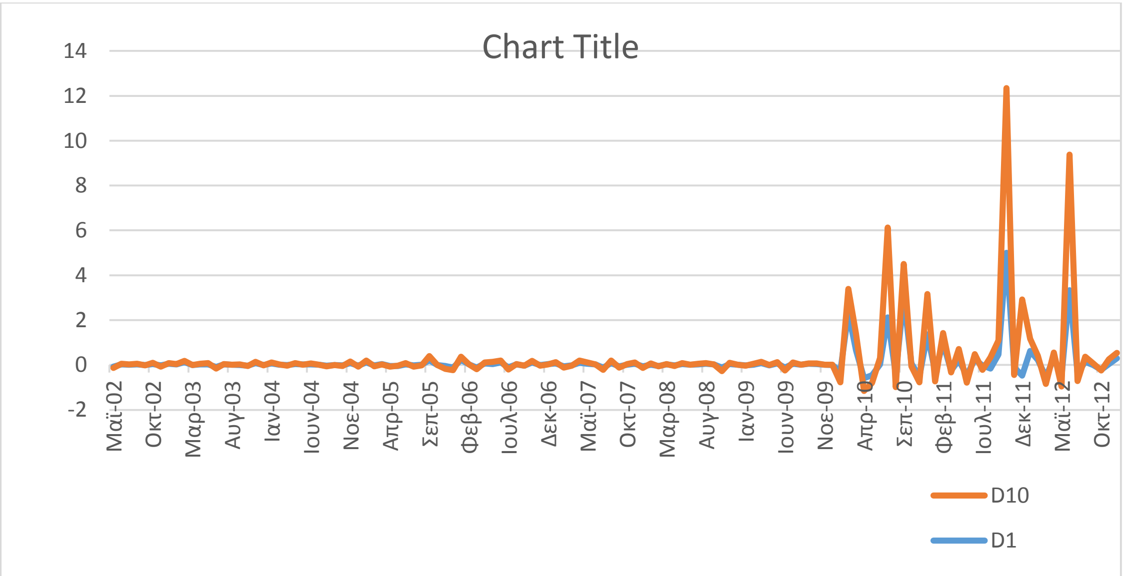

Figure 4. Share Turnover based portfolios. The first decile is the portfolio with the most liquid stocks, while D10 is the portfolio with the least liquid stocks.