MACROECONOMIC DETERMINANTS OF STOCK MARKET LIQUIDITY: EVIDENCE FROM SELECTED ASIAN EMERGING MARKETS

IJAZ UR REHMAN

FACULTY OF BUSINESS AND ACCOUNTANCY
UNIVERSITY OF MALAYA
KUALA LUMPUR

2016

MACROECONOMIC DETERMINANTS OF STOCK MARKET LIQUIDITY: EVIDENCE FROM SELECTED ASIAN EMERGING MARKETS

IJAZ UR REHMAN

THESIS SUBMITTED IN FULFILMENT
OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

FACULTY OF BUSINESS AND ACCOUNTANCY
UNIVERSITY OF MALAYA
KUALA LUMPUR

2016

UNIVERSITI MALAYA

ORIGINAL LITERARY WORK DECLARATION

Name of Candidate: **IJAZ UR REHMAN**

Registration/Matric No: CHA120013

Name of Degree: PHD

Title of Project Paper/Research Report/Dissertation/Thesis ("this Work"):

Macroeconomic Determinants of Stock Market Liquidity: Evidence from Selected Asian Emerging Markets

Field of Study: Banking and Finance

I do solemnly and sincerely declare that:

(1) I am the sole author/writer of this Work;
(2) This Work is original;
(3) Any use of any work in which copyright exists was done by way of fair dealing and for permitted purposes and any excerpt or extract from, or reference to or reproduction of any copyright work has been disclosed expressly and sufficiently and the title of the Work and its authorship have been acknowledged in this Work;
(4) I do not have any actual knowledge nor do I ought reasonably to know that the making of this work constitutes an infringement of any copyright work;
(5) I hereby assign all and every rights in the copyright to this Work to the University of Malaya ("UM"), who henceforth shall be owner of the copyright in this Work and that any reproduction or use in any form or by any means whatsoever is prohibited without the written consent of UM having been first had and obtained;
(6) I am fully aware that if in the course of making this Work I have infringed any copyright whether intentionally or otherwise, I may be subject to legal action or any other action as may be determined by UM.

Candidate's Signature Date

Subscribed and solemnly declared before,

Witness's Signature Date

Name:
Designation:

Witness's Signature

Name: Date
Designation:

ABSTRACT

The popularization of commonalities in liquidity has led the stock market liquidity research to encompass a broader spectrum to investigate the role of macroeconomic forces. Previous stock liquidity literature that uses macroeconomic factors to examine their influence on market liquidity is focused on developed -liquid markets- and quote-driven stock markets. Little is known about the market liquidity sensitivity toward the macroeconomy in Asian emerging equity markets, which are mostly order-driven. This study therefore examines whether macroeconomic variables and stock market liquidity affect each other in five Asian emerging markets, namely, China, India, Pakistan, Malaysia, and Thailand. In particular, this study addresses three major objectives. First is to examine the role of macroeconomic variables in explaining market liquidity in the selected Asian emerging markets. Second is to compare the role of macroeconomic forces in market liquidity of selected Asian emerging markets. Third is to investigate causality/reverse causality/feedback effect between market liquidity and macroeconomic variables in the selected Asian emerging markets. This study uses monthly macroeconomic and stock market illiquidity measures over the period of January 2000 to December 2014 and therefore, employs three kinds of analysis. To address the first and second objective, this study first examines the long and the short run impact of macroeconomic variables on stock market illiquidity using Vector Error correction Models. The results suggest that policy rate and foreign equity flow/fund flow explain stock market illiquidity in four selected Asian emerging markets. In regards to the business cycle components, real economic activities explain stock market illiquidity in three Asian emerging markets in the long run. In the short run, concerning the monetary policy variables, both the monetary base and the policy rate have a lagged effect on stock market illiquidity in the three out of five selected Asian emerging markets. Concerning the business cycles components, inflation has a lagged effect on stock market illiquidity in the

four Asian emerging markets while foreign equity flow/fund flow has significant lagged effect on stock market illiquidity in four Asian emerging markets in the short run. To address the third objective, this study used Granger causality analyses. The results of Granger causality analyses suggest that monetary base and policy rate cause stock market illiquidity in three and one Asian emerging market, respectively, while real economic activities and inflation cause stock market illiquidity in four and one Asian emerging markets respectively. Foreign equity flow/fund flow causes stock market illiquidity in four Asian emerging markets. The causality analysis further suggests that there is bidirectional causality between foreign inflow, inflation, and stock market illiquidity in the Thailand and the Bombay equity markets. The Innovative Accounting Approach (IAA) is used to check the robustness, direction, feedback, extent, and relative strength of casual relationship ahead of selected time span. The results of Innovative Accounting Approach (IAA) suggest that positive shock to policy rate and inflation increases stock market illiquidity in few selected Asian emerging markets while negative shock to monetary base and foreign equity flow/fund increases stock market illiquidity in two out of the total number of selected Asian emerging markets. The results of IAA further suggest that positive shock to real economic activities decreases stock market illiquidity in the majority of Asian emerging markets. The results of variance decomposition analysis (VDA) suggest that business cycle components contribute more to stock market illiquidity in two Asian emerging markets while monetary base has more contribution in stock market illiquidity in the case of Bombay stock exchange and foreign equity flow/fund flow has more contribution in three Asian emerging equity markets. The VDA further suggests that there is feedback effect between foreign equity flow/fund and stock market illiquidity in the case of Thailand stock market and the Bursa Malaysia. The implications of the findings are also presented.

ABSTRAK

Penyelidikan selama dua dekad dalam bidang kecairan pasaran saham telah menunjukkan beberapa gambaran dalam literatur ekonomi kewangan, termasuklah kecairan dari peringkat mikro ke peringkat makro. Faktor kecairan pasaran saham yang semakin popular telah menyebabkan penyelidikan dalam bidang ini menjadi lebih luas untuk menganalisa peranan kuasa makroekonomi terhadap kecairan pasaran saham. Literatur kecairan pasaran saham menujukkan tumpuan lebih kepada faktor-faktor makro terhadap kecairan di pasaran negara maju dan pasaran yang didorong urusniaga (*quote-driven*). Tidak banyak kajian yang dilakukan tentang sensitiviti kecairan pasaran akibat faktor makroekonomi di negara Asia yang sedang membangun, di mana kebanyakannya adalah didorong oleh pesanan (*order-driven*) dan sering terdedah kepada faktor intervensi makroekonomi. Oleh itu, kajian ini bertujuan untuk menganalisa sama ada pembolehubah makroekonomi dan kecairan pasaran saham mempengaruhi antara satu sama lain di lima negara Asia membangun yang terpilih, iaitu China, India, Pakistan, Malaysia dan Thailand. Kajian ini mempunyai tiga objektif utama. Pertama, untuk mengkaji dan membandingkan peranan kuasa makroekonomi dalam mempengaruhi kecairan pasaran di negara-negara Asia terpilih yang sedang membangun. Kedua, untuk mengkaji dan membuat perbandingan sebab dan akibat di antara pembolehubah makroekonomi dan kecairan pasaran saham di negara-negara Asia yang dikaji. Ketiga, untuk mengkaji dan membandingkan potensi sebab dan akibat terbalik daripada kecairan pasaran kepada pembolehubah makroekonomi. Untuk mencapai ketiga-tiga objektif tersebut, kajian ini menggunakan tiga pembolehubah yang telah dipilih hasil daripada tinjauan literatur, iaitu peranan dasar kewangan, kitaran perniagaan, dan komponen aliran pelabur bagi menjelaskan kecairan pasaran saham. Kajian ini menggunakan data bulanan untuk mengukur pembolehubah makroekonomi dan pasaran

saham bagi tempoh Januari 2000 hingga Disember 2014 dan seterusnya menggunakan tiga jenis analisa. Untuk mencapai objektif pertama, kajian ini menganalisa kesan jangka panjang dan jangka pendek pembolehubah makroekonomi ke atas ketidakcairan pasaran saham dengan menggunakan model regresi dan pembetulan ralat (*error correction*). Keputusan kajian mendapati polisi dan aliran dana ekuiti asing memberi kesan kepada kecairan pasaran saham di empat buah negara yang dikaji. Dari segi kesan jangka panjang, keputusan kajian menunjukkan faktor kitaran perniagaan dan aktiviti ekonomi mempengaruhi kecairan pasaran saham di tiga pasaran saham negara Asia yang dikaji. Dari segi kesan jangka pendek, keputusan kajian mendapati asas kewangan (monetary base) dan polisi mempunyai kesan tertangguh ke atas kecairan pasaran saham bagi tiga negara Asia yang dikaji. Seterusnya, pembolehubah kitaran perniagaan dan inflasi pula didapati mempunyai kesan tertangguh ke atas kecairan pasaran saham di empat pasaran saham Asia yang dikaji, manakala dana ekuiti asing mempunyai kesan tertangguh ke atas kecairan pasaran saham di empat pasaran saham bagi jangkamasa pendek. Untuk mencapai objektif kedua dan objektif ketiga, kajian ini menggunakan analisis *Granger causality*. Keputusan analisis *Granger causality* ini mencadangkan asas kewangan mempunyai kesan Granger terhadap kecairan pasaran saham dalam tiga pasaran saham yang dikaji, manakala kadar polisi mempunyai kesan Granger terhadap kecairan pasaran saham dalam hanya satu pasaran saham yang dikaji. Dana ekuiti asing mempunyai kesan Granger terhadap kecairan empat pasaran saham negara membangun tersebut. Keputusan analisa juga mencadangkan terdapat kesan dwi-hala di antara aliran masuk asing, inflasi dan kecairan pasaran saham di pasaran ekuiti Thai dan Bombay. Pendekatan Perakaunan Inovatif (*Innovative Accounting Approach*) (*IAA*) digunakan untuk menyemak kemantapan hala tuju, maklum balas, tahap, dan kekuatan relatif hubungan *kausal* lebih awal daripada jangka masa yang dipilih. Keputusan IAA ini mencadangkan kejutan positif kepada kadar polisi dan inflasi

mengakibatkan kecairan pasaran saham berkurangan bagi beberapa pasaran saham Asia yang membangun, manakala kejutan negatif terhadap asas kewangan dan dana ekuiti asing mengurangkan kecairan pasaran saham bagi dua pasaran saham negara Asia yang membangun. Keputusan IAA juga mencadangkan bahawa kejutan positif terhadap aktiviti ekonomi meningkatkan kecairan pasaran saham dalam kebanyakan pasaran saham negara Asia yang dikaji. Keputusan "*Variance Decomposition Analysis"* (VDA) mencadangkan bahawa komponen-komponen kitaran perniagaan menyumbang lebih kepada kecairan pasaran saham di dua pasaran saham negara Asia yang membangun, manakala asas kewangan menyumbang kepada kecairan pasaran saham bagi kes pasaran saham Bombay, dan dana ekuiti asing menyumbang kepada tiga pasaran saham. Keputusan VDA juga mencadangkan terdapat kesan maklumbalas di antara dana ekuiti asing dan kecairan pasaran saham bagi kes pasaran saham Thailand dan Bursa Malaysia. Implikasi dapatan kajian ini juga diberikan dalam tesis ini.

ACKNOWLEDGEMENTS

All praise to Allah, the lord and cherisher of the universe. May the highest of his blessings be showered upon his Prophet Muhammad (p.b.u.h). I extend my sincere thanks to my supervisors Dr Shahnaz Ahmad Mahdzan and Dr Rozaimah Zainudin and acknowledge with gratitude the inspiring guidance and indispensable suggestions that i have gained from them. They helped me a lot to steer my way through many complexities and ambiguities of research. I certainly would like to thank Bright Sparks Unit of University of Malaya for sponsoring my PhD study. I would also like to thank Waseem Chaudary (State Bank of Pakistan) and Morningstar Asia (Singapore) for providing me necessary data, which enabled me to conduct the analyses. I am indebted to my parents for their consistent support, prayers and for tolerating my absence during my PhD study.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

IAA	Innovative Accounting Approach
VAR	Vector Autoregression
VECM	Vector Error Correction Model
TV	Trading Volume
VO	Number of shared Traded
P	Price
Ami	Amihud Price Impact
R	Returns
COV	Covariance
RPI	Roll's Price Impact
Illiq	Illiquidity
MB	Monetary Base
PR	Policy Rate
IPI	Index of Industrial Production
INF	Inflation
CPI	Consumer Price Index
FNIF	Foreign net Inflow
ADF	Augment Dickey- Fuller
PP	Philips-Perron
KPSS	Kwiatkowski, Philips, Schmidt, and Shin
AR	Autoregressive
ARMA	Autoregressive Moving Average
GLS	Generalized Least Square
ECM	Error Correction Model
AIC	Akaike information criterion
VDA	Variance Decomposition Analysis
IRF	Impulse Response Function
MS	Money Supply
PCNF	Percentage Change in net Fund Flow

LIST OF APPENDICES

Appendix

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter highlights the core fundamentals of equity market liquidity by providing background of how asset liquidity was viewed in early researches and how it gains central importance followed by brief definitions. The chapter further briefly highlights the developments made in early researches and how it has paved the way for empirical investigations that were carried out in the last decade. Further, this chapter underscores how the shift occurs in liquidity research from firm-level characteristics to macroeconomic role in explaining market liquidity by shifting the focus from individual assets to market level and from quote-driven markets to order-driven markets. Next, this chapter highlights the liquidity issues in Asian emerging markets, and then goes on to formulate three research questions, objectives and a description of how and in what way this study departs from earlier similar studies, and then concludes with a statement on the structure of the thesis.

1.2 Background of study

Liquidity holds an indispensable influence in numerous areas of finance, and different policy connotations are attached to the liquidity importance because of the contrasting views on liquidity among academic and practitioners, i.e. whether liquidity stimulates or hampers financial market stability. The multidimensional role of liquidity related to the ease and speed of trading has extended its parameters across the financial markets. For instance, O'Hara (2004) noted that the divergences in the opinions related to liquidity emulates a deeper disparity as to whether liquidity is viewed as a good quality or otherwise in the financial markets. From a policy perspective it is pertinent to determine the role of liquidity as virtue or otherwise to better dictate the role of the authorities. Liquidity is a core measure of stock market eminence and a vital pre-

condition for financial market development and growth. Liquidity plays a key function in risk and hedge management (Acharya and Schaefer, 2006; Das and Hanouna, 2009) and in provoking and transmitting financial catastrophes (Borio, 2004) particularly in most recent financial turmoil (Gorton, 2009; Brunnermeier, 2009), hence directly affecting investors' required returns (Amihud and Mendelson, 1986).

There is voluminous literature that deals with the importance of liquidity and its ultimate economic consequences in financial markets. Early literature dealt with the measurement dimensions of liquidity such as trading cost dimensions (Jones, 2002; Amihud and Mendelson, 1989; 1986), trading quantity dimension, which is captured by volume (Llorente et al., 2002; Campbell et al., 1993), trading activity (Avramov et al., 2006), trading speed dimension (Liu, 2006), price reaction to trading volume (Amihud, 2002) and turnover by (Datar et al. 1998). Few researchers considered liquidity in the stock market as an outcome of investor sentiments (e.g. Baker and Stein, 2004) because of its crucial reflection in asset pricing in financial markets.

The importance of liquidity is considerably covered in the market microstructure framework. In general, liquidity has important implications for asset pricing. Illiquid stocks and stocks with higher transaction cost are traded subject to expected cash flow[1]. Liquidity has a time-varying component. Because of the time-varying nature of liquidity, its importance has grown recently, especially following the global financial crisis. Many researchers opined that the financial crisis was not the outcome of insolvency issues, but rather a result of illiquidity problems. According to Brunnermier and Pedersen (2009), a severe liquidity spiral caused a considerable decline in market activities. If liquidity fluctuates systematically, positively correlated stock returns with

[1] See for example, Chordia et al. (2001), Bekaert, Harvey and Lundblad (2007),Datar et al. (1998), Brennan and Subrahmanyam (1996), Amihud and Mendelson (1986)

stock market liquidity should have higher expected returns[2]. This time-variation is an issue for investors who agonize about the trading cost in a shorter period. Further, liquidity can shape assets' prices. For instance, as compensation, investors demand a high rate of return for holding a liquid asset, and especially those assets that are sensitive to liquidity variations (Comerton-Forde et al, 2010).

In terms of market microstructure view, O'Hara (2004) linked liquidity with the stability of the financial markets. She argues that investors are willing to hold assets that they can quickly buy and sell. By this view, a security can be considered liquid if there are large numbers of ready sellers and buyers. Hence higher liquidity propel greater strength in the market, thus prices will be less affected by trading in the liquid market. She further argued that, such a large amount of participation would lead to bring more liquidity in the market. For informationally efficient markets, liquidity is considered an important feature since illiquid stocks and markets thwart arbitrageurs from pouring prices towards their core fundamentals. Resultantly, informational efficiency leads to the overall welfare via efficient allocation of capital resource across different investment opportunities (Wurgler, 2000). Moreover, liquidity is also critical in convincing firms to list on the exchanges since it is one of significant determinants to the firm's decision related to the optimal capital structure and cost of capital (Wuyts, 2007). All these attributes altogether suggest liquidity as a desirable feature of the financial markets to understand its dynamics across the markets for regulators, investors, and for overall capital markets.

1.3 Definitions of Liquidity

The term liquidity seems to be a simple concept, the precise meaning of liquidity is, however far what liquidity is understood apparently, thus lead this concept to

[2] See for instance Sadka (2006), Goyenko (2005), Martinez et al. (2005), Huberman and Halka (2001), Pastor and Stambaugh (2003), Chordia et al. (2000)

definitional quandary. The definitional quandary of liquidity is largely due to its multifaceted nature. There are three broad features, which together shape liquidity in financial markets (i.e. depth, tightness and resiliency). An early definition of the liquidity can be found in Keynes (1930) who argues that an asset can be more liquid, if it is definitely attainable with short notice without losses. Harris (1990) and O'Hara (1995) classified four dimensions of liquidity. First is *market width*, which refers to the Bid-ask, spread for given numbers of assets and fee & commission paid per share. Second dimension is *depth* which refers to sufficient interest to buy and sell numbers of shares at given Bid-Ask rate. The third dimension of liquidity is *immediacy* which refers to how rapidly a trade of given number of assets in the stock market can be executed at the cost associated with such trade. A fourth dimension of liquidity is *resiliency* which characterizes liquidity in the market by how swiftly prices converge to previous level that were changed as a result of large order flow imbalance prompted by uninformed investors.

Recent economic literature, however, defines liquidity as, the ability of large trading volume with nominal impact on asset prices, cost and delay (Krishnan and Mishra, 2013). Amihud (2002) noted that liquidity is an elusive concept. He simply defines liquidity as ease of trading. Allen and Gale (2005) refer liquidity to a trader's ability to acquire the means of payment required to execute trades in the asset market. Similarly, Mainelli (2007) definition of liquidity focuses on time and value of conversation. He defines liquidity as a probability of converting stock into the expected amount of value within the expected amount of time. Even though, the concept of liquidity is elusive, market microstructure literature generally agrees that liquidity concept is centered on the trader's ability to buy and sells shares in the stock market easily.

1.4 Quote-driven vs Order Driven Market

As equity trading is largely electronic in modern financial markets, market structure of stock exchanges around the world is broadly categorized into two types, namely quote-driven market and order-driven market. By definition, pure quote- driven markets have market-making system, which largely provides liquidity to the market, while order-driven market do not have market-making arrangements (see, Hautsch, 2012, Wuyts, 2007). In the order-driven market, given the absence of specialists, the traders and their unexecuted limit orders provide liquidity. This implies that, if limit orders supply dries up, it will leads to breakdown in the trade. On the contrary, in the quote-driven market, dealers/ specialists/ market markers play important role in the executing the trade and hence supply liquidity to the market. Concerning the spread components of both markets and its implications for the liquidity provision, first this study highlights the spread components of dealer/ quote-driven market and its implications for liquidity provision followed by order-driven market.

In a quote-driven market, bid and ask prices set by the dealers obviously determine the bid-ask spread. Extant literature draws on three key theoretical models, which explains dealers "quoting behavior" namely, order handling costs, asymmetric information models and inventory models (see, uyts, 2007). Order handling costs include cost of matching and clearing orders as well as cost of maintaining the continuous market. Concerning the information models, pioneered by Bagahot (2007) where he differentiated between uninformed traders, informed traders and liquidity traders. Since liquidity traders also called noise trader do not have the information, therefore they trader for the reasons exogenous to the information model, such as portfolio rebalancing motives or, simply they believe that they do have information. In such context, spread in the quote driven market reflects a balance the dealers/market makers between gain and

loss between informed traders and uninformed traders. Concerning the inventory models, the uncertainty in the order flow for the marker makers plays an important role, since they have to face the uncertainty when managing the inventory. While managing the inventory to deal with the uncertainty, market markers set their prices according to the extent of uncertainty[3]. In other similar model, Glosten and Milgrom (1985) suggested that asymmetric information can induce bid-ask spread or it may exist already if the specialists face competitions, have no cost or they are risk neutral. Similarly, in the Kyle (1985) models, in a single information- based model , there is one informed trader against the liquidity traders where trader place their orders concurrently and the specialists note the net order flow and use one price to clear all placed trader orders.

Contrary to quote-driven market, in order driven market, traders which provide liquidity to the market can still expect the compensation of the order handling cost. In the case of informational inefficiency, since no trader has a compulsion to make the market or take the opposite position, therefore the role of inventory appears insignificant. Theoretically, Glosten (1994) model suggests that, due to the probability of trading on private information in the limit order market, such market have a positive bid-ask spread. In this vein, Handa, Schwartz and Tiwari (2003) developed a model for the order-driven market in which investors differ in their beliefs about differences in valuation of share and adverse selection. For order- driven market, Jong Nijman and Roell (1995) empirically noted that order-processing cost plays a significant role in determining the appropriate spread. They noted a positive correlation between trade size and price impact of trade. Ahn, Cai, Hamao and Ho (2002) noted a U-shaped intra-day patterns in order processing-cost and adverse selection.

[3] Few models are built on this idea see for instance, Glosten and Milgrom (1985) and Kyle (1985).

1.5 Commonalities in Liquidity

In financial economics literature, commonalities in liquidity refer to the time series phenomenon of co-movements in liquidity pattern due to some common fundamental determinants across assets in the stock market. It has been widely accepted that liquidity co-varies strongly across assets even under normal economic situation[4]. Chordia et al. (2000) introduced this concept and it implies that firm level liquidity is at least partly explained by market-wide liquidity. Since the introduction of this idea by Chordia et al. (2000), increasing number of studies[5] explore the role of systematic liquidity and commonality in liquidity in different markets. Huberman and Halka (2001) describe such phenomenon as systematic liquidity. The phenomenon of liquidity co-movement has been confirmed in other markets.[6]

Understanding commonalities of liquidity has several significant implications and therefore it is important for a number of reasons. Arguing for the bright side of liquidity in the stock market, O'Hara (2004) articulated that, even if commonalities of liquidity exist in the market, two general views could be drawn. First, *flight-to-quality* may persuade investors to forsake one asset for another as long as investors stay in the market, thus in this case the instability effect— because of commonalities in liquidity— will be local not global. Second, commonalities may convince investors to penetrate the market, thus propel stability in the market by augmenting number of ready sellers and buyers. Third, one of the critical issues for market participants is whether liquidity in the market is priced or not. Domowitz and Wang (2002) argue that commonality in liquidity constitutes a problem of diversification strategies to investors that lean on selecting

[4] Corwin and Lipson (2011), Coughenour and Saad (2004), Eckbo and Norli (2002), Huberman andHalka (2001), Chordia, Roll and Subrahmanyam (2000), Hasbrouck and Seppi (2001)

[5] See for example, (Fernando, Herring, and Subrahmanyam, 2008; Martinez, Nieto, Rubio, and Tapia, 2005; Domowitz, Hansch and Wang, 2005 ; Henker and Martens, 2008; Gibson and Mougeot, 2004; Coughenour and Saad, 2004; Bauer, 2004; Chollete, 2004 ; Pastor and Stambaugh, 2003; Fernando and Herring, 2003; Fernando, 2003; Brockman and Chung, 2002; Huberman and Halka, 2001; Hasbrouck and Seppi, 2001; Lo and Wang, 2000)

[6] For instance, Pukthuanthong-Le and Visaltanachoti, (2009) examined liquidity in Thailand, Galariotisand Giouvris, (2007) in United Kingdom, Fabre and Frino (2004) in Australia, Brockman and Chung, (2002) in the Hong Kong Stock Market

stocks that do not co-move with returns. Given that liquidity of assets co-varies with each other, any shock to the common factors will generate market-wide effects. Further, given that stock returns and market liquidity are interrelated, such phenomenon creates non-diversifiable risk factors, thus investors demand liquidity premium to compensate for non-diversifiable risk (Fujimoto, 2003).

1.6 Macro Economy and Market Liquidity

While studying stock liquidity in the market, it is worthy to highlight that the notion of liquidity for individual stock is different from the notion of aggregate market liquidity. In both cases, demand and supply conditions drive liquidity; however, the determinants that delineate the demand and supply functions for the individual stocks in equity markets are different from the components that shape liquidity in the overall equity market. Moreover, relative stock level liquidity is formed by unique individual asset attributes, whereas overall equity market liquidity is mostly shaped by macroeconomic forces, which are fundamental to the economy (Jun et al, 2003; Lu and Glascock, 2010).

Empirical research on liquidity in equity markets generally agrees that the liquidity of equity markets varies considerably over time with the state of the economy and that instability in market liquidity is one of the main causes of risk for investors. Empirical investigations further substantiate that co-variation in the stock liquidity entails that illiquidity risk is non-diversified and should be viewed as a systematic risk factor.[7] Following the emergence of commonalities in liquidity notion by Huberman and Halka (2001) and Chordia et al. (2000), two issues remained focus in equity market liquidity research. The first issue deals with what effect market liquidity has on stock return, whereas the second issue deals with cause's time-variation in the equity market.

[7] See for instance, Inter-Alia, Acharya and Pedersen (2005), Pastor and Stambaugh (2003)

The first issue has been extensively examined and empirical manifestation generally corroborates the theoretical hypothesis that required return is positively related to illiquidity (Fernández-Amador, Gächter, Martin, Peter, 2013). However, what causes time-variation in market liquidity is still a burgeoning issue, and recently few studies have attempted to address this issue by providing explanations for commonalities in liquidity across the stocks, thus yielding different conclusions. Koch et al. (2009) for instance, link this phenomenon with mutual fund ownership structure. Brunnermeier and Pedersen (2009) relate commonalities in liquidity with funding liquidity, whereas Hameed et al. (2010) provided an explanation of large market decline and Lin (2010) relates it with financial liberalization.

The sudden evaporation of market liquidity during market decline is indeed justified by the inventory risk theory in the market microstructure literature, which suggests that perceived risk of inventory stock holdings maybe caused by changes in economic fundamentals, thus influence market liquidity as a whole (Fujimoto, 2004). Fujimoto (2004) argues that the co-movement of liquidity pattern across individual assets implies that some fundamental economic forces are responsible for this co-movement, which causes systematic elements of liquidity. In this vein, Coughenour and Saad (2004) argue that, although positive time-series liquidity co-variation is provided in Hasbrouck and Seppi (2001) and Chordia et al. (2000), economic source of liquidity co movement is not well understood. Soderberg (2008) opined that evaporation of liquidity from the equity market during the recent financial crisis signifies the macroeconomic sources, which explain variation in the equity market liquidity and these should be identified. Recently, there has not been a dedicated debate in market microstructure framework on macroeconomic forces in forming market liquidity of emerging equity markets. In the context of macroeconomic condition, Chordia, Roll, and Subrahmanyam (2001) were the first to link liquidity of stock market with

macroeconomic conditions and some macroeconomic variables. Since then, many papers have addressed this phenomenon with new theoretical foundations.

The new theoretical foundation and subsequent empirical investigation showed that either business cycles influence market liquidity (e.g. Taddei 2007; Eisfeldt; 2004; Næs, Skjeltorp and Ødegaard, 2011), by mutual fund flow (e.g. Massa, 2004), by funding liquidity (e.g. Fecht and Gruber, 2012; Brunnermeier and Pedersen, 2009), and by monetary policy (e.g. Fernández-Amador et al. 2013). In other related papers, the authors have linked macroeconomic factors with stock market liquidity to investigate how macroeconomic factors determine equity market liquidity[8].

Few studies have explored the hypothesis that, market liquidity is also influenced by business cycles. Intuitively, recession cycles in the economy hamper funding liquidity[9], consequently, reduction in funding liquidity reduces market liquidity. Similarly, when the economy is in a boom, improvement in real economic activities can propel market liquidity (Lu and Glascock, 2010). Brunnermeier and Pedersen (2009) posit that during an economic downturn, exogenous shocks to trader capital could cause dry-up in market liquidity. The sudden evaporation of market liquidity during market decline is indeed justified by the inventory risk theory in the market microstructure literature, which suggests that variations in economic fundamentals may alter perceived risk of inventory stock holdings and thus influence market liquidity as a whole (Fujimoto, 2004). Large market downturns cause market liquidity because capital becomes more scarce and overall uncertainty is high. Vayanos (2004) suggests that liquidity providers become more risk averse in the face of uncertainty about asset values. Investors rebalance their portfolio in view of the uncertainty of capital

[8] See for example, Fernández-Amador et al, (2013), Soderberg (2008) , Goyenko and Ukhov (2009), Chordia, Sarkar and Subrahmanyam (2005), Choi and Cook (2005), Fujimoto (2004)

[9] There are two different types of liquidity (i.e Assets Liquidity and Funding Liquidity). Asset liquidity is investor's ability to trade whereas Funding liquidity is the ability to obtain funding for trading. These two categories of liquidity fortify each other (E.g Brunnermeier and Pedersen, 2009; Gromb and Vayanos, 2002; Kyle and Xiong, 2001). The feedback relationship between these two type of liquidity is often known as `*liquidity spiral (*Lee, 2012)

constraint. This causes a systematic "flight-to-liquidity" effect. If such investors hold large portfolios across multiple markets, their portfolio rebalancing activities would spread the effect of the funding constraint from one market to another, causing a downturn in other stock markets as well. The inference from these studies— whether stock market liquidity is influenced by macroeconomic factors—however remains inconclusive. The difference in the results whether macroeconomic factors predict stock's liquidity is largely driven by dissimilar nature of stock markets and market structure, using different time periods and different measures of liquidity (Soderberg, 2008).

1.7 Problem Statement

It is well acknowledged that two of the major problems that emerging markets face are low liquidity and capital supply shortage (Kairys et al. 2000; Comerton-Forde and Rydge, 2006). Asian emerging markets are no exception. Asian stock markets are fast growing and sizable. During the 1990s, Asian market capitalization has increased — more than double — to $13.7 trillion of the world capitalization. In emerging Asia, being growing equity markets some of the Asian equity markets[10] often serve as a hedging means for the rest of emerging equity markets in the region during the period of uncertain economic conditions. The liquidity of Asian emerging markets has remained a crucial issue in the Asian financial crisis, global financial crisis and even during normal time. In fact, Narayan et al., (2010) argue that the contemporaneous deterioration in market liquidity across several markets was one of the causes of the Asian financial crisis in 1997-1998.

In the context of Asian equity markets, recently, Wang (2013) provided comprehensive empirical evidence on liquidity commonalties. Wang (2013) reported

[10] For instance, Hong Kong and Singapore Equity Markets

existence of large disparities in liquidity across emerging equity markets in Asia. The equity markets of Indonesia, Thailand, China, and Taiwan demonstrate higher liquidity than more developed stock markets in the region, whereas Malaysia, Philippines, India, Singapore and the Korea equity market liquidity is much lower because of low trading volume. Further findings of Wang (2013) reveal that emerging equity markets in Asia have highest liquidity skewness resulting in repeated liquidity spikes. During a global financial crisis, several markets in Asia (e.g. India, Malaysia, Indonesia, Australia, Japan, and Hong Kong) faced a sharp increase in liquidity commonality. The liquidity commonalties in these markets rose by twofold compared to other external markets. At the same time, liquidity commonality in Singapore, Philippines, Korea, and Taiwan declined or unchanged. Overall, equity markets liquidity in Asia was moderately flat during the early cycle of 2001-2007 and it begin to surge during global financial crisis. Statistically, common factors contribute 15% of the daily variation of liquidity in Asian emerging markets, and liquidity commonalities are due to volatility factors in Asian equity markets since volatility explains 12.4% of liquidity variations after the global financial crisis.

Addressing the liquidity issues in Asian equity markets, several other studies have conducted empirical studies at country-specific level in Asian emerging markets[11] using firm-specific factors. The general conclusion drawn from these studies on Asian emerging markets is that strong liquidity commonalities exist in these markets; however, major source of liquidity is still unknown. The absence liquidity from Asian emerging markets during both Asian financial crisis and global financial crisis exemplify and suggest the role of macroeconomic forces in determining market liquidity in Asian emerging markets. Pukthuanthong-Le and Visaltanachoti (2008)

[11] See for instance, Krishnan and Mishra (2013) and Syamala and Reddy (2013) India, Chen, Xu and Zhao (2013) China Lam and Tam (2011) for Hong Kong, Pukthuanthong-Le and Visaltanachoti (2009) for Thailand.

noted that events such as the 1997 East Asian financial crisis might result in individual stock liquidity being influenced by market-wide factors. Given that market liquidity is largely determined by macroeconomic forces that are fundamental to the economy, until recently liquidity issues in Asian emerging markets have been examined at the individual stock level characterized by firm specific attributes.

The dearth of attention to the macroeconomic factors' contribution in market liquidity of Asian emerging markets remains a critical void in market liquidity literature of Asian emerging markets. Specifically, how do changes in macroeconomic fundamentals influence market liquidity? Furthermore, motivated by the argument of Fernández-Amador et al. (2013) that previous theoretical propositions and subsequent large amount of empirical evidence on observed commonalities in the market yield a general conclusion that there should be at least one factor, which simultaneously dictates liquidity of all stocks in the financial markets. It is therefore, expected that among the set of macroeconomic factors there should be at least one factor that determines market liquidity in Asian emerging stock markets at a country- specific level.

In addition, related literature[12] also suggests the influence of market liquidity on real economic activities. In this context, Næs et al. (2011) stated that in the current financial crisis, the apparent causality between decrease in liquidity of financial assets and business cycle have been discussed extensively. In fact, stock market liquidity is a foremost indicator of the real economy. Næs et al. (2011) for instance speculated that stock market liquidity is leading indicator of the real economy, and shift in investors' aggregate portfolio varies with the investors' expectations about the real economy[13]. While the fundamental interest of this study is modeling the macroeconomic forces that

[12] Levine and Zervos (1998) for the first time developed empirical model to by addressing the question of whether liquid stock market can be used to advance economic activities and growth.
[13] For more details on how this channel works, See Levine and Zervos (1998), Lipson and Mortal (2009), Skjeltorp and Ødegaard (2010).

are related to stock market liquidity, there is also the possibility that macroeconomic factors are also caused by the market liquidity or there is a feedback effect between macroeconomic variables and stock market liquidity as examined by earlier studies in the quote-driven markets (Fernández-Amador et al. 2013; Næs et al 2011.; Goyenko and Ukhov, 2009; Soderberg; 2008). Given that until now, the issues of common determinants of stock market liquidity in the Asian emerging markets are empirically examined using firm specific and market variables, the role of macroeconomic variables in explaining stock market liquidity in the order-driven markets of Asian emerging markets is not explored. The interest of this study is therefore to examining the role of macroeconomic forces in determining liquidity and conversely, the role of stock market liquidity in determining macroeconomic variables in the order-driven Asian emerging markets.

1.8 Research Questions and Objectives

This study seeks to answer the following research questions to achieve the objectives of the study.

1.8.1 Research Questions

1. Do changes in macroeconomic variables explain market liquidity of selected Asian emerging markets?
2. Are macroeconomic sources of equity market liquidity similar across the selected Asian emerging markets?
3. Are there causalities/ reverse causalities / feedback effect between stock market liquidity and macroeconomic variables in the selected Asian emerging markets?

1.8.2 Research Objectives

1. To examine the role of macroeconomic variables in explaining market liquidity in the selected Asian emerging markets.

2. To compare the role of macroeconomic forces in market liquidity of selected Asian emerging markets
3. To investigate causality/reverse causality/feedback effect between market liquidity and macroeconomic variables in the selected Asian emerging markets

1.9 Research Significance

This research is expected to contribute significantly to academic literature on the macro economy and market liquidity in order-driven markets, as well as to practitioners, and regulators such as the central banks. The empirical findings of this study are expected to be significant to market liquidity and time-series literature in order-driven market system. In particular, the findings will improve our understanding of the macroeconomic sources of market liquidity in Asia. Previous liquidity studies provide strong evidence of commonality in liquidity but the macroeconomic mechanisms that persuade such commonality are yet be identified in Asian markets. Further, given that there is also the possibility that market liquidity also affects macroeconomic variables through productive investment channel, empirical findings on this relationship in emerging markets will also add to our understanding.

As far as practical investment is concerned, a sound understanding of liquidity dynamics in markets could assist traders to frame better investing strategies. Further, evaluating the macroeconomic source of liquidity in the financial markets will facilitate traders to make decisions on their liquidity exposures. Consequently, trader's confidence will increase with the better understanding of common factors that affect market liquidity, thus guiding to proficient resource distribution (Chordia et al., 2000).

Since market risk is not diversifiable, it is a policy concern for state banks and regulators. Shocks to common determinants of liquidity have market-wide effects and thus financial crisis can be sparked (Narayan et al., 2010). Common liquidity shocks

may cause spontaneity in traders' attitude about the market; consequently, it could lead to a market crash (Fernando and Herring, 2003). Understanding the macroeconomic source of market liquidity can be helpful to regulators for appropriate policy matters especially on monetary policies and foreign portfolio investment.

1.10 Research Contributions

This study contributes to the ongoing debate on market liquidity in following ways. First, given that liquidity is time-varying phenomenon and it moves with the economic condition of the country, this study employs sets of macroeconomic factors to examine which macroeconomic factor(s) simultaneously determine market liquidity of Asian equity markets. Previous liquidity literature, which uses macroeconomic factors to examine influence on market liquidity focuses on developed - most liquid markets - and quote driven stock markets. Little is known about the market liquidity sensitivity toward macro-economy in Asian emerging equity markets, which are order driven stock markets, frequently exposed to macroeconomic interventions.

These two types of markets significantly differ in numbers of way. Importantly, like quote-driven equity market, order-driven markets have no designated market makers[14] and the investors — who largely depend on to what extent investors, participate in equity markets trading— provide liquidity. In comparison to quote-driven, market structure, nature of competition and barriers to entry are dissimilar in order-driven market (Brockman and Chung, 2002). In the presence of limit-order and market-order trader, generally, it is believed market order traders demand liquidity, whereas limit-order traders are considered suppliers of the liquidity. Nevertheless, there is no general agreement on this. Despite the difference in the market structure and design,

[14] In a quote driven Market, Specialist /designated market makers provide minimal liquidity, while by definition there is not such arrangements for order driven markets.

liquidity, however, has been measured using common measures (Krishnan and Mishra, 2013).

Second, the availability of data on foreign equity flow and fund flow (equity class) of selected Asian emerging markets allows this study to a make another contribution by accommodating the role of foreign equity flow and fund flow in an empirical model. Foreign equity flow and fund flow (equity class) have significant implications for market liquidity. Past literature has termed foreign equity flow/ fund flow both as a friend and as a foe for the emerging markets liquidity, hence making the role of foreign equity/fund flow a relevant issue. Concerning the friend aspect, empirical literature provides substantial evidences that foreign investment in the wake of liberalization in emerging markets is beneficial to a country's stock market and thus to economic development.[15] On the other hand, Krugman (1998) and Stiglitz (2000) argue that foreign investors in emerging markets can potentially create excessive volatilities, inflation, impel boom and bust cycles caused by unstable and volatile foreign investors flow.

Third, while previous studies on Asian emerging markets had examined stock liquidity issues at stock level, either across countries or within countries using firms characteristics, this study extends the context from individual stock liquidity to market liquidity response to macroeconomic factors, because global portfolio positions are made at market or country level, not at the individual asset level. Economic policy makers, market regulators, and global investors are largely inclined to focus on market-wide indicators, not on those individual stocks (Wang, 2013).

Fourth, on the methodological side, this study also attempts to accommodate the role of structural break while modeling macroeconomic factors and market liquidity.

[15] See for instance, Miller (1999); Errunza & Miller (2000); Bekaert & Harvey (2000); Henry (2000), Kim & Singal (2000), Huang & Shiu (2005)

Observably, market liquidity has dramatically varied over the last 15 years and financial markets are frequently subject to combined forces of regulation, liberalization, market decline and frequent macroeconomic interventions, which have direct implications for the stock market liquidity and potentially generate non-stationarities in the series under investigation.

Fifth, this study also extends the methodology of bivariate causality phenomenon used in previous similar researches (e.g. Næs et al, 2011; Fernández-Amadoret al, 2013) from traditional Granger causality to Innovative Accounting Approach (IAA) to check the bivariate causality between macroeconomic forces and market liquidity. One of the exclusiveness of IAA approach is that it overcomes the issue of integration and endogeneity of the series. This approach is superior to other causality tests since other causality tests depict a causal relationship between variables with the selected time period, whereas IAA demonstrate the extent and relative strength of casual relationship ahead of selected time span. The IAA includes both impulse response function and forecast error variance decomposition to decompose forecast error variance for individual series following a standard deviation shock to a particular variable and allow us to test which variable is robustly influenced.

1.11 Structure of the Thesis

The rest of the thesis are structured as follow. Chapter two provides a survey of literature on liquidity in context of market microstructure framework and inventory paradigm and other related theories. Chapter three explains the data, variables, modeling, and estimation strategies in detail. Chapter four encompasses detailed estimation of market liquidity and macroeconomic forces at cross-countries level. Chapter five reports conclusion and implications derived from the empirical findings.

CHAPTER 2

MACROECONOMY AND STOCK MARKET STOCK LIQUIDITY

2.1 Introduction

This chapter provides a review of previous literature on stock market liquidity and its relationship with micro and macro variables. Given the vastness of liquidity literature, this chapter limits the focus of liquidity research to few strands. This chapter begins with a brief description of how stock market liquidity was viewed in early studies by limiting its focus to the trade dimension. This chapter further describes the development that has been taken place following the popularization of commonalities in stock liquidity and subsequent attention to this phenomenon in the form of empirical exercises to test this hypothesis both in developed and emerging markets. While reviewing the commonalties in stock liquidity studies, this study also briefly summarized the empirical findings on the relationship between the stock market liquidity and stock return in the world stock markets. Finally, this chapter provides detailed linkages between macroeconomic variables and stock market liquidity and formulates few hypotheses.

2.2 Microstructure Theories of Stock Liquidity

Stock liquidity has been extensively discussed in the market microstructure literature of the capital market. The work of Garman (1976) originated the term "market microstructure" by examining the inventory costs and market making. Following its coining, this term collectively refers in financial economic literature to the process that focuses on explaining the economic forces which influence quotes, trades, and prices of assets or the mechanism through which investors translate their demand into a transaction (Wuyts, 2007). Market microstructure theories are broadly grouped into inventory-based model and information-based models, which will be discussed in detail

in the subsequent sections. O'Hara (1997) noted that, in general, these two types of theories are kept separate. In the inventory-based theories, the influence of information asymmetries models are abstracted away and in information-based theories, the influence of inventory risk and dealer preferences domains is ignored. The implications of both these theories are, however significant, for determining market liquidity and price in any financial market.

