STOCK MARKET LIQUIDITY COMMONALITY AND ITS DETERMINANTS

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ABSTRACT

This study investigates the existence of commonality in the liquidity of an emerging stock market that applies an order-driven trading system. Moreover, this study explores the dynamic relationship between macroeconomic variables and stock market liquidity. In addition, it examines the relation between stock liquidity and expected return. This study examines the market-wide co-movements in liquidity within the Malaysian stock exchange using a broad sample of 125 stocks covering a period of more than 16 years, which is also used in analysing the relation between macroeconomic variables and stock market liquidity. Value-weighted market liquidity variables are used in our estimation. The results show that commonality in liquidity does exist in the Malaysian stock market. To further detect existence of commonality in the Malaysian stock market, the sample is classified into three categories: large, medium, and small companies. Commonality was present within the findings of all three categories. The commonality analysed within the cross-lists, and within the market as a whole, classifies the samples under two categories, one being the cross-listed companies in both Malaysian and foreign markets, and the other identified as companies that are exclusively listed on the Malaysian stock market. To the best of our knowledge, this is the first analysis of the association between market liquidity and market variables (return, trading activity, and volatility), and macroeconomic variables (industrial production, real effective exchange rate, investment portfolio, and interest rate), in an emerging market, conducted through the VAR model. The vector autoregression analysis was first conducted between the market liquidity and market variables; and again it was conducted in one vector consisting of market liquidity and macroeconomic variables. The

sub-samples analysis have shown that the dynamic relation linking both market and macroeconomic variables to market liquidity vary throughout the whole sample period while their impacts were stronger before the Asian economic crisis in 1997. This is due to the capital control policy implemented in Malaysia after the Asian economic crisis in 1997. The relationship between stock returns and deficiency in liquidity was examined and the results show a positive significant relation between a deficient liquidity system and expected returns over 15 years. Moreover, we examined the size effect on the relation between both the liquidity apparent in big and small stock markets, and their respective returns. The results show that the effect of an illiquid market is positive and significant in each of the two sub-samples – the small and big stocks – but the coefficient of the big stock sample is significantly greater than the coefficient of the small stock sample.

ABSTRAK

Kajian ini meneliti tentang wujudnya kesamaan dalam kecairan di pasaran saham baru (yang berpotensi tinggi) yang menerapkan sistem perdagangan berteraskan pesanan (*order-driven*). Selain itu, kajian ini juga mengkaji hubungan dinamik diantara pasaran dan pembolehubah makro ekonomi dengan kecairan pasaran saham. Kajian ini juga turut mengkaji hubungan diantara kecairan saham dan pulangan yang dijangka. Ia menguji gerakan sama (*co-movement*) dalam pasaran saham dalam kecairan saham itu sendiri di bursa Malaysia dengan menggunakan sampel seluas 125 saham dalam jangka masa lebih dari 16 tahun dalam ujian kesamaan kecairan. Ia turut mengenalpasti hubungan diantara pasaran dan pembolehubah makroekonomi dengan kecairan pasaran saham. Pembolehubah nilai kecairan pasaran digunakan dalam penganggaran kami. Keputusan kajian menunjukkan bahawa kesamaan dalam kecairan memang wujud dalam pasaran saham Malaysia. Ini menunjukkan bahawa struktur dan rekabentuk pasaran memainkan peranan penting dengan adanya kesamaan dalam kecairan di pasaran berteraskan pesanan. Untuk lebih mengesan adanya kesamaan di pasaran saham Malaysia, sampel dibahagikan kepada tiga kategori: syarikat besar, sederhana, dan kecil. Kesamaan telah ditemui dalam semua kategori. Persamaan tersebut dikaji melalui senarai-senarai syarikat yang telah disuai-padankan *(cross-listed companies)* dan dalam pasaran secara keseluruhan. Sampel diklasifikasikan ke dalam dua kategori, satu adalah syarikat-syarikat yang telah disuai-padankan di Malaysia dan juga di pasaran asing. Seterusnya adalah syarikat-syarikat yang hanya disenaraikan di pasaran saham Malaysia. Berdasarkan pengetahuan kami, ini adalah kajian yang julungkalinya dijalankan tentang hubungan antara kecairan pasaran (pulangan, urus niaga saham, dan ketaktentuan pasaran), dan pembolehubah makroekonomi (industri pengeluaran, kadar pertukaran efektif, portfolio pelaburan, dan kadar faedah), dalam

pasaran baru dengan menggunakan model VAR. Analisis Autoregrasi vektor mulanya dijalankan diantara kecairan pasaran dan pembolehubah pasaran; dan ianya juga dilakukan di vektor yang terdiri daripada kecairan pasaran dan pasaran dan pembolehubah makroekonomi. Analisis daripada sub-sampel menunjukkan bahawa hubungan dinamik antara pasaran dan pembolehubah makroekonomi dan kecairan pasaran adalah berbeza-beza sepanjang tempoh persampelan dibuat, sementara kesannya lebih ketara sebelum krisis ekonomi Asia pada tahun 1997. Hal ini disebabkan oleh polisi kawalan modal yang diamalkan di Malaysia selepas krisis pasaran Asia pada tahun 1997. Hubungan antara pulangan saham dan ketidakcairan dikaji dan hasilnya menunjukkan bahawa terdapat hubungan penting positif antara ketidakcairan dan jangkaan pulangan dalam tempoh lebih dari 15 tahun. Disamping itu, kami juga menguji kesan saiz pada hubungan antara kecairan saham besar dan saham kecil dan pulangan. Keputusan menunjukkan bahawa pengaruh ketidakcairan adalah positif dan penting dalam kedua-dua sub-sample – saham kecil dan saham besar - tetapi ko-efisien terhadap saham yang lebih besar adalah lebih kuat berbanding saham yang kecil.

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Mohammed H. M. Abuzaid

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PQSPR	Proportional Quoted Spread
AMIHUD	Amihud illiquidity measure
AMI	Amivest liquidity ratio
TNV	share turnover ratio
VL	market volatility
RET	market return
IRF	Impulse Response Functions
VD	Variance Decomposition
IP	Industrial Production
REXR	Real Effective Exchange Rate
INP	Investment Portfolio
IR	Interest Rate
ADF	Augmented Dickey-Fuller
PP	Phillips-Perron
SDRET	standard deviation of the return
DIVYLD	Dividend Yield
B/M	The effect of book to market
ILIQ	The illiquidity measure
SDRET	The standard deviation of the
KLSE	Kuala Lumpur Stock Exchange
$NOSH_{it}$	The number of the outstanding shares for stock *i* in day *t*.
VOL_{it}	The volume of stock *i* in day *t*

CHAPTER ONE

INTODUCTION

1.1 Introduction

The market microstructure literature shows that many studies have been executed concerning the role of liquidity in the individual securities pricing process. Currently, a modern aspect in research studies suggests that liquidity is not just a characteristic of a sole asset, because commonality in liquidity has also been found in the U.S. stock market (Chordia, Roll, & Subrahmanyam, 2000; Hasbrouck & Seppi, 2001; Huberman & Halka, 2001).

A pertinent question that has arisen due to commonality in liquidity is whether shocks in liquidity are sources of undiversifiable risk. The significance of this problem arises from the assertion that, despite its influence on the risk of any security, liquidity is not a factor of risk if it is specific and therefore diversifiable at the portfolio level. The evidence provided by Acharya and Pedersen (2005), Eckbo and Norli (2002), Pastor and Stambaugh (2003) suggests that a variation in aggregate liquidity must be taken into account while expressing the cross-section of stock returns. The variation also explains the time-series of aggregate returns (Amihud, 2002; Bekaert, Harvey, & Lundblad, 2007; Jones, 2002) and the pricing of liquidity risk in the U.S. market (Acharya & Pedersen, 2005; Pastor & Stambaugh, 2003; Sadka, 2006).

Previous research on liquidity determinants has largely been limited in the cross-sectional studies of Benston, and Hagerman, (1974), Stoll, (1978), and Tinic, and West, (1972) founded on inventory and asymmetric information models. The earlier studies suggest that liquidity is influenced by factors that influence the inventory risks handled by market-makers who must manage sub-optimally diversified portfolios to supply the service of immediacy. The latter suggests that liquidity costs occur because market-makers demand compensation for the risk of investing against informed investors.

Recently, the market microstructure literature has started to show concern about the influence of macroeconomic fundamentals on the liquidity of the stock market. Chordia et al., (2001), and Eisfeldt, (2004) pointed out the lack of theoretical models that investigate the association between liquidity and macroeconomics. They claimed that interest rates affect liquidity in the inventory paradigm. To be specific, their study showed that liquidity is reduced when there is an increase in the perceived risk of holding inventory, which might happen as a result of the increase in default spreads. In addition, Eisfeldt (2004) built a model to theorize the correlation between changes in liquidity with real fundamentals, such as investments and productivity. While Massa and the Centre for Economic Policy (2004) observed that a positive association exists between liquidity and fund flows. Moreover, the theoretical model of the "flight-to-quality" ("flight-to-liquidity") in Vayanos (2004), and other empirical studies (Chordia, Sarkar, & Subrahmanyam, 2005; Fujimoto, 2004; Goyenko, & Ukhov, 2009; Hameed, Kang, & Viswanathan, 2010) documented how macroeconomic conditions forecast stock market liquidity.

Unlike the intensive studies on liquidity in the U.S. market, the liquidity has not received adequate consideration in emerging markets; only a few theoretical models in the

market microstructure theory study the dynamics of liquidity on order driven markets. Therefore, our understanding of what causes the liquidity time-varying in emerging markets and driven markets is still limited. The gap in the literature is especially evident for the dynamics of liquidity during long periods, as the common studies in market microstructure normally deal with liquidity dynamics in the transaction-level.

Hence, this study attempts to explore the presence of the commonality of the liquidity in the Malaysian stock exchange market as one of the emerging markets, which operate an order-driven market structure without market-makers. It attempts to extend the literature in this stream by examining if there is commonality of liquidity between the cross-listed stocks in the Malaysian stock market. This study also tries to explore the sources of the market liquidity by examining the intertemporal relation between the market and macroeconomic variables, on one side, and the market liquidity, on the other. The researcher will also study the relationship between return and liquidity. This chapter contains the introduction of this study as well as the justifications and significance of the study, the statement of the problem, the aims of the study and the organization of the thesis.

1.2 Justification for the study

Liquidity is a significant determinant of market behaviour, (O'Hara, 1997), as the knowledge of factors that cause the liquidity will lead to improvements in market organization, regulation and investment management (Chordia et al., 2001). In addition, liquidity is one of the factors that influence asset returns, therefore, a good understanding of liquidity and what causes it could help in explaining both individual and aggregate stock returns (Goyenko, & Ukhov, 2009). Moreover, some of the most famous financial crises in

the past have been related to a market-wide liquidity drop, therefore, understanding liquidity is useful for many, including investors, policymakers, and regulators.

Liquidity is considered as one of the factors contributing to market efficiency, since market efficiency will happen when the price of the stock quickly reflects the new information and the market needs the liquidity to process this information fast in the price (Scott, 1999). Understanding liquidity will lead to improved efficiency in the allocation of corporate resources, and enhance the investors' ability in financial markets (Chordia et al., 2001), thereby helping investors to develop trading strategies (Goyenko, & Ukhov, 2009). Investigating how liquidity risk influences asset pricing in emerging markets is especially relevant, as liquidity, or the lack thereof, is a far greater concern for investors in emerging markets than for developed markets. This point was illustrated through a survey conducted by Chuhan (1994), which showed that illiquidity is among the biggest obstacles to foreign investment in emerging markets. Since investors in illiquid markets are more concerned with liquidity than the investors in liquid ones, the effect of liquidity for emerging markets deserves greater attention than that for developed markets (Bekaert et al., 2007).

A few reasons might show the importance of the commonality in liquidity in the stock market and in the cross-listed stocks. First, as liquidity is one of the asset price factors, asset prices will have been influenced by commonality, either the local or the international stocks. Future models must consider common determinants of liquidity, and will also have to consider liquidity in the financial market regulation.

Second, commonality in liquidity is considered as significant to both regulators and central bankers. As a market risk factor that is non-diversifiable, shocks to commonality will affect market-wide, and, therefore, impact on the functioning of the

financial market. Shocks to the commonality in liquidity could even result in market collapse. Fernando (2003) documented that common liquidity shocks could affect the trust of investors concerning the market, which could drive financial crisis.

Third, for market participants, there are common factors that at least partly drive the liquidity of an individual stock; shocks to these common determinants tend to generate market-wide impact. If there is correlation between market liquidity and asset returns, the impact of the source of common liquidity might count as a systematic risk factor. Thus, a systematic liquidity premium to bear the risk will be demanded by investors holding such assets, either local or international stocks (Fujimoto, 2004).

The existence of commonality in the liquidity of the cross-listed stock may highlight a new issue of whether or not the liquidity should be priced in the international asset pricing models since it carries undiversified risk and contributes to the firms' and investors' investment decision.

Moreover, it provides a better understanding of the relation between cross-listing and liquidity, which could help the regulators and policymakers to organize and regulate the cross-listing policy and roles.

When it comes to trading systems, the major focus of past research has been on quote-driven systems, which are a common feature of developed markets. Emerging markets, however, largely use order driven systems. Brockman and Chung (2002) examined commonality and liquidity on the Stock Exchange of Hong Kong, while Fabre

and Frino (2004) did so for the Australian Stock Exchange. Although both employ order driven systems, the effects of commonality on liquidity were observed to be different for each market, primarily due to the difference in market structure. In fact, a study by Comerton-Forde and Rydge (2006) reported considerable differences in trading mechanisms, order priority rules, market transparency and tick sizes between the market microstructure of ten of the largest Asia-Pacific exchanges. In particular, Malaysia's stock market, the Kuala Lumpur Stock Exchange (KLSE), uses a unique step-function tick size system with seven tick sizes.

1.3 Statement of the Problem

1.3.1 Commonality of liquidity

There are many features of emerging markets that distinguish them from developed markets, including their low liquidity. This could be seen clearly in Chuhan's (1992) survey; illiquidity is considered as the most significant factor that encourages foreign investors to invest in emerging markets. Liquidity is considered as a major element by traders in illiquid markets compared with investors in liquid markets. Therefore, the liquidity effect is considered critical in emerging markets compared to the developed markets (Bekaert et al., 2007).

Brockman and Chung (2002), and Fabre and Frino (2004) concentrated on the order-driven market, studying the Stock Exchange of Hong Kong and the Australian Stock Exchange, respectively. However, these researches report different effects of commonality on liquidity for those markets, suggesting that market structure plays a significant role in

these differences. Fabre and Frino (2004) showed that there is no evidence to support commonality in liquidity in the Australian Stock Exchange. They explained the absence of any commonality in liquidity on the Australian Stock Exchange as being due to the lower inventory holding cost in the market, since there is no market maker. However, Brockman and Chung (2002) documented the existence of commonality in liquidity in the Stock Exchange of Hong Kong. They justify that individual stocks are directly impacted by the common determination of liquidity.

This study examines the existence of commonality in liquidity on the Stock Exchange of Kuala Lumpur (KLSE), Malaysia, which is one of the emerging makets with unique institutional features as reported in Comerton-Forde and Rydge (2006), and Chung et al. (2005). Most of the recent literature only studied developed North American and European economies.

Cross-listings positively influence the liquidity and marketability of stocks. By increasing the range of stocks available for investors (and likely lowering transaction costs), the investment alternatives and the flow of information between markets also increases due to the cross-listings. Thus, improvement in market efficiency and market expectation become a strong possibility. Fanto, and Karmel, (1997), and Mittoo, (1992) shown that financial managers cross-list to increase stock liquidity.

However, all the research studying the relation between the cross-listing and the liquidity were concerned with the individual stocks. To the best of our knowledge, there are no studies about the commonality of liquidity among the cross-listed stocks. Linnainmaa

and Rosu (2008) argued that more market orders explain more trading activity. In general, the existing liquidity supplied by limit orders is consumed by market orders, and, therefore, might lead to less liquidity for limit order markets. This leads to co-movements in individual stock liquidity, which leads us to assume that cross-listing shares could result in liquidity commonality between the cross-listed shares.

Since the cross-listed stocks are, relatively, more liquid with higher trading activity compared to non-cross-listed, this leads to a reduction in the dealer's inventory resulting in the carry cost of the dealer for the cross-listed shares to co-move together. In addition, in order-driven markets Foucault, Kadan, and Kandel, (2005) Ro, (2009), and Rosu, (2009) argued that higher trading activity decreases the cost of traders who wait to compete patient limit order. The same might be applied to the cross-listed stocks in order-driven markets since the cross-listed stocks are more liquid with higher trading activity, relatively, which reduces the costs of traders waiting for competing patient limit order resulting in the carry cost of the dealer for the cross-listed shares co-moving together.

The existence of commonality in the liquidity of the cross-listed stock may highlight a new issue of whether the liquidity should be priced in the international assets pricing models or not, since it carries undiversified risk.

Chordia et al. (2000) argued that the market events and market crises may influence the existence of common factors in liquidity . The financial crisis of East Asia in 1997 is a good case to examine the commonality of market liquidity; therefore, in this study we will examine the commonality of the liquidity during the crisis period.

1.3.2 Liquidity sources

Recent theoretical foundations, such as Eisfeldt (2004), and Taddei (2007) built and examined a model to theorize the correlation between changes in liquidity with real fundamentals, such as investments and productivity. While Massa and the Centre for Economic Policy (2004) observed that there is a positive relationship between liquidity and fund flows when the funds are less informed. Liquidity is also important in the theoretical model of the "flight-to-quality" ("flight-to-liquidity") (Vayanos, 2004).

Unlike the intensive studies on liquidity in the U.S. market, the liquidity has not received adequate consideration in emerging markets. Therefore, our understanding of what causes the liquidity time variation in emerging markets is still limited. Our understanding is even more limited concerning the liquidity dynamics over long periods, as common studies in market microstructure normally deal with liquidity dynamics at the transaction-level. However, this study attempts to explore the role of macroeconomic variables as sources of liquidity across Malaysia's stock market, as one of the emerging markets, in addition to identifying the candidates for macroeconomic liquidity sources. Before examining macroeconomic effects on liquidity, the researcher will investigate the inter-temporal relationship between aggregate liquidity and market variables (namely, market return, market return volatility and the trading activity).

Most of the research performed on the dynamics of the aggregate stock market liquidity across periods of time was done in the U.S. market. The first empirical examination of the variation in the market aggregate liquidity in the U.S. stock market was

executed by Chordia et al. (2001). Many studies were conducted in the dynamics of market liquidity on the U.S. stock market, such as Chordia et al. (2005); Fujimoto (2004) and ;Goyenko & Ukhov (2009), while others, such as Choi and Cook (2005) explored liquidity in relation to the Japanese stock market. Thus, this study contributes to the literature by investigating the aggregate market liquidity in the Malaysian stock market as one of the order-driven markets, as well as an emerging market.

Recently, market microstructure literature has started to show concern over the influence of macroeconomic fundamentals on stock market liquidity. Chordia et al. (2001) pointed out the lack of theoretical models that investigate the association between liquidity and macroeconomics. They claimed that interest rates affect liquidity in the inventory paradigm. To be specific, their study showed that the perceived risk of holding inventory might be increased when there is an increase in default spreads, and thus reduce liquidity. In addition, Eisfeldt (2004) built a model to theorize the correlation between changes in liquidity with real fundamentals, such as investments and productivity. While Massa and the Centre for Economic Policy (2004) observed that there is a positive relationship between stock market liquidity and fund flows when the funds are less informed. Notwithstanding the theoretical model of the "flight-to-quality" ("flight-to-liquidity") in Vayanos (2004), and also other empirical studies (Chordia et al., 2005; Fujimoto, 2004;Goyenko & Ukhov, 2009; Hameed et al., 2010) concerning the ability of macroeconomic conditions to forecast stock market liquidity.

To the best of the researcher's knowledge, all of the research studies attempting to examine if the macroeconomic variables could predict the market liquidity were done in the

U.S. market, except for Choi and Cook, (2005) who examined how the macroeconomic variables could predict market liquidity for the Japanese stock market. Thus, this study contributes to the literature through exploring market liquidity over long periods with the macroeconomic variables in the Malaysian stock market as one of the order-driven markets, as well as an emerging market. In this study, we use four macroeconomic variables, namely, the interest rate, industrial production, investment portfolio and real effective exchange rate. To the best of the researcher's knowledge, the exchange rate has never been studied with the market liquidity while foreign investment has been studied before in relation to market liquidity by Henry (2000), and Levine, and Zervos, (1998). However, they all use the net flow of foreign investment either to the equity market or to other investment; in this study we use the investment portfolio, because we anticipate that it has a stronger effect on the market liquidity.

1.3.3 Liquidity and stock return

A huge body of studies has proven the relationship between securities' liquidity and the expected returns of those securities. The effect of trading costs on required returns documented by Amihud, and Mendelson, (1986), (1989), Brennan et al., (1998), Brennan, & Subrahmanyam, (1996), Jacoby, Fowler, and Gottesman, (2000) showed a negative relationship between securities' liquidity and their return. More recent research by Chordia et al., (2000), Hasbrouck, and Seppi, (2001), and Huberman, and Halka, (2001) focused on the commonality in liquidity and whether liquidity represents an undiversified risk factor.

They showed that the commonality in liquidity did exist in the Stock Market of the U.S. This introduces an additional study issue that the stock liquidity should be priced as an

undiversified risk factor. Amihud (2002) conducted a cross sectional study to examine the liquidity impact on stock returns by utilizing an illiquidity proxy which relates to the Kyle (1985) price impact coefficient λ. The outcomes indicate that the stock returns were influenced positively and significantly by stock illiquidity, which is stated by the theory. Amihud (2002), who used the Fama and MacBeth (1973) method, estimated the cross sectional model to examine the relation between a few variables used as stock characteristics including stock liquidity and return; he did not include book to market ratio in his model as stock characteristic since he only used NYSE stocks for which the book to market ratio was found to have no significant effect, as documented by Easley, Hvidkjaer, and O'Hara, (2002), Loughran, (1997). However, since there is evidence that there is a significant relationship between the book-to-market ratio and return in the Malaysian stock market, as shown by Chen and Zhang, (1998), and Chui and Wei, (1998) the researcher expects a relationship between the book-to-market ratio and return in this model. Hence we include the book to market ratio in this model.

1.4 Research Questions

The problem addressed in this study could be best expressed through the following questions:

1. Does the commonality of liquidity exist in the Malaysian Stock Exchange?
2. Does the commonality of liquidity exist between the cross-listed stocks?
3. Dose the size of the stocks have an effect on the existence of commonality of liquidity?

4. Do crises in the stock market have an effect on the existence of commonality of liquidity?

5. Could the market and the macroeconomic variables predict the market-wide liquidity in the order-driven market?

6. Could liquidity predict stock return?

1.5 The aim of the study

This study aims to examine the existence of the commonality in the stock market liquidity with reference to the Malaysian stock market, which is one of the emerging markets, and operates an order-driven market structure with no market-makers. It attempts to extend the literature in this stream by examining whether there is commonality of liquidity between the cross-listed stocks on the Malaysian stock market. In addition, this research will also try to explore the sources of the market liquidity by examining the inter-temporal relation between the market and macroeconomic variables on one side with the stock market liquidity on the other. The researcher will also study the relation between return and liquidity.

The main objectives of this study could be best expressed as follows:

1. To examine if the commonality of liquidity exists in the Malaysian Stock Exchange.
2. To examine if the commonality of liquidity exists between the cross-listed stocks.
3. To investigate if the size of the stocks have an effect on the existence of commonality of liquidity.
4. To examine if the crises periods in the stock market have effect on the existence of commonality of liquidity?

5. To investigate the dynamic relationship among the market-wide liquidity and the market and macroeconomic variables in the order-driven market..
6. To examine if the liquidity could predict the stock return.

1.6 The Malaysian Stock Exchange – background

The origin of the Malaysian stock market dates back several decades, when it first appeared in the late nineteenth-century, and its emergence has been promoted for many years. However, Malaysian corporate securities only came onto the scene in the early 1960s. The development of the Malaysian stock market has been a steady evolutionary process, and one in which the government has played a catalytic role. The Malaysian stock market has been identified as one of the emerging markets among the developing countries by the International Finance Corporation. Today, it has developed into a fairly mature market, comparable with other emerging markets in the Asia-Pacific region and elsewhere. In terms of market capitalization, the Kuala Lumpur Stock Exchange (KLSE), as reported by Forde and Rydge (2006), is one of the ten largest Asia-Pacific exchanges.

The primary exchange of shares in Malaysia was recorded as early as 1870, as an extension of the British corporate existence in the tin and rubber industries. Stock broking was officially organized on 23rd June 1930 with the establishment of the Singaporean Stockbrokers Association, which changed its name to the Malaya Share Brokers Association in 1938. This Association has operated in a good way, except for the interruption during World War II. In July 1959, it was re-registered as the Malayan Stockbrokers Association. In March 1960, the association changed its name to the Malayan

Stock Exchange. Public trading of shares started on 9th May 1960 in the clearing house of the Central Bank, which provided clerical assistance and telephone facilities. In an effort to encourage public confidence in the stock market, a board was established within the Exchange in 1963 to process and determine the requirements for applications submitted for new listings. An unofficial arrangement was made among the Central Bank, the Stock Exchange and the Registrar of Companies to make public offers of shares (Ariff, Mohamad, & Nassir, 1998).

Following the formation of Malaysia in 1963, the Stock Exchange of Malaysia was founded on 6th March 1964. The functions of the Exchange were further strengthened through the implementation of new rules and bye-laws, the creation of a fidelity fund and the implementation of firmer listing requirements. Its name was consequently changed to the Stock Exchange of Malaysia and Singapore after the division of Malaysia and Singapore in 1965 (Isa, 2000).

In a related event, the Companies Act 1965 came into force to provide a more inclusive legal framework for supervising the operations of companies. The Act has provisions to force companies to give greater disclosure of relevant information in order to protect the investing public, and, thus, promote the growth of a well informed and discriminating group of investors (Ibid, 2000).

Given the new institutional and legal framework, an unofficial arrangement was set up in 1963 among the Central Bank, the Stock Exchange, and the Registrar of Companies for directing the development of the stock market. This framework was formalized in 1968

at the time of establishing the Capital Issues Committee (CIC), by the Minister of Finance in order to ensure a systematic development of the stock market (Ibid, 2000).

In May 1973, the common currency agreement between Singapore and Malaysia was terminated, and, thus, although they continued their relationship through common listings, the stock market became two separate bodies (Ibid, 2000).

A major milestone in the Malaysian securities industry was the enactment of the Securities Industry Act (SIA) in June 1973, which aimed to protect the interests of investors. This Act equipped the Government with the necessary powers to control excessive speculation, insider trading, share rigging and other forms of market manipulation. It also provided for the licensing of dealers. The Kuala Lumpur Stock Exchange Berhad was also established on 2nd July 1973, operating on provisional rules, bye-laws, listing requirements and a corporate disclosure policy. On 27th December 1976, the Securities Industry Act was fully applied, and the name of the stock exchange was changed to the Kuala Lumpur Stock Exchange (KLSE)(Ariff et al., 1998).

February 1974 saw the establishment of the Foreign Investment Committee (FIC) in the Prime Minister's Department. The main purpose of this committee is to ensure a more balanced Malaysian participation in the ownership and control of companies and businesses in line with the goals of the New Economic Policy (NEP). The FIC's main function is the regulation of the acquisition of assets or any interests, mergers or takeovers of companies and businesses, especially by foreign interests (Isa, 2000).

Since the mid-1980s, the Malaysian securities industry has undergone numerous structural and organizational reforms and developments. The efforts of the Government and the KLSE in upgrading the securities industry through regulatory formation and the use of information technology have mainly improved the infrastructure, thus, facilitating trading activities, and the information distribution mechanisms (Ariff et al., 1998).

In order to provide for a more orderly performance of the securities business in the country, a new SIA came into force in July 1983, replacing the SIA of 1973. This new Act provides for more effective supervision and control of the securities industry by regulating the operations of the investors, forbidding artificial trading and market rigging. It also empowers the Minister of Finance to modify the rules of the stock exchange. The status of the CIC was also legally formalized in this new Act (Isa, 2000).

On the regulatory front, in order to further endorse efficiency in the market, the CIC made its set of guidelines more transparent to the public through a formal announcement of its guidelines in April 1986. The guidelines stated in clear terms the CIC criteria and standard protocol for compliance by the public companies. Since then, the CIC has further clarified and strengthened the guidelines (Ariff et al., 1998).

The Malaysian Code on Takeovers and Mergers came into effect on 1 April 1987. It provides for a Panel on Takeovers and Mergers (TOP), which was established in March 1986, to ensure that all takeovers and mergers are conducted in an orderly manner, and to protect the interests of minority shareholders (Isa, 2000).

To ensure the appropriate development of the stock market, the Central Bank also introduced the Code of Ethics: Guidelines on Share Trading for compliance by commercial and merchant banks. These guidelines were designed to avoid the occurrence of a grey market and insider trading, especially by merchant bankers who, as corporate advisers or underwriters for share issues, are privy to inside financial information about specific companies. Financial institutions are expected to either adopt the Central Bank's guidelines or use their own in-house rules. With effect from March 1989, financial institutions are also required to submit quarterly reports to the Central Bank on all breaches observed during the period concerned, and any actions taken against them.

The research Institute Analysts Malaysia (RIIAM) was also established by the KLSE in May 1985. Its main purpose was to improve the level of investment analysis and research, as well as professionalism in the Malaysian securities industry. Over the years, it has organized conferences, seminars, workshops, as well as courses for trainee dealer's representatives, remisiers, and the financial community as a whole. Currently, it grants a Diploma in the Investment Analysis Programme in collaboration with the RMIT University (Isa, 2000).

In 1986, the KLSE launched its Composite Index (KLSE CI), which currently comprises 100 well-established companies listed on the KLSE. Prior to its introduction, investors could only measure the performance of the market based on the New Straits Times Industrial, and the KLSE's own Industrial Index, both of which were found to be inadequate. In November 1991, the KLSE introduced the main board all-share EMAS Index as another barometer of the stock market (Ariff et al., 1998).

The KLSE launched its Second Board on 11th November 1988 to enable those small and medium-sized companies that are viable and have strong growth potential, to tap additional capital from the market through listing on the KLSE. (Isa, 2000).

On January 1990, the Malaysian Government decided, as a matter of national policy, to delist all Malaysian incorporated companies from the Stock Exchange of Singapore (SES). A reciprocal move was made on the same day by Singapore, which led to the delisting of all their 53 companies on the KLSE (Isa, 2000).

One of the most significant developments in the securities industry was the establishment of the Securities Commission (SC) in March 1993, in order to avert problems of fragmented regulation in the capital market (Ibid, 2000).

The SC is basically an independent one-stop agency that has absorbed the operations of CIC and TOP, and has taken over certain operations previously performed by the Central Bank, Registrar of Companies, FIC and other bodies. Thus, it is a single regulatory authority that assumes a supervisory role for the capital market, regulates primary issues, provides surveillance over secondary trading of securities, as well as oversees other financial instruments, such as futures and options (Ibid, 2000).

A significant move was made to corporatize the stock broking industry, with the vision to improve its financial strength, injecting expertise and professionalism, and generating greater international interest in the Malaysian stock market. At first, Malaysian corporate ownership was limited to a maximum 60 per cent stake; however, subsequently, in 1987, this was increased to 100 per cent. Likewise, foreign corporate ownership was

primarily limited to not more than a 30 per cent, but it was later increased to 49 per cent in July 1988. In an additional move to strengthen the stock broking industry, the Minister of Finance set RM20 million as the limit for the minimum capital requirements for new stock broking companies. All existing companies had to obey this minimum limit ruling by 31st December 1991 (Isa, 2000).

In order to complement the various measures taken by the Government, the KLSE itself has implemented various changes and improvements. Among these was the execution of the first phase in November 1983 of a computerized share scrip clearing system, SCANS (The Securities Clearing Automated Network Sdn. Bhd.). The full implementation of SCANS occurred in March 1984. This was followed by the installation of a real-time share price reporting system (MASA) for brokers in 1987, with a consequent increase in share price reporting efficiency. In the same year, the Advance Warning and Surveillance Unit (AWAS) was set up in July, to alert the KLSE of stock broking houses and public listed companies that may be facing problems. Also, in July 1987, the KLSE introduced its new Listing Manual, which has an entirely new section on corporate disclosure policies and penalties (Ibid, 2000).

On 15 May 1989, the KLSE launched a semi-automated trading system SCORE (System on Computerized Order Routing and Execution) to replace the Open-Outcry trading system. The conversion of trading from the open-outcry system to an electronic system has improved the speed and volume of share transactions tremendously. SCORE was implemented in stages, starting with 30 companies. The fully automated SCORE was introduced on 19th October 1992, and by 30th November 1992 all stocks were placed under this system. Another major change to enhance the efficiency of the market was the

execution of the Fixed Delivery and Settlement System (FDSS) by the KLSE on 12th February 1990 (Isa, 2000).

On 20th November 1992, the launching of the Central Depository System (CDS) also had a significant impact on the securities industry. The CDS is essentially a system of securities trading without certificates changing hands. Instead, the ownership of shares is transferred through a book entry using a sophisticated computer system. By 15 July 1997, all securities listed on the KLSE were placed under the CDS (Ibid, 2000).

The KLSE Help Desk Online Services System was introduced to all stock broking companies on 15th January 1999. The service was introduced with the purpose of improving KLSE's communication to stock broking companies, facilitate timely dissemination of circulars, and provide a broad spectrum of information on the information technology services provided by the KLSE Group. Another system, the Message-Based Middleware System, which was fully implemented in October 1998, revolutionized the manner in which messages are sent from the central trading system and the broker frontend trading system. With its implementation, the average response time improved by more than 50% to 3 seconds or less for about 99% of transactions (Malaysia, 1999).

"On 24th April 2006, Bursa Station was launched. Bursa Station is a web-based solution which provides real time market data, news and charting functionalities. Subscribers find it a user friendly tool which offers access to real time data at an affordable price, with fundamental analytical trading tools and portfolio management capabilities. B FTSE Bursa Malaysia Index Series on 26th June 2006; the joint venture between Bursa

Malaysia and FTSE saw 6 new FTSE Bursa Malaysia indices introduced to the global capital market. FTSE Bursa Malaysia EMAS Index, FTSE Bursa Malaysia 100 Index, FTSE Bursa Malaysia Small Cap Index, FTSE Bursa Malaysia Large 30 Index, FTSE Bursa Malaysia Mid 70 Index, and FTSE Bursa Malaysia Fledgling Index. The new indices use the internationally accepted FTSE methodology which includes the establishment of index standards encompassing independent committee governance, liquidity screening, free float adjustment and the FTSE Dow Jones Industry Classification Benchmark (ICB), thereby, creating a transparent process which is easily followed by investors"(Bursa, 2006, p35).

A significant move to improve capital market efficiency and liquidity in Bursa Malaysia's market making framework for SWs and ETFs were made effective in May 2009. The formalized framework replaced previous voluntary practices, and provides for the participation of foreign-based market-makers in addition to local market-makers. Market-makers buy or sell securities at publicly quoted prices on a continuous basis in exchange for profit derived from the bid-ask price spread. At the end of 2009, a total of four market-makers registered with Bursa Malaysia Securities for SWs and another four market-makers for the two ETFs. By combining market making with a re-engineering of Bursa Malaysia's internal processes, the time-to-market for listing of SWs has been reduced from ten market days to as little as one market day (Bursa, 2009).

1.7 Thesis outline

This study consists of five chapters. The first is the introduction for this thesis; it discusses the problem statement of this study and it shows the aims of the study, the

justification of the study and the contributions of this study. The second chapter describes the theoretical background of this study and reviews the related literature, the third chapter outlines the methodology and hypotheses of this study. The fourth chapter discusses the results of the study and the fifth chapter presents the conclusions and the recommendations for future research.

1.8 Chapter Summary

This chapter highlighted the roles of commonality of stock market liquidity, especially in emerging markets. It has provided the statement of the problem, and discussed the significance of the study as well as the justification for this study. It has given the research questions and the objectives of the study and identified the gap in the existing literature on liquidity in relation to emerging markets. The next chapter will review the literature related to various aspects of liquidity, especially the differences in the role of liquidity in quote-driven and order-driven markets.

CHAPTER TWO

LITRATURE REVIEW AND THEORTICAL BACKFROUND

2.1 Introduction

By definition, market liquidity is the ability to buy or sell significant amounts of assets rapidly without substantially affecting the asset's price. In return for supplying liquidity, market-makers are given monopoly rights by the stock exchange to set different prices for sale and purchase of a security. They sell at the ask price Pa and buy at the lower bid price Pb, thus, providing liquidity (for investors, Pa is the purchase price and Pb is the sale price). The difference Pa–Pb is called the bid/ask spread, which is the main source of compensation to market-makers for supplying liquidity.

Liquidity commonality is defined as liquidity co-movements across assets or markets. In the current literature, it is measured relative to a single factor, i.e., the average liquidity across assets or markets. However, liquidity co-movements may not be fully captured by this single factor. Other factors, e.g., aggregate return and volatility, may also contribute to liquidity co-movements. This chapter reviews the related literature and the theoretical background of this study starting by discussing the commonality of liquidity as well as the commonality of liquidity between the cross-listed stocks. This chapter also discusses the literature that explains the relation between the market liquidity, on one side, with the market and macroeconomic variables, on the other. The last section in this chapter presents the literature and theoretical background behind the relationship between the stock return and liquidity.

2.2 Types of stock market

Stock markets are either order-driven or quote (price) driven. Quote driven systems are known as specialist systems as they feature a market-maker, or 'specialist', who mediates between buyers and sellers. The New York Stock Exchange (NYSE), for example, is a quote driven system. Market-makers supply liquidity, which means they are ready to buy and sell an asset at any time, regardless of the quantity of shares. The market-maker preserves a stock inventory, which creates considerable inventory risk. According to Hasbrouck (1988), the spread of these stocks depends heavily on information uncertainty. To demand liquidity, traders submit market orders that are tallied against the market-maker's bid prices and depths. Dealers are obliged to control the asset inventories to the greatest possible extent so as to ensure liquidity and fair prices. In the event of inventory maladjustments, market-makers buy or sell an asset from other dealers on the market to satisfy the needs of investors wanting to buy or sell.

Order-driven markets do not feature market-makers or dealer intermediation. Prices and amounts are set altogether. Both the supply of liquidity and the determination of the depth and bid/ask spread comes from public orders. An order book controlled by a computerized system receives all investor orders and everyone in the market can view transactions. All transactions that show signs of changes in the list of queued orders are registered by the order book. Trade occurs from transactions concluded automatically between traders, whenever orders are matched via an electronic medium in accordance with the price and timing priority criteria. The trading rules applied minimize transaction costs and allow investors to follow the market price, which is an indication of asymmetric information. No market participant is obliged to submit such orders.

Order matching occurs in two ways in order-driven systems: through continuous matching (trading) and call auctions. The continuous trading system, which is to continuously trade throughout the trading time and day, supplies immediate execution of the trade. At low liquidity, low depths and wider bid/ask depths may make immediate trade implementation costly. Call auctions feature larger intertrade periods, receiving grouped orders at preset times of the day. In call auctions, it is the intersection of the supply, demand and market clearing price curves, where all trades are executed that decide the submitted buy and sell orders.

2.3 Liquidity commonality

Commonality in liquidity indicates the effect of a market-wide or common liquidity factor on an individual stock, both in terms of bid-ask spreads, depths and other liquidity measures. Commonality in stock market liquidity has been a research interest that receives extensive investigation. As one of the earliest pioneers in the field, Chordia et al. (2000) has proven the existence of commonality in liquidity, asserting that liquidity must not be taken as the only feature of a single asset. In fact, commonality remains to be one of the most important aspects when other factors that determine liquidity, such as trading volatility, volume, and price, are considered vigilantly by researchers. While confirming that individual liquidity proxies cannot be separated, Chordia et al. (2000) found that aggregate market liquidity affects both spreads and depths significantly. In examining the size effect of commonality in liquidity, the researchers pointed out that changes in spreads do not have a significant impact on small firm spreads as compared to large firms although the latter

may have smaller average spreads. In addition, they have also shown that even though depth has shown commonality, size does not have much impact on depth.

Huberman & Halka (2001) focused on the liquidity of individual assets and warned that theories on variations in liquidity that affect stocks may not be able to generate any new insight for the new market. In examining the fluctuation of liquidity of individual stocks through autoregressive structure prediction for liquidity measures that include spread, quantity depth, spread/price ratio, and dollar depth, the researchers found a common element in the temporal variation. In addition, this variation has a negative correlation with volatility although it is positively correlated with return. However, it is found that a common element of the temporal variation is not restricted by those variables.

