

CAPITAL UNIVERSITY OF SCIENCE AND
TECHNOLOGY, ISLAMABAD



**Does Monetary Policy
Determines Liquidity? New
Evidence From Pakistan Stock
Market**

by

Qudsia Adalat

A thesis submitted in partial fulfillment for the
degree of Master of Science

in the

Faculty of Management & Social Sciences

Department of Management Sciences

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I wholeheartedly dedicated this thesis to my respected parents and teachers whose categorical encouragement and unconditional support made it possible for me to finish the work.



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ISLAMABAD

CERTIFICATE OF APPROVAL

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MMS151033

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Abstract

This dissertation examined the role of monetary policy on liquidity by using sample of 100 firms listed at Pakistan Stock Exchange (non-financial) for the period 2000-2017. As Pakistan is an emerging market with growing opportunities so people interest is increasing and investors are more concern about liquidity position of Pakistan market. So this study aims at investigating impact on both macro and micro level of monetary policy and liquidity. In first step, to explore impact of monetary policy on market liquidity simple regression is estimated in which the liquidity of market in month t is modeled as a function of the Industrial growth rate (IGR_t), Inflation rate (INF_t), market return (RM_t), standard deviation (SD_t) and real interest rate (INT_t). In second step, in-depth investigation is encountered that how announcement of new monetary policy determines the liquidity of individual stocks listed on PSX 100 index. For that purpose, panel regressions (fixed effect model) is estimated in which the liquidity ($LIQ_{(i,t)}$) of stock i in month t is modeled as a function of the (one-month lagged) SBP's monetary policy, the interaction term and other lagged control variables. Findings can be summarized as an expansionary (restrictive) monetary policy results in an increase (decrease) in liquidity. Firstly at stock market level, results confirm that expansionary monetary policy entails more liquid stock markets. Secondly, study complement the micro analysis and find that expansionary (restrictive) monetary policy results in an increase (decrease) in stock liquidity. This study is helpful for investors in devising investment plans on the basis of assessing certain facets of liquidity like risk, return, inflation rate, trading volume. Macro-economic dynamics should also be considered by policy makers.

Key words: Monetary Policy, Liquidity, Turnover, Standard Deviation, Return, Index of Industrial Production, Inflation Rate, Consumer Price Index.

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Abbreviations

PSX	Pakistan Stock Exchange
c	Vector of Intercept
CPI	Consumer Price Index
MP	Monetary Policy
STDV	Monthly Standard Deviation
RET	Equally Weighted Monthly Stock Return
SBP	State Bank of Pakistan
DV	Dependent Variable
MV	Market Value
IV	Independent Variable

Chapter 1

Introduction

1.1 Theoretical Background

Monetary policy and its influence on liquidity is one of the most debatable topic in recent periods. [Kumar and Misra \(2015\)](#) attempt to classify and organize the existing literature to provide a review of framework for modelling liquidity and its firm specific driver and macroeconomic factors. Liquidity is basically the essence of stock market. It is of key concern for the regulators, investors, traders, listed companies and stock exchange. The study related to asset liquidity document the significant co-movement shown by the liquidity of individual stocks. The systematic risk factor can be used to explain illiquidity and as the illiquidity risk cannot be diversified, as implied by the co-variation in stock liquidity.

This study is related to a growing literature in the area of monetary policy and its impact on liquidity. [Herwany et al. \(2017\)](#) studies the impact of monetary policy on stock market liquidity of Indonesian market. This work conclude the effectiveness of monetary policy on market liquidity and further conclude that there is negative relationship between monetary policy and stock price as well.

[Aouadi et al. \(2018\)](#) uses a large sample of 209 companies from 7 countries for the period 2004-2014 and explore that whether information is a significant determinant of stock liquidity. Result show that information is positively linked with

market liquidity i-e asymmetry of information and company overall visibility. Announcement of monetary policy can have noteworthy impact on the macro as well as individual stock level and can be a key factor in the determination of stock market liquidity. Existing literature support that day to day variation in prices are importantly affected by number of macroeconomic factors, such as changes in monetary policy.

To enable growth for economy, the Central Bank use to communicate through monetary policy. The money availability and its supply is controlled, the political aims are linked with economic level which are influenced by government. The macro-economic strength can be achieved by these aims. Central bank usually managed the monetary policy. The tool of policies in an economy have to predict the precise time and affect which is vital step for monetary authorities, for the process of monetary policy to be smooth and effective.

[Chu \(2015\)](#) explore the association between monetary policy and stock market liquidity in the market of China. Empirical result shows that contractionary monetary policy results in less liquid stock market, and highly liquid stocks are because of expansionary monetary policy. For post-crisis period monetary liquidity and stock liquidity rises significantly. Transmission channels are the tools that effect stock prices (exchange channel, asset price channel, trading volume channel, interest rate channel and credit channel etc). The anticipatory monetary and fiscal policy are highly delicate to stock market. But in different economies the delication may vary. Another study by [Hu et al. \(2018\)](#) investigate Chinese stock market. The impact of arrival of new information on market liquidity and its ultimate effect on stock prices. Using GAM model for the period between 1996 and 2013 in Chinese stock market result shows that because of asymmetry of information, uninformed trading encourages adverse information cost and liquidity improvement.

[Fleming and Remolona \(1999\)](#) propose that arrival of any new public information sets off at two-stage adjustment on prices, trading volume and bid-ask spreads. Release of any announcement (monetary policy release) causes a sharp and instantaneous price change significantly affecting liquidity. To standardize and govern

the economy the tool of monetary and fiscal policy are used. The researcher interest can be deliberated in the macro-economic management for the monetary policy importance. In developed and developing countries, the policy maker examine the effect of monetary policy on stock market liquidity.

All the related information can be quickly processed then, it is an efficient market. It is an endless discussion that the impact of monetary policy on stock market liquidity. In reality if monetary policy have impact on liquidity then efficient market includes rapid summarization of all monetary policy information.

1.1.1 Monetary Policy Of Pakistan

Vital role is played by monetary policy for economic stability. Through monetary actions State Bank of Pakistan execute monetary policy and control economic activities. We can divide monetary policy into two system while looking at historical background. Period before 1990s is first system and after that is second system. By using direct and indirect tools State Bank of Pakistan conduct monetary policy in Pakistan.

Monetary policy is being used by the central banks, as reported by Oxford Dictionary of Economics , as a control over money and its supply to effect the economy. Monetary policy intervene to ease financial crisis all over the world.

Action related to amendment in monetary policy have indirect effect on market variables such as changes in central bank discount rate. By using financial data, changes in monetary policy and its effect on liquidity can be identified. Asset pricing also play a significant role in transmission of monetary policy, so link between monetary policy and financial asset pricing is also highly important.

The supporting argument is based on signaling theory. With the assumption that information is not equally available to everyone in market i-e asymmetry of information between policy deviser & investor, thats why when policy maker design policy, it send an indication to market & market respond accordingly. With reference to macroeconomic direction of central bank, monetary policy rate sends

a signal to market. Market participants react differently to both contractionary & expansionary monetary policy.

Considering stock attributes as a key factor in determining individual stock liquidity, theory of market microstructure states that investors demand are translated into volumes. [Madhavan \(2000\)](#) conclude that there exists asymmetry of information as securities are not priced at their full price. That's the reason monetary policy affect stock market liquidity as the cost of financing and perceived risk may get affected by monetary policy.

Liquidity on the other hand plays a critical role for smooth operations of an economy. [Amihud et al. \(2006\)](#) define the ease of trading as a measure of liquidity of financial markets. Liquidity can be defined as cash convertibility without incurring additional cost. So far little work has been done related to the actual impact of monetary policy on liquidity and thereby addresses its role as a determinant of commonality in liquidity.

Relationship between aggregate stock liquidity and monetary policy have been examined empirically by number of studies and mix trend is observed. [Goyenko and Ukhov \(2009\)](#) reports that for US market for the period 1962-2003 there exist strong predictability power of monetary policy toward liquidity. Study finds that tight monetary policy results in positive shocks of fund rate and negative shock result in decreasing in market liquidity. Monetary policy shocks are being forwarded from bond market to stock market, bond market being served as a transmitter. However, [Chordia et al. \(2005\)](#) , explain that monetary policy has fair anticipating power for market liquidity.

[Söderberg et al. \(2008\)](#) investigate the period 1993 to 2005 and little evidence is observed related to impact of 14 macro-economic on liquidity variables. Study conclude that Oslo stock exchange plays an important role in the broad money growth. Similarly for Stockholm stock exchange result shows that liquidity can be predicted by the mutual fund flows and short term interest rate & evidence further conclude that in Copenhagen stock exchange policy rate play major role in explaining stock market liquidity. However, mixed evidence shows that no common variable exist to forecast liquidity for all above mentioned stock exchanges.

On the other hand, [Fujimoto \(2003\)](#)s explore the NYSE and AMEX stocks for time period 1965 to 1982. Result shows that liquidity increases with positive shocks to non-borrowed reserves and liquidity decreases because of upward shift in rate of federal fund rate. Study further contribute that for period 1983 to 2001 both these measures observed to be weak predictor of market liquidity.

This work is focused to explore the role of monetary policy as a common determinant of stock market liquidity & by observing relationship both at market level and individual stock level, the objective of study is to explore relationship between State Bank of Pakistan monetary policy interventions & its impact on stock market liquidity.

Using liquidity as dependent variable & monetary policy as independent variable, the purpose of the study is to examine the relationship between monetary policy and liquidity, with other control variables being employed. [Sensoy \(2016\)](#) investigate the effect of monetary policy i-e macroeconomic announcement on liquidity in Turkey market. The study infer that for developed countries monetary policy announcements raises liquidity. [Ma et al. \(2016\)](#) conduct cross-country studies on market liquidity to review literature on liquidity in international market. This review conclude that liquidity co-varies across countries and transparency and share issuance is positively associated with liquidity.

This dissertation is aimed to investigate the impact of monetary policy, firms specific variables and macro variables on liquidity of both non-financial companies listed at Pakistan Stock exchange (PSX) and Pakistan stock index respectively for the period 2000-2017. As Pakistan is an emerging market with growing opportunities so people interest is increasing and investors are more concern about liquidity position of Pakistan market. So this study aims at investigating impact on both macro and micro level of monetary policy and liquidity.

In first step, to explore impact of monetary policy on market liquidity simple regression is estimated in which the liquidity of market in month t is modeled as a function of the Industrial growth rate (IGR_t), Inflation rate (INF_t), market return (RM_t), standard deviation (SD_t) and real interest rate (INT_t). In second step, in-depth investigation is encountered that how announcement of new monetary policy

determines the liquidity of individual stocks listed on PSX 100 index. For that purpose, panel regressions (fixed effect model) is estimated in which the liquidity ($LIQ(i, t)$) of stock i in month t is modeled as a function of the (one-month lagged) SBP's monetary policy, the interaction term and other lagged control variables.

1.2 Problem Statement

Existing research shows that the monetary policy directly influence market volatility and return. However, very little work has been done so far in context of monetary policy and its possible impact on market liquidity and direct measure has limited evidence. Number of proxies have been identified and tested in various market. For liquidity, measures include Transaction cost, Price impact and Trading activity (Turnover rate, Trading volume). Keeping in view these, turnover rate is used as it is widely used proxy and can help in better explaining the liquidity. For monetary policy, it is generally agreed that interest rate should be used. The study is an effort to examine the possible impact a monetary policy can have on liquidity both at market level as well as for individual stocks liquidity.

1.3 Research Questions

Research questions are as follows.

1. Is there any relationship exist between monetary policy and aggregate market liquidity?
2. Is there any relationship exist between monetary policy and individual stock liquidity?

1.4 Research Objectives

Objectives of the study are as follows:

Research objective 1 The research objective is to provide insight about the monetary policy and its impact on stock market liquidity.

Research objective 2 To provide insight about the role of macroeconomic variables in explaining market liquidity.