The discussion of inventory paradigm and asymmetric information is deeply grounded in the market microstructure theories. The inventory paradigm is further grouped into three categories, namely, market making and order arrival, dealer optimization issues, and multiple liquidity providers. Rationality or rational expectations hypothesis is one of the core elements that connect these paradigms with market microstructure. For instance, economic maxims can be viewed that connect microstructure and rationality though multiple liquidity providers, dealer optimizations, and information-based models. Similarly, the association of rationality as noted by Fama (1965) could be viewed in the information-based models, which are heavily reliant on private information that are generally seen as cause of risk for non-informed traders.

In similar vein, efficient market hypothesis could be connected to information-based models and dealer's optimization problem. Under asymmetric information strands of literature, there are two types of traders, namely, informed and uninformed traders. Informed traders generally take position and engage themselves in trading in the market based on information. This implies that when price of the security deviates from its fundamental, informed investors would tend to engage themselves in selling and buying. Buying and selling by the informed investors in this circumstance would budge back the security price closer to its original value. There is, however, also a possibility that moving the price back to its original position would take substantial time due to

presence of noise traders in the market. Informed investors should therefore take into account the behavior of noise traders. Price deviation behavior from equilibrium in these circumstances has been examined, and several inventory models have been developed, which is generally seen as a starting point of market microstructure research. These inventory models are discussed in the next section.

2.2.1 Garman's Model

The equilibrium price in market trading has received significant attention in financial market research. A price is said to be in equilibrium if quantity supplied equals quantity demanded under the assumption of balance between sellers and buyers. If the arrival time in the market by both these market participants is different, it would leads to price temporal imbalance. Examining this phenomenon, Garman (1976) discussed a stochastic exchange process model. The model shows that there is a single monopolistic and risk-neutral dealer who positions the price for per unit profit capitalization to avoid bankruptcy. This market maker decides to set such bid and ask price where optimal price can be achieved from the difference between these two prices. The setting of selecting bid and ask price is done only once at the start of the trading. This model further assumed that both sell and buy orders should trail a stationary arrival rate in the framework of Poisson distribution. The uncertainty in the model that is represented as independent stochastic processes would therefore emerge due to arrival or sell and buy orders. Given these assumptions, market makers/dealers are supposed to keep a certain level of stock inventory and cash for profit maximization. Therefore, it follows that level of stock and cash at any time interval would rely on the arrival of sell and buy orders.

The assumptions of this model do not allow borrowing cash and changing prices and hence inventory shows a random walk, and sell and buy order shows independent

stochastic processes. In such circumstances, a failure or bankruptcy would therefore be certain under these assumption and hence this case can be seen as gambler's ruin problem. A key limitation of this model is that, even level of inventory settles on the capability of market makers' it is however not clearly integrated into the decision problem of dealers due to a setting of price by the market makers at the beginning of trade.

This key limitation undermines the testability of this model in a circumstance where price perpetually changes. Concerning this limitation, Amihud and Mendelson (1980) overcome this issue by incorporating inventory into pricing problem of dealer's inventory, which suggests that market makers adjust their inventory by altering their price over time. Put it differently, market makers raise or lower the bid-ask price according to shrinking or growing inventory, which allows them to acquire a desired level of inventory position. This model therefore suggests that bid-ask level of price is a monotonic decreasing function of market makers' inventory.

2.2.2 Ho and Stoll's Model

The inventory model by Ho and Stoll (1981) is an extension of the Stoll (1978a, b) model, which extends the understanding on how risk-averse dealers order processing cost, inventory and adverse selection risk influence market makers pricing. This model substantially departs from the Garman (1976) model and that of Amihud, & Mendelson (1980). In this mode, market makers are risk-averse and cannot circumvent the inventory risk. They also capitalize on the expected utility of their wealth. This model therefore exhibits those factors such as base wealth, dealer's cash, and inventory to determine the optimal strategy of the dealer. The vital implications of the optimal pricing strategy are that inventory influences levels of bid-ask price instead of spread magnitude vis-à-vis dealer attempts to increase/decrease both ask and bid prices. In

addition, since the spread shows the dealers' risk aversion, inventory position does not affect spread and hence remains independent.

O'Hara (1995) however noted that some assumptions laid down by the model of Ho and Stoll's are unrealistic. First, given that the model assumes a finite horizon, under this assumption, traders who position for a long horizon would always be better off than the rest of the traders. Second, since dealers confront dual uncertainty in the form of prices and order, spread in this case would not be independent of the dealers' inventory. To avoid this uncertainty, dealers need to alter the spread size and the value of inventory.

2.2.3 Information-Based Models

Besides inventory models, which are significant in determining the price of securities and transaction cost, microstructure literature also presents information based models which play a key role and provide alternative explanation to the market price. This alternative explanation does not necessarily rely on the transaction cost, rather it relies on the information that is largely asymmetric in nature. The fundamental aspect of information–based model is that some traders have superior information and hence their trading process involves decision based on that information as compared to others. Those informed traders lean on buying stocks when price is low and sell when they have information that price is going to be high. In such circumstances, market-makers face losses to those informed traders and hence they have to cover the cost. Market-makers cover this cost from the uninformed traders by increasing the bid-ask spreading, and more severe asymmetric information leads to more wider bid-ask spread. This study presents few important information-based models, which had appeared in the market microstructure literature.

2.2.3.1 Copeland and Galai Model

Using a static one-trade model, Copeland and Galai (1983) formalized the concept of information costs by assuming that market makers have unlimited capital, no bankruptcy, and dealers are risk neutral and set bid-ask to maximize expected returns. Further, information arrival developments and dealers response to information arrival can be classified as follows. An informed trader who is considered first market participant is exposed to exogenously determined events. The market maker limits the size limit of each quote to minimize his possible loss against a better-informed trader. The dealer might adjust his estimate of the 'true price' after each trade, given that information remains no more private, and the arrival of trader is free of stochastic process, which produces changes in price.

The dealers' aim is to select the bid-ask price that increases his profit. If he chooses the bid-ask spread too wide, he might lose expected profit from the liquidity traders; he however can hedge the losses from the informed traders. On the contrary, if the dealer chooses to keep the bid-ask spread too narrow, he might succeed in avoiding potential loss from the informed traders' however, dealer can potentially offset his expected returns from the liquidity traders. Given this scenario, the dealer optimal bid-ask spread is likely to be determined by the trade-off between expected loss against informed traders and expected gain against liquidity traders. Although this model offers a vital feature of bid-ask spread, this model however does not take into account the multi-periods trading.

2.2.3.2 Single Trading Model

The Kyle (1985) model of single trade setting is about derivation of equilibrium prices when trader in the market have asymmetric information and component of insider information is partially reflected in the equilibrium price. This model assumes three key

agents in the market for a specific asset: a noise trader, a market maker/dealer and the insider. They key implication of this model is that it offers theoretical framework for determining the spread component and market impact of the aggregate trade. This model is accompanied by several assumptions. For instance, 1). this model only works in a single period model. When period starts, agents trade in the asset, which has end of the period liquidation value. 2). Noise traders have to trade that are exogenous to the model. This model assumes that noise trader as group submits a market order to buy some portion of a specific asset. 3). It is assumed that the risk –neutral insider has relatively better information and knows the realized end of the period worth of the risky asset and therefore decide to submit a market order of some size in order to maximize the expect end of period profit. 4). Finally, a risk-neutral dealer/marker maker receive the submitted order of both agents (insiders and noise trader) with the combined value of both orders. Of particular importance, dealer/market makers cannot differentiate between the size of order made by the noise trader and the insider and hence the traders are anonymous. When order submission is completed, dealer sets the price and takes the position to clear the market in the assumed perfectly competitive environment. This implies that dealer sets the price such that his profit against the total order submitted by the noise trader and insider is expected to be zero at the end of the period.

2.2.3.3 Multiple Informed Traders Model

The Kyle (1984) model is concerned with multiple informed traders trading over a limited period of time. This model goes as follows: in a group of informed traders, if one informed trader is not a monopolist, other informed traders would influence the return and price of securities. This model takes into account three-dated framework having N informed traders and M market-makers. While this model shares the fundamental features of Kyle (1985) model, it however differs in its approach when liquidity aspect of stock is considered. In this model, since trading can only take place at

two dates, all the trading contracts are considered liquidated at the end of time 2. Resultantly, price adjustment to the information cannot be incorporated in this model over time; however, behavior of stock price is dependent on the association between noise trading, informed traders and extent of information revealed. Another important feature of this model is that since superior information is only available to informed traders, which leads to individual trader profit maximization, increases in number of informed traders would, therefore increases that return of individual traders. Intuitively, when number of informed trader's increases, sharing of private information increases, which will likely to influence the size of each individual trade.

Another vital feature incorporated in this model is the variation in the extent of public information. If the number of informed traders is determined endogenously, then a rise in the extent of public information would decrease the future return because the associated benefits of keeping superior information are now exhausted. Further, when such information is no more private, few 'used to be informed traders' might leave the marketplace, given that such information is not of any purpose anymore.

The models discussed above provide a base to market microstructure literature of stock market liquidity and market making. The general and key message delivered from these models suggests that beside the cost factor, trading process is also a potential source of risk for investors in the stock market. Resultantly, market participants would demand compensation for risk associated with trading process risk, besides, expected trading cost' and hence, stock liquidity issue emerging from these factors would affect the equilibrium price. These inventory models, in particular, Ho and Stoll (1981), Stoll (1978), and Demsetz (1968) paradigm, suggest that cost of financing dealer's inventory, risk of holding inventory and unusual events that aggravate order imbalance would affect inventory overload which further influences stock liquidity (Chordia et al. 2000).

Following the introduction of these models, several studies have examined their testable implications in the context of market returns, order imbalance, stock prices and investment risk. For instance, Jacoby et al. (2000), Amihud and Mendelson (1986) examined the relationship between required returns and trading cost and noted a direct linkage between cost of capital and liquidity. In the context of order imbalance and stock market liquidity, Chordia et al. (2002) noted that more extreme order imbalances affect price and liquidity more strongly regardless of high trading volume[16]. They presented two reasons for this effect. First, since order imbalance can sometime be viewed as indicator of private information being penetrated in the market, which can potentially decrease the liquidity for a short term and can bring changes in the price permanently as noted in the price formation theory of Kyle (1985). Second, even if the order imbalances are random, it could cause inventory of market maker, given that market makers would respond to modify the bid-ask spread and quotation. All these models discussed above provide testable implications to the theoretical footing of market-making, order imbalance, insider information and in determining the optimal bid-ask spread

2.3 Commonalities in Liquidity

Generally, the domain of market microstructure research remained deeply grounded in individual security until early 2000 and focus remains pertained to liquidity, transaction cost and repeated trading in homogeneous assets. In early 2000, the domain of stock market liquidity research has been extended to a market-wide and co-movement in liquidity when Chordia et al. (2000) coined the concept of "commonality in liquidity." Following the introduction of this concept, attention has been directed towards this unexplored phenomenon by noting that trading cost, liquidity and other individual market microstructure concepts have some common fundamental

[16] Several other studies have also examined the effect of order imbalance, see for instance (Brown et al., 1997;Sias 1997; Lauterbach and Ben-Zion,1993; Blume et al. 1989; Lee 1992; Hasbrouck and Seppi, 2001)

elements and hence the emphasis has shifted from in individual stock to market-wide determinants of liquidity. This phenomenon implies that firm-level liquidity is at least partly explained by market-wide liquidity.

Chordia et al. (2000) noted several sources for the existence of commonalities in liquidity. The market-wide intertemporal trading activities' response to general price sways is one of the sources. Given that trading volume is a fundamental factor of dealer inventory, there is a chance that it can induce co-movements in inventory level. Resultantly, co-movement in quoted depth, individual bid–ask spreads and other measures of liquidity are observed. Further, the cost of inventory must also co-move across stocks since cost depends on the interest rate. Chordia et al. (2000) further noted that volatility also affects the risk of maintaining inventory level and possibly has a market component. The dealer's inventory can also be affected by program trading, and institutional funds having identical trading pattern also shows a correlated style, thus exerting pressure on inventory across the market. In addition, Asymmetric information also plays important role in inducing co-variation in the market liquidity, given that few traders contain private information about the market. To sum up, whatever are the sources, liquidity would exhibit a co-movement, if inventory variations were correlated across the individual assets.

Commonalities in liquidity serve important implications for market participants, firms, and regulators and, therefore, understanding its pattern is important for several reasons. Arguing about the bright side of liquidity in the stock market, O'Hara (2004) articulated that even if commonalities of liquidity exist in the market, two general views could be drawn. First, *flight-to-quality* may persuade investors to forsake one asset for another as long as investors stay in the market, thus in this case the instability effect- because of commonalities in liquidity- will be local not global. Second, commonalities

may convince investors to penetrate the market, thus propel stability in the market by increasing number of ready sellers and buyers.

One of the critical issues for market participants whether liquidity in the market is priced or not. Domowitz and Wang (2002) argue that commonality in liquidity constitutes a problem of diversification strategies to investors that lean on selecting stocks that do not co-move with returns. Given that liquidity of assets covaries with each other, any shock to the common factors will generate market-wide effects. Further, given that stock returns and market liquidity are interrelated, such phenomenon will create non-diversifiable risk factors and, investors will -because of non-diversification issues- demand liquidity premium to compensate for non-diversifiable risk (Fujimoto, 2003).

Following the emergence of this phenomenon, a handful of studies examined commonalities in liquidity both in the developed and in emerging markets. For instance, using transaction data of the New York Stock Exchange (NYSE), Chordia et al. (2000) noted that a stock spread is positively associated with individual transactions and, negatively associated with trading level. They further concluded that, common fluctuation both in adverse selection cost and in inventory persuade common variation in liquidity. Using intraday data of Dow Jones Industrial Average stocks, Hasbrouck and Seppi (2001) documented weak evidence of co-variation in liquidity of 24 stocks[17]. Coughenour and Saad (2004) reported a co-movement between specialist portfolio and individual stock liquidity. While taking into account the specialist firm mergers, firm size and market, they further reported that, with the increased liquidity in the presences of risk, co-variation in liquidity also increases in the US market. Vayanos (2004) reported that in a volatile period, illiquid assets beta and liquidity premia increases, risk aversion in the investors' will increase and the correlation between stock and volatility

[17] See also Eckbo and Norli (2002) and Huberman and Halka (2001)

become negative. Several other studies have also examined commonalities in liquidity in the stock markets and reported its existence in the markets[18]. The empirical evidences on the source of liquidity commonalities can be categorized into two strands. The first strand of empirical literature provides evidence of supply-side source of commonalities in liquidity[19]. The supply-side source of commonalities suggests that due to funding constraint during a period of declining or volatile market, the provision of less liquidity during this time surges the liquidity co-movement across several stocks. The second strand of empirical literature provides evidence of demand-side source of commonalities in liquidity[20]. These studies suggest that demand-side source of liquidity commonalities arises from correlated trading pattern among institutions.

2.3.1 Liquidity Literature in Asian Emerging Markets

The commonalities in stock liquidity are also empirically examined in the emerging markets around the world, including the Asian emerging markets and reported varying nature of sources of commonalities in liquidity. Given that, unlike developed stock markets, emerging stock markets have relatively lower degree of market liquidity because low trading volume, therefore the focus has shifted recently to emerging markets to examine factors that affect market liquidity. Jun et al.(2003) argue that emerging equity markets has received significant attention in the context of international diversification and international portfolio balancing. With the increased globalization of equity markets, emerging markets are developing rapidly. High return potentially attracts investors in emerging markets at the same time, however, liquidity risk in the market jolt investors (Zhang, 2010). Moreover, Donadelli and Prosperi (2012) documented that differences of risk and return between emerging markets and

[18] For instance, Domowitz et al. (2005), Acharya and Pedersen (2005), Kamara et al. (2008), Korajczyk and Sadka (2008), Koch et al. (2010), Karolyi et al. (2012)
[19] See for instance Karolyi et al., (2012), Hameed et al., (2010), Brunnermeier and Pedersen, (2009), Coughenour and Saad, (2004), Gromb and Vayanos, (2002), Kyle and Xiong, (2001)
[20] See for instance Liu and Wang, (2012), Karolyi et al., (2012), Corwin and Lipson, (2011), Koch et al., (2010), Kamara et al., (2008)

developed markets are repeatedly huge, and that emerging markets represent generous but significantly volatile returns. Market liquidity in emerging equity markets is positively correlated with economic growth and liberalization policies; therefore, it is logical to suppose that markets with greater amount of liquidity would have higher securities valuation as compared to other markets. Jun et al. (2003) provide justification for this conjecture with both positive relationship between economic growth and liquidity and positive relationship between increased liberalization policies and market liquidity. They further opined that a plausible justification for the positive association between emerging market returns and market liquidity can be understood from the low level of global market integration. If emerging markets are not fully integrated with the developed markets and the global economy, illiquidity will not serve as a risk factor and therefore, it will not affect the cross-sectional returns in the liquid market (i.e Developed Market). Jun et al. (2003) empirically tested this phenomenon and documented lower degree of emerging equity market integration with global economy.

Examining liquidity commonalities in the Stock Exchange of Hong Kong, Brockman and Chung (2006) attributed index inclusion as a source of commonalities in liquidity. In particular, their findings lent support to index inclusion hypothesis for both relative and absolute spread and hence confirmed higher commonalities in liquidity for index-included firms. Bailey et al (2009) reported institutional order imbalance as a source for large price impact and individual order imbalance as a source for commonalities in liquidity in the Shanghai Stock Exchange. Using transaction and limit order book data, Pukthuanthong-Le and Visaltanachoti (2008) examined commonalities in liquidity in the Stock Exchange of Thailand and reported strong evidence of market-wide commonalities. They further reported that depths and spread are more exposed to market-wide commonalities across all-size portfolios. Using Quotes and trade data, Krishnan and Mishra (2013) examined intra-day liquidity pattern in the National Stock

Exchange of India and reported a U-shaped spread and volume related liquidity measures and weak evidence of commonalities in liquidity.

Wang (2013) examined liquidity commonalities in several Asian emerging markets[21] and provided a comprehensive analysis of liquidity commonalties. Wang (2013) reported that there exists a large liquidity disparity among Asian emerging equity markets. Equity markets of Indonesia, China, Thailand and Taiwan demonstrate higher liquidity than most developed stock markets in the region, whereas, Malaysia, Philippines, India, Singapore, and the Korea equity markets liquidity is much lower because of low trading volume.

Further findings of Wang (2013) reveal that emerging equity markets in Asia have highest liquidity skewness resulting in repeated liquidity spikes. During global financial crisis, several markets in Asia (e.g. India, Malaysia, Indonesia, Australia, Japan, and Hong Kong) faced sharp increase in liquidity commonality. The liquidity commonalties in these market rose by two-fold compared to other external markets. At the same time, liquidity commonality in Singapore, Philippines, Korea, and Taiwan, declined or remained unchanged. Overall, equity markets liquidity in Asia was moderately flat during the early cycle of 2001-2007 and it begin to surge during global financial crisis. Statistically, common factors contribute 15% of daily variation of liquidity in Asian emerging markets and liquidity commonalities are attributed to volatility factors in Asia equity market since volatility explains 12.4% of liquidity variations after global financial crisis. Examining the demand-side sources of commonalities in liquidity in the case of the Taiwan Stock Market, Lowe (2014) documented a relationship between higher aggregate ownership of foreign qualified investors, stocks dealers, mutual funds and greater commonalties in liquidity. Bae and Qin (2015) examined liquidity commonalities in 18 emerging markets including Asian

[21] Including China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan, Thailand, Hong Kong, Australia, Singapore

emerging markets and reported that liquidity commonalities are positively related to volatility co-movement and negatively correlated with financial markets development. They further reported strong geographic component and market-wide volatility linkage with a liquidity co-movement.

2.4 Liquidity and Stock Returns

While examining the commonalities in liquidity, two issues remain focused in equity market liquidity research. First issue deals with a question of what effect market liquidity has on stock return, whereas, second issue deals with what cause time-variation in the equity market. As far as the first issue is concerned, it has been extensively examined and empirical manifestation generally corroborates the theoretical hypothesis that required return is positively related to illiquidity. This section briefly summarized the empirical findings on the relationship between stock market return both in the developed and in emerging markets. Using turnover and bid-ask spreads data of the US stock market over 100 years, Jones (2000) reported spreads and turnover predict US stock returns and decreases in the transaction cost has a contribution in fall in equity premium by 1%[22]. Amihud (2002) reported that ex-ante excess returns are positively correlated with expected market liquidity, which signifies that illiquidity is present in the excess stock returns in the US market. Chordia et al. (2000) and Huberman and Halka (1993) noted that if liquidity shows a systematic variation, then stock return having a positive correlation with market liquidity will have high expected returns.[23] A handful of studies conducted in the US stock market using different models generally lent support to the theoretical propositions that required return is positively related to illiquidity. The relationship between liquidity and stock returns has also been empirically examined using data of varying nature, liquidity measures and techniques.

[22] Models which link liquidity with expected return are frequently appeared in the stock market liquidity research using US data and some major contributions includes for instance , O'Hara (2003), Eisfeldt (2002), Huang (2002), Holmstrom and Tirole (2002), Lo, Mamaysky and Wang (2001), Vayanos (1998), Heaton and Lucas (1996), Grossman and Miller (1988), Constantinides (1986) and Amihud and Mendelson (1986),

[23] See also Pastor and Stambaugh (2002) and Sadka (2002)

Jun et al. (2013) for instance, examined stock return and liquidity relationship in 27 emerging markets using trading level data over the period of January 1992 to December 1999. They reported that aggregate market liquidity and stock returns are positively correlated. They measured liquidity as a trading value, turnover ratio, and product of turnover and volatility. Their findings were consistent and robust both in time series and in cross-sectional settings. Bekaert et al. (2003) examined the impact of liquidity on stock returns in 19 emerging markets and reported significant relationship between measure liquidity and future returns. Unlike Jun et al. (2007), the other liquidity measures such as turnover do not predict future return significantly. They further reported that there is positive correlation between unexpected liquidity shocks and shocks to returns and negative correlation between liquidity shocks and dividend yield shocks. In the case of Australian stock market, Marshall and Young (2003) report a significant negative correlation between liquidity (turnover as a measure) and stock returns. In the case of Spanish stock market, Martinez, Nieto, Rubio, and Tapia (2005) reported a significant positive relationship between measure of illiquidity and stock returns using both conditional and unconditional asset pricing.

Chang et al. (2010) examined liquidity and stock returns relation in the case of the Tokyo Stock Exchange and reported significant negative (positive) between (il)liquidity measures of stock and stock returns. Narayan and Zheng (2011) examined liquidity-returns relationship in the case of the Shanghai stock exchange and the Shenzhen stock exchange and reported mixed results. For instance, using liquidity measures such as turnover rate, trading volume and trading probability, they document strong evidence of negative relationship and stock market returns in the Shanghai stock exchange as compared to the Shenzhen stock exchange. They further noted a non-robust evidence of this relationship across different measures of liquidity.

Liang and Wei (2012) examined the relationship between liquidity risk and stock returns in 11 developed markets. They reported that, local liquidity risk along with size, local market and value factor requires a systematic premium across these markets. Using large data sample of US market from 1926-2008, Baradarannia and Peat (2013) re-examined the liquidity and expected returns relationship and reported that with the increase in the stock level of liquidity, expected returns also increase in a time entire sample. Batten and Vo (2014) examined liquidity and stock return relationship in the case of the Vietnam stock market. They reported that, there is positive relationship between returns and liquidity. They further noted that, shortage of liquidity would be a less significant risk factor if a market was fully integrated with global markets. Chiang and Zheng (2015) examined relationship between illiquidity risk and expected excess stock returns in G-7 stock markets and reported a positive correlation between excess stock returns and market illiquidity risk and negative correlation between excess stock returns and firm-level illiquidity innovation.

2.5 Hypotheses Development: Macroeconomic Variables and Market Liquidity

The popularization of commonalities in liquidity concept has also led the stock market liquidity research to broader spectrum of macroeconomic forces role[24]. Since then, several successive empirical studies have examined the role of macroeconomic forces in explaining stock market liquidity with new theoretical foundations[25]. The new theoretical foundations and subsequent empirical evidence suggest that stock liquidity is either influenced by business cycles influence market liquidity as noted in Taddei (2007) Eisfeldt (2004) and Næs et al. (2011), mutual fund flow (i.e. Massa, 2004), funding liquidity (i.e. Fecht and Gruber, 2012; Brunnermeier and Pedersen, 2009), monetary policy (i.e. Fernández-Amador et al, 2013).

[24] Chordia et al. (2000) documented few future research areas that also include the role of macroeconomic variables by documenting that" A sensible next step would attempt to identify specific macroeconomic influences that correlate with time-series variation in liquidity".

[25] The details of theoretical foundations are provided in literature review section.

Several other studies have also linked macroeconomic variables with stock market liquidity[26]. Fernández-Amador et al. (2013) noted that, previous theoretical propositions and subsequent large amount of empirical evidence on observed commonalities in the market yield a general conclusion that, there should be at least one factor, which simultaneously dictates liquidity of all stocks. The conclusion -whether macroeconomic variables explain change in stock liquidity- drawn from these studies however, remains inconclusive and mixed. The differences in the results are largely driven by dissimilar nature of stock markets and market structure, using different time periods and measures of liquidity (Soderberg, 2008).

This study draws on the theoretical framework of previous studies, thereby combining few strands of literature, which have emerged after the discovery of commonalities in liquidity. To understand how stock liquidity is influenced by and moves with macroeconomic variables, we therefore categorized those components of literature into three strands to facilitate the economic interpretation. The in-depth bifurcations generated from these three strands are then discussed in the empirical model construction.

2.5.1 Monetary Policy and Stock Market Liquidity

Central Banks all over the world have carried out substantial monetary policy intervention and thus attempted to relieve financial market in crisis periods. The role of monetary policy in dictating stock market liquidity is indeed justified by Inventory Paradigm. In market microstructure literature, inventory paradigm suggests that inventory risk and turnover influence stock liquidity.[27] Inventory paradigm postulates that if participants in a market can cheaply leverage their stocks and can sense low risk of holding stock, in turn assets are expected to be more liquid. Fernández-Amador et al.

[26] Soderberg (2008); Goyenko and Ukhov (2007); Chordia, Sarkar and Subrahmanyam (2005); Choi and Cook (2005); Fujimoto (2004)
[27] See for instance, Hasbrouck (2007) and O'Hara (1998)

(2013) posit that monetary policy has the potential to influence financing cost and perceived risk of holding assets, which implies that monetary policy should also influence stock market liquidity. In their model, Brunnermeier and Pedersen (2009) suggest that traders funding significantly affects and is affected by market liquidity, signifying an interaction between asset liquidity and funding liquidity. Their model further suggests that under funding constraints condition, traders become disinclined to take on positions and hence experience complications to meet margin call. This diminishes the liquidity of stock market and causes higher volatility. Contrarily, a decline in market liquidity impedes market participants' funding liquidity by means of higher margin required to take on the position. Fernández-Amador et al. (2013) suggest that expansionary (contractionary) monetary policy alleviates (aggravates) margin borrowing constraints and therefore, eases (impedes) funding liquidity for traders. The authors further argue that both market liquidity and monetary policy are closely connected to movements of business cycle and therefore, significant influence of monetary policy on stock market liquidity is expected. Nyborg and Östberg (2014) established a connection between broader financial market and interbank market for liquidity given its foundation in the demand for liquidity by the banks. They argue that tightness in the interbank market compels banks to engage in the liquidity- pullback. The liquidity -pullback entails that when liquidity-pullback phenomenon occurs, it leads to the selling of financial assets either by the levered investors or by banks. They further argue that tight interbank is correlated with more trading volume of the liquid securities and selling pressure in financial market, and transitory negative returns.

Several successive studies in the US addressed the role of monetary policy in dictating stock market liquidity and noted that expansionary measures in monetary policy improve stock market liquidity condition particularly during time of financial

turmoil. For instance, measuring monetary policy through federal funds rate and net-borrowed reserves, Chordia et al. (2005) find moderate predictive role of monetary policy in explaining stock market liquidity in a sample of NYSE traded stocks. Using a sample of stocks from NYSE and AMEX over the period 1962-2003, Goyenko and Ukhov (2009) report strong evidence of the role of monetary policy in predicting stock market liquidity. Their findings suggest that a contractionary monetary policy signified by negative shocks to non-borrowed reserve and positive shocks to federal fund rate appear to dampen stock market liquidity. Using a sample of stocks from Center for Research in Security Prices (CRSP) over the period Sep1954- Dec 2006, Jensen and Moorman (2010) reported the evidence of methodical linkage between inter-temporal variation in the price of liquidity and monetary conditions. The authors report that a shift in expansionary monetary policy causes an improvement in funding conditions and thus increases the market-wide liquidity. This process is particularly favorable to illiquid stocks, and thus these stocks observe reduced returns essential for keeping illiquid stocks. Their overall results suggest that price of stock liquidity is reliant upon monetary conditions.

Drawing upon similar lines, Fecht et al. (2011) examine the mechanism through which financial intermediaries try to recuperate liquidity under tighter funding conditions. Lending support to "liquidity pull-back" trading, their findings locate an association of interbank market tightening with greater trading activity in more liquid equities as compared to less liquid stocks. Using a sample of Stocks listed on European stock markets, Fernández-Amador et al. (2013) examine the influence of monetary policy on stock market liquidity over the period Jan 1999 to Dec 2009. Measuring monetary policy on monetary base, policy rate, and EONIA (Euro Overnight Index Average), their findings suggest that expansionary monetary policy exercised by the European Central Bank pushes aggregate stock market liquidity in

Italian, German and French stock markets. Their findings further report that the impact of monetary policy is considerably higher for smaller equities, which suggests a non-linear effect of monetary policy on liquidity of stocks.

Central banks use certain set of monetary policy tools to manage macro-liquidity. The determined policy rate of central bank is regarded as standard for term structure of interest rate (Florackis et al., 2014) and, this primarily hold accurate in yield curve for a for short-end (Kuttner, 2001). In addition, the stipulation of liquidity provision to banks and financial institutions influence supply of broad money in the economy. Florackis et al. (2014) further noted that, the significant role of financial intermediaries in modern financial markets also entails that shift in monetary stances of central banks induce macro-liquidity shocks, which can be transmitted through chain intermediation, thus ultimately influence the traders in market[28]. Using a sample of UK stocks portfolio over the period 1999-2012, Florackis et al. (2014 a) report considerable surge in stocks trading activities and lesser increase in trading cost on Bank of England Monetary Policy Committee (MPC) meeting days. They further report that market participants perceived cuts in interest rate during recent financial crisis as a signal of deteriorating economic prospects, which strengthened "flight to safety" trading.

Few other studies examined the role of macroeconomic variables– that also include monetary policy measures– in explaining stock market liquidity. For instance, Soederberg (2008) examines the impact of 14 macroeconomic variables on the liquidity of three Scandinavian stock markets over the period 1993-2005 and noted mixed evidence. In the case of Copenhagen stock market, only policy rate is able to predict stock liquidity whereas in the case of Oslo stock market, growth in broad

[28] For more details on the intermediation chain of monetary stance in financial market, see Adrian and Shin (2010).

money plays a significant role in the liquidity of stocks. For a Stockholm stock market, mutual fund flow and short term interest rate appears to predict stock liquidity. Using a sample of NYSE and AMEX stocks, Fujimoto (2003) examines the nexus between macroeconomic forces and stock liquidity over the period 1965-2001. The author splits the sample into two periods (i.e. 1956-1982 and 1983-2001). For a period ranging from 1965-1982, Fujimoto (2003) reports that liquidity of stocks increases with a positive shock to non-borrowed reserved, whereas liquidity of stocks declines as federal fund rate increases. For a period ranging from 1983-2001, shocks to both non-borrowed reserve and federal fund rate are unable to predict market liquidity.

The influence of interest rate on stock market liquidity could also be viewed in the episode capital constraints, where higher interest rates persuade higher liquidity commonality[29]. When interest rate increases, financial intermediaries are more likely to hit their capital constraints (Karolyi, 2012). Underscoring the role of demand and supply side hypotheses, Coughenour and Saad (2004) documented that, a shock to interest rate simultaneously affects both demand and supply of liquidity. An interest rate shock could prompt a shared inclination toward rebalancing portfolios, thus trigger a systematic boost in demand for liquidity. At the same time however, shocks to interest rate could also change the cost of liquidity supply (Soderberg (2008). Given these theoretical explanations, this study hypothesizes that

H1: Expansionary (Contractionary) monetary policy increases (decreases) stock market liquidity in the Asian emerging markets.

[29] The empirical manifestation of such affect can be seen in the models of , for instance, Brunnermeier and Pedersen (2009), Gromb and Vayanos (2002), Kyle and Xiong (2001),

2.5.2 Business Cycles and Stock Market Liquidity

A second strand of literature that connects the macroeconomy and stock market liquidity is business cycle. Jun et al. (2003) noted that, the notion of individual assets liquidity is quite different from the notion of aggregate level liquidity. In both cases, demand and supply dictate the liquidity; however, the determinants that typify the demand and supply functions for individual assets and country equity market are different. Noting further, the relative liquidity of individual assets is driven by the assets characteristics, whereas macroeconomic factors largely determine the liquidity of country's stock market. There are few theoretical explanations, which link real economy and stock market liquidity.

A first explanation that links real economy and stock market liquidity emerged from the theory of market microstructure. In the market microstructure framework, the focus of traditional asset pricing is on investors and their decisions. Given the time-varying risk premium, investors shift optimal portfolio over the time and with the state of economy to address to hedging needs. In this context, Skjeltorp et al (2008) argue that through an association with the time-varying risk premium, liquidity could be linked to business cycle. The authors further argue that, the ratio of investor's participations with time in the equity market is a function of condition of the economy. This implies that when traders anticipate economic meltdown, they change the composition of their portfolios accordingly by shifting their focus from assets in general to illiquid/small stocks in particular. In a similar context, Chetty and Szeidl (2007) theoretically explain the role of "consumption commitment" or "consumption–smoothing" which can spur risk aversion in accordance with moderate shocks and persuade traders to hold safe portfolio. Available related explanation acknowledged that few groups of investors are hit by economic decline before others and that cost of trading increases as these groups of investors with high consumption commitment will

have to liquidate their stock to finance consumption. In such a case, one should expect a positive relationship between stock liquidity and participation, and an association between state of the economy and stock market liquidity (Skjeltorp et al. 2008). Næs et al. (2010) noted that association between real economy and assets' prices can be entrenched through consumption smoothing, theoretically. Current prices of assets should encompass information about market participants' expectations about future real economy, if investors pay more for assets that pay-off when there is economic downturn than assets that pay-off when economy is considered to in a good state. The authors further noted that such kind of observed effects are the outcomes of individual investors' shift in aggregate portfolios. In such situations, changes in investors' expectations about real economy drive shifts in desired portfolios. The authors link this phenomenon with a popular notion of "flight to quality" or "flight to liquidity"[30].

Other streams that link stock market liquidity and real economy are production side of the economy (Skjeltorp et al. 2008) and investment channel (Næs et al. 2011). Both investors and firms considered liquidity differently (Tirole, 2008). Form firms point of view, if a firm can use an assets as "as a cushion" to address pressing needs then assets is considered liquid, while traders considered stock as a liquid if large amount of it can be traded with no significanct change in its prices. Skjeltorp et al. (2008) provide alternative explanation by noting that, both stock market index and Treasury bond index might be equally liquid given the microstructure understanding. According to production side of the view, a Treasury bond by definition is extra liquid as compared to stock market index because stock market index mislays its worth during recession. In the context of productivity channel, Eisfeldt (2004) developed a model where liquidity endogenous variations are linked with fundamentals such as investment and productivity. More specifically, the author shows that, returns on risky

[30] See O'Hara (1998) and Longstaff (2004)

asset amplifies as productivity increases, which causes a surge in investment given the attractiveness of these assets, thus leads to liquidity in risky assets.

The sudden evaporation of market liquidity during market decline is indeed justified by the inventory risk theory in the market microstructure literature, which suggests that perceived risk of inventory stock holdings may be caused by changes in economic fundamentals, thus influencing market liquidity as a whole (Fujimoto, 2004). Fujimoto (2004) argues that the co-movement of liquidity pattern across individual assets implies that some fundamental economic forces are responsible for this co-movement, which causes systematic elements of liquidity. In this vein, Coughenour and Saad (2004) argue that although positive time-series liquidity co-variation is provided in Hasbrouck and Seppi (2001) and Chordia et al. (2000), though, economic source of liquidity co- movement is not well understood. Soderberg (2008) opined that evaporation of liquidity from the equity market during the recent financial crisis signifies the role macroeconomic sources responsible for variation in the equity market liquidity.

Given these theoretical premises, several studies empirically examined the linkages between components of business cycle and liquidity in the market. For instance, Levine and Zervos (1998) report a considerable positive association between current and future economic growth and stock market liquidity in a setting of cross-country regression. Using US stock market data over the period 1962-2001, Fujimoto (2004) examines macroeconomic source in time varying stock market liquidity using VAR method. Fujimoto (2004) reported that, shocks to few macroeconomic forces influence aggregate stock market liquidity. However, this influence seems to vary with dynamics of business cycle since the author reports that the influence of few macroeconomic variables on stock market liquidity is stronger before the mid 1980's

when the dynamics of business cycle were more unstable. Using stock data for the US over the period 1973-1997, Gibson and Mougeot (2004) report that "Time varying liquidity risk premium" is linked with the recession index. Taddei (2007) also documents positive association between bond market liquidity and US business cycle.

Along similar lines, Goyenko and Ukhov (2009) report that shocks to inflation considerably predict a decline in stock market liquidity, whereas industrial production does not forecast liquidity significantly. Soederberg (2008) examines the impact of 14 macroeconomic variables (including component of Business cycle) on the liquidity of three Scandinavian stock markets over the period 1993-2005 and noted mixed evidence. In the case of Copenhagen stock market, only policy rate is able to predict stock liquidity. whereas in the case of Oslo stock market, growth in broad money plays a significant role in the liquidity of stocks. For a Stockholm stock market, mutual fund flow and short term interest rate appears to predict stock liquidity. Both the components of business cycle (inflation and industrial production) were not able to forecast the liquidity of any stock market under investigation. Using a Norwegian and US stock markets data, Næs et al. (2011) examine linkages between stock market liquidity and business cycle, and document that portfolio composition of market participants shifts with dynamics of business cycle. The authors further report that participation of investors is linked to stock market liquidity.

Florackis, Giorgioni , Kostakis and Milas (2014,b) examined the role of stock market liquidity in forecasting UK Gross Domestic Products (GDP). Using non-linear model specifications, they report negative relationship between illiquidity and future GDP of UK. Using a sample of German and UK markets, Apergis, Artikis, and Kyriazis (2015) examined relationship between stock market liquidity and macroeconomic condition. They reported that market liquidity holds strong information about economic

condition even in the presence of leading economic indicators in the German and UK markets. They further documented evidence of "flight-to-quality" phenomenon in these markets. Galariotis and Giouvris (2015) examined interaction between stock market liquidity and macroeconomic variables in G-7 markets. They used both national and global stock market liquidity measures, and reported that, concerning the effect of macroeconomic variables, these markets do not behave in the same manner. In particular, they reported that in a Granger causality framework, national liquidity has a diminishing ability in the sample markets. They further reported a two-way causality between macroeconomic variables and global liquidity measures in six equity markets. This study next hypothesizes that,

H2: Increase (Decrease) in the business cycles components increases (decrease)liquidity of Asian emerging markets.

2.5.3 Foreign Investor's Equity/Fund Flow and Stock Market Liquidity

Following liberalizations of stock markets around the world, several research efforts at country and cross- countries level has been exercised to examine its economic consequences on local markets. In the context of emerging markets, previous research findings categorized foreign investment both as a friend and as a foe, thus making foreign investment still a relevant issue. In the first case (friend), empirical literature provides substantial evidences that foreign investment in the wake of liberalization in emerging markets is beneficial to a country's stock market and thus to economic development.[31] Concerning the foe aspect, empirical evidences are mixed[32]. The original intuitions behind the damaging aspect of foreign investment in equity markets can be traced back from the fear expressed by Krugman (1998) and Stiglitz (2000) that

[31] See for instance, Miller (1999); Errunza & Miller (2000); Bekaert & Harvey (2000); Henry (2000), Kim & Singal (2000), Huang & Shiu (2005)

[32] Kim & Singal (2000) stated that following stock market liberalization volatility in exchange rate and inflation has been dropped. On the other hand, Dvorak (2001) documented the opposite results. Bae et al. (2004) opined that the more firm is open to foreign ownership, the more volatile.

foreign investors in emerging markets can potentially create excessive volatilities, inflation, impel boom and bust cycles caused by unstable and volatile foreign investors flow.

In the context of Asian emerging markets, Agudelo (2010) investigates this phenomenon in a framework of informed foreign investors trading and its impact on market liquidity. Agudelo (2010) concludes that in the very short-term foreign investors aggressively demand liquidity but have a positive impact on the liquidity of the market. Since, in most of the Asian emerging markets, there are few or no direct restrictions on foreign investors' entry into the stock market, the inflow of foreign investors might have a positive impact on stock market liquidity; however, in the short run, a pull back in foreign portfolio equity investment can potentially be damaging to stock market liquidity. As noted by De La Torre et al. (2007) that liberalizing the market can pose a serious threat to authorities and policy makers since migration of trade to an international market can cause reduction in liquidity.

Conventionally, in a transparent and efficient market, both local and foreign investors have same amount of information and foreign investors should not be distinguished from local investors. Stylized facts in extant literature on the role of foreign investors, however, suggest at least two streams where foreign investors can make a difference and can potentially influence stock market liquidity. 1) Real friction effect and 2) information friction effect (see for instance, Ding et al. 2013; Agudelo, 2010; Stoll, 2000). In the case of the former, foreign investors can change the level of trading. The existence of foreign traders can influence the real friction element of stock liquidity by shifting the trading level and activities. More specifically, as a result of increases in foreign traders activities in the market decline in the real friction cost through dispersion of a fixed real cost over increased trade (Stoll, 2000). Higher trading volume – by minimizing inventory cost to liquidity providers– appears to be correlated

with higher liquidity in the inventory model of Ho & Stoll (1981). However, in the case of latter, there is mounting empirical evidence that foreign investors are better informed that average local investors.[33] The informational advantage is naturally a concern for a market dealer. In the presence of informational advantage, dealers are agonized about the plausible losses of positioning against the informed investors; thereby, compelling them to amplify spreads (Ding et al, 2013).

Along the similar lines, Agudelo (2010) noted that in the context of macro variables, foreign institutional investors are supposedly better knowledgeable than local investors as evidenced in Seasholes (2004) in the case of Taiwan and Indonesia as suggested by Agudelo (2010).[34] Agudelo (2010) further noted that the general level of information asymmetry of firms in the overall market tends to amplify in circumstances when foreign investors intensively trade in a specified direction. In an empirical exercise of Bae et al. (2005), there appears to be a positive relationship between information environment and US portfolio in 25 emerging economies. Overall, foreign investors trading at market level is expected to be positively related to market level liquidity (Agudelo, 2010). In a related literature, Hasbrouck and Seppi (2001) and Chordia et al. (2000, 2001) explored the concept of market liquidity in the stock listed on US market. In this vein, it can be argued that foreign investors' trading can potentially affect market level liquidity by originating the order imbalance not necessarily through causing market-wide information asymmetry (Agudelo, 2010).