On the other hand, Hasbrouck and Seppi (2001) pointed out that researchers should not concentrate on examining individual stocks in isolation and overlook the basic facts about interactions between stocks. In response to this, they urged for a shift of attention to focus more on studying variations between stocks. Interestingly, through canonical correlation and principal components analyses, they did not, however, find any significant evidence of the presence of commonality. Although it is still generally believed that there is strong implication for common factors in determining stock returns and order flows in today's market, Hasbrouck and Seppi (2001) called for further research to investigate the commonality in liquidity measures due to a lack of empirical studies that can convincingly prove this.

Another commonality study using the regression model by Eckbo and Norli (2002) expanded previous work by using monthly data covering the period from 1963 to 2000 and

found similar results that were consistent with those documented by Chordia et al. (2000). In addition, using a spread cost decomposition model, Henker and Martens (2003) attempted to prove the same point as the previous researchers and argued that evidence can be found in the proportion of spread, as shown in their market selling and buying pressure analyses.

Another research that was built on the work of Chordia et al., (2000), and Hasbrouck, and Seppi, (2001) was the investigation of Coughenour, and Saad, (2004) on the presence and relative significance of supply generated liquidity co-variation. Their findings are in line with the results produced by previous researchers. More specifically, Coughenour and Saad (2004) found that both specialist portfolio liquidity and market liquidity vary in the same period with individual stock liquidity. Moreover, they argued that each measure of the spread is closely related for more than 90 per cent of the betas of the individual market liquidity.

Another key development in recent studies on the stock market commonality concentrates on the investigation of liquidity commonality in other markets besides the U.S. stock market. To illustrate this, Martinez, Nieto, Rubio, and Tapia (2005), for instance, examined the relationship between asset pricing and liquidity systematic risk in the Spanish context. Not surprisingly, the researchers successfully found important evidence to prove the existence of commonality in Spanish stock market liquidity.

Coming from another point of entry, Brockman and Chung (2002) established a comparable indicator by expanding their research sample to explore the order-driven market to examine the existence of commonality in liquidity. While acknowledging that the

difficulty to entry and exit has diversified the specialist markets, they proved that the demand and supply schedules of liquidity were generated by order-driven systems, which, in turn, achieve symmetry under certain ideal competition in the market. Also, the sum of all coefficients of liquidity in their sample is strongly noteworthy, in which Brockman and Chung (2002) further argued that both the mean of the depth coefficient and the mean of the spread coefficient in order-driven markets are smaller than the coefficients documented for the markets operating with market-makers.

Focusing on the order-driven market in the Swiss Stock Exchange (SWX), Bauer (2004) explored its commonality by employing the modelling strategy that was constructed by Hasbrouck and Seppi (2001). Using principal components analysis, Bauer (2004) commented that the common factors present in his sample elucidated the ratio of the variation in liquidity, which was found to be stronger than previous findings for quote driven markets.

Examining data from the Australian Stock Exchange (ASX) over the year 2000, Fabre and Frino (2004) reaffirmed the presence of commonality in order-driven markets using regression models and filter, as employed by Chordia et al. (2000). Quite different from the research method adopted by Chordia et al. (2000), the researchers included Z-statistics to reinforce their regression results. Understanding the fact that price improvement might be incorporated in electronic trading on the ASX, they attempted to redefine the market liquidity measures by crossing out the proportional effective spread and the effective spread, where dollar depth was utilized simultaneously to measure depth. Commonality in liquidity is found in the ASX in Fabre and Frino (2004) although it is not as strong as the findings shown in the NYSE samples. However, the results for the size

effect has not shown any new insights compared to the findings of Chordia et al. (2000) and other researchers.

Quite different from Fabre and Frino (2004), the study of Sujoto, Kalev, & Faff, (2005), found strong evidence for the existence of commonality in liquidity in a quadratic specification as well as in the up and down markets. Using new liquidity proxies (the bi-dimensional liquidity measure and the turnover rate) and other conventional liquidity measures, they concentrated on a two-year sample over the period of 2001 and 2002 in their investigation.

2.3.1 Cross-listing and liquidity commonality

By increasing the range of stocks available for investors (and likely lowering transaction costs), cross-listings positively influence the liquidity and marketability of stocks. The investment alternatives and the flow of information between markets increases. Thus, improvement in market efficiency and market expectation becomes a strong possibility. Fanto and Karmel, (1997), and Mittoo (1992) proved that financial managers are cross-listing in order to raise stock liquidity.

A number of papers present empirical evidence highlighting the positive influence of cross-listing on liquidity. Kyle (1985) presented an auction model, which establishes a relationship between liquidity and the information environment. It is based on the interaction between informed investors, (uninformed) liquidity investors and a risk-neutral market-maker. This model was studied in a multi-market context by Chowhdry and Nanda (1991), who found that more competition among market-makers in cross-listed stock meant

a lower bid-ask spread. Taking this insight together with that of Amihud and Mendelson (1986), who suggested that in order to invest in high securities liquidity, investors need a lower return, the key advantage of cross-listing is seen to be a decrease in the bid-ask spread firm, reflecting an increase in the valuation of firm. Also, the improved liquidity will likely attract additional institutional investment. Additionally, considering diversification according to the international assets pricing models of Black (1974), Solnik (1974) and Stulz, (1981), firms in security markets (which are incompletely integrated) can gain profit from lower capital costs through cross-listing stocks in other markets. Foreign investors are bound to be drawn to capital from markets that would reduce the risk of their portfolio and would pay for shares for markets that have little correlation with their own market, thus offering firms a premium. In addition, cross-listing in overseas markets allows companies to benefit from strict financial disclosure standards Sarkissian and Schill (2004) allowing a reduction in information asymmetry costs as well, which appeals greatly to managers (Fuerst, 1998; Huddart, Hughes, & Brunnermeier, 1999).

As pointed out by Chordia et al. (2000), trading activity basically exhibits market-wide inter-temporal response to general price fluctuations, and trading activity is one of the basic determinants of the inventory of the market-maker; it is likely that this variation appears to induce co-movements in the levels of optimal inventory that result in co-movements in individual stock liquidity, as well as in order-driven markets. Linnainmaa and Rosu (2008), argued that more market orders explain more trading activity. In general, the existing liquidity supplied by limit orders is consumed by market orders, and, therefore, this might lead to less liquidity for limit order markets. This leads to co-movements in individual stock liquidity, which leads me to assume that the cross-listing shares lead to liquidity co-movement between the cross-listed shares, as, generally, the cross-listing leads

to increased trading volume of the cross-listing shares (Witmer, 2005). Chordia et al. (2000) suggested that as the dealer inventory costs depend on market interest rates, the across stocks must also co-move; accordingly, the same might be applied to the cross-listed stocks since the cross-listed stocks are more liquid and the higher relative trading activity results in a decline in the dealer inventory resulting in the carry cost of the dealer for the cross-listed shares co-moving together. As for order-driven markets, Foucault et al., (2005), and Rosu, (2009) argued that higher trading activity will decrease traders' costs who are waiting to compete patient limit orders. Therefore, these traders bear having limit orders nearer to each other, which is expressed as lower price impact and smaller spreads, that is, higher liquidity; the same might be applied to the cross-listed stocks in order-driven markets since the cross-listed stocks are more liquid and relatively higher trading activity, which results in a decline in the costs of patient traders waiting to complete limit orders, resulting in the carry cost of the dealer for the cross-listed shares co-moving together.

2.4 Sources of Liquidity

Liquidity is a complicated concept and it is affected by many factors. Past studies on liquidity determinants have mainly been limited in the cross-sectional studies, such as Benston, and Hagerman, (1974), Stoll, (1978) and Tinic and West, (1972). They established their research on the inventory and asymmetric information models. They suggest that there are factors that affect liquidity and influence the risks to inventory, which are faced by market-makers who have to provide the service of immediacy by holding sub-optimally diversified portfolios. The latter suggests that the costs of liquidity increase since compensation for the risk of trading is required by market-makers against informed

investors. Thus, there are factors that could affect the market liquidity and the inventory risks of many firms simultaneously. The presence of the commonality of liquidity across sole stocks shows which fundamental economic forces and market factors are responsible for the systematic component of liquidity.

2.5 Liquidity and Market Variables

Some theoretical models in the market microstructure theory deal with the influence of the volatility, return and trading activity in the liquidity of order-driven markets. However, Rosu (2009) argued that one among several causes for the lack of order-driven markets' models due to the interaction's complexity of an enormous number of unspecified investors, while there is one or a small number of market-makers in the quote-driven markets. However, in the market microstructure theory, most of the models are derived from market-maker-based trading systems and quote-driven markets as the inventory paradigm.

O'Hara (1997) found a relationship between volatility and liquidity, that is, when the volatility increases the liquidity decreases on quote-driven markets because of the risk of holding inventory in the paradigm's inventory. Foucault (1999) indicated that less limit orders result from higher volatility, and so, in consistent with the paradigm of inventory, the bid-ask spread becomes larger, in other words, liquidity decreases. In turn, in the dynamic model for order-driven markets, Rosu (2010) noted that liquidity decreases because the amount of limit order submissions in association with market orders decreases

Comment [JD1]: do you mean 'inconsistent' or 'consistent' ?

as a result of the increase in volatility; he also expected that the negative impact on liquidity is caused by an increase in volatility.

Chordia et al., (2006) mentioned that, typically, increasing returns generate positive investment expectations and change the trading behaviour in order that the trading activity of investors rises, thereafter, liquidity rises as well. In the models of Brunnermeier and Pedersen (2008), regarding the significant decrease in stock prices, they argued that the market-makers are encouraged to settle their liquidity status while attaining their margin limits. Consequently, Brunnermeier and Pedersen (2008) indicated that when markets are illiquid there is a negative shock on return due to an equilibrium, which controls markets makers from providing liquidity.

Based on the speculation of Hameed et al. (2010), there are a number of theoretical models besides those of Brunnermeier and Pedersen (2008), which have emerged differently in that the result declines in an illiquid market. However, among these models, there is no clear model derived for order-driven markets.

However, trading activity has often been used an alternative measurement to liquidity. Avramov, Chordia, and Goyal (2006) stated that both are conceptually and empirically divergent, since they measure different types of behaviour and not just the small correlation. However for order-driven markets, Kyle (1985) predicted from the models that increasing trading activity leads to further market liquidity. Conversely, Johnson (2008) indicated that recent empirical research has been unable to confirm this relationship. Other models indicate that higher liquidity is associated with higher trading activity that increases in order-driven markets. It is revealed that the real reason behind the

liquidity increase is that higher trading activity will decrease the cost of the traders who are patiently waiting to complete limit orders (Foucault et al., 2005; Rosu, 2009). Therefore these traders endure limit orders closer to one another, which impacts lower price and smaller spreads, that is, higher liquidity. Though, as argued by Linnainmaa and Rosu (2008), excess market orders explain more trading activity. In general, the existing liquidity supplied by limit orders is consumed by market orders, and, therefore, might lead to less liquidity for limit order markets.

However, Linnainmaa and Rosu (2008) have shown that higher trading activity could be generated by higher liquidity. In addition, using the financial crises' model, Huang and Wang (2009) suggest that as trading activity decreases, liquidity reduces significantly, volatility increases, and there is a down turn in returns. This means that volatility, return, and trading activity cannot only be studied as determinants of liquidity; to be precise, these three market variables are endogenous variables in respect of liquidity.

In Chordia et al. (2005), the joint dynamics of daily return, trading activity, liquidity and volatility were discussed. In the U.S. stock market, they used data between 1991 and 1998 and found that both volatility and return Granger-cause liquidity and volatility resulting from liquidity. In addition, shocks in volatility and those in liquidity are negatively and significantly correlated, whereas the correlation of shocks in both trading activity and return with shocks in liquidity appeared positive. Liquidity responds negatively in the inclination response functions to a growth in volatility while an origination in return predicts an increase in the liquidity.

Fujimoto (2004) investigated and drew a relationship between three market variables and liquidity using the monthly data level from 1965 to 2001. She documented that volatility, trading activity, and return, significantly Granger-cause monthly liquidity, however, the reverse is invalid. Furthermore, an increased liquidity is significantly predicted by a positive shock in trading activity and return, while an increase in volatility in the IRFs, liquidity appeared to react negatively. However, the effect of the market variables on the liquidity in the impulse respond function is higher in the period from 1965 to 1984 than in the second period from 1984 to 2001.

Goyenko, and Ukhov (2009) studied the relationship among monthly volatility, return, and liquidity over the period from 1962 to 2003. They found that the results from the impulse response function (IRF) and Granger causality tests are consistent with Chordia et al. (2005). However, their study showed that volatility was not caused by liquidity, as in Goyenko, and Ukhov (2009). In contrast, according to Chordia et al. (2005), the correlation is insignificant between shocks in volatility and liquidity. On the other hand, Goyenko, and Ukhov (2009) found that a shock in liquidity and return are negatively correlated.

Söderberg (2008) examined the dynamics of liquidity over the period from January 1993 to June 2005 on the stock exchanges of Scandinavia. This study found that liquidity over the study period has increased. However, the variation of liquidity was huge. Furthermore, a VAR framework was employed to study the relationship between market variable volatility, trading activity, returns, and liquidity across the markets. The results showed that (a) an increase in return predicts an increase in liquidity; (b) there is a positive relationship between trading activity and liquidity, and (c) a positive shock in volatility leads to a decline in liquidity.

In the Asia Pacific context, Ahn, Bae, and Chan (2001) examined the impact of volatility on liquidity in the stock exchange of Hong Kong as a limit order market using a small number of the stocks. They found that the increase in market depth, as a measure of market liquidity, leads to a rise in volatility. Conversely, the researchers also observed that a subsequent drop in volatility contributes to a rise in liquidity. In addition, Ranaldo (2004) found that the liquidity declined when the volatility increased in the Swiss Stock Exchange. In short, the findings of Ranaldo (2004), and Ahn et al. (2001) and those of Foucault, (1999), and Rosu, (2010) are consistent with each other. However, Parlour and Seppi (2008) rebuff these propositions, asserting that the negative relationship between liquidity and volatility, as demonstrated in these studies, might be false and may express that prices are more volatile than high bid-ask spreads in thin markets.

In another study on the Helsinki stock exchange, Linnainmaa and Rosu (2008) explored how the liquidity for order-driven markets is affected by volatility and trading activity. They found that an increase in volatility may reduce liquidity, and that an increase in trading activity would lead to higher liquidity. Also, they claimed that increased liquidity would generate a higher trading activity.

2.6 Macroeconomic Variables

Macroeconomic fundamentals are responsible for the systematic liquidity; the inventory risks may have been affected by the changes in economic forces directly. For example, negative economic news may cause a decline in expected future earnings and encourage investors to leave the stock market to the safer bond market. This so-called

"flight-to-quality" effect might yield higher order imbalance, increased volatility, and a declining price for many stocks. The resulting market conditions, in order, contribute to an increase in inventory control risks for market-makers since significant situations are accumulated in the market, on one side, and higher risks of adverse price fluctuation are faced by securities, on the other, which are included in market-makers' inventories.

Chordia et al. (2001) pointed out the lack of theoretical models that investigate the association between liquidity and macroeconomics. They claimed that interest rates affect liquidity in the inventory paradigm. To be specific, their study showed that the perceived risk of holding inventory might be increased when there is an increase in default spreads, and thus liquidity is reduced.

Furthermore, O'Hara (1997) argued that liquidity is affected by inventory risks and inventory turnover rates. To illustrate, O'Hara elucidated how frictions like short-selling limitations and margin requirements may imply that liquidity could be influenced if there is a change in interest rates. For instance, by reducing the cost of both financing inventory and margin trading, trading activity could be decreased by interest rates and thus, stock market liquidity be elevated.

The stock market and bond market are linked by Vayanos (2004) using the "flight-to-quality" effect. The "flight-to-quality" ("flight-to-liquidity") episodes were illustrated by large liquidity declines that concur with market drops. In such a situation, investors move from less liquid assets, such as stocks, to assets that are supposed to be safe, such as cash or treasury bills. In this respect, Chordia et al. (2005) pointed out that the phenomenon of "flight-to-quality" leads to a lowering of the bond market's volatility and an increase in

long-term bond yield. Such a situation could affect the decision of investors to opt for debt instruments rather than equities. Consequently, it leads to a decrease in the liquidity of stock market. Indeed, for the U.S., the effects of money and bond markets on the stock market liquidity have been widely examined [1] (Chordia et al., 2001; Chordia et al., 2005; Goyenko & Ukhov, 2009). More specifically, Chordia et al. (2001) claimed that an increase in the short-term interest rate, which is measured by the terms spread, or the Federal Funds rate may be able to foretell the possibility of a decline in liquidity. Also, it is found that the default spread has no significant effect on liquidity.

In another more recent study, Chordia et al. (2005) showed that (a) increased bond market volatility may serve as an indication of the possibility of a decline in the liquidity of the stock market; (b) the liquidity of the bond market has a positive correlation with stock market liquidity; and (c) the liquidity of the stock market is Granger-caused by bond market return. To support that, the study of Goyenko and Ukhov (2009) showed that the expansion of stock market liquidity is significantly predicted by an increase in bond market yield and volatility. Moreover, stock market liquidity reacts positively to bonds liquidity with short and long time to maturity, while the opposite result is true for the bonds liquidity with medium time to maturity.

2.6.1 Monetary Policy and Funding Liquidity

High interest rates in the recent development indicate how market liquidity is influenced by monetary policy (Brunnermeier & Pedersen, 2008; Greenlaw, Hatzius,

[1] (Pastor & Stambaugh, 2003) show that there is a negative correlation between bond returns and stock returns when there is a sharp drop in market liquidity. This supports "flight-to-quality", since there is a positive correlation between these two returns in the other months.

Kashyap, & Shin, 2008). In this respect, Sauer (2007) investigated how interference from the central bank could be employed as a strategy to raise liquidity when negative liquidity shocks occur in financial markets. Sauer (2007) explained that the Feds have historically reduced the policy rate to raise the liquidity of stock market during the financial crises. In other words, in case of supplying emergency liquidity to the market they execute an expansionary monetary policy.

As suggested by Chordia et al. (2005) free monetary policy might increase liquidity and stimulate more trading activities by lowering the cost to meet margin loan requirements. Furthermore, encouraging dealers to finance their positions could also achieve a similar outcome. In addition, it is argued that monetary policy might also influence liquidity through its effect on market interest rates and volatility. Goyenko, and Ukhov (2009) pointed out that stock illiquidity is negatively related to positive shocks on non-borrowed reserves, while on the other hand, optimistically related to positive shocks on federal fund rates. For example, Chordia et al. (2005), in their study on the U.S., showed that a flexible monetary, measured as a negative interest rate surprise, or reduction in non-borrowed reserves, is linked with increased liquidity.

Adrian, and Shin, (2008), (2010), and Brunnermeier and Pedersen, (2008) used the term funding liquidity to explain the sudden decline of market liquidity.[2] The models (Adrian & Shin, 2010; Brunnermeier & Pedersen, 2008); suggested that a negative shock drives losses for the traders, which gives bigger margins, accordingly, the funding liquidity declines to carry out these new margins the traders have to sell some of their assets, which

[2] According to (Adrian & Shin, 2010) funding liquidity is the growth rate of financial intermediaries' balance sheets, while Brunnermeier and Pedersen, (2008) defined the funding of liquidity as the lack of a speculator (or shadow cost) of liquidity.

further reduces the market liquidity and, moreover, raises the traders' losses. Once more, the required margins rise, and, thus, a vicious cycle is created while the market liquidity dries up. Particularly, Adrian and Shin (2008) used the outstanding repurchase agreements' growth rate as a measure to fund liquidity.

Hameed et al. (2010) used three pointers of higher capital constraints through which they found a solution to control independent change in funding liquidity. The first pointer is the decrease in aggregate repos. The second is the excess return on the investment banks' portfolio besides other financial intermediaries (decline of return suggests tightness of capital). The third pointer is the commercial spread, which is the difference between the three-month Treasury Bills rate and the three-month commercial papers rate. The researchers found that periods of both funding constraints and negative returns reduce liquidity significantly more than other periods.

According to Gatev and Strahan (2006), during low liquidity, controlled funding periods, commercial spread and interbank spread expand. While interbank spread reflects both default risk and liquidity risk, yields from long term bonds only give an indication of the default risk. Adrian and Shin (2010) asserted that it is monetary policy that controls the term of funding liquidity, seeing that when monetary policy is loose, financial institutions extend their financial statements to raise the funding liquidity. It is not possible, therefore, to determine if a market liquidity would change directly or indirectly through a change in the funding liquidity, if there were to be a change in monetary policy. A selection problem arises when the investors or corporate insiders are better informed about the basic value of

a security. Traders with good news would likely be inclined to buy, while those with negative information would likely sell (Akerlof, 1970).

2.6.2 Business Cycle

Taddei (2007) pointed out that more research which has been carried out to investigate the association between business cycle and liquidity of financial assets. In particular, Eisfeldt (2004) built a model which proves that the change in liquidity is correlated with real fundamentals such as investments and productivity. The high risk assets' return increases as a result of high productivity, which, in turn, increases the attractiveness of investment in these assets. Eventually, this condition encourages the growth in risky assets' liquidity (Eisfeldt, 2004). In another model, introduced by Taddei (2007), he documented the same results as Eisfeldt (2004). In an empirical research on the U.S. bond market, Taddei (2007) confirmed that liquidity and business cycle are positively related. Goyenko, and Ukhov (2009) also reported that compared to other periods, the spreads on the U.S. bond market soar during recessions.

Naes, Skjeltorp, and Ødegaard (2008), in their study on the Oslo stock exchange, found that stock liquidity and economic activity measured by output gap has a highly positive correlation. As mentioned in Goyenko, and Ukhov (2009), by generating an increase in inventory holding and order processing cost, inflation shocks can eventually influence the performance of liquidity. Goyenko, and Ukhov (2009) asserted that a decline in stock market liquidity can be foretold by examining innovations in inflation, whereas industrial production does not significantly forecast liquidity. Also, in another study by Goyenko et al. (2009) it is arguable that the term and default spread could be treated like

pointers for the changing business cycle. Furthermore, Ang, Piazzesi, and Wei (2006) documented that economic growth and performance can be predicted by examining the increasing term spread. In brief, these studies argued that the increased liquidity can be forecast by a decline in default spread and an increase in term spread. However, Goyenko et al. (2009) showed that the term and default spread do not significantly forecast the liquidity's bond market while they are utilized for business cycle as indicators.

2.6.3 Investor Flows

Kyle, (1985), and Massa (2004) suggested that as money flows from an increase in mutual funds, liquidity will be limited when the inventories of market-maker are stretched as the funds are expected to be better informed than other investors. Nevertheless, in his empirical study on the U.S. stock market, Massa (2004) documented that if the funds are less informed it will lead to a positive relationship between liquidity and fund flows, which means that stocks that are held to a greater extent of less informed mutual funds have greater liquidity than stocks held by informed mutual funds. . He considers that the funds' degree of informativeness is consistent with their performance, while a high performance means an informed fund. Similarly, in another study on the Stockholm Stock Exchange, Anderson (2004) found that returns and fund flows are positively correlated. In contrast, Chordia et al. (2005) pointed out that investors should be cautious when they employ equity fund flow to predict the liquidity of stock market on the stock markets of the U.S. A convincing liquidity forecast ability is absent in their findings on equity fund flow.

Moreover, stock market liquidity is also affected by the rising net flow from foreign investors as resulted by a liberalization of capital constraints (Henry, 2000; Levine &

Zervos, 1998). In the case of Sweden, for example, Dahlquist and Robertsson (2001) argued that substantial proof was found to attest that the amount of foreign ownerships are higher in some Swedish corporations with higher liquidity.

The exchange rate in previous studies has not been extensively explored on stock market liquidity. Existing empirical studies pointed out that investment is affected by the negative impact of the exchange rate uncertainty. To illustrate this, Goldberg (1993) documented the negative long-run impact of exchange rate uncertainty on investment. In addition, using data from five OECD countries, Darby, Hallett, Ireland, and Piscitelli, (1999), and Servén, (2003) found a similar negative exchange rate impact on aggregate investment. On the other hand, a positive correlation between equity flows from the U.S. to overseas markets and the appreciation of the foreign currency as compared to the dollar is documented in Hau and Rey (2006) in their study on the development of a model to examine how exchange rates, equity prices, and capital flows determine foreign exchange risk trading. Accordingly, it is argued that foreign investor flows might be examined based on observation of the exchange rate.

A few justifications have explained the exchange rate influences on equity prices, for example, the flowing model by Dornbusch and Fischer (1980) suggested that the currency fluctuations affect the balance of the trade position in addition to the international competitiveness of the firm. The real output of a country is thus influenced by exchange rate changes. Share prices of firms are eventually affected resulting in the changes to the company's current and future cash flows. Therefore, the effect on stock returns should be shown by the exchange rate changes. Recently, a study by Alaganar and Bhar (2007) showed that the first- and second-order impacts of exchange rate changes on the stock

market of the U.S. significantly affect diversified portfolios, and they mentioned that the exchange rate information is significant for diversification in the stock market, therefore, the risk of exchange rate is priced in the returns.

Moreover, Mun (2008) examined the contribution of exchange rate fluctuations to volatility of stock market by studying how and to what level international stock market volatility is influenced by exchange rate fluctuations. He showed that a higher volatility of local stock market is influenced by a higher variability of foreign exchange rate. He also found that the variability of a foreign exchange affects the volatility stock market and that it is higher for local markets than for the U.S. market. That the exchange rate might affect liquidity is also suggested by Hau and Rey (2006), who found that the correlation between a depreciation of local currency and higher returns in the local stock market is significantly negative compared to the foreign equity market. This leads us to expect a relationship between liquidity and exchange rate since exchange rate fluctuation has a positive relation with the stock market volatility, as documented by O'Hara (1997). She argued that if the volatility increases the liquidity decreases on quote-driven markets as the risk of holding inventory in the paradigm's inventory increases once volatility is increased in the limit order market models.

The relationship between the exchange rate and stocks' liquidity were explored by Huang, and Stoll, (2001). They found that the relationship between the variability in the exchange rate and stocks liquidity is not significant. Yeyati, Schmukler, and Horen, (2008) also studied the exchange rate and liquidity and found that a depreciation of the local currency in some South American countries against the U.S. dollar predicts a decline in stock market liquidity for those countries during financial crises. However in contrast with

the previous studies on exchange rate and liquidity, this study will explore the aggregate stock market liquidity during financial crises not only for a long period but also for short periods.

2.7 Liquidity and Return

The market microstructure literature shows that many studies have been conducted concerning the role of liquidity in the individual securities pricing process. Lately, a new aspect of research suggests that liquidity is not only a characteristic of a sole asset, because commonality in liquidity has been found in the U.S. stock market (Chordia et al., 2000; Hasbrouck & Seppi, 2001; Huberman & Halka, 2001).

Exogenous private information, trading costs, search problems and market-makers' inventory risk can result in illiquidity (Amihud, Mendelson, & Pedersen, 2006). In Amihud et al., (2006) it is argued that fragmentation of markets and investors constitute the basis for illiquidity, as not all investors can be present in the same market at the same time. Such a predicament, however, may be resolved by market-makers who provide immediacy to facilitate the trading activity at any time convenient to traders. However, as mentioned by Stoll (1978), the market-maker must be compensated while he or she deals with the risk of basic price changes in the period between. A monopolist market-makers model was designed by Garman (1976) to examine the influence of quoted prices on the intensity of arrival of sellers and buyers. It is argued that the market-maker will undoubtedly be in jeopardy if quoted prices are fixed. To solve this predicament, Amihud and Mendelson, (1980), and Ho and Stoll, (1983) employed the quoted bid-ask prices that rely on the inventory of traded securities. Based on the proposition of Amihud and Mendelson (1980),

due to the risk and capital constraint, a market-maker will opt to restrict his inventory position so that he can administer inventory and avoid the restrictions that he might face. On the other hand, Ho and Stoll (1983) asserted that to reduce the risk exposure, a risk-averse market-maker will usually administer his inventory vigilantly. Amihud et al., (2006), Grossman and Miller, (1988),and Ho & Stoll, (1983) considered demand-pressure models with competitive market-makers. Moreover, variations in liquidity were linked cross-sectionally to market-makers' capital constraints by (Brunnermeier & Pedersen, 2008).

Akerlof (1970) suggested that an adverse selection problem: informed traders with good news have a motivation for buying, and those with bad news are likely to sell. Since, high information processing ability or more useful information is available to corporate insiders and some investors about the basic value of a security.

Grossman, and Stiglitz, (1980) maintained that market equilibrium is based on information asymmetries. As the implications of all the information is reflected in the prices, this might not motivate anyone to collect information, believing in noisy rational expectations equilibrium (REE) where price taker investors who learn from prices are in competition with other investors. The scenario in equilibrium is that some investors who incur costs in gathering information can expect better investment performance, while others may altogether refrain from collecting information. However, the overall expected benefit remains the same for both. Admati, (1985), Garman, (1976), and Hellwig, (1980) and others document further insights concerning the exposure of information through prices in REE.

The price impact of trade is taken into consideration by investors with private information, and, against informed traders, the market-makers defend themselves strategically. Bagehot, (1971) suggests that the increase of bid-ask spread, is important to market-makers to compensate for their losses to the informed investors. Since the market-maker loses money to informed investors and gains from trading with uninformed liquidity investors.

Copeland and Galai (1983) pointed out that the difference between the gains from liquidity investors and the loss to informed investors represents the profit of the market-maker, accordingly they proposed a model that quotes a profit-maximizing of market-maker's decision. Copeland and Galai (1983) suggested that the bid and ask prices are, respectively, the strike (exercise) prices of the put and of the call, straddling the existing price of the security. The market-maker determined the quoted bid and the ask prices as strike prices on two free alternatives in short validity duration to the informed investor. The model's implication is that higher uncertainty (volatility) widens the spread, which is consistent with the empirical evidence.

To deal with informed traders, the market-maker is presumed to be competitive and the discount rate is considered the same as the risk-free rate, which is normalised to zero. This is how the market-makers strategy is generally modelled. A market structure, as Glosten Paul and Lawrence (1985) perceived, must allow competitive market-makers to quote binding ask and bid prices, where traders who reach in sequence can choose whether to sell single stock at the bid, buy single stock at the ask, or desist from trading. In other words, investors can distinguish that the bid is the expected basic value provided that the next trade is a sell order, and likewise for the ask (Amihud et al., 2006).

Amihud et al. (2006) suggested that the quoted ask indicates the risk that the buyer is informed of good news and the bid price indicates risk of sellers being informed of bad news. If market-makers are not certain of whether their counter party is informed and whether there are potential investors who wish to sell, market-makers would face too high a price to trade. Market-makers may still profit by offering a "low"-bid-price to buy from their counter party or sell at a "high"-ask price, thus profiting from trading with uninformed investors or losing out to informed investors that they overlook. However, in a competitive market, the informed investors profit at the expense of the uninformed trade and the market-maker ends up with zero profit. Therefore, more informed traders mean a larger bid-ask spread, with the bid less than the ask price.

Another market model where the market-maker closes up with zero gain was suggested by Kyle, (1985) in which both informed and uninformed traders submit market orders for a security, with the price determined by the market-maker based on the aggregate order flow. A trader who is informed of the high value of an asset may lead to higher projections of demand, which would result in the market-maker increasing the price. Thus, both the market impact and the bid-ask spread can gauge low liquidity in the market due to information asymmetry.

Although the Kyle model does not address how information asymmetry influences the required return, Mendelson and Tunca (2004) extended the model to include endogenous liquidity trading but only dealt with the impact of private information about basic news. An investor might as well use his information about someone else moving a large block of securities. More recent studies focus on the significance of such private

information about order flow. Madrigal, (1996) gave credence to non-fundamental speculation; Attari, Mello, and Ruckes, (2005), and Brunnermeier and Pedersen, (2005) investigated predatory trading (trading that exploits or encourages the need of other investors for liquidating their position), Cao, Lyons, and Evans, (2003), and Vayanos, (2001) regarded strategic trading as the result of risk sharing, and Gallmeyer, Hollifield, and Seppi (2005) examined the uncertainty concerning the preferences of potential counterparties.

Baker, and Stein, (2004) suggested a substitute justification, which is built on the assumption that a group known as noise traders under-react to the information enclosed in order flows, and that there are short-sale restraints. In this model, the price impact of trades is reduced and liquidity is increased since the irrational investors are existed. The valuations of the rational traders are lower than the irrational traders, which means that irrational traders will be most active in the market. Thus, high liquidity is a positive signal of irrational traders' sentiment. In addition, Easley et al., (2002), and Easley and O'Hara, (2004) proposed that the theoretical models that document the process in which prices are informationally efficient are influenced by private information. Therefore, the risk of holding an asset is influenced. Consequently, superior expected returns could be obtained from stocks with a greater probability of information based trading.

Comment [JD2]: since the irrational investors exited?
or ' since irrational investors exist' ?

Garleanu, Pedersen, and Poteshman, (2009) established a model to examine the frequent trading of a limited number of agents by submitting market or limit orders, thereby observing the impact of information asymmetry on the required return. Agents may be informed about the subsequent dividend from time to time, a phenomenon termed "liquidity shock". Agents may receive a potential "liquidity shock", or information about the

subsequent dividend from time to time. In this respect, the researchers argued that there would not be any direct cost of trading if they are symmetric ex ante, and future bid-ask spreads caused by the disclosure of private information, which implies that unlike the case of exogenous trading costs, the price is not directly reduced by their present value. The cause of this outcome is the expectation of the future losses an agent will suffer as the benefits that they will make when trading are based on information to compensate trading for liquidity reasons. However, if the case is that liquidity trades are more likely to be made by some agents than others, the marginal trader does not break even on average and the required return is increased by their estimated net trading losses. Significantly, the inefficient allocation resulting from trading-decision alterations might cause indirect cost due to the adverse-selection problems. This indirect allocation cost increases the required return even more. Additionally, Wang (1993) proposed a dynamic infinite-horizon model to explore how traders observe a dividend process and the corresponding share price, with just a few of them scrutinizing the growth rate of the dividend process. Often, the price does not reflect the stochastic growth rate of dividend because of the randomness of the supply of stocks. However, the required return would increase considerably if there are many less-informed traders who overlook the stochastic growth rate (Wang, 1993). When dividends rise, less-informed traders will usually raise their expectations of dividend growth, which, in turn, leads to an increase in price. It is only a matter of time before the correlation of prices and dividends are affected. As a result, the volatility of total return rises, resulting in decreased consumption smoothing and risk sharing, while increasing the average risk premium.

Using data from the hybrid quote-driven U.S. market, early empirical tests studied the cross-sectional relationship between return and liquidity. The bid-ask spread was made

a proxy for liquidity. Amihud and Mendelson (1986) report that with the rise of spread for NYSE listed stocks, the risk-adjusted returns increase. They explain the relation between the liquidity impact and firm size and show that it can uniquely and effectively explain what shows for beta and size (Banz, 1981; Fama & French, 1992).

Amihud and Mendelson (1989) further estimated the return-spread relationship, also taking into account the effect of volatility. Eleswarapu (1997) supported this early result through proving the existence of an important association between the spread of Nasdaq stocks and their return. However, other work has not expressed confidence in the return-spread relationship. Amihud et al. (2006) documented that Chen and Kan (1996) showed that the findings of Amihud and Mendelson (1986) only applied to their methodology and that even with the same data, a different methodology yielded no association between the return and the spread. Eleswarapu and Reinganum (1993) documented that the existence of a significant relationship between return and spread was only shown in January for NYSE stocks. Chalmers & Kadlec (1998) documented no relationship between the return and spread for NYSE stocks. They constructed a complicated amortised spread measure that included the actual transaction price.

Due to the discrepancies in the relationship of return and spread, a new liquidity measure had to be introduced. The definition of 'turnover rate' is the total dollar value of trading in a share in specific duration over the capitalization of the market. Haugen and Baker (1996) showed that lower liquid stocks have greater turns by observing a negative return-turnover rate relationship for shares on the Russell 3000 stock index.

This finding was corroborated by Datar (1998), and Hu (1997) using NYSE data. Brennan et al.(1998) used volume traded instead of turnover rate to measure liquidity and found a negative relationship for both NYSE and Nasdaq stocks. The changes in the slope of the relationship between price changes λ, which were shown by Kyle (1985) to affect asset returns, were studied by Brennan and Subrahmanyam (1996). Theoretically, the relationship between trading volume and returns seems viable seeing that the former depends on the price effect of trades. However, there is a significant difference in real markets. For example, in the Kyle (1985) model, the orders in the call market are presumably aggregated and the net imbalance only affects the price, while in the real markets the estimation is done on a trade-by-trade basis.

In their study, Brennan, and Subrahmanyam, (1996) documented a negative association between return and liquidity by utilizing data for two years from the NYSE data and the slope of the market reaction curve to measure liquidity. In another research, utilizing NYSE data, Easley et al., (2002) proved that the relationship between return and the trade-based measure of information risk is statistically significant and positive. The information risk measure is negatively associated with turnover and positively related to spreads that indicate that it is a proxy for liquidity.

In small pure order-driven markets, the relationship between return and liquidity is uncertain. Chan, and Faff, (2003) and Marshall, and Young, (2003) used Australian Stock Exchange (ASX) data. A positive liquidity premium is indicated by the negative relationship between return and turnover rate. On the other hand, Marshall and Young (2003) revealed a negative liquidity premium, which had been indicated by the negative

relationship between return and spread; however, they found no relationship between the theoretically superior liquidity proxy of amortized spread and return.

Extending the model proposed by Acharya, and Pedersen, (2005) Bekaert et al., (2007) examined the pricing of liquidity risk in emerging markets. They modelled the impact of the U.S. and global liquidity factors, as well as the return factor, considering liquidity and market to be differently priced risks. Through their model, the presence of risks due to the global return and liquidity factors can be used to identify the differences in the impact on the expected return of integrated and segmented markets. They report that the price of local liquidity risk is significant, while the local market risk price is not. A mixed model that considers both integration and segmentation explains the positive impact of the local liquidity risk. The effect of both the level and risk of liquidity on stock returns differs over time across identifiable states, as was shown by Fujimoto and Watanabe (2006). They found the liquidity beta from a regression of portfolio returns on a liquidity index to be superior in states when investors may expect liquidity needs, especially when turnover is abnormally high. This applied to both small and large firm portfolios.

Rouwenhorst (1999) examined the returns, categorized by turnover, in 20 emerging markets. He observed that there was no difference between high- and low-categorized returns. He also showed that turnover is larger for high and small beta firms. However, his test period may be too short. In addition, the impact of turnover may as well have been confused with that of risk and size, as he did not employ controls for the latter in analysing the return-turnover relationship. Nguyen, Mishra, and Prakash (2005) also used turnover as a proxy for liquidity. They used two different approaches to investigate the impact of turnover on stock returns, utilizing data from 1970 to 2002. In the first approach, the Fama

and French (1993), three factor model (the market, factors for book-to-market ratio and size) were used. They were constructed into twenty five portfolios, acquired by categorizing either size or book-to-market ratio and within that on turnover. No systematic association was reported between average parameters and the portfolios' turnover, that is, it is not considered consistent with the effect of liquidity. In the second approach, Nguyen et al. used sole stocks (instead of portfolios), by applying a cross-section analysis using the Fama and MacBeth (1973) method with the GLS setup of Litzenberger and Ramaswamy (1979). Size, beta, and book-to-market ratio were controlled by the researchers in this model. As would be expected from the liquidity effect, they reported that turnover had a considerable negative coefficient.

Deploying an illiquidity proxy based on Kyle (1985), price impact coefficient λ, Amihud, (2002) inspected the impact of liquidity on the cross-section of stock returns. The results of his study showed that illiquidity has a positive and significant impact on stock returns. Similarly, Gottesman and Jacoby (2006) investigated the impact of investors' personal taxes and firm's pay-out policy on the relationship between expected return and stock liquidity utilizing the method of Amihud and Mendelson (1986) method. It is found that repurchased stocks create a tax advantage in relation to dividend but it involves certain transaction costs. As a result, a wider bid-ask spread loses its attractiveness as most of the investors would attempt to maximize their expected net return after the deduction of tax and transaction cost. In fact, Gottesman and Jacoby found that the return-spread is positively related. However, Spiegel and Wang (2005) considered the possibility of the confusion between the effects of risk and illiquidity on stock returns. They found a significant association between illiquidity and idiosyncratic risk (the standard deviation of factor-model residuals).

CHAPTER THREE

DATA AND METHODOLOGY

3.1 Introduction

This chapter discusses the methodology and the hypothesis of the research. In the first section of this chapter the researcher discusses the data and the liquidity proxies used in this research, the second section displays the methodology and the hypotheses used to study the commonality of liquidity in the wide-market and the cross-listed stocks. The third section discusses the methodology and hypothesis used to explore the intertemporal relationship between the market and macroeconomic variables. In the last section the researcher displays the methodology and the hypothesis used to study the relation between the stock return and the liquidity.