Research objective 3 To explain the role of microeconomic variable in explaining the liquidity of individual stocks.

1.5 Research Significance

Previously work has been done in relation with monetary policy and stock market volatility or return. So far, limited literature exist related to market liquidity and its relationship with monetary policy. Monetary policy has been discussed either in relation to stock market return or volatility, rather for last two decades after the contribution of Amihud (1993) stock market liquidity has grasped the attention of researcher.

As Pakistan is an emerging market with growing opportunities so people interest is increasing and investors are more concerned about liquidity position of Pakistan market. But in Pakistan very limited work has been found on stock market liquidity and monetary policy at stock market level and individual stocks. So this study aims at investigating both at macro level and micro level.

Study of association between monetary policy and liquidity is new and mixed evidence is being observed. This work is contextual in nature which actually means that yet Pakistan market is not fully explored and investigated in the context of Pakistan monetary policy and its possible effect on stock market liquidity.

This work provides in-depth study of various factors that may affect liquidity of market and also of individual firm stock either positively or negatively. Existing literature is much extensive on return and volatility but this domain of research has been somewhat overlooked. This work is an attempt to contribute in terms of fulfilling the gap so that investors, policy makers and general public can have the hand on information related to liquidity both at market level as well as individual

firm level. As Pakistan is an emerging market with growing opportunities so people interest is increasing and investors are more concern about liquidity position of Pakistan market. So this study aims at investigating impact on both macro and micro level of monetary policy and liquidity.

In first step, to explore impact of monetary policy on market liquidity simple regression is estimated in which the liquidity of market in month t is modeled as a function of the Industrial growth rate (IGR_t), Inflation rate (INF_t), market return (RM_t), standard deviation (SD_t) and real interest rate (INT_t). In second step, in-depth investigation is encountered that how announcement of new monetary policy determines the liquidity of individual stocks listed on PSX 100 index. For that purpose, panel regressions (fixed effect model) is estimated in which the liquidity ($LIQ(i, t)$) of stock i in month t is modeled as a function of the (one-month lagged) SBP's monetary policy, the interaction term and other lagged control variables.

This dissertation help investors regarding their buying decision i-e which stocks are more liquid and where to invest or not. This also enable, market participants to have better understanding about important macro and micro-economic factors affecting liquidity while making investment plans. The base theory which help to understand the association between monetary policy and liquidity is signaling theory. According to this theory when new monetary policy is designed it send a signal to the market and market react accordingly upon the arrival of new information.

As we know that information is not equally available to everyone in the market and monetary policy effect both the risk of holding securities and cost of financing. So, we can hypothesized that stock market liquidity should be affected by monetary policy. This work is an empirical testimony about the above mentioned association of monetary policy and liquidity in the emerging market of Pakistan.

1.6 Organization Of Thesis

The study is organized in five chapters. Chapter 1 provides the introduction, background of the study, objective and significance of the research study. Chapter

2 is about extensive review of the previous studies. Chapter 3 explains the data employed and methodology used to analyze the data, Chapter 4 present the empirical results and discussions of findings. Conclusion and recommendations are presented in chapter 5.

Chapter 2

Literature Review

This study is related to a growing literature in the area of monetary policy and its impact on stock market liquidity. The macro-economic factor have noteworthy effect on stock market movement and monetary policy is an important factor in determination of liquidity. Existing literature tend to confirm that how announcements of macroeconomic affect day to day fluctuations in stock prices.

[Amihud and Mendelson \(1986\)](#) study investigate the relationship between stock returns and illiquidity, results indicate that stock returns have increasing effect on illiquidity. The investor demands high return for holding less liquid stocks for the compensation, this theoretical proposition is generally confirmed by the empirical literature. Another existing strand of literature is related to commonality in liquidity. [Kumar and Misra \(2015\)](#) attempt to classify and organize the existing literature to provide a review of framework for modelling liquidity and its firm specific driver and macroeconomic factors. Liquidity is basically the essence of stock market. It is of key concern for the regulators, investors, traders, listed companies and stock exchange. The study related to asset liquidity document the significant co-movement shown by the liquidity of individual stocks. The systematic risk factor can be used to explain illiquidity and as the illiquidity risk cannot be diversified, as implied by the co-variation in stock liquidity.

[Florackis et al. \(2014\)](#) study monetary policy, micro-liquidity and macro-liquidity by using data for the period 1999 and 2012 for UK stock market. Result shows

that there exist strong association between monetary policy and liquidity shocks. [Fernández-Amador et al. \(2013\)](#) explore the actual impression of monetary policy on stock liquidity. Result for European central bank shows that an expansionary monetary policy causes an increase in stock market liquidity in French, German and Italian markets.

[Jonathan & Oghenebrume \(2017\)](#) investigated Nigerian market by studying the association among monetary policy and stock market liquidity for the period 1985 to 2015. Result shows that exchange rate, monetary policy rate and broad money supply have significant impact on stock market liquidity in Nigeria. [Chu \(2015\)](#) explore the association between monetary policy and stock market liquidity in the market of China. Empirical result shows that contractionary monetary policy results in less liquid stock market, and highly liquid stocks are because of expansionary monetary policy. For post-crisis period monetary liquidity and stock liquidity rises significantly.

[Cochrane \(2005\)](#) states that liquidity is a difficult notion. In simple words it is defined as the ease of trading. One major cause of illiquidity is transaction costs such as taxes, fee related to order-processing, or stockbroker fees. The buyer/seller encounters a transaction cost every time a stock is traded and this continue throughout the life of the stock as buyer/seller further foresees cost upon future buying/selling.

[Christoffersen et al. \(2017\)](#) examine continuous model for stock market including market illiquidity as an economic variable as a dominating factor in explaining stock market crash risk in the context of volatility. Results highlight the importance of index return dynamics and conclude that increase in market volatility causes increase in market illiquidity. [M Friedman \(1963\)](#) examines the attitude of monetary policy by exploring monetary history of the United States. Study shows that measuring policy behavior is not an easy task. This work employs discount rate as monetary policy shocks and conclude that it has significant impact on market liquidity.

[Amihud and Levi \(2018\)](#) investigate the effect of firms investment and production on stock liquidity. This study conclude that investment is a diminishing function

of stock illiquidity. Result shows that investors expect higher return on illiquid stock because of increase in cost of capital. This study also show that firms with lower liquidity have lower capital ratio and higher output per unit of capital.

Another study by [Hu et al. \(2018\)](#) investigate Chinese stock market. The impact of arrival of new information on market liquidity and its ultimate effect on stock prices. Using GAM model for the period between 1996 and 2013 in Chinese stock market result shows that because of asymmetry of information, uninformed trading encourages adverse information cost and liquidity improvement.

[Armstrong et al. \(2017\)](#) documents that information shocks have significant effect on market liquidity. Based on the argument of signaling theory public information shocks effects trading i-e liquidity. Results show that positive information arrival immediately adjust prices however with the arrival of negative news prices responded with a delay ultimately combined with trading volume i-e liquidity innovations. [Albuquerque et al. \(2018\)](#) studied the key role played by asymmetric information on liquidity with respect to demand for private equity stakes between 2009 and 2016 of London-based stock market. Study shows that demand responses to liquidity shocks, when new information arrive liquidity conditions changes i-e demand for small funds increases.

[Tran et al. \(2018\)](#) examined Vietnamese stock market liquidity in different market conditions specifically in the context of ownership structure. Studies conclude that during 2008 financial crisis stock market experienced lower liquidity. During financial crisis liquidity declines. [Chen et al. \(2018\)](#) explore US equity markets for the time period of 1926-2015 to analyze the stock market returns and its impact on liquidity. This study finds a strong indication that liquidity forecasts stock market returns.

[Chowdhury et al. \(2018\)](#) explore eight emerging stock markets of Asia both at market level and firm level. This study examine the impact of fiscal and monetary policy on liquidity of emerging markets of Asia. This study employs four illiquidity measure and nine macroeconomic variables and conclude that changes in government expenditure, private borrowing and money supply significantly impact market liquidity. Short term interest rate, bank rate, cost of funds i-e government

borrowing significantly affect illiquidity. This work contribute that service sector is least affected. [Christiano et al. \(2005\)](#) present a model that observe impact of increase/decrease in inflation on stock market liquidity. Result show that expansionary shock to monetary policy causes a severe rise in marginal costs ultimately leads to illiquidity.

[ElBannan \(2017\)](#) work on the impact of capital structure on equity liquidity of US firms. This study uses uni-variate analysis and find a significant and positive association between leverage and liquidity. Further by using multivariate panel regression analysis. The study compare US firms with Egyptian firm and find insignificant association between stock liquidity and capital structure.

[Ellington \(2018\)](#) investigated UK market from 1988Q1 to 2016Q4 by using VAR model to study the link between macro-economic dynamics and financial market illiquidity. Number of proxies are used to capture liquidity conditions in the stock market and document that during 2008 recessions because of decline in GDP growth rate by 1.89% and inflation by 1.78%, illiquidity increases. [Lu-Andrews and Glascock \(2010\)](#) show the effect of macroeconomic factors on liquidity. Result explain that growth in industrial production has significant effect on the price of liquidity when market is in recession.

[Kim and Na \(2018\)](#) examine empirically pricing of liquidity risks and interpret the role of asymmetric distribution of the illiquidity in portfolio management and asset pricing. This work discover that the expected return by the investor should contain the premium for holding less liquid stocks. [Welker \(1995\)](#) find that disclosure policy stimuli market liquidity. Uninformed investors against adverse selection protect prices which is ultimately exhibited in market liquidity. The finding of the study shows that increase trading by informed investors with relevant information increase spread and strengthen the relationship between spread and disclosure policy. [Lucas Jr \(1990\)](#) analyses the government open-market operations i-e interest rate behavior and its impact on liquidity. This work assumes various factors on the basis of fisherian fundamentals and characterize nature of securities traded and the behavior of shocks.

[Garcia and Liu \(1999\)](#) examines the macro-economic determinants of stock market liquidity, specifically market capitalization. By using pool data for the time period from 1980 to 1995 for United States and Japan. The study finds that market capitalization is an important determinant of stock market liquidity.

[Fleming and Remolona \(1999\)](#) propose that arrival of any new public information sets off a two-stage adjustment on prices, trading volume and bid-ask spreads. Release of any announcement (monetary policy release) causes a sharp and instantaneous price change significantly affecting liquidity.

To examine the stocks liquidity in market this study uses the least one common factor which is suggested by abroad commonality, that is monetary policy. The limited literature of micro structure related to inventory indicates that inventory risk and inventory turnover effect stock market liquidity. This model propose that if participants in market can finance cheaply by their holding and holding assets have low risk, results indicate that the stocks are expected to be more liquid. The study show that monetary policy affect the stock market liquidity and the literature exhibit that risk of holding securities and cost of financing both are influenced by monetary policy.

[Barro and Gordon \(1983\)](#) investigated monetary policy and its link with unemployment and government revenue. A policy maker can create surprise inflation with respect to investors expectations. Result shows excessive monetary growth rate and inflation. Unemployment is independent of monetary policy. Monetary policy is being used by the central banks, as reported by Oxford Dictionary of Economics , as a control over money and its supply to effect the economy. Monetary policy intervene to ease financial crisis all over the world.

[Ruenzi et al. \(2018\)](#) introduce the concept of extreme downside liquidity risk (EDL) by combining the existing literature on systematic liquidity risk with downside return risk. The study shows that stock returns reveals premium for bearing EDL risk. This effect is more prominent after 1987 market crash. [Fallah and Hashemi \(2017\)](#) investigated the listed 77 companies in Tehran Stock Exchange for the period 2003-2013, multivariate regression model is used to examine the relation

between inflation and cash holdings (liquidity). Direct relationship is observed between inflation and liquidity.