Several successive studies empirically test the linkage between foreign equity trading and trade level outcomes of the equity market, giving mixed results. For instances, using Swedish equity market data, Dahlquist and Robertsson (2002) empirically examined the foreign trader investment behavior and local market returns

[33] For details, see Grinblatt & Keloharju (2000); Seasholes (2004); Agudelo (2005); Huang & Shiu (2005). The asymmetric information model of Kyle (1985), Easley & O'Hara (1987) and Glosten & Milgrom (1985) also suggests because of informed trading foreign investors can cause decline in stock market liquidity.

[34] In cross-country settings, Chan and Hameed (2006) also provided similar kind of results.

following linearization and reported stronger relation between local market returns and foreign investors trading. They further reported that purchase by foreign investors caused a permanent surge in the prices and homogenously a perpetual reduction in cost of equity. Such phenomenon can be explained by the impulsive nature of foreigner trading as noted by Grinblatt and Keloharju (2000) that foreign investors are inclined toward momentum trading, such that they prefer to sell past losers and buy past winner stocks. Using Indonesia and Thailand stocks data, Wang (2007) examined the relationship between foreigner equity trading and stock market volatility and reported considerable relationship between foreigners trading and volatility. Wang (2007) further noted that foreign selling appeared to be most important factors causing market volatility and that during the Asian economic crisis, foreign traders were net buyers both in Thailand, and Indonesia markets, whereas price adjustment process was mainly led by foreign traders only in Indonesia market. Bekaert et al. (2007) documented a positive impact of foreigner investor's openness on liquidity in a set of emerging stock markets.

Using Indonesian stock data, Rhee and Wang (2009) empirically examine relationship between stock liquidity and foreign institutional ownership while controlling different liquidity measures and persistency in foreign ownership. The authors report negative linkage between foreign holdings and future liquidity. More specifically, a 10% surge in foreign institutional ownership causes roughly 2% raise in bid-ask spread, 4% rise in price sensitivity and 3% decline in depth in subsequent months. Wei (2010) document positive relationship between increased foreign institutional ownership and stock market liquidity, thereby supporting the notion that increased participation promote liquidity of stock through various channels, including greater liquidity trading and improved informational competition. Using foreign ownership and foreigner trading data of seven emerging markets, Agudelo (2010) documented that foreign trader assertively demand liquidity in short run, though have

long lasting positive impact on the emerging markets liquidity. Given these intuitions and theoretical justification, this study hypothesizes that,

H3: Increase (decrease) in inflow (outflow) of foreign equity/funds trading increases (decreases) stock market liquidity of Asian emerging markets.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains the nature and source of data, variable selection, model construction, and empirical strategies involved in testing the benchmark models to address the objectives of this study. This chapter first explains the data gathering process of key statistics required for models testing followed by procedures of constructing measures of the stock market liquidity. This chapter next develops an empirical model by introducing key macroeconomic variables followed by empirical strategies. In empirical strategies, this study first outline the fundamental framework of preliminary statistics and diagnostics tests for examining the unit root properties of the series under investigation to decide on the choice of appropriate econometric techniques for model testing.

This study next outlines the role of financial crisis/market decline as an important structural break while modeling macroeconomic variables against the stock market liquidity. A Vector Autoregression (VAR) is used to determine the appropriate lag length criteria. After testing for cointegration between the variables, Vector Error Correction Model (VECM) is used to generate long and short run coefficients. The Granger causality is further used to test the causality between variables. Finally, this study utilizes Innovative Accounting Approach (IAA) to examine the impact of shock, relative strength of causality or feedback effect between the variables.

3.2 Data

For empirical analyses, this study considers daily data of all stocks listed on stock exchanges of five Asian emerging markets. This study considers five Asian emerging markets, namely, the Shanghai stock market (A- Share stocks), the Karachi stock

exchange, the Bombay stock exchange (Sensex stocks), the Bursa Malaysia, and the stock exchange of Thailand[35]. Constrained by key statistics, the initial sample, this study considers all common stocks listed on stock exchanges of selected Asian emerging markets over the period January 2000 - December 2014 (the latest data obtainable at the time of extracting)[36]. This study uses various sources to gather both macro and stock related variables data[37]. The detailed definition and sources of data and variables are provided in Appendix 6. The firm-level stock data are combed from both Data Stream managed by Thomson Financial and from respective stock exchanges databases where available[38]. Monthly macroeconomic variables data are obtained from three sources, namely, International Financial Statistics (IMF-IFS, 2014), Data Stream and central banks of respective selected emerging markets. This study constructs key monthly measures of stock market illiquidity from daily stock level data.

3.3 Stock illiquidity Measures – Dependent Variable

One of the core challenges in empirical research on stock liquidity is how to construct measures that are able to confine all dimensions of stock liquidity in an appropriate way. Given the latent nature of stock liquidity, there are several dimensions and therefore, several empirical measures of stock market liquidity. These dimensions can be broadly categorized into three groups, namely, depth, tightness and resiliency. Kyle (1985) noted that depth, tightness, and resiliency are fundamental components of a liquid market. Later day studies also included trading time component for liquid market qualification. The depth component of liquidity suggests market ability to absorb large

[35] The choice of selecting these is not arbitrary rather this choice is driven by unavailability of data of important variables namely foreign equity buy/selling and foreign fund flow (equity class) for a complete time period this study considered.
[36] In the case of Shanghai A -share market, the time span of study is over the period Jan 2003- Dec 2014 since the data of foreign fund equity flow was only available from Jan 2003.
[37] The usage of two more than two alternative source for data assist in watching the data entry mistakes and therefore fill up those missing data points .
[38] For instance, the prices and order related trade level data of stocks listed on Karachi stock exchange is gathered from http://www.brecorder.com/market-data/karachi-stocks/. Similarly, for Sensex Bombay stock exchange, prices of stocks and other related trade level data was obtained from http://www.bseindia.com/markets/equity/EQReports/StockPrcHistori.aspx?expandable=7&flag=0

trading volume with negligible price impact. The tightness component largely indicates the transaction cost regardless of market price and is often measured as bid-ask spread. A narrow bid-ask spread indicates that a market is liquid. Market resiliency shoes a price recovery from the small trade to its original position. More specifically, a market that recovers from price shocks and resets to its balance amid quick orders is said to be a resilient market (Krishnan and Mishra, 2013).

Another challenge in empirical research on stock market liquidity revolves around the usage and choice of ex-ante and ex-post liquidity measures. The order based stock liquidity measures that include posted depth and quoted spread refer to currently obtainable liquidity in the stock market, which is also called ex-ante liquidity measures. Trade based liquidity measures such as, trading volume and turnover imply realized liquidity or ex-post liquidity. Næs et al. (2008) noted that both kinds of liquidity measures should furnish accurate signals under normal condition; trading activity, however, might also be high during an economic downturn, when stock liquidity appears to be low, since traders are scuffling to leave their positions. Despite these differences, the general immensity of stock liquidity empirical literature lean on trade based measures (Næs et al. 2008) which is largely driven by the third challenge in empirical studies on stock market liquidity, i.e. data availability and this issue is particularly more severe in emerging stock markets[39]. Since most of the stock illiquidity concepts are closely related, it would be intricate to measure illiquidity directly. Given the several dimensions of stock liquidity, several calculable measures of stock liquidity have been developed in finance literature ranging from high frequency measures to low frequency measures. Korajczyk and Sadka (2008) noted that none of liquidity measures in extant literature could precisely confine stock illiquidity. Since many illiquidity proxies (i.e. Bid-ask Spread, relative bid-ask Spread and other measures which are

[39] Order based measures generally require detailed information related to transaction process.

considered useful for high frequency analyses) data for the emerging markets are not available for longer period (Agudelo, 2010; Lesmond, 2005), this study therefore use two commonly used stock illiquidity measures.

Since the fundamental interest of this study is to model macroeconomic variables with stock market liquidity, it will therefore consider two measures of stock market illiquidity, namely, Amihud (2002) illiquidity measures of price impact and Roll's illiquidity measures, covering the implicit spread of stocks. The choice of liquidity proxies is driven by the desire for relatively longer period for firm-level attributes data availability, and for those illiquidity measures that can be calculated from daily firm-level prices and trade data, and which have received careful attention in recent stock liquidity literature. While computing the measures of stock market illiquidity, this study follows standard stock filtering criteria (see for instance, Fernández-Amador et al. 2013; Næs et al. 2011; Soderberg 2008), that have received immense attention in recent empirical stock market liquidity research. While this study wants to circumvent the risk of obtaining spurious results, it also wants to reduce the risk of including the contaminated stocks. This study therefore expunge those stocks 1) that are not actively traded since rarely traded securities would not furnish reliable statistics (Chordia et al. 2000); 2) that has a less than 10 trading days; 3) that has more than 80% of zero return days in a month; 4) price of the share is less than 1 unit in domestic currency; and stocks where daily price variation is ± 50% during a month. This study also exercised 1% winsorization on Roll's illiquidity measures because of the estimation procedure that Roll's inherit by the implicit trimming of where Roll's is fixed to zero whenever, it is undefined given the positive autocovariance of daily change in the stock prices.

Each stock filtering criterion carries implications. For instance, those stocks, which are not actively traded if included in the sample, would potentially influence the average absolute returns and average trading volume. As a result, reliable statistics would not be furnished. The second filtering criteria if ignored would allow the stocks that are influenced by thin trading and hence it will affect the composition of liquidity series, thus affect overall statistics. The third criteria where this study exclude those stocks which have 80% of zero return days in a month is significant in a sense that if stock price have 80% of zero return days, it implies that stock prices of the that particular security is not moving from its original position. Including such stock in the illiquidity measure construction violates the basic assumptions through which Amihud price impact measure was developed. The fourth criteria where stock with less than 1 unit price in domestic currency was excluded. The purpose of excluding such stock is to avoid the illiquidity measures and subsequent analysis not to be driven by penny stocks. Stocks with daily price variation is ± 50% are excluded because this much of abnormal variation is neither caused by trading volume nor by the increasing /decreasing spread of such specific security. Such variation in daily price level is attributed to exogenous factors and hence considering such stock in illiquidity measurement construction would provide unreliable results[40]

It is relevant to state that the trading intensity dimensions of stock market liquidity can be regarded as liquidity measures since higher trading intensity means higher liquidity (Fernández-Amador et al., 2013). As pointed by Skjeltorp and Ødegaard (2009), in general one could think of active market as liquid market where investor can easily liquidate the stocks and rebalances the portfolios. Whereas, the price impact and transaction cost measures are regarded as illiquidity measures, since the higher the score of these liquidity measures, lower is liquidity of a particular stock. The Amihud

[40] For more details, see Fernández-Amador et al., 2013), Chordia et al. (2000), Soderberg (2008)

illiquidity measure is based on traded volume. To measure the trading activities aspect of liquidity, this study first calculated traded volume for selected markets where direct measure of trading volume was not available. Brennan et al. (1998) proposed this measure, which has been used in previous studies (i.e. Fernández-Amador et al, 2013). Brennan et al. (1998) assumed that, a higher traded volume, more liquid are the stocks, and this would be suitable measures of liquidity and stock trading activities. Following Fernández-Amador et al, (2013), this study computes traded volume through the formula as outlined in (1).

$$Tv_{idm} = VO_{idm}, P_{imd} \ldots\ldots (1)$$

Where Tv is trading volume of stock i at day d in a month m, VO is number of share traded of stock I at day d multiplied by price P of respective stock i at day d in a month m.

The first illiquidity measure this study considers is Amihud (2002) price impact measure. This measure is most frequently used in stock liquidity empirical literature following its popularization[41]. This measure was proposed to capture the price impact of large order flow. Kyle (1985) describes the price impact as the reaction of price to order flow. This measure captures the elasticity dimension of liquidity. The elasticity dimension of liquidity attempts to take into account the sensitivity of stock prices as a response to trading volume. Amihud (2002) liquidity measure is well established and several past studies have utilized this proxy to study the liquidity dynamics. Hasbrouck (2009) and Goyenko et al. (2009) particularly documented its adequacy as a measurement of price impact. The computation of Amihud (2002) price impact measure is outlined in (2)

[41] See for instance Galariotis and Giouvris (2015), Smimou and Khallouli (2015) Florackis et al (2014a,b), Smimou (2014), Fernández-Amador et al., (2013), Næs et al, (2010), Hasbrouck (2009), Korajczyk and Sadka (2008), Kamara et al. (2008), Watanabe and Watanabe (2008), Avramov et al. (2006), Acharya and Pedersen (2005.)

$$Ami_{im} = \frac{|R_{idm}|}{TV_{idm}} \ldots..(2)$$

Where Ami_{iym}, is the illiquidity of stock of *i* at day *d* in a year *y*. R_{iymd} is an absolute return to share of *m* at day *d* divided by corresponding trading volume[42] TV_{iyd} of that security *i* at day *d* for a month *m*. A high estimate of this ratio indicates low liquidity and thus high price impact and vice versa. A high price impact suggests a low market, which implies that the price is moved by even smaller trading volume (Skjeltorp and Ødegaard, 2009).

Next, this study considers Roll's price impact proposed by Roll's (1984). The measure captures the implicit spread and also called the effective bid-ask spread (Næs et al. 2011). Roll's price impact can be measured by taking a serial covariance of consecutive changes in price movements. The basic intuitions behind Roll's price impact can be assessed in the following way.

Let m_t be the fundamental value of a share for a day *t*, which follows a random walk, and *it* is an innovation term with zero mean, uncorrelated public information shock for the day *t.* Thus, it evolves as follow,

$$m_t = m_{t-1} + e_t \ldots \quad (3)$$

Further assume that p_t is the last observable share price on which asset is traded on the day *t.* Each trade cause some transaction cost (assumed to half of the bid-ask spread) denoted by $\frac{1}{2}s$ with a probability of sell and buy order is equal to 0.5 and also *i.i.d*. The observed price *Pt* at time *t* depends occurrence of buy/sell orders. Therefore, the equation will evolve as outlined in (4)

[42] Trading volume is recorded in a local currency

$$P_t = m_t + Q_t \frac{1}{2} S \ldots(4)$$

Where Q_t=1 (Q_t=-1) if the stock is sold (bought), is serially uncorrelated and independent of public information shock e_t. Taking the first difference of the equation (3) and combining it with an equation (4) results in equation (5)

$$\Delta p_t = \frac{1}{2} S \Delta Q_t + e_t \ldots(5)$$

Where Δ is a difference operator. Computing the covariance of consecutive price changes, the following equation evolves

$$Cov(\Delta p_t, \Delta p_{t-1}) = -\frac{1}{4} S^2 \quad \ldots(6)$$

Or, correspondingly it is equal to the spread of the given stock at day *t* by taking the inverse

$$S = 2\sqrt{-Cov(\Delta p_t, \Delta p_{t-1})} \quad \ldots(7)$$

The equation outlined as (7) denotes that if the covariance between consecutive price movements is positive, it is considered undefined and the numerical value should be put to zero. For empirical estimation, Roll's measure can be computed for daily price changes each month by the following ways.

$$Roll's_{iyd} = 2\sqrt{-Cov(\Delta p_t, \Delta P_{t-1})} \text{ When } Cov(\Delta p_t, \Delta p_{t-1}) < 0 \ldots(8)$$

$$Roll's_{iyd} = \quad 0 \quad \text{When } Cov(\Delta p_t, \Delta p_{t-1}) \geq 0 \ldots (9)$$

To compute the price impact, the score originated from Roll's (8) or (9) is divided by the traded volume of specific stock for a day *d,* in a given month *m,* yielding the following equation.

$$RPI_{imd} = \frac{ROLL's_{imd}}{TV_{imd}} \ldots(10)$$

For a time series adjustment and estimation, following Fernández-Amador et al. (2013), Næs et al (2011) and Soderberg (2008), this study calculates monthly average of individual stock illiquidity measures from daily data. Similar steps are exercised to compute equally weighted average illiquidity measures across the stocks to generate market level time series illiquidity measures for a given month. The mathematical expressions are laid out in eqution (11) and (12). The term $IlliQ_{iym}$ is a replacement factor for two illiquidity measures.

$$IlliQ_{iym} = \frac{1}{D_{iym}} \sum_{d=1}^{D_{iym}} IlliQ_{iymd} \ldots(11)$$

$$IlliQ_{iym} = \frac{1}{N_{iym}} \sum_{i=1}^{N_{iym}} IlliQ_{iymd} \ldots. (12)$$

3.4 Selection of Macroeconomic Variables and Empirical Model Construction

This study draws upon the theoretical footing of empirical model on three strands that have already discussed in the literature review chapter. The macroeconomic variables selected for this study are related to monetary policy, business cycle, and foreign investor's inflow. To highlight the role of monetary policy in explaining stock market liquidity, this study draws support from the model of Brunnermeier and Pedersen (2009) who noted that, trading needs capital. When investor acquires a security, that security can be used as collateral and the trader can borrow against that security. The trader however cannot use the whole price. The difference between collateral worth and asset's price is known as margin, which must be funded by the investor' own finances. The total margin on a trader's position therefore, cannot exceed an investor's finances at any time.

In circumstances, where the funding liquidity is dense, market participants are disinclined to take on trading position particularly in capital intensive and high margin assets. Resultantly, market liquidity decline, and higher volatility is observed in the market. In addition, under certain circumstances, low market liquidity increase the risk of funding a trade, thereby increasing the margins. Among other important testable implications, Brunnermeier and Pedersen (2009) linked dealer and margin funding to market liquidity by noting that a decrease in funding lessens market liquidity particularly when funding is already tight for a high margin asserts (through non-linear effect).

Given these intuitions, the role of monetary policy in dictating stock market liquidity is indeed justified by the Inventory Paradigm. In market microstructure literature, inventory paradigm suggests that inventory risk and turnover influence stock liquidity. The inventory paradigm postulates that, if participants in a market can cheaply leverage their stocks and can sense low risk of holding stock, then assets are expected to be more liquid. In this vein, Fernández-Amador et al. (2013) posit that monetary policy has the potential to influence financing cost and perceived risk of holding assets, which implies that monetary policy should also influence stock market liquidity. A recent research study by Florackis et al. (2014) also lends support to the role of monetary in dictating macro-liquidity. The authors noted that central banks use certain set of monetary policy tools to manage macro-liquidity. Among the tools, determined policy rate of central bank is regarded as standard for term structure of interest rate (Florackis et al., 2014), and this is primarily held to be accurate in yield curve for a for short-end (Kuttner, 2001). In addition, the stipulation of liquidity provision to banks and financial institutions influence supply of broad money in the economy. Florackis et al., (2014) further noted that the significant role of financial

intermediaries in modern financial markets also entails that shift in monetary stances of central banks induce macro-liquidity shocks, which can be transmitted to chain intermediation, thus ultimately influencing the traders in the market.

This study considers two key variables of monetary policy to examine their role in stock market liquidity. They are policy rate[43] (interest rate) and monetary base. Previous literature normally used individual components of money supply or monetary aggregates to capture the affect of monetary policy on stock market liquidity. Since supply of capital appears to have a positive impact on stock market liquidity (e.g. Fernández-Amador et al. 2013; Zheng, 2008), traditionally the two most common measures of money supply are narrow money and broad money. In this study, following Fernández-Amador et al, (2013), monetary base growth as a first explanatory variable is considered. Monetary base is defined as currency including coins and bank notes in circulation plus reserve money central banks hold. The choice of using monetary base is characterized by the intuition that monetary base signifies the monetary aggregates and is smoothly influenced by the central banks (Fernández-Amador et al, 2013). In addition, Chordia et al (2001) pointed out that interest rate appears to have an influence on stock market liquidity.

Drawing on the business cycles and stock market liquidity strand of literature, this study next considers two variables of business cycles namely monthly Industrial production and monthly Inflation. As shown in the model of Eisfeldt (2004) the liquidity endogenous fluctuations are associated with real fundamentals such as investment and productivity in the economy. In this vein, Næs et al (2008) argue that through an association with the time-varying risk premium, liquidity could be linked to business cycle. The authors further argue that, the ratio of investor's participations

[43] A policy rate is termed as a replacement for the varying nature of interests rates of each markets used in this study. More details on the definition of variables are reported in the definition Tables at appendix 6.

with time in the equity market is a function of condition of the economy. This implies that when traders anticipate economic meltdown, they change the composition of their portfolios accordingly by shifting their focus from assets in general to illiquid/small stocks in particular. In a similar context, Chetty and Szeidl (2007) theoretically explain the role of "consumption commitment" or "consumption– smoothing" which can spur risk aversion in accordance with moderate shocks and persuade traders to hold safe portfolio. The first component of business cycle is industrial production that by and large denotes the real economic condition of the country, which can potentially alter the perceptions of investors to decide on the portfolio rebalancing[44]. As pointed out by Naes et al. (2011), stock market liquidity is a leading indicator of the real economy and shift in investor's aggregate portfolio varies with the investors' expectations about the real economy. The impact of industrial production on market liquidity can also be viewed in the vintage of economic turbulence, when funding liquidity is affected, market liquidity significantly abridges because traders fail to meet the margin requirements due to hurdles in access to finance (Lu and Glascock, 2010).

Another key variable of business cycle is inflation. Inflation is considered as a significant macroeconomic factor that can influence stock market liquidity. In market microstructure literature it is argued that excessive inflationary pressure is expected to impact stock liquidity indirectly by pushing outflow of fund, declines the prices and increase the volatility, thus aggravate inventory risks (Fujimoto, 2004). Since inflation indicates and important economic condition of the country, it can affect both demand and supply in the stock market. Moreover, Fernández-Amador et al. (2013) stated that along with other macroeconomic variables (e.g. industrial production), inflation act as transmission mechanism for monetary policy and thus impact stock market liquidity.

[44] For more details see, Brunnermeier and Pedersen (2007); Næs et al, (2011); Lu and Glascock,(2010)

Additionally, negative (positive) inflation shocks can increase (decrease) stock market liquidity by uplifting processing cost and inventory holding (Goyenko and Ukhov, 2007).

A final key variable of the present study is related to foreign investor equity inflow. Concerning this variable, this study considered fundamentally focus on foreigner buying/selling of equity in local markets.[45] Massa (2004) and Kyle (1985) argued that greater fund flow in equity can potentially reduces stock market liquidity since fund investors are more informed than others investors, thus compelling dealers to hold inventories. Massa (2004), however, also reported that, if funds investors are relatively less informed then fund flow to equity market can positive influence stock market liquidity. In a similar stream, foreign equity portfolio investment is also related with stock market (il)liquidity. Theoretically, two developed streams link profound linkages between stock market liquidity and foreign equity portfolio investment. 1) Real friction effect and 2) information friction effect (Ding et al. 2013; Agudelo, 2010; Stoll, 2000). In the case of former, foreign investors can change the level of trading. The existence of foreign traders can influence the real friction element of stock liquidity by shifting the trading level and activities. More specifically, as a results of foreign traders activities in the market cause trading intensity, thereby effect the real friction cost through dispersion of fixed real cost over increased trade (Stoll, 2000).

Higher trading volume- by minimizing inventory cost to liquidity providers- appears to be correlated with higher liquidity in the inventory model of Ho & Stoll (1981). In the case of latter, there are growing empirical evidences that foreign investors are better informed than average local investors. The informational advantage is naturally a concern for market dealers. In the presence of informational advantage, dealers are

[45] Since this particular set of data is not available for the Shanghai Share A market and the Bursa Malaysia on monthly bases and for the entire time period, this study therefore uses foreign fund flow of equity class as a replacement for foreign equity buying/selling for these two markets. The theoretical nature and established intuitions on the linkages between foreign fund flow and stock market liquidity remains same as of foreign equity buying/selling.

agonized about the reasonable losses of positioning against the informed investors; thereby, compelling them to amplify spreads (Ding et al, 2013). To construct a foreign equity portfolio inflow, this study considers net foreign equity flow/net foreign fund flow, which is the outcome of difference between monthly foreign buying and foreign selling. Given these theoretical justifications, the functional form empirical model is outlined in equation (13)

$$illiQ_{iym} f(MB_{i,t-1}, PR_{i,t-1}, IPI_{i,t-1}, INF_{i,t-1}, FNIF_{i,t-1}) \ldots (13)$$

Where, $MB_{i,t-1}$ is monthly monetary base, $PR_{i,t-1}$ is monthly policy rate , $IPI_{i,t-1}$ is month industrial production, $INF_{i,t-1}$, is monthly inflation, $FNIF_{i,t-1}$ monthly net foreign equity flow/ fund flow foreign equity investment $Illiq_{iym}$ is a replacement factor of two measures of stock illiquidity. An illustration 3.1 is provided on the variables selection which are included in the equation (13) and (14)

3.5 Estimation Techniques

To gauge the role of macroeconomic variables in explaining illiquidity, this study estimates the following equation for each market.[46]

$$IlliQ_t = \lambda_{i-t} + \lambda_2 LnMB_{i,t-1} + \lambda_3 PR_{i,t-1} + \lambda_4 LnIPI_{i,t-1} + \lambda_5 LnINF_{i,t-1} + \lambda_6 LnFNIF_{i,t-1} + e_{it} \ldots (14)$$

Where, $LnMB_{i,t-1}$ is monthly monetary base in a logarithmic form, $PR_{i,t-1}$ is monthly policy rate, $LnIPI_{i,t-1}$ is monthly industrial production in a logarithmic form, $LnINF_{i,t-1}$, is monthly inflation in a logarithmic form , $LnFINF_{i,t-1}$ monthly net foreign equity investment and e_{it} is the error term. The term $IlliQ_t$ is a replacement factor of two measures of stock illiquidity.[47] Since this study considers two measures of

[46] The model is estimated against two measures of stock market illiquidity.

[47] Both *LnMB* and *PR* represent monetary policy components. *LnMB* represents monetary base in a logarithmic form for all countries. For few countries such as Thailand and China, reserve money data were not available to generate the monetary base

illiquidity as a dependent variable, therefore different signs of estimated parameters are expected to determine if macroeconomic variables have a negative/positive impact on stock market illiquidity in a multivariate regression framework. This study expect the parameters estimated sign to be λ_2<0, λ_3>0, , λ_4<0, , λ_5>0, and , λ_6<0 .

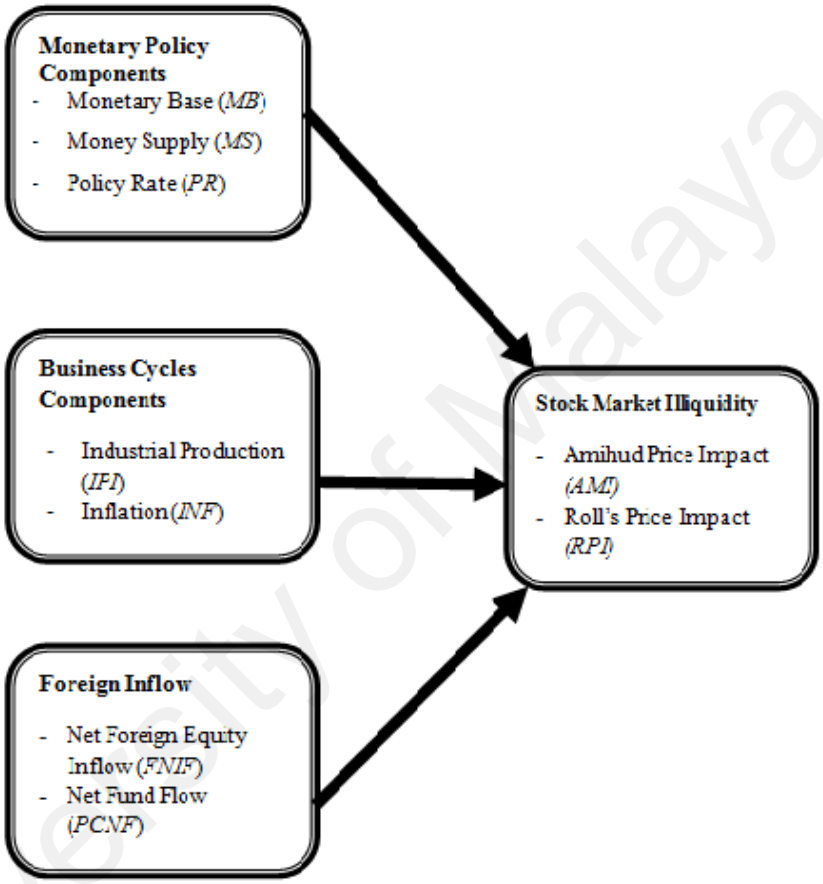


Figure 3.1 Summary of Variables in the empirical model

(*MB*), hence broad money supply is used in the estimation. For the sake of uniformity in the results presentation, the term *MB* in natural logarithmic form is reported. *PR* represents policy rate of each market. Policy rate is a general representation of varying nature of monetary policy rates in each market for the sake for uniformity. *LnIPI* is natural logarithmic form of index of Industrial Production. *LnINF* represents general level of inflation measured by consumer price index. For the India and China market, direct measure of inflation is used in the estimation given the unavailability of general level of consumer price indices in these markets. Both *LnIPI* and *LnINF* represent the components of business cycle. *LnFNIF* is a general representation of net foreign flow in the selected emerging markets. In the case of China market, information about month fund inflow and outflow was not available, hence aggregate measures of net fund flow was transformed into logarithmic form. In the case of Malaysian market, monthly net fund flow was calculated in a percentage form. While in the rest of markets, net outcome of foreign buying and foreign selling was used.

3.5.1 Testing Unit Root and Stationarity Properties

In time series analysis, testing unit root and stationarity behavior of data series is said to be a natural procedure and one of the prime steps. Many financial and economic time series data display nonstationarity or trending pattern in the mean. In financial time series, macroeconomic aggregates, exchange rate, and stock prices are few leading examples of such pattern. The stemming of such pattern within the data points is therefore problematic to regression model estimates. One of the significant econometric tasks is to locate most apposite trending pattern in the time series data. There is a handful of studies in econometrics literature, which have developed different econometric techniques over time, by which the time series properties of data can be judged. Among the available methods, Augmented Dickey-Fuller (ADF) (1979) Phillips-Perron (1988), Kwiatkowski, Philips, Schmidt, and Shin (KPSS) (1992) tests to name few, are common techniques that appeared in diagnosing the unit root pattern in the previous published studies.

Each technique has some peculiarities and hence usefulness of each test varies from case to case. The ADF test for instance is developed to examine the presence of non-stationarity or unit in a univariate time series. The ADF test form a parametric correction by assuming that *y* series follows a AR *(p*) process for a higher order correlation and adding a *p* lagged dependent variables term to the right side of the regression test. In its simplest form, the ADF test is as expressed in (15).

$$\Delta y_t = \alpha y_{t-1} + x_t'\Phi + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \ldots + \beta_p \Delta y_{t-p} + v_t \ldots (15)$$

Along ADF test, several other tests are also introduced in econometrics literature. For instance, a test proposed by Phillips and Perron (PP) (1988), commonly known as Phillips and Perron unit root test or Z statistics emerged from the limitations of distribution of the ADF test. In this particular limitation, limit distribution of several

ADF statistics are on the assumption that error term is an *iid* process is relaxed. The PP test suggests that given the assumptions which is generally made related to the distribution of error term, the error term actually follow equations (16)

$$\sigma_e^2 = \lim_{T \to \infty} \left[\frac{\sum_{t=1}^{t=T} E(e_t^2)}{T} \right] \ldots.(16)$$

and

$$\sigma^2 = \lim_{T \to \infty} \frac{E\left[\sum_{t=1}^{t=T} e_t\right]^2}{T} \ldots(17)$$

The PP test assumes that if the error term is *iid* process then the terms σ_e^2 and σ^2 are supposed to be similar. One of the merits of employing PP test is that it eliminates heteroskedasticity and serial correlation in the error term and hence the requirement of choosing lag length is ruled out. It is worthy to document that both ADF and PP tests are predicted on asymptotic theorization. Therefore, it is significant to judge how accurately the limiting distribution converges to the finite sample distribution in both cases of relevant statistics. Contrary to ADF and PP tests, Kwiatkowski, Phillips, Schmidt, and Shin introduced yet another unit root diagnostic test commonly known as KPSS (1992) test.

Despite the theoretical and practical significance of these commonly used unit root tests in time series analysis, these tests are recently subject to criticisms. For instance, in the case of ADP and PP unit root test, both these tests can be asymptotically comparable; these tests however significantly differ in the case of finite sample. Schwert (1989) particularly documented that, in case Δy_t has ARMA process with negative and large Moving Average (MA) component, then both the PP and the ADF

are seriously size distorted and thus much often reject 1(*1*) when it is true. This scenario hold much true for PP test than the ADF test. Second common criticism in the literature also suggests that these traditional unit root tests have low power against *1(0)* substitute to *1(1)*. This implies that these traditional unit root tests overlook high persistency between nonstationary and stationary process, thus the difference is indistinguishable. Third, power of these tests yet again diminishes with addition of deterministic term in regression test. This implies that while exercising these tests, when constant and trend is included in regression test, the power of test is reduced as compared to the inclusion of only constant term in the regression specification.

Given these deficiencies in the traditional unit root tests, later studies proposed news tests and suggested modifications to these tests. For instance, Elliott, Rothenberg and Stock (ERS) (1996) and Ng and Perron (2001) proposed new test for maximum power size to test persistency in the data series. This study utilizes Ng and Perron (2001) unit root test that is based on the modification of previous tests and extension of ERS. Using Generalized Least Square (GLS) detrended method of ERS and to construct more efficient versions of Perron and Ng (1996), Ng and Perron (2001) developed four tests. These tests are adjusted version of previous PP test which is based on *Z* statistics and the Bhargava (1986) R_1 and the ERS optimal statistics. By defining the initial term as in equation(18)

$$K = \sum_{t=2}^{T} (y_t^{\,d} - 1)^2 / T^2 \ldots (18)$$

Modified version of these statistics can expressed in equation (19) to equation (20) with a decision criteria of NP $_{\text{statistics}}$ > Critical Values

$$MZ_a^d = \frac{(T^1 y_T^d)^2 - f_o}{2k} \ldots (21)$$

$$MZ_t^d = MZ_a * MSB \ldots (22)$$

$$MSB = (\frac{k}{f_o})^{1/2}$$

$$MZ_T^d = \frac{(c^{-2}k - \bar{c}T^1)(y^dT)^2}{f_o} \text{ if } x_t = \{1\} \ldots (23)$$

$$MP_T^d = \frac{\left(c^{-2}k + (1-\bar{c})T^1\right)\left(y^dT\right)^2}{f_o} => \text{if } x_t = \{1,t\} \ldots (24)$$

$$k = \sum_{t-2}^{T} \frac{\left(y_{t-1}^d\right)^2}{T^2} => \bar{c} = -7 \text{ if } x_t = \{1\} => \bar{c} = -13.5 \ldots (25)$$

$$if \quad x_t = \{1,t\}$$

3.5.2. Accommodation of Structural Break: The Role of Financial Crisis/ Market Declines

A financial or economic time series is frequently based on the stationarity assumptions such as consistency of parameters. In applied financial time series, the scenario does not hold as it has been assumed. Financial markets are frequently exposed to changes and it has an effect on the pattern of data series. In particular, the notion that market decline leads to stock market illiquidity in the time of crisis has received significant attention in theoretical research. There are few theoretical streams, which show linkages between a market decline in the time of crisis and stock market illiquidity. For instance, Brunnermeier and Pedersen (2009) developed a model by linking funding liquidity and market liquidity. By linking funding liquidity and market liquidity, they argued that liquidity sudden dry-up, which destabilize the margins, since financers are not well- informed thus causes variations in fundamental volatility. They further argued that, since funding conditions hit speculators liquidity provision of all assets, therefore the fragility in funding liquidity and market liquidity co-moves across

assets. In this vein, Hameed et al. (2010) noted that liquidity dry-ups take place because either financial intermediaries stop providing liquidity in form of funding (known as a supply effect) or market participants' start panic selling (known as a demand effect).

Theoretical models consider occurrence of illiquidity after a market declines in different ways. In a collateral-based view, when dealers experience funding constraints in the wake of market declines, they try to obtain funding by posting margins and pledge the assets they keep as collateral. Therefore, when stock price significantly decreases, the intermediaries affect their margin constraints and force the dealers to liquidate the holdings. In coordination failure context, Morris and Shin (2004) and Bernardo and Welch (2004) noted that differing trading limits by trader causes them to sell the holdings. When one trader hits his limit, this may decreases the price and causes other traders limit to be hit, hence early liquidation offers a better price as compared to late liquidation. At that time, traders get engaged in liquidating their holdings after a negative shock to market; hence when price ultimately fall, liquidity black hole emerged similar to the model of bank run.

While financial economics literature provides several theoretical justifications and models of the negative effect of market declines on stock market liquidity, the exact details of these models differ. These models however agree and predict that large negative shock to markets augment the liquidity demand as agent/ dealers/participants liquidate their positions across assets, this reduce the liquidity supply as liquidity providers face funding constraints (Hameed et al, 2010).

Available literature suggests that the impact of liquidity shocks originated following the financial crisis began in late 2007 in US and spread quickly across other countries. While global financial crisis could have transmitted by several mediums, Dang et al. (2014) argue that there are grounds to believe that important role of institutional

investors in shocks transmission across counties and asserts cannot be ruled out. Recent theoretical literature detailed the explanation of institutional investors destabilizing role during liquidity shocks. In Particular, Brunnermeier and Pedersen (2009) suggest a model where interplay between leveraged financial institutions funding liquidity and market liquidity of assets are appear to have transmission and amplification of liquidity shocks across assets. In a similar context, few studies argue that because of wealth effect originated due to shocks to asset markets, financial intermediaries exercise high risk aversion (Kyle and Xiong, 2001; Xiong, 2001) capital pull out because poor performance of financial intermediaries (Shleifer and Vishny, 1997) and even tighter risk management (Garleanu and Pedersen, 2007). These factors jointly contribute to push the selling pressure in a stock market and financial institutions across the international markets decline to provide liquidity to the stock market, thereby causes of propagation of shock through trading impact of institutional investors. To accommodate the role of market decline in stock market illiquidity of Asian emerging markets, this study constructs a dummy variables[48] over the period of July 2008–May 2010 (Glick and Hutchison, 2013).

3.5.3. Vector Autoregressions (VAR) Analysis

This study uses a Vector Autoregression (VAR) framework to examine the dynamic relationship between macroeconomic variables and stock market liquidity. VAR is one of the powerful and frequently used econometrics methods in empirical analyses. VAR models have a long convention as technique in multiple time series analysis. After Sims (1980) advocated the usage of VAR model instead of simultaneous equations model, the VAR method has gained popularity. Being multivariate simultaneous equations, VAR treats each variable as endogenous and finite lags of entire variables are jointly considered in a regression. VAR models are more useful in time series analysis when a

[48] Dummy variable is constructed following Heinesen (1997)

phenomenon for which no strong priori and competing explanations are available. VAR models provide a methodical way to take into account the rich and forceful dynamics of multiple time series. VAR Models often offer sophisticated forecast as compared to univariate time series modeling and provide robust support to simultaneous equations that lean of theory-based arguments. Further, given the flexibility of VAR Models, potential future path forecast generated from the VAR can be formed condition of specified variables.

The simplest form of VAR model can be expressed algebraically as outlined in (26).

$$y_t = \alpha + \Pi_1 Y_{t-1} + \Pi_2 Y_{t-2} + ... + \Pi_p Y_{t-p} + \mu_t \quad t = 1,.....,T \ \ldots (26)$$

In the above specification y_t is the endogenous variable represented by of vector of y_1, y_2, y_3… and y_n with basic *p* lagged order of vector autoregressive process VAR($_p$). Further, Π represents coefficient matrix of *nxn* , where, μ_t is the unobservable (nx1) white noise zero mean vector process along a time invariant and covariance matrix of Σ. The matrix representation of bivarite VAR can be expressed as outlined in equation (27).

$$\begin{pmatrix} y_{1t} \\ y_{2t} \end{pmatrix} = \begin{pmatrix} b_1 \\ b_2 \end{pmatrix} + \begin{pmatrix} \pi_{11}^{\ 1} \pi_{12}^{\ 1} \\ \pi_{21}^{\ 2} \pi_{22}^{\ 2} \end{pmatrix} \begin{pmatrix} y_{1t-1} \\ y_{2t-1} \end{pmatrix} + \begin{pmatrix} \pi_{11}^{\ 1} \pi_{12}^{\ 1} \\ \pi_{21}^{\ 2} \pi_{22}^{\ 2} \end{pmatrix} \begin{pmatrix} y_{1t-2} \\ y_{2t-2} \end{pmatrix} + \begin{pmatrix} \mu_{1t} \\ \mu_{2t} \end{pmatrix} \ldots (28)$$

Alternatively in algebraic equation form, the matrix representation of specifications outlined in equation (35) can be expressed as outlined in equation (29) and (30) with each equation having same regressors.

$$y_{1t} = \phi_1 + \gamma^1{}_{11}\varphi_{1t-1} + \gamma^1{}_{12}\varphi_{2t-1} + \gamma^2{}_{11}\varphi_{2t-2} + \gamma^2{}_{12}\varphi_{2t-1} + \mu_{1t} \ldots (29)$$

$$y_{2t} = \phi_2 + \gamma^1{}_{21}\varphi_{1t-1} + \gamma^1{}_{22}\varphi_{2t-1} + \gamma^2{}_{21}\varphi_{2t-2} + \gamma^2{}_{22}\varphi_{2t-1} + \mu 2 \ldots (30).$$

3.5.4 The Cointegration Test

Many practitioners and academic researchers commonly face the issues of unit root in time series analysis. As mentioned above, if a series has a unit root problem or its unit root properties are not checked and it is regressed against other variable, then the outcomes of regression would be spurious, thus resulting in misleading inferences and misgauged forecasts. This issue can be avoided by examining the residual of estimated regression for stationarity. If the estimated residuals are stationary, then two time series are said to be cointegrated. Alternatively, individual series are tested for unit root properties, and order of integration is examined. If the two time series are stationary and integrated at order *1(1)* then those series should be examined for potential cointegration. If variables are cointegrated, this implies that variables are drifting together or converging to equilibrium in the long run. The theory of cointegration was popularized by Granger (1981) and further detailed by Engle and Granger (1987) and Johansen (1988). The notion of cointegration essentially deals in incorporating the short run dynamics with long run relationships. The algebraic form of the cointegration is as expressed in equation (31) and (32) below.

$$Y_t = \alpha + \beta X_t + \mu_t \ldots..(31)$$

$$\mu_t = Y_t - a - \beta X_t \ldots (32)$$

In the above specifications, Yt and Xt are two time variables, β and *a* are the coefficients and u*t* is the error term. If the unit root test concluded that both these time variables are non-stationary at level, they however are stationary at first level or integrated at order *1(I)*, then cointegration test is used to further establish whether both the time variables have a linear combination. This study used Johansen cointegration test following PP unit root test in VAR framework. Johansen and Juselius (1990) proposed two popular statistics in the time series literature. The first test is known as the

Trace statistics and second is known as maximum Eigen statistics. The trace statistics test if the matrix rank of π is r_0 under the null hypothesis that rank $\pi = r_0$ or there is no cointegration between the series, while alterative hypothesis stats that $r_{0<}$ Rank $(\pi) \leq n$ and n is number of potential cointegration vectors. The Maximum Eigen statistics on the other hand tests if the largest Eigen score is zero as compared to the next highest Eigen value. The null hypothesis that rank $(\pi) = 0$ against the alternative hypothesis of $(\pi) = 1$. In this study, both these tests are reported to decide on the existence of cointegration between the variables.