3.2 Data and Liquidity Proxies

Market liquidity is defined as the ability to buy or sell significant amounts of an asset quickly without significant movements in the asset price. While there are no straightforward measures of liquidity, proxies such as price impact, bid-ask spread and market depth have been presented in literature. The issue is that these proxies depend on transaction or high frequency data which is only available for the U.S. stock market, which hinders studies that would be especially useful for emerging markets such as Malaysia. Also, the available data is limited to a short time period, which seriously compromises the ability of researchers to enhance the power of their tests. Therefore, researchers have proposed some estimations of liquidity measures using daily return data, and, if available, daily volume data as well. Empirical studies document that neither liquidity measures

constructed from transaction data nor liquidity proxies estimated with daily data are an accurate measure of liquidity. However, most of these measures are highly positively correlated (Goyenko, Holden, & Trzcinka, 2009; Lesmond, 2005) . Although neither the proxies nor the estimates are accurate measures of liquidity as has been empirically demonstrated in literature, most of these measures have been shown to be highly positively correlated. Therefore, this research also uses daily data of bid and ask price and volume data to create a number of measures to study liquidity in Malaysia.

3.2.1 Data

The data set in this study gathered from various sources. Most of the liquidity proxies were captured from daily price and trading volume data. We confine this study to the Kuala Lumpur Stock Exchange (KLSE), for the period from October 1992 to December 2008, since the bid and ask price started to be available for the Kuala Lumpur Stock Exchange in late 1991.

To increase the study sample we set the start of the study period as October 1992 and we included all the listed companies, namely, those with bid and ask price data available at the start and the end date of the study (a total of 125 listed companies). Daily price and trading volume, annual market capitalization and monthly number of shares outstanding for each stock were obtained from Datastream, while bid and ask price were drawn from Bloomberg database. We only used ordinary common shares in our study. The monthly market economic data, such as money market rate as a proxy for the interest rate and the growth rate of the industrial production (IP) as a proxy for the output. The

investment portfolio, and the Real Effective Exchange Rate; were collected from international financial statistics published by IMF and Bank Negara in Malaysia.

The quality of the data obtained from DataStream studied by Ince & Porter (2006), they filtered the data based on geographic location and securities type. They identified many cases of errors; and suggested some other screening procedures which will really enhance the quality of the data. It is considered that their suggestion by more filtering the data as follows:

1. In any stock, if the return of the month goes above 300% and reverses within one month, then returns for both months have to be set as a missed value;
2. If, all stocks have no returns, in any day, or all stocks have no trading volume, in that particular day therefore, all return for any of the single security will be set as missing;
3. The extreme 1% observations on each of my several liquidity proxies within the market are removed.

3.2.2 Liquidity proxies

The first measure for liquidity we used is proportional quoted spread proxies following Chordia et al., (2006), and Goyenko, and Ukhov, (2009). This proxy is not usually used in emerging markets due to the unavailability of the bid and ask prices for most of those markets. Since this data were available for the Malaysian market we used this proxy to compare with other measures normally used in emerging markets.

The bid and ask prices for the stock *i* in day *t* is computed as:

$$\text{proportional Quoted spread}_{it} = \frac{Ask_{it} - Bid_{it}}{\frac{Ask_{it} + Bid_{it}}{2}}$$

Where Ask_{it} is the ask price for stock i in day t, and Bid_{it} is the bid price for stock *i* in day *t*. The average of market illiquidity across stocks in each day is constructed mathematically as:

$$\text{proportional Quoted spread}_{t} = 1/N_t \sum_{t=1}^{Nt} \text{proportional Quoted spread}_{it}$$

Where N_t is the number of stocks in day *t*. the measure at a monthly frequency: On each month m, for each stock *i*, proportional quoted spread constructed as follows:

$$\text{proportional Quoted spread}_{im} = \frac{1}{\mathrm{D_{im}}} \sum_{t=1}^{D_{im}} \frac{Ask_{it} - Bid_{it}}{\frac{Ask_{it} + Bid_{it}}{2}}$$

Where D_{im} is the number of days for which data are available for stock *i* in month m. The average market quoted spread across stocks in each month is calculated as:

$$\text{proportional Quoted spread}_{m} = 1/N_m \sum_{t=1}^{N_m} \text{proportional Quoted spread}_{im}$$

Where N_m is the number of stocks in month m.

The second proxy is based on Amihud (2002); he used illiquidity measure (*ILLIQ*), defined as the proportion of the daily absolute return to the trading volume in millions of dollars. This illiquidity measure essentially detains the order flow effect on the price, which intimately follows the Kyle, (1985) price impact definition of liquidity. However, where, the Amihud measure captured the impact of the cumulative unsigned volume on the absolute return. Kyle's λ measures the impact of a cumulative signed order flow on the return. We calculated this measure at a daily frequency: for each stock *i*, On each day *t*, Amihud's illiquidity ratio is structured as follows:

$$ILLIQ_{it} = |R_{it}| / \mathrm{VOLD_{it}}$$

$ILLIQ_{it}$ is the illiquidity measure for stock i in day t. R_{it} is the return of stock i in day t, and $\mathrm{VOLD_{it}}$ is the daily volume in ringgits of stock i in day t. The average market illiquidity across stocks in each day ($AILLIQ_t$) is calculated as:

$$AILLIQ_t = 1/N_t \sum_{t=1}^{Nt} ILLIQ_{it}$$

Where N_t is the number of stocks in day t. the measure at a monthly frequency: On each month m, for each stock *i*, Amihud's illiquidity ratio is calculated as follows:

$$\mathrm{ILLIQ_{im}} = \frac{1}{\mathrm{D_{im}}} \sum_{\mathrm{t=1}}^{\mathrm{D_{im}}} |\mathrm{R_{it}}| / \mathrm{VOLD_{it}}$$

Where D_{im} is the number of days for which data are available for stock i in month m. The average market illiquidity across stocks in each month is calculated as:

$$AILLIQ_m = 1/N_m \sum_{t=1}^{N_m} ILLIQ_{im}$$

Where N_m is the number of stocks in month m.

The third proxy we utilized is the Amivest liquidity ratio (*AMI*), which is constructed by the proportion of trading volume to absolute return:

$$AMI_{it} = \frac{VOL_{it}}{|RET_{it}|}$$

Where $\mathrm{VOL_{it}}$ is the volume of stock i in day t, and RET_{it} is the return of stock i in day t. The intuitive of liquid security is based on; a high volume of trading might be recognized in a small change in price. In another measure, we calculated the Amivest ratio for each stock daily on return and averaged across all stocks to come up with the aggregate daily market measure. To measure the monthly liquidity for each stock i in month m, the Amivest ratio is calculated as follows:

$$AMI_{im} = \frac{1}{D_{im}} \sum_{t=1}^{D_{im}} \frac{VOL_{it}}{|RET_{it}|}$$

Where D_{im} is the number of days for which data are available for stock i in month m.

The average market illiquidity across stocks in each month is calculated as:

$$AMI_m = \frac{1}{N_m} \sum_{t=1}^{N_m} AMI_{im}$$

Where N_m is the number of stocks in month m.

The fourth proxy utilized for measuring liquidity is daily and monthly share turnover ratio. The turnover ratio (*TNV*) is calculated as the daily trading volume for share i in day t to total number of shares outstanding:

$$TNV_{it} = \frac{VOL_{it}}{NOSH_{it}}$$

Where VOL_{it} is the volume of stock *i* in day *t*, while $NOSH_{it}$ is the number of the outstanding shares for stock *i* in day *t*. The aggregate market daily turnover ratio is calculated as the equally weighted average of daily turnover ratios of individual stocks. While we calculated the monthly (TNV), as trading volume for share *i* in month m to total number of shares outstanding:

$$TNV_{im} = \frac{VOL_{im}}{NOSH_{im}}$$

Where TNV_{im} is the share turnover for share i in month m. VOL_{im} is the volume of stock *i* in month m, while $NOSH_{im}$ is the number of the outstanding shares for stock *i* in month m. The market monthly cumulative ratio of share turnover is calculated as the equal weighted average of monthly turnover ratios of each sole stock. The proxy has been utilized

frequently by Rouwenhorst, (1999), and Bekaert et al. (2007), and others. Turnover ratio reflects the trading frequency. However, the cost per trade is not captured by this measure that differs significantly within securities. Lesmond, (2005) mentioned that, "Given the specific focus on only trading volume, turnover is likely to rise during liquidity crunches such as occurred during the Asian Crisis…" but, this measure remain under use up to now by several studies, as it is easy to construct.

3.3 The methodology

3.3.1Commonality of liquidity

Testing the existence of commonality in liquidity

Following Chordia et al. (2000) this study tested the existence of commonality in liquidity by examining the cross-sectional average from individual stocks using the market model to regress the percentage change in an individual stock liquidity proxy on the concurrent proportion of variation in the measure of the market liquidity (the market liquidity measures is the value weighted average of liquidity of all sole stock calculated which does not include the stock in the dependent variable) that is expressed as follows:[3]

[3] Chordia et al. (2000) justify the utilized of liquidity changes proportion rather than levels for two reasons: First, "time series of liquidity levels might be plagued by econometric problems (e.g., nonstationarity)".; Second, the interest "is fundamentally in discovering whether liquidity co-moves"

$$DLIQ_{i,t} = \alpha_i + \beta_1\, DLIQ_{mkt,t+1} + \beta_2\, DLIQ_{mkt,t} + \beta_3\, DLIQ_{mkt,t-1} + \beta_4\, DVL_{i,t} + \beta_5\, RET_{mkt,t+1} + \beta_6\, RET_{mkt,t} + \beta_7\, RET_{mkt,t-1} + \varepsilon_{i,t}$$

Where $DLIQ_{i,t}$ the percentage change in liquidity for each individual security *i* for each day t, and $\text{DLIQ}_{\text{mkt,t}}$ is the percentage change in the market wide liquidity in day *t*. $\text{DLIQ}_{\text{mkt,t}-1}$, $\text{DLIQ}_{\text{mkt,t}+1}$ is the percentage change in the market wide liquidity in day t-1 and day t-1, $DVL_{i,t}$ is the percentage of daily change in single stock squared return , $RET_{mkt,t+1}$ is the lead of the market return, $RET_{mkt,t}$ the concurrent of the market return, and $RET_{mkt,t-1}$ is the lag of the market return. We ran this regression for each individual security.

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One lag and one lead of the market wide liquidity plus the percentage of daily change in single stock squared return (a measure of change in return volatility) and the lead, concurrent and lag values of the market return were included as additional regressors. The one lag and one lead of the market wide liquidity are included in order to allow for noncontemporaneous adjustments in liquidity caused by thin trading (Pukthuanthong-Le, & Visaltanachoti, 2009). The market return was included to remove spurious dependency produced by the relationship between the returns and spread measures. While lags and leads of the market return were included to capture any lagged adjustment in commonality (Chordia et al., 2000). The squared stock return is included to proxy for volatility, which from our perspective is a nuisance variable possibly influencing liquidity (Pukthuanthong-Le, & Visaltanachoti, 2009).

We captured the existence of the commonality in liquidity by estimating the means of the lag, concurrent, and lead coefficients, then testing the means by t-statistic test. We also calculated the percentage of the positive coefficients to determine the direction of the relationship between the liquidity of the individual stocks and the liquidity of the market.

To estimate the market model we calculate the change in liquidity ratio for each sole stock *i* for each day $DLIQ_{i,t}$ as:

$$DLIQ_{i,t} = \frac{LIQ_{i,t} - LIQ_{i,t-1}}{LIQ_{i.t-1}}$$

Where $DLIQ_{i,t}$ denotes our liquidity measure of $\text{Quoted spread}_{it}$, AMI_{it} and $ILLIQ_{it}$, which does not include the stock in the dependent variable then on each day, the aggregate market illiquidity is measured as:

$$LIQ_{mkt,t} = 1/N_t \sum_{t=1}^{Nt} LIQ_{it}$$

And percentage change in market aggregate illiquidity is measured as:

$$DLIQ_{mkt,t} = \frac{LIQ_{mkt,t} - LIQ_{mkt,t-1}}{LIQ_{mkt.t-1}}$$

Cross-listed wide commonality liquidity

We examined the effect of cross-listed wide-liquidity on single liquidity measures while controlling for the effect of market liquidity. That is specified by Chordia et al.

(2000), trading volume is a principal determinant of market-maker inventory; its variation seems likely to induce co-movements in optimal inventory levels, which lead to co-movements in individual stock liquidity; that led me to assume that the cross-listing shares lead to liquidity co-movement between the cross-listed shares, as, generally, the cross-listing leads to increased trading volume of the cross-listed shares. Chordia et al., (2000) and Witmer, (2005) mentioned that across stocks, dealer inventory carrying costs must also co-move because these costs depend on market interest rates; accordingly the same might be applied to the cross-listed stocks since the cross-listed stocks are relatively more liquid, which lead to a reduction in the dealer inventory resulting in the carry cost of the dealer for the cross-listed shares co-moving together. Reducing the dealer inventory will lead to a reduction in the risk of maintaining inventory for the cross-listed shares, which also leads to liquidity co-movement between the shares cross-listed.

As pointed out by Chordia et al. (2000), if the change in the inventory risk is correlated across individual stocks, liquidity might be expected to exhibit similar co-movement. Linnainmaa and Rosu (2008) argued that more trading activity explained by additional market orders, that, in general, evaporate the available liquidity provided by limit orders, and, therefore, could lead to less, not increase the liquidity for limit order markets. This leads to co-movements in individual stock liquidity that leads me to assume that the cross-listing shares result in liquidity co-movement between the cross-listed shares. Moreover, since the cross-listed stocks are more liquid and higher trading activity, relatively, compared to none cross-listed that lead to reduce the dealer inventory resulting in the carry cost of the dealer for the cross-listed shares co-move together. In addition, in order-driven markets Foucault et al., (2005), Ro u, (2009), and Rosu, (2009) argued that higher trading activity decreases traders' cost outstanding for competition to patient limit

order. The same might be applied to the cross-listed stocks in order-driven markets since the cross-listed stocks are more liquid with higher trading activity, relatively, that reduces the traders' cost outstanding for competition patient limit order resulting in the carry cost of the dealer for the cross-listed shares co-moving together. To examine the cross-listed-wide commonality liquidity, we estimated the following regression:

$$DLIQ_{i,t} = \alpha_i + \beta_1 DLIQ_{mkt,t+1} + \beta_2 DLIQ_{mkt,t} + \beta_3 DLIQ_{mkt,t-1} + \lambda_1 DLIQ_{Lmkt,t+1} + \lambda_2 DLIQ_{Lmkt,t} + \lambda_3 DLIQ_{Lmkt,t-1} + \beta_4 DVL_{i,t} + \beta_5 RET_{mkt,t+1} + \beta_6 RET_{mkt,t} + \beta_7 RET_{mkt,t-1} + \varepsilon_{i,t}$$

Where $DLIQ_{i,t}$ the percentage is changing in liquidity for each individual security *i* for each day t, and $\text{DLIQ}_{\text{mkt,t}}$ is the percentage change in the market wide liquidity in day *t*. $\text{DLIQ}_{\text{mkt,t}-1}$, $\text{DLIQ}_{\text{mkt,t}+1}$ are the percentage change in the market wide liquidity in day t-1 and day t-1. $DLIQ_{Lmkt,t}$ is the percentage change in the cross-listed-wide liquidity in day t. $\text{DLIQ}_{\text{Lmkt,t}-1}$, $\text{DLIQ}_{\text{Lmkt,t}+1}$ are the percentage change in the cross-listed-wide liquidity in day *t*-1 and day *t*-1, , $DVL_{i,t}$ is the percentage of daily change in single stock squared return , $RET_{mkt,t+1}$ is the lead of the market return, $RET_{mkt,t}$ the concurrent of the market return, and $RET_{mkt,t-1}$ is the lag of the market return.

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This regression was estimated for 18 securities cross-listed on the Malaysian stock market and other markets for the period 2007 to 2008.[4] The percentage change in liquidity for each individual security and the percentage change in both market wide and cross-listed

[4] The researcher estimated the regression over the period 2007 and 2008 only, because of the limited number of companies that were cross-listed before 2007.

wide liquidity are calculated in the same way as it was calculated when we estimated the market wide commonality in liquidity.

One lag and one lead of the market wide liquidity plus the percentage of daily change in individual stock squared return (a measure of change in return volatility) and the lead, concurrent and lag values of the market return were included as additional regressors. The market return included removing spurious dependency produced by the relationship between the returns and spread measures. The lags and leads were included to capture any lagged adjustment in commonality.

Size effect and the liquidity commonality

Chordia et al., (2000) reported the presence of a size effect in the level of commonality in liquidity. They argued that the bid-ask spreads of large companies tend to have a higher response to market-wide changes. To examine the size effect on the commonality of liquidity in the Malaysian market we partitioned the sample into three subsamples, large medium and small, based on the average of market capitalization at the beginning and the end of the sample period. Following Chordia et al., (2000) to test the size effect on the commonality in liquidity, we examined the cross-sectional average from individual stocks using the market model to regress the percentage change in a single security liquidity proxy on the concurrent percentage change in the market wide liquidity proxy for each size sample (value weighted of all individual stock liquidity in each size sample, excluding the stock in the dependent variable) .

This regression is estimated for each single stock in each size sample with the weighted average liquidity of the size sample that the dependent security size ranged in. The percentage change in liquidity for each single security and the percentage change in liquidity are calculated in the same way as it was calculated when the market wide commonality in liquidity was estimated.

One lag and one lead of the market wide liquidity plus the percentage of daily change in individual stock squared return (a measure of change in return volatility) and the lead, concurrent and lag values of the market return were included as additional regressors. The market return included removing spurious dependency produced by the relationship between the returns and spread measures. While the lags and leads were included to capture any lagged adjustment in commonality.

Testing the existence of commonality in liquidity during the crises

This part studies the commonality in liquidity during the crises time. Chordia et al. (2000) argued that the existence of common factors in liquidity may be correlated to the market events and market crashes. The financial crisis of East Asia in 1997 is a good case to examine the commonality of market liquidity; therefore, in this study we examine the commonality of the liquidity during the crisis period . First we examined the existence of commonality in liquidity in each year starting from 1993 to 2008. Second we calculated the average of the commonality of each stock over the each day. Third we calculated the average of daily commonality over each year. Forth we calculated the average of the commonality over the whole period of the study and during the crises to compare the level of the existence of the commonality during the two periods.

We used Chordia et al. (2000) to test the existence of commonality in liquidity by examining the cross-sectional average of individual stocks using the market model to regress the percentage change in an individual stock liquidity proxy on the concurrent proportion of variation in the measure of the market liquidity (the market liquidity measures is the value weighted average of liquidity of all sole stock calculated which does not include the stock in the dependent variable).

One lag and one lead of the market wide liquidity plus the percentage of daily change in individual stock squared return (a measure of change in return volatility) and the lead, concurrent and lag values of the market return were included as additional regressors. The market return was included to remove spurious dependency produced by the relationship between the returns and spread measures. While the lags and leads were included to capture any lagged adjustment in commonality.

$$AMI_{it}\ ILLIQ_{it}\ LIQ_{mkt,t} = N_t \sum_{t=1}^{Nt} LIQ_{it}\ DLIQ_{mkt,t} = \frac{LIQ_{mkt,t} - LIQ_{mkt,t-1}}{LIQ_{mkt,t-1}}$$

Field Code Changed

3.3.2 The intertemporal relationship between stock market liquidity and macroeconomic conditions

The main goal of this section is to explore the role of macroeconomic variables as sources of liquidity across Malaysia's stock market as one of the emerging markets and to identify candidates for macroeconomic liquidity sources. However, before examining macroeconomic effects on liquidity we investigated the intertemporal relationship between aggregate liquidity and market variables.

The intertemporal relationship between stock market liquidity and market variables

Several reasons make this study important. First, since earlier research has documented market factors, such as return, return volatility, and share turnover, as the determinants of the individual stocks liquidity, Chordia et al., (2005), Fujimoto, (2004), and Goyenko, and Ukhov, (2009) documented that they are also important in explaining the daily and monthly variation in the liquidity in the U.S. market. However, we studied the joint dynamics between liquidity and the market factors at the monthly frequency in the Malaysian stock market as one of the emerging markets, and investigated whether the nature of the relationship is different in an emerging market than the U.S. market. Second, the identification of market-wide liquidity drivers is critical since they are expected to provide channels through which macroeconomic shocks are conveyed to liquidity. For example, negative shocks in the economy may drive a price decrease and a volatility raise in the stock market as investors reallocate their wealth from riskier stocks to less risky assets. These changes in the stock market conditions, caused by the macro shock produce systematic portfolio rebalancing, and, consequently, may lead to a liquidity drop by deteriorating the inventory adjustment concerns for market-makers.

Some theoretical models in the market microstructure theory deal with the influence of the volatility, return and trading activity in the liquidity of order-driven markets. However, Rosu (2009) argues that one among several causes for the lack of order-driven markets' models due to the interaction's complexity of a enormous number of unspecified investors, while there is one or a small number of market-makers in the quote-driven

markets. Yet, in market microstructure theory, most of the models are derived from market-maker-based trading systems and quote-driven markets as the inventory paradigm.

Based on Hameed et al., (2010) speculations, there are number of theoretical models beside Brunnermeier and Pedersen (2008) these have emerged differently in which market declines result in lesser liquidity. Yet, none of these models is clearly derived for order-driven markets.

Variables and data

In this section, we study the intertemporal association between liquidity and three market variables – return, return volatility and share turnover – using monthly data over the period starting from October 1992 until December 2008. We used three different proxies to measure the liquidity, which are effective spread, Amivest liquidity ratio, and Amihud liquidity measure; the definitions of these proxies and how they are calculated are provided in the previous section. The market variables were measured as follows: first the market return is measured by using the monthly price index of the Malaysian stock market calculated by DataStream database, then we calculated the return using the following formula:

$$R_{mt} = \frac{PI_{mt} - PI_{mt-1}}{PI_{mt-1}}$$

Where R_{mt} is the market return of month t, P_{mt} is the price index of month t , and P_{mt-1} is the price index of month t-1.

Volatility is given by the standard deviation of the monthly market return, while the market monthly aggregate turnover ratio is calculated as the equally weighted average of monthly turnover ratios of the individual stocks, where monthly individual-stock turnover is calculated by the average daily turnover over the month.

The methodology

To examine the intertemporal association and the causality between liquidity and the market variables return, return volatility, and share turnover, we conducted four-variable VAR models analysis of liquidity and the market variables. We tested the variables for the unit root by using augmented Dickey-Fuller and the Phillips-Perron unit root tests; Then we specified the order of variables in the model based on theory since results from the IRFs and variance decompositions are basically sensitive to the specific ordering of the endogenous variables and assuming that placing a variable earlier in the ordering tends to raise its impact on the variables that follow it, therefore the ordering of the endogenous variables might affect the outcome of the IRFs and VDs in the VAR system. We conducted the VAR analysis over the whole period of the study using two lag, then we examined our results robustness by estimating the VAR model again for two subsamples using one lag. The VAR order selected by using Akaike's Information Criterion (AIC) and Schwarz Criterion (SC).

In accordance with Chordia et al., (2005), Roll, Schwartz, and Subrahmanyam, (2007), and Subrahmanyam, (2007) the variables are ordered in the VAR model: Trading activity, market volatility , market return, and liquidity measures. As explained by Chordia et al. (2005) they placed trading activity variable first, because the stock price normally start forming by the observation of market-makers on an order. In addition, according to the

theory of market microstructure, generally the information influence prices in the course of trading. However, Subrahmanyam (2007) indicated that the ordering of the remaining variables are unclear. Conversely, Foucault, (1999), Foucault et al., (2005), and Rosu, (2009) models of order-driven markets, it is pointed out that trading activity and volatility respectively could be placed prior to liquidity variable in the ordering in the VAR model. Also, as our objective is to examine how liquidity responds to market wide shocks, the liquidity is ordered at last.

Hypotheses

The common notion that liquidity may affect returns through a premium for higher trading costs was first discussed in Amihud and Mendelson (1986). Returns may also impact future trading behaviour that might influence liquidity. For example, the psychological bias of loss aversion entails return-dependent investing behaviour Odean (1998) and the trading in one direction happening after a price change may affect liquidity. Chordia et al., (2006) mentioned that typically increasing returns generates positive investment expectations and alter the investing behaviour in order that the trading activity of investors rises, and then, liquidity rises as well. In the models of Brunnermeier and Pedersen (2008) the market makers are required to liquidate their positions, as they reach their margin limits. Thus, the models in Brunnermeier and Pedersen (2008) argued that a negative shock in return results in an equilibrium while markets are illiquid, which prevents markets makers from providing liquidity.

This leads us to the following hypothesis:

H1: liquidity increases following a positive return shock.

The effect of volatility on liquidity has been addressed in O'Hara, (1997) she found a relationship between volatility and liquidity that is, when the volatility increases the liquidity decreases on quote-driven markets because of the risk of holding inventory in the paradigm's inventory. Foucault (1999) higher volatility leads to less limit orders, and so, in consistence with the paradigm of inventory, the bid-ask spread becomes larger, in other words, liquidity decreases. In turn, in the dynamic model for order-driven markets, Rosu (2010) denoted that liquidity decreases because of the proportion of limit order submissions in relation to market orders decreases as results of increasing in volatility; he also expected that a negative impact on liquidity is caused by an increase in volatility.

This leads us to the following hypothesis:

H2: liquidity decreases following a positive volatility shock.

Trading activity has often been used as a proxy to measure liquidity, however, as shown by Avramov et al., (2006) both are conceptually and empirically divergent, since they measure different types of behaviour beside the only little correlation. However for order-driven markets, Kyle (1985) predicted from the models that increasing trading activity leads to further market liquidity. Conversely, Johnson (2008) indicates that recent empirical researches were unable to confirm this relationship. Other models indicate that higher Liquidity is associated with higher trading activity that increases in order-driven markets. It is revealed that the real reason behind liquidity increase is that higher trading activity will decrease traders' cost who are waiting to compete patient limit orders

(Foucault et al., 2005; Rosu, 2009). Therefore these traders endure limit orders closer to one another, and impacts lower price and smaller spreads, that is, higher liquidity. Though, as notarized by Linnainmaa and Rosu (2008), argued that more market orders explain more trading activity. In general, the existing liquidity supplied by limit orders is consumed by market orders and, therefore, that might lead to less liquidity for limit order markets.

However, as Linnainmaa and Rosu (2008) have shown that higher trading activity could be generated by higher liquidity.

This leads us to the following hypothesis:

H3: liquidity increases following a positive trading activity shock.

There are good reasons to expect bidirectional causalities between the liquidity and the market variables based on the discussion in the hypothesis above.
That leads us to the following hypothesis:

H4: There are bidirectional causalities between the liquidity and the market variables.

3.3.3 The intertemporal relationship between stock market liquidity and macroeconomic variables

Macroeconomic fundamentals are responsible for the systematic liquidity; the changes in economic forces may have a direct effect on inventory risks. For example, negative economic news may cause a decline in expected future earnings and encourage

investors to leave the stock market to the safer bond market. This so-called "flight-to-quality" effect might yield higher order imbalance, increased volatility, and a declining price for many stocks. The market conditions will contribute to an increase in inventory control risks for market-makers since they accumulate significant situations on one side of the market and face higher risks of adverse price fluctuation for stocks held in their inventories.

Chordia et al. (2001) pointed out the lack of theoretical models that investigate the association between liquidity and macroeconomics. They claimed that interest rates affect liquidity in the inventory paradigm. To be specific, their study showed that an increase in default spreads might increase the perceived risk of holding inventory, and thus reduces liquidity.

Furthermore, O'Hara (1997) argued that liquidity is affected by inventory risks and inventory turnover rates. To illustrate, O'Hara elucidated how frictions such as margin requirements and short-selling limitations may imply that a change in interest rates could sway liquidity. For instance, by reducing the cost of both financing inventory and margin trading, trading activity could be decreased by interest rates and thus, stock market liquidity be elevated.

The primary goal of this section is to explore the role of macroeconomic variables as sources of liquidity. Economy-wide shocks, for instance, and unanticipated interest rate changes may affect market-wide liquidity directly by changing the financing cost of inventory for market-makers Chordia et al. (2001). However, factors, for instance, unexpected productivity decrease and excessive inflationary pressures, will probably

influence liquidity indirectly by inducing fund outflows, increased volatility and price drop for the stock market and worsening inventory risks. To study whether macroeconomic factors are associated with stock market liquidity through both of these channels, we examined the effects of economy-wide shocks on liquidity and on the market-wide liquidity sources (return, volatility, and share turnover).

Variables and data

The macroeconomic variables used in this study are money market rate as a proxy for the interest rate and the growth rate of the industrial production (IP) as a proxy for the output. The investment portfolio and the real effective exchange rate are measured as the weighted average of Ringgit Malaysia relative to an index or basket of other major currencies adjusted for the effects of inflation measured. Interest rate reflects the money and bond market rate, which are considered as alternative investment opportunities. The Industrial Production measures real economic activity and the business cycle, exchange rate and investment portfolio measure the foreign investor flow.

Monthly data was used for the period that started from October 1992 until December 2008. All the data were obtained from International Financial Statistics and Bank Negara statistics. All the data were available in monthly frequency except investment portfolio, which were available in quarterly frequency; therefore, we converted the data from quarterly to monthly frequency using the Matlab Statistic software. The method used is explained in the appendix two.

The Methodology

To study the intertemporal association and the causality between liquidity and the macroeconomic variables, we conducted eight-variable VAR models analysis involving liquidity, market variables, and macroeconomic variables, with one lag base on Akaike's Information Criterion (AIC) and Schwarz Criterion (SC). We tested the variables for the unit root by using augmented Dickey-Fuller and the Phillips-Perron unit root tests, the results show that all the macroeconomic variables are stationary in the first level, except the investment portfolio, which was stationary in the second level. The VAR allows us to test the causality between the variables in the model and calculate the effects of shocks in each variable on itself and the others.

Hypotheses

High interest rates in the recent development indicate how market liquidity is influenced by monetary policy (Brunnermeier & Pedersen, 2008; Greenlaw et al., 2008). In regards to this, Sauer (2007) investigated how interferences from central bank could be employed as a strategy to raise liquidity when negative liquidity shocks in financial markets occur. Sauer (2007) explained that the Feds have historically reduced the policy rate to raise the liquidity of stock market during the financial crises. In other words, they executed an expansionary monetary policy in order to supply emergency liquidity to the market.

As suggested by Chordia et al.(2005), free monetary policy might increase liquidity and stimulate more trading activities by lowering the cost to meet margin loan requirements. Furthermore, encouraging dealers to finance their positions could also

achieve similar outcome. Besides, it is argued that monetary policy might also influence liquidity through its effect on market interest rates and volatility

The relationship between interest rate and stock market liquidity was addressed in Chordia et al. (2001). They claimed that interest rates affect liquidity in the inventory paradigm. To be specific, their study showed that the perceived risk of holding inventory might be increased when there is an increase in default spreads, and thus liquidity is reduced. In addition, O'Hara (1997) argued that liquidity is affected by inventory risks and inventory turnover rates. To illustrate, O'Hara elucidated how frictions like short-selling limitations and margin requirements may imply that liquidity could be influenced if there is a change in interest rates. For instance, by reducing the cost of both financing inventory and margin trading, trading activity could be decreased by interest rates and thus, stock market liquidity be elevated.

This led us to the following hypothesis:

H5: liquidity decreases following a positive interest rate shock.

Taddei (2007) pointed out that there are more research which has been carried out to investigate the association between business cycle and liquidity of financial assets. In particular, Eisfeldt (2004) built a model to theorize the correlation between changes in liquidity with real fundamentals such as investments and productivity. The high risk assets' return increases as a result of high productivity, which, in turn, increases the attractiveness of investment in these assets. Eventually, this condition encourages the growth in risky assets' liquidity (Eisfeldt, 2004). Another model introduced by, Taddei (2007), he

documented the same results as Eisfeldt (2004). In an empirical research on the U.S. bond market, Taddei (2007) confirmed that liquidity and business cycle is positively related.Goyenko, and Ukhov (2009) also reported that as compared to other periods, the spreads on the U.S. bond market are soaring during recessions.

This led us to the following hypothesis:

H6: liquidity increases following a positive industrial production shock.

Kyle, (1985), and Massa, (2004) suggested that as money flows from mutual funds increases, liquidity will be limited when market-maker inventories are stretched since the funds are expected to be better informed than other investors. Nevertheless, in his empirical study on the U.S. stock market, Massa (2004) observed that a positive relationship exists between liquidity and fund flows when the funds are less informed. In other words, greater liquidity will be generated if stocks are held to a greater extent of less informed mutual funds, as compared to those held by informed mutual funds. He claimed that the performance of funds affects the degree of informativeness, where creation of an informed fund is perceptible when its performance is towering. Similarly, in another study on the Stockholm Stock Exchange, Anderson (2004) found that returns and fund flows are positively correlated. In contrast, Chordia et al. (2005) pointed out that investors should be cautious when they employ equity fund flow to predict stock market liquidity on the U.S. stock markets. A convincing liquidity forecast ability is absent in their findings on equity fund flow.

This led us to the following hypothesis:

H7: liquidity increases following a positive investment portfolio shock.

The stock market volatility affected by a foreign exchange variability is higher for local markets than for the U.S. market, as pointed out by Chun Mun (2008); he also mentioned that the exchange rate might affect liquidity. Moreover, Hau and Rey (2006) found a negative significant correlation between a home currency depreciation and higher returns in the home equity market relative to the foreign equity market. That led me to expect a relationship between liquidity and exchange rate since the exchange rate fluctuation has a positive relation with the stock market volatility, as documented by O'Hara (1995). She argued that if the volatility increases the liquidity decreases on quote-driven markets since the risk of holding inventory in the inventory paradigm increases once there is an increase in volatility in the limit order market models. The relationship between the exchange rate and stock liquidity have been explored in Huang and Stoll (2001); they found no significant effect of the variability in the exchange rate on liquidity. Yeyati, Schmukler, and Horen (2007) also studied the exchange rate and liquidity and they found that a depreciation of the local currency against the U.S. dollar predicts a decline in stock market liquidity for some South American stock markets during financial crises.

This led us to the following hypothesis:

H8: liquidity increases following a positive exchange rate shock.

There are good reasons to expect bidirectional causalities between the liquidity and the macroeconomic variables based on the discussion in the hypothesis above.

That leads us to the following hypothesis:

H9: There are bidirectional causalities between the liquidity and the macroeconomic variables

Table 3-1: The hypotheses

H1	Liquidity increases following a positive return shock.
H2	Liquidity decreases following a positive volatility shock.
H3	Liquidity increases following a positive trading activity shock.
H4	There are bidirectional causalities between the liquidity and the market variables
H5	Liquidity decreases following a positive interest rate shock.
H6	Liquidity increases following a positive industrial production shock.
H7	Liquidity increases following a positive investment portfolio shock.
H8	Liquidity increases following a positive exchange rate shock.
H9	There are bidirectional causalities between the liquidity and the macroeconomic variables.

3.3.4 Illiquidity and stock return

A huge body of studies have proven the relationship between securities' liquidity and the expected returns of those securities. The effect of trading costs on required returns documented by Amihud and Mendelson, (1986), (1989), Brennan et al., (1998), Brennan and Subrahmanyam, (1996), and Jacoby et al., (2000) showed a negative relationship between securities' liquidity and their return. More recent research by Chordia et al., (2000), Hasbrouck and Seppi, (2001), and Huberman and Halka, (2001) focused on the commonality in liquidity and whether liquidity represents an undiversified risk factor.

The relationship between illiquidity and stock return is investigated for stocks traded on the Kuala Lumpur stock exchange (KLSE) for the from 1993 to 2008, utilizing data from daily and monthly databases of DataStream. we used the Fama and MacBeth (1973) method for testing the relationship between illiquidity and stock return following Amihud (2002). A cross section model is estimated for each month m = 1, 2…,12 in year y, y = 1994; 1995,…, 2008 (a total of 180 months), as monthly returns of stock are a function of stock characteristics:

$$R_{imy} = \beta_{omy} + \sum_{j=1}^{j} \beta_{jmy} X_{ji,y-1} + \varepsilon_{imy}$$

R_{imy} is the return on stock *i* in month m of year y, $X_{ji,y-1}$ is the characteristic j of stock *i* computed from data in year y _ 1 and investors could have this data at the early time of year y at the time investors make decisions for their investment. The impacts of stock characteristics on expected return are measured by coefficients β_{jmy} , while ε_{imy} are the residuals. This model produces 180 estimates of each coefficient β_{jmy} , j = 0, 1, 2,..., J. As the model estimated monthly from 1994 to 2008

Stocks are included in the cross-sectional estimation's procedure in month m of year y when the stocks match with these criterions:

1. The stock must be listed at the end of year y _ 1:
2. To make the estimation of coefficients more reliable, the stock should have data for more than 200 days during year y _ 1 for return and volume , Amihud (2002).

3. The stock has data on market capitalization at the end of year y _ 1

There are 125 stocks are included in the cross-section estimations which match with the above three conditions.

Three groups of stock Characteristics used in this study. The first group is the Liquidity variable, Amihud illiquidity measure. To calculate the Amihud illiquidity measure at a yearly frequency, on each year y, for each stock *i*, Amihud's illiquidity ratio is constructed as follows:

$$\mathrm{ILLIQ_{iy}} = \frac{1}{\mathrm{D_{iy}}} \sum_{\mathrm{t=1}}^{\mathrm{D_{iy}}} |\mathrm{R_{it}}| \, / \mathrm{VOLD_{it}}$$

Where D_{iy} is the number of days for which data are available for stock *i* in year

R_{it} is the return of stock i in day t, and $\mathrm{VOLD_{it}}$ is the daily volume in ringgits of stock i in day t, y.

The average market illiquidity across stocks in each year is calculated as:

$$AILLIQ_y = 1/N_y \sum_{t=1}^{y} ILLIQ_{iy}$$

Where N_y is the number of stocks in year y.

The $\mathrm{ILLIQ_{iy}}$ is replaced by its mean-adjusted value in the estimation of the cross-section model, since average illiquidity varies considerably over the years

$$\mathrm{ILLIQM_{iy}} = \mathrm{ILLIQ_{iy}} \; / AILLIQ_y$$

The size $\mathrm{SIZE}_{iy}$of each stock is included in the cross-sectional model; it is measured as the market value of stock *i* at the end of year y. Size might be considered as a proxy for liquidity (Amihud, 2002).

The second group of the stock characteristics is risk variables daily return's standard deviation $\mathrm{SDRET_{iy}}$ on stock *i* in year y. As shown in the asset pricing models of (Levy, 1978), and (Merton, 1987), As the portfolios of the investors are not well diversified since they are constrained, the SDRET is admitted. Amihud (2002) argued that $\mathrm{ILLIQ_{iy}}$ may be considered as a measure of the stock's risk, which is related to$\mathrm{SDRET_{iy}}$.

Theoretically, illiquidity and risk are positively related. Stoll (1978) suggested that there is a positive relation between stock illiquidity and the stock's risk since the bid-ask spread set by a risk-averse market-maker is rising in the risk of stock.

BETA_{iy} is included in the model as a measure of risk, calculated as follows:

Stocks divided into ten equal portfolios, according to their ranked size, size measured as the capitalization of the stocks at the end of each year y;

The portfolio return R_{pty} is computed as the equally-weighted average of stock returns on day t in year y in portfolio p.

The market model is used for each portfolio p; p = 1, 2,…, 10

$$R_{pty} = \alpha_{py} + BETA_{py} \times RM_{ty} + \varepsilon_{pty}$$

RM_{ty} is the equally-weighted market return and $BETA_{py}$is the slope parameter, estimated by using the method of Scholes and Williams (1977). The beta of stock I,$BETA_{iy}$, is $BETA_{py}$ of the portfolio in that stock i is included.

The last group of stock characteristic included additional variables as $R100_{iy}$ is the return on stock over the last 100 days of year y, while $R100YR_{iy}$, is the return on stock i during remained days which exactly starts at the beginning of the year y and precedes the last 100 days of the year y, are included in the cross sectional model as characteristics of the stock since the past stock returns were shown to have a significant effect on their expected returns (Amihud, 2002; Brennan et al., 1998).

Finally, the dividend yield of the stock i in year y, $DIVYLD_{iy}$, is included in the model following (Amihud, 2002; Brennan et al., 1998), they suggested that the stock return positively influenced by dividend yield when the rate of the tax on dividend is higher in compare to the rate of capital gains tax. The dividend yield $DIVYLD_{iy}$ is computed as the sum of the dividends in year y over the price at the end of year

The book-to-market variable was examined in Fama and French (1992); they showed that cross-sectional variation in stock returns could be expressed by the book-to-market ratio of stocks. Moreover, Kothari and Shanken (1997) found that market returns of the Dow Jones Industrial Index (DJIA) are predicted by the book-to-market ratio. They suggested that a negative expected returns is predicted by the book-to-market ratio; however, Amihud (2002) did not add book-to-market ratio to his model. I have added book-to-market ratio in the model to study the relation between liquidity and stock return since

the relation approved between book-to-market ratio and return for the Malaysia stock market as shown by (N. Chen & Zhang, 1998; Chui & Wei, 1998), therefore, the researcher expects a relationship between book-to-market ratio and return in this model.