[Drechsler et al. \(2017\)](#) propose that through change in nominal rate, the central bank affects the liquidity. The study concludes that lower nominal rates make liquidity cheaper. [Bekaert et al. \(2007\)](#) uses daily firm returns averaged over the month as a measure of liquidity and explore emerging equity markets. Study finds that expected returns in emerging market is a major driver of local market liquidity.

[Brogaard et al. \(2017\)](#) use the Securities and Exchange Commission decimalization regulation as a shock to stock liquidity and explore the association among risk (i.e. bankruptcy risk) and stock liquidity. The study concludes the mechanism that information efficiency has higher explanatory power toward stock liquidity. [Shahid and Gul \(2017\)](#) explore two South Asian emerging markets i.e. India and Pakistan to study the relationship between investment opportunities and liquidity by using pooled OLS fixed effect model over the data consist of listed companies in BSE and PSX for the time period 2010-2015. The study concludes that companies investment opportunities are positively related to liquidity. The work explains that investment opportunities for firms are vital for both external and internal liquidity.

[Ball \(1999\)](#) use Svensson-Ball model and investigate how optimal policy change affects economy. The study shows that in an open economies change in monetary policy impacts economy through exchange rate i.e. import prices as well as liquidity is significantly affected by it. [Drechsler et al. \(2017\)](#) present a new channel for the transmission of monetary policy i.e. the deposits channel. The study shows that increase in federal fund rates causes increase in spread which bank charge on deposits, ultimately impact liquidity premium. [Acharya and Naqvi \(2012\)](#) explore banking sector that how risk affects liquidity. The result shows that fight to quality results in abundant liquidity.

[Alom \(2013\)](#) use sample of 44-firm listed on Dhaka Stock Exchange (DSE) for the period 2004-2017 to explore the impact of firm specific factors on capital structure decision. Study finds that profitability and liquidity have negative impact on leverage. To enable growth for economy, the Central Bank uses monetary policy

to communicate. The money availability and its supply is controlled, the political aims are linked with economic level which are influenced by government. The macro-economic strength can be achieved by these aims. Central bank usually managed the monetary policy. The tool of policies in an economy have to predict the precise time and affect which is vital step for monetary authorities, for the process of monetary policy to be smooth and effective.

[Abudy et al. \(2018\)](#) study the illiquidity of securities by considering the trading frequency of the securities. The work estimate the model using discount on securities for lack of marketability and result show that due to reduction in discount the liquidity significantly decreases. [Mestel et al. \(2018\)](#) use the sample of 4.5 years from the Austrian equity market and explore the relation among trading and liquidity. By addressing the endogeneity problem result shows that increase in market share of algorithmic trading results in decrease in spread however price impacts are unaffected. [Cooper et al. \(1985\)](#) examines the relationship between exchange listing and price behavior with common stock liquidity during severe market fluctuations. High liquidity is set to be a desirable feature of a stock attractive to the investors who trade in large volume. Result show that price behavior effects liquidity. This study further conclude that exchange listing does not result in stock liquidity by taking firm capitalization into account.

[Zhang et al. \(2018\)](#) explore China non-tradable (illiquid) shares by using quasi-natural experiment. Considering firm value, result shows that improvement in firm value lead to higher stock liquidity. [Lavstuvkova \(2017\)](#) study the Slovenian banking sector by focusing on internal factors which may have possible impact on liquidity. Internal factors as independent variables include profits, capital, and size of the bank, loans and deposits with multiple dependent variables exploring different views of liquidity such as net change, outflow, and creation of liquidity, total reallocation and gross liquidity flows. This study conclude that internal factors have the greatest effect on the creation of liquidity.

[Al-Harbi \(2017\)](#) explore developing/less developing countries and uses OLS fixed effect model on unbalanced panel data over the period 1989-2008 for all commercial banks(686 banks) operational in Islamic countries and identify the key factors

affecting banks liquidity. Result shows that factors such as capital ratio, credit risk, inflation rate, monetary policy negatively affects bank liquidity. On the other hand, size, market capitalization, efficiency and concentration have positive link with bank liquidity. [Ho \(2017\)](#) explore the South Africa market by using data for the period 1975-2015. The study examines the macroeconomic determinants of stock market development (liquidity). It investigate the impact of economic growth, inflation rate, real interest rate and trade openness on South African stock market liquidity. The study conclude that inflation rate and trade openness have negative impact on long-run stock market development. While, economic growth have long-run positive effect.

[Trebbi and Xiao \(2017\)](#) investigate US market and examine the effect of post-crisis financial regulation on market liquidity. Result conclude that liquidity is massively upset because of post-crisis regulation. [Adrian et al. \(2017\)](#) discuss the wider trading environment by considering drivers of market liquidity. To examine market liquidity in the post-crisis, study uses the balance sheets data after the financial crisis of 2007-2009 of US treasuries and corporate bonds market. The result conclude limited evidence for worsening market liquidity is observed for high-frequency corporate bonds.

[Herwany et al. \(2017\)](#) studies the impact of monetary policy on stock market liquidity of Indonesian market. This work conclude the effectiveness of monetary policy on market liquidity and further conclude that there is negative relationship between monetary policy and stock price as well. [Aouadi et al. \(2018\)](#) uses a large sample of 209 companies from 7 countries for the period 2004-2014 and explore that whether information is a significant determinant of stock liquidity. Result show that information is positively linked with market liquidity i-e asymmetry of information and company overall visibility.

[Mishra et al. \(2017\)](#) finds a strong link between Federal Reserve Bank (FED) monetary policy and individual stock liquidity. The study uses US market data for the period 2003-2013 and find that liquidity of each US stocks with respect to change in monetary policy. Overall, positive relation between FED monetary

policy and market liquidity is observe. FED increase, increase in short sales, fall in bank credits negatively affect individual stock liquidity.

Transmission channels are the tools that effect stock prices (exchange channel, asset price channel, trading volume channel, interest rate channel and credit channel etc). The anticipatory monetary and fiscal policy are highly delicate to stock market. But with the different economy the delication may vary.

To standardize and govern the economy the mean of monetary and fiscal policy are used. The researcher interest can be deliberated in the macro-economic management for the monetary policy importance. In developed and developing countries, the policy maker examine the effect of monetary policy on stock market liquidity. [Schoenfeld \(2017\)](#) study the effect of voluntary disclosure on stock liquidity using index fund which includes the profile of indecisive traders are who are obvious to prefer high liquidity and high disclosure. The study conclude that disclosure of the information results in increase stock liquidity. [Schnabl and Hoffmann \(2008\)](#) study the impact of bursting bubbles on liquidity supply with influencing role of monetary policy in new and emerging markets. Investigating the market bubbles starting from 1980 i-e Japanese bubble to US 2007/2008 market crisis, the work conclude that policy announcements contribute much to market liquidity.

[Chordia et al. \(2004\)](#) conclude that during the crisis period expansion in monetary policy results in increase liquidity. The study uses bond and stock liquidity data for the time period 1991-1998 from data source of NYSE TAQ and ISSM (Institute for the study of securities market). The result also show that volatility shocks are useful in forecasting shifts in liquidity. All the related information can be quickly processed then, it is an efficient market. It is an endless discussion that the impact of monetary policy on stock market liquidity. In reality if monetary policy have impact on liquidity then efficient market includes rapid summarization of all monetary policy information.

Relationship between aggregate stock liquidity and monetary policy have been examined empirically by number of studies and mix trend is observed. [Goyenko and Ukhov \(2009\)](#) reports that for US market for the period 1962-2003 there exist strong predictability power of monetary policy toward liquidity. Study finds

that tight monetary policy results in positive shocks of fund rate and negative shock result in decreasing in market liquidity. Monetary policy shocks are being forwarded from bond market to stock market, bond market being served as a transmitter. However, [Chordia et al. \(2005\)](#), explain that monetary policy has fair anticipating power for market liquidity.

[Zhang \(2015\)](#) conclude that product market power with arrival of new information can pace up stock liquidity. Significant relation is being observe i-e with increased asymmetry of information market liquidity also increases. [Elshandidy and Neri \(2015\)](#) also examines the impact of risk on market liquidity with the key role of governance. By using sample of Italy and UK market study find that weakly governed companies tend to signal more rational risk information which leads to improve market liquidity. [Xiao \(2016\)](#) develop ARMA model for China market and explore that liquidity is said to lifeline which play a key role in maintaining the market dynamics of country and even across the globe. The study specifically studied Chinas commercial banks and propose that liquidity plays a key role.

[Capelle-Blancard and Havrylchyk \(2016\)](#) uses the data of French firm listed on Euornext to study the effect of securities transaction tax (STT) on market liquidity implemented in France during 2012. The result shows that implementation of tax has reduced stock trading i-e liquidity. [Peranginangin et al. \(2016\)](#) take trade-level data from Indonesian Stock Exchange to study the transmission mechanism with the help of which foreign trade may effects the market liquidity. Result concludes that trade encourages price discovery process which causes increase in liquidity. [Gomes and Waelbroeck \(2015\)](#) examine how market respond to liquidity with the arrival of new information for NASDAQ listed stocks. Results shows that new information causes prices adjustment which encourages buying and selling in the market.

[Ding and Hou \(2015\)](#) analyze S&P 500 stocks for the period 2004-2009 uses search volume index (SVI) of the stock to capture the effect of investor attention on stock liquidity. The results shows that change in SVI reflected by increase investor attention expand shareholder base which improves stock liquidity. [Ben-Rephael et al. \(2015\)](#) finds that stock liquidity has significantly improved over recent 4

decades. Improvement in trading activity decreases liquidity premium. Using sample of US stocks, this work conclude that liquidity is significantly priced for stocks which are small among listed NASDAQ stocks. [Gresse \(2017\)](#) uses data from eight stock exchanges the study explore how lit and dark market fragmentation affects liquidity. The study shows that neither lit order nor dark trading effects liquidity. [Benmelech et al. \(2017\)](#) explore automobile industry of United States to analyze the real impact of financial crisis on liquidity. The study conclude that decline in car sales during the time of financial crisis was because of credit supply shocks which is driven by the illiquidity of market.

[Bloomfield et al. \(2015\)](#) propose hidden liquidity and conclude that transparency of trading information noticeably increase the profit and trading activity of informed trader i-e liquidity depending upon the efficacy of arrived private information. [Sensoy \(2016\)](#) investigate the effect of monetary policy i-e macroeconomic announcement on liquidity in Turkey market. The study infer that for developed countries monetary policy announcements raises liquidity. [Ma et al. \(2016\)](#) conduct cross-country studies on market liquidity to review literature on liquidity in international market. This review conclude that liquidity co-varies across countries and transparency and share issuance is positively associated with liquidity.

[Koulakiotis et al. \(2015\)](#) highlight the importance of liquidity with respect to asymmetry of news spread and stock market volatility for pre and post 2009 global crisis in Athens Stock Exchnage (ASE). By using uni-variate EGARCH model, arrival of new information results in asymmetric behavior of volatility which effect liquidity of market. [Schestag et al. \(2016\)](#) uses daily data of US corporate bond market to compare all liquidity measure as there is no one consensus on a common liquidity measure.

[Söderberg et al. \(2008\)](#) investigated from period 1993 to 2005 and little evidence is observed related to impact of 14 macro-economic on liquidity variables. Study conclude that Oslo stock exchange plays an important role in the broad money growth. Similarly for Stockholm stock exchange result shows that liquidity can be predicted by the mutual fund flows and short term interest rate & evidence further conclude that in Copenhagen stock exchange policy rate play major role in

explaining stock market liquidity. However, mixed evidence shows that no common variable exist to forecast liquidity for all above mentioned stock exchanges.

On the other hand, [Fujimoto \(2003\)](#) explore the NYSE and AMEX stocks for time period 1965 to 1982. Result shows that liquidity increases with positive shocks to non-borrowed reserves and liquidity decreases because of upward shift in rate of federal fund rate. Study further contribute that for period 1983 to 2001 both these measures observed to be weak predictor of market liquidity.