3.5.5 Vector Error Correction Model

In a time series analysis, when variables in the VAR are cointegrated, then vector error correction model (VECM) is used further to determine the short run dynamics of long run equilibrium. This implies that cointegration involves imposition of restrictions on coefficients in VAR model. Such restrictions are required to establish the degree (1, 1) order of cointegrated relationship exists between the variables and also ensure the existence of error-correction model. The Granger representation framework noted that for any pair of *1(I)* time variables, cointegration and error correction are identical. In VECM framework, the long run coefficients are obtained by regressing independent variables on dependent variables. The short run estimates are obtained through error correction model (ECM) if variables are co-integrated with each other's. The algebraic expression of VECM process is represented by equation (33).

$$\Delta y_t = \alpha + \beta \Delta x_t + \lambda e_{t-1} + \mu_t \ldots. (33)$$

In the above specification Δy and Δx are two cointegrated variables in a difference form and e_{t-1} is the outcome of error acquired from regression between X and Y and μ_t is the disturbance term.

In the fundamental framework of regression, it is well established that changes in Y is because of changes of X. However, in the specification stated in (33), Δy is associated with e_{t-1}. The variation in e_{t-1} is the correction process to make Δy in equilibrium in the current period. In other words, if coefficient e_{t-1} is negative, this implies λ_{t-1} will also turn out to be negative. The negative coefficient of λ_{t-1} is considered well above the equilibrium of $\Delta y_t = \alpha + \beta \Delta x_t$, hence the coefficient of λ_{t-1} start diminishing in the next period and ultimately the convergence is achieved. In this study, VEC models are used with appropriate lag lengths for each market to report both the long run and the short run estimates along error correction estimates of each selected market.

3.5.6 Granger Causality

Granger (1969) popularized the concept Granger causality to address an important question like what causes what in a VAR framework. Testing causality between variables is important issue in a time series analysis. By definition, a variable x causes variable y if past value of x series assist in predicting the current values of y series, provided all other information is available and vice versa. This study used Vector Error Correction Model (VECM) Granger causality to test the causal relationship between macroeconomic variables and stock market liquidity. Having information about the existence of cointegration between the variables guide this study to examine the direction of Granger-causality between stock market liquidity and a set of macroeconomic variables. The Granger representation theorem advocates that provided that variables are integrated of order one or *I(1)* and evidence of cointegration among the variables are established, then there must be Granger causality at least from one direction.

Engle and Granger (1987) noted that given the existence of cointegration among candidate variables, Granger causality if exercised at first difference by VAR method will be misleading. The χ^2 statistics are therefore, used with 1st differenced lag independent variables to decide on the Granger causality between the variables of interest. The addition of error correction term in VAR framework would therefore assist us in locating the long run relationship. This study, therefore included the error correction term in augmented version of Granger causality specification and put it together in a bi-variate *pth* order vector error-correction model (VECM). The matrix specification is depicted in equation (34).

$$\begin{bmatrix} \Delta illIQ_t \\ \Delta \ln MB_t \\ \Delta PR_t \\ \Delta INF \\ \Delta \ln IPI_t \\ \Delta \ln FNIF_t \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \\ b_5 \\ b_6 \end{bmatrix} + \begin{bmatrix} B_{11,1}B_{12,1}B_{13,1}B_{14,1}B_{15,1}B_{16,1} \\ B_{21,1}B_{22,1}B_{23,1}B_{24,1}B_{25,1}B_{26,1} \\ B_{31,1}B_{32,1}B_{33,1}B_{34,1}B_{35,1}B_{36,1} \\ B_{41,1}B_{42,1}B_{43,1}B_{44,1}B_{45,1}B_{46,1} \\ B_{51,1}B_{52,1}B_{53,1}B_{54,1}B_{55,1}B_{56,1} \\ B_{61,1}B_{62,1}B_{63,1}B_{64,1}B_{65,1}B_{66,1} \end{bmatrix} \times \begin{bmatrix} \Delta illIQ_{t-1} \\ \Delta \ln MB_{t-1} \\ \Delta PR_{t-1} \\ \Delta INF_{t-1} \\ \Delta \ln IPI_{t-1} \\ \Delta \ln FNIF_{t-1} \end{bmatrix} + \ldots + \begin{bmatrix} B_{11,m}B_{12,m}B_{13,m}B_{14,m}B_{15,m}B_{16,m} \\ B_{21,m}B_{22,m}B_{23,m}B_{24,m}B_{25,m}B_{26,m} \\ B_{31,m}B_{32,m}B_{33,m}B_{34,m}B_{35,m}B_{36,m} \\ B_{41,m}B_{42,m}B_{43,m}B_{44,m}B_{45,m}B_{46,m} \\ B_{51,m}B_{52,m}B_{53,m}B_{54,m}B_{55,m}B_{56,m} \\ B_{61,m}B_{62,m}B_{63,m}B_{64,m}B_{65,m}B_{66,m} \end{bmatrix} \ldots(34)$$

$$\times \begin{bmatrix} \Delta illIQ_{t-1} \\ \Delta \ln MB_{t-1} \\ \Delta PR_{t-1} \\ \Delta INF_{t-1} \\ \Delta \ln IPI_{t-1} \\ \Delta \ln FNIF_{t-1} \end{bmatrix} + \begin{bmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \\ \zeta_4 \\ \zeta_5 \\ \zeta_6 \end{bmatrix} \times (ECM_{t-1}) + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \\ \mu_{3t} \\ \mu_{4t} \\ \mu_{5t} \\ \mu_{6t} \end{bmatrix}$$

In the above matrix representation, Δ is difference operator, m shows optimal and appropriate lag length using AIC. The term ECM_{t-1} is residuals obtain using empirical equations of cointegration. The $\mu_{1t} \ldots \mu_{6t}$ are the disturbance terms with normal distribution, zero mean and encoded covariance matrix. The key advantage of VECM specification is that it offers both short-and-long runs Granger causality. To this end, χ^2 statistics are used with 1st differenced lag independent variables to decide on the short run Granger causality direction between the variables of interest. In the above specification, for instance, if $B_{12,m} \neq 0$, $B_{13,m} \neq 0$, $B_{14,m} \neq 0$, $B_{15,m} \neq 0$ and $B_{16,m} \neq 0$ depicts short run Granger causality runs from monetary policy variables (monetary base, interest rate), Business cycle component (Industrial Production and

Inflation) and net foreign inflow to stock market illiquidity respectively. Whereas, ECM_{t-1} with a negative sign determine the nature of long run Granger Causality.

3.5.7 Robustness Check: Innovative Accounting Approach (IAA)

The extant literature in time series suggests that VECM approach to capture the Granger causality between variables is limited to demonstrating whether one variable causes another variables but it does not suggest the exact magnitude. Further, VECM causality captures causality between the variables only in the selected sample period and cannot account anything ahead of selected sample period. This study also uses to extend the causality analysis through Innovative Accounting Approach (IAA). The IAA approach tests the relative strength of causalities between macroeconomic variables and stock market liquidity. This measure has been adopted in the view of the limitation of the bi-variate Granger causality. Previous studies on relationship macroeconomic variables and market liquidity in developed markets provide inconclusive results as far as causality in concerned. For instance, (Fernández-Amadoret al. (2013); Næs et al.(2011); Goyenko and Ukhov (2009); Soderberg (2008) performed Granger causality tests between financial variables and market liquidity, whereas Skjeltorp and Ødegaard (2009) performed reverse causality test to check the feedback affect between macroeconomic variables and market liquidity. The general conclusion drawn from these studies is that there is wide disparity in the findings of causality direction. One of the plausible reasons of disparity in finding might be the lack of relative strength of Granger causality test and inability to forecast causality beyond the selected sample period.

To handle this issue, Shan (2005) popularized the term Innovative Accounting Approach (IAA) to test causality between variables. The IAA focuses on joint assessment of Variance Decomposition Analysis (VDA) and Impulse Response

Function (IRF) to demonstrate the direction, magnitude, and strength of causality. Motivated by the weakness of VECM Granger causality, we extend the causality analyses to examine the shocks impact by exercising Innovative Accounting Approach (IAA). One of the exclusiveness of IAA approach is, it overcomes the issue of integration and endogeneity of the series. In this context, Shahbaz (2012) noted that simple Granger causality test do not capture the relative strength of individual variable causes by another variable beyond the selected time span and thus undermine the forecasting abilities of variables and robustness of the test. To overcome this issue, this study exercises IAA and first explains the forecast variance decomposition followed by the IRF to examine the impact of shocks.

3.5.7.1 Forecast Variance Decomposition Analysis

The Variance decomposition analysis (VDA) shows the predicted error variance and magnitude for a variable accounted by innovation stemming from each explanatory variable over varying time horizons beyond the time period selected as sample. Pesaran and Shin (1998) noted that generalized forecast VDA demonstrates the relative contribution of one variable in another variable because of stemming of innovative shocks. The main exclusiveness of this method it is insensitive to variables ordering like orthogonalized forecast error VDA, since variables ordering is exclusively determined by VAR system. In addition, generalized forecast error VDA calculates the simultaneous shock effects. In this vein, with VAR framework, VDA originates reliable results compared to other traditional approaches (Ibrahim, 2005; Engle and Granger, 1987).

3.5.7.2 Impulse Response Function

This study also exercises impulse response function (IRF) to sketch out the time path of the influence of shock on candidates in a VAR system. The IRF assists to determine how much stock market liquidity responds to its own shocks and shocks of

macroeconomic variables. For instance, in macroeconomic variables, business cycle components causes' stock market liquidity if IRF demonstrates significant response of industrial production and inflation to shocks in stock market liquidity as compared to other candidates in a system. Similarly, a significant reaction of macroeconomic variable, saying, industrial production and inflation to shocks in stock market liquidity, we may conclude that both stock market liquidity and macroeconomic variables Granger causes each others'. A VAR framework takes into the account the following form:

$$V_t = \sum_{i=1}^{k} \delta_i V_{t-1} + \eta_t \quad \ldots\ldots (35)$$

where, $V_t = (illiQ_t, MB_t, PR_t IPI_t INF_t, FNIF_t)$

$$\eta_t = (\eta_{LiQ}, \eta_{mb}, \eta_{pr}, \eta_{ipi}, \eta_{\inf}, \eta_{NFIF})$$

Where, $\delta_1 - \delta_k$ are 6x6 matrices of coefficients, and η is a vector of error terms.

3.6 Conclusion

This chapter provided detailed description of data, variables construction and estimation techniques used in this study to achieve the research objectives. For the first objective, the short and the long run estimates generated through VECM are used to examine macroeconomic sources of market liquidity. For the second objective, using the same short and long run analysis are used to compare the macroeconomic sources across the selected Asian emerging markets. For the third objectives, Granger causality and its extension namely IAA is used to examine causality, reverse causality/feedback effect between macroeconomic variables and stock market liquidity.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents detailed econometric analyses of the linkages between macroeconomic variables and stock market liquidity. In this chapter, five Asian Emerging markets are selected. The choice of these stock markets is largely driven by the availability of both daily firm level trade data and monthly macroeconomic data.[49] This chapter presents econometric analyses of stock markets sample at individual level. First, summary statistics of the variables of interest are presented to gauge general liquidity level in each stock market using basic descriptive statistics. In exercising standard econometric methodology, several prerequisite statistical tests such as unit root tests are employed to examine the stationary behavior of time series data to decide on the choice of techniques. For this purpose, the results of Ng and Perron unit root of both macroeconomic and stock liquidity variables are presented. This chapter further proceeds with the selection of appropriate lag length by exercising VAR Lag length criteria followed by Vector Auto regression (VAR) and VECM Granger Causality. The robustness-check of causality is further cross-checked through Innovative Accounting Approach (IAA).

4.2 Summary Statistics

This chapter begins with reporting the preliminary statistics of key variables used in this study. The summary statistics of key variables are presented in Table 4.1 and Table 4.2. In Table 4.1, the summary statistics of two stock market liquidity (*Ami* and *RPI*) measures

[49] Sample of countries included; Karachi Stock Exchange (Pakistan), Sensex Stock Exchange (India), Shanghai Stock Exchange Share – A (China), Kuala Lumpur Stock Exchange (Bursa Malaysia) and Stock Exchange of Thailand (Thailand)

are presented for five stock markets. The means of Amihud Price impact (Ami) for Shanghai Stock market is 0.600 followed by Karachi Stock Exchange (Ami =0.783), Bombay Stock Exchange-Sensex (Ami =0.407), Bursa Malaysia (Ami =0.555) and Stock Exchange of Thailand (Ami =0.415). The mean values of second stock liquidity measure (Roll's Price estimators) for each stock are also reported in the Table 4.1. Evidently, the means of Roll's price estimator (Re) for Shanghai Stock market is 0.240, followed by Karachi Stock Exchange (Re =0.313), Bombay Stock Exchange-Sensex (Re =0.171), Bursa Malaysia (Re =0.047) and Stock Exchange of Thailand (Re =0.255). In term of average ranking according to Amihud (2002) measure, Bombay stock exchange, the stock exchange of Thailand and Bursa Malaysia exhibit high liquidity while Karachi stock exchange exhibits low liquidity followed by Shanghai Stock market. However, according to Roll's measures of stock market liquidity, which largely denote the implicit spread dimension of stock market liquidity, the figures suggest that China, Pakistan, and Thailand stock market exhibit relatively higher implicit spread than the Malaysian and Indian equity markets.

Both the Amihud and Roll's measures of stock market illiquidity imply that a higher value reflects lower stock market liquidity and vice versa. While both these measures fundamentally denote stock market liquidity, there are, however, slight differences in both these stock liquidity measures as far as stock liquidity dimensions are concerned, and hence yield different results. For instance, in the case of Amihud (2002) price impact dimension of liquidity, since it is more dependent on market capitalization, Amihud price impact will tend to yield different results in a market where nominal shocks to capitalization are more dominated (Fernández-Amador et al. 2013). As noted by Florackis et al. (2011), the Ami aspect of stock market illiquidity is peripheral to the effect

of order imbalance as examined by Pastor and Stambaugh (2003). More specifically, due to adverse selection large buy/sell orders to illiquid securities trigger a large movement in stock prices because of inventory cost and adverse selection that partially bounce back the following day as this wide shocks are being subsumed (O'Hara, 2003;Amihud and Mendelson, 1980). The differences in high/ low Amihud Liquidity in the selected market can be potentially due to the "price discovery factor" that exists in Amihud measure of stock liquidity. Cochrane (2005) noted that, since expectations and information can motivate trading pattern of investors, *Ami* has a price discovery and this measure of stock illiquidity can be understood as a proxy to gauge differences in investors (Amihud, 2002). This implies that a change in stock prices is observed with low trading volume when traders are in accord about the implication of information and news. On the contrary, when investors have heterogeneous beliefs about implications of news, large prices movements with low trading volume are observed (Florackis et al. 2011).The Roll's price impact estimator provides assistance in assessing the price impact aspect in the context of implicit spread dimensions of stock market liquidity. Similar to Amihud price impact measures, Roll's estimator also implies that the higher the value of this measures, the lower is the market liquidity, and vice versa.

The skewness statistics of both these measures suggest that distributions of both measures are left skewed and data points are largely concentrated on the right side of the mean in a sample of selected exchanges. Similarly, the kurtosis statistics for both these measures suggest Leptokurtic pattern in the stock exchanges of China, Pakistan, and India, whereas a Platykurtic distribution in the case of Thailand and Malaysia.

In Table 4.2, summary statistics of macroeconomic measures are reported for each country. The summary statistics in Table 4.2 suggest reasonable variations in few

macroeconomic variables. More specifically, the pattern of interest rates represented by a policy rate, inflation and investors flow varies significantly across the selected sample. The general conclusion drawn from the summary statistics is that stock market liquidity exhibit large disparity across the selected samples. Further, the skewness and kurtosis statistics suggest abnormality, which is consistent with other studies that have appeared in the finance literature (e.g. Smimou, 2014, Fernández-Amador et al. 2013, and Narayan and Zheng, 2011).

Table -4.1 Summary Statistics of Stock Liquidity Measures

Liquidity Measures									
		Amihud Price Impact (*Ami*)				Roll's Estimator (*RPI*)			
Exchanges	Countries	Mean	Std. Dev	Skewness	Kurtosis	Mean	Std. Dev	Skewness	Kurtosis
Shanghai Stock Exchange –Share A	China	0.600	0.151	0.014	3.574	0.240	0.080	-0.976	4.915
Karachi Stock Exchange- KSE100	Pakistan	0.783	0.208	2.767	8.106	0.313	0.083	6.732	6.16
Bombay Stock Exchange-Sensex	India	0.407	0.108	2.767	9.319	0.171	0.048	2.106	8.223
Bursa Malaysia	Malaysia	0.555	0.137	0.341	2.418	0.047	0.011	0.075	2.203
Stock Exchange of Thailand	Thailand	0.415	0.217	1.818	7.718	0.255	0.157	0.545	2.330

Table -4.2 Summary Statistics of Macroeconomic Measures

Macroeconomic Measures										
	Monetary Policy components				**Business Cycles components**				**Investors Flow**	
	Monetary Base (MB)		Policy Rate (PR)		Industrial Production (IPI)		Inflation (INF)		Fund Flow/ Equity Portfolio Flow (Net) (NFIF)	
Markets	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
China	4.699	0.251	3.412	1.374	4.734	0.034	0.153	0.361	8.055	0.428
Pakistan	14.653	0.8615	11.238	2.773	5.161	0.249	8.685	5.037	11.571	0.703
India	16.326	0.615	6.629	2.019	5.500	0.263	6.914	3.130	0.135	0.184
Malaysia	11.532	0.369	5.844	0.143	4.557	0.143	4.537	0.103	0.110	1.243
Thailand	16.048	0.321	2.326	1.084	5.012	0.228	4.486	0.12375	`-0.003	0.073

Note: For a better and understandable presentation of summary statistics of macroeconomic measures, only mean and standard deviation are reported. Macroeconomic economic variables are bifurcated into three groups, namely monetary policy, Business cycles and investors flow. Data is represented in local currency. For unit uniformity of the variables, billions are converted into a millions particularly in the case of monetary base computation. For a counties like India and China, inflation (*INF*) data is acquired which is measured through year-to year (YOY) monthly percentage change in consumer price index (CPI) while in the rest of the sample countries, logarithmic form of consumer price index are used in estimation. Monetary base (MB) and index of industrial production are also transformed into logarithmic form. In the case of investor flow, two key variables are used in this study. For those countries where historical data of foreign buying and selling of equities was available, it was transformed into logarithmic (i.e. Thailand, India), while in the case of China and Malaysian market, given the unavailability data of foreigners buying and selling, monthly net fund flow was utilized. In the case of China market, information about total fund inflow and outflow was not available, hence aggregate measures of net fund flow was transformed into logarithmic form. In the case of Malaysian market, monthly net fund flow was calculated in a percentage form. Data coverage of this study ranges from January 2000- December 2014 for all exchanges except Shanghai Composite index for which data coverage is from January 2003 to December 2014.

4.3. Unit Root Testing

To proceed with the analysis, unit root existence in key variables is tested. Given that time series pattern of economic and financial variables strongly persuade the econometric estimations, this study proceeds to evaluate the stationarity properties of time series data as a first natural and necessary step. For instance, if time series data is non-stationary, it generally implies that there are infinite shocks. In specifications of two variables that are trending over time, even though the intuitive relationships are not established, regressing one variable over another can yield high R square, suggesting spurious results. In addition, if a data series exhibits non-stationary behavior and regression model is exercised, it can potentially undermine t- distribution and hence asymptotic analysis will be invalid, and one cannot perceive valid hypothesis testing in the regression parameters (Brooks, 2002). Available literature on the importance of unit root existence suggests that typical inference approaches, which carry an integrated dependent or independent variables, are not accord with regression. Hence, it is crucial to inspect the stationarity of series before exercising it in the regression model.

While this study desires to avoid the risk of achieving misleading inferences, this study also want to avoid the risk of over-differencing the candidate variables. Following previous studies (for instance Fernández-Amador et al. 2013; Wang, 2013; Næs et al, 2011; Goyenko and Ukhov, 2009), this study therefore exercises unit root tests on candidate variables to examine time series properties. Extant literature in applied economics presents several tests for unit root diagnosis. Among the available methods are the Augmented Dickey-Fuller (ADF) Test (1984) based on the Dickey Fuller test of 1979, Philips-Perron Test (1998), and the Kwiatkowski, Philips, Schmidt, and Shin (KPSS) Test (1992).

Despite the theoretical and practical significance of these commonly used unit root tests in time series analysis, these tests have been subject to criticisms. For instance, in the case of ADP and PP unit root tests; both these tests can be asymptotically comparable; these tests however significantly differ in the case of finite sample. Harris (2003) and Dejong et al. (1992) argued that due to the low explanatory power of both the ADF and PP tests, the empirical estimate generated through these tests yield ambiguous findings. These authors further suggested that if the data sample is small, these tests could potentially distort the size and thereby mislead the results. Elliot et al. (1996) argued that when a hypothesis is true, these tests reject the null hypothesis and vice versa. This issue was resolved by Ng-Perron (2001), who developed four tests. These tests are adjusted version of previous PP test, which is based on *Z*, and the Bhargava (1986) R1 and the ERS optimal statistics. The Ng-Perron test is more suitable to small sample data, thus produce reliable and efficient results. Due to deficiencies in both the ADF and the PP tests, this study exercised Ng-Perron (2001) test and results are tabulated in the Table 4.3.

The results suggest that both the stock liquidity measures and the independent variables show the problem of unit root, thus exhibiting non-stationary at level having both trend and intercept across the selected sample. The non-stationarity pattern of liquidity measures is partially consistent with the results of previous studies (i.e. Fernández-Amador et al. 2013; Næs et al, 2011; Goyenko and Ukhov, 2009). The variables are found to be stationary at first difference. It indicates that the variables are integrated at *I(1)* at 1% and 5% level of significance in the selected sample.

Table 4.3 Unit Root Analyses (Ng-Perron, 2001)

	Shanghai Stock Exchange (China)				Karachi Stock Exchange (Pakistan)			
Variables	Mza	MZt	MSB	MPT	Mza	MZt	MSB	MPT
Ami_t	-11.320(6)	-2.379	0.210	8.049	-2.670 (3)	-1.427	0.777	12.100
RPI_t	-3.853(3)	-1.107	0.287	20.28	-13.500(1)	-2.552	0.189	7.0190
PR_t	-7.643 (1)	-1.896	0.248	3.426	-1.957 (1)	-0.989	0.505	46.550
MB_t	-11.74(3)	-2.274	0.194	8.553	-4.470 (1)	-1.494	0.334	20.370
INF_t	-4.965 (8)	-1.573	0.316	4.938	-1.055 (1)	-0.581	0.550	60.480
IPI_t	-3.559(2)	-1.130	0.317	6.901	-5.921 (3)	-1.599	0.270	15.250
$FNIF_t$	-0.330 (2)	-0.275	0.833	37.79	-7.018 (2)	-1.828	0.260	13.050
ΔAmi_t	-48.700(2)***	-4.875	0.099	2.190	-70.600 (2)***	-5.943	0.084	1.2910
ΔRPI_t	-761.700(2)***	-19.51	0.025	0.1203	-49.170(3)***	-4.958	0.100	1.8530
ΔPR_t	-70.430(1)***	-5.891	0.084	1.485	-78.410(1)***	-6.253	0.079	1.1950
ΔMS_t	-51.970(1)***	-5.097	0.098	1.755	-95.300 (2)***	-6.905	0.072	0.9550
ΔINF_t	-16.170(4)***	-2.839	0.175	1.534	-29.820 (2)**	-3.815	0.127	3.3260
ΔIPI_t	-28.170(3)***	-3.739	0.133	3.317	-22.160 (2)**	-3.328	0.150	4.1120
$\Delta FNIF_t$	-46.880(1)***	-4.841	0.103	0.522	-20.850 (1)**	-3.223	0.154	4.4020
	Bombay Stock Exchange (India)				**Bursa Malaysia (Malaysia)**			
Variables	MZa	MZt	MSB	MPT	MZa	MZt	MSB	MPT
Ami_t	-6.662	-1.720	0.259	4.037	-17.456(4)	-2.712	0.1554	2.274
RPI_t	-1.985	-0.880	0.445	11.190	-10.069(4)	-2.205	0.219	9.233
PR_t	-10.187	-2.230	0.219	9.057	-5.746(2)	-1.617	0.281	15.72
MB_t	-5.053	-1.310	0.260	16.889	-4.343(2)	-1.388	0.319	20.24
INF_t	-13.835	-2.450	0.177	7.616	-10.671(1)	-2.283	0.214	8.674
IPI_t	-8.351	-1.970	0.237	11.134	-5.767 (2)	-1.698	0.294	15.79
$FNIF_t$	-7.169	-1.880	0.263	3.437	-0.011 (11)	-0.015	1.408	375.13
ΔAmi_t	-17.620(3)**	-2.960	0.168	1.403	-92.03(4)***	-6.783	0.073	0.991
ΔRPI_t	-51.060(2)***	-5.053	0.099	1.785	-276.9(3)***	-11.760	0.042	0.330
ΔPR_t	-50.080(7)***	-4.990	0.100	1.868	-65.17(1)***	-5.706	0.088	1.409
ΔMS_t	-45.580(5)***	-4.730	0.104	2.198	-19.96(2)**	-3.154	0.158	4.597
ΔINF_t	-88.370(3)***	-6.620	0.075	1.112	-1274(4)***	-25.24	0.020	0.074
ΔIPI_t	-70.460(8)***	-5.900	0.084	1.420	-44.49(2)***	-4.705	0.106	2.110
$\Delta FNIF_t$	-30.550(2)***	-3.900	0.128	2.986	-43.73(2)***	-4.675	0.107	2.092

Table 4.3 (Continued) Unit Root Analyses (Ng-Perron, 2001)

Stock Exchange of Thailand (Thailand)				
Variables	MZa	MZt	MSB	MPT
Ami_t	-12.471(3)	-2.489	0.200	7.354
RPI_t	-14.849(4)	-2.666	0.180	6.493
PR_t	-13.543(5)	-2.560	0.189	6.976
MB_t	-7.054(12)	-1.809	0.256	13.02
INF_t	-12.618(3)	-2.488	0.197	7.360
IPI_t	-5.419(3)	-1.492	0.275	16.38
$FNIF_t$	-11.869(6)	-2.422	0.204	7.757
ΔAmi_t	-14818(2)***	-86.07	0.006	0.006
ΔRPI_t	-143.060(3)***	-8.454	0.059	0.648
ΔPR_t	-31.321(2)***	-3.957	0.126	2.911
ΔMB_t	-45.509(2)***	-4.756	0.105	2.076
ΔINF_t	-76.319(1)***	-6.161	0.081	1.263
ΔIPI_t	-70774(3)***	-188.11	0.002	0.001
$\Delta FNIF_t$	-88.745(1)***	-6.648	0.075	1.080

Note: ,*** and ** indicates significant at 1% and 5% levels of significance respectively. Lag length of variables is shown in small parentheses. Ng & Perron (2001) developed a set of four test statistics namely MZa, MZt, MSB and MPT for testing unit root. These tests have different distribution from each other's.

4.4 Vector Autoregression (VAR) Analysis

Once properties of series integration are known, the next significant task is to exercise an appropriate technique to decide on the choice of path for causality testing. Traditional literature leans on usage of Vector Autoregression (VAR) model to examine the causality between variables. After Sims (1980) advocated the usage of the VAR model instead of simultaneous equations model, since then VAR utilization in a time series modeling has became popular. Being multivariate simultaneous equations, VAR treats each variable as endogenous and finite lags of variables are jointly considered in the regression. VAR models' are more useful in time series analysis when a phenomenon for which no strong priori and competing explanations are available. VAR models provide a methodical way to take into account the rich and forceful dynamics of multiple time series. VAR Models often offers sophisticated forecast as compared to univariate time series modeling and provide robust support to simultaneous equations that lean on theory-based arguments. Further, given the flexibility of VAR Models, potential future path forecast generated from

the VAR can be formed for specified variables. In a VAR method, auto-regressive model with finite order is estimated and subsequently inverted to locate the moving average estimates of coefficients.

A model estimated through this method is warranted as an approximation to the autoregressive representation (ARR). It is however, acknowledged in the literature that several stationary processes do not contains the ARR. Despite econometricians disagreeing on many issues', they do agree on this, that VAR is misspecified, if ARR in a series does not exist (Marcet, 2004). In a time series analysis, it is imperative to test for order of integration largely due to two reasons. First, knowing the order in integration is critical for developing an econometric to generates inferences. Second, economic theory suggests that, groups of variables should be integrated and shows the process of martingale or random walk. Once the variables of interests are classified as deterministic trend stationary or integrated, one can sort out the short and the long run effects of the estimates in the model and develop a model where the inference generated from the analysis will be meaningful (Sjo, 2008).

In a time series analysis, two popular approaches are developed to test the dynamics between variables. The first is refers to VAR (unrestricted) model, and the second is known as Vector Error correction Model (VECM). The choice of using both the models in the econometric analysis for a cointegrated series is debatable (Ibrahim, 2007). Ibrahim (2007) further noted that it is crucial to test for integration and cointegration in variables for appropriate specification in VAR to expunge the risk of misspecification and obtaining spurious regression. More specifically, if variables are nonstationary or non-cointegrated, then VAR model is first difference is suggested. On the contrary, if variables are integrated at first order and cointegration is established, then unrestricted VAR in level or VECM

should be used (Selover and Round 1996; Engle and Granger 1987). Granger (1988), however, noted that if there is cointegration in a set of variables, then there must be a short- and a long run causal dynamics between variables, which are unlikely to be captured through first differencing in a VAR framework.

4.5 VAR Lag Order Selection Criteria and Cointegration Analysis

Given the suggestions by previous studies, this study first checked the order of integration among the variables through unit root testing in a selected sample. The results of unit root tests guide this study to adopt the cointegration path of testing the relationship between variables, given the *1(I)* order of integration among the variables. While implementing cointegration among the variables and further analysis through VECM, it is important to decide on the appropriate choice of VAR order. Several information criteria are cited in time series literature that can be utilized to determine the appropriate lag-length.[50] Information criteria are the first measure that one can adopt while choosing appropriate lag-length in a time series analysis. Given the availability of plenty information criteria, conflicting results regarding lag length are reported in past literature when each criteria is assessed individually and suggested that caution should be exercised while choosing lags length. More specifically, during implementation of a VAR model, which depends on the number of observations, some studies reported using sufficiently large numbers of lags and the same the model should be tested with a few lags and compare the likelihood ratio by pairing down both models. In this vein, Khim and Liew (2004) provided a detailed overview of their simulation findings.

Of particular interest, Khim and Liew (2004) noted that, about half of the time these information criteria managed to choose the correct lag in a small sample and performance

[50] Such as sequential modified LR test statistic; FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion to name few.

of these information criteria increases significantly once sample size is increased. Khim and Liew (2004) further noted that Hannan-Quinn information criterion outperformed rest of the information criteria if sample size is relative larger. Contrary to Hannan-Quinn information criterion, Akaike information criterion and Final prediction error can be appropriate choice for small data. They further noted that both Akaike information criterion and Final prediction error appeared to generate the least probability of under estimation for all information criteria and issues of over estimation are negligible in all information criteria's. In a related debate, based on several simulations McQuarrie and Tsai (1998) noted that there is no generally "best" criterion for VAR order selection as it does not exist since it all depends on what one wishes to optimize.

Since each individual information criterion is insufficient to evaluate the appropriate lag length criteria, in a related strand; much more emphasis is provided on the examination of autocorrelation structure of VAR residuals. In this vein, Cheung and Lai (1993) noted that in the presence of moving average error terms, choosing lag length using information criteria might not be sufficient. Johansen (1992) and Hall (1989) however noted that one should choose lag length in such a way that VAR residuals are Gaussian and not serially correlated.

This study chooses to use the method of assessing the serial correlation pattern of VAR model in choosing the appropriate lag. Choosing this method is largely motivated by the repeated exercise of testing cointegration and VECM model following information criteria's and the presences of serially correlation pattern in the suggested lags. For instance, in a selected sample, this study first follows the suggestions of Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) using lag 1 followed by Final prediction error; AIC: Akaike information criterion for choosing Lag

length 2. For each sample, VAR Lag length criterion suggested by these information criteria was initially considered and a VECM model for each sample was tested. Both models for each sample did not survive the problem of serial correlation in the model. This study, therefore take assistance from Portmanteau test of autocorrelations and made modification in appropriate lag-length to generate estimates, which are free from the problem of serial correlation.[51] This study follows a Portmanteau test for autocorrelations developed by Escancianoa and Lobato (2009) that permits non-linear dependence of which parameter is not fixed given it is selected directly from the data. This test offers some additional advantages over already developed tests for similar purpose. First, given its simplicity in implementation, this test is easily computable and Chi-Square represents the asymptotic null distribution with one degree of freedom, thus the researcher does not require inputting any bandwidth number/ block length to execute this test or generate relevant critical values. Second, the empirical power of this test is more in finite samples than the rival tests. Finally, this test better suited to financial data given its robustness to conditional heteroskedasticity (Escancianoa and Lobato, 2009).

The Portmanteau test calculates the Ljung-Box Q-statistics / multivariate Box-Pierce statistics for serially correlated residuals up to P order. This test reports both Adjusted Q-statistics and Q- Statistics. The null hypothesis posits non-presence of serial correlation up to Lag h. Both statistics follow approximate distribution of Chi-Square having degree of freedom $K^2(h-p)$. Where P represents VAR lag order. Given that the distribution is approximate, it does require moving average coefficients to be zero for Lag $i > h - p$. The approximation will tend to poor polynomial root of autoregressive are closer

[51] VAR lag length computed through Information and results or autocorrelation for selected sample are reported in the appendix.

to 1 given the small h. Hatemi-J (2004) noted that Portmanteau Tests for Autocorrelations have better properties than the LM test in almost all cases.

In this study, Lag- lengths of two benchmark models (Amihud price impact model and Roll's price impact estimator) were tested in VECM framework for serial correlation through Portmanteau Tests for Autocorrelations. In a set of five selected samples, Portmanteau test for Autocorrelations of China, Indian and Pakistan markets suggest that at the lag lengths at order 3 and 4, both benchmark models appear to survive the problem of serial correlation. While in the case of Malaysia and Thailand markets, the lag lengths at order 3 survived the issue of serial correlation in both models. Taking suggestions from these statistics, this study selected lag length at order three for China, Indian, and Pakistan Markets, while lag length of 2 was selected for Thailand and Malaysian markets.

Once appropriate lags order for further analysis and causality test were established, this study further advanced the estimation to test for cointegration among the variables to decide on the choice of path for causality testing, and whether or not to test the causality through VECM methods. Given that in a selected sample of the markets, both macroeconomic variables and stock market liquidity variables are integrated at order *1(I)* with varying level of lags at 1% and 5 % level of significance, this study proceeded with testing cointegration among variables. The results of cointegration test between variables of interest in the selected markets are reported in Table 4.4.

This study examines cointegration between stock market illiquidity and macroeconomic variables as specified in Eq.(14) based on the VAR approach popularized by Johansen (1988). According to this test, P dimensional VAR can be specified as below

$$Z_t = a + \Pi_1 Z_{t-1} + \Pi_2 Z_{t-2} + \ldots + \Pi_k Z_{t-k} + \varepsilon_t$$

The above algebraic expression can be simplified as

$$\Delta Z_t = a + \Pi_k Z_{t-k} + \sum_{i=1}^{k-1} \theta_i \Delta z_{t-1} + \varepsilon_t$$

In the above specification, Π and θ are *P*x*P* matrices of unknown parameters and ε is a disturbance term. Johansen and Juselius (1990) proposed two likelihood ratio tests (i.e. Trace Statistics and the Maximum Eigen Value test). Trace statistics examine the null hypothesis of "at most" *r* cointegrating vectors against the general *null* of *p* cointegrating vectors. The Maximum Eigen Statistics examine the *r* cointegrating vectors under the null hypothesis against the *r+1* cointegrating vectors under alternative. If one cointegrating vector exists in a set of variables, it implies the existence of cointegration, thus the track of error correction model (ECM) is used further.

In Table 4.4, the cointegration relationship between macroeconomic variables and stock market liquidity is reported separately with two benchmark models in the selected market. This study first uses Amihud price impact measure with macroeconomic variables to test the cointegration, and a similar exercise is repeated to test the conintegration by using Roll's price impact estimator and macroeconomic variables. This study reported both the trace and Maximum Eigen statistics with corresponding probability values of both models.

Table 4.4: Johansen Cointegration Test

Hypothesis	Trace Test	Prob.	Max-eigen	Prob.	Trace Test	Prob. value	Max-eigen	Prob.
	Amihud Price Impact (Ami_t)				**Roll's Price Impact Estimator (RPI_t)**			
Shanghai Stock Exchange- Share A Market (China)								
$R = 0$	109.200***		38.010		123.880***		52.700***	
$R \leq 1$	71.250**		31.892		71.116**		26.241	
$R \leq 2$	39.358		15.243		44.875		21.582	
$R \leq 3$	24.114		13.735		23.293		13.908	
$R \leq 4$	10.378		7.215		9.385		6.328	
$R \leq 5$	3.163		3.1633		3.057		3.057	
Karachi Stock Exchange - Pakistan								
$R = 0$	157.7000***		59.140*		153.970***		61.040***	
$R \leq 1$	98.650***		36.803		92.935**		35.330	
$R \leq 2$	61.850		23.948		57.605		29.003	
$R \leq 3$	37.900		15.395		28.602		15.909	
$R \leq 4$	22.511		13.636		12.693		8.146	
$R \leq 5$	8.875		8.8750		4.546		4.546	
Bombay Stock Exchange - India								
$R = 0$	151.200***		76.200***		130.31***		73.000***	
$R \leq 1$	75.011		27.501		56.630		25.978	
$R \leq 2$	47.510		23.678		30.650		12.355	
$R \leq 3$	23.831		11.113		18.300		9.108	
$R \leq 4$	12.718		8.810		9.195		7.560	
$R \leq 5$	3.907		3.907		1.635		1.635	
Bursa Malaysia – Malaysia								
$R = 0$	100.630**		46.122**		122.430***		59.950***	
$R \leq 1$	54.510		22.708		62.480		33.407	
$R \leq 2$	31.802		15.958		29.070		12.889	
$R \leq 3$	15.844		10.076		16.180		10.796	
$R \leq 4$	5.768		5.550		5.380		5.188	
$R \leq 5$	0.218		0.218		0.200		0.196	
The Stock Exchange of Thailand – Thailand								
$R = 0$	127.47***		48.570***		143.040***		59.650***	
$R \leq 1$	78.906***		36.670**		83.390***		44.200***	
$R \leq 2$	42.236		22.067		39.180		22.604	
$R \leq 3$	20.169		13.522		16.580		11.220	
$R \leq 4$	6.647		6.637		5.360		5.355	
$R \leq 5$	0.009		0.009		0.000		0.001	

Note: **** and ** indicates 1% and 5% significance levels.

The results in Table 4.4 suggest that, in the case of the Chinese market, trace statistics show two cointegration relationships at 1% and 5 percent level of significance and Maximum Eigen statistics suggest at least one cointegration relationship at a 1% level of significance when Amihud price impact model is considered. While in the case of Roll's

price impact model, trace statistics show two cointegration relationships at 1% and 5 percent level of significance and Maximum Eigen statistics suggest at least one cointegration relationship at a 1% level of significance for similar market.

In the case of Pakistan market, both the trace statistics and Max-Eigen test of cointegration suggest the presence of cointegration among the variables at 1% and 5% level of significance respectively. The available evidence suggests that trace statistics report two cointegration vectors at 1% and 5% level of significance. The Max-Eigen test on the other hand suggests one cointegration vector at 1% level of significance when Amihud price impact model is considered. In the case of Roll's price impact estimators, trace statistics shows two cointegration relationships at 1% and 5 percent level of significance and Maximum Eigen statistics suggest at least one cointegration relationship at a 1% level of significance for the same market. In the case of the Indian market, both models show at least one cointegration vector at trace and Maximum Eigen statistics at a 1% level of significance. Similar results are reported for the Malaysian market, where cointegration test suggest at one cointegration vector among the variables at a 1% level of significance using both trace statistics and Maximum Eigen statistics for both benchmark models.

In the case of the Thailand market, both the trace statistics and Max-Eigen test of cointegration tests suggest the presence of cointegration among the variables at the 1% and 5% levels of significance respectively. The available evidence suggests that trace statistics report two cointegration vectors at the 1% level of significance. The Max-Eigen test on the other hand suggests at least two cointegration vectors at 1% level of significance when Amihud price impact model is considered. In the case of Roll's price impact estimators, both trace statistics and Maximum Eigen statistics show two cointegration relationships at

1% level of significance. The general conclusion drawn from the cointegration test in the selected Asian emerging markets is that cointegration between variables of interest exists. This indicates that empirical results reject the hypothesis of no cointegration and reveal the existence of cointegration relationship between the series.

4.6 Long Run and Short Run Linkages between Macroeconomic Variables and Stock Market Liquidity

The conclusion drawn from the cointegration relationships between variables in the selected Asian emerging guided this study to proceed with vector error correction model (VECM) to examine the long and the short run dynamics between the variables of the study. To this end, this study estimates benchmark model (14) against two measures of stock market illiquidity measures as a dependent variable.

4.6.1 Long Run Analysis

This study first reports the results of long run dynamics between stock market liquidity measures and macroeconomic variables in selected markets. The results of estimates of Amihud price impact models are reported in the Table 4.5. The results therein suggest that in a set of monetary policy components, monetary base ($LnMB$) has no statistically significant impact on stock market liquidity in four out of five Asian emerging markets in long run. The impact of monetary base ($LnMB$) is only statistically significant in the case of Thailand stock markets. In particular, the coefficient of monetary base ($LnMB$) suggests a negative impact on stock market illiquidity (Ami) at 5 percent level of significance in the case of the Thailand stock market in the long run. Table 4.5 further reports the long run coefficients of another component of monetary policy, which suggests that policy rate (PR) does influence stock market illiquidity in all selected emerging markets. In particular, the statistically significant coefficients of policy rate (PR) suggest

that increases in policy lead to increases in stock market illiquidity in three out of five stock markets in the long run.

Table 4.5 further details the long run coefficients of business cycle components of selected Asian emerging markets. The negative long run coefficients suggest that real economic activities measured by industrial production (*LnIPI*) significantly affect stock market illiquidity in three out of five Asian emerging markets. In particular, increase in real economic activities decreases stock market illiquidity in Chinese, Pakistan and Indian stock markets at 1% and 5% level of significance, while the impact of real economic activities on stock market illiquidity is statistically insignificant in both the Malaysian and the Thailand stock markets.

The impact of inflation (*LnINF*) on stock market liquidity appears to be statistically significant in three out of five equity markets. More specifically, increases in inflation significantly increase stock market illiquidity in the Chinese, Indian and Thailand stock markets while this impact is statistically insignificant in the Pakistan and the Malaysian stock markets in the long run.

Table 4.5 further presents the long run coefficients of foreign flow measured by net foreign equity flow /net fund flow (*LnFNIF*) in the selected Asian emerging markets. It is evident from the long run coefficients that the statistically significant impact of net foreign equity flow /net fund flow on stock market illiquidity appeared in four out of five Asian emerging equity markets in the long run at 1% and5% level of significance.