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3.3.5 Illiquidity of different size firms and stock return

Numerous studies examined the firm size effect on stock return with different results. Amihud and Mendelson (1989) report that there is no size effect on the return while by (Banz, 1981; Reinganum, 1981) found a negative size effect on stock returns. Recently Shum and Tang (2005) reported that firm size is one of the factors that contributes significantly in explaining the cross section of average returns.

According to Beedles et al. (1988) large firms have higher liquidity. Consistently, Amihud, (2002) reported that firm size is positively correlated with a stock's liquidity, and suggested that the effects of illiquidity on stock excess return differ by the firm size.

The size effect on the relation between the big and the small stock liquidity is examined for stocks traded on the Kuala Lumpur stock exchange (KLSE) for the years 1993–2008. We used the Fama and MacBeth (1973) method to test the size effect on the relation between the big and the small stock liquidity following Amihud (2002). We used size as a dummy variable, which equals 1 if the firm market capitalization is larger than its yearly median. We used the same test for estimating the relationship between the small stock liquidity and its return, using size as a dummy variable, which equals 1 if the firm market capitalization is smaller than its yearly median.

A cross section model is estimated for each firms size sample for each month m = 1, 2…,12 in year y, y = 1994; 1995,…, 2008 (a total of 180 months), where monthly stock returns are a function of stock characteristics:

$$R_{imy} = \beta_{omy} + \sum_{j=1}^{j} \beta_{jmy} X_{ji,y-1} + \varepsilon_{imy}$$

R_{imy} is the return on stock *i* in month m of year y, $X_{ji,y-1}$ is the characteristic j of stock *i* computed from data in year y _ 1 and investors could have this data at the early time of year y at the time investors make decisions for their investment. The impacts of stock characteristics on expected return are measured by coefficients β_{jmy} , while ε_{imy} are the residuals. This model produces 180 estimates of each coefficient β_{jmy} , j = 0, 1, 2,..., J. As the model estimated monthly from 1994 to 2008.

CHAPTER FOUR

FINDINGS

4.1 Introduction

This chapter discusses the finding of the research. In the first section of this chapter the researcher discusses the empirical features of the liquidity proxies used in this research, the second section displays the finding in study the commonality of liquidity in the wide-market and the cross listed stocks. The third section discusses the results of the intertemporal relationship between the market and macroeconomic variables. In the last section the researcher displays the finding in the study of the relationship between the stock return and liquidity.

4.2 Empirical Features of the Market Liquidity Measures

This section discusses the empirical features of the liquidity proxies used in this research, proportional quoted spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI), and share turnover ratio (TNV). Table 4-1 presents the summary descriptive statistics for the four primary liquidity/illiquidity proxies at the aggregate market level. Panel A shows the descriptive statistics of the proxies of Aggregate liquidity which is used in this study. There is right skewness in the cross-section of the all liquidity measures, as the medians value is lower than the mean value. This result is consistent with (Chordia et al., 2000; Fabre & Frino, 2004).

Table 4-1: Descriptive Statistics for Monthly Aggregate Liquidity Measures

Panel A: Cross-sectional statistics for time series means

	Mean	Median	Maximum	Minimum	Std. Dev.
PQSPR	0.0185	0.0173	0.065	0.009	0.006
AMIHUD	2.13	1.72	7.37	0.075	3.52
AMI	4222	3709	364512	3508	7172
TNV	0.012	0.009	0.059	0.001	0.001

Panel B: correlations between liquidity measure pairs

	PQSPR	AMIHUD	AMI	TNV
PQSPR	1	0.347	-0.163	-0.092
AMIHUD		1	-0.197	-0.014
AMI			1	0.087
TNV				1

The above table presents descriptive statistics for four monthly aggregate liquidity measures, proportional quoted spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI), share turnover ratio (TNV). Panel A calculates the mean, median, maximum, minimum and standard deviation for each variable. Panel B shows the correlations between liquidity measure pairs. The sample period is 1992:10-2008:12.

Table 4.1 Panel B reports the correlations among the four liquidity variables. As we can see, all the means correlation coefficients show the correct sign. Similar to Lesmond (2005), the correlation between proportional quoted spread and the share turnover is very low while the correlation between proportional quoted spread and Amihud illiquidity measure relatively higher . Moreover, the correlation between the different liquidity measures ranging from -0.197 to 0.087 except the correlation between PQSPR and AMIHUD is 0.347. These results are consistent with previous studies (Sujoto et al., 2005;

Zheng & Zhang, 2006), as there results shown that the correlation between the liquidity measures were -0.0159 to-0.1803 and -0.0130 to 0.3825 respectively. These results ensure the efficiency of the liquidity measures that are used in this study.

4.3 Market-wide commonality in liquidity

This section discusses the finding of examining the existence of commonality in the market liquidity; it is also show the results of examining if the size and cross-listed characteristic are factors of commonality of liquidity. Several reasons might show the importance of commonality in liquidity in the stock market. Its show that liquidity is one of the asset prices factor, commonality in liquidity will have an impact on asset prices, either the local or the international stocks. Future models must consider common determinants of liquidity, and will also have to consider liquidity in financial market regulation.

A similar approach to that proposed by Chordia et al. (2000) is used to test the existence of commonality in liquidity by examining the cross-sectional average of individual stocks using the market model to regress the percentage change in an individual stock liquidity proxy on the concurrent proportion of variation in the measure of the market liquidity (the market liquidity measures is the value weighted average of liquidity of all sole stock calculated which does not include the stock in the dependent variable). The market model ran for each individual security.

One lag and one lead of the market wide liquidity plus the percentage of daily change in individual stock squared return (a measure of change in return volatility) and the lead, concurrent and lag values of the market return were included as additional regressors. The market return was included to remove spurious dependency produced by the

relationship between the returns and spread measures, while the lags and leads were included to capture any lagged adjustment in commonality, the squared stock return is included to proxy for volatility, which from our perspective is a nuisance variable possibly influencing liquidity.

Cross-sectional means of the parameters of time series slope is presented with the corresponding *t*-statistics. "Percentage+" indicates the positive coefficients percentage, whereas "Percentage significant" shows the proportion that the adjusted *t*-statistics is significant at the 5% critical level. The adjusted *t*-statistics presents the cross-correlation in each individual stock regression residual. The big number of the commonality regression might tend to have big effect on the standard error due to the cross correlation in the residual of the cross sectional average. To solve this problem we follow Chordia et al. (2000), the adjusted *t*-stat is the OLS *t*-statistics divided by $[1 + 2(N-1)\rho]^{1/2}$, where N is the number of regressions and ρ is the average residual cross-correlation across 125 regressions.

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Table 4-2a shows the regression outcomes of market-wide commonality in liquidity. PQSPR is the proportional quoted spread, Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI), and share turnover ratio (TNV). D indicates the daily proportional changes for each liquidity measure in that variable. The market average liquidity variables calculated by excluding the dependent variable stock. Mean and the median parameters are documented, as well as the positive parameters proportional and the significant parameters with positive sign are reported. They are presented on concurrent liquidity variables, also for the next trading day (lead) and previous trading day (lag) .

SUM denotes the mean of the total of concurrent, lead and lag. The mean and the median of adjusted R^2 are reported. The results for the proportional quoted spread show that the market liquidity variable's concurrent coefficient average is 0.84, with an associated *t*-statistic of 31.36. Nearly 85% of the sole parameters obtain a positive sign from the 125 time series regressions whereas 74% of theses coefficients are positively significant at the 5% level. For Amihud measure, the market liquidity variable's concurrent coefficient average is 0.51 with *t*-statistic of 26.34. It is shown that 75.4% of the sole parameters obtain a positive sign from the 125 time series regressions and 62 % of these coefficients are significant at 5%.

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Considering the Amivest liquidity ratio, strong evidence for commonality was shown in the results of regression. The coefficient shows a value of 0.69, with an associated t-statistic of 29.20. Nearly 83% of the sole parameters obtain a positive sign and 67.5% exceed the 5% one-tailed critical value. For share turnover ratio, the mean coefficient of the concurrent market-wide liquidity is 0.91 with t-statistics of 39. 76.4% and 70.45% of the parameters obtain a positive sign and significant at the 5% level.

Table 4- 2a: Market-wide Commonality in Liquidity

	DPQSPR	DAMIHUD	DAMI	DTNV
Concurrent				
Mean	0.8	0.5	0.7	0.9
t-stats	31.4	26.3	29.2	39.0
Median	0.8	0.5	0.7	0.9
Percentage+	84.6	75.4	83.2	76.4
Percentage significant	73.7	61.8	67.5	70.5
Lead				
Mean	-0.01	0.11	0.08	0.10
t-stats	-0.03	5.35	1.84	3.25
Median	0.00	0.12	0.07	0.00
Percentage+	45.57	54.41	58.62	48.50
Percentage significant	9.79	8.82	10.13	10.25
Lag				
Mean	-0.04	0.02	0.00	0.01
t-stats	4.44	2.70	0.12	1.23
Median	-0.03	0.03	0.00	0.00
Percentage+	42.47	45.89	62.79	61.00
Percentage significant	10.66	7.79	8.21	11.80
Sum				
Mean	0.79	0.65	0.77	1.02
t-stats	4.66	5.82	12.01	2.78
Median	0.73	0.26	0.80	0.96
Adj- R^2%				
Mean	2.54	2.26	1.87	2.14
Median	2.23	2.17	1.68	2.06

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Table 4- 2b: Average coefficients of the additional variables in market-wide commonality regression

	DPQSPR	
	Mean	**t-stats**
Intercept	0.031	9.62
Lead of market return	-0.052	-4.7
Concurrent of market return	-0.057	-7.9
lag of market return	0.049	3.09
Change in return volatility	0.372	3.26

These empirical findings report that there is an evidence for the presence of commonality in liquidity in an order-driven market structure. Beside, the liquidity of Malaysia stocks seems to respond significantly to the market aggregate liquidity across time as the sum of concurrent, lag, and lead coefficients for all liquidity measures are highly significant. When compared with prior results, this research reports stronger evidence of the presence of commonality in liquidity in the stock market exchange of Malaysia. In addition, the magnitude and significance of β for the proportional quoted spread measure in Table 4-2a is higher than the finding of (Chordia et al., 2000; Fabre & Frino, 2004).

This indicates that commonality in liquidity seems to be more significant in emerging markets. Our results are consistent with (Brockman & Chung, 2002) but contradictory to (Fabre & Frino, 2004)

4.3.1 Cross-listed wide commonality in liquidity

Cross-listings positively influence the liquidity and marketability of stocks. By increasing the range of stocks available for investors (and likely lowering transaction costs), The investment alternatives and the flow of information between markets also increases due to the cross-listings. Improvement in market efficiency and market expectation thus become a strong possibility. Fanto and Karmel (1997), and Mittoo (1992) proved that financial managers cross-list to increase stock liquidity.

To examine the cross-listed-wide commonality liquidity, we estimated the market model to regress the percentage change in liquidity for each individual security and the percentage change in both market wide and cross-listed wide liquidity are calculated in the same way as it was calculated when we estimated the market wide commonality in liquidity.

One lag and one lead of the market wide liquidity plus the percentage of daily change in individual stock squared return (a measure of change in return volatility) and the lead, concurrent and lag values of the market return were included as additional regressors. The market return included remove spurious dependency produced by the relationship between the returns and spread measures. The lags and leads were included to capture any lagged adjustment in commonality. This regression was estimated for 18 securities cross-listed on the Malaysian stock market and other markets for the period 2007 to 2008.

Cross-sectional mean of the parameters of time series slope is presented in (Table 4-3) with the corresponding *t*-statistics. The adjusted *t*-statistic is significant at the 5% critical

level. The adjusted *t*-statistic presents the cross-correlation in each individual stock regression residuals. Following Chordia et al. (2000), the adjusted *t*-statistic is the OLS *t*-statistic divided by $[1 + 2(N-1)\rho]^{1/2}$, where N is the number of regressions and ρ is the average residual cross-correlation across 18 regressions.

Table 4-3 shows the regression outcomes of Cross-listed wide commonality in liquidity. PQSPR is the proportional quoted spread, Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI), and share turnover ratio (TNV). D indicates the daily proportional changes for each liquidity measure in that variable. The market average liquidity variables calculated by excluding the dependent variable stock. And the average liquidity variables of the cross listed stocks. Mean parameters are documented, for the market and the cross listed samples. They are presented on concurrent liquidity variables, and also for the next trading day (lead) and previous trading day (lag) . SUM denotes the mean of the total of concurrent, lead and lag. The mean and the median of adjusted R^2 are reported.

The results for the proportional quoted spread show that the average coefficient on the concurrent market liquidity variable is 0.378, with an associated t-statistic of 11.23while the average coefficient on the concurrent cross-listed liquidity variable is 0.605, with t-statistic of 16.41. The results for the Amihud illiquidity measure (AMIHUD) and share turnover ratio (TNV) show that the average coefficient on the concurrent market liquidity variable is 0.364, with an associated t-statistic of 8.96 and -0.270, with an associated t-statistic of 0.184 respectively, while the average coefficient on the concurrent cross-listed liquidity variable is 0.567, with t-statistic of 12.4 and 0.670, with an associated t-statistic of 4.27 respectively. However, the results of Amivest liquidity ratio (AMI) show that the

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average coefficient on the concurrent market liquidity variable is higher than the average coefficient on the concurrent cross-listed liquidity variable. the concurrent market liquidity variable is 0.513, with an associated t-statistic of 8.21 while the average coefficient on the concurrent cross-listed liquidity variable is 0.176, with t-statistic of 5.14.

Table 4-3: Cross-listed wide commonality in liquidity

	DPQSPR		DAMIHUD		DAMI		DTNV	
	market	listed	market	Listed	market	listed	market	listed
concurrent	0.38	0.61	0.36	0.57	0.51	0.18	-0.27	0.67
t-state	11.23	16.41	8.96	12.40	8.21	5.14	0.18	4.27
lead	0.04	0.07	0.05	0.07	0.05	0.02	0.13	0.00
t-state	2.37	2.76	1.42	1.84	0.94	0.27	1.71	0.82
lag	0.06	0.08	0.09	0.18	0.12	0.06	0.10	0.24
t-state	2.56	2.84	1.61	2.72	1.57	0.42	0.72	1.68
sum	0.48	0.76	0.51	0.81	0.68	0.26	0.05	0.91
t-state	9.76	12.70	6.87	10.71	7.25	3.24	0.96	2.81
Adj- R^2%								
mean	3.72		2.83		1.67		1.75	
median	2.42		1.76		0.73		0.95	

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The results show that all the liquidity variables except for DAMI seem to be affected by both market and cross-listed liquidity; cross-listed liquidity actually has larger coefficients for three of the four liquidity measures. These empirical findings report that there is an evidence for the presence of commonality in liquidity in the cross-listed stocks. This result indicates that the existence of commonality in the liquidity of the cross-listed stock may suggest that the liquidity should be pricing in the international assets pricing models, since it carries undiversified risk.

4.3.2 Size effect and the liquidity commonality

Chordia et al. (2000) examined the size effect on the level of commonality in liquidity. They argue that the bid-ask spreads of large companies tend to have a higher response to market-wide changes. This section displays the size effect on the market-wide average liquidity variable. To examine the size effect on the commonality of liquidity in the Malaysian market we partitioned the sample into three subsamples, large medium and small, based on the average of market capitalization at the beginning and the end of the sample period. Following Chordia et al. (2000), to test the size effect on the commonality in liquidity, we examined the cross-sectional average from individual stocks using the market model to regress the percentage change in an individual stock liquidity proxy over the proportion concurrent change in the market wide liquidity proxy for each size sample (value weighted of all individual stock liquidity in each size sample, excluding the stock in the dependent variable).

The regression estimated for each individual security in each size sample with the weighted average liquidity of the size sample that the dependent security size ranged in. The percentage change in liquidity for each individual security and the percentage change in liquidity are calculated in the same way as it was calculated when the market wide commonality in liquidity was estimated.

One lag and one lead of the market wide liquidity plus the percentage of daily change in individual stock squared return (a measure of change in return volatility) and the lead, concurrent and lag values of the market return were included as additional regressors. The market return included to remove spurious dependency produced by the relationship

between the returns and spread measures. While the lags and leads were included to capture any lagged adjustment in commonality.

Table 4-4 shows the outcomes of regression of the size effect on the market-wide commonality in liquidity. Based on the total assets of each company, the samples were ranked and separated into three groups (large, medium and small). Therefore, the groups of subsamples of (large, medium and small size) contain 42, 41 and 42 stocks, respectively. The regression was conducted for each one of the three samples. PQSPR is the proportional quoted spread, Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI), and share turnover ratio (TNV). D indicates the daily proportional changes for each liquidity measure in that variable. The market average liquidity variables calculated by excluding the dependent variable stock. Mean and the Median parameters are documented, as well as the positive parameters proportional and the significant parameters with positive sign are reported. They are presented on concurrent liquidity variables, and also for the next trading day (lead) and previous trading day (lag) . SUM denotes the mean of the total of concurrent, lead and lag. The mean and the median of adjusted R^2 are reported. Cross-sectional mean of the parameters of time series slope are presented with the corresponding *t*-statistics. "Percentage+" indicates the positive coefficients percentage, whereas "Percentage significant" shows the proportion that the adjusted *t*-statistics is significant at the 5% critical level. The adjusted *t*-statistics presents the cross-correlation in each individual stock regression residual. The big number of the commonality regression might tend to have big effect on the standard error due to the cross correlation in the residual of the cross sectional average. To solve this problem we follow Chordia et al. (2000), the

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adjusted *t*-statistics is the OLS *t*-statistics divided by $[1 + 2(N - 1)\rho]^{1/2}$, where N is the number of regressions and ρ is the average residual cross-correlation across 42 regressions.

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Table 4-4 shows that all the three size groupings of all liquidity variables exhibit significant commonality in liquidity; that is, commonality in liquidity is not driven by only one size group. Consistent with Chordia et al. (2000), the results show that large companies have relatively large market-wide coefficients in PQSPR and AMI. The mean of the concurrent of DPQSPR for the large, medium and small size groups where 0.939, 0.938 and 0.898, respectively . The mean of the concurrent of DAMI for the large, medium and small size groupswhere 0.405, 0.381 and 0.293, respectively .the results show that the mean of the concurrent ofDPQSPR and DAMI are positively related with firm size. While DTNV are negatively related with firm size, the (small) size group tends to have the strongest response to concurrent and this result is consistent with the results of (Zheng & Zhang, 2006). The mean of the concurrent of DTNV for the large, medium and small size groups were 0.761 , 0.804 and 0.849, respectively In AMIHUD the (Medium) size group tends to have the strongest response to concurrent, for the large, medium and small size groups were 0.510, 0.464 and 0.497, respectively

Table 4-4a: Size effect and the liquidity commonality

Size effect and the liquidity commonality in DPQSPR, and DAMIHUD						
	DPQSPR			DAMIHUD		
Concurrent	L	M	S	L	M	S
Mean	0.939	0.938	0.898	0.510	0.464	0.497
t-stats	32.395	30.074	29.524	27.346	23.034	24.354
Percentage+	84.615	91.667	83.769	90.750	83.769	87.120
Percentage significant	82.500	79.200	74.800	57.400	51.700	62.400
Lead						
Mean	0.019	-0.006	0.011	0.037	0.015	0.007
t-stats	0.957	-0.275	0.627	2.552	1.078	0.451
Percentage+	52.800	47.300	45.100	62.700	60.500	57.200
Percentage significant	1.100	1.100	1.100	0.000	1.100	0.000
Lag						
Mean	-0.029	-0.042	0.021	-0.031	-0.035	-0.017
t-stats	-1.903	-2.926	1.243	-2.552	-2.761	-1.199
Percentage+	40.700	38.500	55.000	34.100	35.200	39.600
Percentage significant	0.000	0.000	0.000	0.000	0.000	0.000
Sum						
Mean	0.928	0.892	0.930	0.517	0.444	0.487
t-stats	21.560	20.482	20.933	16.357	15.004	14.454
Adj- R^2%						
Mean	2.772	2.618	2.838	1.672	1.804	1.551
Median	2.310	2.376	2.123	1.562	1.452	1.056

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Table 4-4b: Size effect and the liquidity commonality

Size effect and the liquidity commonality in DAMI, and DTNV.						
	DAMI			DTNV		
Concurrent	L	M	S	L	M	S
Mean	0.405	0.381	0.293	0.761	0.804	0.849
t-stats	22.759	20.130	18.557	21.021	25.674	23.199
Percentage+	79.037	77.000	70.400	72.600	70.258	67.222
Percentage significant	57.500	65.400	62.100	64.900	73.700	57.200
Lead						
Mean	0.023	0.012	0.020	-0.008	0.035	0.053
t-stats	1.837	0.902	1.881	-0.451	2.167	3.047
Percentage+	67.100	60.500	59.400	41.800	60.500	66.000
Percentage significant	0.000	0.000	0.000	1.100	0.000	0.000
Lag						
Mean	-0.014	-0.019	-0.009	-0.042	-0.048	0.009
t-stats	-1.144	-1.595	-0.836	-2.343	-2.321	0.451
Percentage+	48.400	45.100	48.400	37.400	46.200	55.000
Percentage significant	0.000	0.000	0.000	1.100	1.100	1.100
Sum						
Mean	0.414	0.374	0.304	0.711	0.836	0.866
t-stats	15.147	12.947	12.419	15.004	16.599	16.808
Adj- R^2**%**						
Mean	1.903	1.485	1.210	2.882	3.113	2.904
Median	1.606	1.012	0.759	2.618	2.530	2.266

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The results of the whole liquidity measures show that the commonality of liquidity is existed in all the different sizes, and that indicates the commonality of liquidity not driven by specific firms' size. For the concurrent of liquidity measures DPQSPR the AMIHUD more than 80% of the stocks in each size group have positive coefficient . And more than 70% of the stocks in each size group of DAMI, and DTNV have positive coefficient

The results of previous studies by those who have conducted the same test show varying results. Chordia et al. (2000) they show that, the means of "SUM" of the cross-sectional for DQSPR and DPQSPR, are related with company size positively. However, Fabre and Frino (2004) do not capture any size pattern for any of the liquidity proxies. Whereas, Brockman and Chung (2002) documented that a reversed U-shape pattern of the cross-sectional means of the coefficient when using the spread as proxy of liquidity; the proportion of stocks with positively significant coefficient increases with company size. In order to express the lack of consistency between the size patterns shown in the outcomes of previous studies and in our study and, additional investigation is required.

4.3.3 Market-wide commonality in liquidity during the 1997-98 crises.

This part studies the commonality in liquidity during the crises time. Chordia et al.(2000) argued that the presence of common factors in liquidity might be related to the market events and market crisis. The financial crisis of East Asia in 1997 is a good case to examine the commonality of market liquidity; therefore, in this study we examine the commonality of the liquidity during the crisis period. Table 4-5 compares the market-wide commonality in liquidity over the period of 1993- 2008, it is shows that the mean of sum of the lag, concurrent, and the lead of the coefficients of the daily percentage changes in an individual stock's liquidity measures of each year.

A similar approach to that proposed by Chordia et al. (2000) is used to test the existence of commonality in liquidity by using the market model to regress the percentage change in a sole stock liquidity proxy on the concurrent proportion of variation in the

measure of the market liquidity (the market liquidity measures is the value weighted average of liquidity of all sole stocks calculated which does not include the stock in the dependent variable) . The market model ran for each individual security for each year from 1993 to 2008.

One lag and one lead of the market wide liquidity plus the percentage of daily change in individual stock squared return (a measure of change in return volatility) and the lead, concurrent and lag values of the market return were included as additional regressors. The market return was included to remove spurious dependency produced by the relationship between the returns and spread measures. While the lags and leads were included to capture any lagged adjustment in commonality. following Chordia et al. (2000), the adjusted *t*-stat is the OLS *t*-statistics divided by $[1 + 2(N-1)\rho]^{1/2}$, where N is the number of regressions and ρ is the average residual cross-correlation across 125 regressions.

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Table 4-5: Variation of Commonality in Liquidity

	DPQSPR		DAMIHUD		DAMI		DTNV	
	Mean	β +	Mean	β +	Mean	β +	Mean	β +
1993	0.81	90.70	0.83	74.42	0.85	53.49	0.98	76.80
1994	0.84	93.02	1.06	67.44	0.85	53.49	0.92	88.80
1995	0.83	91.47	0.78	52.71	0.83	85.27	0.95	90.40
1996	0.78	87.60	1.25	63.57	0.81	86.82	1.01	67.20
1997	0.94	94.57	1.30	69.77	0.81	90.70	1.01	53.60
1998	0.84	96.90	0.78	75.97	0.82	91.47	0.97	89.60
1999	0.71	90.70	0.31	75.97	0.80	92.25	0.91	84.00
2000	0.63	86.82	0.23	87.60	0.78	95.35	0.93	79.20
2001	0.74	84.50	1.22	69.77	0.69	89.92	0.90	68.80
2002	0.44	69.77	0.91	71.32	0.81	89.92	0.87	84.80
2003	0.46	78.30	0.17	55.04	0.74	84.50	2.36	62.40
2004	0.56	71.32	0.51	57.36	0.71	88.37	0.97	84.80
2005	0.56	71.32	0.06	44.19	0.69	79.85	0.96	60.00
2006	0.67	84.50	0.10	62.79	0.76	79.85	0.67	76.80
2007	0.91	87.60	0.31	58.92	0.80	90.70	0.98	81.60
2008	0.67	74.42	0.55	59.69	0.63	79.85	0.90	73.60

In Table 4-5 PQSPR is the proportional quoted spread, Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI), and share turnover ratio (TNV). D indicates the daily proportional changes for each liquidity measure in that variable. The market average liquidity variables calculated by excluding the dependent variable stock. The sum of cross sectional Mean parameters are documented, as well as the positive parameters proportional.

Table 4-6: Commonality in liquidity during the crises

	DPQSPR	DAMIHUD	DAMI	DTNV
average 1997-1999	0.829	0.796	0.808	0.961
average 1993-2008	0.683	0.613	0.765	1.030

Table 4-6 compares the average of the mean coefficients cross the market liquidity measures over the whole period and the crises period. Table 4-6 show that the averages of the mean coefficients in the crises period are greater than the average for the whole period across all the liquidity measures. The results of DPQSPR show that the average coefficient on the SUM mean coefficients from 1997 to 1999 is 0.83 while the SUM mean coefficients from 1993 to 2008, excluding the crises years, is 0.68, a difference of 0.15. For DAMIHUD, the SUM mean coefficients in 1997 to 1999 is approximately 0.80 while the SUM mean coefficients in 1993 to 2008 exclude the crises years is 0.61, its difference being 0.19. Considering the DAMI, and DTNV the results consistent with the DPQSPR and DAMIHUD.

The empirical evidence shown in Table 4-6 are consistent with Brockman and Chung (2002) who argue that the financial crisis might lead to individual liquidity being strongly affected by market-wide factors

4.4 Sources of Liquidity

Liquidity is a complicated concept and it is affected by many factors. Past studies on liquidity determinants have mainly been limited in the cross-sectional studies such as Benston Hagerman, (1974), Stoll, (1978), and Tinic and West, (1972) They established their research on inventory and asymmetric information models. They suggest that there are factors affect liquidity and influence the risks of inventory which are faced by market-makers who have to provide the service of immediacy by holding sub-optimally diversified portfolios. The latter suggests that the costs of liquidity increase since compensation for the risk of trading is required by market-makers against informed investors. Thus, there are factors that could affect the market liquidity and the inventory risks of many firms simultaneously. The presence of the commonality of liquidity across individual stocks shows which certain fundamental economic forces and market factors are in charge of the systematic component of liquidity.

In contrast to the rich literature on liquidity in the U.S. market, the liquidity has not received adequate consideration in emerging markets. Therefore, our understanding of what causes the liquidity time variation in emerging markets is still limited. Our understanding is even more limited concerning the liquidity dynamics over long periods, as traditional studies in market microstructure normally deal with transaction-level liquidity dynamics. However, this study attempts to explore the role of macroeconomic variables as sources of liquidity across Malaysia's stock market, as one of the emerging markets, and to identify the candidates for macroeconomic liquidity sources. Before examining macroeconomic effects on liquidity, the researcher will investigate the intertemporal relationship between

aggregate liquidity and market variables (namely, market return, market return volatility and the trading activity).

4.4.1 Market variables and liquidity

Recent theoretical foundations such as Eisfeldt, (2004), and Taddei, (2007) built and examined a model to theorize the correlation between changes in liquidity with real fundamentals such as investments and productivity. While Massa and Centre for Economic Policy (2004) observed that a positive relationship exists between liquidity and fund flows when the funds are less informed. Liquidity is also important in the theoretical model of the "flight-to-quality" ("flight-to-liquidity") in (Vayanos, 2004).

The main goal of this section is to explore the role of macroeconomic variables as sources of liquidity across Malaysia's stock market as one of the emerging markets and to find what are candidates for macroeconomic liquidity sources. But before examining macroeconomic effects on liquidity, we are going to investigate the intertemporal relationship between aggregate liquidity and market variables.

In this section, we study the intertemporal association between liquidity and three market variables – return, return volatility and share turnover – using monthly data over the period starting from October 1992 until December 2008. we used three different proxies to measure the liquidity, which are effective spread, Amivest liquidity ratio, and Amihud liquidity measure; the definitions of these proxies and how they are calculated are provided in the previous section.

To examine the intertemporal association and the causality between liquidity and the market variables return, return volatility, and share turnover, we conducted four-variable VAR models analysis of liquidity and the market variables.. We tested the variables for the unit root by using augmented Dickey-Fuller and the Phillips-Perron unit root tests since all the variables in the VARs; the results show that all the variables are stationary, which allowed the causality between the variables in the model to be tested and the effects of shocks in each variable on itself and the others to be calculated.

This section starts by presenting the correlation between the market-wide liquidity measures and the market variables. Table 4-7 presents the correlation between the three liquidity measures at the aggregate market level and the market variables. The liquidity measures are PQSPR, AMIHUD and AMI. While the market variables are market share turnover (TNV), market volatility (VL), market return (RET).

Table 4-7: Correlation between the Monthly Aggregate Liquidity Measures and the market variables

	VL	TNV	RET	PQSPR	AMIHUD	AMI
VL	1	-0.151	0.025	0.393	-0.009	-0.069
TNV		1	-0.112	-0.212	0.096	-0.351
RET			1	-0.252	-0.183	0.289
PQSPR				1	0.690	-0.390
AMIHUD					1	-0.197
AMI						1

The correlation coefficients in Table 4-7 show that there is no high correlation between the variables. The highest correlation of .39 is between the VL and PQSPR; this result indicates that there is no multicollinearity and that consistent with the assumption of conducting the VARs.

Since the variables in the VARs model are supposed to be stationary, Table 4-8 presents the results of the augmented Dickey-Fuller and the Phillips-Perron unit root tests in every variable. The results show that the null hypothesis of nonstationarity is rejected for all the variables at the level for both tests.

Table 4-8: Unit root test of market variables

	ADF	PP
	Level	level
Series	Prob.	Prob.
PQSPR	0.016	0.024
AMIHUD	0.000	0.000
AMI	0.000	0.000
TNV	0.000	0.000
VL	0.000	0.000
RET	0.000	0.000

4.4.1.1 Granger causality tests

This section starts by examining the causal associations between liquidity and the market variables (market return, market volatility, and market share turnover). Variable A is Granger-cause variable B when a forecast of B rooted in previous records could be enhanced by considering the past history of A. Testing whether A Granger-causes B is basically a test of the hypothesis that the coefficients on lagged A are jointly equal to zero when B is the dependent variable in the VAR model.

Table 4-9 reports Chi-sq and *p*-value for the Granger causality tests. The results of the VAR model with PQSPR document that RET Granger-causes PQSRP at the 1%

significance level and VL weakly predict PQSPR at the 10% significance level. There is two-way causation observed between PQSPR and VL, indicating that PQSPR helps predict future VL and vice versa. That can show PQSPR has indirect information about RET through its strong predictive ability for VL. Also, the PQSPR causes the TNV although the reverse is not true. The tests based on the VAR model with AMIHUD indicate that it is significantly predicted by RET while AMIHUD itself does not predict any of the market variables, which is consistent with Fujimoto (2004) She documented that volatility, trading activity, and return, Granger-cause monthly liquidity significantly, however, the reverse is invalid We also observe that TNV Granger-cause AMI while RET and VL are significantly predicted by AMI. Overall, the result supporting the implications from the inventory risk model, and the dynamic model for order-driven markets in(Rosu, 2009). Moreover, the most of the results are consistent with the previous empirical results in US stock markets, as Goyenko, and Ukhov (2009), They found that both volatility and return Granger-cause liquidity and volatility is resulted from liquidity which are consistent with Chordia et al. (2005) study outcomes. However, In Goyenko, and Ukhov (2009) their study showed that volatility was not caused by liquidity.

Table 4-9: Granger Causality Tests

		RET	**VL**	**TNV**	**PQSPR**
	Chi-sq		10.077	1.671	21.100
RET	P-value		0.0065***	0.434	0.000***
	Chi-sq	0.559		3.089	5.200
VL	P-value	0.756		0.214	0.0838*
	Chi-sq	0.490	3.434		1.980
TNV	P-value	0.783	0.180		0.370
	Chi-sq	1.727	4.344	7.173	
PQSPR	P-value	0.422	0.0959*	0.0277**	
		RET	**VL**	**TNV**	**AMIHUD**
	Chi-sq		23.736	0.960	9.620
RET	P-value		0.000***	0.619	0.008***
	Chi-sq	1.583		2.421	0.820
VL	P-value	0.453		0.298	0.660
	Chi-sq	0.498	2.744		1.300
TNV	P-value	0.780	0.254		0.514
	Chi-sq	0.739	0.914	2.702	
AMIHUD	P-value	0.691	0.633	0.259	
		RET	**VL**	**TNV**	**AMI**
	Chi-sq		27.390	1.540	1.500
RET	P-value		0.000***	0.463	0.460
	Chi-sq	2.688		3.647	2.130
VL	P-value	0.261		0.162	0.340
	Chi-sq	0.409	1.417		5.600
TNV	P-value	0.815	0.493		0.075*
	Chi-sq	11.665	4.695	2.660	
AMI	P-value	0.0029***	0.0956*	0.264	

The table above presents the outcomes of the Granger causality tests. The null hypothesis of no causality from a horizontal construct to a vertical construct examined by utilizing the VAR(12) consisting of market return (RET), market volatility (VL), market share turnover (TNV), and market liquidity variables, PQSPR is the proportional quoted spread, Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI). Chi-sq and

related p-values (in parentheses) are reported. The p-values being significant at 1, 5, and 10% as pointed out by '***', '**', and '*', respectively. The sample period is 1992:10-2008:12.

Impulse response functions and variance decomposition

To study the joint dynamics between the market liquidity and the market variables, the full VAR system, impulse response functions (IRF), and variance decomposition (VDs) have been estimated. The IRFs document dynamic responses of liquidity variables to orthogonalized one- unit standard deviation positive shocks in it and the other variables. That were conducted by utilizing standard Cholesky decompositions of the VAR residuals Since Results from the IRFs and variance decompositions are basically sensitive to the specific ordering of the endogenous variables and assuming that placing a variable earlier in the ordering tends to raise its impact on the variables that follow it, therefore the ordering of the endogenous variables might affect the outcome of the IRFs and VDs in the VAR system.

In accordance with Chordia et al., (2005), Roll, Schwartz, and Subrahmanyam, (2007), and Subrahmanyam, (2007), the variables are ordered in the VAR model: Trading activity, market volatility , market return, liquidity measures. As explained by Chordia et al. (2005) they placed trading activity variable first, because the stock price normally start forming by the observation of market-makers on an order. In addition, according to the theory of market microstructure, generally the information influence prices in the course of trading. However, Subrahmanyam (2007) indicated that the ordering of the remaining variables are unclear. Conversely, Foucault, (1999), Foucault et al., (2005), and Rosu,

(2009) models of order-driven markets, it is pointed out that trading activity and volatility respectively could be placed prior to liquidity variable in the ordering in the VAR model. Also, as our objective is to examine how liquidity responds to market wide shocks, the liquidity is ordered at last.

Figure 4-1, the IRFs over a 2-year period are shown for the different illiquidity (PQSPR and AMIHUD) and liquidity (AMI) proxies, the contemporaneous effect is given in month 0. The vertical axes scaled to the measurement of the responding variable. The IRF results indicate that a unit innovation in VL has small effects on both illiquidity measures, yielding a 3-month increase in PQSPR and 5 month-long significant rise in AMIHUD, while the liquidity measure AMI declines in response to VL by 0.1 standard deviation, and the decline remains for more than 8 months. This result is consistent with (Foucault, 1999; Rosu, 2010) models, whereby a shock to volatility forecasts a decline in liquidity. A positive unit standard deviation shock in TNV generates an insignificant impulse response in illiquidity and liquidity measures. This result is consistent with Fujimoto (2004) who found insignificant impulse responses in liquidity to the share turnover shocks, and Goyenko, and Ukhov (2009) who omitted the trading activity variable as it has relatively weak impact on liquidity.

A positive unit standard deviation shock in RET produces an initial month decline of about 0.1 in the illiquidity measures, PQSPR and AMIHUD, while the RET has smaller effect on AMI. This is in line with previous empirical evidence of liquidity improvements connected with rising markets (Chordia et al., 2001).

Figure 4-1: Impulse response of liquidity

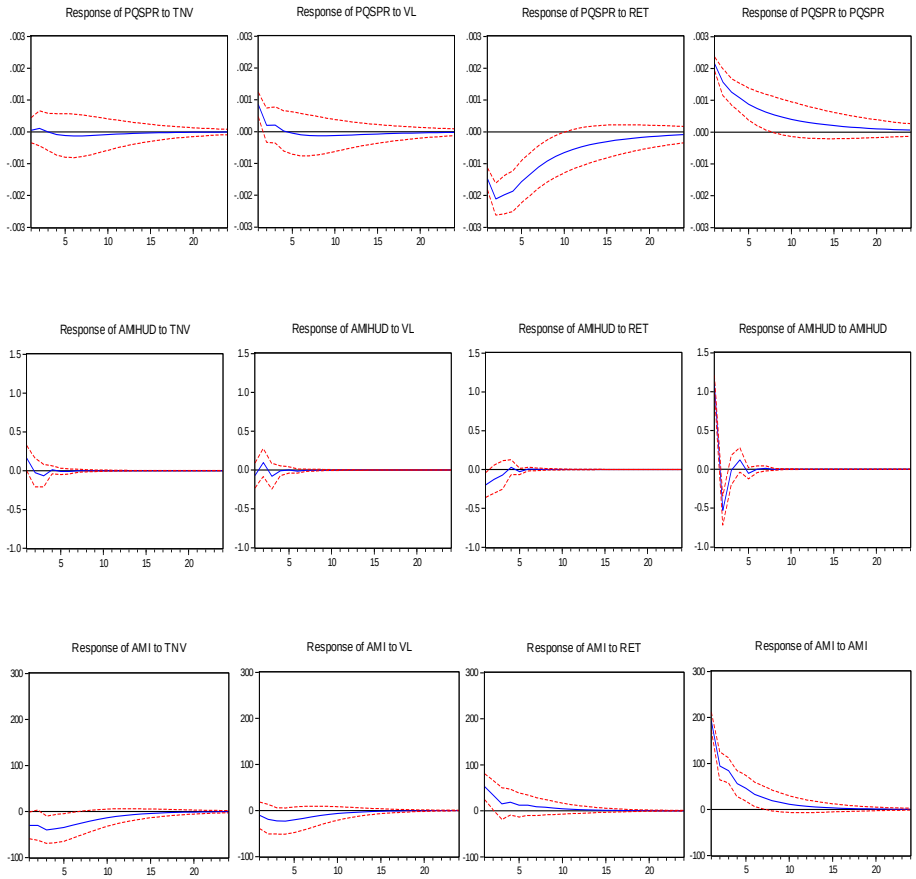


Figure 4-1 illustrates the impulse response functions. The figures plot impulse response functions estimated from the VAR(12) models composed of market share turnover (TNV), market volatility (VL), market return (RET), and market liquidity in that order. Liquidity measures can be proportional spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI). Impulse responses of liquidity measures plots to a Cholesky one standard deviation shock in each VAR variable over a 24-month period. The sample period is 1992:10-2008:12.

The directions of the liquidity responses to the market variables shocks are all consistent with the forecast based on the models of Foucault, (1999), Foucault et al., (2005), and Rosu, (2009) in order-driven markets and as dose the inventory risk model while the persistence and magnitude of the responses differ across different liquidity proxies.

Since the results of IRFs could be based on the ordering of the variables in the VAR model, other alternatives of ordering (not reported) are performed. Shocks to return significantly forecast liquidity increase of all liquidity proxies that are independent of the ordering specified in the VAR model. Additionally, if return is placed after the liquidity variables, the response peaks in the second period for all specified liquidity variables. The outcomes of the IRF are not robust for the ordering of trading activity and volatility.