[Strongin \(1995\)](#) examines the literature related to monetary policy disturbances. Its finding shows that monetary policy issued by Federal Reserve has a strong impact on US market liquidity. [Leeper and Gordon \(1992\)](#) studies the relation between monetary aggregates and liquidity effect i-e interest rate with main focus on monetary policy announcement. Mixed evidence is being observed and this study suggested that for complete characterization of the liquidity both policy behavior and identification of private information is required.

[Kumar and Prasanna \(2018\)](#) explore the cross relation between cross-market linkages and intensity of liquidity. Sample data consist of nine Asian market and five developed markets for the time period 2006 to 2016. The result shows that among the developed markets Germany, United Kingdom and United States market dynamics significantly affect liquidity, however, for developing countries like India, China, Singapore and Japan on an average receives 7% deviation from the global market and 16% from regional. The study also examined the illness caused by financial crisis and its impact on market liquidity.

Vital role is played by monetary policy for economy stability. Through monetary actions state bank of Pakistan executed monetary policy and control economics activities. We can divide monetary policy into two system while looking at historical background .Period before 1990s is first system and after that is second system. By using direct and indirect tools state bank of Pakistan conduct monetary policy in Pakistan.

The supporting argument is based on signaling theory. With the assumption that information is not equally available to everyone in market i-e asymmetry

of information between policy deviser & investor, that's why when policy maker design policy, it send an indication to market & market respond accordingly. With reference to macroeconomic direction of central bank, monetary policy rate sends a signal to market. Market participants react differently to both contractionary & expansionary monetary policy.

Considering stock attributes as a key factor in determining individual stock liquidity, theory of market microstructure states that investors demand are translated into volumes. [Madhavan \(2000\)](#) conclude that there exists asymmetry of information as securities are not priced at their full price. That's the reason monetary policy affect stock market liquidity as the cost of financing and perceived risk may get affected by monetary policy.

Liquidity on the other hand plays a critical role for smooth operations of an economy. [Amihud et al. \(2006\)](#) define the ease of trading as a measure of liquidity of financial markets. Liquidity can be defined as cash convertibility without incurring additional cost. So far little work has been done related to the actual impact of monetary policy on liquidity and thereby addresses its role as a determinant of commonality in liquidity.

[Christiano et al. \(2005\)](#) explains that liquidity is a difficult notion. In simple words it is defined as the ease of trading. One major cause of illiquidity is transaction costs such as taxes, fee related to order-processing, or stockbroker fees. The buyer/seller encounters a transaction cost every time a stock is traded and this continue throughout the life of the stock as buyer/seller further foresees cost upon future buying/selling.

Action related to amendment in monetary policy have indirect effect on market variables such as changes in central bank discount rate. By using financial data, changes in monetary policy and its effect on liquidity can be identified. Asset pricing also play a significant role in transmission of monetary policy, so link between monetary policy and financial asset pricing is also highly important.

The supporting literature which explore the effect of monetary policy on term structure includes ([Cook and Hahn, 1989](#); [Papadamou, 2013](#)).

[Fernandez \(1999\)](#) study that liquidity is considered as the life force for the financial market. For the smooth operation of economy liquidity plays very vital and critical role. Even in an individual instruments or single market segment, its unexpected erosion can create disturbance that are transferred through increasingly all around the world of globally linked and connected markets. But still despite of its significance, the measuring of risk associated to liquidity is not clearly defined. [Andersson et al. \(2006\)](#) that market liquidity and interest rate term structure are being affected by inflation reports & repo rate changes. It further conclude that unexpected change in the liquidity are driving forces for unexpected movements in the monetary policy rate. Whereas, short rates are affected by the published inflation reports. The above mentioned argument confirm that short term interest rate can be adjusting by using monetary policy signals, policy maker can also navigate future long term interest rate.

[Florackis et al. \(2010\)](#) demonstrate that arrival of new monetary policy has a number of appealing adjustment in terms of market liquidity i-e direct link between stock prices and trading costs because trading and transaction cost which cause correspondence affect that means a lot for asset pricing.

On the other hand, [Brunnermeier and Pedersen \(2008\)](#) propose a model between asset liquidity and funding liquidity & there interaction, Result shows that investors in which liquidity to market are unable to provide to the market are the one who are facing capital deficit and are unable to meet basic requirements i-e trader funding liquidity is reduced. Through higher margin requirements because of market liquidity. This cause higher equilibrium, lower liquidity and loss spiral. The model also explains that restrictive monetary policy uncomforted constraints for borrowing and thus, discourages the funding liquidity of market participants. Another logical argument is that business cycle movements play a significant role for both monetary policy and market liquidity. Thus, economy which are efficient and served as a transmission medium, one may forecast a noticeable impact of monetary policy on stock liquidity.

[Goyenko and Ukhov \(2009\)](#) reports that for US market for the period 1962-2003 there exist strong predictability power of monetary policy toward liquidity. Study

finds that tight monetary policy results in positive shocks of fund rate and negative shock result in decreasing in market liquidity. Monetary policy shocks are being forwarded from bond market to stock market, bond market being served as a transmitter.

[Chordia et al. \(2001a\)](#) well executed study shows that emphasis is made several times on the liquidity determinant from the time period of 1980s. [Barclay and Smith Jr \(1988\)](#) ; [Brockman and Chung \(1999\)](#) explain in literature that there are three main proxies of liquidity in micro structure variable such as volume, price and volatility.

[Chordia et al. \(2005\)](#) states that monetary policy predictive power reported for stock market liquidity. The NYSE stock is used as a sample and result shows that monetary policy is linked with the liquidity only at crisis period. The monetary policy is measured by using the federal fund and net borrowed results.

[Goyenko and Ukhov \(2009\)](#) explore the relationship between bond market and liquidity. Study shows that there exist lead-lag association among monetary policy and liquidity. Evidence supports that liquidity is impacted by monetary policy and study prove the illiquidity between bond and stock markets.

Empirical study conducted by [Söderberg et al. \(2008\)](#) explored stock exchanges of Scandinavian, Copenhagen, Oslo & Stockholm. Study uses 14 macro-economic variables for the period of 1993 to 2005 and find that interest rate and fund rate flow forecast liquidity in Stockholm stock exchange. Whereas, policy rate is able to predict Copenhagen stock exchange liquidity. Study conclude that no common variable exist to predict liquidity for all three exchanges.

Similarly, [Fujimoto \(2003\)](#) for the time frame of 1965 to 1982, explored the association among macro-economic variable and liquidity. Using data of AMEX & NYSE stocks, study concluded that liquidity decreases with increases in fund rate and it increases with positive shocks to non-borrowed reserves.

Taking finance theory and prevailing literature as a base, when it comes to think about exploring and analyzing the possible gateway through which monetary policy affect liquidity in short run, empirical evidence provide two possibilities.

Firstly, pre-announcement affects i-e calm before the storm. [Jones et al. \(1998\)](#) stated that liquidity of treasury market is lower which results in major economic data scattering i-e the calming effect and the days on which policy is announced, liquidity tends to be higher- the storm or news effect. This is also further supported by [Engle \(1998\)](#) and [Bomfim \(2003\)](#) and concluded such phenomenon are being observed in financial press.

Secondly, as the study conducted by [Harris and Raviv \(1993\)](#) & [Varian \(1989\)](#) found that monetary policy effect liquidity because of the nature of the news itself. Meaning that release of new policy results in spreading of new information i-e asymmetry of information, which get adjusted into asset prices and liquidity may adjust accordingly as newly arrived information is not equally available to everyone. This effect is called News effect.

[Adrian and Shin \(2009\)](#) study the liquidity meaning that the plentiful supply of credit. Liquidity nature can be understood by the financial intermediaries are important in a financial system and results show that the monetary policy is interconnected with the financial stability. The short term liabilities are used to finance the illiquid assets and long term are hold by the financial system. [Bernanke and Mihov \(1998\)](#) study the liquidity and explain the effect of liquidity in long run.

The study uses the long run monetary and liquidity effects are equally consistent. Consider the both propositions in context of structural VAR, using market model for bank reserves. [Bhide \(1993\)](#) study indicates the manager stockholder and stock market liquidity are closely interconnected. By providing internal monitoring agency cost reduce for active stockholders and also decreases stock liquidity by creating a problem of information asymmetry.

[Cassola and Morana \(2004\)](#) study examines the transmission mechanism in the role of stock market in the euro area and find that the financial & price stability are equally reliable objectives. In transmission mechanism of euro area the asset prices plays vital role. The result shows that the stock market prices plays a vital role and have interdependently direct impact on inflation. [Fang et al. \(2009\)](#) study examines the association of firms performance and stock liquidity. It uses

the market to book ratio to measure liquidity and better performance of firm show with liquid stocks. Theoretical models indicates that a positive relationship between firm performance and stock liquidity. The reasons provided by theories are stock price, illiquidity risk, agency and sentiment for that is why liquidity has positive relationship with firm performance.

[Tang \(2013\)](#) propose that whenever a new policy is devised it provide a signal to market encourages prices to adjust accordingly. Signaling channel can lead policy makers to maintain more stable inflation by linking policy accommodation to higher inflation expectations. [Amihud and Mendelson \(1986\)](#) studies the primary attribute liquidity made toward investment plans and financial instruments. It analyze a model in which relationship of monetary policy is explored with respect to liquidity. Investors with different expected holding periods trade with different relative spreads. The result shows that marginal increase in value due to improved liquidity will equal the marginal cost of such an improvement. Difference in firms ability to impact liquidity will be reflected in risk-adjusted returns across securities.

[Amihud \(2002\)](#) shows that over time, expected market illiquidity positively aects ex ante stock excess return, suggesting that expected stock excess return partly represents an illiquidity premium. The hypothesis on the relationship between stock return and stock liquidity is that return increases in illiquidity. The results show that both across stocks and over time expected stock returns are an increasing function of expected illiquidity.

[Baker \(1996\)](#) & [Bali et al. \(2013\)](#) conclude that stock liquidity are being adjusted by stock market. Study shows that return and liquidity shocks are not only positive liquidity but also able to forecast future returns. The results add to the literature that liquidity and stock return association and found that stock level liquidity shocks react in response to variation in returns

[Barclay and Smith Jr \(1988\)](#) find that the NASDAQ market remains liquid despite the reduction in trading costs to investors. [Brennan et al. \(2013\)](#) conrm that monetary policy significantly affect liquidity of market. Earlier 1970s, the study uses long and broad data sample to examine the cross- section of asset return which are priced in reliably to illiquidity measure.

O'hara (1995) based on market microstructure research examines relationship between monetary policy and liquidity and result show that monetary policy significantly affect liquidity. Chen et al. (2013) work on determining the determinants of liquidity by using the individual stock data from Shananghai stock exchange and Shenzhen stock exchange. By employing methodology of Graphical Reversible-Jump-MCMC algorithm (G-RJMCMC-VS) in line with work of Lunn et al. (2009) conclude that short-selling encourages the liquidity of middle-scale stocks while daily average prices and holding proportion are two most important determinants of liquidity. Chordia and Swaminathan (2000) used trading volume as a proxy to measure stock market liquidity. Trading volume is a significant determinant of stock returns i-e returns of portfolio containing high volume of trading(highly liquid) react sluggishly to new information and effect on prices immediately. Clarida et al. (2000) investigated monetary policy reaction toward postwar United States economy Pre and Post Volcker period i-e appointment of Volcker as Fed Chairman in 1979. Result show that interest rate policy changes is more sensitive toward market liquidity in Volcker period than before his appointment indicating stable market dynamics as an outcome of policy attempted to equilibrium interest rate, inflation and market capitalization.

Chordia et al. (2001b) conduct in-depth study over trading activity of U.S. equities and conclude that long and short-term interest rates influence liquidity. A change in daily market averages and arrival of new information induces liquidity. Depth and trading activity increases in respond to major macroeconomic announcements. Chordia et al. (2008) suggest that arrival of private information incorporate into prices during the period of more liquidity. Constantinides (1986) uses two-asset portfolio to assess the effect on frequency and volume of trade. Study shows that investor expected utility is insensitive to deviations and liquidity premium due to transaction costs is small. Datar et al. (1998) provides an alternative test of Amihud and Mendelsons model using the turnover as a proxy for liquidity.