.**Table 4.5 Long Run Estimates -Amihud Price Impact (Ami_t) Model**

	Independent Variables	Shanghai Stock Exchange	Karachi Stock Exchange	Bombay Stock Exchange	Bursa Malaysia	Thailand Stock Exchange
Monetary Policy	$LnMB_{t-1}$	2.634	-0.050	-0.011	0.169	-1.663**
		(1.370)	(-0.943)	(-0.287)	(0.206)	(-2.587)
	PR_{t-1}	-0.072**	0.015**	0.017**	0.317**	-0.082**
		(2.283)	(2.059)	(3.653)	(2.262)	(-2.932)
Business Cycles	$LnIPI_{t-1}$	-5.914***	-0.445**	-0.289**	0.832	-0.356
		(4.200)	(-2.708)	(-3.672)	(0.945)	(-1.49)
	$LnINF_{t-1}$	0.070**	0.003	0.020**	4.199	4.322**
		(4.688)	(0.541)	(4.347)	(1.250)	(2.238)
Investors flow	$LnFNIF_{t-1}$	-0.233**	-0.267**	-0.075	0.632***	-2.659***
		(-3.235)	(-3.167)	(-1.156)	(7.481)	(-5.829)

Note 1: *** and ** represent 1% and 5% level of significance

Note 2: The table presents the long run coefficients of macroeconomic variables generated through vector error correction where macroeconomic variables are regressed against the Amihud (*Ami*) measures of illiquidity with a varying lags in the selected markets. The associated t- statistics are reported in parenthesis. To facilitate the economic interpretation, macroeconomic variables are grouped into three main categories. Both *LnMB* and *PR* represent monetary policy components. *LnMB* represents monetary base in a logarithmic form for all countries. For few countries such as Thailand and China, reserve money data was not available to generate the monetary base (*MB*), hence broad money supply is used in the estimation. For the sake of uniformity in the results presentation, the term *MB* in natural logarithmic form is reported. *PR* represents policy rate of each market. Policy rate is a general representation of varying nature of monetary policy rates in each market for the sake for uniformity. *LnIPI* is natural logarithmic form of index of Industrial Production. *LnINF* represents general level of inflation measured by consumer price index. For the India and China market, direct measure of inflation is used in the estimation given the unavailability of general level of consumer price indices in these markets. Both *LnIPI* and *LnINF* represent the components of business cycle. *LnFNIF* is a general representation of net foreign flow in the selected emerging markets. In the case of China market, information about month fund inflow and outflow was not available, hence aggregate measures of net fund flow was transformed into logarithmic form. In the case of Malaysian market, monthly net fund flow was calculated in a percentage form. While in the rest of markets, net outcome of foreign buying and foreign selling was used. Data coverage of this study ranges from January 2000- December 2014 for all exchanges except Shanghai Composite index for which data coverage is from January 2003 to December 2014.

More specifically, increase in net foreign equity flow decreases stock market illiquidity in the Shanghai stock exchange, the Karachi stock exchange, the Thailand Stock Exchange at 5 % and 1% level of significance respectively in the long run. The positive long run coefficient of net fund flow in the case of Bursa Malaysia suggests that net fund flow significantly increases the stock market illiquidity of Bursa Malaysia in the long run at 1 % level of significance.

This study also utilized the alternative liquidity measures namely Roll's Price Impact as a dependent variable that fundamentally provide a coverage to price impact of liquidity aspect vis-à-vis implicate spread dimension of stock liquidity. This study reports the results of long run dynamics between stock market liquidity measures and

macroeconomic variables in selected markets using Eq.(14). The results of estimates of Roll's price impact models are reported in the Table 4.6.

The results in Table 4.6 suggest that, in a set of monetary policy components, monetary base has a statistically significant impact on implicit spread aspect of stock market illiquidity in two out of five Asian emerging markets. In particular, increase in monetary base decreases the stock market illiquidity in Shanghai Stock Exchange and Bombay Stock Exchange at 1% level of significant, while the impact of monetary base in explaining implicit spread aspect of stock market illiquidity in Karachi Stock Exchange, Bursa Malaysia, and Thailand Stock Exchange is statistically insignificant in the long run. The impact of policy rate (PR) in explaining stock market illiquidity is statistically significant in four out five Asian emerging equity markets. More specifically, increase in a policy rate increases implicit spread dimension of stock market illiquidity in the Karachi stock exchange, the Bursa Malaysia, and the stock market of Thailand at 10% and 5% level of significance, while policy rate decreases the stock market illiquidity in the Shanghai Stock Exchange at 10% level of significance in the long run. The impact of policy rate is statistically insignificant in explaining market liquidity of the Bombay Stock Exchange in the long run.

Table 4.6 Long Run Estimates -Roll's Price Impact Estimator (RPI_t)

	Independent Variables	Shanghai Stock Exchange	Karachi Stock Exchange	Bombay Stock Exchange	Bursa Malaysia	Thailand Stock Exchange
Monetary Policy	$LnMB_{t-1}$	-5.754***	0.008	-0.669***	0.0685	-0.369
		(-5.333)	(0.505)	(-5.783)	(0.782)	(-0.677)
	PR_{t-1}	-0.031*	0.005*	0.003	0.0629**	0.099**
		(-1.797)	(1.941)	(1.273)	(4.212)	(4.172)
Business Cycles	$LnIPI_{t-1}$	-3.975**	-0.195**	0.071	-0.036	-0.469**
		(-5.042)	(-2.9343)	(1.571)	(-0.384)	(- 2.32)
	$LnINF_{t-1}$	-0.016**	0.008	0.0131***	-0.078	1.476
		(2.043)	(0.3345)	(5.408)	(-0.219)	(-0.900)
Investors flow	$LnFNIF_{t-1}$	0.277***	0.098**	-0.0116	0.037**	-2.304***
		(6.749)	(3.1491)	(-0.373)	(4.147)	(-5.92)

Note : *** and ** represent 1% and 5% level of significance. t-statistics are reported in parenthesis. Dependent variables is Roll's price impact estimator *RPI*. Rest of the specifications/definitions/time span of variables remains same as of the first model.

Table 4.6 next present the long run coefficients of business components namely real economic activities measured by industrial production (*LnIPI*) and inflation (*LnINF*). The results suggest a statistically significant role of real economic activities in explaining the stock market illiquidity in the three out of five Asian emerging markets in the long run. In particular, increase in real economic activities decreases stock market illiquidity of the Shanghai Stock Exchange, the Karachi Stock Exchange, and the Thailand Stock Exchange at 5 % level of significance in the long run. The impact of real economic activities on stock market illiquidity of Bombay Stock Exchange and Bursa Malaysia appeared to be statistically insignificant. Table 4.6 further reports the impact of another business cycles components namely inflation on the stock market illiquidity. The long run coefficients of inflation (*LnINF*) suggest that, inflation has statistically significant impact on stock market illiquidity in the two out of five Asian emerging markets. In particular, increases in inflation increases stock market illiquidity of Bombay Stock Exchange, while this impact is statistically negative in the case of the Shanghai Stock Exchange. The impact of inflation in explaining stock market illiquidity appeared to be statistically insignificant in the case of

the Karachi Stock Exchange, the Bursa Malaysia and the stock exchange of Thailand in the long run.

Turning now to the role of foreign equity flow/ foreign fund flow ($LnFNIF$), which appears to have a statistically significant impact on the implicit spread dimensions of stock market illiquidity in the majority of selected Asian emerging markets in the long run. Results suggest that foreign equity flow/ fund significantly affect stock market illiquidity of four out of five Asian emerging equity markets. In particular, increases in foreign equity flow have negative impact on stock market illiquidity in the stock exchange of Thailand at 1% level of significance. Table 4.6 further detailed that foreign net flow has positive impact on stock market illiquidity of Shanghai stock exchange, Karachi stock exchange and the Bursa Malaysia at 1% and 5% level of significance respectively, whereas net foreign flow has no statistically significant impact of the stock market illiquidity of the Bombay stock exchange in the long run.

The key message obtained from the long run coefficients of macroeconomic variables suggest that monetary policy, business cycles, and foreign inflow play a significant role in explaining the increase/decrease of Asian emerging stock market illiquidity in the long run. In particular, expansion in monetary policy and real economic activities generally decreases the market illiquidity of selected Asian emerging markets. In the monetary policy components, policy rate appears to be more influential in explaining the changes in market liquidity in four out of five emerging markets. The plausible explanation of the statistically significant negative coefficients for the Chinese and the Thailand stock markets is their historically low level of interest rates. As a measure to promote financial development, interest rates in these markets remain lower. As noted by Liao and Tapsoba (2014) in attempts of a series of financial development reforms in china,

interest rates liberalization played a key role over the last decade. In particular, interbank market has emerged as significant source of short term funding by financial intermediaries. In addition, trading of repurchase agreement products in the stock market also facilitates to inject funds into interbank market from households. Other notable coefficients are of foreign fund flow in the case of Bursa Malaysia, which are robust in both the measure of stock market illiquidity. The positive coefficients of foreign fund flow for both Amihud and Roll's price impact in the case of Bursa Malaysia suggest a negative impact of net fund flow on the market liquidity of Bursa Malaysia.

One of potential factors that could have an association with the adverse impact of net fund flow on stock market liquidity of Bursa Malaysia is the volatility recorded in foreign fund flow in Malaysia since the last decade. An annual report published by Bank Negara Malaysia (2009)[52] noted that several episodes of large outflow and inflow in the portfolio funds are recorded since 2004. These volatile episodes are largely driven partly by finance crisis and partly by the domestic economic outlook. Further, it is noted that portfolio outflow during the last decade was because of steady growth in aboard investment by the residents. The outflow in the form of equity security was about 3.9% of GDP over the period of 2000-2009. While Bursa experiences continuous episodes of volatile foreign fund flow between 2010-2012, the year 2014 was a period of a complete loss in retaining the foreign funds in Bursa. In particular, the Malaysian market was the biggest loser among Asian emerging markets in 2014. Foreign funds were the net sellers, which amounted up to USD 2 billion. This was the largest outflow of foreign funds from Bursa since the departure of global financial crisis in 2008. The cumulative foreign purchase since the last 5 years still amounted approximately to USD 8.8 billion suggesting an overhang of foreign

[52] http://www.bnm.gov.my/files/publication/ar/en/2009/cp01_003_whitebox.pdf

investors liquidity in the Bursa is still significant (Malaysian Industrial Development Finance, 2015)[53].

4.6.2 Short Run Analysis

After having information on macroeconomic variables long run impact on stock market illiquidity in the selected Asian emerging markets, this study then examines the short run dynamics between macroeconomic variables and stock market illiquidity in selected Asian emerging markets. Of particular interest, the short run impact of monetary policy, business cycles and fund flow/investors flow variables on stock market illiquidity in these markets are examined. To this end, this study estimates Eq.(14) against two measures of stock market illiquidity and model with macroeconomic variables. First, macroeconomic variables are modeled against the Amihud price impact measures of stock market illiquidity. In a second step, alternative measures of stock market illiquidity, namely, Roll's price impact is employed and modeled with macroeconomic variables.

Since stock market liquidity is subject to one important structure break namely markets decline (Florackis et al 2014) as a consequence of global financial crisis, this study take into account the effect of the global financial crisis by constructing a dummy variable over the period of July 2008–May 2010 (Glick and Hutchison, 2013). This study first reports the results of short run estimates where Amihud price impact measure is considered as a dependent variable followed by Roll's price impact measure model. This study first reports the short run estimates of first model in Table 4.7. Recalling the selection of information criteria discussion presented earlier, this study presents the short run estimations of the Shanghai Stock Exchange, the Karachi Stock Exchange and the Indian

[53] http://www.bursamarketplace.com/index.php?ch=26&pg=93&ac=10253&bb=research_article_pdf

Stock Market with three differenced lags while for stock markets of Malaysia and Thailand, the short run estimates are reported with two differenced lags.

In the case of the Shanghai Stock Exchange, the results reported in Table 4.7 suggest that both measures of monetary policy do influence stock market liquidity with varying differenced lags in the short run at 5% level of significance. In particular, the influence of broad money supply ($\Delta LnMB$) on stock market illiquidity is evidenced in first and second differenced lags in the short run. In particular, increases in broad money supply decrease the stock market illiquidity at 5 % level of significance in the short run. Contrary to broad money supply, policy rate (ΔPR) influences the market illiquidity in differenced lag 3 at 5 % level of significance. Concerning business cycle components, inflation (ΔINF) appears as a significant predictor of market illiquidity in the Shanghai stock exchange in all three lags in the short run. In particular, increases in inflation increase the stock market illiquidity of the Shanghai stock exchange in the short run in all considered lags at 1%, 5% and 10% level of significance. The role of net fund flow ($\Delta LnFNIF$) in Shanghai Stock exchange is statistically significant at first two differenced lags. The coefficients of $\Delta LnFNIF$ in both the lags suggest that net fund flow significantly decreases the stock market illiquidity in the Shanghai Stock exchange. Turning now to the role of global financial crisis reported in Table 4.7 as a DUM_t the result suggests that market decline in the wake of financial crisis has a significant positive impact on Shanghai stock market illiquidity at 5% level of significance. Finally, the statistically significant lagged error correction term ECM_{t-1} is statistically significant, which suggests that short run deviation is corrected by 0.43 % each month in the case of the Shanghai stock exchange.

Table 4.7 next presents the short run coefficients of macroeconomic variables in the case of the Karachi stock exchange. The coefficients in the case of Karachi stock market suggest that, in a set of monetary policy variables, monetary base ($\Delta LnMB$) has a statistically significant impact on stock market illiquidity at lag 1. More specifically, an increase in monetary base decreases the market illiquidity of the Karachi stock market at 5% level of significance. Similarly, interest rate (PR) has a statistically significant impact on stock market illiquidity at lag 2 at 5% level of significant which suggest that increases in interest decreases the market illiquidity of the Karachi stock market at 5% level of significance in the short run. .

Concerning the business cycles component, unlike the long run statistically significant impact of industrial production ($LnIPI$) the impact of industrial production on stock market liquidity appeared to statistically insignificant in all considered lags. The short run impact of increase in inflation (INF) has statistically significant impact of stock market illiquidity at 5 % level of significance at lag 3 only. This significant impact suggests that increase in inflation increases the market illiquidity of Karachi stock exchange in the short run. The results further suggest that the short run coefficients of foreign net inflow, which signifies that increase in foreign equity net inflow, decreases stock market illiquidity at 5% level of significance at lag 2 in the Karachi Stock exchange. The results further suggest that marginal impact of market decline as represented by *DUM* in the wake of financial crisis show statistically insignificant impact on stock market liquidity in Karachi stock exchange.

Table 4.7 Short Run Estimates -Amihud Price Impact (ΔAmi_t) Model

	Independent variable	Shanghai Stock exchange	Karachi Stock Exchange	Indian Stock Market	Bursa Malaysia	Thailand Stock Market
	Constant	0.056	0.015	0.010	-0.005	-0.006
		(3.102)	(0.962)	(1.103)	(-0.178)	(-0.242)
Monetary Policy	$\Delta LnMB_{t-1}$	-4.193**	-0.581**	-0.017	-1.110	3.040
		(-2.18)	(-2.231)	(-0.048)	(-1.499)	(1.560)
	$\Delta LnMB_{t-2}$	-6.230**	0.313	-0.017	0.457	0.182
		(-3.274)	(1.1126)	(-0.048)	(0.681)	(0.092)
	$\Delta LnMB_{t-3}$	0.015	0.133	-0.957**	N/A	N/A
		(0.008)	(0.526)	(-2.652)		
	ΔPR_{t-1}	0.021	-0.031	-0.012**	-0.424	-0.013
		(1.284)	(-0.984)	(-2.125)	(-1.193)	(-0.117)
	ΔPR_{t-2}	0.002	0.180**	-0.007	0.059	0.135
		(0.154)	(5.845)	(-1.215)	(0.166)	(1.210)
	ΔPR_{t-3}	-0.032**	-0.0038	0.000		
		(-2.024)	(-0.125)	(0.159)	N/A	N/A
Business Cycles	$\Delta LnIPI_{t-1}$	-0.003	0.178	-0.097	0.981	-0.140
		(-0.217)	(0.824)	(-0.821)	(1.312)	(-0.462)
	$\Delta LnIPI_{t-2}$	0.022	0.303	-0.327**	1.579**	-0.299
		(1.550)	(1.349)	(-2.527)	(2.333)	(-0.998)
	$\Delta LnIPI_{t-3}$	0.006	0.176	0.007	N/A	N/A
		(0.474)	(0.811)	(0.063)		
	ΔINF_{t-1}	2.316***	-0.009	0.014**	5.331	-0.588**
		(4.027)	(0.765)	(2.011)	(0.793)	(-2.341)
	ΔINF_{t-2}	1.572**	0.007	0.004	1.851	-1.964
		(2.895)	(0.533)	(0.641)	(0.277)	(-0.583)
	ΔINF_{t-3}	0.792*	0.314**	0.026**	N/A	N/A
		(1.748)	(2.317)	(3.498)		
Investors flow	$\Delta LnFNIF_{t-1}$	-0.269**	-0.266	-0.094**	-0.085	0.546**
		(-2.140)	(-1.446)	(-2.580)	(0.063)	(2.174)
	$\Delta LnFNIF_{t-2}$	-0.439**	-0.458**	-0.017	-0.063**	0.033
		(-3.435)	(-2.511)	(-0.456)	(-3.109)	(0.159)
	$\Delta LnFNIF_{t-3}$	-0.196	0.227	-0.048	N/A	N/A
		(-1.516)	(1.226)	(-1.344)		
	ECM_{t-1}	-0.427***	-0.823***	-0.847*	-0.187**	-0.338**
		(-5.192)	(-6.709)	(-8.157)	(-3.223)	(-3.487)
	DUM_t	0.069**	-0.087	0.051**	-0.068	0.018
		(2.566)	(-0.0422)	(2.418)	(-0.874)	(0.373)
			Diagnostic Tests			
	R Squared	0.442	0.414	0.472	0.395	0.435
	F- Statistic	4.731	5.486	6.942	7.555	8.919
	LM test	0.678	1.912	1.206	0.223	0.078
	Durbin Watson	2.136	1.938	2.048	2.075	2.012

Note: ***,** and* denotes 1%,5% and 10% level of significance. The table presents the short run coefficients of macroeconomic variables generated through vector error correction where macroeconomic variables are regressed against the Amihud (*Ami*) measures of illiquidity with a varying lags in the selected markets. The associated t- statistics are reported in parenthesis. The *LnMB* and *PR* differenced operators represent monetary policy components. The *LnIPI* and *LnINF* with differenced operators represent components of business cycles and *LnFNIP* is net fund flow/net foreign equity flow.

The lagged error correction term ECM_{t-1} is statistically significant which suggests that short run deviation towards the long run is corrected by 0.82% each month in the case of the Karachi Stock Exchange**.**

Table 4.7 further reports the short run coefficients of macroeconomic variables in the case of the Bombay stock exchange. Concerning the monetary policy variables, both monetary base and policy rate do influence stock market illiquidity at 5 % percent level of significance at lag three and at lag one respectively. In a set of business cycle components, both the inflation (ΔINF) and the real economic activities ($\Delta LnIPI$) influence market illiquidity of the Indian Stock Exchange in the short run. The impact of both these components ,however appeared in different lags. In particular, the impact of real economic activities on market liquidity appeared at second differenced lag, and the coefficients of inflation are statistically significant at first and third lags. The results further shows that, unlike statistically insignificant impact of foreign equity net inflow in the long run, net inflow of foreign equity does impact the market liquidity of Indian Stock Exchange at first lag in the short run. In particular, the coefficient of net foreign inflow ($\Delta LnFNIF$) at first lag suggests that, increases net foreign inflow decrease stock market illiquidity in the Bombay Stock Exchange in the short run.

Table 4.7 further reports the impact of global financial crisis/market decline on stock market illiquidity. The coefficients of global financial crisis is represented by DUM_t, which suggests that market decline following the financial crisis have a significant positive impact on stock market illiquidity at 5% level of significance. Finally, the lagged error correction term ECM_{t-1} is statistically significant which suggest that short run deviation is corrected by 0.85% each month in the case of the Bombay Stock Exchange.

This study now turns to the short run coefficients of macroeconomic variables for the Stock markets of Malaysia and Thailand in Table 4.7. The coefficients suggest that none of the monetary policy variables is able to explain the changes in market illiquidity of the Malaysian and Thailand stock markets at any lags in the short run. Concerning the business cycles components coefficients, change in industrial production is able to explain variations in market illiquidity of the Malaysia stock market at second lag while inflation predicts significant changes in market illiquidity of the stock market of Thailand at first lag in the short run.

The available evidence of fund flow/ net foreign equity flow suggests the statistically significant role of foreign investors flow in moving market illiquidity in both Malaysia and Thailand Stock markets. The role of foreign equity flow is statistically significant at second lag for Malaysia stock market indicating that increase in net fund flow decreases stock market illiquidity and similar inferences hold for Thailand stock market given the statistically significant coefficient of net foreign equity flow ($\Delta LnFNIF$) at first lag. Of particular interest, increases in net foreign equity flow/ net fund flow decreases market liquidity Bursa Malaysia and increases the market illiquidity of Thailand stock market in the short run. The role of financial crisis represented by DUM_t appears to be statistically insignificant for both markets. Finally, the lagged error correction term ECM_{t-1} is statistically significant which suggest that short run deviation towards long run is corrected by 0.1879% and 0.3389% each month in the case of Bursa Malaysia and the stock exchange of Thailand. The fundamental diagnostic tests of serial correlation such as LM test and Durbin Watson tests suggest that model survives the issue of serial correlation in the specification in the selected Asian emerging markets.

As an alternative measure of stock market illiquidity, the study modeled macroeconomic variables against the Roll's price impact measures of stock market illiquidity. Repeating similar estimation procedures, the short run coefficients of the macroeconomic variables are reported in Table 4.8. The short run estimates of the Shanghai stock exchange suggest that both components of monetary policy significantly explains implicit spread dimension of the stock market liquidity in the considered lags at 5 % level of significance. In particular, the negative coefficient of monetary base at differenced Lag 1 and Lag2 denote that increases in money supply significantly lower the market illiquidity of the Shanghai stock exchange. Similar inferences are gathered on the impact of change in policy rate on market illiquidity at second and third differenced lags. Turning now to the business cycles components, the coefficients of both the components of business cycles suggest a significant impact on the market illiquidity of the Shanghai stock exchange. The negative impact of industrial production on market illiquidity appeared in the second differenced lag, while the positive impact of changes in inflation on stock market illiquidity (RPI_t) is statistically significant at all considered lags.

The role of change in net fund flow ($\Delta LnFNIF$) in explaining stock market illiquidity (RPI_t) as reported in Table 4.8 appeared to be statistically significant at first and second differenced lags in the case of the Shanghai Stock exchange. The coefficients suggest the negative impact of change in net fund flow on stock market illiquidity in the Shanghai Stock exchange. In particular, the coefficients suggest that increase (decrease) in change in net fund flow into Shanghai Stock exchange decreases (increases) market illiquidity. The role of market decline following the financial crisis represented by DUM_t suggests a statistically significant impact on market liquidity. The statistically significant ECM_{t-1}

suggests 0.30% speed of adjustment from short run deviation in market illiquidity towards the long run equilibrium in the case of the Shanghai Stock Exchange.

Table 4.8 further reports the short run coefficients of macroeconomic variables of the Karachi stock exchange. The coefficients of both monetary base and policy rate suggest that none of the monetary policy variables is able to explain the implicit spread dimension of the stock market illiquidity at any considered lags in the short run. While in a set of business cycle components, only change in industrial production ($\Delta LnIPI$) is able to explain the implicit spread aspect of market illiquidity in the Karachi stock exchange at second lag in the short run at 5% level of significance. Further, evidence on the role of net foreign equity flow into the Karachi stock exchange suggests statistically significant impact on stock market illiquidity in the short run. In particular, the coefficients of $\Delta LnFNI$ at first and second differenced lags suggest that increase in net foreign equity flow into Karachi stock exchange significantly decrease the implicit spreads aspects of illiquidity. The statistically insignificant impact of market decline on the spread dimension of stock market liquidity as denoted the by the coefficient of DUM_t suggest that financial crisis has no impact on the spread dimension of stock market illiquidity of the Karachi stock exchange. The statistically significant error correction term is also noted which signifies the significant speed of adjustment toward market equilibrium at 0.38% correction each month.

Table 4.8 next presents the short run coefficients of macroeconomic variables in the case of Bombay Stock Exchange. It is evident from the short run estimates of monetary policy variables that change in monetary base significantly explain Roll's prices impact dimension of market illiquidity. In particular, changes in monetary base ($\Delta LnMB$) at lag 1 and lag 3 account for variations in RPI_t. This implies that in increase monetary base

decreases stock market illiquidity at Lag 1 and Lag 3 at 5% level of significance in the short run. The role of policy rate in explaining the RPI_t appeared to be statistically insignificant in the short run. Concerning the business cycle components, both real economic activities and changes in inflation explain changes in RPI_t though at varying lags. More specifically, the coefficients of changes in industrial production is statistically significant at lag one only in the short run. This coefficient suggests that increase in real economic activities declines decreases the RPI_t in lag 1 at 5 percent level of significance, while on the other hand the coefficients of changes in inflation suggest that inflation impact RPI_t in lag 1 and lag 3 at 5% level of significance.

The coefficients of inflation at both lags suggest that increase in inflation increases market illiquidity of Indian stock exchanges at 5 % level of significance in short run. The results reported in Table 4.8 for Indian stock market further suggest that like first model where change in foreign equity net flow does not influence the Ami_t, change in foreign equity net flow has no statistically significant influence on RPI_t as well ,at any differenced lags. The error correction term however, is statistically significant at 1% suggesting high speed of adjustments towards market equilibrium at the speed of 0.77%.

Table 4.8 Short Run Estimates –Roll's Price Impact (RPI_t) Model

	Independent variable	Shanghai Stock exchange	Karachi Stock Exchange	Bombay Stock Market	Bursa Malaysia	Thailand Stock Market
	Constant	0.025	0.001	0.052	-0.014	0.014
		(2.614)	(0.460)	(1.314)	(-2.04)	(0.768)
Monetary policy	$\Delta LnMB_{t-1}$	-2.051**	-0.066	-0.298***	-0.085	-1.233
		(-2.635)	(-1.349)	(-1.872)	(-0.658)	(-0.877)
	$\Delta LnMB_{t-2}$	-2.441**	0.066	-0.106	0.017	0.398
		(-3.259)	(1.235)	(-0.659)	(0.115)	(0.398)
	$\Delta LnMB_{t-3}$	-0.324	0.011	-0.5628**	N/A	N/A
		(-0.452)	(0.237)	(-3.476)		
	ΔPR_{t-1}	-0.008	-0.001	0.0003	-0.136*	0.032
		(-1.450)	(-0.179)	(0.128)	(-1.701)	(0.404)
	ΔPR_{t-2}	-0.0121**	0.004	0.0017	-0.151	-0.0131
		(-1.989)	(0.794)	(0.711)	(-1.890)	(-0.167)
	ΔPR_{t-3}	-0.0213**	-0.004	0.0035	N/A	N/A
		(-3.447)	(-0.790)	(1.498)		
Business Cycles	$\Delta LnIPI_{t-1}$	-0.001	0.023	-0.1221**	0.094	-0.110
		(-0.266)	(0.572)	(-2.390)	(0.567)	(-0.493)
	$\Delta LnIPI_{t-2}$	-0.013**	-0.075*	-0.0236	0.175	-0.141
		(2.558)	(-1.774)	(-0.418)	(1.167)	(-0.645)
	$\Delta LnIPI_{t-3}$	0.003	0.050	0.068	N/A	N/A
		(0.698)	(1.217)	(1.374)		
	ΔINF_{t-1}	0.961**	-0.002	0.009**	1.371	-3.565
		(4.443)	(-1.101)	(2.846)	(0.911)	(-1.516)
	ΔINF_{t-2}	0.627**	-0.0001	0.004	1.644	1.012
		(1.903)	(-0.318)	(1.518)	(1.101)	(0.4227)
	ΔINF_{t-3}	0.319**	0.002	0.0119**	N/A	N/A
		(3.160)	(0.804)	(3.619)		
Investor Flow	$\Delta LnFNIF_{t-1}$	-0.133**	-0.041*	-0.019	-0.019***	-0.620**
		(-2.760)	(-1.716)	(-1.252)	(-4.281)	(-3.287)
	$\Delta LnFNIF_{t-2}$	-0.174**	-0.091**	0.012	-0.012**	-0.302**
		(-3.567)	(-2.624)	(0.730)	(-3.132)	(-1.938)
	$\Delta LnFNIF_{t-3}$	-0.0527	-0.082**	-0.007	N/A	N/A
		(-1.075)	(-2.296)	(-0.487)		
	ECM_{t-1}	-0.300***	-0.382***	-0.766***	-0.696***	-0.449***
		(-6.038)	(-4.100)	(-8.096)	(-6.179)	(-5.303)
	DUM_t	0.0243**	-0.014	0.013	0.006	-0.041
		(2.579)	(-1.0803)	(1.519)	(0.372)	(-1.162)
				Diagnostic Tests		
	R Squared	0.420	0.315	0.447	0.460	0.319
	F- Statistic	4.313	3.574	6.265	9.887	5.428
	LM test	0.041	1.216	0.122	0.085	0.814
	Durbin Watson	2.025	2.168	1.976	1.979	2.037

Note: ***,** and* denotes 1%,5% and 10% level of significance. The table presents the short run coefficients of macroeconomic variables generated through vector error correction where macroeconomic variables are regressed against the Amihud (*Ami*) measures of illiquidity with a varying lags in the selected markets. The associated t- statistics are reported in parenthesis. The *LnMB* and *PR* differenced operators represent monetary policy components. The *LnIPI* and *LnINF* with differenced operators represent components of business cycles and *LnFNIP* is net fund flow/net foreign equity flow.

The short run coefficients of macroeconomic variables in the case of Bursa Malaysia and the stock exchange of Thailand are reported Table 4.8. In a set monetary policy variables coefficients of both markets, only policy rate shows statistically significant impact on on RPI_t in Bursa Malaysia in differenced lag1 at 10 % level of significance. Concerning the business cycle components (inflation and real economic activities), the coefficients suggest that none of the business cycle variables significantly explains change in RPI_t at any considered lags. The impact of fund flow/ net foreign equity flow shows statistically significant impact on RPI_t in both stock markets. In particular, the coefficient suggest that increase in net fund flow / foreign investors equity net flow decreases implicit spread aspect of stock market illiquidity both in the Bursa Malaysia and the stock exchange of Thailand at 5% level of significance. Concerning the market decline impact on RPI_t , available evidence suggest no statistically significant impact of market on RPI_t both in the Bursa Malaysia and the Thailand stock market. The ECM_{t-1} term shows statistically significant signs in both markets denoting a high speed of adjustment towards market equilibrium from the short deviation. The speed of adjustment in Malaysian market is relatively higher than the Thailand stock market.

The following key inferences are derived from the short run coefficients of macroeconomic variables of the both models in the selected Asian emerging markets. First, macroeconomic variables produce significant changes in market illiquidity in the selected Asian emerging equity markets. The disparity in the significance of macroeconomic variables across the selected Asian emerging market suggest that not all variables in all selected Asian emerging markets influence stock market illiquidity, rather, the effect of macroeconomic variables on stock market illiquidity varies in individual equity markets.

For instance, the coefficients of monetary policy are more notable and robust in both the illiquidity measures in the Shanghai and Bombay equity markets at varying lags in the short run. This implies that expansionary (contractionary) monetary policy decreases (increases) stock market illiquidity in the equity markets of China and India. There is also evidence of the impact of monetary base and interest rate on the stock market liquidity of Karachi stock exchange; the coefficients of both these variables however are not robust to both the measures of stock market illiquidity in the short run. Similarly, the coefficient of interest rate in the case of Bursa Malaysia in the short run is also not robust in the second measure of stock market illiquidity.

Second, the role of business cycle components are notable in three out five Asian emerging equity markets and are generally robust to both the measures of stock market illiquidity. In particular, increase (decrease) in real economic activities decreases (increases) stock market illiquidity in the Shanghai, the Karachi, and the Bombay equity markets. In addition, increase (decreases) in inflation in these three markets increases (decreases) stock market illiquidity in the short run. Within the business cycle components, the role of inflation in increasing (decreasing) stock market illiquidity of the Shanghai, the Karachi, and the Bombay equity markets are notable in the short run. The coefficients of business cycles further suggest both the real economic activities and inflation do influence market illiquidity of Bursa Malaysia and Thailand respectively; the coefficients however are not robust in the second measures of stock market illiquidity.

Third, the role of foreign equity flow/fund flow appears significant and robust in both measure of stock illiquidity in all selected Asian emerging markets except for Bombay equity market in the short run. The coefficients of fund flow in the Shanghai and Bursa Malaysia suggest that increase (decreases) in foreign fund flow decreases (increases) stock

market illiquidity in the short run. Similar evidences are recorded for stock markets of Karachi and Thailand where increases (decreases) in foreign equity flow decreases (increases) stock market illiquidity. The coefficients of foreign equity flow in the case of Bombay stock exchange are not robust for the second measure of stock illiquidity.

Fourth, the impact of market decline following global financial crisis appeared to be statistically insignificant in the Karachi, the Malaysian and the Thailand equity markets. The impact of market decline appeared significant only in the equity markets of China and India.

4.7 Causality Analyses

Having information about the existence of cointegration between the variables guides this study to examine the direction of Granger-causality between stock market liquidity and a set of macroeconomic variables. The Granger representation theorem advocates that, provided that variables are integrated of order one or *I(1)* and evidence of cointegration among the variables are established, then there must be Granger causality at least from one direction. Engle and Granger (1987) noted that given the existence of cointegration among candidate variables, Granger causality exercised at first difference by VAR method will be misleading. χ^2 statistics are therefore, used with 1st differenced lag independent variables to decided on the Granger causality direction between the variables of interest.

Given the above preface, this study utilized two VECM models to examine the causality (in a Granger sense) between stock market illiquidity and macroeconomic variables. This study therefore, first report the Granger causality between macroeconomic variables and first measure of stock market stock liquidity namely Amihud price impact

followed by Roll's price impact measures of stock market liquidity in the selected Asian emerging markets. The results of Granger causality between macroeconomic variables and stock market illiquidity are reported in Table 4.9.

The results reported in Table 4.9 (Panel A) suggest that monetary base ($\Delta LnMB$) causes stock market illiquidity (ΔLiQ_t) in three out of five Asian emerging markets. In particular, monetary base (ΔMB)causes stock market illiquidity (ΔLiQ_t) in the Shanghai stock exchange, the Bombay stock Market and the Bursa Malaysia at 1%,5% and 10 % level of significance respectively. Concerning the component of monetary policy, policy rate (ΔPR) causes stock market illiquidity (ΔLiQ_t) only in the Shanghai stock market at 10 % level of significance.

Table 4.9 (Panel A) further reports that at least one component of business cycle causes stock market illiquidity of all Asian emerging markets. In particular, Inflation ($\Delta LnINF$) granger causes stock market illiquidity (ΔLiQ_t) in the Bombay stock Market and the Thailand stock Market at 5 % level of significance. The real economic activities measured by the industrial production ($\Delta LnIPI$)causes stock market illiquidity (ΔLiQ_t) in the Shanghai stock exchange, Karachi stock Exchange, the Bombay stock Market and the Bursa Malaysia at 1%, 10%, 1% and 10% level of significance respectively.

Table 4.9 Granger causality between macroeconomic variables and stock market illiquidity (Amihud illiquidity measure)

Independent Variable	Shanghai Stock exchange	Karachi Stock Exchange	Bombay Stock Market	Bursa Malaysia	Thailand Stock Market
Panel(A) – Macro Measures → Stock Market illiquidity (ΔLiQ_t)					
Ho: Macro variables (Column) does not Granger causes Stock Market illiquidity (ΔLiQ_t)					
$\Delta LnMB$	13.448***(0.003)	5.146 (0.1614)	9.462**(0.023)	5.101* (0.078)	2.449 (0.293)
ΔPR	6.485*(0.090)	1.317 (0.7250)	5.354 (0.147)	1.423(0.490)	1.702 (0.426)
$\Delta LnINF$	2.9236 (0.403)	2.233 (0.5253)	8.832**(0.031)	0.962 (0.617)	7.347**(0.025)
$\Delta LnIPI$	16.520***(0.000)	6.455* (0.091)	15.542***(0.001)	5.506* (0.063)	1.302 (0.521)
$\Delta LnFNIF$	15.841***(0.001)	9.580**(0.022)	8.104**(0.043)	10.505***(0.005)	6.444**(0.039)
Panel(B) Macro Measures ← Stock Market illiquidity (ΔLiQ_t)					
Ho: Stock Market illiquidity (ΔLiQ_t)does not Granger causes Macro Variables (Column)					
$\Delta LnMB$	2.868 (0.412)	1.006 (0.799)	1.795 (1.795)	3.659 (0.160)	2.738 (0.2544)
ΔPR	4.785 (0.188)	1.274 (0.7352)	4.068 (0.254)	0.113 (0.945)	15.307***(0.0005)
$\Delta LnINF$	1.226 (0.746)	3.660 (0.300)	9.353**(0.024)	0.628 (0.730)	0.166 (0.9203)
$\Delta LnIPI$	3.534 (0.316)	1.736 (0.628)	6.896* (0.075)	2.35 (0.307)	2.491 (0.2877)
$\Delta LnFNIF$	1.234 (0.744)	0.367 (0.9468)	2.281 (0.516)	4.095 (0.129)	11.717***(0.0029)

Note: ****, ** and * indicates the significance level at 1%, 5% and 10% respectively. The χ^2 statistics are reported with probability values in the parenthesis. Since the interest of this study is to examine the causality between macroeconomic variables and stock market illiquidity, the causality of macroeconomic variables with each others are nor reported. In Panel (A), this study test the causality runs from macroeconomic variables to stock market illiquidity by testing the joint significance of $\sum \Delta LnMB_{t-1}$, $\sum \Delta PR_{t-1}$, $\sum \Delta LnIPI_{t-1}$, $\sum \Delta LnINF_{t-1}$ and $\sum \Delta LNFNIF_{t-1}$ through VECM granger causality. ΔMB Commonly represents difference of monetary base variable in all selected emerging markets. In the case of Shanghai Stock exchange and the Thailand Stock Market, this study used broad money supply as one of alternative measures of monetary policy ΔPR represents the interests rates in differenced form in the selection Asian emerging markets while ΔIPI and ΔINF are industrial production and inflation in differenced from. $\Delta FEPI$ is net foreign equity flow/fund flow in difference form. In Panel (B), Granger causality from stock market illiquidity to macroeconomic variables are reported for the selected Asian emerging market .

Table 4.9 (Panel A) next presents Granger causality between foreign equity/fund flow in the selected Asian emerging equity markets. It is evident from the results that foreign equity/fund flow ($\Delta LnFNIF$)causes stock market illiquidity (ΔLiQ_t) in all selected Asian emerging markets at 1 %,5%, 5%, 1% and 5% level of significance respectively.

Table 4.9 (Panel B) reports the results of Granger causality from stock market illiquidity (ΔLiQ_t) to macroeconomic variables. The results suggest that in a set of monetary policy variables, stock market illiquidity causes policy rate only in the Thailand stock market at 1% level of significance. Furthermore, that both the components of business cycles are caused by stock market illiquidity only in the Indian Equity market out of selected Asian emerging markets. Foreign equity flow Granger caused by stock market illiquidity only in the case of the Thailand stock market out of selection Asian market.

The conclusions drawn from the results reported in the Table 4.9 suggest that there is unidirectional causality runs from monetary base to stock market illiquidity in the Shanghai stock exchange, the Bombay stock Market and the Bursa Malaysia. Further, there is unidirectional run from policy rate to stock market illiquidity in the case of the Shanghai stock exchange and there is unidirectional causality runs from Inflation to stock market illiquidity in the case of the Thailand Stock Market. There is unidirectional causality runs from real economic activities to stock market illiquidity in the case of Shanghai Stock Market, Karachi Stock Market and Bursa Malaysia. There is unidirectional causality runs from foreign equity /fund flow to stock market illiquidity in the case of the Shanghai Stock Exchange, the Bombay stock exchange, the Karachi stock market and Bursa Malaysia. There is bidirectional causality runs between inflation and stock market illiquidity in the

case of the Bombay stock market. Further, there is bidirectional run between foreign equity flow and stock market illiquidity in the case of the Thailand stock market.

This study next report the results of Granger causality of variables of interest using the Roll's price impact measure of stock market illiquidity. The results are reported in Table 4.10. Panel A of Table 4.10 reports the results of causality runs from macroeconomic variables to stock market illiquidity. It is noted that in a set of monetary policy components, monetary base causes implicit spread dimension of stock market illiquidity in the Shanghai and the Bombay Stock markets while policy rate Granger causes implicit spread dimension of stock market illiquidity in Shanghai Stock Market and Bursa Malaysia. Table 4.10 further reports that, in a set of business cycle components, real economic activities ($\Delta LnIPI$) Granger causes implicit spread dimension of stock market illiquidity in the Shanghai and the Bombay Stock Exchange while inflation($\Delta LnINF$) causes implicit spread dimension of stock market illiquidity in the Shanghai, the Bombay and Karachi Stock Exchange. Table 4.10 Panel (A) further reports that foreign equity flow/fund flow Granger causes implicit spread dimensions of stock market illiquidity in all the selected Asian emerging markets except the Bombay stock exchange.

Table 4.10 (Panel B) further reports the Granger casualty from stock market illiquidity to macroeconomic variables. The results suggests that in a set of monetary policy variables, only policy rate is caused by stock market illiquidity in the case of Bursa Malaysia out of all selected Asian emerging markets. In a set of business cycle components, inflation is caused by stock market illiquidity while foreign equity portfolio is caused by stock market illiquidity only in the case of the Thailand Stock Market out of all select Asian emerging markets.

Table 4.10 Granger causality between macroeconomic variables and stock market illiquidity (Roll's illiquidity measure)

Independent Variable	Shanghai Stock exchange	Karachi Stock Exchange	Bombay Stock Market	Bursa Malaysia	Thailand Stock Market
Panel(A) – Macro Measures → Stock Market illiquidity (ΔLiQ_t)					
Ho: Macro variables (Column) does not Granger causes Stock Market illiquidity (ΔLiQ_t)					
$\Delta LnMB$	13.861***(0.003)	3.279 (0.350)	16.118***(0.001)	0.515 (0.773)	0.822 (0.662)
ΔPR	14.135***(0.002)	1.887 (0.596)	2.387 (0.4959)	7.772** (0.020)	0.164 (0.920)
$\Delta LnINF$	20.247***(0.000)	15.477***(0.006)	20.227***(0.000)	3.039 (0.218)	2.301 (0.316)
$\Delta LnIPI$	7.807** (0.050)	4.389 (0.222)	12.918***(0.004)	1.417 (0.492)	0.707 (0.702)
$\Delta LnFNIF$	18.147***(0.000)	14.21***(0.003)	4.115 (0.249)	18.942***(0.000)	10.805***(0.004)
Panel(B) Macro Measures ← Stock Market illiquidity (ΔLiQ_t)					
Ho: Stock Market illiquidity (ΔLiQ_t)does not Granger causes Macro Variables (Column)					
$\Delta LnMB$	3.757 (0.288)	4.136 (0.247)	3.582 (0.310)	0.583 (0.746)	0.405 (0.816)
ΔPR	4.351 (0.225)	4.863 (0.182)	0.269 (0.965)	7.155**(0.027)	0.937 (0.625)
$\Delta LnINF$	1.783 (0.618)	4.820 (0.185)	7.644* (0.054)	1.681 (0.431)	0.173 (0.917)
$\Delta LnIPI$	3.330 (0.343)	4.513 (0.211)	4.815 (0.185)	0.710 (0.701)	0.029 (0.985)
$\Delta LnFNIF$	1.174 (0.759)	0.081 (0.994)	2.334 (0.505)	4.385 (0.111)	11.664***(0.003)

Note: ****, ** and * indicates the significance level at 1%, 5% and 10% respectively. The χ^2 statistics are reported with probability values in the parenthesis. Since the interest of this study is to examine the causality between macroeconomic variables and stock market illiquidity, the causality of macroeconomic variables with each others are nor reported. In Panel (A), this study test the causality runs from macroeconomic variables to stock market illiquidity by testing the joint significance of $\sum \Delta MB_{t-1}$, $\sum \Delta PR_{t-1}$, $\sum \Delta IPI_{t-1}$, $\sum \Delta INF_{t-1}$ and $\sum \Delta FNIF_{t-1}$ through VECM granger causality. ΔMB Commonly represents difference of monetary base variable in all selected emerging markets. In the case of Shanghai Stock exchange and the Thailand Stock Market, this study used broad money supply as one of alternative measures of monetary policy ΔPR represents the interests rates in differenced form in the selection Asian emerging markets while ΔIPI and ΔINF are industrial production and inflation in differenced from. $\Delta FEPI$ is net foreign equity flow/fund flow in difference form. In Panel (B), Granger causality from stock market illiquidity to macroeconomic variables are reported for the selected Asian emerging market.

