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Does Monetary Policy Determines Liquidity? New Evidence from Pakistan Stock Market

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Abstract. Monetary policy and its influence on liquidity is one of the most contentious issues in recent periods. 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. This research using sample of 100 firms listed at Pakistan Stock Exchange (non-financial) for the period 2000-2020. In first step, simple regression is estimated to investigate the effect of monetary policy on market liquidity. In which the liquidity of market in month t is modeled as a function of the Industrial growth rate (IGRt), Inflation rate (INFt), market return (RMt), standard deviation (SDt) and real interest rate (INTt). 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) are estimated in which the liquidity (LIQi,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 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.

Key words: Monetary Policy, Liquidity, Turnover, SD, Return, Index of Industrial Production, Inflation Rate, CPI.

1 Introduction

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 (Rigobon, 2019). This study is connected to a growing body of literature on the relationship between monetary policy and liquidity.

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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 systems while looking at historical background. Period before 1990's 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 affect the economy. Monetary policy intervenes to ease financial crisis all over the world (Chu et al., 2019).

The supporting argument is based on signaling theory. Considering the premise 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 sends an indication to market & market respond accordingly. 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 hypothesize that stock market liquidity should be affected by monetary policy. 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 is translated into volumes. Kumar et al. (2020) concludes 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.

1.2 Liquidity

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 effect of monetary policy on liquidity and, in doing so, examines its function as a factor influencing liquidity commonality.

1.3 Research Objectives

This work is to explore the part of monetary policy as a common determinant of stock market liquidity & by observing relationship both at market level and individual stock level.

The aim is to explore relationship between State Bank of Pakistan' monetary policy interventions & its impact on liquidity by using liquidity as dependent variable & monetary policy as independent variable, with other control variables being employed.

1.4 Research Question

This study aims at addressing the following questions:

Q1. Is there any relationship exist between monetary policy and aggregate market liquidity?

Q2. Is there any relationship exist between monetary policy and individual stock liquidity?

1.5 Problem Statement

Previously work has been done in relation with monetary policy and stock market volatility or return. So far, limited literature exists 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 et al. (2006), stock market liquidity has grasped the attention of researcher. 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.

1.6 Significance of the Study

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 This work provides in-depth analysis of several market liquidity-affecting elements 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. This also enable, market participants to have better understanding about important macro and micro-economic factors affecting liquidity while making investment plans. This work is an empirical testimony in the emerging market of Pakistan about the above-mentioned association of monetary policy and liquidity.

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 has 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 et al. (2006), 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 fewer 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. 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 them exist strong association between monetary policy and liquidity shocks. /citetflorackis2014 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 and 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. Han et al. (2015) explores 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 (2009) 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. (2021) 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. Winsten et al. (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 et al. (2006), investigate the effect of firm's 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 shows 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.

Chen et al. (2019) 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. (2019) 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 examines 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 contributes 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.

Review of above literature indicates that the monetary policy and its effect on liquidity are recognized well in the worldwide. Pakistani evidence also exists 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.

3 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 intervenes to comfort financial crisis and to ensure price stability, this debate has earned much importance in current year. Antonia Garcia-Benau et al. (2013) 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:

$$TOt = c + \beta 1IGRt + \beta 2INFt + \beta 3INTt + \beta 5RMt + \mu t$$

In which the liquidity *(TOt)* of market in month t is modeled as a function of the Industrial growth rate *(IGRt)*, Inflation rate *(INFt)*, market return *(RMt)* & standard deviation *(SDt)* and real interest rate *(INTt)*. μt Label the 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 *(LIQi,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:

$$LIQi,\ t = c + B1LIQi,\ t\text{-}1 + \beta 2MCi,\ t\text{-}1 + \beta 4STDVi,\ t\text{-}1 + \beta RETi,\ t\text{-}1 + ci + \mu i,\ t$$

Where the dependent variable *LIQi,t* represents liquidity measures.

This study includes the one month lagged liquidity measures *LIQi,t-1* as a regressor. *MPt-1* is monetary policy rate as announced by the SBP and *MCi,t-1* is market capitalization. Other control variables on the stock level includes monthly return *RETi,t-1*, monthly standard deviation of daily stock returns *(STDVi,t-1)*. μt 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 21 years; starting from year 2000 to year 2020 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 thought to be trustworthy 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. Nonfinancial sector is considered because of difference in reporting period i-e while the accounting period for the financial sector finishes by December, it does not do so for the non-financial sector until the end of June. Moreover, a major difference exists between the capital structures of financial and non-financial sectors.

3.3 Measurement of Variables

This study employs 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 discover 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 et al. (2006), 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:

Turnover rate = Turnover / 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.

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 includes 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 influences 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 defining as how much the members of a group differ from the mean value for the group. Following formula is used to calculate standard deviation:

$$SD = \sqrt{\frac{\sum (R - R)^2}{n}}$$

Copelan & 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 exists a 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.