An alternative approach to characterize the liquidity dynamics is by the variance decomposition. The variance decomposition (VDs), estimates the magnitude of the forecast error variance in liquidity at different forecast horizons that are computed for by innovations in each VAR series. The results of the VDs summarize the relative importance of different shocks in explaining the unexpected movements of liquidity. In Table 4-10, the innovations of the VARs are correlated. Thus, it is useful to perform Cholesky decomposition of the VAR residuals when conducting the VDs. Furthermore, the variables in the VAR system are in the same ordering that are used in the IRFs, i.e., the ordering are TNV, VL, RET, and Liquidity measure. Table 4-10 depicts the outcomes for the VDs of the illiquidity for the five forecast horizons (1, 3, 6, 12, and 24 months).

Table4-10a: Variance Decompositions

Variance Decompositions of the liquidity variables					
		TNV	VL	RET	PQSPR
PQSPR	1.000	0.032	9.761	28.748	61.460
	3.000	0.070	4.070	52.663	43.197
	6.000	0.170	2.735	60.385	36.710
	12.000	0.308	2.598	62.011	35.083
	24.000	0.321	2.635	62.124	34.920
AMIHUD	1.000	2.009	0.386	3.090	94.515
	3.000	1.918	1.301	3.766	93.015
	6.000	1.914	1.302	3.818	92.965
	12.000	1.916	1.304	3.818	92.962
	24.000	1.916	1.304	3.818	92.962
AMI	1.000	2.277	0.267	6.788	90.668
	3.000	5.571	1.591	6.773	86.065
	6.000	9.492	3.020	6.568	80.919
	12.000	11.278	3.475	6.498	78.749
	24.000	11.407	3.490	6.489	78.614

The table above presents the results of the variance decompositions estimated from the VAR (12) system comprise four variables that are market share turnover (TNV), market volatility (VL), market return (RET), and market liquidity. where market liquidity is proportional spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI) .Panel :A show The variance decompositions of PQSPR , AMIHUD , and , AMI with TNV, VL, and RET. The numbers in the table present the percentages of the predict error variance in a row variable computed for by innovations in each column variable at month horizons 1, 3, 6, 12, and 24. The sample period is 1992:10-2008:12.

Table4-10b

Variance Decompositions of the liquidity variables					
	horizon	TNV	VL	RET	PQSPR
TNV	1.000	100.000	0.000	0.000	0.000
	3.000	97.586	0.427	0.069	1.918
	6.000	91.793	0.374	2.466	5.367
	12.000	83.649	0.359	8.102	7.890
	24.000	81.573	0.406	9.611	8.411
VL	1.000	0.815	99.185	0.000	0.000
	3.000	2.296	86.052	10.728	0.924
	6.000	3.790	82.351	12.912	0.948
	12.000	4.406	81.642	12.750	1.202
	24.000	4.419	81.502	12.817	1.262
RET	1.000	0.510	0.000	99.490	0.000
	3.000	0.739	0.495	98.236	0.530
	6.000	0.737	0.779	97.580	0.905
	12.000	0.743	0.793	97.424	1.041
	24.000	0.745	0.793	97.400	1.062

The table above presents the results of the variance decompositions estimated from the VAR (12) system comprise four variables that are market share turnover (TNV), market volatility (VL), market return (RET), and market liquidity. where market liquidity is proportional spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI) .Panel :A show The variance decompositions of PQSPR , AMIHUD , and , AMI with TNV, VL, and RET. The numbers in the table present the percentages of the predict error variance in a row variable computed for by innovations in each column variable at month horizons 1, 3, 6, 12, and 24. The sample period is 1992:10-2008:12.

The majority of the liquidity variables variation is expressed by its own past shock; also the market variables make significant contributions. For example, RET and VL shocks

respectively account for 28% to 62.1% and 3 to 10% of the variation in PQSPR at different prediction horizons. The role of TNV innovation contribution to PQSPR is very small and it is increases slightly over the forecast period. Correspondingly, in forecasting liquidity variables, the innovations in liquidity cause fractions of the error variance which are higher for Amihud than AMI. In forecasting liquidity variables, the innovations in liquidity cause the fraction of the error variance which is more than 94% for Amihud and below 92% for AMI. The fractions in AMI decline significantly unlike Amihud the fractions just hardly decline at longer horizons.

In table 4-10, panel A the market return RET has the greatest relative significance to explain the error variance in liquidity. The contribution of RET to error variance of AMIHUD barely rises from 3% at the 1-month horizon to 3.8% at the 2-year horizon, while its contribution to AMI declined from 6.8% at the 1-month horizon to 6.4% at the 2-year horizon. The liquidity's error variance significantly explained more by trading activity compared to Volatility, for both liquidity measures Amihud and AMI. The contribution of TNV to AMIHUD at short horizons is up to 2% at shorter and longer horizons, while the contribution of VL to error variance of AMIHUD declined at the 1-month horizon from 0.3% to 1.3% at longer horizons. While The contribution of TNV to AMI increased significantly from 2.3% at the 1-month horizon to 11.4% at 2-year horizon, while the contribution of volatility slightly increased at the 1-month horizon from 0.3% to 3.5% at longer horizons.

To sum up the findings of this section: based on the granger causality tests, impulse response functions (IRF). We follow Weinhagen, (2002) pointed out that impulse response function is statistically significant when both standard error bands are above or below zero

on the y-axis., the market factors, as volatility and return, are significant factors of market-wide liquidity at the monthly frequency. Positive shocks in market return improve liquidity Chordia et al. (2006) argued that usually the increasing of stock returns known as a factor that can lead to positive investor expectations and change the investing behavior to increase the trading activity of investors, thus, liquidity increases, while an innovation in volatility declines it that consistent with Rosu (2010) in the dynamic model for order-driven markets he argued that liquidity decreases due to that the proportions of limit order submissions in relation to market orders decreasing when volatility increases and he also expected that an increase in volatility cause a negative impact on liquidity.

Subsample results

This section examines the robustness of our results in the earlier section by estimating the same VAR models again for two subsamples, before and after Asian economic crises in 1997. The two subsamples would be from 1992 to 1997 and 1999 to 2008. We expect the subsample analyses of the dynamic relation between market and market liquidity are varying throughout the whole sample due to the economic and investment policies that implemented in Malaysia before and after the Asian markets crises in 1997.

For the purpose of this study, we are concerned with the constancy of the interactions between liquidity and the market variables, as the changes in their associations may change the extent to which macroeconomic shocks influence liquidity through their effects on the market variables. This section explores this issue by conducting the impulse

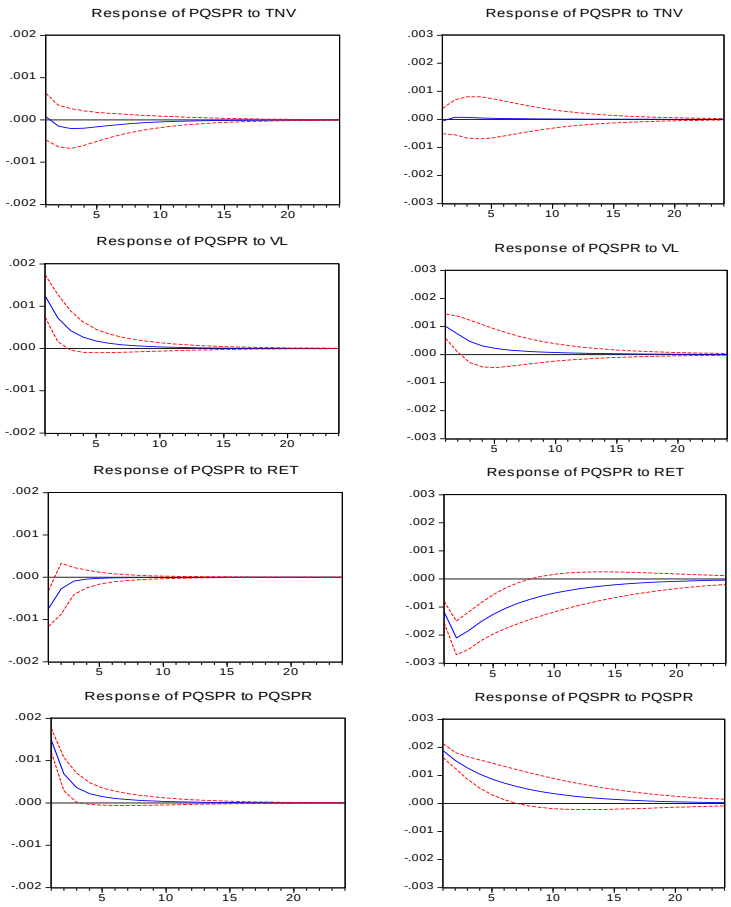
response functions (IRFs) and variance decompositions (VDs) of liquidity for the two subsamples.

The results of the IRFs given in Figure 2 illustrate that the patterns of the liquidity responses to the market variables shocks vary substantially between the two subsamples. Particularly, the effects of the VL shocks on liquidity become smaller in terms of the magnitude in the latter half of the sample, while the effect of the RET become bigger in the latter half of the sample. For example, a positive *VL* shock during the first subperiod yields immediate increase of 0.012, and 0.01 standard deviations in *PQSPR* and *AMIHUD*, respectively, and its effects on the corresponding liquidity measures remain significant for the subsequent 9, and 3 months. In the following period, the same shock produces smaller initial-month increases in *PQSPR* and *AMIHUD* and its effects are significant for *PQSPR* only *over* shorter time periods. positive *RET* shock during the second subperiod yields immediate declines of 0.01, and 0.3 standard deviations in *PQSPR* and *AMIHUD* , respectively, and its effects on the corresponding liquidity measures remain significant for the subsequent 16, and 10 months. In the first period, the same shock produces smaller initial-month reductions in *PQSPR* and *AMIHUD* and its effects are significant for both *PQSPR* and *AMIHUD* over shorter time periods.

Figure 4-2a: Impulse responses of liquidity to market variables shocks – Subsample results.

PQSPR

1992:10-1997:6 1999:3-2008:12



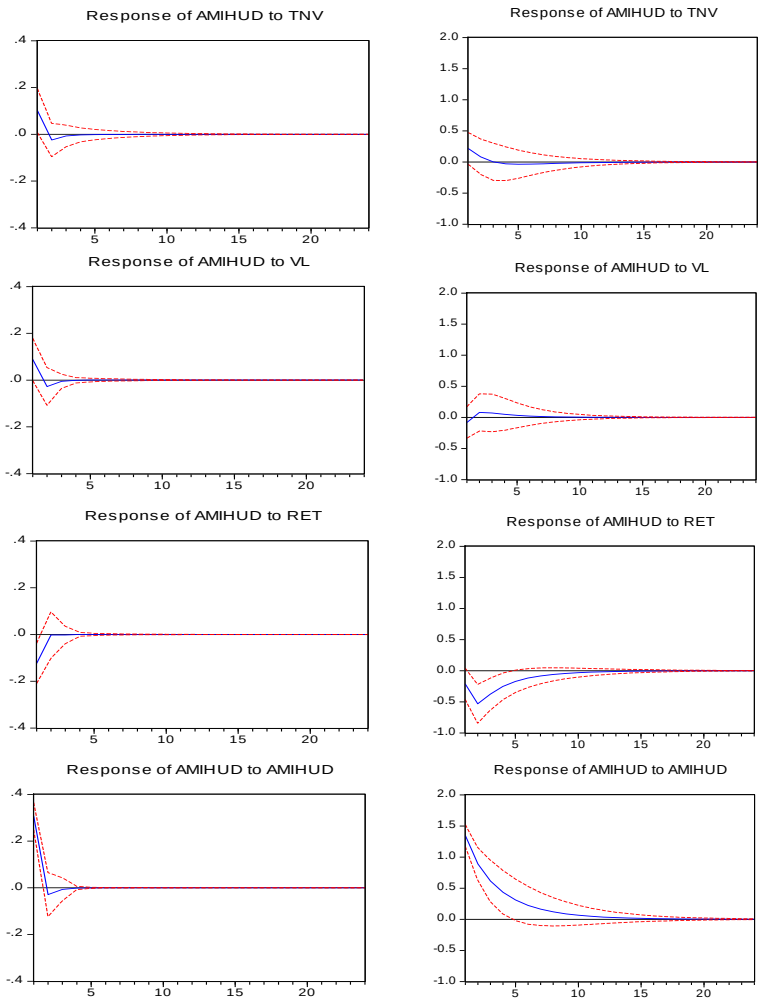
Impulse responses of PQSPR to market variables shocks - Subsample results

The figures present impulse responses of market-wide liquidity to a Cholesky one standard deviation shock in each market factor over two subsamples, 1992:10-1997:06 and 1999:03-2008:12. The VAR(11) models consisting of market share turnover (TNV), market volatility (VL), market return (RET),and market liquidity in that order are estimated. Liquidity can be proportional spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI) .In Panel: A, two columns represent impulse responses of PQSPR to the market variables shocks TNV, VL, and RET. Dashed lines are two standard error bands.

Figure 4-2b: Impulse responses of liquidity to market variables shocks - Subsample results. (Continued)

AMIHUD

1992:10-1997:6 1999:3-2008:12



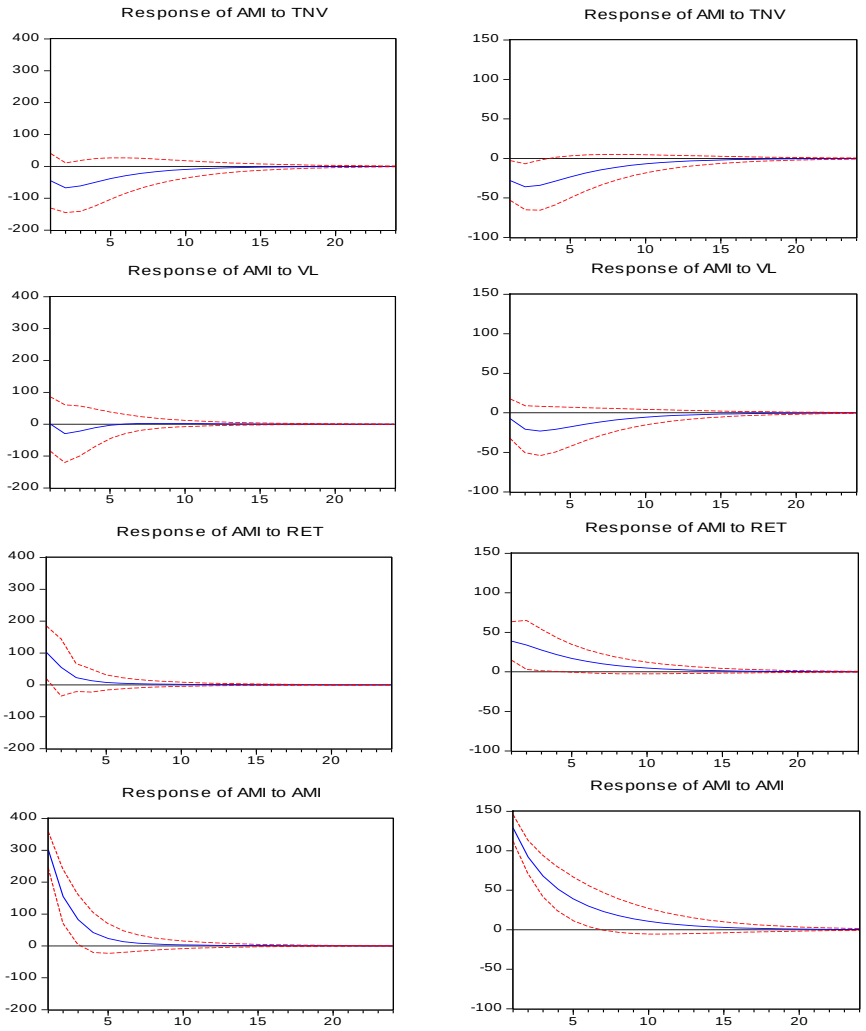
Impulse responses of AMIHUD to market variables shocks - Subsample results.

Two columns represent impulse responses of AMIHUD to the market variables shocks TNV, VL, and RET. Dashed lines are two standard error bands.

Figure 4-2c: Impulse responses of liquidity to market variables shocks - Subsample results. (Continued)

AMI

1992:10-1997:6 1999:3-2008:12



Impulse responses of AMIHUD to market variables shocks - Subsample results. Two columns represent impulse responses of AMIHUD to the market variables shocks TNV, VL, and RET. Dashed lines are two standard error bands

The figure also indicates that the effects of the VL shocks on AMI become bigger in terms of the magnitude in the latter half of the sample. While the effect of the RET is become bigger in the first half of the sample. this result consistent with the PQSPR and AMIHUD since both of them are measures for the illiquidity while AMI is measure for the liquidity. Insignificant influences of a *TNV* innovation on *PQSPR* are observed throughout the both sample. In general, the effects of the market shocks on liquidity become smaller both in terms of the magnitude and persistence in the latter half of the sample. For example, a positive *RTN* shock during the first subperiod yields immediate declines of 0.21, 0.25, and 0.32 standard deviations in *PSPR*, *PRIM*, and *NREV*, respectively, and its impacts on the corresponding liquidity measures.

Table 4-11 shows the variance decompositions of the liquidity measures for two subsamples, 1992:10-1997:06 and 1999:03-2008:12. The VAR (11) models comprise market share turnover (TNV), market volatility (VL), market return (RET), and market liquidity. where market liquidity is proportional spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI) .Panel :A show The variance decompositions of PQSPR , AMIHUD , and , AMI with TNV, VL, and RET. The numbers in the table present the percentages of the predict error variance in a row variable computed for by innovations in each column variable at month horizons 1, 3, 6, 12, and 24.

The results of the VDs provided in Table 4-11 complement the findings of the IRFs and show that the results of the market-wide shocks for the movements of liquidity variables is vary between the subsamples. The declines in the effects of VL shocks are especially at the longer end of the forecast periods. For example, the fractions of the

forecast error variances to VL shock decrease from about 39 to 6.7% for PQSPR, 6.6 to 0.6% for AMIHUD.While its increase from 0.9 to 4.8% for AMI at the 2-year horizon. The contributions of a RET shock increase at the shorter and long horizons for PQSPR, While its decrease at short horizons and increase in the long horizon for AMIHUD.

Table 4-11: Variance Decompositions - Subsample Results

1992:10-1997:06						1999:03-2008:12			
horizon	horizon	TNV	VL	RET	PQSPR	TNV	VL	RET	PQSPR
PQSPR	1	0.14	35.85	12.82	51.19	0.07	17.09	23.34	59.51
	3	1.22	38.99	11.07	48.72	0.08	9.58	49.73	40.61
	6	2.53	39.08	10.59	47.80	0.08	7.47	54.51	37.94
	12	2.91	39.00	10.50	47.58	0.07	6.80	55.85	37.29
	24	2.93	38.99	10.50	47.57	0.07	6.72	56.00	37.22
AMIHUD	1	8.14	6.16	12.01	73.68	2.46	0.34	2.30	94.89
	3	8.50	6.64	11.80	73.05	1.53	0.51	13.32	84.64
	6	8.51	6.64	11.80	73.05	1.44	0.55	14.52	83.48
	12	8.51	6.64	11.80	73.05	1.47	0.55	14.61	83.37
	24	8.51	6.64	11.80	73.05	1.47	0.55	14.61	83.36
AMI	1	1.98	0.00	10.12	87.89	4.11	0.28	8.03	87.58
	3	6.99	0.91	9.49	82.61	8.62	2.71	9.18	79.49
	6	9.72	0.95	9.19	80.14	10.73	4.29	9.51	75.47
	12	10.34	0.96	9.13	79.57	11.26	4.74	9.57	74.42
	24	10.36	0.96	9.13	79.55	11.29	4.77	9.58	74.37

In addition the fractions of the forecast error variances to TNV shock decrease from about 2.93 to 0.07% for PQSPR, 8.51 to 1.47% for AMIHUD ,While its increase from 10.36 to 11.29% for AMI at the 2-year horizon.

To sum up the findings of this section, the dynamic relationships between the market variables and the market aggregate liquidity are different in time. Also, the market

factors, as volatility and return, are significant factors of market-wide liquidity at the monthly frequency. The intertemporal relations between market return and liquidity is stronger during the second half of the sample period. While the intertemporal relation between market volatility on AMI become bigger in terms of the magnitude in the latter half of the sample. While the effect of the RET become bigger in the first half of the sample. This result consistent with the PQSPR and AMIHUD since both of them are measures for the illiquidity while AMI is measure for the liquidity.Insignificant influences of a *TNV* innovation on *PQSPR* are observed throughout the both sample.

Positive shocks in market return improve liquidity Chordia et al. (2006) argued that usually the increasing of stock returns known as a factor that can lead to positive investor expectations and change the investing behavior to increase the trading activity of investors, thus, liquidity increases, while an innovation in volatility declines it that consistent with Rosu (2010) in the dynamic model for order-driven markets he argued that liquidity decreases due to the increasing of volatility which lead to decreasing in the proportions of limit order submissions in relation to market orders, and he also expected that an increase in volatility cause a negative impact on liquidity. In the first half of the sample, the market-wide shocks have stronger impacts on the aggregate liquidity and explain larger proportions of the liquidity variation in the short horizon and the long horizon. The relation between market variables and market liquidity are varying throughout the whole sample might be due to the economic and investment policies that implemented in Malaysia before and after the Asian markets crises in 1997. Since Malaysia implemented the capital control policy after the Asian markets crises in 1997.

4.4.2 Macroeconomic variables and liquidity

Macroeconomic fundamentals are responsible for the systematic liquidity; the changes in economic forces may have a direct effect on inventory risks. For example, negative economic news may cause a decline in expected future earnings and encourage investors to leave the stock market to the safer bond market. This so-called "flight-to-quality" effect might yield higher order imbalance, increased volatility, and a declining price for many stocks. The resulting market conditions, in order, contribute to an increase in inventory control risks for market-makers since they accumulate significant situations on one side of the market and face higher risks of adverse price fluctuation for stocks held in their inventories.

The macroeconomic variables used in this study are money market rate as a proxy for the interest rate and the growth rate of the industrial production (IP) as a proxy for the output. The investment portfolio and the Real Effective Exchange Rate are measured as the weighted average of Ringgit Malaysia relative to an index or basket of other major currencies adjusted for the effects of inflation measured. Interest rate reflects the money and bond market rate, which are considered as alternative investment opportunities. The Industrial Production measures real economic activity and the business cycle, exchange rate and investment portfolio measure the foreign investor flow.

Monthly data was used for the period that started from October 1992 until December 2008. All the data were obtained from International Financial Statistics and Bank Negara statistics. All the data were available in monthly frequency except investment portfolio, which were available in quarterly frequency; therefore, we converted the data

from quarterly to monthly frequency using the R Statistic software. The method used is explained in the appendix.

To examine the intertemporal association and the causality between liquidity and the macroeconomic variables, we conducted eight-variable VAR models analysis involving liquidity, market variables, and macroeconomic variables, with one lag based on Akaike's Information Criterion (AIC) and Schwarz Criterion (SC). All the series are standardized and contained in the analysis. We tested the variables for the unit root by using augmented Dickey-Fuller and the Phillips-Perron unit root tests since all the variables in the VARs should be stationary. The results in table 4-13 show that all the macroeconomic variables are stationary in the first level, except the investment portfolio, which was stationary in the second level. The VAR allows us to test the causality between the variables in the model and calculate the effects of shocks in each variable on itself and the others.

The main goal of this section is to explore the role of macroeconomic variables as sources of liquidity across Malaysia's stock market as one of the emerging markets and to find what are candidates for macroeconomic liquidity sources. This section starts by present the correlation between the market and the macroeconomic variables with the market-wide liquidity measures. Table 4-12 presents the correlation between the three liquidity measures at the aggregate market level and the market variables. The liquidity measures are PQSPR , AMIHUD and AMI. While the market variables are market share turnover (TNV), market volatility (VL), market return(RET), Industrial Production (IP), Real Effective Exchange Rate(REXR), Investment Portfolio (INP), and Interest Rate (IR).

Table 4-12 presents the correlation between three monthly aggregate liquidity measures,and the market and the macroeconomic variables, proportional quoted spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI). While the market variables are market share turnover (TNV), market volatility (VL), market return (RET), Industrial Production (IP), Real Effective Exchange Rate(REXR), Investment Portfolio(INP) , and Interest Rate (IR).The sample period is 1992:10-2008:12.

Table 4-12: Descriptive Statistics for Monthly Aggregate Liquidity Measures

	IP	REXR	INP	IR	VL	TNV	RET	PQSPR	AMIHUD	AMI
IP	1	-0.03	0.03	0.05	-0.07	0.17	-0.01	-0.12	0.02	-0.06
REXR		1.00	0.01	0.02	0.03	-0.06	0.25	-0.08	-0.14	0.02
INP			1.00	0.06	-0.06	0.01	0.06	-0.50	-0.01	0.43
IR				1.00	-0.01	-0.07	-0.08	-0.06	-0.03	0.08
VL					1.00	-0.15	0.03	0.39	-0.01	-0.07
TNV						1.00	-0.11	-0.21	0.10	-0.35
RET							1.00	-0.25	-0.18	0.29
PQSPR								1.00	0.69	-0.39
AMIHUD									1.00	-0.20
AMI										1.00

The correlation coefficients in Table 4-12 show that there is no high correlation between the variables. The highest correlation of 0.473 is between the INP and PQSPR.

Since the variables in the VARs are assumed to be stationary, Table 4-13 presents the results of the Augmented Dickey-Fuller (ADF) and the Phillips-Perron(PP) unit root tests on liquidity variables: Industrial Production (IP), Real Effective Exchange Rate(REXR),

Investment Portfolio(INP) , and Interest Rate (IR). The results indicate that the null hypothesis of nonstationarity is rejected for the all variables at the 1st difference for both tests, while the investment portfolio (INP) is stationary in the level.

Table 4-13: Unit root test of market variables

	ADF		PP	
	Level	1st dif	level	1st dif
Series	Prob.	Prob.	Prob.	Prob.
IP	0.5395	0.000	0.5592	0.000
REXR	0.357	0.000	0.4054	0.000
INP	0.0428	0.000	0.0393	0.000
IR	0.5855	0.000	0.3809	0.000

Granger Causality Tests

This section examines the causal relationships between macroeconomic variables (IP, REXR, INP, and IR), and liquidity and the market variables of market return, market volatility, and market share turnover. Table 4-14 reports the Chi-sq and *p*-value for the Granger causality tests. The null hypothesis of no causality from a row variable to a column variable is tested using the VAR(12) consisting of Industrial Production (IP), Real Effective Exchange Rate(REXR), Investment Portfolio(INP) , Interest Rate (IR), market return (RET), market volatility (VL), market share turnover (TNV), and market liquidity variables, PQSPR is the proportional quoted spread, Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI). Chi-sq and related p-values (in parentheses) are reported.

Table 4-14: Granger Causality Tests

		TNV	VL	RET	PQSPR
	Chi-sq	1.366	0.578	2.896	19.561
IP	Prob.	0.505	0.749	0.235	0.000***
	Chi-sq	0.695	23.849	12.041	10.219
REXR	Prob.	0.707	0.000***	0.002***	0.006***
	Chi-sq	0.095	3.799	6.393	1.298
INP	Prob.	0.954	0.150	0.041**	0.523
	Chi-sq	0.403	1.135	4.247	6.101
IR	Prob.	0.818	0.567	0.120	0.047**
		TNV	VL	RET	AMIHUD
	Chi-sq	1.165	1.325	0.107	1.724
IP	Prob.	0.559	0.515	0.948	0.422
	Chi-sq	0.408	16.237	7.910	2.361
REXR	Prob.	0.816	0.000***	0.019**	0.307
	Chi-sq	0.553	6.092	4.265	1.673
INP	Prob.	0.758	0.048**	0.099*	0.433
	Chi-sq	0.052	0.330	3.752	0.820
IR	Prob.	0.975	0.848	0.153	0.664
		TNV	VL	RET	AMI
	Chi-sq	1.398	1.435	0.256	0.192
IP	Prob.	0.497	0.488	0.880	0.908
	Chi-sq	0.429	15.705	7.315	1.292
REXR	Prob.	0.807	0.000***	0.0258**	0.524
	Chi-sq	1.727	5.101	5.616	2.745
INP	Prob.	0.422	0.078*	0.0603*	0.254
	Chi-sq	0.033	0.334	4.052	0.067
IR	Prob.	0.984	0.846	0.132	0.967

The p-values being significant at 1, 5, and 10% are indicated by '***', '**', and '*", respectively. The sample period is 1992:10-2008:12.

The results of the VAR model with PQSPR document that IP and REXR Granger-causes PQSRP at the 1% significance. IR Granger-causes PQSRP at the 5% level, while there is no Granger-cause between the macroeconomic variables and the other liquidity variables (AMIHUD and AMI). Real effective exchange rate (REXR), Granger-causes VL and RET across all of the liquidity variables. Similarly, INP predicts both VOL and RET

for all of the liquidity measures except for the PQSPR. Its only predicts RET at the 5% significance level.

The Real effective exchange rate and investment portfolio significantly Granger-causes market volatility and market return with all the market liquidity measures. That suggests The Real effective exchange rate and investment portfolio to be other important drivers of liquidity. The results therefore indicate that macroeconomic shocks not only affect liquidity directly, but also indirectly through their impacts on other stock market variables.

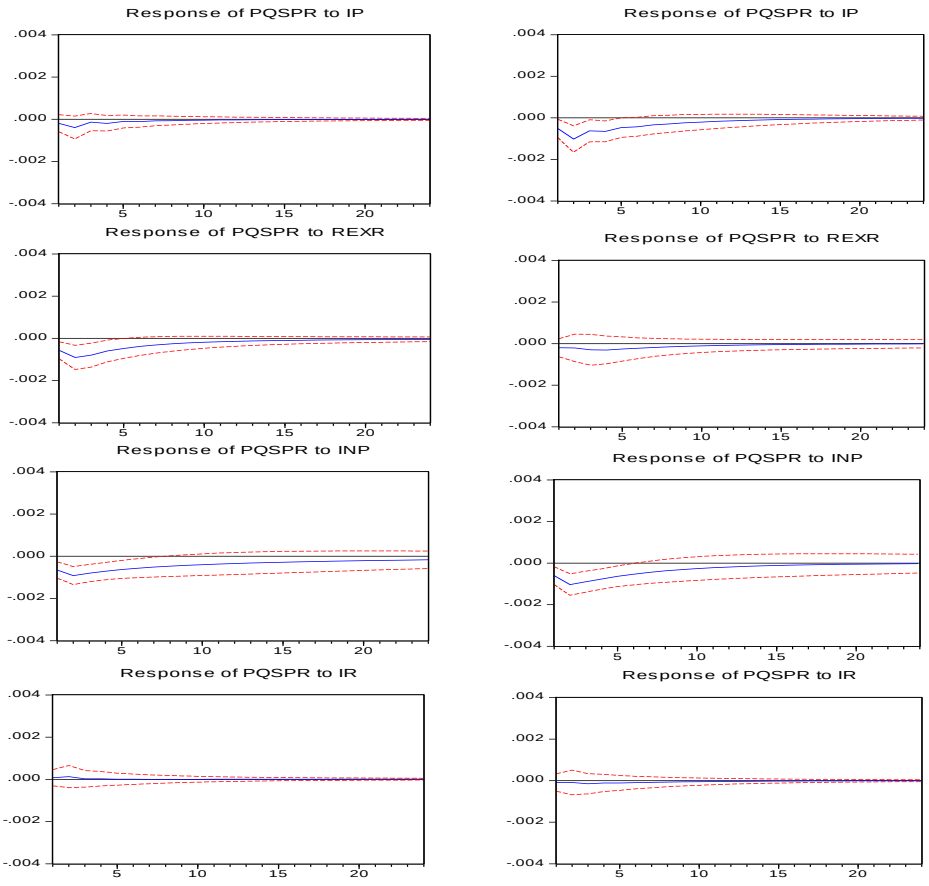
Impulse Response Functions and Variance Decomposition

The eight-variable VAR models are composed of *IP*, *REXR*, *INP*, *IR*, TNV, VOL, RET, and Liquidity is estimated with one lag based on Akaike's Information Criterion (AIC) and Schwarz Criterion (SC). Based on the conventional practice in the macroeconomic studies, the economic series are ordered as follows: IP, REXT, INP, and IR and are placed before the market variables whose ordering is kept the same as in the previous section. Following (Bjørnland, 2009; Christiano, Eichenbaum, & Evans, 1996), REXR is placed ahead of IR when its effects on ILLIQ are estimated. As shown by the recent business cycle studies, Figure 4-3, show the results of the subsample IRFs of the liquidity variables to the macroeconomic shocks

Figure 4-3a: Impulse responses of liquidity to macroeconomic variables shocks – Subsample results.

PQSPR

1992:10-1997:6 1999:3-2008:12

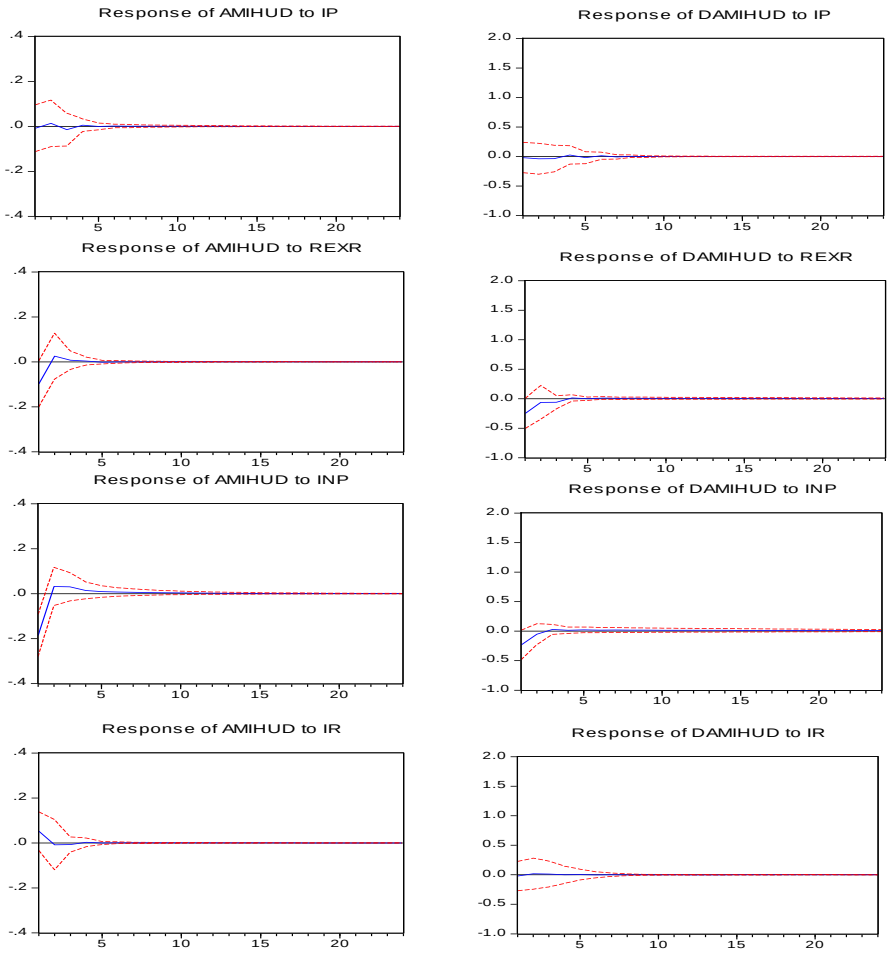


Impulse responses of PQSPR to macroeconomic variables shocks - Subsample results. The figures present impulse responses of market-wide liquidity to a Cholesky one standard deviation shock in each macroeconomic factor over two subsamples, 1992:10-1997:06 and 1999:03-2008:12. The VAR(11) models consisting of industrial production (IP), Real Effective Exchange Rate(REXR), Investment Portfolio(INP) , Interest Rate (IR) market share turnover (TNV), market volatility (VL), market return (RET),and market liquidity in that order are estimated. Liquidity can be proportional spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI) .In Panel: A, two columns represent impulse responses of PQSPR to the macroeconomic variables shocks IP, REXR, INP and IR. Dashed lines are two standard error bands.

Figure 4-3b: Impulse responses of liquidity to macroeconomic variables shocks – Subsample results. (Continued)

AMIHUD

1992:10-1997:6 1999:3-2008:12



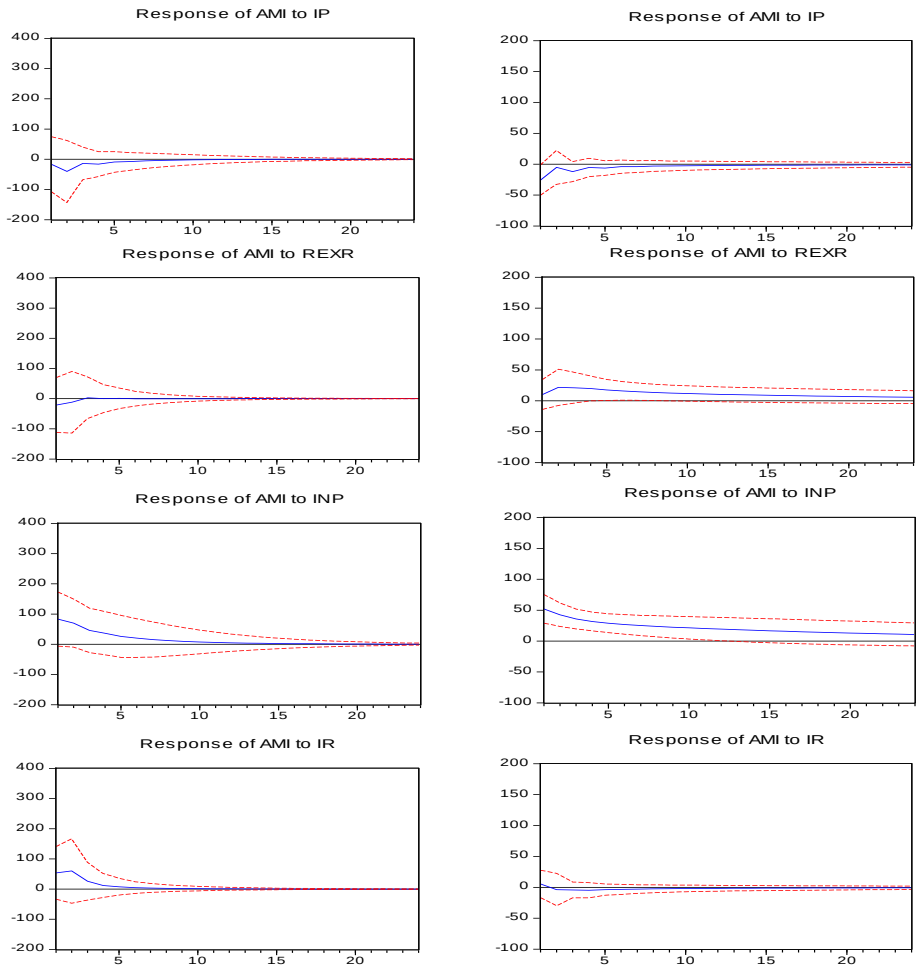
Impulse responses of AMIHUD to macroeconomic variables shocks - Subsample results.

Two columns represent impulse responses of AMIHUD to the macroeconomic variables shocks IP, REXR, INP and IR. Dashed lines are two standard error bands.

Figure 4-3c: Impulse responses of liquidity to macroeconomic variables shocks – Subsample results. (Continued)

AMI

1992:10-1997:6 1999:3-2008:12



Impulse responses of AMI to macroeconomic variables shocks - Subsample results.

Two columns represent impulse responses of AMI to the macroeconomic variables shocks IP, REXR, INP and IR. Dashed lines are two standard error bands.

Panel A of the figure 4-3 indicates that a positive unit standard deviation shock in *IP* affects PQSPR insignificantly in the first subsample, while the effect on the second subperiod is more stronger and remained for more than 12 months. However, the positive shock in IP affects AMIHUD and AMI insignificantly in the two subsamples. The effects of the REXR and INP shocks on liquidity become smaller in terms of the magnitude in the latter half of the sample. For example, a positive *REXR* shock during the first subperiod yields immediate decline of 0.01, and 0.09 changes in *PQSPR* and *AMIHUD*, respectively, and its effects on the corresponding liquidity measures remain significant for the subsequent 8, and 2 months. In the following period, the same shock produces smaller initial-month decline in *PQSPR* and *AMIHUD* and its effects are significant for *AMIHUD* only *over* shorter time periods.