The overall conclusion derived from the second measures of stock market illiquidity suggest that a unidirectional causality runs from monetary base to stock market illiquidity in the case of the stock market of China and India and there is a unidirectional causality runs from policy rate to stock market illiquidity in the case of the Shanghai stock market. Concerning the business cycle component, a unidirectional run from inflation to stock market illiquidity in the case of Shanghai and the Karachi Stock Exchange and there is a unidirectional causality runs from real economic activities to stock market illiquidity in the case of Shanghai and the Karachi stock markets. The results further suggest that a unidirectional causality run from foreign equity flow/net fund flow in the case of the Shanghai stock market, the Karachi stock market, and Bursa Malaysia. Bidirectional causality between stock market illiquidity and policy rate is noted in the case of Bursa Malaysia. Further, bidirectional causalities between inflation and stock market illiquidity and foreign inflow and stock market illiquidity are noted in the case of the Bombay stock market and the stock market of Thailand respectively.

4.8 Innovative Accounting Approach

The extant literature in time series suggests that the VECM approach to capture the Granger causality between variables has its limitations and is unable to exact magnitude of causality between the variables. Further, the VECM causality captures causality between the variables only in the selected sample period and cannot account for anything ahead of selected sample period (Shahbaz et al. 2014). Shan (2005) posits that the VECM Granger approach fail to locate the exact magnitude of the impact from one variable to another. To handle this issue, Shan (2005) popularized a term innovative accounting approach (IAA) to test causality between variables. The IAA focuses on joint assessment of variance decomposition analysis (VDA) and Impulse Response Function (IRF) to demonstrate the

direction, magnitude, and strength of causality. Motivated by the limitations of the VECM Granger causality, the IAA extends the causality analyses to examine the impact of shocks by exercising Innovative Accounting Approach (IAA). This study first reports the results of forecast variance decomposition followed by IRF to examine the impact of shocks at individual Asian emerging stock markets.

4.8.1. Forecast Variance Decomposition Analysis

The VDA shows the predicted error variance and magnitude for a variable accounted by innovation stemming from each explanatory variable over varying time horizons beyond the time period selected as sample. Pesaran and Shin (1999) noted that generalized forecast VDA demonstrates the relative contribution of one variable in another variable because of stemming of innovative shocks. The main exclusiveness of this method is that, it is insensitive to variables ordering like orthogonalized forecast error VDA, since variables ordering is exclusively determined by the VAR system. In addition, generalized forecast error VDA calculates the simultaneous shock effects. In this vein, with the VAR framework, the VDA generates reliable results comparative to other traditional approaches (Ibrahim, 2005; Engle and Granger, 1987).

4.8.2 Impulse Response Function

This study exercised Impulse Response Function (IRF) to sketch out the time path of the influence of shock on candidates in a VAR system. The IRF can assist us to determine how much stock market illiquidity responds to its own shocks and shocks of macroeconomic variables. For instance, in macroeconomic variables, business cycle components causes stock market illiquidity if IRF demonstrates significant response of industrial production and inflation to shocks in stock market liquidity as compared to other

candidates in a system. Similarly, a significant reaction of macroeconomic variable, say, industrial production, and inflation to shocks in stock market illiquidity, it may be conclude that both stock market illiquidity and macroeconomic variables causes each other's.

Following this approach, this study first report the results of VDA for the Shanghai stock exchange using Amihud price impact as a stock market liquidity measure. The results of 60 periods forecast variance decomposition are reported in the Table 4.11

Table 4.11 Forecast Variance Decomposition Analysis (Model-1)
Shanghai stock Market

	Variance Decomposition of Ami_t					
Period	Ami_t	$LnMS_t$	PR_t	$LnIPI_t$	INF_t	$LnFNF_t$
1	100.000	0.000	0.000	0.000	0.000	0.000
10	52.609	4.170	5.955	11.901	19.278	6.088
20	39.880	3.202	7.951	18.019	25.894	5.054
30	34.344	2.773	8.842	20.676	28.778	4.587
40	31.277	2.532	9.335	22.152	30.379	4.325
50	29.326	2.379	9.649	23.091	31.397	4.158
60	27.974	2.273	9.866	23.742	32.103	4.042
	Variance Decomposition of: $LnMS_t$					
Period	Ami_t	$LnMS_t$	PR_t	$LnIPI_t$	INF_t	$LnFNF_t$
1	3.443	96.557	0.000	0.000	0.000	0.000
10	2.423	83.100	6.435	0.060	7.929	0.052
20	1.718	78.790	6.848	0.055	12.553	0.036
30	1.487	77.388	6.967	0.053	14.074	0.031
40	1.373	76.693	7.027	0.052	14.827	0.029
50	1.304	76.278	7.062	0.051	15.277	0.027
60	1.259	76.002	7.086	0.051	15.576	0.027

Table 4.11(Continued) Forecast Variance Decomposition Analysis (Model -1) (Shanghai Stock Market)

Variance Decomposition of PR_t						
Period	Ami_t	$LnMS_t$	PR_t	$LnIPI_t$	INF_t	$LnFNF_t$
1	0.149	1.749	98.102	0.000	0.000	0.000
10	0.794	3.998	66.936	0.218	27.951	0.103
20	0.971	6.191	59.100	0.260	33.341	0.137
30	1.019	6.907	56.682	0.279	34.970	0.143
40	1.042	7.261	55.487	0.288	35.776	0.147
50	1.056	7.472	54.773	0.293	36.258	0.148
60	1.065	7.612	54.298	0.297	36.578	0.150
Variance Decomposition of $LnIPI_t$						
Period	Ami_t	$LnMS_t$	PR_t	$LnIPI_t$	INF_t	$LnFNF_t$
1	0.114	0.349	0.013	99.524	0.000	0.000
10	2.853	12.946	0.820	74.005	6.227	3.150
20	3.623	16.899	0.516	67.277	6.942	4.744
30	3.920	18.383	0.393	64.694	7.236	5.375
40	4.081	19.179	0.327	63.305	7.395	5.712
50	4.182	19.676	0.286	62.440	7.494	5.923
60	4.251	20.015	0.257	61.848	7.562	6.067
Variance Decomposition of $LnCPI_t$						
Period	Ami_t	$LnMS_t$	PR_t	$LnIPI_t$	INF_t	$LnFNF_t$
1	1.556	0.393	0.249	1.832	95.969	0.000
10	1.001	3.714	3.528	11.426	78.966	1.364
20	0.718	6.251	3.012	11.993	76.317	1.709
30	0.653	6.986	2.867	12.229	75.431	1.834
40	0.622	7.328	2.800	12.341	75.016	1.893
50	0.598	7.597	2.747	12.429	74.689	1.940
60	1.556	0.393	0.249	1.832	95.969	0.000
Variance Decomposition of $LnFNIF_t$						
Period	Ami_t	$LnMS_t$	PR_t	$LnIPI_t$	INF_t	$LnFNF_t$
1	1.897	0.013	0.025	0.120	1.951	95.993
10	0.352	0.211	0.188	0.137	9.721	89.390
20	0.307	0.099	0.246	0.116	11.326	87.906
30	0.297	0.064	0.261	0.110	11.838	87.430
40	0.292	0.048	0.268	0.106	12.085	87.202
50	0.289	0.038	0.272	0.105	12.230	87.067
60	0.287	0.031	0.274	0.103	12.325	86.978

The results reported in Table 4.11 indicate that one standard innovative shock stems in Ami_t explains itself by 28 %. The $LnMS_t$, PR_t, $LnIPI_t$, INF_t and $LnFNF_t$ contribute to

Ami_t by 2.73%, 9.86%, 23.74%, 32.10% and 4.04% respectively. The contribution of Ami_t, PR_t, $LnIPI_t$ and $LnFNF_t$ to $LnMS_t$ is minimal i.e. 1.25%, 7.08%, 0.05% and 0.02% respectively. A 61.84% of economic activity is explained by its own innovative shock and 6.06% is contributed by Ami_t. A 1.55%, 0.39%, 0.24%, 1.83% is contributed to inflation by Ami_t, $LnMS_t$, PR_t and $LnIPI_t$ respectively but 96% is explained by innovative shock stem in inflation.

Using second measures of stock market illiquidity (i.e. Roll's price impact), this study exercises VDA analysis (reported in Appendix). The results of VDA between macroeconomics and stock market liquidity suggest that, one standard innovative shock stems in RPI_t explains itself by 18.04%. The contribution of $LnMS_t$, PR_t, $LnIPI_t$, INF_t and $LnFNF_t$ to RPI_t 15.22%, 0.24%, 46%, 16.43% and 4.03% respectively. RPI_t, PR_t, $LnIPI_t$, INF_t and $LnFNF_t$ to $LnMS_t$ is 1.49%, 14.30%, 0.03%, 12.12% and 0.27% respectively. A 71.76% contribution to $LnMS_t$ is by its innovative shocks

The overall results of variance decomposition analysis in the case of the Shanghai stock exchange indicates that shocks stemming in business cycles components cause large portion of innovative shocks in Stock market illiquidity of Shanghai stock market followed by monetary policy variables. Of particular interest, the combined contribution ($LnIPI_t$ and INF_t) of innovative shocks stems in business cycles components contribute 52.84 % of innovation in stock market liquidity when Amihud price measure of stock market illiquidity is considered. The joint contribution of innovative shocks in monetary policy variables

(Money supply and policy rate) is 12.13 percent innovations towards Amihud price measure of stock market illiquidity. Similarly, in the case of Roll's price impact measures, the joint contribution of business cycles innovative shocks in stock market liquidity innovation is 62.83 percent followed by 15.47 % of joint contribution of monetary policy variables. The innovative shocks contribution of net fund flow in stock market liquidity appeared to be minimal. The study further noted that contributions of innovative shocks in stock market liquidity in macroeconomic variables are not notable in the case of Shanghai stock market.

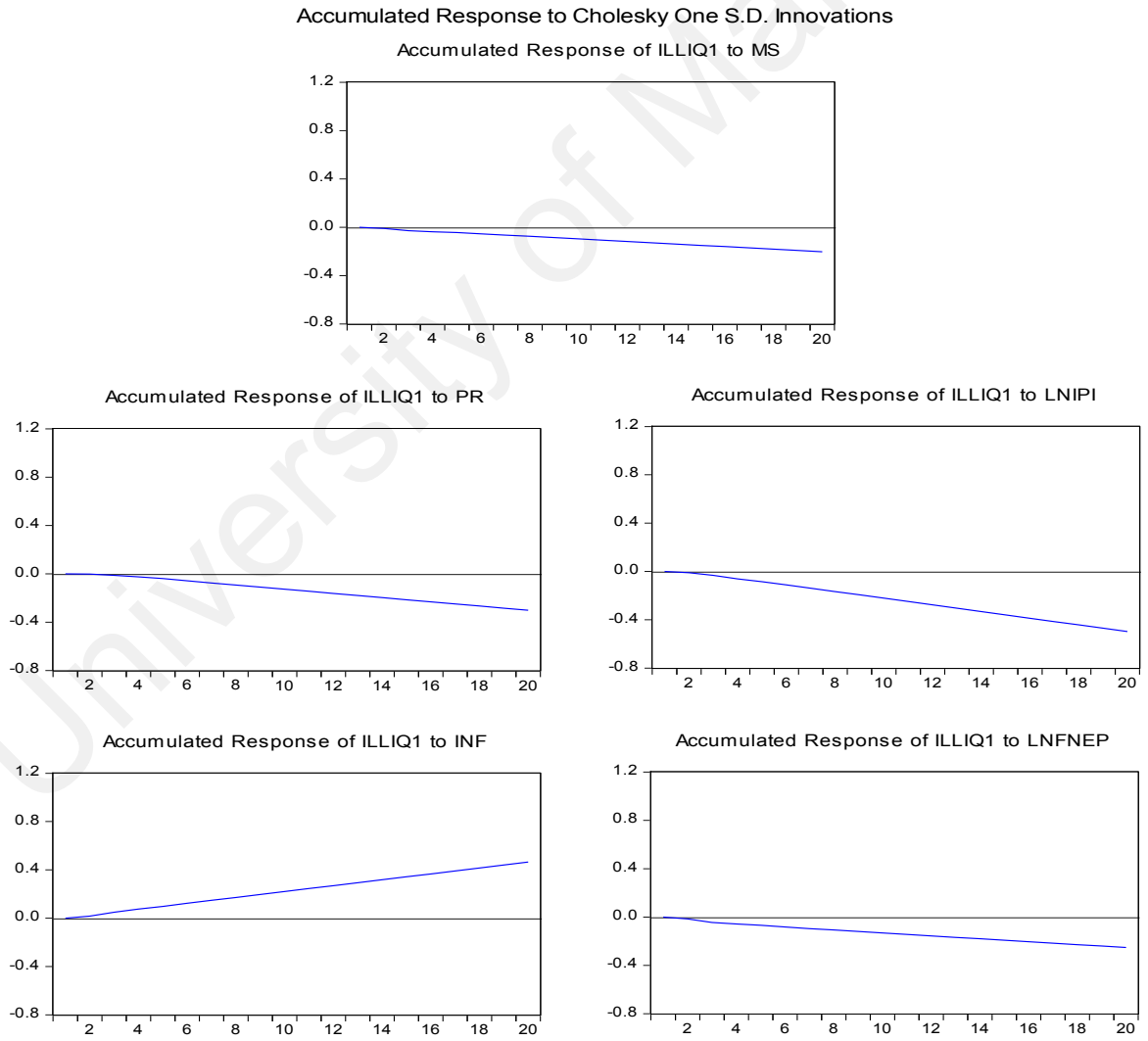


Figure 4.1 Response market Liquidity to shock in macroeconomic Variables: Shanghai Stock Market

Figure 4.1 indicates impulse response of stock market illiquidity to macroeconomic variables. In particular, it is noted that response in stock market illiquidity is negative due to shocks in money supply after 3rd horizon. The IRF further suggests that negative shocks to policy rate decrease stock market illiquidity after 4th horizon. Similarly, shocks to real economic activities decrease stock illiquidity in 2nd horizon. On the other hand, positive shock inflation increases stock market illiquidity from 1st horizon while shocks to net fund flow decrease stock market illiquidity in 2nd horizon.

This study also reported the impulse of macroeconomic variables to shocks in stock market illiquidity in the Shanghai Stock Market.[54] The IRF results suggest a negative response, money supply due to shocks in stock market illiquidity from the 1st horizon. Policy rate shows no impulse to shocks in market illiquidity in the Shanghai Stock Market. The IRF further suggests significant impulse in both business cycle components due to shock in stock market illiquidity. In particular, shocks to market illiquidity in the Shanghai Stock Market originate positive impulse in inflation and negative impulse in real economic activities. The impulse of fund flow due to shocks in market illiquidity in Shanghai stock market is negative but minimal. The robustness of shocks impact is also gauged through second measure of stock market liquidity, namely, Roll's price impact. The graphs of IRF of macroeconomic variables with second measures of stock market illiquidity are reported in the Appendix. Next, thus study reports the variance decomposition analysis in the case of Karachi stock market. The results are reported in Table 4.12.

[54] The IRF graphs are reported in Appendix

Table 4.12 Forecast Variance Decomposition Analysis (Model -1)
Karachi Stock Market

Variance Decomposition of Ami_t						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$LnFNIF_t$
1	100.000	0.000	0.000	0.000	0.000	0.000
10	70.668	2.609	0.877	9.886	8.265	7.695
20	55.502	3.440	0.912	18.132	11.668	10.346
30	45.720	4.089	0.941	23.412	13.767	12.071
40	38.960	4.546	0.961	27.056	15.220	13.258
50	34.014	4.880	0.976	29.722	16.283	14.127
60	30.237	5.135	0.987	31.757	17.094	14.790
Variance Decomposition of $LnMB_t$:						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$LnFNIF_t$
1	1.328	98.673	0.000	0.000	0.000	0.000
10	12.966	85.743	0.933	0.090	0.236	0.033
20	13.567	85.216	0.725	0.092	0.387	0.013
30	13.732	85.081	0.660	0.092	0.427	0.008
40	13.805	85.023	0.631	0.091	0.445	0.006
50	13.845	84.990	0.615	0.091	0.454	0.004
60	13.871	84.969	0.605	0.091	0.460	0.004
Variance Decomposition of PR_t						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$LnFNIF_t$
1	0.833	0.579	98.588	0.000	0.000	0.000
10	1.713	0.844	74.582	1.060	21.082	0.719
20	1.940	1.746	66.634	1.016	27.487	1.176
30	1.948	2.158	64.446	0.998	29.136	1.313
40	1.949	2.361	63.409	0.990	29.914	1.378
50	1.949	2.480	62.803	0.985	30.369	1.415
60	1.949	2.558	62.406	0.981	30.666	1.439
Variance Decomposition of $LnIPI_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$LnFNIF_t$
1	2.477	0.075	1.169	96.280	0.000	0.000
10	8.348	0.097	0.683	86.927	2.833	1.112
20	8.470	0.077	0.377	86.253	3.400	1.423
30	8.523	0.075	0.272	86.051	3.555	1.525
40	8.547	0.074	0.219	85.949	3.634	1.576
50	8.562	0.074	0.187	85.887	3.682	1.607
60	8.572	0.074	0.166	85.846	3.714	1.628

Table 4.12 (Continued) Forecast Variance Decomposition Analysis (Model -1) Karachi Stock Market

Variance Decomposition of $LnCPI_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$LnFNIF_t$
1	0.799	1.661	0.019	0.000	97.521	0.000
10	0.390	1.256	0.453	0.160	97.518	0.224
20	0.178	1.783	0.738	0.203	96.887	0.211
30	0.115	2.008	0.819	0.217	96.637	0.204
40	0.085	2.118	0.858	0.224	96.515	0.200
50	0.068	2.183	0.880	0.228	96.443	0.198
60	0.056	2.225	0.895	0.231	96.397	0.197
Variance Decomposition of $LnFNIF_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$LnFNIF_t$
1	0.493	0.017	0.888	1.292	0.225	97.084
10	2.437	1.371	1.348	3.087	0.982	90.776
20	2.281	2.323	1.421	3.164	1.068	89.744
30	2.202	2.706	1.447	3.189	1.101	89.356
40	2.162	2.899	1.459	3.200	1.118	89.162
50	2.138	3.014	1.467	3.208	1.128	89.046
60	2.122	3.090	1.472	3.212	1.134	88.969

Results reported in Table 4.12 indicate that one standard innovative shock stem in Ami_t explains itself by 30.24%. The innovative shock stems in $LnMB_t$, PR_t, $LnIPI_t$, $LnCPI_t$ and $LnFNIF_t$ contribute to Ami_t by 5.14 % , 0.99% , 31.76 %, 17.09 %, and 14.78% respectively. One standard innovative shock stems in Ami_t contributes to $LnMB_t$ by 13.87%. The results reported in Table 4.12 further suggest that one standard innovative shock stems in PR_t explains $LnCPI_t$ by 30.66 %. The contribution of Ami_t in explaining innovative shocks in $LnIPI_t$ is 8.57%. Similar inferences are generated from the variance decomposition analysis of second model when Roll's price impact measure is considered. The results are reported in Appendix. The results of second model suggest that one standard innovative shocks stems in RPI_t explains itself by 26.42 %. One standard deviation

innovative shocks stemming in $LnIPI_t$ and $LnCPI_t$ explain 17.49 % and 49.36% innovations in stock market liquidity in the case of Karachi stock market. Innovative shocks stems in RPI_t explains 21.58 % and 30.45% contributions in $LnMB_t$ and $LnIPI_t$ respectively in Karachi Stock Exchange while one standard innovative shocks in $LnMB_t$ and $LnIPI_t$ explains itself by 75.81% and 58.13% respectively.

The general conclusion drawn from the variance decomposition analysis in the case of the Karachi stock market suggests that business cycles components and foreign net inflow explain more contribution in stock market illiquidity. More specifically, the contribution of one standard deviation shock in industrial production explains 30.23 % innovation and contribution in stock market illiquidity that is significant portion of cumulative shocks. Similarly, one standard deviation shock in inflation contributes 24.35 % innovation and contribution in stock market liquidity. Both the components of business cycles jointly contribute 54.58% to stock market liquidity. Foreign equity net inflow ranked second in providing significant forecast to stock market liquidity. More specifically, a one standard deviation shock to foreign equity net inflow explains 12% percent innovation in stock market liquidity. The contribution of stock market illiquidity in explaining innovation in macroeconomic variables appears to be low. For instance, a one standard deviation shock in stock market illiquidity explains 16 % innovation in monetary base, 0.28 % innovation in interest rate, 10.70 percent and 5.13 percent in business cycles components and 0.29 percent in foreign equity net inflow. VDA thus, suggests that the contribution of business cycles components and foreign equity net inflow innovation stock market liquidity is more as compared to monetary policy components. The VDA further suggests weak evidence of feedback from stock market liquidity to macroeconomic variables.

The results of IRF indicate that response in stock market liquidity is positive due to shocks in monetary base by 8th horizon and it reaches its peak and remains negative after 9th horizon. Similarly, the response of stock market liquidity to shock in interest appears positive after 3rd horizon. The response of stock market liquidity from the shocks in business cycles components are stronger. More specifically, a positive shock to industrial production has negative impact on stock market illiquidity, whereas a positive shock to inflation has a positive impact on stock market illiquidity after 3rd horizon. A shock to foreign equity net inflow has a positive impact on stock market illiquidity until 2nd horizon. The impact became negative in 3rd and 4th horizon and then became and remain positive after 5th horizon.

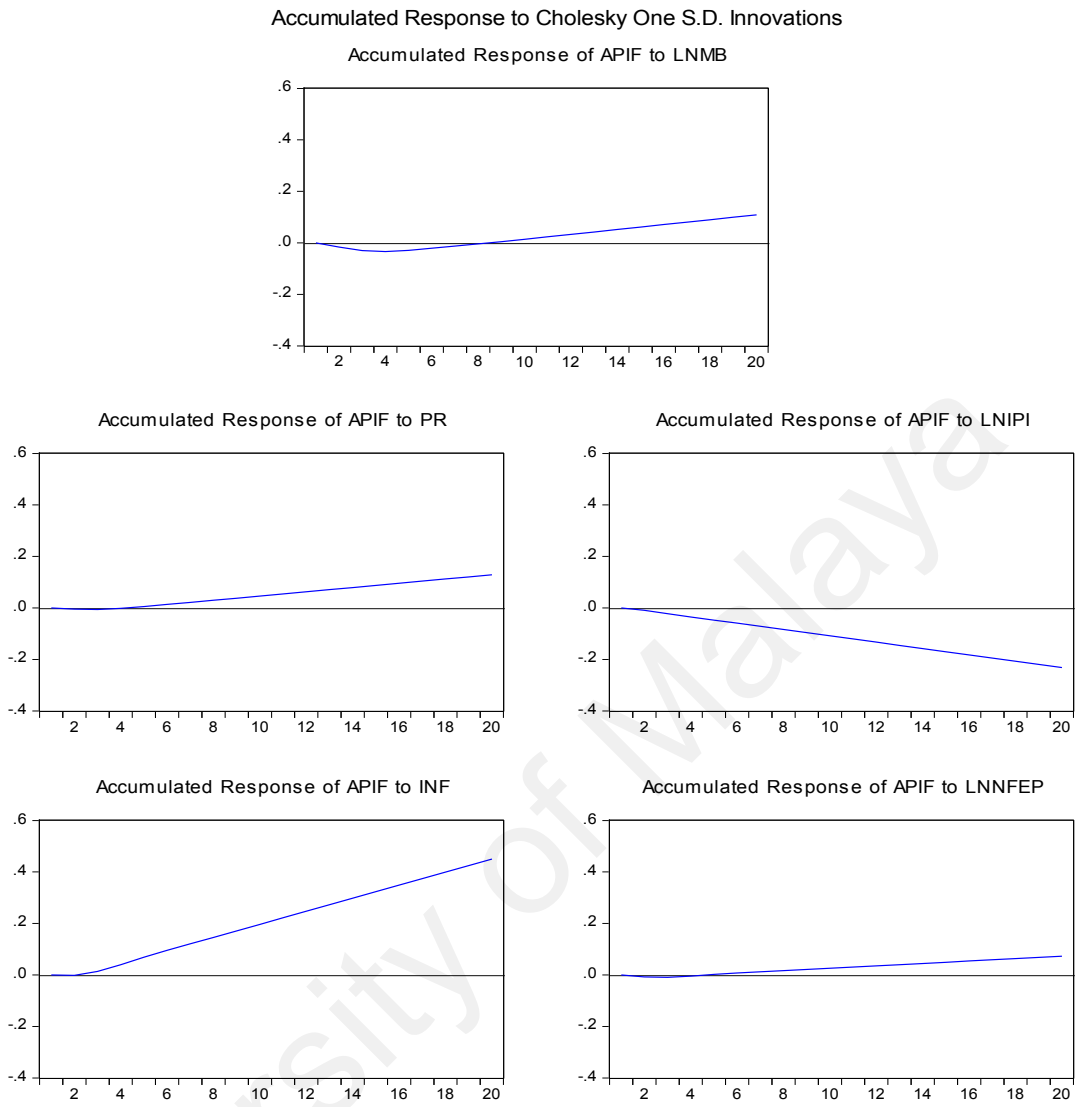


Figure 4.2 Response market Liquidity to shock in macroeconomic variables: Karachi Stock Market

This study also reported the impulse of macroeconomic variables to shocks in stock market illiquidity in the Karachi stock exchange.[55] The IRF results suggest a negative response monetary base due to shock in stock market illiquidity from the 3rd horizon. Policy rate shows negative impulse to shocks in market illiquidity in Karachi stock exchange. The IRF further suggests moderate impulse in one business cycle components due to shock in stock market illiquidity. In particular, shocks to market illiquidity in

[55] The IRF graphs are reported in Appendix

Karachi stock originate positive impulse in inflation and negative impulse in real economic activities. The impulse of industrial production is however minimal unlike impulse in inflation. The impulse of foreign equity net flow due to shock to market illiquidity in Karachi is negative but minimal. The robustness of shocks impact is also gauge through second measure of stock market liquidity namely Roll's price impact. The graphs of IRF of macroeconomic variables with second measures of stock market illiquidity are reported in the Appendix. This study next presents the VDA in the case of Bombay stock exchange in the Table 4.13.

Table 4.13 Forecast Variance Decomposition Analysis (Model -1)
Bombay Stock Market

Variance Decomposition of Ami_t						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	100.000	0.000	0.000	0.000	0.000	0.000
10	63.552	12.698	1.325	4.027	17.440	0.958
20	49.288	18.493	1.547	5.790	23.960	0.922
30	40.582	22.184	1.670	6.835	27.849	0.881
40	34.913	24.608	1.749	7.530	30.348	0.852
50	30.927	26.313	1.804	8.022	32.102	0.832
60	27.969	27.578	1.845	8.387	33.404	0.817
Variance Decomposition of $LnMB_t$:						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	0.499	99.501	0.000	0.000	0.000	0.000
10	0.577	95.560	0.007	2.094	1.597	0.165
20	0.532	95.380	0.003	2.286	1.633	0.165
30	0.516	95.309	0.002	2.351	1.657	0.165
40	0.508	95.274	0.002	2.383	1.668	0.165
50	0.502	95.253	0.001	2.402	1.675	0.165
60	0.499	95.240	0.001	2.415	1.680	0.165

Table 4.13(Continued) Forecast Variance Decomposition Analysis (Model -1) Bombay Stock Market

Variance Decomposition of PR_t						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	0.091	0.003	99.905	0.000	0.000	0.000
10	0.059	0.271	96.010	0.356	1.381	1.923
20	0.043	0.274	95.988	0.282	1.423	1.990
30	0.039	0.275	95.981	0.263	1.435	2.008
40	0.037	0.275	95.977	0.251	1.442	2.019
50	0.035	0.275	95.974	0.243	1.447	2.026
60	0.092	0.229	96.203	0.608	1.199	1.668
Variance Decomposition of $LnIPI_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	1.074	1.427	1.761	95.738	0.000	0.000
10	1.087	0.807	0.668	95.326	1.351	0.761
20	0.790	0.482	0.505	96.374	1.429	0.420
30	0.685	0.364	0.445	96.746	1.466	0.294
40	0.631	0.303	0.414	96.939	1.484	0.229
50	0.598	0.266	0.394	97.058	1.495	0.189
60	1.074	1.427	1.761	95.738	0.000	0.000
Variance Decomposition of $LnCPI_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	0.014	0.130	0.033	0.001	99.822	0.000
10	5.584	2.058	0.118	3.348	88.159	0.733
20	5.842	2.302	0.124	3.442	87.488	0.802
30	5.948	2.445	0.128	3.488	87.161	0.830
40	5.995	2.525	0.129	3.510	86.996	0.845
50	6.023	2.574	0.130	3.523	86.897	0.854
60	6.041	2.606	0.131	3.532	86.830	0.860
Variance Decomposition of $LnFNIF_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	1.164	0.065	0.265	0.086	0.830	97.591
10	2.926	8.555	0.117	0.948	3.423	84.030
20	3.076	9.847	0.072	1.120	3.614	82.271
30	3.135	10.360	0.053	1.190	3.697	81.564
40	3.170	10.658	0.043	1.231	3.746	81.153
50	3.192	10.854	0.036	1.257	3.777	80.884
60	3.201	10.928	0.033	1.267	3.789	80.782

The results reported in the Table 4.13 report the variance decomposition analysis of macroeconomic variables and stock market illiquidity (Amihud Price impact). The results

reported in Table 4.13 indicate that one standard innovative shock stems in Ami_t explains itself by 27.96%. The $LnMB_t$, PR_t, $LnIPI_t$, INF_t and $LnFNF_t$ contribute to Ami_t by 27.57%, 1.84%, 8.38%, 33.40 % and 0.81 % respectively. Similar inferences are generated from the shocks stemming in Ami_t . The contribution of Ami_t is also minimal in explaining the macroeconomic variables.

Using a second measure of stock market illiquidity (i.e. Roll's price impact), this study exercises VDA analysis (reported in Appendix). The results of VDA between macroeconomics and stock market liquidity suggest that one standard innovative shock stems in RPI_t explains itself by 29.22%. The contribution of $LnMB_t$, PR_t, $LnIPI_t$, INF_t and $LnFNF_t$ to RPI_t 49.23 %, 1.32%, 1.12 %, 18.56% and 0.54% respectively. The results further suggest 9.05% contribution of RPI_t in $LnMB_t$ while 85.40 % explanation to $LnMB_t$ is contributed by its innovative shocks. The general conclusion drawn from the VDA analysis for Indian stock market is that shocks to monetary base and inflation explain innovation in stock market liquidity. The role of innovative shocks in stock market liquidity (in both measures of liquidity) appears to be negligible.

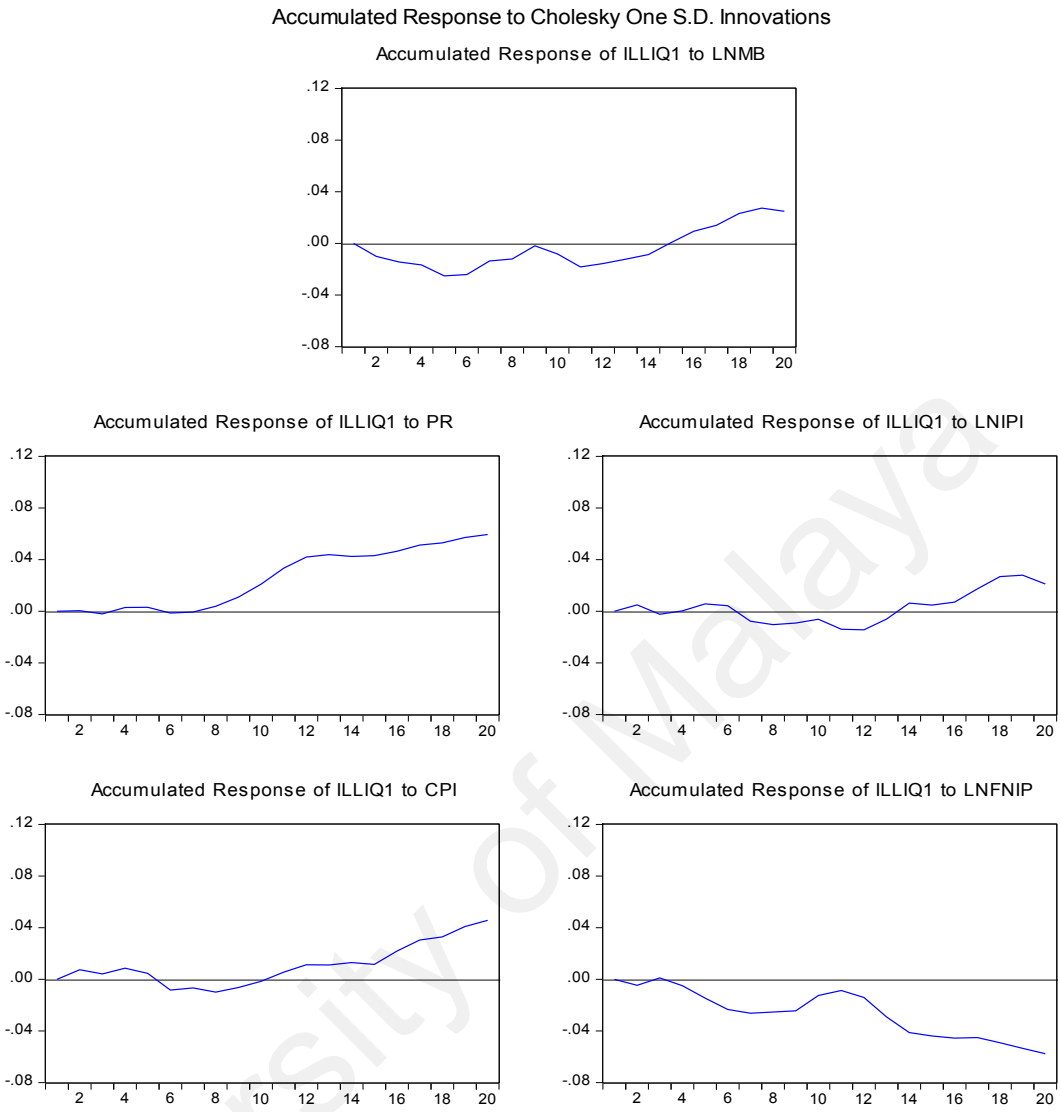


Figure 4.3 Response market Liquidity to shock in macroeconomic variables: Bombay Stock Market

The results of impulse response function of stock market illiquidity and macroeconomic variables in the case of the Bombay stock exchange are reported in the Figure 4.3. The results suggest that impulse of stock market liquidity due to shocks in macroeconomic variables varies over different horizons. In particular, response of stock market illiquidity is negative in 2nd horizon and remained negative until 8th horizon due to forecast error (shock) occurring in monetary base. The impulse became zero at 9h horizon, turned, and remained negative until 15th horizon due to forecast error in monetary base.

After the 15th horizon, the impulse of stock market illiquidity remains positive due to forecast error in monetary base in the case of Bombay stock exchange. Similarly, the impulse of stock market illiquidity due to shock in policy rate appears and remains positive after 5th horizon. Further, the impulse of stock market liquidity varies due to forecast errors in real economic activities. For instance, the impulse of stock market illiquidity fluctuates and remains positive until 6th horizon, then it become and remains negative until 13th horizon and again become and remains positive until 20th horizon due to a forecast error in real economic activities measured by industrial production. Similar inferences of impulse response of stock market liquidity due to forecast error in inflation are noted whereas; impulse of stock market illiquidity due to forecast error in net foreign equity largely remains negative.

This study further reports the impulse of macroeconomic variables due to forecast error/shocks in stock market illiquidity[56]. The pattern of IRF suggest that the impulse of policy rate, inflation and foreign net equity portfolio responds to shocks in stock market illiquidity, the response however is minimal. The monetary base and industrial production do not respond to the shocks in stock market illiquidity. The inference generated from the impulse response analysis of second measure of stock market illiquidity generally confirms the results.[57] Turning then to the VDA of Bursa Malaysia, similar estimations are executed and the results are reported 4.14

[56] IRF graph is reported in the appendix

57 The graphs of IRF using roll's price impact measure are provided in the Appendix

Table 4.14 Forecast Variance Decomposition Analysis (Model -1)
Bursa Malaysia

Variance Decomposition of Ami_t						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$PCNFF_t$
1	100.000	0.000	0.000	0.000	0.000	0.000
10	85.409	1.347	0.116	1.964	1.185	9.979
20	83.333	1.265	0.068	1.962	1.209	12.164
30	82.510	1.235	0.049	1.958	1.219	13.029
40	82.073	1.219	0.039	1.956	1.224	13.489
50	81.803	1.209	0.033	1.955	1.227	13.773
60	81.618	1.203	0.029	1.954	1.229	13.967
Variance Decomposition of $LnMB_t$:						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$PCNFF_t$
1	0.481	99.519	0.000	0.000	0.000	0.000
10	1.689	95.648	0.094	0.106	1.782	0.681
20	1.659	95.548	0.116	0.096	2.001	0.580
30	1.649	95.510	0.123	0.093	2.081	0.544
40	1.644	95.490	0.127	0.091	2.122	0.526
50	1.641	95.479	0.129	0.090	2.146	0.515
60	1.639	95.471	0.131	0.089	2.163	0.508
Variance Decomposition of PR_t						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$PCNFF_t$
1	1.286	0.669	98.045	0.000	0.000	0.000
10	1.593	1.913	91.853	0.009	2.994	1.638
20	1.533	2.008	90.857	0.004	3.790	1.807
30	1.515	2.038	90.548	0.003	4.038	1.859
40	1.506	2.052	90.397	0.002	4.158	1.885
50	1.501	2.061	90.307	0.002	4.230	1.900
60	1.497	2.067	90.248	0.002	4.277	1.910
Variance Decomposition of $LnIPI_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$PCNFF_t$
1	0.057	0.387	1.547	98.010	0.000	0.000
10	0.821	16.959	1.279	72.147	1.694	7.101
20	0.680	16.388	1.166	71.518	2.034	8.215
30	0.626	16.160	1.124	71.281	2.157	8.653
40	0.598	16.041	1.101	71.158	2.221	8.881
50	0.580	15.969	1.088	71.082	2.260	9.021
60	0.568	15.919	1.078	71.031	2.287	9.116

Table 4.14 (Continued) Forecast Variance Decomposition Analysis (Model -1) Bursa Malaysia

Variance Decomposition of $LnCPI_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$PCNFF_t$
1	0.014	1.369	0.119	0.795	97.701	0.000
10	0.191	1.452	0.437	0.595	97.121	0.201
20	0.209	1.388	0.537	0.596	97.081	0.188
30	0.215	1.367	0.568	0.596	97.069	0.183
40	0.217	1.358	0.583	0.596	97.063	0.181
50	0.219	1.352	0.592	0.596	97.059	0.180
60	0.220	1.348	0.598	0.596	97.057	0.179
Variance Decomposition of $LnFNIF_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	$LnCPI_t$	$PCNFF_t$
1	1.149	0.026	0.429	0.052	0.474	97.868
10	22.256	0.728	0.844	0.303	1.212	74.655
20	34.165	1.010	1.292	0.266	1.140	62.124
30	41.634	1.188	1.574	0.244	1.097	54.261
40	46.759	1.310	1.767	0.229	1.068	48.865
50	50.494	1.399	1.908	0.218	1.046	44.933
60	53.336	1.466	2.016	0.209	1.030	41.940

The results reported in the Table 4.14 suggest that one standard innovation shock in Ami_t contributes 81.61% to its own innovation. While there is no notable innovation in Ami_t from the shocks stemming in $LnMB_t$, PR_t, and $LnIPI_t$, innovative shocks to net fund flow ($PCNFF_t$) partially explain stock market liquidity in the Malaysian stock market which is 13.96 % percent. Further evidence suggests that shocks stemming in $LnMB_t$ explain 15.91 % contribution in $LnIPI_t$. On the other hand, shocks stemming in Ami_t contribute negligible innovation in $LnMB_t$, PR_t, $LnCPI_t$ and $LnIPI_t$. The only notable contribution of shocks stemming in Ami_t appeared in $PCNFF_t$. This suggests that the shocks stemming in stock market illiquidity (Ami_t) explains 53.33 % innovation in change in net fund flow in the Bursa Malaysia.

By exercising the second measure of stock market liquidity (RPI_t), this study obtained similar results to that of Ami_t. The results of VDA between macroeconomic variables and RPI_t are reported in appendix. It is noted from the results that, one standard innovative shock stemming in RPI_t explains itself by 43.73 %. Similar to previous VDA of Malaysia market, this study found no evidence of innovation in RPI_t due to shocks stems in $LnMB_t$, PR_t, $LnCPI_t$ and $LnIPI_t$. The only notable innovation in RPI_t is recorded due to innovative shocks stems in $PCNFF_t$. In particular, one standard innovative shock to $PCNFF_t$ explain 48.75% contribution in stock market liquidity. Furthermore, one standard innovative shock to RPI_t explains $PCNFF_t$ by 29.56 % while $PCNFF_t$ is explained by its own innovative shock by 66.61 %. A general conclusion yields from the VDA of Malaysia suggest a feedback between stock market illiquidity and fund flow in Bursa Malaysia.