Fernandez (1999) measure the several dimensions of liquidity and focuses to use numerous aspects of liquidity. Hameed et al. (2010) define that liquidity is ease of cash convertibility and report that the asymmetrical respond of liquidity leads to

change in asset market values. Results show that during the tightness funding of market the negative market returns decreases stock liquidity.

Ioannidis and Kontonikas (2008) investigate the relationship between monetary policy and stock return for the time period 1972-2002 for sample of 13 OECD countries. Results show that the monetary policy have significantly and positively effect on market liquidity.

Baker and Stein (2004) study use model which help in understanding of increasing in liquidity and empirical evidence indicates that liquidity significantly get affected by the announcement of monetary policy. Subrahmanyam and Brennan (1996), Amihud and Mendelson (1986) and Brennan et al. (1998) study liquidity measures by using the low bid-ask spreads, low price trade and high turnover.

As Pakistan is an emerging market with growing opportunities so people interest is increasing and investors are more concerned about liquidity position of Pakistan market. But in Pakistan very limited work has been found on stock market liquidity and monetary policy at stock market level and individual stocks. So this study aims at investigating both at macro level and micro level.

Study of association between monetary policy and liquidity is new and mixed evidence is being observed. This work is contextual in nature which actually means that yet Pakistan market is not fully explored and investigated in the context of Pakistan monetary policy and its possible effect on stock market liquidity.

This work provides in-depth study of various factors that may affect liquidity of market and also of individual firm stock either positively or negatively. Existing literature is much extensive on return and volatility but this domain of research has been somewhat overlooked. This work is an attempt to contribute in terms of fulfilling the gap so that investors, policy makers and general public can have the hand on information related to liquidity both at market level as well as individual firm level

Review of above literature indicates that the monetary policy and its effect on liquidity are recognized well in the worldwide. Pakistani evidence also exist and in line with the theory with same deviation. Strong evidence is also observed in

US market by [Goyenko and Ukhov \(2009\)](#). However, in developed market evidence is mixed. Behavior of Pakistani market is still unexplored. This study is an effort to bridge this gap.

Chapter 3

Data And Methodology

3.1 Econometric Model

This study applies both simple regression and panel data analysis.

3.1.1 The Macro Level: Aggregate Market Liquidity

This study started with investigating the impact of State Bank of Pakistan policy on aggregate liquidity of Pakistani market. Despite the fact that monetary policy intervene to comfort financial crisis and to ensure price stability, this debate has earned much importance in current year. [Garcia and Liu \(1999\)](#) concludes that during financial upsets, central bank may bring ease to market liquidity through monetary policy. For the best functioning of market, a rational level of liquidity is always required.

For that purpose, simple regression is estimated.

$$TO_t = c + \beta_1 IGR_t + \beta_2 INF_t + \beta_3 INT_t + \beta_4 SD_t + \beta_5 RM_t + \mu_t \quad (3.1)$$

The above mention equation 3.1, in which the liquidity (TO_t) of market in month t is modeled as a function of the Industrial growth rate (IGR_t), Inflation rate (INF_t), market return (RM_t) & standard deviation (SD_t) and real interest rate (INT_t). μ_t label vector of residuals.

3.1.2 The Micro Level: Individual Stock Liquidity

In next step, detailed investigation is done that monetary policy as implemented by the State Bank of Pakistan affects the liquidity of individual firm listed on PSX 100 index. For this, panel regressions is estimated in which the liquidity ($LIQ(i, t)$) of stock i in month t is modeled as a function of the (one-month lagged) SBP's monetary policy, the interaction term and other lagged control variables:

$$LIQ_{i,t} = c_i + \beta_1 LIQ_{i,t-1} + \beta_2 MC_{i,t-1} + \beta_3 MP_{t-1} + \beta_4 STDV_{i,t-1} + \beta_5 RET_{i,t-1} + \mu_{i,t} \quad (3.2)$$

Where the dependent variable $LIQ(i, t)$ represents liquidity measures. This study include the one-month lagged liquidity measures $LIQ(i, t - 1)$ as a regressor. $MP(t - 1)$ is monetary policy rate as announced by the SBP and $MC(i, t - 1)$ is market capitalization. Other control variables on the stock level includes monthly return ($RET(i, t - 1)$), monthly standard deviation of daily stock returns ($STDV(i, t - 1)$). μ_t label the vector of residuals.

3.2 Data Description

This study uses data of listed firm of PSX 100 index for the time period of 18 years; starting from the year 2000 to year 2017 to explore the relationship of monetary policy with liquidity. For each company the variables include the number of shares traded & number of outstanding shares, daily returns as well as end of day price. The source of the data includes data obtained from website of Pakistan Stock Exchange, business recorder, and Pakistan economic survey. These are considered as reliable sources of information.

The data is investigated both at micro as well as market level. Panel data analysis is used in order to explore the liquidity at micro level. Sample consists of firms from non-financial sector.

Non-financial sector is considered because of difference in reporting period i-e in case of financial sector accounting period closes by December but in non-financial sector, accounting period closes at the end of June. Moreover, a major difference exist between the capital structures of financial and non-financial sectors.

3.3 Measurement Of Variables

This study employ number of variables including liquidity measure, monetary policy measures and control variables. Control variables include company specific variables and macroeconomic variables.

This study uses following dependent and independent variables to explore the possible relationship and impact of monetary policy on liquidity (Both at market level and firm specific level).

3.3.1 Dependent Variable

In this study stock market liquidity is dependent variable. It is a very debatable and broad concept. There exist six different measures which are used as a measure to explore the impact of monetary policy can have on liquidity.

It is divided into three basic divisions:

- i. Trading activity (Turnover rate, Trading volume)
- ii. Price impact (Illiquidity ratio, Turnover price impact, Roll impact)
- iii. Transaction cost (Relative roll)

In literature, most of the variables used are well-explored and by using daily stock market data can be easily computed. This study uses turnover as a proxy for measure of liquidity. As bid/ask information is not readily available plus base money differs so the study employed trading activity as a measure of liquidity as it is widely used. Since data is in ratio form so problem of stationarity does not exist in data.

a). **Trading activity:**

In literature, Trading is defined as activity related to dealing of company securities on a renowned stock exchange, with the objective of earning a profit or ignoring a loss. This measure explains that if trading activity increases in the market, it means liquidity of stock market also increases & vice versa.

Constantinides (1986) report that trading activity decrease for the stocks that are less liquid i-e stocks with efficient trading are highly liquid stocks. Amihud and Mendelson (1986) study shows that investor hold those stocks which are more liquid for short term period with the expectation of high trading activity as compared to stocks which are less liquid.

Following are the two measures of trading activity i-e. Turnover and traded volume

i. **Turnover rate:**

Turnover rate is based on traded volume. Datar et al. (1998) explains it as the total volume of shares sold in a year divided by the average number of shares outstanding.

By using following formula, we can calculate turnover rate:

$$\text{Turnover rate} = \text{Turnover} / \text{No. of shares outstanding}$$

ii. **Traded Volume:**

Traded volume is the actual number of shares traded daily. Brennan et al. (1998) proposes that liquidity can be measure by trading activity. High stock liquidity is defined in terms of high trading volume & vice versa.

It is hypothesized that their exist significant negative relation between monetary policy and liquidity.

3.3.2 Independent Variable

Independent variables are defined as the one that bring change in dependent variables. These are used to study or explore the possible outcome and variation in the values of another variable i-e. DV.

Independent variable include monetary policy measures and control variables (Monthly return, monthly standard deviation, industrial production, consumer price index, market capitalization, inflation rate and PSX 100 index).

3.3.2.1 Monetary Policy Measures

To examine the monetary policy, the money aggregate or interest rate are used in existing literature. Hence, in this study monthly Treasury bill rate is incorporated to capture the said attribute.

Major measure which is used in monetary policy is interest rate. It influence the quantity of money demanded in a country. T-bill rate is defined as rate at which the rediscounting of bills and preparation of commercial banks or providing of advance to commercial banks against approved securities are issued by central bank.

Change in lending rate and fluctuation of market interest rate cause change in interest rate. However, the exiting interest elasticity, demand, size, strength of money market and flow of funds are the factors which determine the efficiency of the interest rate.

3.3.3 Control Variables

To determine stock liquidity the study uses firm stock characteristics. For macroeconomic level the variables used are same like in stock market liquidity.

3.3.3.1 Individual Stock Characteristics

i. Monthly Standard Deviation

It is define as how much the members of a group differ from the mean value for the group.

Following formula is used to calculate standard deviation

$$\text{S.D} = \sqrt{\frac{\Sigma(R-\bar{R})^2}{n}}$$

Copeland and Galai (1983) reports that stock return volatility should be negatively related to liquidity that's why this study incorporated monthly standard deviation of daily returns.

It is hypothesized that there exist significant positive relation between stock return volatility and stock liquidity.

ii. Monthly Return

Average return is calculated by adding the returns for each month and dividing the total by the number of periods.

$$\text{Return} = \frac{\sum \text{Return of each period}}{\text{No. of each periods}}$$

$$\text{RET} = \frac{\sum R_i}{n}$$

This study includes return as a control variable, as Brunnermeier and Pedersen (2009) shows that stock liquidity is influenced by returns.

It is hypothesized that there exist a significant negative relationship between stock return and stock liquidity.

iii. Market Capitalization

Market capitalization can be defined as a company size. It is defined as sum of total share price to its shares outstanding. The formula for calculating market capitalization is:

$$\text{Market Capitalization} = \text{Share price} \times \text{No. of shares outstanding}$$

Amihud (2002) reports that there is negative relationship between market capitalization and stock liquidity. This study hypothesized that liquidity and stock market value are negatively related.

3.3.3.2 Macroeconomic Variables

Impact of macroeconomic variables on stock market liquidity is explained in this study. Einfeldt (2004) theoretically explains the relationship between macroeconomic variables and liquidity, however, it has been empirically tested by

Söderberg et al. (2008) and Naes et (2010). This study uses daily price index to calculate monthly standard deviation, monthly consumer price index, monthly industrial production index and monthly T-bill rate to explore the association of liquidity with fluctuations in market.

i. Monthly Market Return (Rm)

It is define as return on market portfolio. Average market return is calculated by dividing the current market price minus market price ($P_n - P_o$) with previous market price (P_o)

Following formula is used to calculate market return:

$$RM = \frac{P_n - P_o}{P_o}$$

It is hypothesized that their exist significant positive relation between market return and market liquidity.

ii. Monthly Standard Deviation (SD)

Standard deviation is defined as deviation of a set of a data from its average. In financial terms, it is used as a measure of risk involved in an investment.

It is calculated by using following formula:

$$\text{Monthly SD} = SQRT(n) * STDEV(Rm)$$

This study hypothesized that their exist significant positive relation between standard deviation and market liquidity.

iii. Growth rate of Index of Industrial Production (IIP)

Another macro-economic variable use in this study is growth rate of Index of Industrial Production. For that, large scale manufacturing index is used. Source of data on LSMI is extracted from website of Pakistan Bureaus of Statistics. Census of Manufacturing Industries (CMI) is used i-e monthly data on manufacturing sectors output. It measures new industrial developments, captures new industrial products and establishment.

This study hypothesized that there exist significant positive relation between growth rate of index of industrial production and market liquidity.

iv. **Consumer Price Index (CPI)**

CPI is one of the key statistics used for identifying time periods of inflation or deflation. CPI is the measure of average of prices of consumer goods and services. Any change in CPI are used to analyze changes in prices linked with cost of living i-e inflation. Monthly data of CPI is retrieved using IFS browser for the time frame of period 2000 to 2017.