Positive *INP* shock during the first subperiod yields immediate declines of 0.01, and 0.2 changes in *PQSPR* and *AMIHUD*, respectively, and its effects on the corresponding liquidity measures remain significant for the subsequent 15, and 2 months. In the following period, the same shock produces smaller initial-month reductions in *PQSPR* and *AMIHUD* and its effects are significant for both *PQSPR* and *AMIHUD* over shorter time periods. Figure 4-3 also indicates that the effects of the INP shocks on AMI during the first subperiod yields immediate increase of 0.9, and 0.5 standard deviations in the first and second subsamples, respectively, and its effects on the corresponding liquidity measures remain significant for the subsequent 6, and 10 months. While the effect of the REXR shocks in AMI produces small initial-month and its effects are significant in the second half of the sample. This result is consistent with the PQSPR and AMIHUD since both of them are measures for the illiquidity while AMI is measure for the liquidity. Insignificant

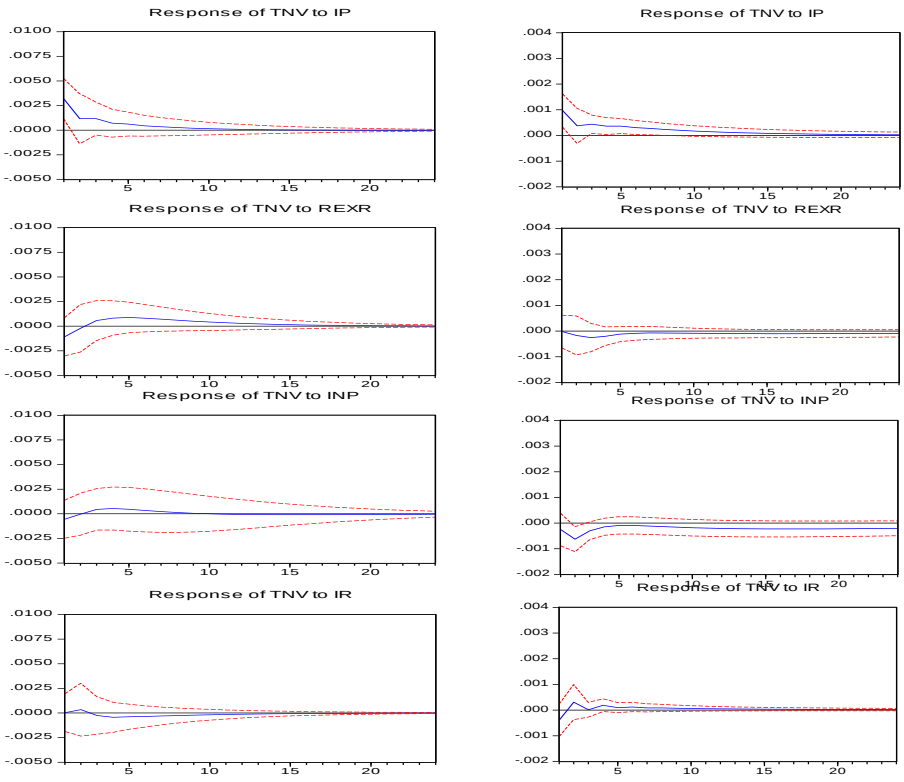
influences of a IR innovation on all the liquidity measures are observed throughout both samples.

Since macroeconomic shocks are also expected to impact liquidity through other stock market variables, this study explores how the economy-wide shocks influence the factors that drive liquidity at the market level. Figure 4-4 presents selected results of the IRFs for TNV, VL, and RET, estimated from the VAR (1) model with PQSPR. Similar to the results of the IRFs for the liquidity measures, the effects of the macroeconomic shocks are strong in the first period. Panel A and B of Figure 4.4 indicates that The IRFs of *TNV* and *VL* respond significantly to wide- economic shocks during the first sample period, indicating that they provide indirect channels through which liquidity can be influenced by the macro-level shocks. A positive *IP* shock generates a significant *TNV* increase while having insignificant influences of an IP innovation on VL. In addition, the positive REXR shocks affect *TNV* and VL negatively. An increase in *TNV* following a *INP* innovation is significant for the subsequent 2 months, while *VL increase* caused by positive *INP* shock remain significant for the initial 10 months. The effects of the REXR and INP shocks on VL turn insignificant in the second period, but the IR innovation still incurs a insignificant initial impact on TNV in the first period and significant in the second period with much smaller magnitude. The positive affect of unexpected interest rate declines on *TNV* is in accordance with the argument that such policy changes can cause trading activity by decries the cost of margin trading (Chordia et al., 2001).

Figure 4-4a: Impulse responses of market variables to macroeconomic variables shocks - Subsample results.

PQSPR

1992:10-1997:6 1999:3-2008:12

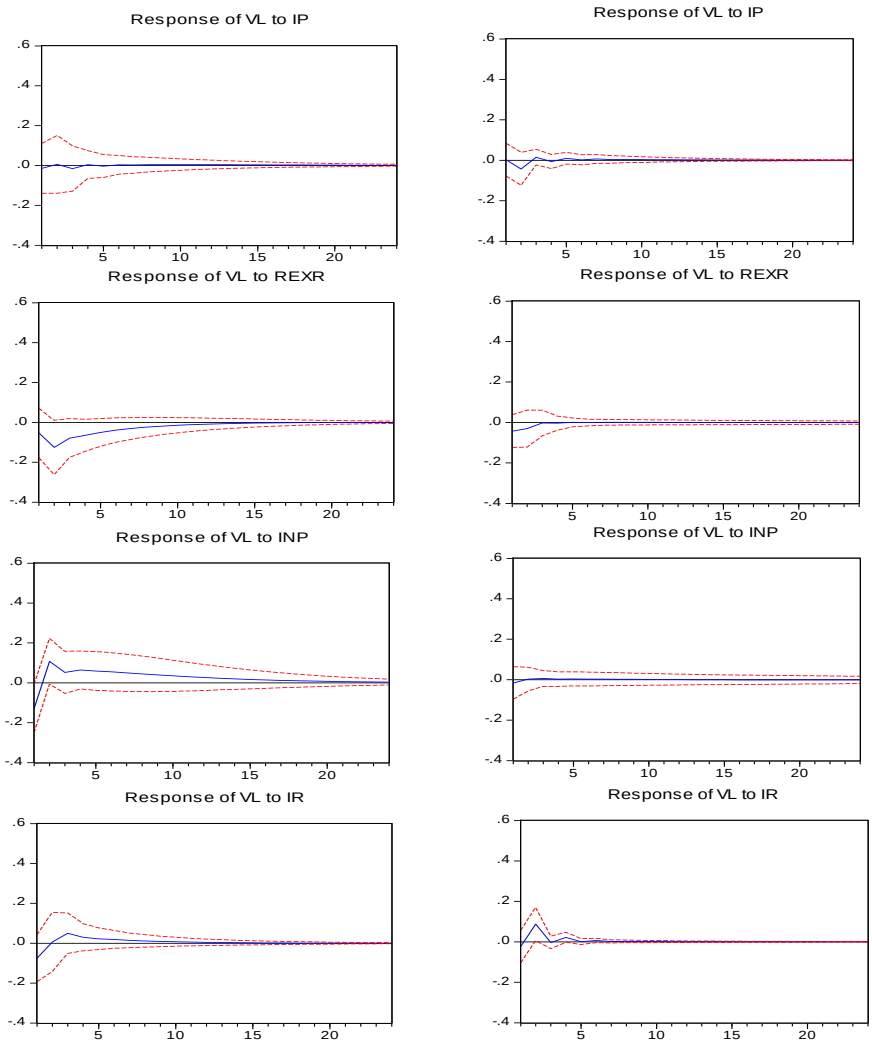


Impulse responses of TNV to macroeconomic variables shocks - Subsample results. The figures present impulse responses of market variables to a Cholesky one standard deviation shock in each macroeconomic factor over two subsamples, 1992:10-1997:06 and 1999:03-2008:12. The VAR(1) models consisting of industrial production (IP), Real Effective Exchange Rate(REXR), Investment Portfolio(INP) , Interest Rate (IR) market share turnover (TNV), market volatility (VL), market return (RET),and market liquidity in that order are estimated. Liquidity can be proportional spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI) .In Panel: A, two columns represent impulse responses of TNV to the macroeconomic variables shocks IP, REXR, INP and IR. Dashed lines are two standard error bands.

Figure 4-4b: Impulse responses of market variables to macroeconomic variables shocks - Subsample results.

AMIHUD

1992:10-1997:6 1999:3-2008:12



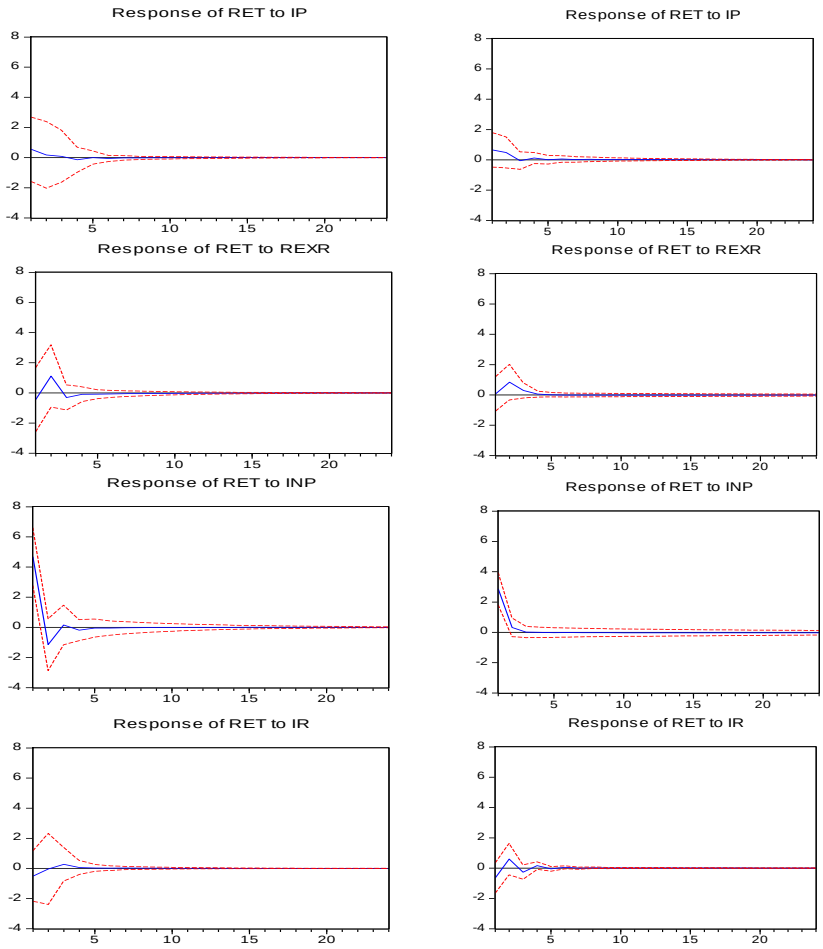
Impulse responses of VL to macroeconomic variables shocks - Subsample results.

Two columns represent impulse responses of VL to the macroeconomic variables shocks IP, REXR, INP and IR. Dashed lines are two standard error bands.

Figure 4-4c: Impulse responses of RET to macroeconomic variables shocks – Subsample results. (Continued)

AMI

1992:10-1997:6 1999:3-2008:12



Impulse responses of RET to macroeconomic variables shocks – Subsample results.

Two columns represent impulse responses of RET to the market variables shocks IP, REXR, INP and IR. Dashed lines are two standard error bands.

The RET reacts insignificantly to the IP shock throughout the whole sample, it increased in response to the REXR shock during the two subperiod and exhibits a small decline 2 months after the IR shock. Positive INP shock yields immediate increase of 5, and 3 standard deviations in the two subsamples, and its effects on the corresponding liquidity measures remain significant for the subsequent 4, and 3 months.

The results of the subsample VDs given in Table 4-15 complement the findings of the IRFs by reporting a greater role of macroeconomic in the dynamics of liquidity in the first subperiod. Table 4-15 shows the variance decompositions of the liquidity measures for two subsamples, 1992:10-1997:06 and 1999:03-2008:12. The VAR (1) models consisting of industrial production (IP), Real Effective Exchange Rate(REXR), Investment Portfolio(INP), Interest Rate (IR), market share turnover (TNV), market volatility (VL), market return (RET), and market liquidity. where market liquidity is proportional spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI).

The VDs for the first subsample, given in Panel A of Table 4-15, indicate that a large part of the liquidity variation is influenced by the innovations in INP and REXR. For example, the maximum proportions of the predicted error variance in PQSPR attributed to the INP and REXR shocks reach nearly 29% at the 1-month horizon and 9% at the 2-year horizon, respectively. Other economic variables shocks play a minor role in the PQSPR movements, each IP and IR accounting for less than 3% at all horizons. The VDs of AMIHUD and AMI indicate that the innovations in INP and REXR correspondingly explain 25% and 7% of the variation in AMIHUD and 11% and 1% of the prediction variance in AMI at the 2-year horizon.

We observe that the overall affects of the macroeconomic shocks on liquidity increase as the forecast horizon lengthens. And we also can observe the combined impacts of the macroeconomic shocks, reducing the contributions of the market-wide shocks to the liquidity before we add the macroeconomic variables to the model. This shows that much of the variations in the market variables, which exhibit substantial effects on the first subsample liquidity dynamics as seen in the previous section, are reflecting the economy-wide shocks.

Table 4-15a: Variance Decompositions Subsample macroeconomic variables

Variance Decompositions – first Subsample Results									
	horizon	IP	REXR	INP	IR	TNV	VL	RET	PQSPR
PQSPR	1	0.10	0.41	28.57	1.06	0.63	26.23	2.37	40.62
	3	0.78	7.29	24.10	3.02	1.26	25.48	1.71	36.38
	6	1.00	8.33	22.68	2.99	2.27	26.17	1.52	35.04
	12	1.07	8.58	21.98	2.98	2.76	26.20	1.47	34.96
	24	1.07	8.61	21.93	2.98	2.79	26.19	1.47	34.97
AMIHUD	1	0.05	6.80	24.40	1.95	4.68	2.10	0.76	59.26
	3	0.31	6.94	24.51	1.93	5.38	3.18	0.86	56.89
	6	0.33	6.93	24.66	1.93	5.37	3.17	0.87	56.74
	12	0.34	6.92	24.71	1.93	5.37	3.16	0.88	56.70
	24	0.34	6.92	24.71	1.93	5.37	3.16	0.88	56.69
AMI	1	0.25	0.41	6.41	2.68	2.12	0.11	7.23	80.79
	3	1.37	0.39	9.03	4.66	5.93	0.54	6.47	71.62
	6	1.54	0.37	10.01	4.55	7.03	0.53	6.42	69.55
	12	1.56	0.36	10.28	4.52	7.19	0.53	6.43	69.15
	24	1.56	0.36	10.30	4.52	7.19	0.53	6.43	69.13

Table 4-15b: Variance Decompositions Subsample macroeconomic variables

Variance Decompositions – second Subsample Results									
	Hori-zon	IP	REXR	INP	IR	TNV	VL	RET	PQSPR
PQSPR	1	4.51	0.68	6.24	0.15	0.01	18.38	14.24	55.81
	3	8.97	0.91	11.82	0.21	0.50	10.68	31.73	35.20
	6	9.27	1.41	12.87	0.27	0.70	8.27	35.09	32.13
	12	9.27	1.57	13.23	0.31	0.75	7.46	36.09	31.33
	24	9.27	1.59	13.29	0.31	0.76	7.36	36.20	31.22
AMIHUD	1	0.85	1.49	2.79	0.23	2.74	0.44	0.34	91.13
	3	2.02	4.34	6.75	0.28	1.63	0.33	6.90	77.75
	6	2.32	5.33	7.33	0.29	1.51	0.29	7.47	75.45
	12	2.37	5.51	7.57	0.29	1.51	0.28	7.55	74.91
	24	2.37	5.53	7.67	0.29	1.51	0.29	7.55	74.79
AMI	1	3.69	0.56	15.19	0.17	0.67	0.04	4.19	75.50
	3	2.77	3.38	19.32	0.21	3.21	3.03	4.86	63.22
	6	2.48	5.34	22.61	0.31	3.94	4.99	4.86	55.48
	12	2.26	6.74	26.38	0.33	3.81	5.65	4.91	49.93
	24	2.10	7.60	29.12	0.33	3.61	5.82	4.97	46.45

The results of the VDs for the market variables in Table 4.16 show that the primary macro-level liquidity drivers, such as IP, REXR, INP and IR shocks affect the market factor variations with different degrees.

Table 4-16: Variance Decompositions – Subsample market and macroeconomic variables

Sample 1992:10-1997:06									
	horizon	IP	REXR	INP	IR	TNV	VL	RET	PQSPR
	1	17.060	1.981	0.516	0.001	80.441	0.000	0.000	0.000
	3	12.449	1.497	0.492	0.175	74.492	1.699	0.048	9.148
	6	10.886	2.845	0.870	0.508	66.268	5.006	0.040	13.578
	12	10.293	3.719	0.862	0.675	62.753	6.459	0.050	15.191
TNV	24	10.229	3.806	0.909	0.693	62.401	6.553	0.060	15.349
	1	0.103	1.367	8.064	2.773	5.263	82.430	0.000	0.000
	3	0.155	7.822	9.726	2.592	4.854	57.675	1.490	15.685
	6	0.146	9.050	11.340	2.726	4.600	52.004	1.724	18.410
	12	0.166	9.171	13.083	2.723	4.403	49.719	1.881	18.854
VL	24	0.187	9.132	13.492	2.712	4.392	49.391	1.908	18.787
	1	0.514	0.331	37.073	0.435	1.094	3.507	57.045	0.000
	3	0.521	2.335	35.350	0.508	1.124	3.233	53.742	3.188
	6	0.554	2.358	35.300	0.514	1.147	3.320	53.587	3.219
	12	0.556	2.368	35.275	0.516	1.161	3.340	53.544	3.242
RET	24	0.556	2.369	35.272	0.516	1.161	3.341	53.540	3.245
Sample 1999:03-2008:12									
	1	7.356	0.003	0.481	1.223	90.936	0.000	0.000	0.000
	3	7.025	0.530	3.060	1.388	81.549	1.473	1.440	3.535
	6	7.996	0.777	2.912	1.520	72.967	1.460	4.383	7.985
	12	8.466	0.913	3.491	1.537	67.570	1.423	6.383	10.217
TNV	24	8.309	1.377	5.909	1.519	64.761	1.564	6.264	10.297
	1	0.005	0.963	0.137	0.271	8.237	90.386	0.000	0.000
	3	0.824	1.094	0.120	3.249	6.959	87.300	0.435	0.017
	6	0.865	1.080	0.129	3.398	6.845	86.975	0.588	0.119
	12	0.902	1.077	0.137	3.393	6.826	86.733	0.713	0.219
VL	24	0.909	1.078	0.142	3.392	6.823	86.691	0.730	0.236
	1	1.127	0.013	21.729	1.092	1.719	4.547	69.774	0.000
	3	1.655	1.976	20.844	2.091	1.674	4.355	67.370	0.037
	6	1.693	1.978	20.800	2.164	1.671	4.365	67.263	0.067
	12	1.699	1.979	20.796	2.164	1.670	4.364	67.240	0.088
RET	24	1.700	1.983	20.813	2.164	1.669	4.364	67.216	0.092

The IP and REXR innovations are the most important economic-wide shocks for the longer-horizon TNV variation, causing 17% and 4% of its unexpected movements at the 2-year horizon respectively. Additionally, the REXR, INP, and IR innovation explains 9,

14, and 3% respectively of the variation in VL at the 2-year forecast horizon and a REXR and INP shocks contributes to RET by 3 and 37 % at the 6-month horizon.

The Variance Decompositions VDs for the second subsample, presented in Panel B of Table 4-16, provide significantly different results. The role of REXR and INP shocks is reduced. The IP and INP innovations are the most important economic-wide shocks for the longer-horizon TNV variation, causing 9% and 6% of its unexpected movements at the 2-year horizon respectively. In addition, a REXR, and IR innovation explains 2%, and 4% respectively of the variation in VL at the 6-months forecast horizon and INP shocks contributes to RET by 20% at the 6-month horizon, while the IP, REXR, and IR each are contributing by 2 variations.

Similarly with the results in the previous section, the results indicate that the fractions of the market factor variations associated with the economy-wide shocks decline significantly in the second half of the sample. These results together showed those both direct and indirect linkages between stock market liquidity and the macroeconomic variables are weakened in the recent sample.

To summarize the main findings of this section, we find that the macroeconomic variables are significant determinants of the liquidity dynamics and their effects are stronger before the Asian crises. The results of the study show that Industrial Production, Real Effective Exchange Rate, and Interest Rate significantly Granger-causes market illiquidity with the proportional quoted spread measure while it is insignificant with the other liquidity measures.

Real effective exchange rate and investment portfolio are particularly important in causing the liquidity fluctuations. Market liquidity improves significantly in response to the real effective exchange rate, the stock market volatility might be affected by a foreign exchange variability is higher for local markets than for the US market, as pointed out by Mun (2008) he also mentioned that the exchange rate might affect liquidity. Moreover, Hau & Rey, (2006) who found the correlation between a depreciation of local currency and higher returns in the local stock market is significantly negative in compare to the foreign equity market. That explain the relationship between liquidity and exchange rate since the exchange rate fluctuation has a positive relation with the stock market volatility as documented by O'Hara (1997). She argued that if the volatility increases the liquidity decreases on quote-driven markets since the risk of holding inventory in the inventory paradigm increases once there is an increase in volatility in the limit order markets models. The relationship between the exchange rate and stock liquidity have been explored in Huang & Stoll, (2001) they found no significant effect of the variability in the exchange rate on liquidity. Yeyati, Schmukler, and Horen (2008) also studied the exchange rate and liquidity and they found that a depreciation of the local currency in some of South American countries against the U.S. dollar predicts a decline in stock market liquidity for those counties during financial crises.

Market liquidity also improves significantly in response to the positive investment portfolio shocks stock market liquidity is also affected by the rising net flow from foreign investors as resulted by a liberalization of capital constraints (Henry, 2000; Levine & Zervos, 1998). In the case of Sweden, for example, Dahlquist and Robertsson (2001) argued that substantial proof was found to attest that the amount of foreign ownerships are higher in some Swedish corporations with higher liquidity.

The Real effective exchange rate and investment portfolio significantly Granger-causes market volatility and market return, which are candidate to be other important drivers of liquidity. The results therefore indicate that macroeconomic shocks not only affect liquidity directly, but also indirectly through their impacts on other stock market variables.

The foreign investment flow, presented by the Real Effective Exchange Rate and the Investment Portfolio, are particularly important in causing the first period liquidity fluctuations, reflecting the open economy with less restriction on foreign investment flow in Malaysia before the crises. The share turnover, volatility, and market return, also react more strongly to the Effective Exchange Rate and the Investment Portfolio innovations during the first half of the sample and it also provided indirect channels through which liquidity can be influenced by these shocks. Under economic environment with high restriction toward investment flow in the second half of the sample, the macro-level innovations play a significantly smaller role in explaining the movements of market liquidity and of the market-level liquidity drivers.

4.5 Illiquidity and stock return

The market microstructure literature shows that many studies have been conducted concerning the role of liquidity in the individual securities pricing process. Lately, a new aspect of research, which suggests that liquidity is not only a characteristic of a sole asset, because commonality in liquidity found in U.S. stock market (Chordia et al., 2000; Hasbrouck & Seppi, 2001; Huberman & Halka, 2001)

The relationship between illiquidity and stock return is examined for stocks traded on the Kuala Lumpur stock exchange (KLSE) for the years starting from 1993 to2008, using data from daily and monthly databases of DataStream. We used the Fama and MacBeth (1973) method to test the relationship between illiquidity and stock return following Amihud (2002). A cross section model is estimated for each month m = 1, 2…,12 in year y, y = 1994; 1995,…, 2008 (a total of 180 months), where monthly stock returns are a function of stock characteristics.

The stock characteristics are including the Amihud illiquidity measure, the size of each stock is included in the cross-sectional model; it is measured as the market value of stock *i* at the end of year y. The standard deviation of the daily return on stock *i* in year y (multiplied by 10^2). Beta of each stock also included in the model as a measure of risk, calculated for ten equal portfolios by estimated the market model for each portfolio that ranked base on the size of the stocks .moreover the return on stock over the last 100 days of year y, and the return on the stock during remained days which exactly starts at the beginning of the year and precedes the last 100 days of the year y, are included in the cross sectional model as characteristics of the stock. Finally, the dividend yield and the book-to-market ratio of the stock i in year y, are included also in the model as characteristics of stocks. the dividend yield is computed as the sum of the dividends during year y divided by the end-of-year price .

This section presents the results of examining the relationship between liquidity and the stock return. Table 4-17 presents descriptive statistics of stock illiquidity measure (ILLIQ),stock size (SIZE), standard deviation of the return (SDRET), Book to Market (B/M) ratio and the dividend yield (DIVYLD): In each year, the annual mean, standard

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deviation across stocks are calculated for stocks in the sample, and then these annual statistics are averaged over the 15 years. To examine the stability of the stock characteristics impacts over the time, the study executed separately for two subsamples of 7 and 8 years for each.

Table 4-17: Statistics on variables

	Average of annual means	Average of annual S.D	Median of annual means	Max of annual means	Min of annual means
ILIQ	0.21	0.37	0.91	3.76	0.15
SDRET	1.73	0.65	1.70	3.09	1.06
size (RM millions)	35.23	0.70	2.89	78.00	18.43
DIVYLD%	4.44	1.03	4.20	6.59	3.29
B/M	0.27	0.15	0.25	0.72	0.12

In the table above illiquidity measure $ILLIQ_{iy}$ represents the daily ration of the stocks' absolute return to its average trading dollar volume over the year. $SDRET_{iy}$, is the daily stock return standard deviation during the year $SIZE_{iy}$, is the market capitalization log of each stock at the end of the year, $DIVYLD_{iy}$ denoted as the dividend yield, the total cash dividend annually over the price at end-of-year and $B\backslash M_{iy}$is the ratio of the book to market value of the stock at the end of the year, and. Each variable is calculated for each security in each year across stocks included in the sample in that year. Then the mean each variable and the standard deviation are computed over securities every year. As indicated in the table, over the 15 years period the means of the annual means, standard deviations and the medians of the annual means, in addition to the minimum and maximum annual means. The data period is 1993–2008

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The results, shown in Table 4-18, strongly support the hypothesis that illiquidity is priced, consistent with Amihud (2002). The coefficient of ILIQ has a mean of 0.13 that is statistically significant (t = 2.7). Of the estimated coefficients, 69.4% (125 of the 180) are positive. The illiquidity effect is positive and significant in each of the two subsamples of 7and 8 years.

Table 4-18: Cross-section regression analyses on stock return illiquidity and other Characteristics

	All the sample		1994-2000		2001-2008	
	mean	t-stat	mean	t-stat	mean	t-stat
C	-1.62	3.4	-1.84	2.6	-1.53	3.11
ILIQMA	0.13	2.7	0.11	2.52	0.092	2.27
beta	0.17	1.3	0.14	1.41	0.19	0.84
R100	0.65	3.2	0.48	2.87	0.57	3.14
R100y	0.34	2.6	0.28	2.24	0.31	2.07
SDRET	-0.15	2.7	-0.132	2.1	-0.11	1.9
ln size	-0.12	2.3	-0.09	2.17	0.105	2.1
DIVYLD%	-0.074	1.92	-0.061	1.75	-0.067	1.84
B/M	-0.19	2.2	-0.17	2.13	-0.13	1.98

The illiquidity measure ILIQ represents the daily ration of the stocks' absolute return to its average trading dollar volume over the year. ILIQ averaged in each year across stocks. While ILIQMA is the particular variables' adjusted means, computed as the rate of the variable over its annual mean for all stocks. BETA is a measure of risk, calculated for ten equal portfolios by estimated the market model for each portfolio that ranked base on the size of the stocks . R100 denoted as the return on stock over the last 100 days of year y, and R100YR is the return on the stock during the remaining days that exactly starts at the

beginning of the year and precedes the last 100 days of the year y . SDRET, is the daily stock return standard deviation during the year ln SIZE, is the market capitalization log of each stock at the end of the year, DIVYLD denoted as the dividend yield, the total cash dividend annually over the price at end-of-year and B/M is the ratio of the book to market value of the stock at the end of the year, and. The data include 180 months over 15 years, 1994–2008, (the stock characteristics are calculated for the years 1993–2007). A cross section model is estimated for each month m = 1, 2…,12 in year y, y = 1994; 1995,…, 2008 (a total of 180 months), where monthly stock returns are a function of stock characteristics.

Table 4-19: the number of the times that the estimated coefficients were significant

	sig 0.05	**sig 0.1**
C	47.220	63.330
ILIQ	57.770	69.400
beta	9.110	17.670
R100	58.890	63.890
R100y	42.780	50.000
SDRET	57.220	66.110
lin size	47.780	56.560
DIVYLD%	32.730	47.220
B/M	48.230	59.670

The effect of BETA is positive, as expected but it is insignificant since the SIZE is included in the model, since beta is calculated for size-based portfolios. Past returns R100 and R100Y both have positive and significant coefficients. The parameter of ln SIZE is significantly negative, Size might be a proxy for liquidity, however, the size negative

parameter could be caused by being a proxy for the reciprocal of expected return (Amihud, 2002; Berk, 1995).

In Amihud and Mendelson (1989), Risk variable SDRET has a negative coefficient ; Amihud and Mendelson justify the negative coefficient as accounting for the value of the tax trading option. The effect of book to market B/M variable has negative significant coefficient consistent with Fama and French (1993); they showed that the book-to-market ratio of stocks is proxy for sensitivity to risk factors that may have the ability to explain cross-sectional variation in stock returns. Moreover anther paper by Kothari and Shanken (1997) found that the book-to-market ratio predicts market returns.

The assumption of Redding (1997) about dividend preference by some investors is consistent with the results of the negative coefficient of DIVYLD. These impacts could offset the positive impact of DIVYLD that results from the greater personal tax on dividends. Amihud (2002) justified the negative coefficient of DIVYLD as it might express the impact of an unseen risk factor which is correlated with DIVYLD across stocks negatively.

Table 4-19 presents the number of the times that the estimated coefficients were significant at the 5% and 10% significance level. To summarize the main findings of this section, we find that the results of this study show a positive significant relation between illiquidity and expected return over 15 years. The results are consistent with Amihud (2002). This study included the new variable – book to market value – that was omitted in Amihud (2002), as he expected it to have an insignificant relation with the expected return, while this study shows it has a negative significant relation with the expected return. To

examine the stability of the the stock characteristics impacts over the time , the study was done separately for two sub periods and the results were the same in the two subsamples. This result indicates that the illiquidity is priced in the expected return.

4.6 Illiquidity of different size firms and stock return

In this section we examine the size effect on the relation between the big and the small stock liquidity and return by using Fama and MacBeth(1973) method the same methodology that used in the previous section. In this section we use the same data period and Stock Characteristics that used in the previous section except size and illiquidity replaced by interaction variable between size and illiquidity.

To estimate the relation between the big stocks liquidity and its return we used the size as a dummy variable which equal 1 if firm market capitalization mean over the study period is larger than its median. We use the same test to estimate the relation between the small stocks liquidity and its return, we use the size as a dummy variable which equal 1 if firm market capitalization mean over the study period is smaller than its median.

The size effect on the relation between the big and the small stock liquidity is examined for stocks traded on the Kuala Lumpur stock exchange (KLSE) over the years starting from 1993to2008, using data from daily and monthly databases of DataStream. we used the Fama and MacBeth (1973) method to test the size effect on the relation between the big and the small stock liquidity following Amihud (2002). We use size as a dummy variable, which equals 1 if the firm market capitalization is larger than its yearly median.

We use the same test to estimate the relation between the small stock liquidity and its return, using size as a dummy variable, which equals 1 if the firm market capitalization is smaller than its yearly median.

Table 4-20 the results of examining the relationship between the stocks liquidity and return. in two sub-samples. Those sub-sample divided base on the size to big and small stock size sub-samples. The results shown that illiquidity is priced in the both sub-samples, consistent with previous section. The coefficient of ILIQMA*Size for the big stocks sample has a mean of 0.172 that is statistically significant (t = 3.2).while the coefficient of the same variable for the small stocks sample has mean 0.096 with t-statistic 2.31.

Table 4-20: Illiquidity of different size firms and stock return

	Big size sample		Small size sample	
	mean	t-stat	mean	t-stat
C	-1.43	3.21	-1.72	3.34
ILIQMA*SIZE	0.172	3.2	0.096	2.31
BETA	0.164	2.27	0.217	2.39
SDRET	-0.127	2.14	-0.173	2.41
R100	0.715	4.2	0.697	3.04
R100y	0.289	2.57	0.304	2.13
DIVYLD%	-0.053	1.52	-0.087	1.92
B/M	-0.244	2.51	-0.162	1.72

The illiquidity measure ILIQ represents the daily ration of the stocks' absolute return to its average trading dollar volume over the year. ILIQ averaged in each year across stocks. While ILIQMA is the particular variables' adjusted means, computed as the rate of

the variable over its annual mean for all stocks.SIZE is dummy variable is measured by the market capitalization log of each stock at the end of the year. BETA is a measure of risk, calculated for ten equal portfolios by estimated the market model for each portfolio that ranked base on the size of the stocks . R100 denoted as the return on stock over the last 100 days of year y, and R100YR is the return on the stock during the remaining days that exactly starts at the beginning of the year and precedes the last 100 days of the year y . SDRET, is the daily stock return standard deviation during the year , DIVYLD denoted as the dividend yield, the total cash dividend annually over the price at end-of-year and B/M is the ratio of the book to market value of the stock at the end of the year, and. The data include 180 months over 15 years, 1994–2008, (the stock characteristics are calculated for the years 1993–2007). A cross section model is estimated for each month m = 1, 2…,12 in year y, y = 1994; 1995,…, 2008 (a total of 180 months), where monthly stock returns are a function of stock characteristics.

The illiquidity effect is positive and significant in each of the two subsamples the small and the big stocks but the coefficient of the big stock sample is significantly bigger than the coefficient of the small stocks sample. That shows the size effect in the relationship between the illiquidity and the stock return. Consistent with Amihud (2002) reports that Firm size is positively correlated with a stock's liquidity . And suggested that the effects of illiquidity on stock excess return differ by the firm size.

The effect of BETA is positive, as expected and significant for the both subsamples the small and the big stocks but the coefficient of the big stock sample is significantly smaller than the coefficient of the small stocks sample consistent with Banz (1981) reported

that the smaller firms have higher risk adjusted returns. Past returns R100 and R100Y both have positive and significant coefficients for both subsamples and there is no size effect in these two variables since the coefficients are mostly equal.

Risk variable SDRET has significant negative coefficient for both subsamples as in Amihud and Mendelson (1989); Amihud and Mendelson justify the negative coefficient as accounting for the value of the tax trading option. The coefficient of the big stock sample is significantly smaller than the coefficient of the small stocks sample consistent with Banz (1981) reported that the smaller firms have higher risk adjusted returns. The effect of book to market B/M variable has negative significant coefficient in the big subsample. The coefficient of the big stock sample is bigger than the coefficient of the small stocks sample consistent with Fama and French (1995) reported that within the book to market groups in their study the small stocks tends to have less return; The dividend yield DIVYLD has negative coefficient for both of the subsample, that consistent with Redding (1997) who assumed the dividend preferred by some investors. The greater personal tax on dividends could offset the positive impact of DIVYLD. Amihud (2002) justified the negative coefficient of DIVYLD as it might express the impact of an unseen risk factor which is correlated with DIVYLD across stocks negatively. The coefficient of the small stock sample is significant and bigger than the coefficient of the big stocks sample consistent with Roll (1981).

CHAPTER FIVE

CONCLUSION

5.1 Introduction

This study investigated the existence of commonality in liquidity in the stock market of Malaysia as one of the emerging markets that apply an order-driven trading system. Moreover, this study explored the dynamic relationship between market and macroeconomic variables with stock market liquidity. In addition, it examined the relation between the stock liquidity and the expected return. This chapter starts by discussing the findings of the study; it then presents the implications of this study and suggestions for future studies. The last section in this chapter discusses the limitations of the study.

5.2 The Findings of the Study

5.2.1 The findings concerning commonality of stock market liquidity

Commonality in liquidity might be driven by different variables. Recently, the market microstructure literature has started to show concern about the significance of the co-movements of liquidity that are driven by common factors within stocks. Accordingly, research work has, in general, reported that part of the change, at least, in the liquidity of a sole stock, is caused by market-wide factors. Thus, commonality of liquidity is a systemic determinant of the stock return, and stocks should be characterized by liquidity, with risk and returns. Studies in commonality and its outcomes appeared as one of the main significant developments of the theory of finance in the last year. The existing literature,

however, is still limited, as few studies have been done on liquidity commonality in order-driven and emerging markets. This is so, even though one of the main concerns resulting in the development of the commonality literature is that the shock to liquidity was one of the contributing factors in the financial crisis in emerging markets during 1997 - 98. Not much research has been found on commonality and liquidity in order-driven systems. Brockman and Chung (2002) examined commonality and liquidity in the Stock Exchange of Hong Kong, while Fabre and Frino (2004) did so for the Australian Stock Exchange. Although both employed order driven systems, the effects of commonality on liquidity were observed to be different for each market, primarily due to the difference in market structure.

This study fills the existing gap in the literature by studying the Malaysian stock market as a good case to study the commonality of liquidity since it has significant differences in market design. As reported in Chung, Kim, and Kitsabunnarat, (2005), and Comerton-Forde, & Rydge, (2006), the investigation of the commonality of liquidity and its dynamics will provide a better understanding of the rules of liquidity in the emerging markets.

This study examines the liquidity of market-wide commonality in the Malaysian stock exchange using a broad sample of 125 stocks covering a period of more than 16 years. The existence of commonality in liquidity is tested by examining the cross-sectional average from individual stocks using the market model to regress the percentage change in an individual stock liquidity proxy on the proportion of variation of concurrent, lag, and lead in the measure of the market liquidity.

The results show that co-movement of liquidity exists in the Malaysian stock exchange market. In addition, this result is stronger than in the earlier studies. The magnitude, the proportion of stocks with positive and significant liquidity beta, in many cases, are much higher than comparable measures in previous research by Chordia et al., (2000), and Pukthuanthong-Le and Visaltanachoti, (2009). This indicates that the existence of commonality in liquidity seems to be much more significant in emerging markets.

To examine the existence of the liquidity commonality through the cross-listed stocks and across the market altogether, we rank the sample into two subsamples, one is the cross-listed companies in Malaysia and other markets, and the second comprises the companies that are only listed on the Malaysian stock market. The cross-sectional results indicate that the liquidity construct of single stocks can be affected by market-wide common factors in addition to the exact common factors that might lead the cross-listed stocks to co-move together, such as the higher trading volume or the higher liquidity relatively to the cross-listed stocks. Both could affect the market-maker inventory cost and lead to co-movement among the cross-listed stocks.

To further detect the existence of commonality in the Malaysian stock market, we classified the sample into three categories: large, medium, and small companies. We found that commonality exists in all categories. The three size groupings of all liquidity variables exhibit significant commonality in liquidity; that is, commonality in liquidity is not driven by only one size group. Consistent with Chordia et al. (2000), the results show that large companies have relatively large market-wide coefficients in PQSPR, AMIHUD and AMI. The mean of the concurrent of DPQSPR and DAMI are positively related with firm size. While DTNV are negatively related with firm size, the (small) size group tends to have the strongest response to concurrent and this result is consistent with the results of Zheng and

Zhang (2006). In AMIHUD, the (Medium) size group tended to have the strongest response to concurrent. The results of previous studies by those who have conducted the same test show varying results. Chordia et al. (2000) showed that the means of "SUM" of the cross-sectional for DQSPR and DPQSPR, are positively related with company size. However, Fabre and Frino (2004) did not capture any size pattern for any of the liquidity proxies. Whereas, Brockman and Chung (2002) documented a reversed U-shape pattern of the cross-sectional means of the coefficient when using the spread as proxy of liquidity; the proportion of stocks with positively significant coefficient increases with company size. Commonality in liquidity was also found to be stronger in the time of the Asian crisis 1997-1998 compared to more stable periods. This indicates an association between market liquidity and the crisis, as well as a link between the stock liquidity and macroeconomic conditions.

5.2.2 The Sources of Market Liquidity

This study has examined the market and macroeconomic sources of the time-series variation in the Malaysian stock market liquidity. To the best of our knowledge this is the first examination of the relationship between market liquidity (return, trading activity, and volatility), and the macroeconomic variables (industrial production, real effective exchange rate, investment portfolio, and interest rate), in an emerging market by conducting the VAR model. Most of the previous studies were conducted in the U.S. market. The significant differences existing between the Malaysian and U.S. stock markets are the economic size and the market structure, as the Malaysian economy is based on a developing country with small economic size compared to the U.S. economy. The Malaysian stock exchanges are order-driven, while this is not the case in the U.S.

In this study, vector autoregression analyses were conducted first between the market liquidity and market variables; and again it was conducted in one vector consisting of market liquidity and market and macroeconomic variables. The subsample analyses have shown that the dynamic relation between market and macroeconomic variables and market liquidity vary throughout the whole sample period while their impact was stronger before the Asian economic crisis in 1997. This is due to the capital control policy implemented in Malaysia after the Asian markets crisis in 1997.