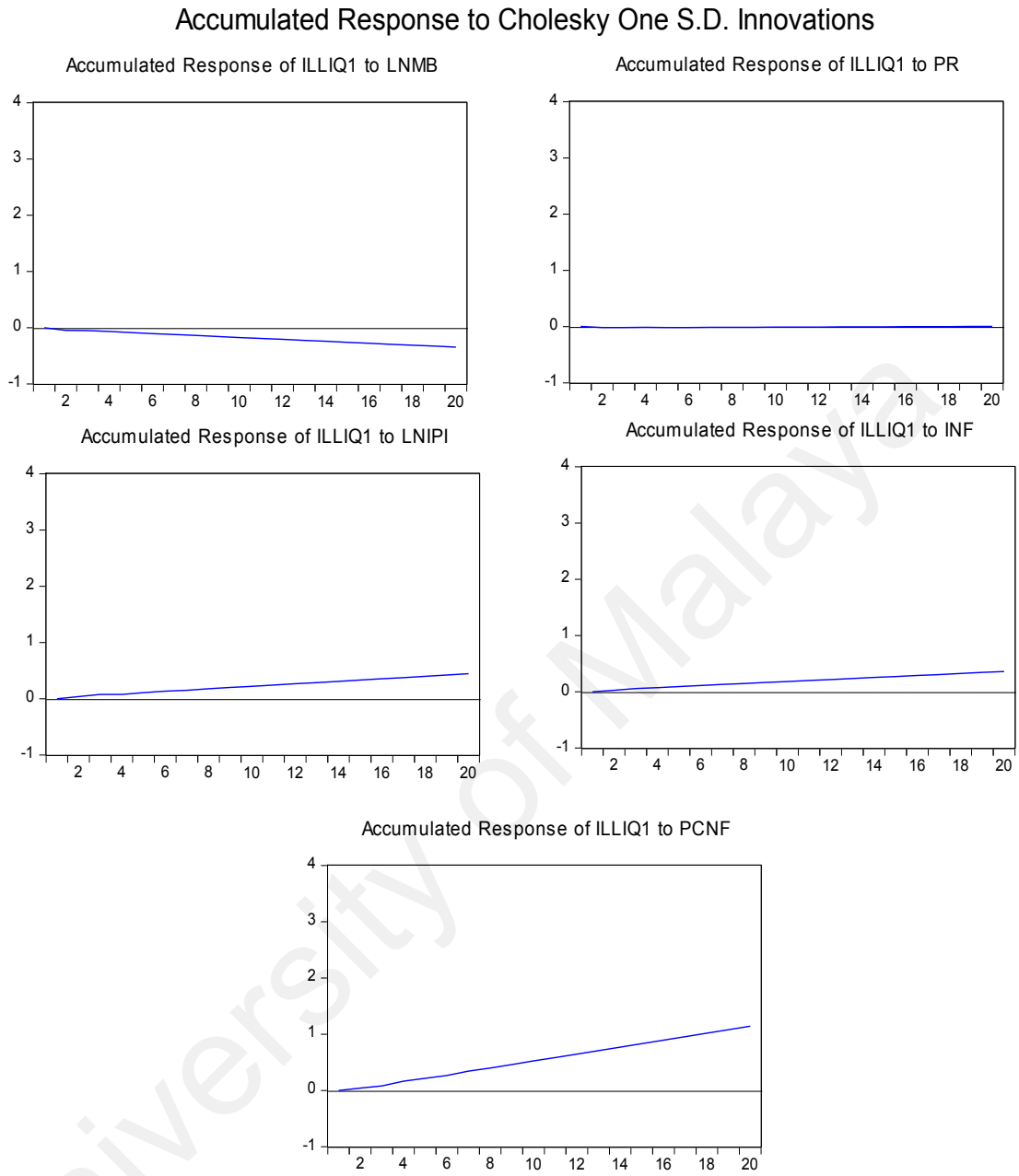


Figure 4.4 Response market Liquidity to shock in macroeconomic variables: Bursa Malaysia

Finally, this study reports the VDA of Thailand stock market and similar estimations are executed and the results are presented in Table 4.15. The results suggest that one standard innovation shock in Ami_t contributes 66.023 % its own innovation. While there is no notable innovation in Ami_t from the shocks stems in $LnMB_t$, PR_t, and $LnIPI_t$, innovative shocks to net foreign equity flow($LnFNIF_t$ explains innovation in stock market

liquidity in the stock market of Thailand by 27.38 %. Further evidence suggests that shocks stems in $LnMB_t$ explains 10.22 % contribution in PR_t. On the other hand, shocks stemming in Ami_t contribute negligible innovation in $LnMB_t, PR_t, LnCPI_t$ and $LnIPI_t$. The only notable contribution of shocks stemming in Ami_t appeared in $LnFNIF_t$. This suggests that the shocks stemming in stock market liquidity (Ami_t) explains 35.78 % of innovation in net foreign equity inflow. While innovation occurs in $LnFNIF_t$ explains itself by 46.33%.

By excising the second measure of stock market liquidity (RPI_t), this study gather inference similar to that of Ami_t. The results of VDA between macroeconomic variables and RPI_t are reported in appendix. It is noted from the results that one standard innovative shock stems in RPI_t explains itself by 52.16 %. Similar to previous VDA of the Thailand Stock Market, this study found no evidence of innovation in RPI_t to due shocks stems in $LnMB_t, PR_t, LnCPI_t$ and $LnIPI_t$. The only notable innovation in RPI_t is recorded due to innovative shocks stems in $LnFNIF_t$. In particular, one standard innovative shock to $LnFNIF_t$ explain 40.47% contribution in stock market illiquidity.

This study further reports that one standard innovation shock to RPI_t explains $LnFNIF_t$ by 32.044% while $LnFNIF_t$ is explained by its own innovative shock by 57.24%. General conclusion from the VDA of the Thailand Stock Market suggests that, there exists a feedback process between stock market illiquidity and net foreign equity flow.

Table 4.15 Forecast Variance Decomposition Analysis (Model -1)
Stock Market of Thailand

Variance Decomposition of Ami_t						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	100.000	0.000	0.000	0.000	0.000	0.000
10	75.315	1.370	3.542	1.197	1.508	17.064
20	70.537	1.315	3.672	1.129	0.933	22.412
30	68.443	1.302	3.750	1.099	0.682	24.721
40	67.278	1.294	3.795	1.083	0.542	26.005
50	66.537	1.290	3.823	1.073	0.453	26.822
60	66.023	1.286	3.842	1.065	0.392	27.389
Variance Decomposition of $LnMB_t$:						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	0.074	99.925	0.000	0.000	0.000	0.000
10	0.269	85.913	7.414	0.627	5.642	0.131
20	0.359	85.030	9.101	0.574	4.769	0.164
30	0.385	84.702	9.663	0.559	4.517	0.172
40	0.398	84.539	9.942	0.551	4.391	0.176
50	0.406	84.442	10.109	0.547	4.316	0.178
60	0.411	84.377	10.220	0.544	4.266	0.179
Variance Decomposition of PR_t						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	1.888	0.225	97.886	0.000	0.000	0.000
10	1.830	0.249	66.159	1.398	23.138	7.223
20	1.951	0.124	62.157	1.565	26.568	7.633
30	1.989	0.087	60.969	1.613	27.576	7.763
40	2.007	0.070	60.402	1.636	28.057	7.825
50	2.017	0.060	60.070	1.650	28.339	7.861
60	2.024	0.053	59.851	1.659	28.524	7.885
Variance Decomposition of $LnIPI_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	0.006	0.801	0.090	99.101	0.000	0.000
10	0.490	0.987	4.032	89.500	4.495	0.494
20	0.487	0.936	4.922	89.224	4.024	0.405
30	0.487	0.918	5.246	89.104	3.869	0.374
40	0.487	0.909	5.412	89.042	3.790	0.358
50	0.487	0.903	5.513	89.004	3.742	0.348
60	0.487	0.900	5.581	88.979	3.709	0.342

Table 4.15(Continued) Forecast Variance Decomposition Analysis (Model -1) Stock Market of Thailand

Variance Decomposition of $LnCPI_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	0.641	1.483	0.506	0.023	97.346	0.000
10	3.093	4.679	0.509	0.282	89.884	1.551
20	3.487	5.614	0.309	0.230	88.561	1.795
30	3.611	5.938	0.246	0.213	88.114	1.875
40	3.672	6.098	0.215	0.205	87.893	1.914
50	3.709	6.195	0.196	0.200	87.760	1.938
60	3.734	6.259	0.183	0.197	87.671	1.954
Variance Decomposition of $LnFNIF_t$						
Period	Ami_t	$LnMB_t$	PR_t	$LnIPI_t$	INF_t	$LnFNIF_t$
1	2.589	0.033	3.028	0.006	0.066	94.275
10	25.503	0.809	10.541	0.565	1.197	61.384
20	31.011	0.555	13.101	0.567	1.492	53.271
30	33.268	0.449	14.116	0.568	1.610	49.987
40	34.490	0.391	14.664	0.568	1.673	48.210
50	35.256	0.355	15.008	0.568	1.713	47.096
60	35.781	0.331	15.244	0.569	1.740	46.333

The results of impulse response function of stock market illiquidity and macroeconomic variables in the case of stock exchange of Thailand are reported in the Figure 4.5. The pattern of IRF suggests that in the set of monetary policy variables, the impulse of stock market illiquidity due to forecast error in policy rate appear notable. Specifically, impulse of stock market illiquidity is positive due to one standard deviation shock/forecast error in policy rate in 3rd horizon and remains positive till 20th horizon.

The IRF further suggests that impulse of stock market illiquidity is not responsive to the one standard deviation shock in both the components of business cycles, while the impulse of stock market liquidity is more responsive to one standard deviation shock in net foreign equity inflow. The shocks to net foreign equity flow suggest a negative impulse in the stock market illiquidity in the case of stock market of Thailand.

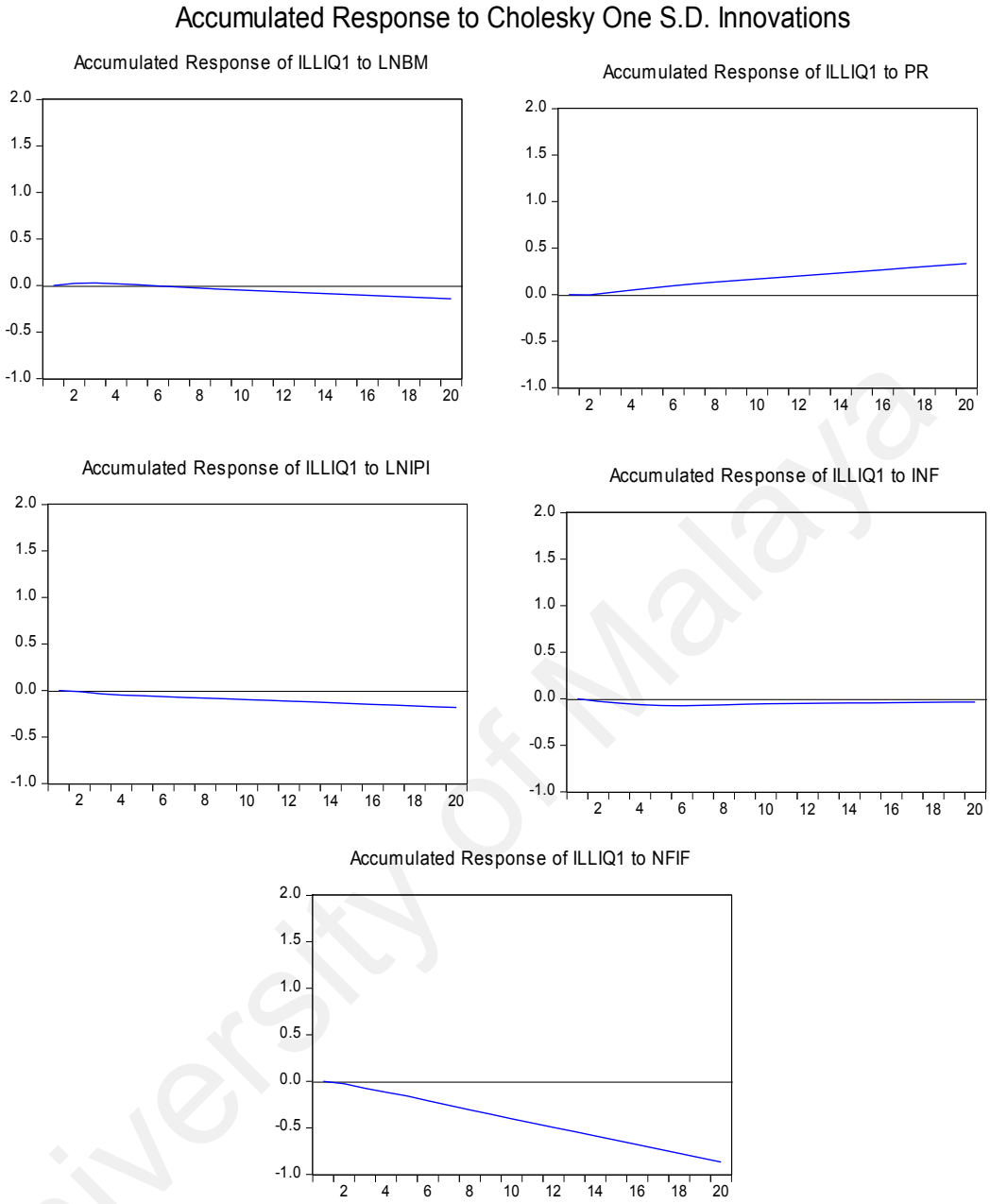


Figure 4.5 Response market Liquidity to shock in macroeconomic variables: Stock Market of Thailand

This study further reports the impulse of macroeconomic variables due to forecast error/shocks in stock market illiquidity[58]. The pattern of IRF suggests that the policy rate show minimal impulse to standard shock in stock market illiquidity in set of monetary policy variables. The impulse of both business cycle components is negligible due to one

[58] IRF graph is reported in the appendix

standard deviation shock in stock market illiquidity. The impulse of net foreign equity flow is more responsive toward one standard deviation shock in stock market illiquidity.

4.9 Conclusion

The overall findings from of this chapter suggest a wide disparities in the level of stock market in general while macroeconomic sources of market liquidity particularly in the selected Asian emerging markets. For instance, the descriptive statistics generally support the findings of Wang (2013) that there is large disparity in liquidity in Asian emerging markets and these markets exhibit high kurtosis and skewness, thus representing excessive spikes in the market liquidity pattern. In terms of stock market liquidity ranking, the descriptive statistics suggest that Bombay Stock Exchange and the stock exchange of Thailand exhibit high stock market liquidity while Karachi stock exchange exhibit low market liquidity. Concerning the stock market liquidity ranking, Wang (2013) noted that liquidity ranking in cross-country settings could be very different given that trading aspects of liquidity are used while measuring stock market liquidity. There are several plausible reasons, which can induce this pattern in stock market liquidity. Such as:

First, the large disparity in the liquidity spikes also suggests lower/higher trading pattern, which could influence the market capitalization in the selected Asian emerging markets. Given that Amihud (2002) liquidity measures have more dependency on market capitalization, it will tend to yield different results in markets, where nominal shocks to capitalization are more dominant (Fernández-Amador et al. 2013).

Second, differences in liquidity pattern of Asian emerging markets could possibly be attributed to the price discovery factor existing in the Amihud measure of stock liquidity. As noted by Cochrane (2005), since expectations and information can motivate

trading pattern of investors, Amihud (2002) measure has a price discovery and this measure of stock illiquidity can be understood as proxy for degree of gauging differences in investors (Amihud, 2002). This suggests that when investors at large know the implications of news, variations in price of securities are observed with a low trading volume. In contrast, if investors exhibit heterogeneous belief about the implication of news, large variation in price with low traded volume is observed (Florackis et al. 2011).

Third, findings of descriptive statistics also provide the general picture of the order imbalance in the selected order driven markets. As noted by Florackis et al. (2011), the Amihud (2002) aspect of stock market illiquidity is peripheral to the effect of order imbalance as examined by Pastor and Stambaugh (2003). More specifically, due to adverse selection, large buy/sell orders to illiquid securities trigger a large movement in stock prices because of inventory cost and adverse selection that partially bounce back following day when market-wide shocks are being subsumed (O'Hara, 2003; Amihud and Mendelson, 1980). The findings from the second measure of stock market liquidity, which largely denotes the implicit spread dimension of stock market liquidity, suggest that, China, Pakistan, and Thailand stock markets exhibit relatively higher implicit spread than Malaysian and Indian equity markets.

The role of macroeconomic variables in explaining stock market liquidity also varies across the selected stock markets. In general, the results support the entire three hypotheses related to monetary policy, business cycles and foreign equity/fund flow impact on stock market liquidity in the selected Asian emerging markets. The individual impact of these three key components of macroeconomy on stock market liquidity, however, varies from markets to markets. For instance, in the China and Indian stock markets, the role of monetary policy and business cycles components are notable, while in

Karachi stock exchange, business cycle components and foreign equity flow appear to influence stock market liquidity. In the case of Bursa Malaysia and the stock exchange of Thailand, only fund flow and foreign equity dictate a major role in explaining stock market liquidity. In the case of Shanghai stock exchange, the findings of Chu (2015) provide support to the results of this study. Chu (2015) noted that unexpected spread in stocks and unexpected 1-month *Shibor* display a positive time varying dependence in the lower and upper tails in a Chinese market, which lends support to the notion that contractionary monetary policy influence liquid stock market while liquid markets are reliant on expansionary monetary policy.

In comparison to developed and quote-driven stock market, findings related to the role of monetary policy are in line with previous studies (i.e. Florackis et al ,2014; Nyborg and Östberg,2014; Fernandez-Amador et al. 2013; Goyenko and Ukhov,2009; Chordia et al. 2005). In particular, Florackis et al. (2014a) noted that the nexus between liquidity sorted portfolio and macro-liquidity shocks has significantly varied during the financial crisis and movement in nominal interest rates is noted closer to zero lower bound. They further noted lower prices for liquid stocks because of expansionary rate surprises since investors discern it as bad news for future economic growth. In addition, cuts in interest rate propel the portfolio rebalancing to safe haven such as bond market from stocks market. In a similar vein, Fernandez-Amador et al. (2013) also reported the positive effect of expansionary monetary policy on the stock liquidity of Italian, French, and German stock markets. On the other hand, Goyenko and Ukhov (2009) show that monetary tightening increases the illiquidity in the market and Chordia et al (2005) reported the positive association between monetary expansion and stock market liquidity.

While there are other few potential explanations of transmission channels through which interplay between monetary policy and stock market liquidity can be established, Chordia et al. (2005), noted the influence of monetary shocks on stock market liquidity through co-movement across asset classes. In particular, they noted that, a number of asset allocation strategies shift capital between bond and stock market in practice. A negative information shock to stock market therefore, induces investors to flight-to-quality as substitute of safe assets. In such circumstances, pressure in assets prices emerged because of flow to bond market from the stock market, thus causing liquidity of both bond and stock market. Because of information shock, there is also a possibility that both stock and both market liquidity complement each other's. For instance, if central banks exercise an expansionary monetary policy, an increase in funding could trigger the order flow in both bond and stock markets thus causes a potential change in both markets liquidity position. In addition, Further, systematic informational or capital shocks could persuade positively associated trading activity across fixed income securities and equity thus causing a co-movement in liquidities across these markets.

In a related stream, Adrian and Shin (2010) provided a thorough explanation of a long intermediation chain and transmission of liquidity shocks in modern financial markets. Of particular interest, in circumstances, where financial markets are not liquid, high demand for asset is likely to put increasing pressure on its prices, which in turn is likely to generate a potential for feedback effect. This implies that, a stronger balance sheet would desire higher demand for assets and resultantly raising in the prices of assets would in turn lead to stronger balance sheet. The process also holds true in a reverse circumstances or in downturns. For instance, if there is imperfection in the market in terms of liquidity, excess supply of asset is likely to lay a downward pressure on assets

prices. Resultantly, a potential for feedback would tend to generate where weaker balance sheet would cause substantial assets sale. This phenomenon would likely depress the prices of assets and will cause a fragile balances sheet. Noting further, the authors argue that in a circumstance where financial intermediary's financial leverage is procyclical, the abnormal nature of reaction to change in prices are even stronger. Drawing on these lines, Florackis et al. (2014a) documented the role of broad money supply in the liquidity provision to the financial markets. Of particular interest, they noted that in the modern financial system, crucial role of financial intermediaries entails change in the monetary stance by the central banks to induce macro-liquidity shocks that can be transmitted vis-à-vis intermediation chain, which ultimately affect investors in the market.

The role of business cycle components in explaining stock liquidity appears to be more prominent in three (China, India and Pakistan equity markets) out of five selected emerging equity markets. The findings related to the business cycles and stock market liquidity nexus in Asian emerging equity markets are not only in line with previous research studies (i.e. Galariotis and Giouvris, 2015 ;Florackis et al. 2014 b; Smimou, 2014; Næs et al. 2011) in quote- driven market but also confirm the theoretical expectations of Næs et al (2008). The authors expected that, a surge in market participation in economic booms would lead to amplify competition and enhance market liquidity specifically in limit order-driven markets where no designated specialists exist to provide liquidity to the market. A rationale for this expectation is largely driven by "consumption- commitment" hypothesis. It follows that, few groups of investors are hit by economic decline before others and that cost of trading increases as these groups of investor with high consumption commitment will have to liquidate their stock to finance consumption. In such case, one should expect a positive relationship between stock liquidity and participation and an

association between state of economy and stock market liquidity (Næs et al. 2011). Næs et al. (2011) also noted that association between real economy and assets prices can be entrenched through consumption smoothing. This implies that current prices of assets should encompass information about market participants' expectations about future real economy, if investors pay more for assets that payoff when there is economic downturn than assets that payoff when economy is considered to be in a good state. The authors further noted that such kind of observed effects are the outcomes of individual investors shift in aggregate portfolios. In such situations, changes in investors' expectations about real economy drive shifts in desired portfolios.

The observed relationship between stock market liquidity and business cycle components can also be viewed in a signaling mechanism of the stock market. Since market liquidity can act as leading informative indicators of economic condition, thus set of investors can use the revealed information about the economic condition. This intuition is more practicable at the time of negative outlook or distress about future state of economy. At a time of distress or uncertainty about the economy, investors are likely to shift their funds/assets from risky investment to short term or fixed income securities or government bonds, thus reducing their exposure or depart from the stock market altogether (flight to quality). If the shifts in investor's portfolio composition are driven by fear of market liquidity dry-up fear then *flight-to-liquidity* is prominent (Longstaff, 2004). Further, the actions of investors specifically institutional investors tend to correlate at time of financial crunch and hence the effect of portfolio rebalancing becomes more pronounced. This effect is shown in the model of Brunnermeier and Pedersen (2009) where underlying process between funding liquidity and market liquidity ultimately

convert into a liquidity spiral. When a liquidity spiral phenomenon happens, institutional investors are compelled to move their stock holding to securities with low margins.

This observed relationship between stock market liquidity and the real economy can possibly be viewed vis-à-vis production side of economy (Skjeltorp et al., 2008) and investment channel (Næs et al., 2011). Both investors and firms consider liquidity differently (Tirole, 2008). Form firm point of view, if a firm can use assets as "as a cushion" to address pressing needs then an asset is considered liquid, while traders consider stock as liquid if large amount of it can traded with no significance change in its prices. Naes et al. (2008) provide alternative an explanation by noting that, both stock market index and Treasury bond index might be equally liquid given the microstructure understanding. According to production side of the view, a Treasury bond, however by definition is extra liquid as compared to stock market index because stock market index mislays its worth during recession. In the context of investment and productivity channel, Eisfeldt (2004) developed a model where liquidity endogenous variations are linked with fundamentals such as investment and productivity. More specifically, the author shows that returns on risky asset expand as productivity increases, which causes a surge in investment given the attractiveness of these assets, thus leads to an expansion in liquidity of risk assets.

The two-way relationship between stock market liquidity and foreign equity flow/fund flow suggests that foreign equity flow affects and is affected by local stock market liquidity both in Malaysia and in Thailand. This finding is consistent of that with Agudelo (2010) that the inflow of foreign equity investment has a lasting impact on local

stock market liquidity; however, in the short run, foreign investors aggressively demand market liquidity.

While liberalization literature justified the role of foreign investors in local stock market dynamics, there are at least two channels, which justify this two-way relationship between stock market liquidity and foreign equity inflow /fund flow. These two channels include real friction effect and information friction effect (see for instance, Ding et al, 2013; Agudelo, 2010; Stoll, 2000). In the case of former, foreign investors can change the level of trading. The existence of foreign traders can influence the real friction element of stock liquidity by shifting the trading level and activities. More specifically, as a results of foreign traders activities in the market trading intensity increases, thereby causing a decline in the real friction cost through dispersion of fixed real cost over increased trade (Stoll, 2000). Higher trading volume - by minimizing inventory cost to liquidity providers- appears to be correlated with higher liquidity in the inventory model of Ho & Stoll (1981). While, in the case of latter, there are mounting empirical evidence that foreign investors are better informed than average local investors.[59] The informational advantage is naturally a concern for market dealer. In the presence of informational advantage, dealers are agonized about the plausible losses of positioning against the informed investors; thereby, compelling them to amplify spreads (Ding et al, 2013). To put it differently, when foreign traders have better information in a day/ month for a given stock, foreign traders will be more inclined to actively buy the stock but, on the other hand, if foreign traders have bad information, the tendency of foreign trader will be

[59] For more details, see Grinblatt & Keloharju (2000); Seasholes (2004); Agudelo (2005); Huang & Shiu (2005). The asymmetric information model of Kyle (1985), Easley & O'Hara (1987) and Glosten & Milgrom (1985) also suggests because of informed trading foreign investors can cause decline in stock market liquidity.

stronger to sell the stock. Given this scenario, the net buy/sell volume will tend to put pressure on friction both in term of trading activities and spread.

The general inferences derived from the role of market decline (represented by financial crisis) in the liquidity of selected Asian emerging market are also consistent with the findings of Wang (2013) where he noted that unlike Hameed et al. (2010), the bull-bear market has no strong effect on the strong market liquidity of Asian emerging markets. In this study, the effect of a market decline on stock market liquidity is observed only in two (China and India) equity markets out of five equity markets.

CHAPTER 5

CONCLUSION

5.1 Introduction

Stock liquidity is viewed as one of the significant factors in modern financial markets. Generally, high levels of stock market liquidity have a reputation of offering substantial support to the financial system by means of higher asset prices. Hence, lack of liquidity in the stock market is naturally a concern for investors because investors stipulate a premium as a compensation for holding less liquid stock. This implies that less liquid stocks have higher required returns, which further follows that the stock return is an increasing function of stock illiquidity (Amihud and Mendelson, 1986). Empirical investigations have generally lent support to the notion that investors require a premium as a reward for holding less liquid stocks. Meanwhile liquidity shock hypothesis has also received immense attention following global financial crisis, which, argues that sudden evaporation in the liquidity of asset market causes equity price to fall and to increases the price of liquid assets (Kiyotaki and Moore, 2008). In addition, in circumstances where firms handle the financing constraints of their investment, such a fall in the asset prices decreases the funds which firms can raise by utilizing equity as collateral for borrowing, or issue equities.

Two decades of research on stock market liquidity has yielded several strands in the financial economics literature, ranging from micro-level to macro-level liquidity. Early evidence on the stock liquidity was related to measurement dimensions of liquidity that appeared in market microstructure literature. Some of these dimensions include trading cost, trading quantity, trading activity, trading speed, price reaction, and turnover. Chordia et al. (2000) coined the concept of commonalities in liquidity, which refers to the time

series phenomenon of co-movements in liquidity pattern due to some common fundamental determinants across assets in the stock market. Several successive empirical studies have tested this phenomenon both in the developed and emerging stock markets, thereby confirming the existence of commonalities in liquidity in the stock markets. Empirical studies have examined the role of macroeconomic forces in explaining stock market liquidity with new theoretical foundations. These studies suggest that stock liquidity is either influenced by business cycles (Taddei, 2007; Eisfeldt, 2004; Næs, Skjeltorp and Ødegaard, 2011), mutual fund flow (i.e. Massa, 2004), funding liquidity (i.e. Brunnermeier and Pedersen, 2009), and monetary policy (i.e. Fernández-Amador et al. 2013).

This study examined the role of macroeconomic variables in explaining stock market liquidity of five Asian emerging markets. In particular, this study addressed three major objectives. First, it was examine the role of macroeconomic forces in determining market liquidity in a set of Asian emerging stock markets; second was to compare the role of macroeconomic forces in market liquidity across the set of Asian emerging markets. Third was to investigate causality/reverse causality/feedback effect between market liquidity and macroeconomic variables across the set of Asian emerging markets. To address these objectives, this study drew on three strands of literature, namely, the role of monetary policy, the role of business cycles, and the role of investors flow components in explaining the stock market liquidity. This study used monthly macroeconomic and stock market illiquidity measures over the period of January 2000 to December 2014 and therefore, employs three kinds of analyses. The contributions of this study to the knowledge are four-fold: First, this study examined the role of macroeconomic variables in explaining stock market liquidity in order-driven Asian emerging markets. Second, this study took into account the role of foreign equity/fund flow while modeling

macroeconomic variables against stock market liquidity. Third, this study also took into account the role of market decline as a major structural break while modeling macroeconomic variables and stock market liquidity. Fourth, this study extended the Granger causality analysis to Innovative Accounting Approach to examine the dynamic causal relationship between macroeconomic variables and stock market liquidity. The findings of this study are sequentially summarized below according to the objectives outlined in Chapter One.

5.2. Summary of Preliminary Statistics

This study first presented the summary statistics of key variables of the study. Of particular interest, this study noted large disparities in the level of stock market illiquidity measures across Asian emerging markets. The findings of large disparity in the level of stock market liquidity are consistent with the findings of Wang (2013) where he reported that there is large disparity in liquidity in Asian emerging markets and exhibit high kurtosis and skewness, thus representing excessive spikes in the market liquidity pattern in these markets. In regards to stock market liquidity ranking, preliminary statistics suggest that, according to Amihud measures of stock market illiquidity, the Bombay Stock Exchange and the Stock Exchange of Thailand exhibited high stock market liquidity while the Karachi Stock Exchange exhibited low market liquidity. The findings from the Roll's measure of stock market liquidity- largely denoting the implicit spread dimension of stock market liquidity- suggesting that China, Pakistan, and Thailand stock markets exhibit relatively higher implicit spread than Malaysian and Indian equity markets. In the cross–country settings, stock market liquidity ranking could be largely attributed to, for instance, the trading aspect of liquidity are used while measuring stock market liquidity, lower/higher trading pattern, domination of nominal shocks to capitalization, price

discovery factor in Amihud measure of stock illiquidity, order imbalance and differences in investors' beliefs on the implications of news.

5.3 Summary of Major Findings

This section presents summary of major findings according to key objectives outlined in the chapter 1. Three kinds of analyses were conducted to achieve these objectives.

5.3.1 Macroeconomic Variables and Stock Market Liquidity in the Selected Asian Emerging Markets (RO1)

This section summarizes findings related to the first objective of this study. First objective of this study is as follow.

***RO1*:** To examine the role of macroeconomic variables in explaining market liquidity in the selected Asian emerging markets

To achieve RO1, this study estimates both long and short run coefficients of macroeconomic variables with market liquidity across the selected Asian emerging markets. After having preliminary information about the cointengrated relationship between macroeconomic variables and measures of stock market liquidity, this study leveraged on the VECM model to estimate the benchmark model using two measures of stock market liquidity. This study first reported the long run estimates of macroeconomic variables, which are generally robust to both the measures of stock market illiquidity. In a set of monetary policy components, monetary base has no statistically significant impact on stock market liquidity in four out of five Asian emerging markets in long run. The impact of monetary base is only statistically significant in the case of the Thailand stock markets, which suggest that expansion (contraction) in monetary base decrease (increases) stock

market illiquidity. The long run results of second measure of monetary policy suggest that increases in policy rate lead to increase in stock market illiquidity in three out of five stock markets[60] in long run.

Further, the long run estimates of business cycle components suggest that increases in real economic activities decrease stock market illiquidity in Chinese, Pakistan and Indian stock markets while the impact of real economic activities on stock market illiquidity is statistically insignificant in both the Malaysian and the Thailand stock markets. The impact of inflation on stock market liquidity is statistically significant in three out of five equity markets. The coefficient of inflation suggest that increases in inflation significantly increases stock market illiquidity in the Chinese, Indian and Thailand stock markets while this impact is statistically insignificant in the Pakistan and the Malaysian Stock markets in the long run.

The long run estimates further suggest that impact of net foreign equity flow /net fund flow on stock market illiquidity appeared significant in four out of five Asian emerging equity markets. In particular, increase in net foreign equity flow decreases stock market illiquidity in the Shanghai stock exchange, the Karachi stock exchange, the Thailand Stock Exchange in the long run. The positive long run coefficient of net fund flow in the case of Bursa Malaysia suggests that net fund flow significantly increases the stock market illiquidity of Bursa Malaysia and hence adverse impact of net fund flow on stock market liquidity is noted in the case of Bursa Malaysia.

The overall results of long run analysis suggest that that monetary policy, business cycles, and foreign inflow play a significant role in explaining the increase/decrease of

[60] Karachi Stock Exchange, Bombay Stock Exchange, and Thailand Stock Exchange

Asian emerging stock market illiquidity in the long run. In particular, expansion in monetary policy and real economic activities generally decreases the market illiquidity of selection Asian emerging markets. In the monetary policy components, policy rate appeared to be more influential in explaining the changes in market liquidity in four out of five emerging markets. The general conclusion drawn from the long run coefficients of macroeconomic variable suggest that although macroeconomic variables do influence stock market liquidity in the Asian emerging markets, the impact of macroeconomic variables on stock market liquidity, however, varies across markets. This is consistent with Galariotis and Giouvris (2015) argument that unlike Neas et al. (2011), the relationship between macroeconomic variables and stock liquidity is not a global phenomenon rather it is more country-specific because markets do not behave in the same manner.

Concerning the short run estimates, the impact of each macroeconomic variable on stock market liquidity is assessed with three lags vis-à-vis error correction model (ECM). To this end, this study tested the impact of macroeconomic variables against two measures of stock market illiquidity and coefficients are generally robust for both the measures of stock market liquidity. The findings suggest that, in the short run, monetary bases have statistically significant impact on stock market illiquidity only in t China and Indian stock markets in varying lags, while policy rate has a statistically significant impact only in the China stock market. Concerning the business cycle components, real economic activities have a statistically significant impact on stock market liquidity in the three out of five Asian emerging markets in a varying lags[61], while inflation has significant impact on stock market liquidity of the Shanghai Stock exchange and the Bombay Stock Market in varying

[61] Shanghai Stock exchange, Karachi Stock Exchange and Bombay Stock Market

lags[62]. This study further noted that, in the short run, the impact of net foreign equity flow/ net fund flow appears significant in four out of five Asian emerging markets. The findings further concluded that the impact of market decline following global financial crisis appeared to be statistically insignificant in the Karachi, the Malaysian and the Thailand equity markets. The impact of market decline appeared significant only in the equity markets of China and India.

5.3.2 Comparison of Macroeconomic Source of Market Liquidity Across Asian Emerging Markets (RO 2)

RO 2: To compare the role of macroeconomic forces in market liquidity of selected Asian emerging Markets

Using the same long run and short run estimates, this study then compared the role of macroeconomic variables in explaining stock market liquidity of selected Asian emerging market, the following general conclusions are drawn from the short run and long run analysis.

First, macroeconomic variables produce significant changes in market illiquidity in the selected Asian emerging equity markets. The disparity in the significance of macroeconomic variables across the selected Asian emerging market suggest that not all variables in all selected Asian emerging markets influence stock market illiquidity; rather, the effect of macroeconomic variables on stock market illiquidity varies in individual equity market. For instance, the coefficients of monetary policy are more notable and robust to both the illiquidity measures in the Shanghai and Bombay equity markets at varying lags in the short run. This implies that expansionary (contractionary) monetary

[62] In all three lags of Shanghai Stock exchange and 1st and 3rd lags in Bombay Stock Market

policy decreases (increases) stock market illiquidity in the equity markets of China and India. There is also evidences of the impact of monetary base and interest rate on the stock market liquidity of Karachi stock exchange; the coefficients of both these variables, however are not robust in both the measures of stock market illiquidity in the short run. Similarly, the coefficient of interest rate in the case of Bursa Malaysia in the short run is also not robust to second measure of stock market illiquidity.

Second, the role of business cycle components is notable in three out five Asian emerging equity markets and is generally robust to both the measures of stock market illiquidity. In particular, increase (decrease) in real economic activities decreases (increases) stock market illiquidity in the Shanghai, the Karachi, and the Bombay equity markets. In addition, increase (decreases) in inflation in these three markets increases (decreases) stock market illiquidity in the short run. Within the business cycle components, the role of inflation in increasing (decreasing) stock market illiquidity of the Shanghai, the Karachi, and the Bombay equity markets are notable in the short run. The coefficients of business cycles further that suggest both the real economic activities and inflation do influence market illiquidity of the Bursa Malaysia and Thailand respectively; the coefficients however are not robust to second measures of stock market illiquidity.

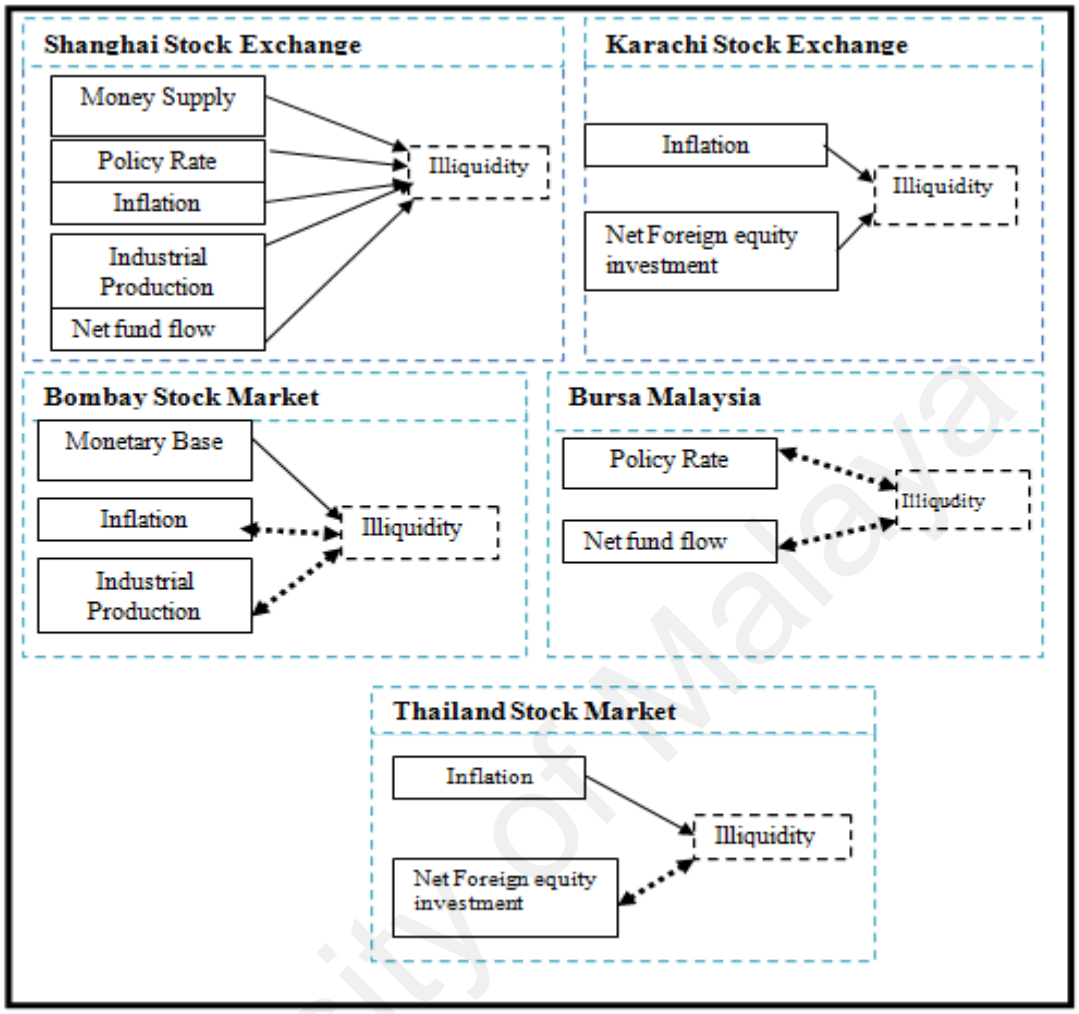
Third, the role of foreign equity flow/fund flow appears to be significant and robust in both measure of stock illiquidity in all selected Asian emerging markets except for Bombay equity market in the short run. The coefficients of fund flow in the Shanghai and Bursa Malaysia suggest that increase (decreases) in foreign fund flow decreases (increases) stock market illiquidity in the short run. Similar evidence is recorded for stock markets of Karachi and Thailand where increases (decreases) in foreign equity flow decreases (increases) stock market illiquidity.

5.3.3 Causalities/ Reverse Causalities/ Feedback between Macroeconomic Variables and Stock Market Liquidity (RO 3)

RO3*:* To investigate causality/reverse causality/feedback effect between market liquidity and macroeconomic variables in the selected Asian emerging markets

To achieve RO 3, this study conducted Granger causality and Innovative Accounting Approach to examine the direction of causality, strength and exact magnitude of contribution of one variable in another variable. This study first exercised VECM Granger causality between macroeconomic variables and measures of stock market illiquidity. Based on the results of Granger Causality, it is concluded, that there is unidirectional causality runs from monetary base, money supply, policy rate, industrial production and inflation to stock market illiquidity in the Shanghai Stock Exchange and the Bombay stock Market.

Further, there is unidirectional causality run from net fund flow and foreign equity flow to stock market illiquidity in the case of the Shanghai stock market and the Karachi stock market. Inflation causes stock market illiquidity in the case of the stock market of Thailand and the Karachi stock market. The causality analysis led to the conclusion that, there is bidirectional causality between inflation and stock market illiquidity in the case of the Bombay stock market and there is bidirectional causality between net fund flow/ foreign equity flow and stock market illiquidity in the case of the stock market of Thailand and Bursa Malaysia



Note: (⟶) Shows unidirectional causality from macroeconomic variables to stock market liquidity while (⟷) shows bidirectional causality between macroeconomic variables and stock market liquidity.

Figure 5.1 Summary of Granger causality between macroeconomic variables and stock market liquidity in selected Asian emerging markets

The Innovative Accounting Approach (IAA) focuses on joint assessment of Variance Decomposition Analysis (VDA) and Impulse Response Function (IRF) to demonstrate the direction, magnitude, and strength of causality. The IAA also assists in examining the robustness of Granger causality. Motivated by the limitations of the VECM Granger causality, the IAA extends the causality analyses to examine the impact of shocks by exercising Innovative Accounting Approach (IAA). This study first summarizes the results of Forecast Error Variance Decomposition followed by IRF. Just like long run, short

run analysis and Granger causality analysis, the contribution of macroeconomic variables in explaining stock market liquidity and vice versa varies across the markets in selected Asian emerging markets. For instance, in the Shanghai stock Market, one innovative shock to both the components of business cycles jointly contribute 55.84% in the stock market liquidity while rest of contributions in the stock market liquidity is by one standard innovative shock in money supply, policy rate, net fund flow and shocks to stock market liquidity itself.

Similarly, in the case of the Karachi Stock market, one innovative shock to both the business cycle components jointly contribute 48.84 % innovation in stock market liquidity followed by 14.78% contribution by net foreign equity flow. This study further concludes that in the case the Bombay stock market, one standard innovative shock in monetary base explain 27.58 % innovation in the stock market liquidity, followed by 33.40% innovation of inflation in the stock market liquidity. In the case of the Bursa Malaysia, one standard innovative shock to net fund flow appears to contribute to stock market liquidity by 14% while one standard innovative shock to stock market liquidity in Bursa Malaysia contributes to net fund flow by 55.33% in Bursa Malaysia. Similar pattern is noted in the case the Thailand stock market. For instance, one standard innovative shock to foreign equity flow contributes 27.38 % innovation in the liquidity of Thailand stock market while one standard innovative shock to stock market liquidity contributes innovation in net foreign equity flow by 35.78%. This study further concludes that in both the cases of Bursa Malaysia and the Thailand stock market, there is a *feedback effect* between stock market liquidity and net foreign equity/fund flow.