This study hypothesized that there exist significant positive relation between growth rate of index of industrial production and market liquidity.

TABLE 3.1: Summary Of Variables

Dependent Variables	Measures
TO	Turnover/ No. of shares outstanding
Independent Variables	Measures
Monetary Policy	Interest rate
Control Variables	Measures
a. Individual stocks variables	<ol style="list-style-type: none"> 1. Number of ordinary shares from balance sheet 2. Monthly standard deviation of daily return (STDV) 3. Monthly Return (RET) 4. Market Capitalization
b. Macro-economic variables	<ol style="list-style-type: none"> 1. Monthly Market Return (Rm) 2. Monthly Standard deviation(S.D) 3. Growth rate of Index of Industrial Production(IIP) 4. T-bill rate(IR) 5. Consumer price index(CPI)

Chapter 4

Empirical Results And Discussion

This chapter includes results and discussions. Result includes the descriptive statistics, correlation matrix and panel data analysis.

This dissertation examined the role of monetary policy on liquidity by using sample of 100 firms listed at Pakistan Stock Exchange (non-financial) for the period 2000-2017. As Pakistan is an emerging market with growing opportunities so people interest is increasing and investors are more concern about liquidity position of Pakistan market. So this study aims at investigating impact on both macro and micro level of monetary policy and liquidity.

In first step, to explore impact of monetary policy on market liquidity simple regression is estimated in which the liquidity of market in month t is modeled as a function of the Industrial growth rate (IGR_t), Inflation rate (INF_t), market return (RM_t), standard deviation (SD_t) and real interest rate (INT_t). In second step, in-depth investigation is encountered that how announcement of new monetary policy determines the liquidity of individual stocks listed on PSX 100 index. For that purpose, panel regressions (fixed effect model) is estimated in which the liquidity ($LIQ(i, t)$) of stock i in month t is modeled as a function of the (one-month lagged) SBP's monetary policy, the interaction term and other lagged control variables.

4.1 Descriptive Statistics (Market Level Analysis)

Descriptive statistics is used to summarize and explain the statistical behavior of the data.

TABLE 4.1: Descriptive Statistics

	TO (%)	IGR (%)	INF (%)	RM (%)	SD (%)	INT (%)
Mean	0.01	0.037	0.05	0.014	0.054	0.0074
Median	0.001	-0.0038	0.049	0.019	0.043	0.0075
Std Dev.	0.0006	0.082	0.02	0.077	0.0044	0.003
Kurtosis	4.552	4.25	1.93	9.18	8.31	1.266
Skewness	1.193	0.177	-0.17	-1.14	5.45	-0.746
Minimum	0.0035	-0.263	0.025	-0.448	0.03	0.001
Maximum	0.036	0.283	0.075	0.241	0.49	0.012

Table 4.1 reports the statistical behavior of monetary policy variables. Descriptive statistics includes mean, median, standard deviation, skewness etc.

It Exhibits the data related to macroeconomic, control variables & liquidity. It shows the mean, median, standard deviation, maximum and minimum values, Skewness and kurtosis of all variables.

The average value for turnover (TO) be 1%, with maximum value of 0.036, and minimum value is 0.0035. Whereas, the mean for inflation (INF) is 5%, middle value is 0.049, maximum & minimum values are 0.075 & 0.025 respectively. INF, RM & INT are skewed negatively, which shows that tail on left side is longer or flatter but the skewness is marginally negative. On the other hand, TO, IGR and SD are positively skewed i-e tail on right side is flat.

A distribution with kurtosis greater than three having shorter & thinner tails, and high central peak are leptokurtic. The variable includes TO, IGR, RM & SD. whereas, the platykurtic variable are INF & INT with kurtosis less than 3.

4.2 Correlation Matrix (Market Level Analysis)

The correlation matrix is analyzed through both signs and values of the variable. If the value is 1, this shows a perfect relationship between variables and sign shows the direction of relationship. Positive sign shows that increase in one variable results in an increase in other variable, whereas, negative sign explains that variable move against each other.

TABLE 4.2: Correlation Matrix

	TO	IGR	INF	RM	SD	INT
TO	1	0.024	-0.006	0.146	0.178	-0.255
IGR		1	-0.194	0.026	-0.04	-0.052
INF			1	-0.03	0.059	0.048
RM				1	-0.23	-0.18
SD					1	-0.083
INT						1

Table 4.2 shows the correlation matrix for the variables employed at macro level. Turnover has positive relation with IGR, RM and SD while has negative relationship with INF and INT means an increase in TO results in decrease in INF & INT. Likewise, IGR has positive relation with RM means an increase in IGR results in an increase in RM and has negative relation with INF, SD & INT. INF has positive relation with SD & INT and negative relation with RM. Similarly, RM has negative relation with SD & INT. The relationship in all cases is weak which indicates that problem of multicollinearity does not exist.

4.3 Determinant Of Market Liquidity

At macro level, 4.3 shows the simple least square regression analysis for the variables employed at macro level.

Regarding macroeconomic variables, regression based on OLS technique is applied on time series data to explain the predictive power of factor identified. Macroeconomic variables which affect market liquidity as proposed by financial theory

TABLE 4.3: Impact Of Monetary Policy and Macro-Economic Variables On Market Liquidity

	Coefficient	t Stat	P-value
Intercept	0.0003	4.207	0.000
IGR	0.0002	0.456	0.6485
INF	-0.013	-2.375	0.0184
SD	0.0008	1.933	0.0546
Real Interest rate	-0.009	-2.365	0.0189
RM	0.0009	2.413	0.0167
TO(-1)	0.771	16.034	0.000
Adj. R^2	0.686	Sig (F-stat)	0.000
D.W stat	2.068	F Statistics	309.8124

includes: interest rates, inflation, and standard deviation. Industrial growth rate (IGR) does not influence market liquidity. Similarly inflation rate (INF) is significant negatively related to turnover. The results are in line with [Romer \(1993\)](#) suggesting that higher inflation rate results in lower market liquidity. It means that during high inflation turnover decreases and market becomes less liquid. A finding of RM shows positive and significant relation with turnover.

Real interest rate is significant and negatively related to turnover. Increase in interest rate leads to increase in market prices which discourages buying and selling in the market ultimately results in lower market liquidity. The standard deviation is positive and significant for TO which shows that as risk increases few people being risk averse exit market by selling, however on the other side people start buying riskier stocks. This pace up the buying and selling trend in market which results in increase in liquidity.

Adj R^2 is 68.6% so this model explains large part of variation in stocks (R^2 60%). Durbin Watson statistics is 2.068 so no problem of autocorrelation exists in data.

4.4 Descriptive Statistics (The Micro Level(Company Specific Factors))

TABLE 4.4: Descriptive Statistics

	LIQ (%)	MC (billions)	MP (%)	STDV (%)	RET (%)
Mean	0.05	3.60E+10	0.09	0.013	0.0071
Median	0.005	7.50E+09	0.093	0.0008	0.0008
Std Dev.	0.2	1.09E+11	0.033	0.003	0.0014
Kurtosis	2.54	3.39	2.937	4.6	5.177
Skewness	9.26	7.77	-0.762	3.09	0.2
Minimum	0.01	0.0005	0.012	0	-0.189
Maximum	0.4619	1.50E+12	0.1401	0.038	0.0471

Table 4.4 reports the statistical behavior of liquidity variables. Descriptive statistics includes mean, median, standard deviation, skewness etc.

It summarizes that the average value for liquidity (LIQ) is 5% which shows generally in market trading is slow i-e on average 5% of shares are being traded. However few stocks are more widely traded because in some periods trading of shares is 4 times of the outstanding shares i-e maximum value of 0.4619 and minimum value of 0.01 shows that only few shares were traded.

LIQ, MC, STDV & RET are positively skewed means that tail on right side of probability density is longer or flatter and the skewness is positive. On the other hand, MP is negatively skewed.

Platykurtic behavior is observed for LIQ and MP with kurtosis less than 3. The leptokurtic variables are MC, RET & STDV with kurtosis more than 3. In financial time series data this issue do exist. Returns are negative as market is very dynamic and radical behavior is observed.

4.5 Correlation Matrix (The Micro Level(Company Specific Factors))

The correlation matrix is analyzed through both signs and values of the variable. If the value is 1, this shows a perfect relationship between variables and sign shows the direction of relation. Positive sign shows that increase in one variable results in an increase in other variable, whereas, negative sign explains that variable move against each other.

TABLE 4.5: Correlation Matrix

	LIQ	MC	MP	STDV	RET
LIQ	1	-0.038	-0.16	0.008	-0.013
MC		1	0.037	-0.005	-0.015
MP			1	-0.0007	0.0002
STDV				1	-0.0009
RET					1

Table 4.5 shows the correlation matrix for the variables employed at micro level. Liquidity has negative relation with MC, MP & RET while has positive relationship with STDV means an increase in LIQ results in increase in STDV. Likewise, MC has positive relation with MP means an increase in MC results in an increase in MP and has negative relation with STDV & RET. MP has positive relation with RET and negative relation with STDV. Similarly, STDV has negative relation with RET. All relationships are found insignificant so no problem of multicollinearity exists.

4.6 Panel Data Analysis

At micro level, the impact of monetary policy on stock liquidity is determined by considering the company specific variables. This data includes both cross-sectional as well as time series data so Panel data analysis is used in this study.

Panel data employed three basic techniques and these model talks about intercept behavior.

1. Common effect Model
2. Fixed Effect Model
3. Random Effect Model

Monetary policy is an independent variable and individual stock liquidity is dependent variable. In estimating, total 100 non-financial firms are used for a period of 2000 to 2017.

For best and appropriate model selection in panel data analysis, firstly we have applied the Redundant Fixed Effects-Likelihood ratio between common effect and fixed effect model.

The result of table 4.7 shows that Chi-square value is significant which represents that fixed effect model is appropriate for this study and this model should be applied for further panel data analysis.

In the next step, we further applied the Hausman test between fixed effect and random effect. This model assumes the random behavior of intercept.

Above table 4.8 of Correlated Random effects- Hausman test shows that significant value of chi-square indicates that model suitable for this study is fixed effect model.

4.7 Impact of Firm Specific Variable on Stock Liquidity

Table 4.9 reports that monetary policy $MP_{i,t-1}$ (P value= 0.000) significantly determines the liquidity of individual stocks. Standard deviation $STDV_{i,t-1}$ (P value=0.0078) report significant impact on stock liquidity means that an increase in standard deviation results in increase in individual stock liquidity.