5.2.2.1 Market variables and market liquidity

The results of the study show that return significantly Granger-causes market illiquidity, and a decrease in illiquidity is forecast by an increase in return on the Malaysian stock exchange. Thus, similar to the previous findings on the U.S. stock market Fujimoto, (2004), and. Goyenko, & Ukhov, (2009) an increase in return positively affects liquidity on the Malaysian securities market. According to the forecast of the models in Foucault (1999), and Rosu, (2010) market volatility tested Granger-causes and was found to be significant with market illiquidity. An increase in volatility was found to significantly forecast an increase in illiquidity on the Malaysian securities market.

The market trading activity predicts an insignificant Granger-cause and impulse response in illiquidity and liquidity measures. This result is consistent with Fujimoto (2004), who found insignificant impulse responses in liquidity to the share turnover shocks. Goyenko, and Ukhov (2009) omitted the trading activity variable since it has relatively weak effects on liquidity.

5.2.2.2 Macroeconomic variables and market liquidity

This study examines the dynamic relation between macroeconomic variables and market liquidity. To the best of our knowledge this is the first examination of exchange rate and investment portfolio with the market liquidity using the VAR model. The results of the study show that industrial production, real effective exchange rate, and interest rate significantly Granger-cause market illiquidity with the proportional quoted spread measure while it is insignificant with the other liquidity measures.

Real effective exchange rate and investment portfolio are particularly important in causing the liquidity fluctuations. Market liquidity improves significantly in response to the positive real effective exchange rate and investment portfolio shocks. The real effective exchange rate and investment portfolio significantly Granger-causes market volatility and market return, which are candidates to be other important drivers of liquidity. The results indicate that macroeconomic shocks not only affect liquidity directly, but also indirectly through their impact on other stock market variables.

5.2.3 Illiquidity and market return

This study examined the relation between illiquidity and the expected return on the Malaysian stock market using the same test used by Amihud (2002). The results of this study show a positive significant relation between illiquidity and expected return over 15 years. The results are consistent with Amihud (2002). This study included the new variable – book to market value – that was omitted in Amihud (2002), as he expected it to have an insignificant relation with the expected return, whereas this study shows it has a negative

significant relation with the expected return. To examine the stability over time of the impact of the stock characteristics, the study was done separately for two sub periods and the results were the same in the two subsamples. This result indicates that the illiquidity is priced in the expected return.

This study also examined the size effect on the relation between the big and the small stock liquidity and return and it shows that the illiquidity effect is positive and significant in each of the two subsamples – the small and the big stocks – but that the coefficient of the big stock sample is significantly bigger than the coefficient of the small stock sample. This shows the size effect in the relationship between the illiquidity and the stock return. This is consistent with Amihud (2002) who reported that firm size is positively correlated with a stock's liquidity and suggested that the effects of illiquidity on stock excess return differ by the firm size.

5.3 Implications of the Study

The findings in this paper of the existence of commonality of liquidity and the dynamics of liquidity in Malaysian stock are important, not only in an academic perspective, but also for policymakers, regulators, investors, portfolio managers, and other decision makers in Malaysia and emerging financial markets. For example, given that liquidity is a factor of asset prices, commonality in liquidity will have an impact on asset prices, either for the local or the international stocks. Future models must consider common determinants of liquidity.

This study documents that market structure and design might play role in the existence of commonality in liquidity in order-driven markets and that it must be considered in the regulation and trading system design in the Malaysian stock market and other emerging markets that use an order driven trading system.

The significant relation between exchange rate and investment portfolio shows the importance of foreign investment to the market liquidity and should be considered by the policymakers and regulators, especially at the central banks. The existence of the commonality in liquidity means that the liquidity carries systematic risk that cannot be avoided by the individual investors and portfolio managers, if they are investing in either local or global stock markets.

The existence of the commonality in liquidity between the cross-listed stocks should be considered by the financial managers who cross-list their stocks in other markets as it carries systematic liquidity risk. Moreover, it should be considered by the investors and financial analysts in pricing the cross-listed stocks.

This study showed that the liquidity could be influenced by common factors across the stocks therefore; the market-wide will exhibit systematic fluctuations. As a result, the exchanges and the regulators will have to consider the cross-sectional effect of liquidity shocks in order to guarantee stability.

This study priced liquidity as one of the stock return factors and shows that the size effect exists in the relation between liquidity and stock return. These results should be considered by investors, portfolio managers and financial analysts.

5.4 Future studies

The findings of this study suggest that macroeconomic conditions, especially exchange rate and investment portfolio, have a strong impact on liquidity and this motivates us to call for more research on the dynamic relation between macroeconomic conditions and liquidity. Further research could develop new macroeconomic conditions and variables that can forecast liquidity. Future research might want to explore other candidates as determiners of commonality in liquidity, such as tick size and variation of commonality over time. The results of this study also suggest that markets consider the impact of liquidity on the pricing of international stocks so it might be good motivation to price liquidity in the international stock return models.

5.5 Limitations of the Study

This study was conducted in an emerging market, which caused certain limitations in terms of the availability of the microstructure data. This study used four different liquidity measures all constructed based on price data except the proportional quoted spread measure, which was based on microstructure data (the bid and ask prices) and was only available starting from October 1992. The stock sample number was limited due to the availability of the bid and ask prices for these stocks in the beginning and the end of the study duration. Thus, the sample only included stocks that had available bid and ask prices from the beginning until the end of the study duration. The depth data is not available for any of the databases; therefore, we did not use any liquidity measure based on such data.

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APPENDICIES

Appendix One

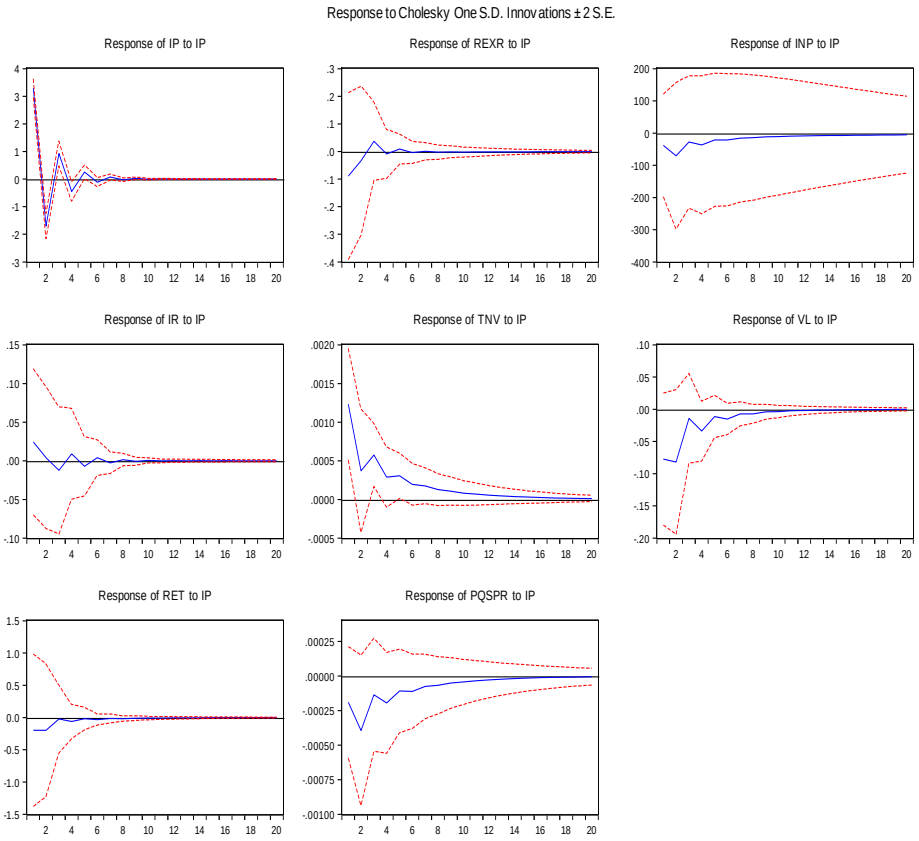
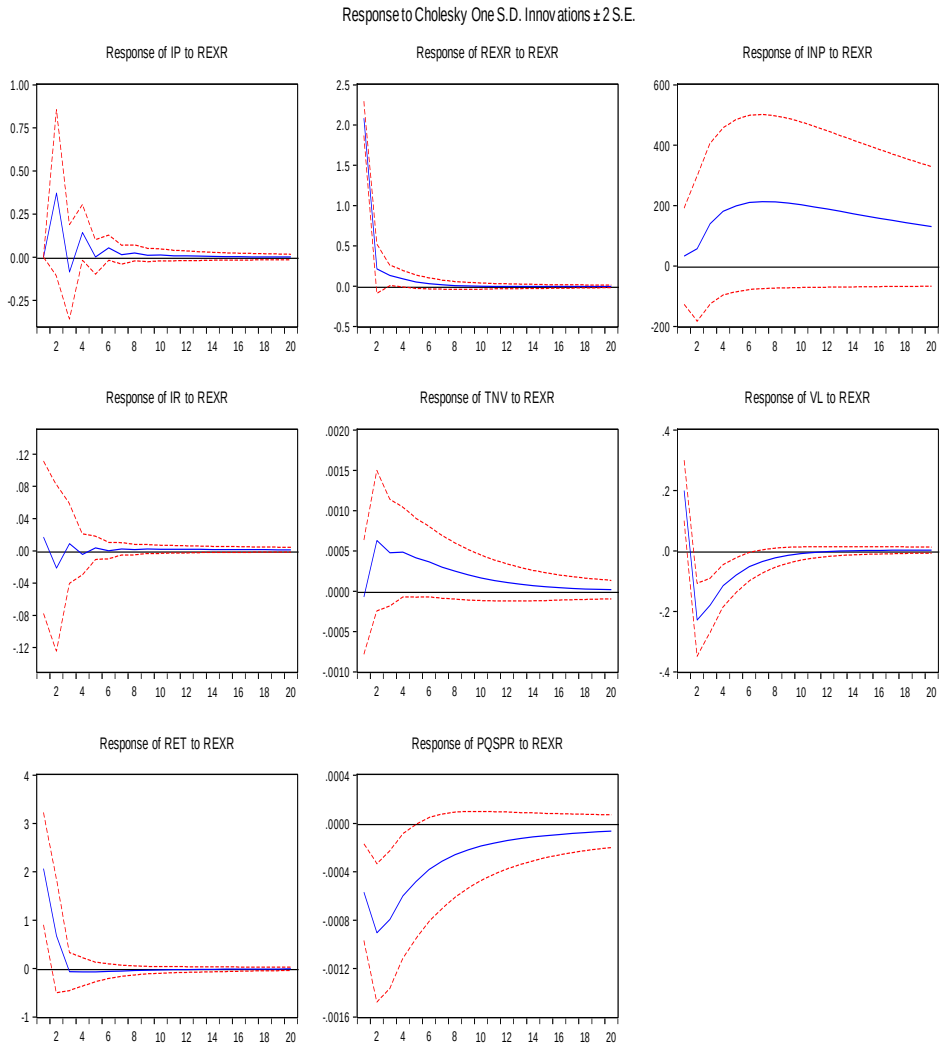
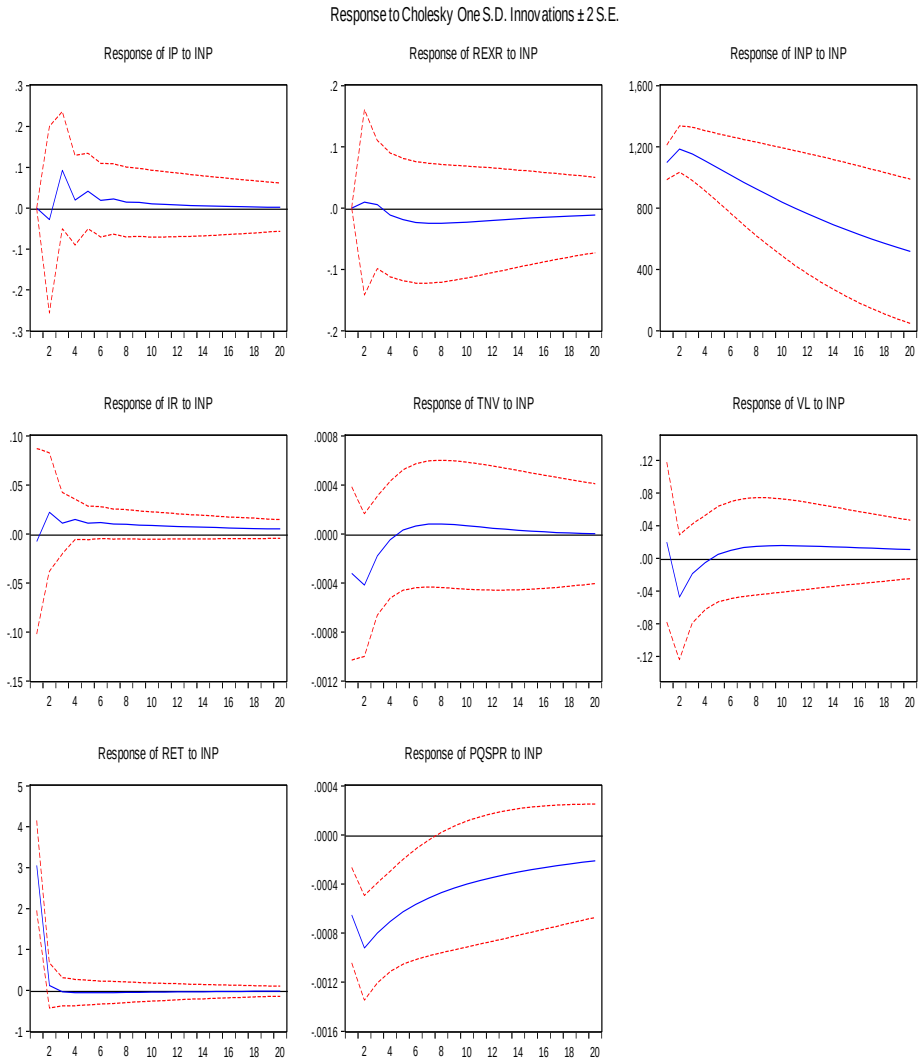


Figure A:1. Impulse responses of VAR model variables to each other with PQSPR liquidity measure

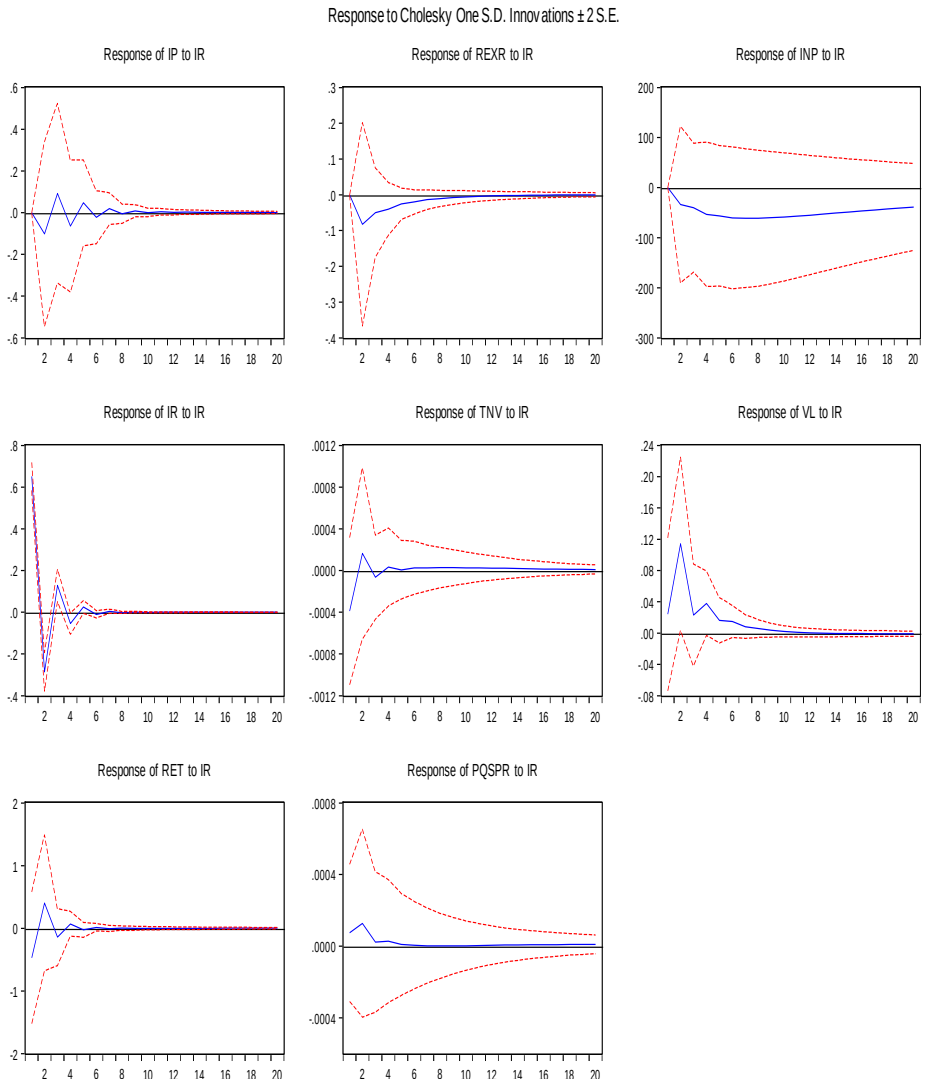
Panel: A. Impulse responses of all variables to IP shocks with PQSPR **.** The figures present impulse responses of VAR model variables to each other with for PQSPR liquidity to a Cholesky one standard deviation shock on each others, 1992:10-1997:06 and 1999:03-2008:12. The VAR(1) models consisting of industrial production (IP), Real Effective Exchange Rate(REXR), Investment Portfolio(INP) , Interest Rate (IR) market share turnover (TNV), market volatility (VL), market return (RET),and market liquidity in that order are estimated. All the series are standardized and liquidity can be proportional spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI).



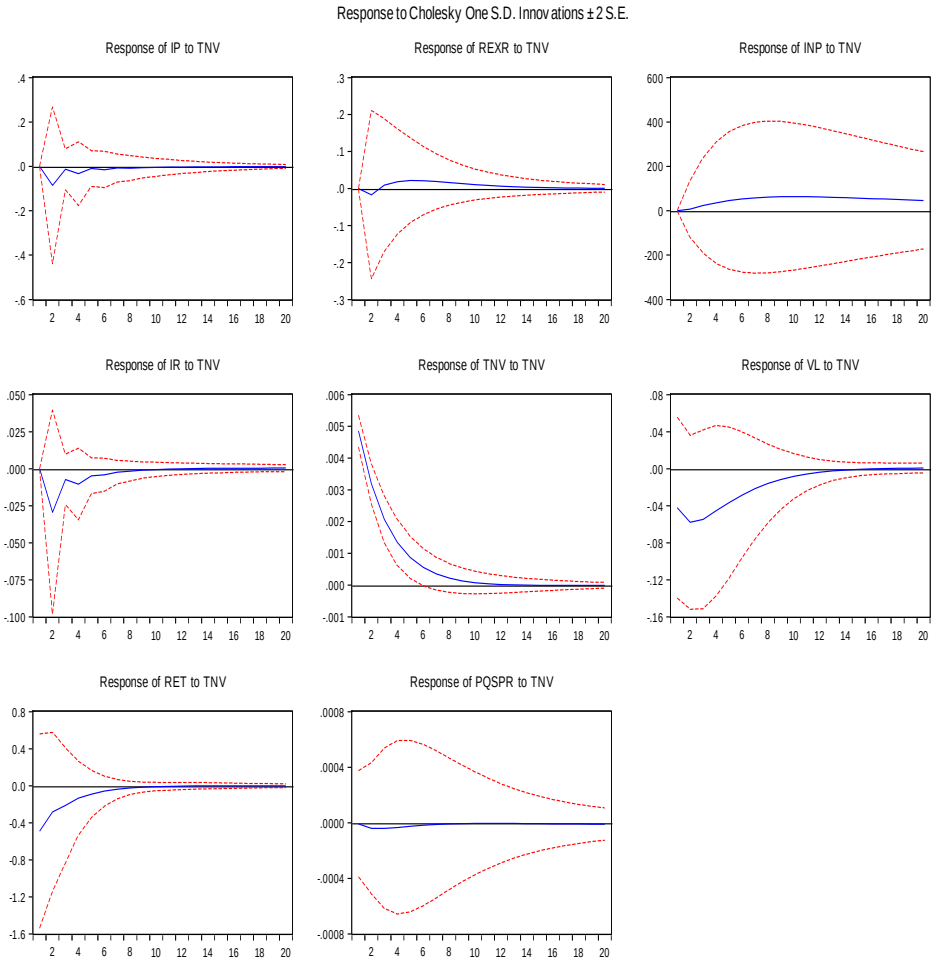
Panel: B. Impulse responses of all variables to REXR shocks with PQSPR



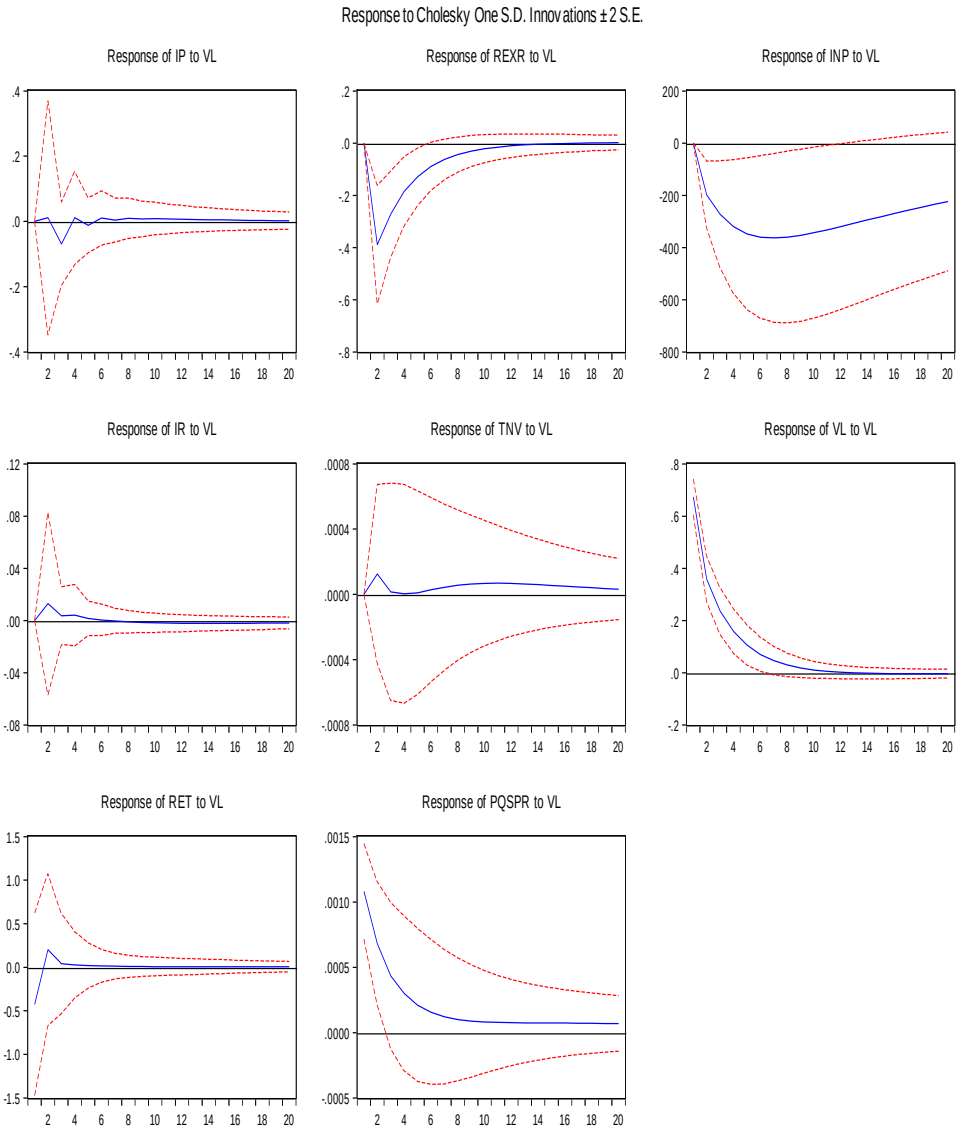
Panel: C. Impulse responses of all variables to INP shocks with PQSPR



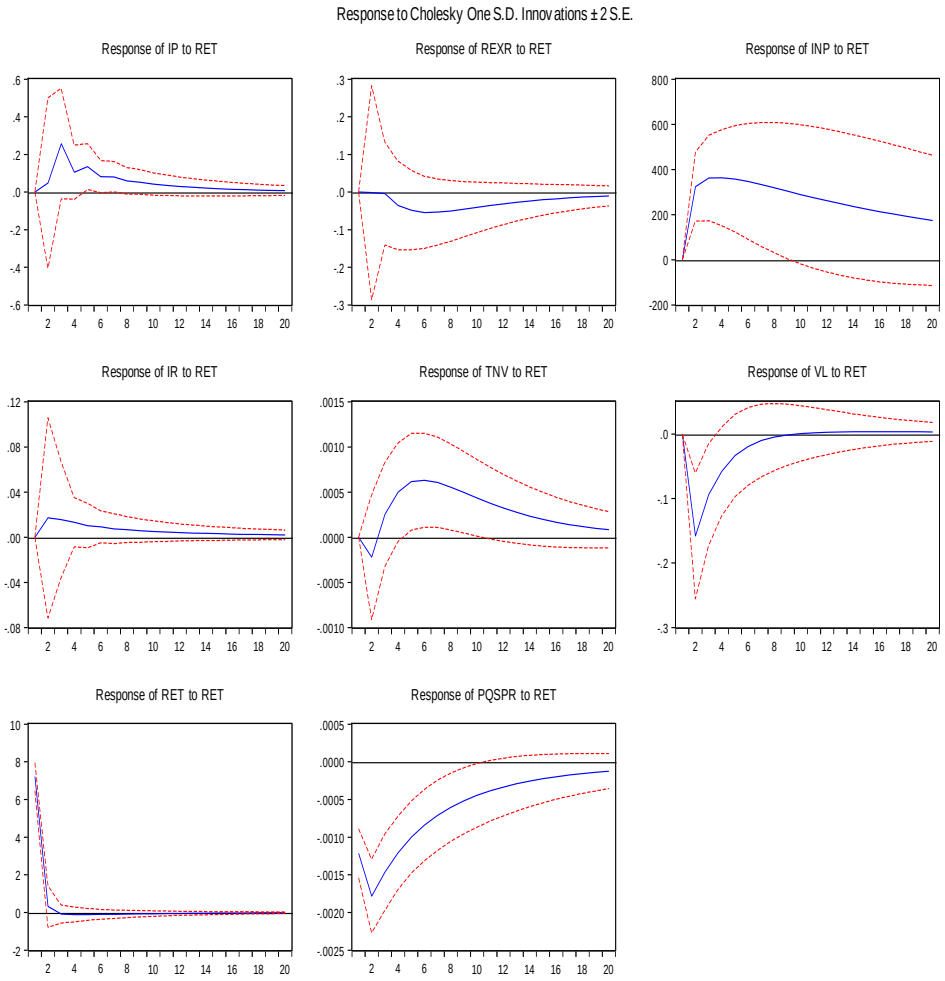
Panel: D. Impulse responses of all variables to IR shocks with PQSPR



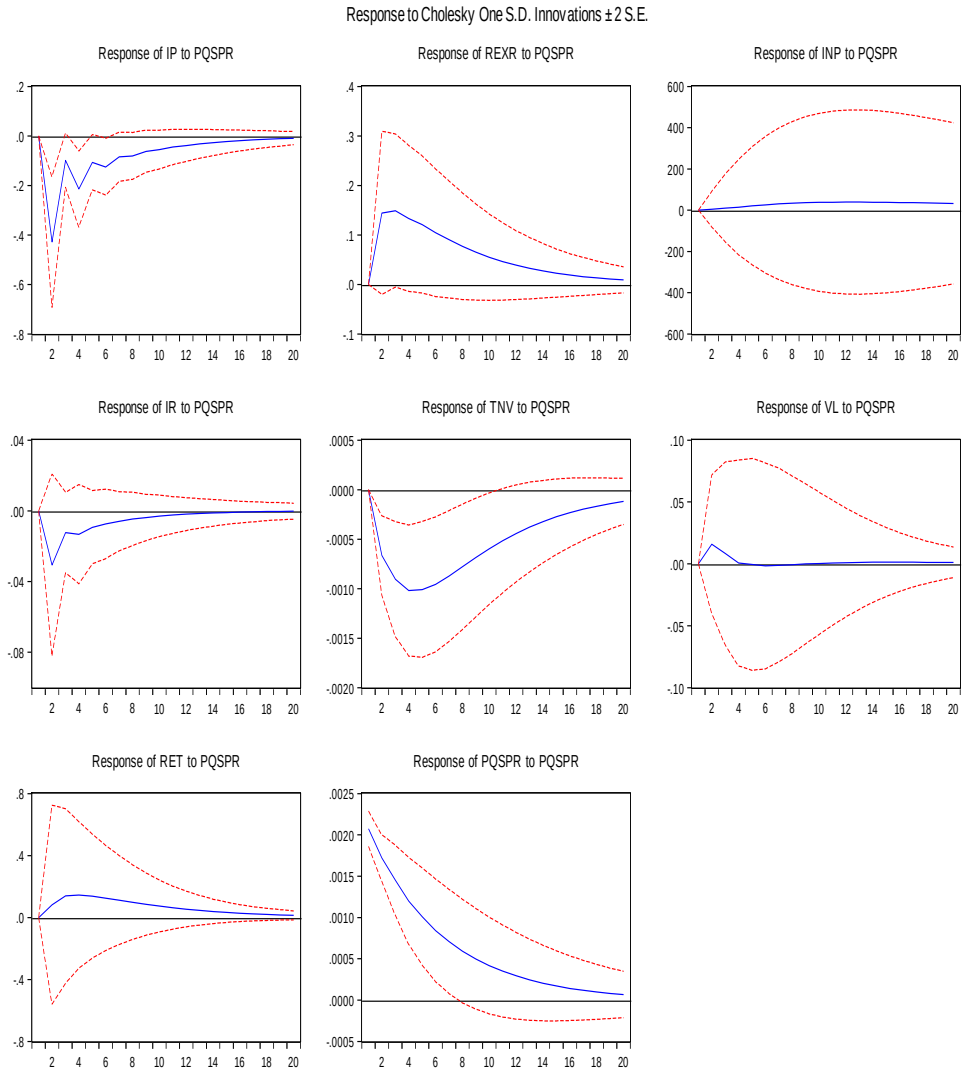
Panel: E. Impulse responses of all variables to TNV shocks with PQSPR



Panel: F. Impulse responses of all variables to VL shocks with PQSPR



Panel: G. Impulse responses of all variables to RET shocks with PQSPR



Panel: H. Impulse responses of all variables to PQSPR shocks with PQSPR liquidity measure.

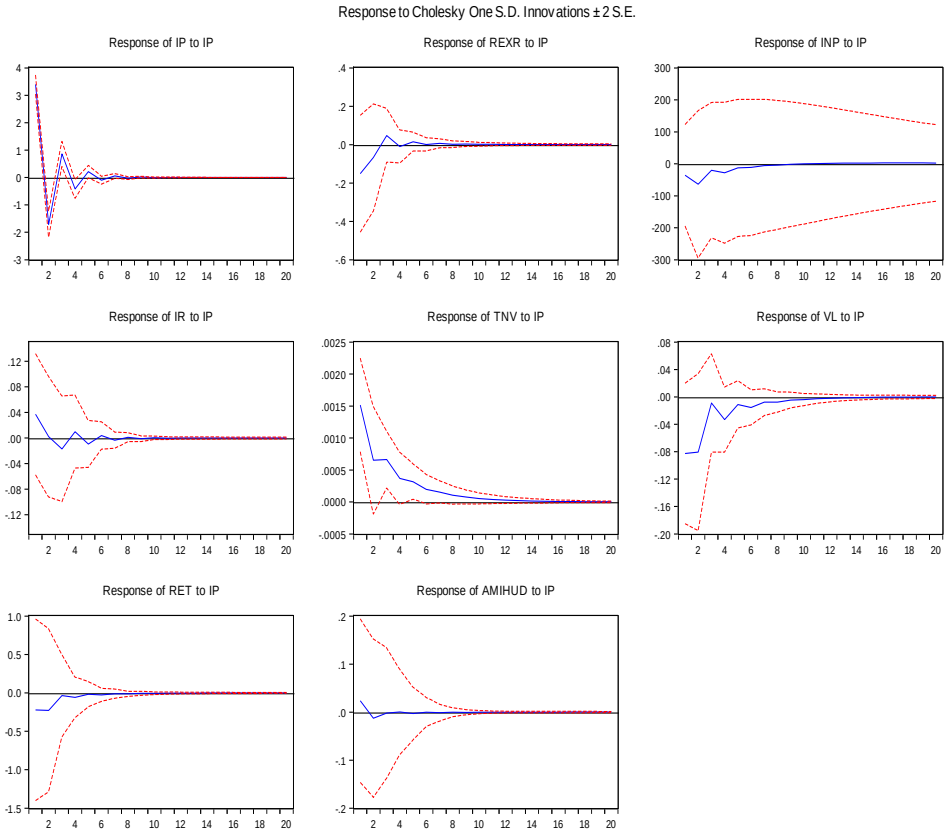
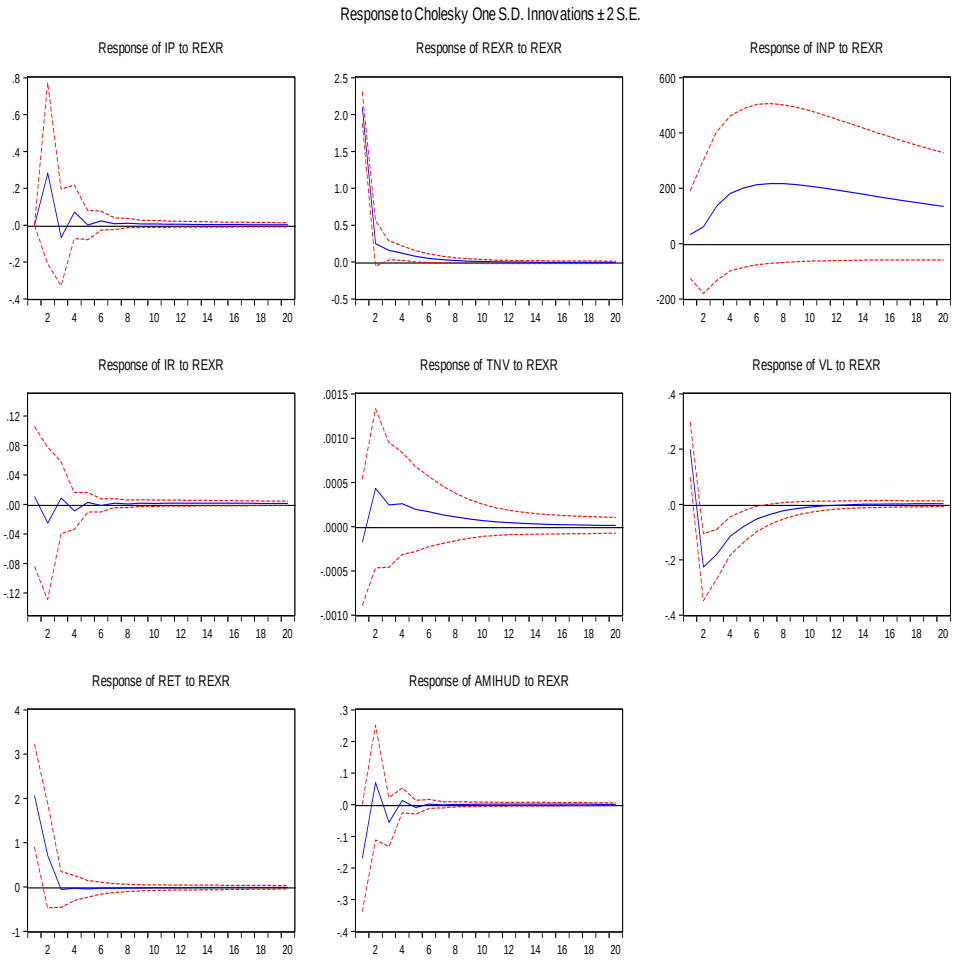
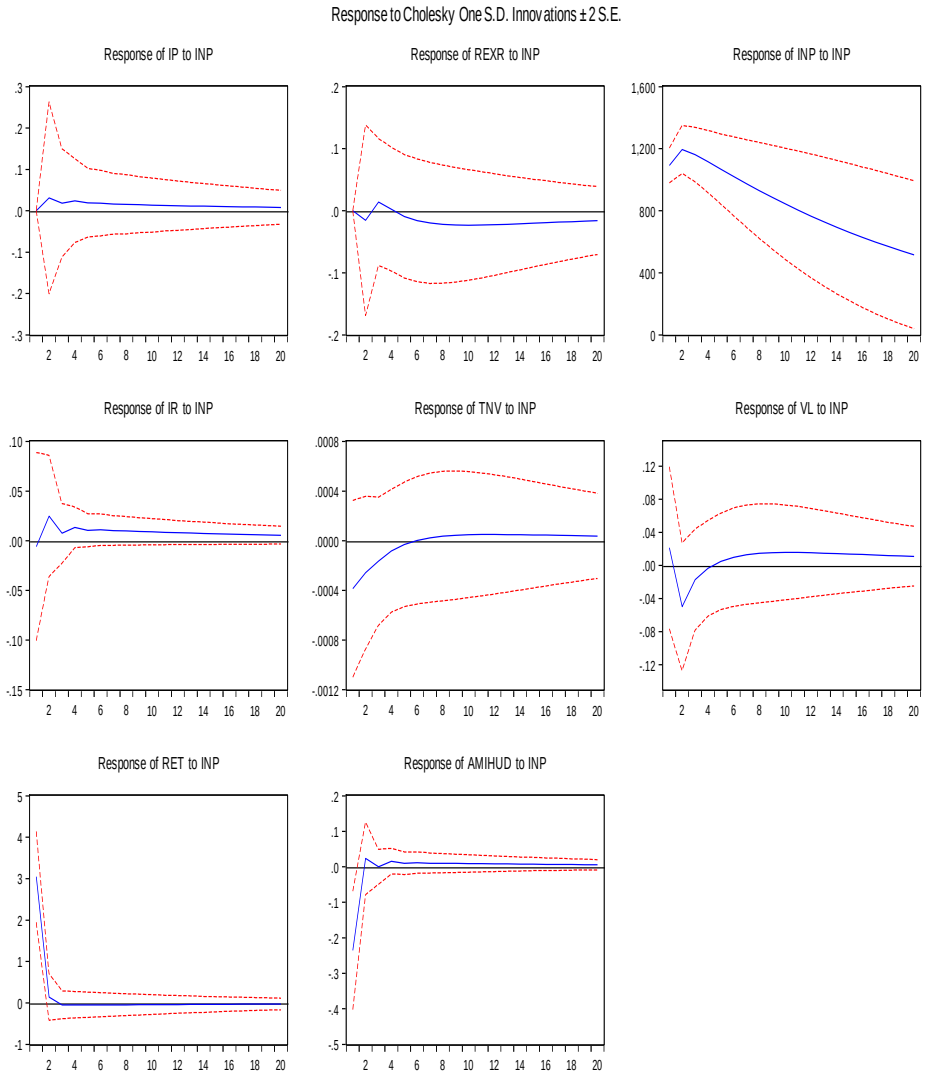


Figure A:2. Impulse responses of VAR model variables to each other with AMIHUD liquidity measure

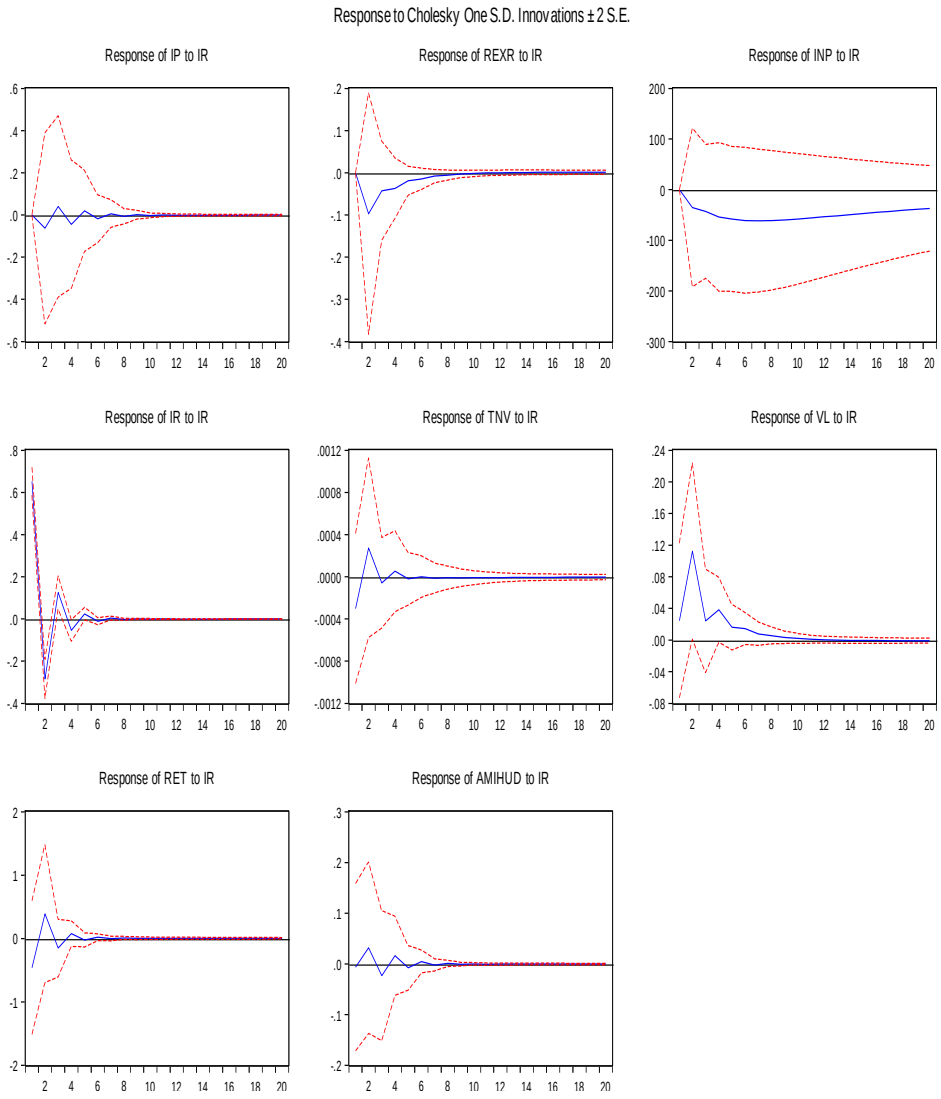
Panel: A. Impulse responses of all variables to IP shocks with AMIHUD **.** The figures present impulse responses of VAR model variables to each other with for PQSPR liquidity to a Cholesky one standard deviation shock on each others, 1992:10-1997:06 and 1999:03-2008:12. The VAR(1) models consisting of industrial production (IP), Real Effective Exchange Rate(REXR), Investment Portfolio(INP) , Interest Rate (IR) market share turnover (TNV), market volatility (VL), market return (RET),and market liquidity in that order are estimated. All the series are standardized and liquidity can be proportional spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI).