Concerning the results of IRF, similar conclusions are derived from the results across the selected markets. The summary of IRF of both measures of stock market

illiquidity and macroeconomic variables is presented in the Table 5.1. This study noted that shocks to macroeconomic variables cause stock market illiquidity in Asian emerging market generally, however the impact of shocks varies from across the stock markets. For instance, in the case the Bombay stock market, the Shanghai Stock Market, and the Karachi Stock Market, the role of monetary policy and business cycles components are more dominant such that one unit standard innovation shocks to the components monetary policy and business cycles negatively (positively) causes stock market illiquidity in these markets. This impact is generally robust to both the measures of stock market illiquidity. The role of net foreign equity/ fund flow is more dominant in the case of Bursa Malaysia and the Stock market of Thailand. One standard innovation shock to net fund flow positively impacts on stock market illiquidity, and one standard innovation shock to net foreign equity flow negatively impact stock market illiquidity which is consistent with the results earlier studies.

The results of impulse response function further conclude that there are reverse causalities/feedback effect between net foreign equity/fund flow and stock market illiquidity in the Bursa Malaysia and the Thailand stock market, while feedback between business cycle components and stock market illiquidity is notable in the Shanghai Stock Market. There is also a weak evidence of feedback effect/reverse causality between business cycles components and stock market illiquidity in the case of Bombay stock market, while there is no reverse causality/feedback effect between any macroeconomic variable and stock market liquidity in the case of the Karachi Stock Market.

Table 5.1 Summary of Impulse Response Function

Asian Emerging Markets

Variables		Shanghai Stock Market	Karachi Stock Market	Bombay Stock Market	Bursa Malaysia	Thailand Stock Market
		Panel (A):Response of stock market illiquidity to one Unit standard Innovation shock in macroeconomic Variables				
Monetary Base	*Ami*	(-/+)	(-)	(-/+)	(Nil)	(Nil)
	RPI	(-)	(-)	(-)	(Nil)	(Nil)
Policy Rate	*Ami*	(-)	(+)	(+)	(Nil)	(Nil)
	RPI	(Nil)	(Nil)	(-/+)	(Nil)	(Nil)
Industrial Production	*Ami*	(-)	(-)	(-/+)	(Nil)	(Nil)
	RPI	(-)	(-)	(-)	(Nil)	(Nil)
Inflation	*Ami*	(+)	(+)	(-/+)	(Nil)	(Nil)
	RPI	(+)	(+)	(+)	(Nil)	(+)
Net foreign equity/ fund Flow	*Ami*	(Nil)	(-)	(Nil)	(+)	(-)
	RPI	(-)	(Nil)	(Nil)	(+)	(-)
		Panel (B): Response of macroeconomic variables to one standard innovation shock in stock market illiquidity				
Monetary Base	*Ami*	(Nil)	(+/-)	(Nil)	(Nil)	(Nil)
	RPI	(-)	(Nil)	(Nil)	(Nil)	(Nil)
Policy Rate	*Ami*	(Nil)	(Nil)	(+)	(Nil)	(Nil)
	RPI	(Nil)	(Nil)	(Nil)	(Nil)	(Nil)
Industrial Production	*Ami*	(-)	(Nil)	(+/-)	(Nil)	(Nil)
	RPI	(-)	(Nil)	(+/-)	(Nil)	(Nil)
Inflation	*Ami*	(+)	(+)	(-)	(Nil)	(+)
	RPI	(+)	(Nil)	(+/-)	(Nil)	(Nil)
Net foreign equity/ fund Flow	*Ami*	(Nil)	(Nil)	(+)	(+)	(+)
	RPI	(+)	(-)	(Nil)	(+)	(+)

`Note: (+) and (-) denotes a positive response and negative response respectively, (-/+) denotes both positive/negative response in different horizons, (Nil) denotes zero or uncertain response from a unit standards innovation shock. Panel (A) shows response of stock market illiquidity due to one unit standard innovation shocks in macroeconomic variables while panel (B) shows response of macroeconomic variables due to one unit standard innovation shock in stock market illiquidity. The *Ami* and *RPI* represent Amihud Price impact and Roll Price impact measures of stock market illiquidity.

5.4 Implications

This study provides empirical evidence on the role of macroeconomic variables in explaining stock market liquidity in selected Asian emerging markets. The findings of this study provide several implications in general and to individual markets in particular. The implications of study are broadly divided into two categories namely practitioners/investors, and policy makers/regulators.

5.4.1 Practitioners/Investors

As far as practical investment is concerned, a sound understanding of liquidity dynamics with changing macroeconomic conditions in the markets could assist investors /traders to frame better investing strategies. Evaluating the macroeconomic source of liquidity in the financial markets would facilitate traders to make decisions on their liquidity exposures. Consequently, trader's confidence will increase with the better understanding of common factors that affect market liquidity, thus guiding them to proficient resource distribution (Chordia et al., 2003). Market liquidity can act as leading informative indicators of economic condition, thus a set of investors can use the revealed information about the economic condition. This intuition is more practicable at the time of negative outlook or distress about future state of the economy. In times of distress or uncertainty about the economy, investors are likely to shift their funds/assets from risky investment to short term or fixed income securities or government bonds, thus reducing their exposure or depart from the stock market altogether (flight-to-quality).

Since both stock liquidity and real economic activities mutually reinforce each others in few markets, investors in these markets may find it useful that when the economic outlook is good, they can develop aggressive investing strategies and shift their capital to

equity markets from other products in the market to reap benefits from high liquidity assets. On the onset of recession, the surge in the supply of liquid assets can potentially settle down the financing constraints of the firms, thereby stabilizing their equity prices, which are equally beneficial to investors and firms. Once prices of equity are stabilized, the situation could boost firms' capabilities to take advantage of equity market to finance their investment with reduced cost of capital.

5.4.2 Policy Makers/ Regulators

Given that market risk is not diversifiable, it is a policy concern for central banks and regulators. Common liquidity shocks may cause spontaneity in traders' attitude about the market; consequently, it could lead to a market crash (Fernando and Herring, 2003). The sensitivity of stock market liquidity to macroeconomic variables particularly, monetary policy and business cycles components suggests that, if there is an unexpected shock to stock liquidity which is caused by real economic activities, then policy makers/authority can reduce the impact of diminished real economic activities by increasing the counter-cyclicality of supply of liquid assets. When business cycles dynamics change and there is possibility of recession, central banks can exercise liquid assets to acquire assets to hedge against the sharp decline in equity prices.

Since order-driven markets do not have any designated market makers who can provide liquidity to the market, providing more dominance to the liquidity profile of equity market by the authorities can potentially lessen the investment risk as this will offer a saver to buy up equities fast enough with low cost associated with it. Adding a liquidity profile to the equity market would enhance the liquidity of the market, which will improve the capital allocation resultantly, therefore leading to more investment and perpetuity in selling and

buying of equities. In addition, firms' illiquid equity is more exposed to external shocks, a liquidity provision to equity markets can significantly reduces the liquidity risk faced by traders, which could potentially lead reduction in cost of equity capital in future fund generation and hence increases in real economic activities (Lerner and Schoar, 2004; Levine, 1991).

The negative impact of inflation on stock market liquidity can be a concern for regulators in three Asian emerging stock markets. The results suggest that, increase in inflation increases stock market illiquidity by outward flow from the stock market. This outward flow is largely driven by "consumption-smoothing" which implies that, a few groups of investors are hit by economic decline before others, and that cost of trading increases as these groups of investor with high consumption commitment will have to liquidate their stock to finance their consumption. Increases in inflation can also serve as sources of information about the health of economy. This entails that, in accordance with state of economy, changes in investors' expectation about real economy bring changes in their desires portfolios. This implies that current prices of assets should encompass information about market participants' expectations about future real economy, if investors pay more for assets that payoff when there is economic downturn than for assets that payoff when economy is considered to in a good state. To diminish the impact of inflation on stock market illiquidity, authorities can exercises inflation-targeting policies through a market-based intervention to provide liquidity to investors those who have held long positions in the equity market.

The negative impact of interest rate on stock market liquidity also suggests exercising appropriate monetary policy. Appropriate in the sense that, expansionary monetary policy should be exercised with caution, particularly in time of extreme market

decline because cuts in the interest rate can potentially be used as signaling tools by the investors. Conventional tools of monetary policy such as lowering of interest rate may be unproductive since investors perceived cut in interest rate as a signal of weak economic condition. As a result, this motivate market participants to "flight to safety", either from stock market to bond market, or from small capitalization stocks (less liquid) to large capitalization stocks (more liquid) (Florackis et al. 2014b). In both cases, the effect of such measures can potentially be damaging to the financial stability of the market since fleeing from the market or switching between assets could initialize downward spiral and thus pose major threat to the financial system.

Finally, the two-way relationship between foreign equity flow /fund flow in the Thailand stock market and the Bursa Malaysia has also implications for both markets. In general, this two-way relationship implies that foreign equity investors demand liquidity in the market and also provide liquidity to the market. It is further follows that, in circumstances where market liquidity dries up, foreign investors may not be willing to invest in the equity market. If a market exhibits liquidity, this can attract foreign investors for participation and trading. Resultantly, they can further push the liquidity of the market upward. In the case of the Bursa Malaysia in particular, the negative relationship between net fund flow and stock market illiquidity suggests that, in the short run outflow of foreign funds negatively affect the liquidity position of the local market. This negative effect suggests foreign equity/fund flow governance for the foreign investors for a long term equity investment in local Bursa. In the governance, policy makers can consider removal of barriers, legal assistance, encouraging foreign equity/funds investors to stay in market with funds buying tendency rather than selling and fleeing from the market. Similarly, regulators could assist the local Bursa by providing liquidity through financial

intermediation to stabilize the liquidity of the Bursa in the case of extreme liquidity crunch, which could resultantly attract and make foreign fund flow stay in the market and hence bring perpetuity in the liquidity to the local Bursa. Such efforts from the regulators /policy makers however should not be without assessing the costs and benefits associated with such measures.

5.5 Limitations and Future Research

This study is subject to a few limitations, which future research can take into consideration. First, this study does not take into account bond market into consideration given its non-availability of data for a complete time period. The consideration of bond market jointly with monetary policy, and business cycle components is important. It is important in the sense that, when bond market is taken into consideration, "flight to liquidity" or "flight to safety" phenomenon can effectively be examined in these markets. Further, the impact of central bank policies appears obvious on bond market because of monetary policy instruments and other open market operations. As suggested Keynes arguments, the ultimate influence of monetary policy is reliant on the relative attractiveness of other assets (which could be a bond market in this case). Chordia et al. (2005) noted that the influence of monetary shocks on stock market liquidity can noted through comovement across asset classes. In particular, they noted that a number of asset allocation strategies shift capital between bond and stock market in practice. A negative information shock to stock market therefore compels investors to flight-to-quality as substitute for safe assets. In such circumstances, pressure on assets prices emerged because of flow to bond market from the stock market, thus causing liquidity of both bond and stock markets. Because of information shocks, there is also a possibility that both stock and both market liquidity complement each others.

Similarly, the impact of business cycle component on bond and stock market liquidity can also be viewed in a signaling mechanism. Since market liquidity can act as leading informative indicators of economic condition, thus set of investors can use the revealed information about the economic condition. This intuition is more practicable in times of negative outlook or distress about future state of the economy. In times of distress or uncertainty about the economy, investors are likely to shift their funds/assets from risky investment to short term or fixed income securities or government bonds, thus reducing their exposure or they just depart from the stock market altogether. If the shifts in investor's portfolio composition are driven by market liquidity dry-up fear, then flight-to-liquidity is prominent (Longstaff, 2004).

On methodology side, given the time-varying nature of stock market liquidity and changing dynamics of casual relationship, information spill over, regime shifts and evolutions in financial markets over time, future research can consider regime switching model testing and time-varying and asymmetric causality among, monetary policy, state of business cycles, and bond market to examine linkages between these three key strands.

REFERENCES

Acharya, V. V., & Pedersen, L. H. (2005). Asset pricing with liquidity risk. *Journal of Financial Economics*, *77*(2), 375-410.

Acharya, V., & Schaefer, S. (2006). Liquidity risk and correlation risk: Implications for risk management. *London Business School*

Adrian, T., & Shin, H. S. (2010). Liquidity and leverage. *Journal of Financial Iintermediation*, *19*(3), 418-437.

Agudelo, D. A. (2010). Friend or foe? Foreign investors and the liquidity of six Asian markets. *Asia-Pacific Journal of Financial Studies*, *39*(3), 261-300.

Agudelo, D., (2005). Home advantage or big fish? Do local or foreigner traders know more about the Indonesian market? Working Paper, Indiana University, Bloomington, IN.

Allen, F., & Gale, D. (2005). From Cash-In-The-Market Pricing To Financial Fragility. *Journal of the European Economic Association*, *3*(2-3), 535-546.

Amihud, Y. (2002). Illiquidity and stock returns: cross-section and time-series effects. *Journal of Financial Markets*, *5*(1), 31-56.

Amihud, Y., & Mendelson, H. (1980). Dealership market: Market-making with inventory. *Journal of Financial Economics*, *8*(1), 31-53.

Amihud, Y., & Mendelson, H. (1986). Asset pricing and the bid-ask spread. *Journal of Financial Economics*, *17*(2), 223-249.

Amihud, Y., & Mendelson, H. (1989). The effects of beta, bid-ask spread, residual risk, and size on stock returns. *Journal of Finance*, 479-486.

Andrieș, A. M., Ihnatov, I., & Tiwari, A. K. (2014). Analyzing time–frequency relationship between interest rate, stock price and exchange rate through continuous wavelet. *Economic Modelling*, *41*, 227-238.

Apergis, N., Artikis, P. G., & Kyriazis, D. (2015). Does Stock Market Liquidity Explain Real Economic Activity? New Evidence from Two Large European Stock Markets. *Journal of International Financial Markets, Institutions and Money, Forthcoming.*

Avramov, D., Chordia, T., & Goyal, A. (2006). Liquidity and autocorrelations in individual stock returns. *The Journal of Finance*, *61*(5), 2365-2394.

Bae, K. H., Chan, K., & Ng, A. (2004). Investibility and return volatility. *Journal of Financial Economics*, *71*(2), 239-263.

Bai, M., & Qin, Y. (2015). Commonality in liquidity in emerging markets: Another supply-side explanation. *International Review of Economics & Finance*,*39*, 90-106.

Bailey, W., Cai, J., Cheung, Y. L., & Wang, F. (2009). Stock returns, order imbalances, and commonality: Evidence on individual, institutional, and proprietary investors in China. *Journal of Banking & Finance*, *33*(1), 9-19.

Baker, M., & Stein, J. C. (2004). Market liquidity as a sentiment indicator. *Journal of Financial Markets*, *7*(3), 271-299.

Baradarannia, M. R., & Peat, M. (2013). Liquidity and expected returns—Evidence from 1926–2008. *International Review of Financial Analysis*, *29*, 10-23.

Batten, J. A., & Vo, X. V. (2014). Liquidity and return relationships in an emerging market. *Emerging Markets Finance and Trade*, *50*(1), 5-21.

Bauer, W. (2004). Commonality in liquidity in pure order-driven markets. *National Centre of Competence in Research Working Paper*

Bekaert, G., & Harvey, C. R. (2000). Foreign speculators and emerging equity markets. *The Journal of Finance*, *55*(2), 565-613.

Bekaert, G., Harvey, C. R., & Lundblad, C. (2007). Liquidity and expected returns: Lessons from emerging markets. *Review of Financial Studies*, *20*(6), 1783-1831.

Bernardo, A. E., & Welch, I. (2004). Liquidity and financial market runs. *The Quarterly Journal of Economics*, 135-158.

Bhargava, A. (1986). On the theory of testing for unit roots in observed time series. *The Review of Economic Studies*, *53*(3), 369-384.

Blume, M. E., Mackinlay A. C., and Terker , B. (1989). Order Imbalances and Stock Price Movements on October 19 and 20, 1987. *The Journal of Finance* 44, 827–848.

Borio, C. E. (2004). Market distress and vanishing liquidity: anatomy and policy options. Available on SSRN, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=781228

Brennan, M. J., & Subrahmanyam, A. (1996). Market microstructure and asset pricing: On the compensation for illiquidity in stock returns. *Journal of Financial Economics*, *41*(3), 441-464.

Brockman, P., & Chung, D. Y. (2002). Commonality in Liquidity: Evidence from an Order-Driven Market Structure. *Journal of Financial Research*, *25*(4), 521-539.

Brown, P., Walsh, D., & Yuen, A. (1997). The interaction between order imbalance and stock price. *Pacific-Basin Finance Journal*, *5*(5), 539-557.

Brunnermeier, M. K. (2008). *Deciphering the liquidity and credit crunch 2007-08*(No. w14612). National Bureau of Economic Research.

Brunnermeier, M. K., & Pedersen, L. H. (2009). Market liquidity and funding liquidity. *Review of Financial Studies*, *22*(6), 2201-2238.

Campbell, J. Y., and Kyle, A.S.(1993). Smart Money, Noise Trading and Stock Price Behavior. *Review of Economic Studies* 60 (January 1993), 1-34

Chan, K., & Hameed, A. (2006). Stock price synchronicity and analyst coverage in emerging markets. *Journal of Financial Economics*, *80*(1), 115-147.

Chang, Y. Y., Faff, R., & Hwang, C. Y. (2010). Liquidity and stock returns in Japan: New evidence. *Pacific-Basin Finance Journal*, *18*(1), 90-115

Charoenseang, J., & Manakit, P. (2007). Thai monetary policy transmission in an inflation targeting era. *Journal of Asian Economics*, *18*(1), 144-157.

Chen, G., Xu, A., & Zhao, X. (2013). Institutional investors' involuntary trading behaviors, commonality in liquidity change and stock price fragility. *China Finance Review International*, *3*(1), 90-110.

Chetty, R., & Szeidl, A. (2007). Consumption commitments and risk preferences. *The Quarterly Journal of Economics,* 122(2), 831-877.

Cheung, Y. W., & Lai, K. S. (1993). Finite-sample sizes of Johansen's likelihood ratio tests for cointegration. *Oxford Bulletin of Economics and statistics*, *55*(3), 313-328.

Chiang, T. C., & Zheng, D. (2015). Liquidity and stock returns: Evidence from international markets. *Global Finance Journal*. Forthcoming

Chollete, L. (2004). Asset pricing implications of liquidity and its volatility. *Job Market Paper*, 1-50.

Chordia, T., Roll, R., & Subrahmanyam, A. (2000). Commonality in liquidity. *Journal of Financial Economics*, *56*(1), 3-28.

Chordia, T., Roll, R., & Subrahmanyam, A. (2001). Market liquidity and trading activity. *Journal of finance*, 501-530.

Chordia, T., Roll, R., & Subrahmanyam, A. (2002). Order imbalance, liquidity, and market returns. *Journal of Financial Economics*, *65*(1), 111-130.

Chordia, T., Sarkar, A., & Subrahmanyam, A. (2005). An empirical analysis of stock and bond market liquidity. *Review of Financial Studies*, *18*(1), 85-129.

Chordia, T., Subrahmanyam, A., & Anshuman, V. R. (2001). Trading activity and expected stock returns. *Journal of Financial Economics*, *59*(1), 3-32.

Chris, B. (2002). Introductory econometrics for finance. *International edition*.

Chu, X. (2014). Modelling impact of monetary policy on stock market liquidity: a dynamic copula approach. *Applied Economics Letters*, 22(10),820-824.

Cochrane, J. (2005). *Financial markets and the real economy* (No. w11193). National Bureau of Economic Research.

Comerton-Forde, C., & Rydge, J. (2006). The current state of Asia-Pacific stock exchanges: A critical review of market design. *Pacific-Basin Finance Journal*, *14*(1), 1-32.

Comerton-forde, Carole., Hendershott, T., Jones, C. M., Moulton, P. C., & Seasholes, M. S. (2010). Time Variation in Liquidity: The Role of Market-Maker Inventories and Revenues. *The Journal of Finance*,*65*(1), 295-331.

Constantinides, G. M. (1986). Capital market equilibrium with transaction costs.*The Journal of Political Economy*, *94*(4), 842.

Copeland, T. E., & Galai, D. (1983). Information effects on the bid-ask spread. *The Journal of Finance*, *38*(5), 1457-1469.

Corwin, S. A., & Lipson, M. L. (2011). Order characteristics and the sources of commonality in prices and liquidity. *Journal of Financial Markets*, *14*(1), 47-81.

Coughenour, J. F., & Saad, M. M. (2004). Common market makers and commonality in liquidity. *Journal of Financial Economics*, *73*(1), 37-69.

Dahlquist, M., & Robertsson, G. (2004). A note on foreigners' trading and price effects across firms. *Journal of Banking & Finance*, *28*(3), 615-632.

Das, M. S. (2015). *Monetary Policy in India: Transmission to Bank Interest Rates* (No. 15-129). International Monetary Fund.

Das, S. R., & Hanouna, P. (2009). Hedging credit: Equity liquidity matters. *Journal of Financial Intermediation*, *18*(1), 112-123.

Datar, V. T., Naik, N. Y., & Radcliffe, R. (1998). Liquidity and stock returns: An alternative test. *Journal of Financial Markets*, *1*(2), 203-219.

De la Torre, A., Gozzi, J. C., & Schmukler, S. L. (2007). Stock market development under globalization: Whither the gains from reforms?. *Journal of Banking & Finance*, *31*(6), 1731-1754.

Demsetz, H. (1968). The cost of transacting. *The Quarterly Journal of Economics*, 33-53.

Dickey, D. A., and Fuller, W. A. (1979). Distribution for the estimates for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74, 427–31

Ding, M., Nilsson, B., & Suardi, S. (2013). Foreign Institutional Investors and stock market liquidity in China: State ownership, trading activity and information asymmetry. *The Knut Wicksell Centre for Financial Studies, Lund University Working Paper*, *14*.

Domowitz, I., & Wang Beardsley, X. (2002). Liquidity, liquidity commonality and its impact on portfolio theory. *Available at SSRN 296870*.

Domowitz, I., Hansch, O., & Wang, X. (2005). Liquidity commonality and return co-movement. *Journal of Financial Markets*, *8*(4), 351-376.

Easley, D., & O'hara, M. (1987). Price, trade size, and information in securities markets. *Journal of Financial Economics*, *19*(1), 69-90.

Eckbo, B. E., & Norli, O. (2002). Pervasive liquidity risk. *Available at SSRN 996069*.

Eisfeldt, A. L. (2004). Endogenous liquidity in asset markets. *The Journal of Finance*, *59*(1), 1-30.

Elliott, G., Rothenberg, T. J., & Stock, J. H. (1992). Efficient tests for an autoregressive unit root. *Econometrica,* 64 (4), 813-836

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: Journal of the Econometric Society*, 251-276.

Errunza, V. R., & Miller, D. P. (2000). Market segmentation and the cost of the capital in international equity markets. *Journal of Financial and Quantitative analysis*, *35*(04), 577-600.

Escanciano, J. C., & Lobato, I. N. (2009). An automatic portmanteau test for serial correlation. *Journal of Econometrics*, *151*(2), 140-149.

Fabre, J., & Frino, A. (2004). Commonality in liquidity: evidence from the Australian stock exchange. *Accounting & Finance*, *44*(3), 357-368.

Fecht, F., & Grüber, P. (2012). Interaction of Funding Liquidity and Market Liquidity–Evidence from the German Stock Market. LUISS International Conference on Money, Banking and Finance.

Fecht, F., Nyborg, K. G., & Rocholl, J. (2011). The price of liquidity: The effects of market conditions and bank characteristics. *Journal of Financial Economics*, *102*(2), 344-362.

Fernald, J. G., Hsu, E., & Spiegel, M. M. (2014). Has China's economy become more "standard"?. *FRBSF Economic Letter*, *2014*, 30.

Fernández-Amador, O., Gächter, M., Larch, M., & Peter, G. (2013). Does monetary policy determine stock market liquidity? New evidence from the euro zone. *Journal of Empirical Finance*, *21*, 54-68.

Fernando, C. S. (2003). Commonality in liquidity: Transmission of liquidity shocks across investors and securities. *Journal of Financial Intermediation*,*12*(3), 233-254.

Fernando, C. S., Herring, R. J., & Subrahmanyam, A. (2008). Common liquidity shocks and market collapse: Lessons from the market for perps. *Journal of Banking & Finance*, *32*(8), 1625-1635.

Florackis, C., Gregoriou, A., & Kostakis, A. (2011). Trading frequency and asset pricing on the London Stock Exchange: Evidence from a new price impact ratio. *Journal of Banking & Finance*, *35*(12), 3335-3350.

Florackis, C., Kontonikas, A., & Kostakis, A. (2014 a). Stock market liquidity and macro-liquidity shocks: Evidence from the 2007–2009 financial crisis. *Journal of International Money and Finance*, *44*, 97-117.

Florackis, C., Giorgioni, G., Kostakis, A., & Milas, C. (2014 b). On stock market illiquidity and real-time GDP growth. *Journal of International Money and Finance*, *44*, 210-229.

Fujimoto, A. (2003). Macroeconomic sources of systematic liquidity. *Unpublished working paper. Yale University*.

Fujimoto, A. (2004). *The Role of Systematic Liquidity in Financial Markets* (Doctoral dissertation, Yale University).

Galariotis, E. C., & Giouvris, E. (2007). Liquidity commonality in the London stock exchange. *Journal of Business Finance & Accounting*, *34*(1-2), 374-388.

Galariotis, E., & Giouvris, E. (2015). On the stock market liquidity and the business cycle: A multi country approach. *International Review of Financial Analysis*, *38*, 44-69.

Garman, M. B. (1976). Market microstructure. *Journal of Financial Economics*,*3*(3), 257-275.

Gibson, R., & Mougeot, N. (2004). The pricing of systematic liquidity risk: Empirical evidence from the US stock market. *Journal of Banking & Finance*,*28*(1), 157-178.

Glick, R., & Hutchison, M. (2013). China's financial linkages with Asia and the global financial crisis. *Journal of International Money and Finance*, *39*, 186-206

Glosten, L. R., & Milgrom, P. R. (1985). Bid, ask and transaction prices in a specialist market with heterogeneously informed traders. *Journal of Financial Economics*, *14*(1), 71-100.

Goh, S. K., & McNown, R. (2015). Examining the exchange rate regime–monetary policy autonomy nexus: Evidence from Malaysia. *International Review of Economics & Finance*, *35*, 292-303.

Gorton, G. B. (2009). *Information, liquidity, and the (ongoing) panic of 2007* (No. w14649). National Bureau of Economic Research.

Goyenko, R. (2005). Stock and Bond Pricing with Liquidity Risk. Working paper, Indiana University

Goyenko, R. Y., & Ukhov, A. D. (2009). Stock and bond market liquidity: A long-run empirical analysis. *Journal of Financial and Quantitative Analysis*,*44*(01), 189-212.

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica: Journal of the Econometric Society*, 424-438.

Granger, C. W. (1981). Some properties of time series data and their use in econometric model specification. *Journal of Econometrics*, *16*(1), 121-130.

Granger, C. W. (1988). Some recent development in a concept of causality. *Journal of Econometrics*, *39*(1), 199-211.

Grinblatt, M., & Keloharju, M. (2000). The investment behavior and performance of various investor types: a study of Finland's unique data set. *Journal of Financial Economics*, *55*(1), 43-67.

Gromb, D., & Vayanos, D. (2002). Equilibrium and welfare in markets with financially constrained arbitrageurs. *Journal of Financial Economics*, *66*(2), 361-407.

Grossman, S. J., & Miller, M. H.. (1988). Liquidity and Market Structure. *Journal of Finance* 43:617–33

Gyu Choi, W., & Cook, D. (2005). *Stock Market Liquidity and the Macroeconomy: Evidence from Japan*. IMF WP/05/6, January.

Hall, S. G. (1991). The effect of varying length VAR models on the maximum likelihood estimates of cointegrating vectors. *Scottish Journal of Political Economy*, *38*(4), 317-323.

Hameed, A., Kang, W., & Viswanathan, S. (2010). Stock market declines and liquidity. *The Journal of Finance*, *65*(1), 257-293.

Han Kim, E., & Singal, V. (2000). Stock Market Openings: Experience of Emerging Economies. *The Journal of Business*, *73*(1), 25-66.

Harris, L. (1990). Statistical Properties of the Roll Serial Covariance Bid/Ask Spread Estimator. *Journal of Finance* 45:579–90

Hasbrouck, J., & Seppi, D. J. (2001). Common factors in prices, order flows, and liquidity. *Journal of financial Economics*, *59*(3), 383-411

Hatemi-J, A. (2004). Multivariate tests for autocorrelation in the stable and unstable VAR models. *Economic Modelling*, *21*(4), 661-683.

Heaton, J., and Lucas D. (1996). Evaluating the Effects of Incomplete Markets on Risk Sharing and Asset Prices. *Journal of Political Economy* 104:443–87.

Henker, T., & Martens, M. (2008). Price discovery and liquidity in basket securities. *Financial Review*, *43*(2), 219-239.

Henry, P. B. (2000). Do stock market liberalizations cause investment booms?.*Journal of Financial Economics*, *58*(1), 301-334.

Ho, T., & Stoll, H. R. (1981). Optimal dealer pricing under transactions and return uncertainty. *Journal of Financial economics*, *9*(1), 47-73.

Holmstrom, B., & Tirole, J. (2002). Domestic and international supply of liquidity. *American Economic Review*, 42-45.

Huang, M. (2003). Liquidity Shocks and Equilibrium Liquidity Premia. *Journal of Economic Theory* 109:104–29

Huang, R. D., & Shiu, C. Y. (2005). Overseas monitors in emerging financial markets: Evidence from foreign ownership in Taiwan. *Available at SSRN 875365*.

Huberman, G., & Halka, D. (2001). Systematic liquidity. *Journal of Financial Research*, *24*(2), 161-178

Ibrahim, M. H. (2005). Sectoral effects of monetary policy: evidence from Malaysia. *Asian Economic Journal*, *19*(1), 83-102.

Ibrahim, M. H. (2007). The Yen-Dollar Exchange Rate And Malaysian Macroeconomic Dynamics. *The Developing Economies*,*45*(3), 315-338.

Jacoby, G., Fowler, D. J., & Gottesman, A. A. (2000). The capital asset pricing model and the liquidity effect: A theoretical approach. *Journal of Financial Markets*, *3*(1), 69-81.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, *12*(2), 231-254.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration with applications to the demand for money. *Oxford Bulletin of Economics and statistics*, *52*(2), 169-210.

Jones, C. M. (2002). A century of stock market liquidity and trading costs. *Available at SSRN 313681*.

Jun, S. G., Marathe, A., & Shawky, H. A. (2003). Liquidity and stock returns in emerging equity markets. *Emerging Markets Review*, *4*(1), 1-24.

Kairys, J. P., Kruza, R., & Kumpins, R. (2000). Winners and losers from the introduction of continuous variable price trading: Evidence from the Riga Stock Exchange. *Journal of Banking & Finance*, *24*(4), 603-624.

Kamara, A., Lou, X., & Sadka, R. (2008). The divergence of liquidity commonality in the cross-section of stocks. *Journal of Financial Economics*,*89*(3), 444-466.

Karolyi, G. A., Lee, K. H., & Van Dijk, M. A. (2012). Understanding commonality in liquidity around the world. *Journal of Financial Economics*,*105*(1), 82-112.

Keynes, J. M. (1930). *A Treatise on Money: In 2 Volumes*. Macmillan & Company.

Kiyotaki, N., & Moore, J. (2008). Liquidity, monetary policy and business cycles. *Princeton University*.

Koch, A., Ruenzi, S., & Starks, L. T. (2009). Commonality in liquidity: a demand-side explanation. In *AFA 2010 Atlanta Meetings Paper*.

Korajczyk, R. A., & Sadka, R. (2008). Pricing the commonality across alternative measures of liquidity. *Journal of Financial Economics*, *87*(1), 45-72

Krishnan, R., & Mishra, V. (2013). Intraday liquidity patterns in Indian stock market. *Journal of Asian Economics*, *28*, 99-114.

Krugman, P. (1999). *What happened to Asia* (pp. 315-327). Springer US.

Kuttner, K. N. (2001). Monetary policy surprises and interest rates: Evidence from the Fed funds futures market. *Journal of Monetary Economics*, *47*(3), 523-544.

Kwiatkowski, D., Phillips, P. C., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root?. *Journal of Eeconometrics*,*54*(1), 159-178.

Kyle Albert, S. (1984). A theory of futures market manipulation. *The Industrial Organization of Futures Markets*.

Kyle, A. S. (1985). Continuous auctions and insider trading. *Econometrica: Journal of the Econometric Society*, 1315-1335.

Kyle, A. S., & Xiong, W. (2001). Contagion as a wealth effect. *The Journal of Finance*, *56*(4), 1401-1440.

Lam, K. S., & Tam, L. H. (2011). Liquidity and asset pricing: Evidence from the Hong Kong stock market. *Journal of Banking & Finance*, *35*(9), 2217-2230

Lauterbach, B., & BEN-ZION, U. R. I. (1993). Stock market crashes and the performance of circuit breakers: Empirical evidence. *The Journal of Finance*,*48*(5), 1909-1925.

Lee, J. (2013). Funding Liquidity and Its Risk Premium. *Available at SSRN 1795480*.

Lerner, J., & Schoar, A. (2004). The illiquidity puzzle: theory and evidence from private equity. *Journal of Financial Economics*, *72*(1), 3-40.

Lesmond, D. A. (2005). Liquidity of emerging markets. *Journal of Financial Economics*, *77*(2), 411-452.

Levine, R., & Zervos, S. (1998). Stock markets, banks, and economic growth. *American Economic Review*, 537-558.

Liang, S. X., & Wei, J. K. (2012). Liquidity risk and stock returns around the world. *Journal of Banking & Finance*, *36*(12), 3274-3288.

Liew, V. K. S. (2004). Which lag length selection criteria should we employ?.*Economics Bulletin*, *3*(33), 1-9.

Lin, C. (2010). Financial liberalization and liquidity commonality. *Unpublished working paper, National University of Singapore*.

Lipson, M. L., & Mortal, S. (2009). Liquidity and capital structure. *Journal of Financial Markets*, *12*(4), 611-644.

Liu, W. (2006). A liquidity-augmented capital asset pricing model. *Journal of Financial Economics*, *82*(3), 631-671.

Llorente, G., Michaely, R., Saar, G., & Wang, J. (2002). Dynamic volume-return relation of individual stocks. *Review of Financial Studies*, *15*(4),1005-1047.

Lo, A. W., & Wang, J. (2000). Trading volume: definitions, data analysis, and implications of portfolio theory. *Review of Financial Studies*, *13*(2), 257-300.

Lowe, A. (2014). The demand-side explanation for commonality in liquidity: The role of institutional ownership in the Taiwan Stock Exchange. *Pacific-Basin Finance Journal*, *29*, 59-85.

Lu-Andrews, R., & Glascock, J. L. (2010). Macroeconomic effects on stock liquidity. *Available at SSRN 1662751*.

Mainelli, M. (2007). Liquidity: Finance in Motion or Evaporation?. *Gresham College lecture, London, England, September*, *5*.

Marcet, A. (2005). Overdifferencing VARs is OK. *Manuscript, Universitat Pompeu Fabra*.

Marshall, B. R., & Young, M. (2003). Liquidity and stock returns in pure order-driven markets: evidence from the Australian stock market. *International Review of Financial Analysis*, *12*(2), 173-188.

Martınez, M. A., Nieto, B., Rubio, G., & Tapia, M. (2005). Asset pricing and systematic liquidity risk: An empirical investigation of the Spanish stock market. *International Review of Economics & Finance*, *14*(1), 81-103.

Martinez, M., Nieto B., Rubio ,G., and Tapia, M.. (2005). Asset Pricing and Systematic Liquidity Risk: An Empirical Investigation of the Spanish Stock Market. *International Review of Economics and Finance* 14:81–103

Massa, M. (2004). *Mutual Fund Competition and Stock Market Liquidity* (No. 4787). CEPR Discussion Papers.

McQuarrie, A. D., & Tsai, C. L. (1998). *Regression and Time series Model Selection* (Vol. 43). Singapore: World Scientific.

Miller, D. P. (1999). The market reaction to international cross-listings:: evidence from Depositary Receipts. *Journal of Financial Economics*, *51*(1), 103-123.

Morris, S., & Shin, H. S. (2004). Coordination risk and the price of debt. *European Economic Review*, *48*(1), 133-153.

Næs, R., Skjeltorp, J. A., & Ødegaard, B. A. (2008). Liquidity at the Oslo stock exchange. *Available at SSRN 1158410*

Næs, R., Skjeltorp, J. A., & Ødegaard, B. A. (2011). Stock market liquidity and the business cycle. *The Journal of Finance*, *66*(1), 139-176.

Narayan, P. K., & Zheng, X. (2011). The relationship between liquidity and returns on the Chinese stock market. *Journal of Asian Economics*, *22*(3), 259-266.

Narayan, P. K., Zheng, X., & Zhang, Z. (2011). Some hypothesis on commonality in liquidity: New evidence from the Chinese stock market.*Available at SSRN 2052120*.

Ng, S., & Perron, P. (2001). Lag length selection and the construction of unit root tests with good size and power. *Econometrica*, 1519-1554.

Nyborg, K. G., & Östberg, P. (2014). Money and liquidity in financial markets. *Journal of Financial Economics*, *112*(1), 30-52

O'hara, M. (1995). *Market microstructure theory* (Vol. 108). Cambridge, MA: Blackwell.

O'Hara, M. (2004). Liquidity and financial market stability. *National Bank of Belgium Working Paper*, (55).

Pastor, L., and Stambaugh, R. F. (2003). Liquidity Risk and Expected Stock Returns. *Journal of Political Economy* 111:642–85.

Patterson, K. (2000). *An introduction to applied econometrics: a time series approach*. Macmillan, 2000.

Perron, P., & Ng, S. (1996). Useful modifications to some unit root tests with dependent errors and their local asymptotic properties. *The Review of Economic Studies*, *63*(3), 435-463.

Pesaran, H. H., & Shin, Y. (1998). Generalized impulse response analysis in linear multivariate models. *Economics letters*, *58*(1), 17-29.

Phillips, P.C.B. & P. Perron (1988). Testing for Unit Roots in Time Series Regression. Biometrika, 75, 335-346.

Pukthuanthong-Le, K., & Visaltanachoti, N. (2009). Commonality in liquidity: Evidence from the Stock Exchange of Thailand. *Pacific-Basin Finance Journal*,*17*(1), 80-99.

Rhee, S. G., & Wang, J. (2009). Foreign institutional ownership and stock market liquidity: Evidence from Indonesia. *Journal of Banking & Finance*, *33*(7), 1312-1324.

Roll, R. (1984). A simple implicit measure of the effective bid-ask spread in an efficient market. *The Journal of Finance*, *39*(4), 1127-1139.

Sadka, R. (2003). Momentum, liquidity risk, and limits to arbitrage. *Unpublished working paper, Kellogg Graduate School of Management, Northwestern University*.

Sadka, R. (2006). Momentum and post-earnings-announcement drift anomalies: The role of liquidity risk. *Journal of Financial Economics*, *80*(2), 309-349.

Schwert, G. W. (1989). Tests for unit roots: A Monte Carlo investigation.*Journal of Business & Economic Statistics*, *20*(1), 5-17.

Seasholes, M. S. (2004). Re-examining information asymmetries in emerging stock markets. *University of California at Berkeley working paper*.

Selover, D. D., & Round, D. K. (1997). Business cycle transmission and interdependence between Japan and Australia. *Journal of Asian economics*,*7*(4), 569-602.

Shahbaz, M. (2012). Does trade openness affect long run growth? Cointegration, causality and forecast error variance decomposition tests for Pakistan. *Economic Modelling*, *29*(6), 2325-2339.

Shahbaz, M., Tahir, M. I., Ali, I., & Rehman, I. U. (2014). Is gold investment a hedge against inflation in Pakistan? A co-integration and causality analysis in the presence of structural breaks. *The North American Journal of Economics and Finance*, *28*, 190-205.

Shan, J., (2005). Does financial development lead economic growth? A vector auto-regression appraisal. *Applied Economics*, 37, 1353-1367

Sias, R. W. (1997). Price Pressure and The Role Of Institutional Investors In Closed-End Funds. *Journal of Financial Research*, *20*(2), 211-229.

Sims, C. A. (1980). Macroeconomics and reality. *Econometrica: Journal of the Econometric Society*, 1-48.

Sjö, B. (2008). Testing for unit roots and cointegration. *Nationalekonomiska institutionen, Lindköpings Universitet*.

Skjeltorp, J. A., & Ødegaard, B. A. (2009). The information content of market liquidity: An empirical analysis of liquidity at the Oslo Stock Exchange. *UiS Working Papers in Economics and Finance, University of Stavan-ger*, (35).

Skjeltorp, J. A., & Ødegaard, B. A. (2010). *Why do firms pay for liquidity provision in limit order markets?* (Working Paper No. 2010/12). Norges Bank.

Smimou, K. (2014). Consumer attitudes, stock market liquidity, and the macro economy: A Canadian perspective. *International Review of Financial Analysis*,*33*, 186-209.

Smimou, K., & Khallouli, W. (2015). On the intensity of liquidity spillovers in the Eurozone. *International Review of Financial Analysis*. Forthcoming

Söderberg, J.(2008). *Do macroeconomic variables forecast changes in liquidity? An out-of-sample study on the order-driven stock markets in Scandinavia*. No. 2009: 10. Centre for Labour Market Policy Research (CAFO), School of Business and Economics, Linnaeus University.

Stiglitz, J. E. (2000). Capital market liberalization, economic growth, and instability. *World development*, *28*(6), 1075-1086.

Stoll, H. R. (1978,a). The supply of dealer services in securities markets. *The Journal of Finance*, *33*(4), 1133-1151.

Stoll, H. R. (1978 b). The pricing of security dealer services: An empirical study of NASDAQ stocks. *The Journal of Finance*, *33*(4), 1153-1172.

Syamala, S. R., & Reddy, V. N. (2013). Commonality in Liquidity and its Determinants: An Empirical Examination of Stocks Listed on National Stock Exchange of India. *Available at SSRN 2255383*.

Taddei, F. (2007). Liquidity and economic fluctuations. *Available at SSRN 943067*.

Tirole, J. (2008). Liquidity shortages: theoretical underpinnings. *Banque de France Financial Stability Review: Special Issue on Liquidity*, *11*, 53-63.

Vayanos, D. (1998). Transaction costs and asset prices: A dynamic equilibrium model. *Review of Financial Studies*, *11*(1), 1-58.

Vayanos, D. (2004). *Flight to quality, flight to liquidity, and the pricing of risk*(No. w10327). National Bureau of Economic Research.

Vithessonthi, C., & Techarongrojwong, Y. (2012). The impact of monetary policy decisions on stock returns: Evidence from Thailand. *Journal of International Financial Markets, Institutions and Money*, *22*(3), 487-507.

Wang, J. (2007). Foreign equity trading and emerging market volatility: Evidence from Indonesia and Thailand. *Journal of Development Economics*,*84*(2), 798-811.

Wang, J. (2013). Liquidity commonality among Asian equity markets. *Pacific-Basin Finance Journal*, *21*(1), 1209-1231.

Watanabe, A. (2004). Macroeconomic sources of systematic liquidity. *Available at SSRN 598781*.

Wei, C. (2010). Do Foreign Institutions Improve Stock Liquidity?. *Available at SSRN 1571220*.

Wuyts, G. (2007). Stock market liquidity: Determinants and implications.*Tijdschrift voor Economie en Management*, *52*(2), 279.

Zheng, X. (2008). *Commonality in Liquidity: Evidence from the Chinese Stock Market* (Doctoral dissertation, University of Durham).

Zuo, H., & Park, S. Y. (2011). Money demand in China and time-varying cointegration. *China economic review*, *22*(3), 330-343.