Market capitalization $MC_{i,t-1}$ (P value= 0.000) is also significantly related to liquidity of individual stocks i-e big size companies are generally less liquid as there

TABLE 4.6: Three Basic Techniques Employed For Panel Data Analysis

	Random Effect Model	Fixed Effect Model	Common Co-efficient Model
C			
Co-efficient	0.0395	0.0026	0.028
T-statistics	14.199	11.08	10.43
Prob	0.000	0.000	0.000
<i>MC_{<i>i,t-1</i>}</i>			
Co-efficient	-1.64E-14	-1.38E-14	-1.38E-14
T-statistics	-1.53	-4.201	-1.63
Prob	0.1258	0.000	0.103
<i>MP_{<i>i,t-1</i>}</i>			
Co-efficient	-0.27	-0.197	-0.197
T-statistics	-9.61	-7.325	-7.02
Prob	0.000	0.000	0.000
<i>STDV_{<i>i,t-1</i>}</i>			
Co-efficient	2.42E-09	1.83E-09	1.83E-09
T-statistics	1.08	2.661	0.821
Prob	0.278	0.0078	0.0411
<i>RET_{<i>i,t-1</i>}</i>			
Co-efficient	-1.74E-09	-3.69E-09	-3.69E-09
T-statistics	-0.272	-2.146	-0.585
Prob	0.7858	0.0319	0.558
<i>LIQ(-1)_{<i>i,t-1</i>}</i>			
Co-efficient	0.74	0.813	0.813
T-statistics	137.84	50.54	-174.37
Prob	0.000	0.000	0.000
F Statistics	333.414	6336.214	6336.21
Sig (F-stat)	0.000	0.000	0.000
Adj. <i>R</i> ²	0.672	0.684	0.672
D.W stat	2.159	2.019	2.23

TABLE 4.7: Likelihood Ratio Test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	6.396445	(9,515,334)	0.000
Cross-section Chi-square	599.856058	95	0.000

TABLE 4.8: Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	606.547891	5	0.000

TABLE 4.9: Impact of Firm Specific Variable on Stock Liquidity

	Coefficient	t-Stat	P-value
C	0.029	11.08	0.000
$MC_{i,t-1}$	-1.38E-14	-4.201	0.000
$MP_{i,t-1}$	-0.197	-7.325	0.000
$STDV_{i,t-1}$	1.83E-09	2.661	0.0078
$RET_{i,t-1}$	-3.69E-09	-2.146	0.0319
$LIQ(-1)_{i,t-1}$	0.813	50.54	0.000
Adj. R^2	0.684	Prob. (F-stat)	0.000
D.W stat	2.019	F Statistics	6336.21

exist negative relation between market size and liquidity. The return $RET_{i,t-1}$ (P value= 0.0319) is negative and significant for individual stock liquidity which shows that as return decreases liquidity increases in line with Amihud (2002) conclude that stock returns are positively affected by market illiquidity i-e illiquidity premium depicts expected excess stock return. The hypothesis states that as stock return increases stock liquidity decreases.

The above results can be summarized as: over time as expected stock returns increases illiquidity also increases. Lag value of liquidity $LIQ_{i,t-1}$ is used which is significantly positive. It means that liquidity is not isolated and has persistence behavior. Liquidity which is being experienced in one period has effect on the liquidity of next period. Positive co-efficient value shows that for every 1% increase in $(LIQ(-1)_{i,t-1})$ will lead to marginal increase in liquidity by 0.813.

Significant influence of monetary policy ($MP_{i,t-1}$), standard deviation ($STDV_{i,t-1}$), market capitalization ($MC_{i,t-1}$), return ($RET_{i,t-1}$) & Lag value of liquidity ($LIQ(-1)_{i,t-1}$) on individual stock liquidity are in line with Amihud et al. (2006), Fleming and Remolona (1999), Söderberg et al. (2008), Tang (2013) & Ioannidis and Kontonikas (2008)

This model explains large part of the variation in stocks as R is 68.4%. Durbin Watson statistics is 2.019 so no problem of correlation exists in data. Value of F-statistics 6336.21 is with highly significant probability (0.000) means that overall model is fit and correctly specified.

Chapter 5

Conclusion And Recommendations

5.1 Conclusion

This study shed lights on the monetary policy and its outcome on market liquidity. Sample of 100 non-financial listed companies at Pakistan Stock Exchange index is taken for the period of 2000 to 2017. As Pakistan is an emerging market with growing opportunities so people interest is increasing and investors are more concerned about liquidity position of Pakistan market. But in Pakistan very limited work has been found on stock market liquidity and monetary policy at stock market level and individual stocks. So this study aims at investigating both at macro level and micro level.

Study of association between monetary policy and liquidity is new and mixed evidence is being observed. This work is contextual in nature which actually means that yet Pakistan market is not fully explored and investigated in the context of Pakistan monetary policy and its possible effect on stock market liquidity.

This work provides in-depth study of various factors that may affect liquidity of market and also of individual firm stock either positively or negatively. Existing literature is much extensive on return and volatility but this domain of research has been somewhat overlooked. This work is an attempt to contribute in terms of

fulfilling the gap so that investors, policy makers and general public can have the hand on information related to liquidity both at market level as well as individual firm level

The study examine whether change in stance of monetary policy effect the liquidity of stocks (both at market level and micro level). This study uses regression analysis at macro level (to measure stock market liquidity) and panel data analysis for micro level (Individual stock liquidity).

Findings can be summarized as increase (decrease) in liquidity because of an expansionary (restrictive) monetary policy. Relationship of monetary policy is examined both for market as well as at company level.

Firstly at stock market level, it is concluded that contractionary monetary policy results in less liquid stock market, and highly liquid stocks are because of expansionary monetary policy and this is in line with [Chu \(2015\)](#) . Study explore the association between monetary policy and stock market liquidity in the market of China. Inflation rate (INF) is significant negatively related to turnover in line with [Romer \(1993\)](#) suggesting that higher inflation rate results in lower stock market liquidity. A finding of RM shows positive significance level with turnover. Also real interest rate is significantly related to turnover. As interest rate decrease the liquidity of the stock increases. Similarly when interest rate increases liquidity decreases. So liquidity of market move with monetary policy. There are period of high liquidity and low liquidity.

The standard deviation is positive and significant for TO which show that as risk increases liquidity also increases. However information related to industrial growth rate (IGR) is found insignificant with stock market liquidity.

Secondly, study uses panel estimations for micro level analysis. Fixed effect model is used and result shows that expansionary (restrictive) monetary policy results in an increase (decrease) in stock liquidity. Standard deviation shows significant result means that with the increase in risk, individual stock liquidity also increases.

Market capitalization is also significantly related to liquidity of individual stocks i.e big companies are generally less liquid as liquidity and market size are negatively

related. The return is found significant and negative for individual stock liquidity which shows that with the increase in return liquidity decreases.

5.2 Recommendations And Policy Implementations

1. Investors should devise investment plans on the basis of assessing certain facets of liquidity like risk, return, inflation rate, trading volume. Macro-economic dynamics should also be considered by policy makers.
2. Large firms stocks are considered to be less liquid, so one should be analytical in buying such stocks.
3. Keep an eye on monetary policy as it not only effect price but also liquidity.
4. Also standard deviation is positive and significant so investors should be vigilant that higher liquidity may have an outcome of higher risk.

5.3 Direction For Future Research

This study may serve as a key step to further research. Existing studies on monetary policy related to liquidity is limited and can be extended to financial sector as well. By comparing indices of various countries with Pakistan stock exchange magnificent research can be conducted.

Bibliography

- Abudy, M. M., Binsky, H., and Raviv, A. (2018). The effect of liquidity on non-marketable securities. *Finance Research Letters*.
- Acharya, V. and Naqvi, H. (2012). The seeds of a crisis: A theory of bank liquidity and risk taking over the business cycle. *Journal of Financial Economics*, 106(2):349–366.
- Adrian, T., Fleming, M., Shachar, O., and Vogt, E. (2017). Market liquidity after the financial crisis. *Annual Review of Financial Economics*, 9:43–83.
- Adrian, T. and Shin, H. S. (2009). Money, liquidity, and monetary policy. *American Economic Review*, 99(2):600–605.
- Al-Harbi, A. (2017). Determinants of banks liquidity: evidence from oic countries. *Journal of Economic and Administrative Sciences*, 33(2):164–177.
- Albuquerque, R. A., Cassel, J., Phalippou, L., and Schroth, E. J. (2018). Liquidity provision in the secondary market for private equity fund stakes.
- Alom, K. (2013). Capital structure choice of bangladeshi firms: An empirical investigation. *Asian Journal of Finance & Accounting*, 5(1):320–333.
- Amihud, Y. (2002). Illiquidity and stock returns: cross-section and time-series effects. *Journal of financial markets*, 5(1):31–56.
- Amihud, Y. and Levi, S. (2018). The effect of stock liquidity on the firm’s investment and production.
- Amihud, Y. and Mendelson, H. (1986). Asset pricing and the bid-ask spread. *Journal of financial Economics*, 17(2):223–249.

- Amihud, Y., Mendelson, H., Pedersen, L. H., et al. (2006). Liquidity and asset prices. *Foundations and Trends® in Finance*, 1(4):269–364.
- Andersson, M., Dillén, H., and Sellin, P. (2006). Monetary policy signaling and movements in the term structure of interest rates. *Journal of Monetary Economics*, 53(8):1815–1855.
- Aouadi, A., Arouri, M., and Roubaud, D. (2018). Information demand and stock market liquidity: International evidence. *Economic Modelling*, 70:194–202.
- Armstrong, W. J., Cardella, L., and Sabah, N. (2017). Information shocks and liquidity innovations.
- Baker, H. K. (1996). *Trading location and liquidity: An analysis of US dealer and agency markets for common stocks*. Blackwell Pubs.
- Baker, M. and Stein, J. C. (2004). Market liquidity as a sentiment indicator. *Journal of Financial Markets*, 7(3):271–299.
- Bali, T. G., Peng, L., Shen, Y., and Tang, Y. (2013). Liquidity shocks and stock market reactions. *The Review of Financial Studies*, 27(5):1434–1485.
- Ball, L. M. (1999). Policy rules for open economies. In *Monetary policy rules*, pages 127–156. University of Chicago Press.
- Barclay, M. J. and Smith Jr, C. W. (1988). Corporate payout policy: Cash dividends versus open-market repurchases. *Journal of Financial Economics*, 22(1):61–82.
- Barro, R. J. and Gordon, D. B. (1983). A positive theory of monetary policy in a natural rate model. *Journal of political economy*, 91(4):589–610.
- Bekaert, G., Harvey, C. R., and Lundblad, C. (2007). Liquidity and expected returns: Lessons from emerging markets. *The Review of Financial Studies*, 20(6):1783–1831.
- Ben-Rephael, A., Kadan, O., and Wohl, A. (2015). The diminishing liquidity premium. *Journal of Financial and Quantitative Analysis*, 50(1-2):197–229.

- Benmelech, E., Meisenzahl, R. R., and Ramcharan, R. (2017). The real effects of liquidity during the financial crisis: Evidence from automobiles. *The Quarterly Journal of Economics*, 132(1):317–365.
- Bernanke, B. S. and Mihov, I. (1998). The liquidity effect and long-run neutrality. In *Carnegie-Rochester conference series on public policy*, volume 49, pages 149–194. Elsevier.
- Bhide, A. (1993). The hidden costs of stock market liquidity. *Journal of financial economics*, 34(1):31–51.
- Bloomfield, R., O’hara, M., and Saar, G. (2015). Hidden liquidity: Some new light on dark trading. *The Journal of Finance*, 70(5):2227–2274.
- Bomfim, A. N. (2003). Pre-announcement effects, news effects, and volatility: Monetary policy and the stock market. *Journal of Banking & Finance*, 27(1):133–151.
- Brennan, M., Huh, S.-W., and Subrahmanyam, A. (2013). An analysis of the amihud illiquidity premium. *The Review of Asset Pricing Studies*, 3(1):133–176.
- Brennan, M. J., Chordia, T., and Subrahmanyam, A. (1998). Alternative factor specifications, security characteristics, and the cross-section of expected stock returns¹. *Journal of Financial Economics*, 49(3):345–373.
- Brockman, P. and Chung, D. Y. (1999). An analysis of depth behavior in an electronic, order-driven environment. *Journal of Banking & Finance*, 23(12):1861–1886.
- Brogaard, J., Li, D., and Xia, Y. (2017). Stock liquidity and default risk. *Journal of Financial Economics*, 124(3):486–502.
- Brunnermeier, M. K. and Pedersen, L. H. (2008). Market liquidity and funding liquidity. *The review of financial studies*, 22(6):2201–2238.
- Brunnermeier, M. K. and Pedersen, L. H. (2009). Funding liquidity and market liquidity. *Review of Financial Studies*, 22(2201-2238):6.