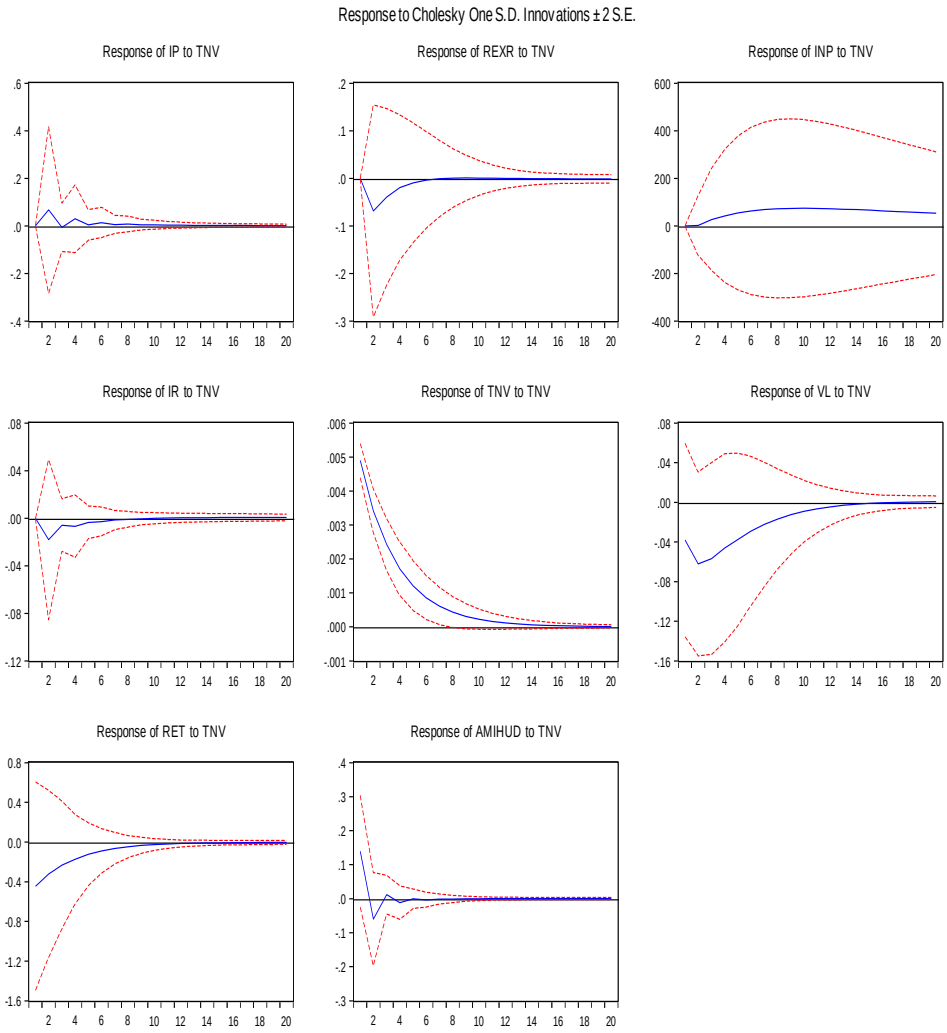
Panel: B. Impulse responses of all variables to REXR shocks with AMIHUD liquidity measure



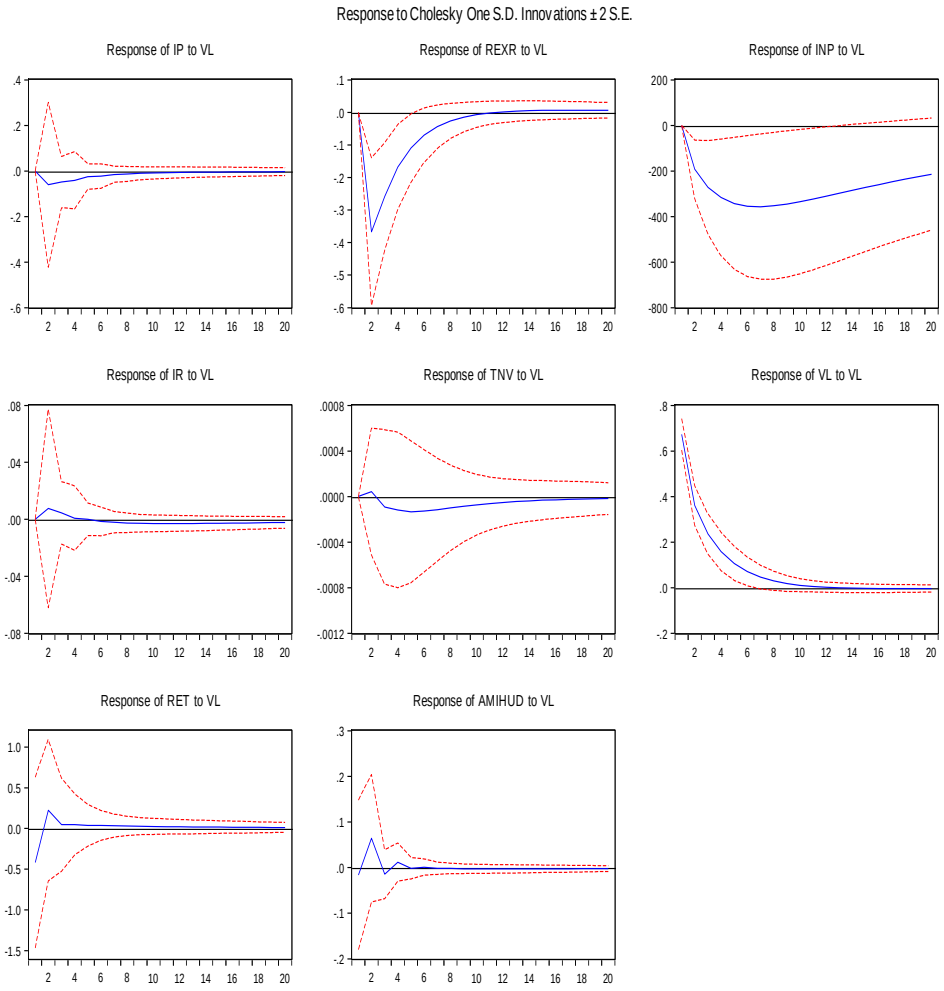
Panel: C. Impulse responses of all variables to INP shocks with AMIHUD liquidity measure



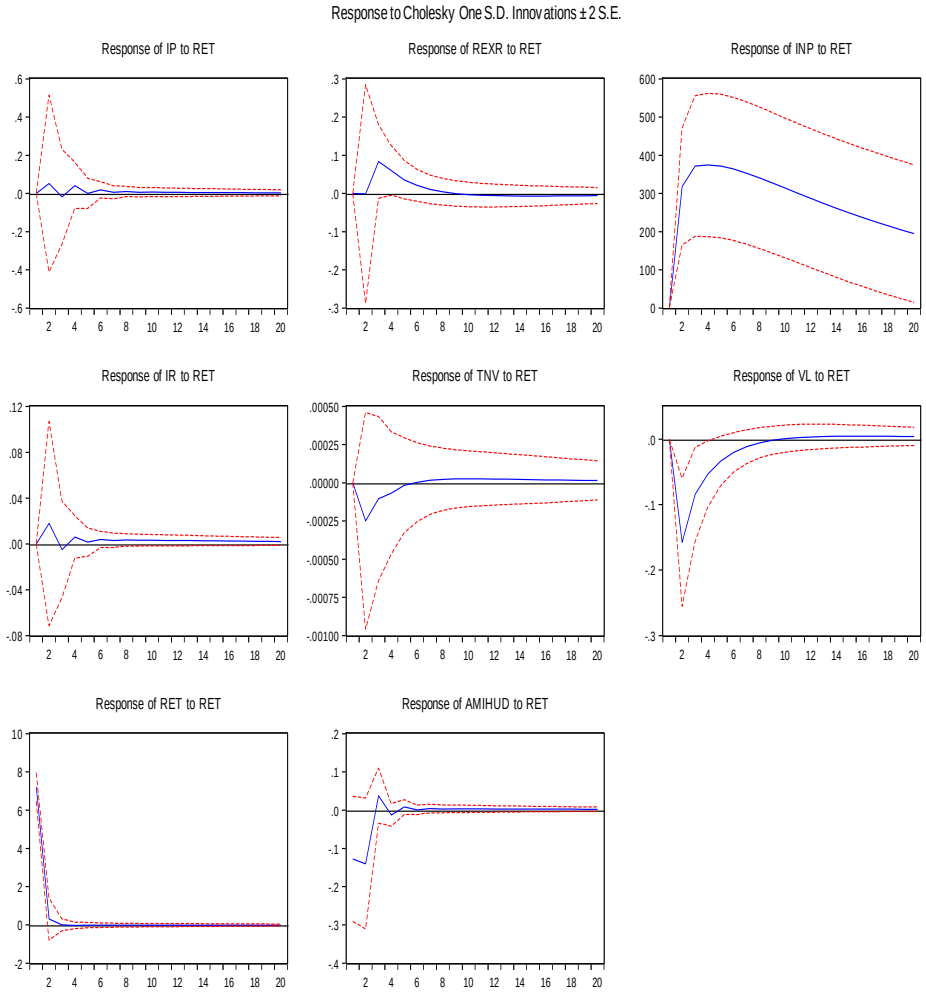
Panel: D. Impulse responses of all variables to IR shocks with AMIHUD liquidity measure



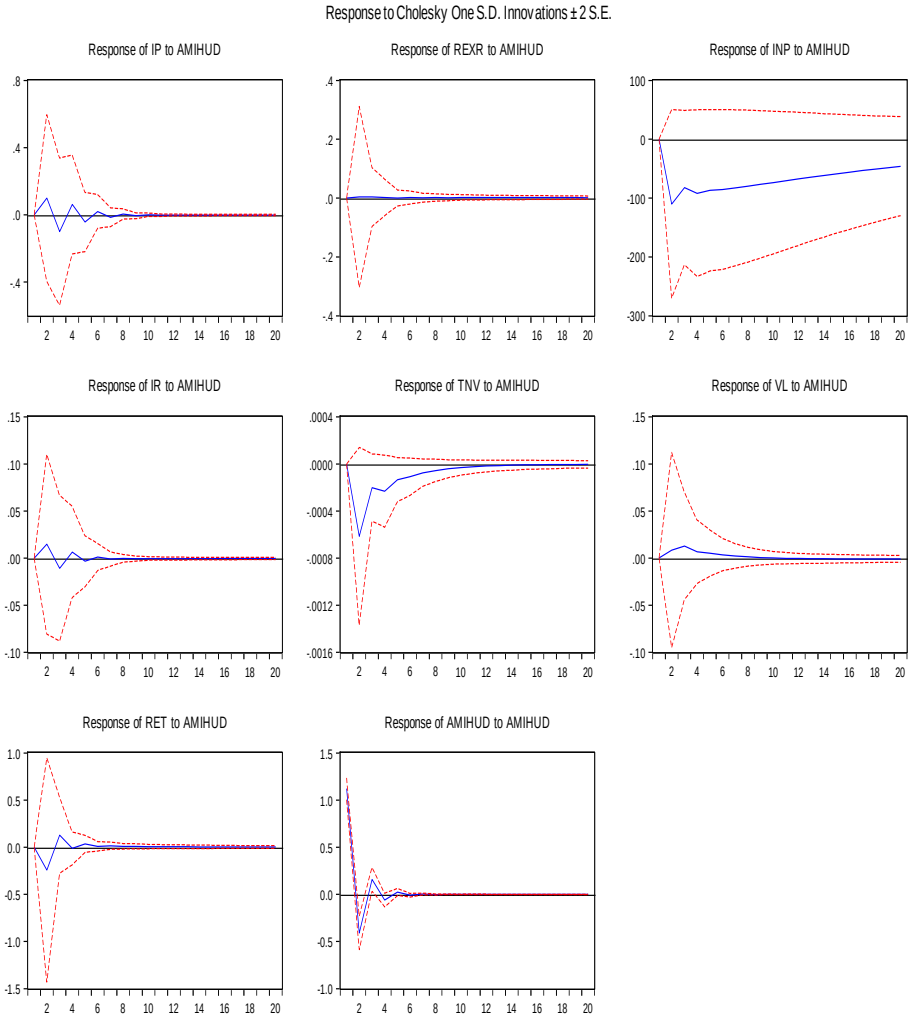
Panel: E. Impulse responses of all variables to TNV shocks with AMIHUD liquidity measure



Panel: F. Impulse responses of all variables to VL shocks with AMIHUD liquidity measure



Panel: G. Impulse responses of all variables to RET shocks with AMIHUD liquidity measure



Panel: H. Impulse responses of all variables to AMIHUD shocks with AMIHUD liquidity measure

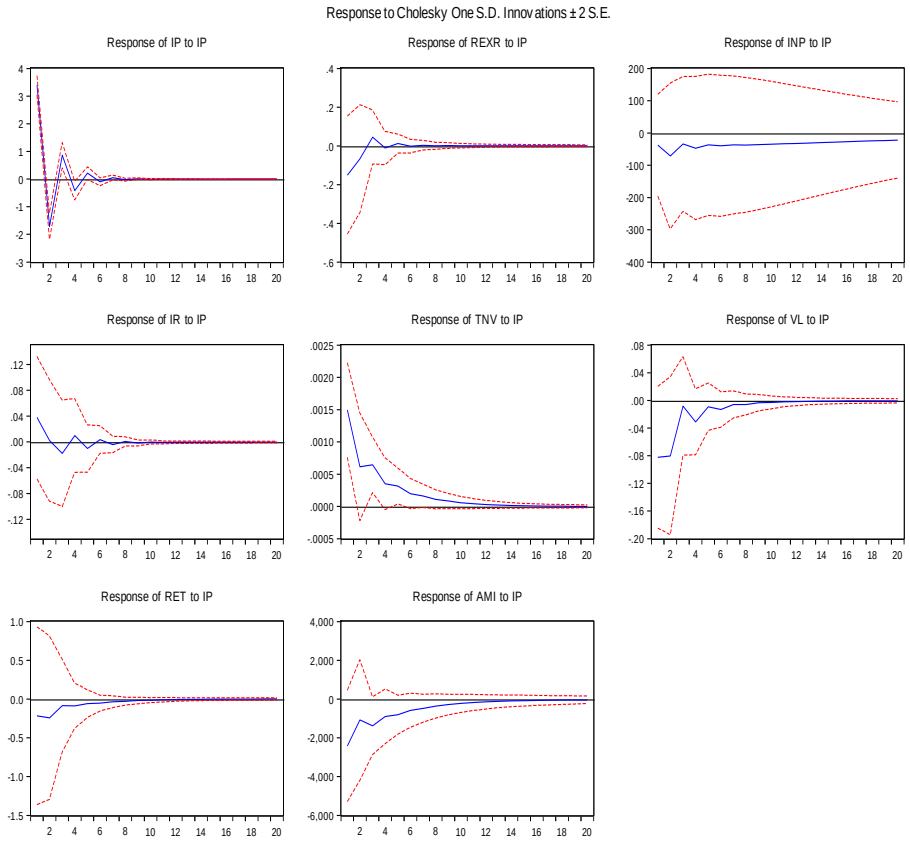
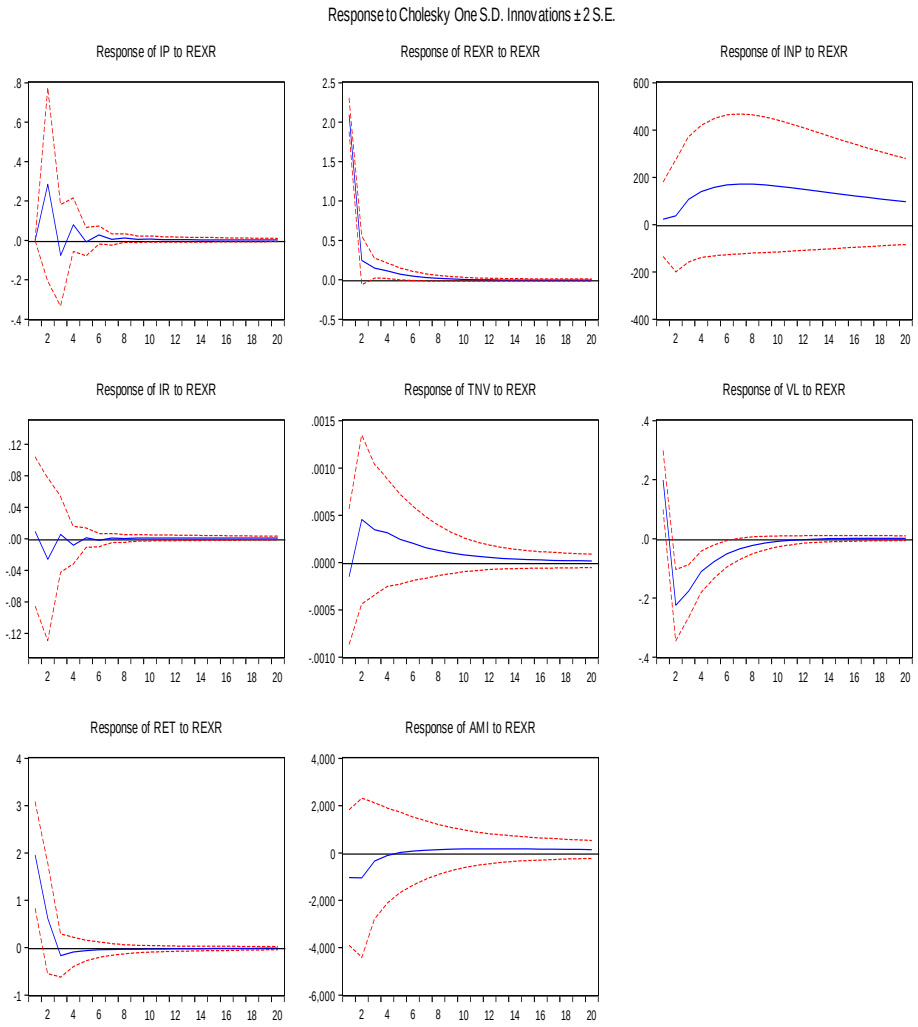
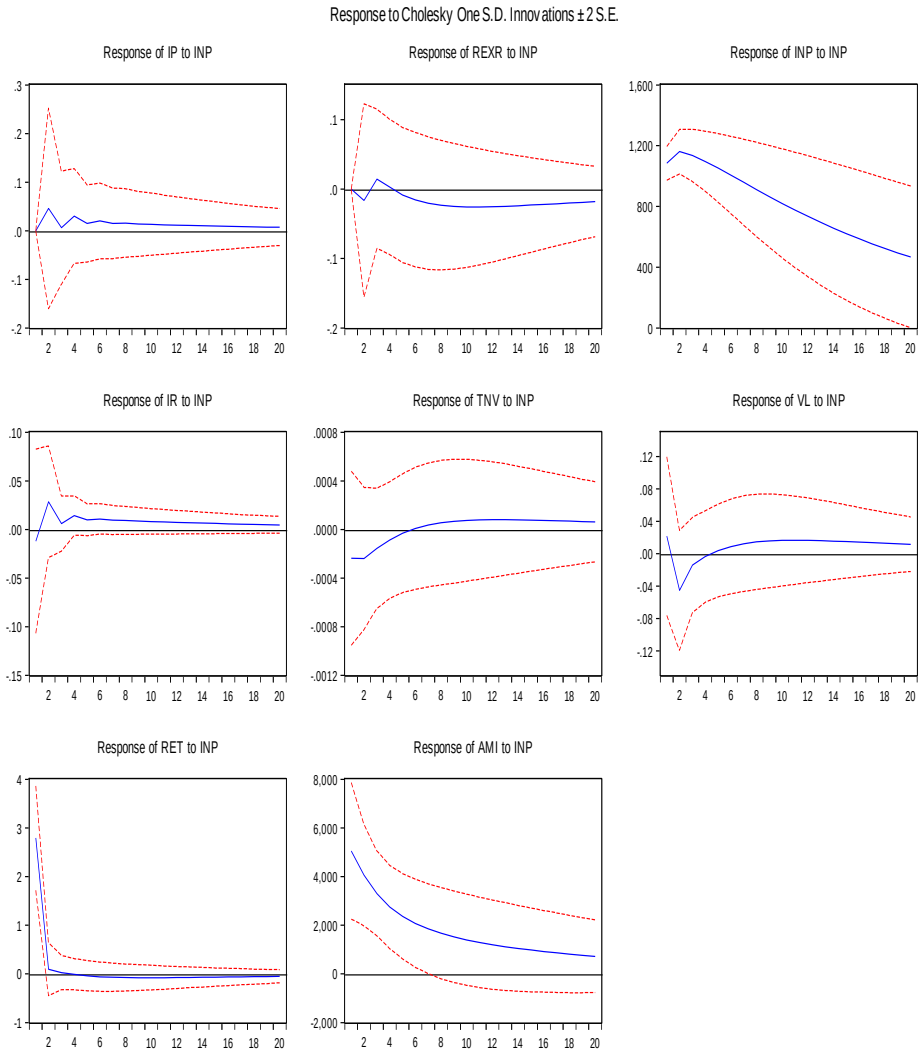


Figure A:3. Impulse responses of VAR model variables to each other with AMI liquidity measure

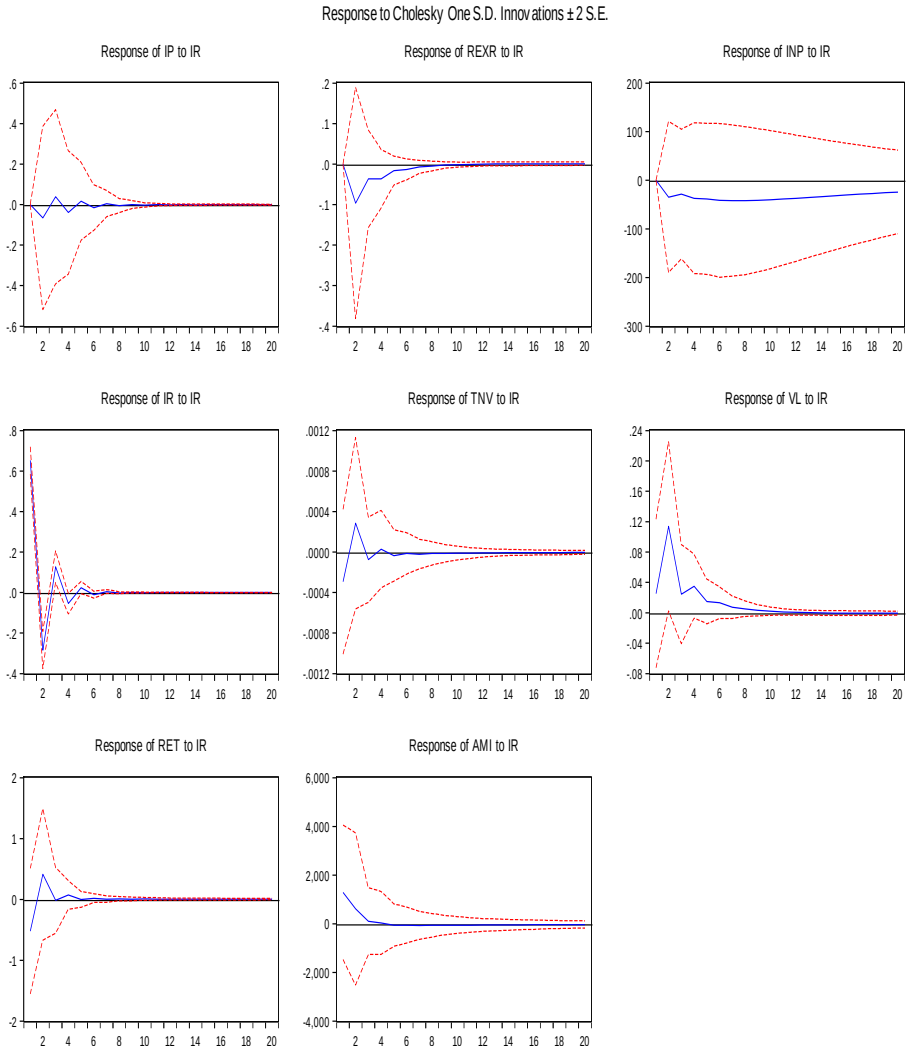
Panel: A. Impulse responses of all variables to IP shocks with AMI liquidity measure. The figures present impulse responses of VAR model variables to each other with for PQSPR liquidity to a Cholesky one standard deviation shock on each others, 1992:10-1997:06 and 1999:03-2008:12. The VAR(1) models consisting of industrial production (IP), Real Effective Exchange Rate(REXR), Investment Portfolio(INP) , Interest Rate (IR) market share turnover (TNV), market volatility (VL), market return (RET),and market liquidity in that order are estimated. All the series are standardized and liquidity can be proportional spread (PQSPR), Amihud illiquidity measure (AMIHUD), Amivest liquidity ratio (AMI).



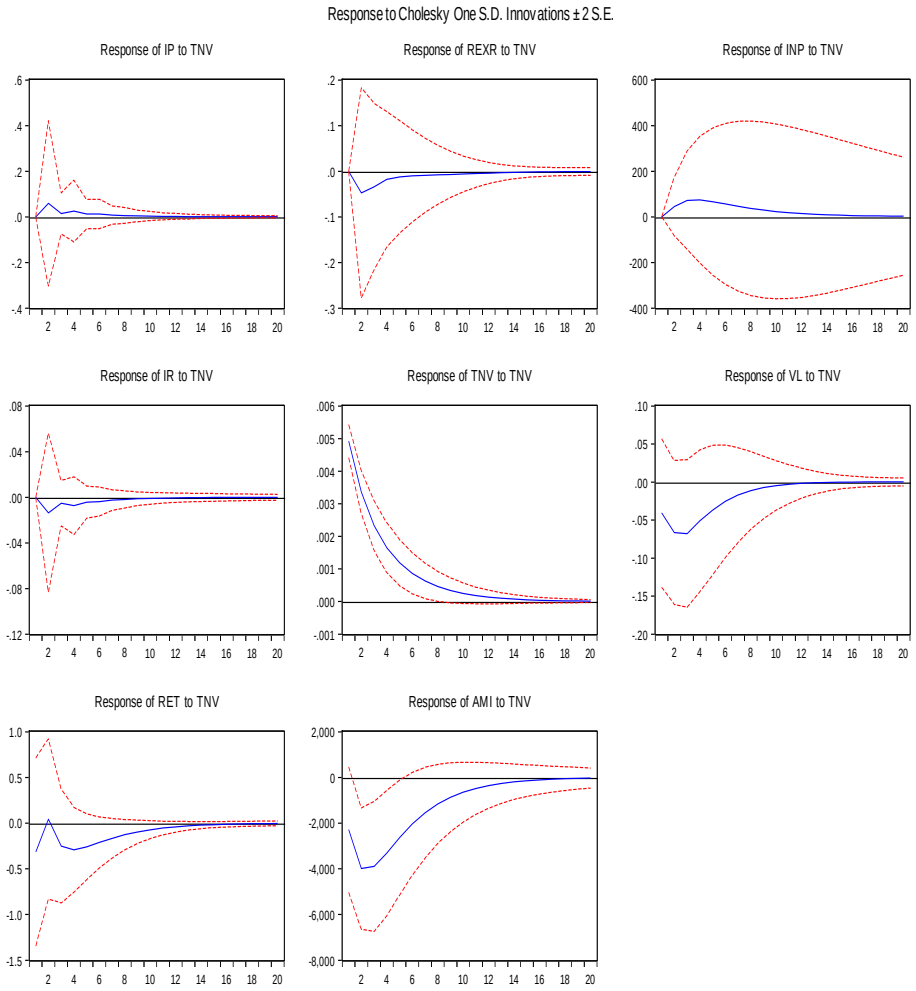
Panel: B. Impulse responses of all variables to REXR shocks with AMI liquidity measure



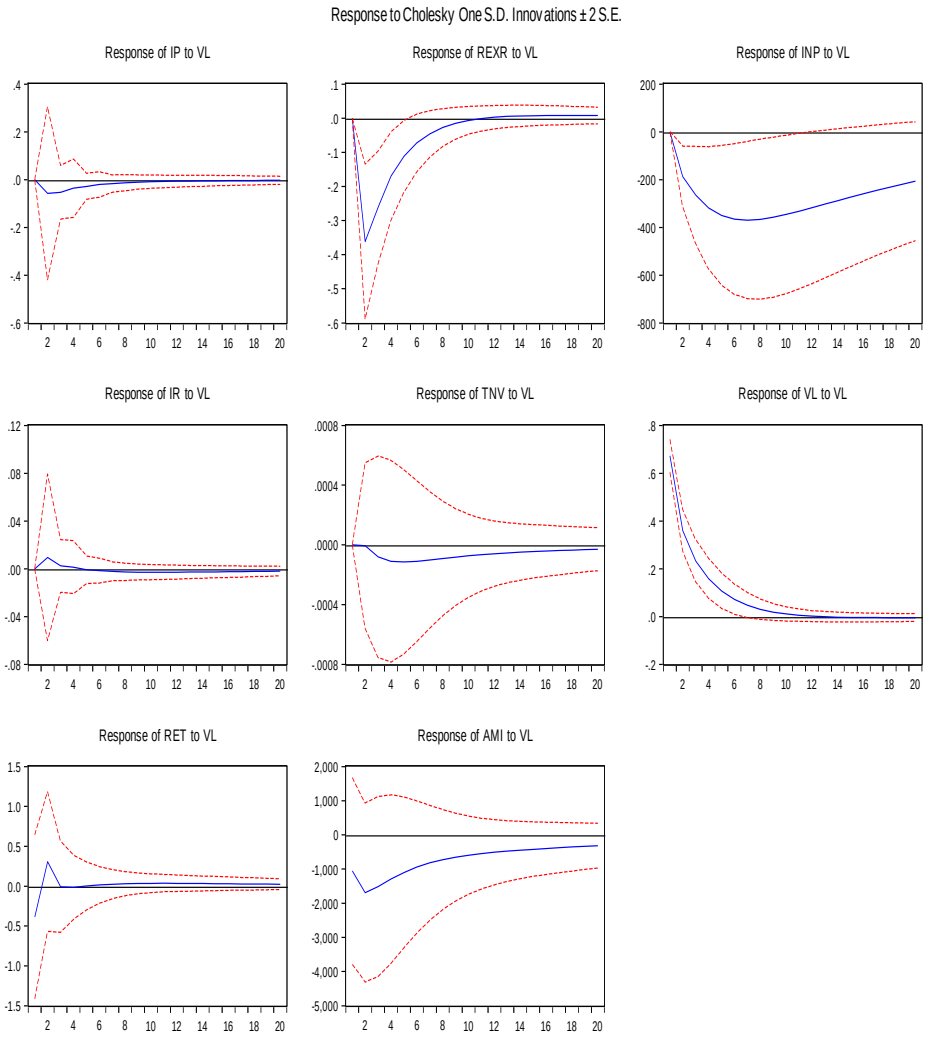
Panel: C. Impulse responses of all variables to INP shocks with AMI liquidity measure



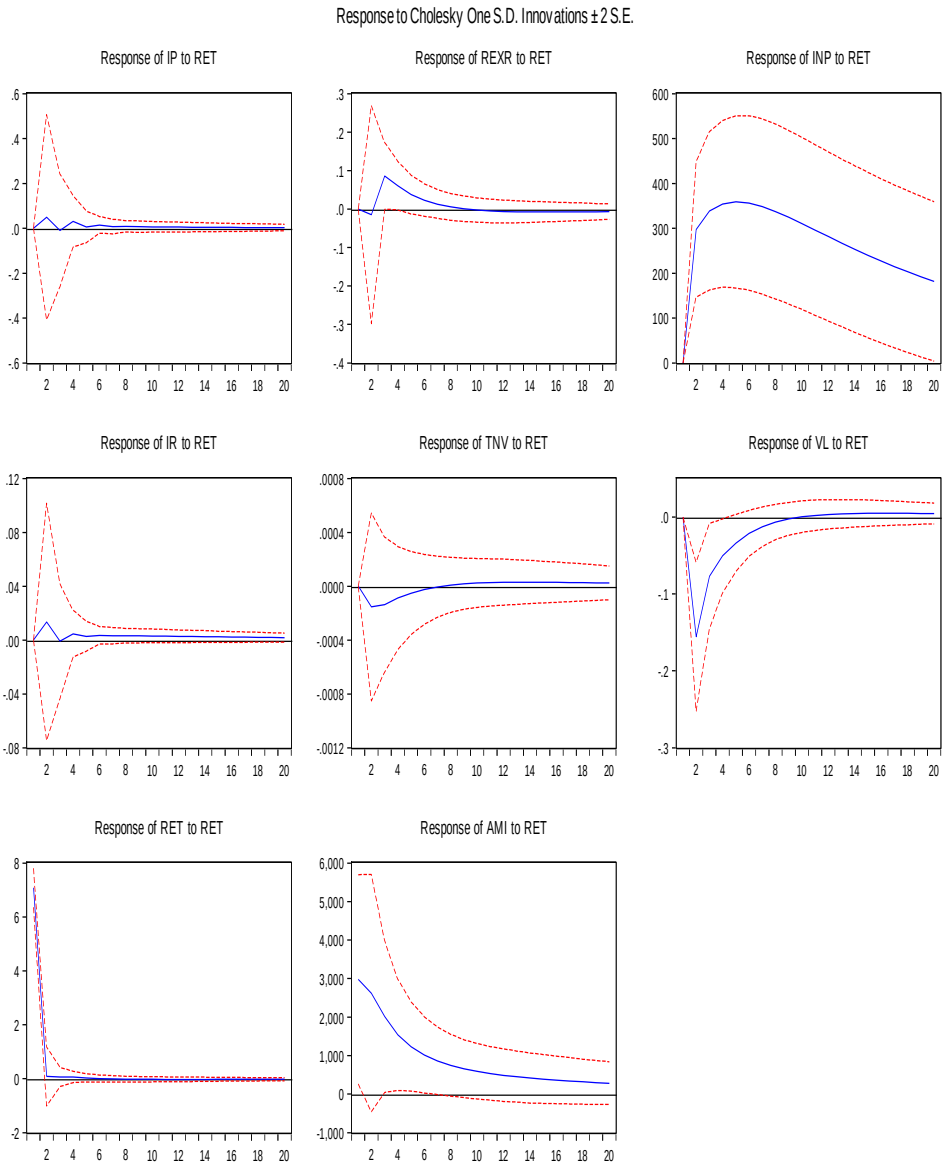
Panel: D. Impulse responses of all variables to IR shocks with AMI liquidity measure



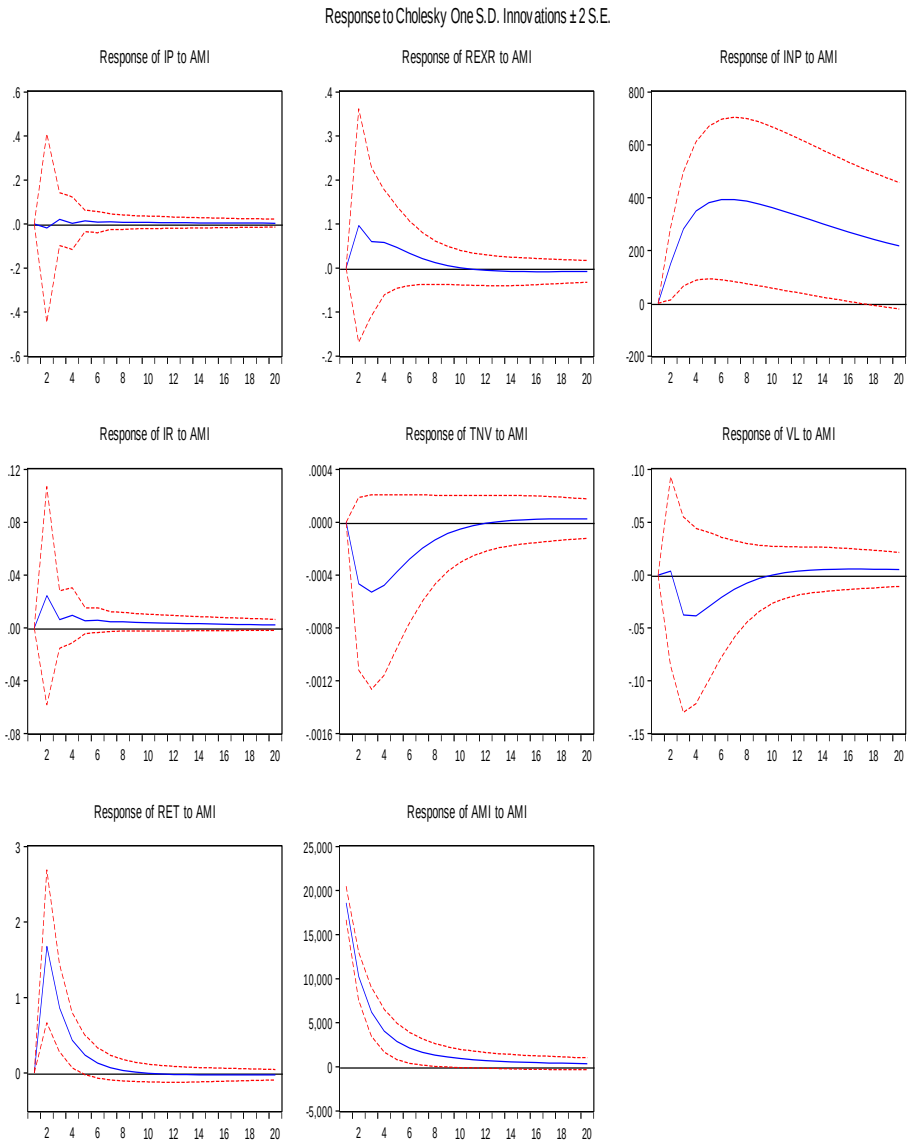
Panel: E. Impulse responses of all variables to TNV shocks with AMI liquidity measure



Panel: F. Impulse responses of all variables to VL shocks with AMI liquidity measure



Panel: G. Impulse responses of all variables to RET shocks with AMI liquidity measure



Panel: H. Impulse responses of all variables to AMI shocks with AMI liquidity measure

Appendix Two

CONVERT QUARTRLY DATA TO MONTHLY DATA