Return = $\sum$ return of each period / No. of each period

$$RET = \sum \frac{R_1}{n}$$

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 them 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:

Market Capitalization = Share price x No. of shares outstanding

Amihud et al. (2006), 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. Eisfeldt (2004) theoretically explains the relationship between macroeconomic variables and liquidity, howsoever, it has been empirically tested by (Söderberg and Wester, 2012). 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 defined as return on market portfolio. Average market return is calculated by dividing the current market price minus market price *(Pn - Po)* with previous market price *(Po)* Following formula is used to calculate market return:

$$RM = \frac{P_n - P_0}{P_0}$$

It is hypothesized that there exists 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:

*Monthly SD = SQRT (n) * STDEV (Rm)*

This study hypothesized that there exists 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 exists 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 2021.

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

4 Empirical Results and Discussion

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

4.1 Market Level Analysis

4.1.1 Descriptive Statistics

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

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

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

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 0.0049, maximum & minimum values are 0.045 & 0.258 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 >3 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 < 3.

4.1.2 Determinant of Market Liquidity

At macro level, Table 4.2 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 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

Table 4.2: Impact of Monetary Policy and Macro-Economic Variables on Market Liquidity

	Coefficient	**T Stat**	**P-value**
Intercept	0.0003	4.207	0.0000
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	0.0000
Adj. R^2	0.686	Sig (F-stat)	0.000
D.W stat	2.068	F Statistics	309.8124

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 ($R^2 \geq 60\%$). Durbin Watson statistics is 2.068 so no problem of auto-correlation exists in data.

4.2 The Micro Level (Company Specific Factors)

4.2.1 Panel Data Analysis

At micro level, taking into account the factors unique to each company, one can calculate how monetary policy will affect stock liquidity. 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.

- Common effect Model
- Fixed Effect Model
- Random Effect Model

Monetary policy is a dependent variable and individual stock liquidity is dependent variable. In estimating, total 100 non-financial firms are used for a period of 2000 to 2020.

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.

Table 4.3: Three Basic Techniques Employed for Panel Data Analysis

	Random Effect Model	Fixed Model Effect	Common Model Co-efficient
C			
Co-efficient	0.0395	0.0026	0.028
T-statistics	14.199	11.08	10.43
Prob	0.000	0.000	0.000
MCi,t-1			
Co-efficient	-1.64E-14	-1.38E-14	-1.38E-14
T-statistics	-1.53	-4.201	-1.63
Prob	0.1258	0.000	0.1030
MPt-1			
Co-efficient	-0.27	-0.197	-0.197
T-statistics	-9.61	-7.325	-7.02
Prob	0.000	0.000	0.000
STDVi,t-1			
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
RETi,t-1			
T-statistics	-0.272	-2.146	-0.585
Prob	0.7858	0.0319	0.558
LIQ(-1)i,t-1			
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	333.4140	6336.214	6336.21
Sig (F-stat)	0.000	0.000	0.000
Adj. R^2	0.672	0.684	0.672
D.W stat	2.159	2.019	2.23

The result of table 4.4 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

Table 4.4: Likelihood Ratio Test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	6.396445	(95,15334)	0.0000
Cross-section Chi-square	599.856058	95	0.0000

effect. This model assumes the random behavior of intercept.

Table 4.5: Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	606.547891	5	0.0000

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

4.2.2 Panel Option: Fixed

Table 4.6: Impact of Firm Specific Variable on Stock Liquidity

	Coefficient	T-Stat	P-value
C	0.029	11.08	0.0000
MCi,t-1	-1.38E-14	-4.201	0.0000
MPi,t-1	-0.197	-7.325	0.0000
STDVi,t-1	1.83E-09	2.661	0.0078
RETi,t-1	-3.69E-09	-2.146	0.0319
LIQ(-1)i,t-1	0.813	50.54	0.0000
Adj. R^2	0.684	Prob. (F-stat)	0.000
D.W stat	2.019	F Statistics	6336.21

Table 4.6 reports that monetary policy (MPi, t-1) (P value= 0.000) significantly determines the liquidity of individual stocks. Standard deviation (STDVi,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 (MCi,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 exist negative relation between market size and liquidity. The return (RETi,t-1) (P value= 0.0319) is negative and significant for individual stock liquidity which shows that as return increases liquidity decreases in line with Amihud et al. (2006), 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 (-1) 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 (MPi,t-1), standard deviation (STDVi,t-1), market capitalization (MCi,t-1), return (RETi,t-1) & Lag value of liquidity (LIQ (-1) i,t-1) on individual stock liquidity are in line with (Amihud et al., 2006; Ioannidis and Kontonikas, 2008; Liu et al., 2013; Söderberg and Wester, 2012).

This model explains large part of the variation in stocks as R^2 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.

5 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 2020. The study examines 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, 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 moves 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. 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. This also enable, market participants to have better understanding about important macro and micro-economic factors affecting liquidity while making investment plans.

This work is an empirical testimony about the above-mentioned association of monetary policy and liquidity in the emerging market of Pakistan.

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