- Capelle-Blancard, G. and Havrylchyk, O. (2016). The impact of the french securities transaction tax on market liquidity and volatility. *International Review of Financial Analysis*, 47:166–178.
- Cassola, N. and Morana, C. (2004). Monetary policy and the stock market in the euro area. *Journal of Policy Modeling*, 26(3):387–399.
- Chen, L., Luo, J., and Liu, H. (2013). The determinants of liquidity with g-rjmcvc-vs model: Evidence from china. *Economic Modelling*, 35:192–198.
- Chen, Y., Eaton, G. W., and Paye, B. S. (2018). Micro (structure) before macro? the predictive power of aggregate illiquidity for stock returns and economic activity. *Journal of Financial Economics*.
- Chordia, T., Roll, R., and Subrahmanyam, A. (2001a). Market liquidity and trading activity. *The journal of finance*, 56(2):501–530.
- Chordia, T., Roll, R., and Subrahmanyam, A. (2001b). Market liquidity and trading activity. *The journal of finance*, 56(2):501–530.
- Chordia, T., Roll, R., and Subrahmanyam, A. (2005). Evidence on the speed of convergence to market efficiency. *Journal of Financial Economics*, 76(2):271–292.
- Chordia, T., Roll, R., and Subrahmanyam, A. (2008). Liquidity and market efficiency. *Journal of Financial Economics*, 87(2):249–268.
- Chordia, T., Sarkar, A., and Subrahmanyam, A. (2004). An empirical analysis of stock and bond market liquidity. *The Review of Financial Studies*, 18(1):85–129.
- Chordia, T. and Swaminathan, B. (2000). Trading volume and cross-autocorrelations in stock returns. *The Journal of Finance*, 55(2):913–935.
- Chowdhury, A., Uddin, M., and Anderson, K. (2018). Liquidity and macroeconomic management in emerging markets. *Emerging Markets Review*, 34:1–24.

- Christiano, L. J., Eichenbaum, M., and Evans, C. L. (2005). Nominal rigidities and the dynamic effects of a shock to monetary policy. *Journal of political Economy*, 113(1):1–45.
- Christoffersen, P., Feunou, B., Jeon, Y., and Ornathanalai, C. (2017). Time-varying crash risk: The role of stock market liquidity. Technical report.
- Chu, X. (2015). Modelling impact of monetary policy on stock market liquidity. *Applied Economics Letters*, 22:820–824.
- Clarida, R., Gali, J., and Gertler, M. (2000). Monetary policy rules and macroeconomic stability: evidence and some theory. *The Quarterly journal of economics*, 115(1):147–180.
- Cochrane, J. (2005). Financial markets and the real economy. *Foundation- and Trends in Finance*, 1:1–101.
- Constantinides, G. M. (1986). Capital market equilibrium with transaction costs. *Journal of political Economy*, 94(4):842–862.
- Cook, T. and Hahn, T. (1989). The effect of changes in the federal funds rate target on market interest rates in the 1970s. *Journal of Monetary Economics*, 24(3):331–351.
- Cooper, S. K., Groth, J. C., and Avera, W. E. (1985). Liquidity, exchange listing, and common stock performance. *Journal of Economics and Business*, 37(1):19–33.
- Copeland, T. E. and Galai, D. (1983). Information effects on the bid-ask spread. *the Journal of Finance*, 38(5):1457–1469.
- Datar, V. T., Naik, N. Y., and Radcliffe, R. (1998). Liquidity and stock returns: An alternative test. *Journal of Financial Markets*, 1(2):203–219.
- Ding, R. and Hou, W. (2015). Retail investor attention and stock liquidity. *Journal of international financial markets, institutions and money*, 37:12–26.

- Drechsler, I., Savov, A., and Schnabl, P. (2017). The deposits channel of monetary policy. *The Quarterly Journal of Economics*, 132(4):1819–1876.
- Eisfeldt, A. L. (2004). Endogenous liquidity in asset markets. *The Journal of Finance*, 59(1):1–30.
- ElBannan, M. A. (2017). Stock market liquidity, family ownership, and capital structure choices in an emerging country. *Emerging Markets Review*.
- Ellington, M. (2018). Financial market illiquidity shocks and macroeconomic dynamics: Evidence from the uk. *Journal of Banking & Finance*, 89:225–236.
- Elshandidy, T. and Neri, L. (2015). Corporate governance, risk disclosure practices, and market liquidity: Comparative evidence from the uk and i taly. *Corporate Governance: An International Review*, 23(4):331–356.
- Engle, R. F. (1998). Macroeconomic announcements and volatility of treasury futures.
- Fallah, S. and Hashemi, S. A. (2017). The effects of inflation and operating cycle on cash holdings (liquidity) of listed companies in tehran stock exchange. *Asian Economic and Financial Review*, 7(1):43.
- Fang, V. W., Noe, T. H., and Tice, S. (2009). Stock market liquidity and firm value. *Journal of financial Economics*, 94(1):150–169.
- Fernandez, F. A. (1999). *Liquidity risk: new approaches to measurement and monitoring*. Securities Industry Association.
- Fernández-Amador, O., Gächter, M., Larch, M., and Peter, G. (2013). Does monetary policy determine stock market liquidity? new evidence from the euro zone. *Journal of Empirical Finance*, 21:54–68.
- Fleming, M. J. and Remolona, E. M. (1999). Price formation and liquidity in the us treasury market: The response to public information. *The journal of Finance*, 54(5):1901–1915.

- Florackis, C., Gregoriou, A., and Kostakis, A. (2010). Trading frequency and asset pricing: Evidence from a new price impact ratio. *SSRN eLibrary*.
- Florackis, C., Kontonikas, A., and Kostakis, A. (2014). Stock market liquidity and macro-liquidity shocks: Evidence from the 2007–2009 financial crisis. *Journal of International Money and Finance*, 44:97–117.
- Fujimoto, A. (2003). Macroeconomic sources of systematic liquidity. Technical report.
- Garcia, V. F. and Liu, L. (1999). Macroeconomic determinants of stock market development. *Journal of Applied Economics*, 2(1).
- Gomes, C. and Waelbroeck, H. (2015). Is market impact a measure of the information value of trades? market response to liquidity vs. informed metaorders. *Quantitative Finance*, 15(5):773–793.
- Goyenko, R. Y. and Ukhov, A. D. (2009). Stock and bond market liquidity: A long-run empirical analysis. *Journal of Financial and Quantitative Analysis*, 44(1):189–212.
- Gresse, C. (2017). Effects of lit and dark market fragmentation on liquidity. *Journal of Financial Markets*, 35:1–20.
- Hameed, A., Kang, W., and Viswanathan, S. (2010). Stock market declines and liquidity. *The Journal of Finance*, 65(1):257–293.
- Harris, M. and Raviv, A. (1993). Differences of opinion make a horse race. *The Review of Financial Studies*, 6(3):473–506.
- Herwany, A., Satyakti, Y., and Wardhana, W. (2017). The impact of monetary policy on stock market liquidity and the business cycle in indonesia.
- Ho, S.-Y. (2017). The macroeconomic determinants of stock market development: Evidence from south africa.
- Hu, M., Jain, A., and Zheng, X. (2018). Stock splits and liquidity risk in the chinese stock market.

- Ioannidis, C. and Kontonikas, A. (2008). The impact of monetary policy on stock prices. *Journal of policy modeling*, 30(1):33–53.
- Jones, C. M., Lamont, O., and Lumsdaine, R. L. (1998). Macroeconomic news and bond market volatility¹. *Journal of Financial Economics*, 47(3):315–337.
- Kim, S. and Na, H. (2018). Higher-moment liquidity risks and the cross-section of stock returns. *Journal of Financial Markets*, 38:39–59.
- Koulakiotis, A., Babalos, V., and Papasyriopoulos, N. (2015). Liquidity matters after all: Asymmetric news and stock market volatility before and after the global financial crisis. *Economics Letters*, 127:58–60.
- Kumar, G. and Misra, A. K. (2015). Closer view at the stock market liquidity: A literature review. *Asian Journal of Finance & Accounting*, 7(2):35–57.
- Kumar, S. and Prasanna, K. (2018). Liquidity in asian markets: Intensity of regional and global linkages. *Applied Economics*, pages 1–14.
- Lavstuvkova, J. (2017). Dimension of liquidity and their factors in the slovenian banking sector.
- Leeper, E. M. and Gordon, D. B. (1992). In search of the liquidity effect. *Journal of Monetary Economics*, 29(3):341–369.
- Lu-Andrews, R. and Glascock, J. L. (2010). Macroeconomic effects on stock liquidity.
- Lucas Jr, R. E. (1990). Liquidity and interest rates. *Journal of economic theory*, 50(2):237–264.
- M Friedman, A. S. (1963). A monetary history of the united states.
- Ma, R., Anderson, H. D., and Marshall, B. R. (2016). International stock market liquidity: a review. *Managerial Finance*, 42(2):118–135.
- Madhavan, A. (2000). Market microstructure: A survey. *Journal of financial markets*, 3(3):205–258.

- Mestel, R., Murg, M., and Theissen, E. (2018). Algorithmic trading and liquidity: Long term evidence from austria. *Finance Research Letters*.
- Mishra, A. K., Parikh, B., and Spahr, R. W. (2017). Individual stock market liquidity, financial crisis and quantitative easing.
- O'hara, M. (1995). *Market microstructure theory*, volume 108. Blackwell Publishers Cambridge, MA.
- Papadamou, S. (2013). Market anticipation of monetary policy actions and interest rate transmission to us treasury market rates. *Economic Modelling*, 33:545–551.
- Peranginangin, Y., Ali, A. Z., Brockman, P., and Zurbruegg, R. (2016). The impact of foreign trades on emerging market liquidity. *Pacific-Basin Finance Journal*, 40:1–16.
- Romer, D. (1993). Openness and inflation: theory and evidence. *The quarterly journal of economics*, 108(4):869–903.
- Ruenzi, S., Ungeheuer, M., and Weigert, F. (2018). Extreme downside liquidity risk.
- Schestag, R., Schuster, P., and Uhrig-Homburg, M. (2016). Measuring liquidity in bond markets. *The Review of Financial Studies*, 29(5):1170–1219.
- Schnabl, G. and Hoffmann, A. (2008). Monetary policy, vagabonding liquidity and bursting bubbles in new and emerging markets: An overinvestment view. *World Economy*, 31(9):1226–1252.
- Schoenfeld, J. (2017). The effect of voluntary disclosure on stock liquidity: New evidence from index funds. *Journal of Accounting and Economics*, 63(1):51–74.
- Sensoy, A. (2016). Commonality in liquidity: Effects of monetary policy and macroeconomic announcements. *Finance Research Letters*, 16:125–131.
- Shahid, M. S. and Gul, F. (2017). Investment opportunities & liquidity constraints: Evidence from two emerging markets, india and pakistan. *Journal of*

- Independent Studies & Research: Management & Social Sciences & Economics*, 15(1).
- Söderberg, J. et al. (2008). Do macroeconomic variables forecast changes in liquidity? an out-of-sample study on the order-driven stock markets in scandinavia. Technical report, Centre for Labour Market Policy Research (CAFO), School of Business and Economics, Linnaeus University.
- Strongin, S. (1995). The identification of monetary policy disturbances explaining the liquidity puzzle. *Journal of Monetary Economics*, 35(3):463–497.
- Tang, J. (2013). Uncertainty and the signaling channel of monetary policy.
- Tran, L. T. H., Hoang, T. T. P., and Tran, H. X. (2018). Stock liquidity and ownership structure during and after the 2008 global financial crisis: Empirical evidence from an emerging market. *Emerging Markets Review*.
- Trebbi, F. and Xiao, K. (2017). Regulation and market liquidity. *Management Science*.
- Varian, H. R. (1989). Price discrimination. *Handbook of industrial organization*, 1:597–654.
- Welker, M. (1995). Disclosure policy, information asymmetry, and liquidity in equity markets. *Contemporary accounting research*, 11(2):801–827.
- Xiao, Y. (2016). The research on liquidity risk management of chinas commercial banks. *Open Journal of Social Sciences*, 4(03):251.
- Zhang, L., Li, Y., Huang, Z., and Chen, X. (2018). Stock liquidity and firm value: evidence from china. *Applied Economics Letters*, 25(1):47–50.
- Zhang, Y. (2015). Product market power, corporate governance and stock market liquidity.

Appendix