Impact of Stock Price Synchronicity on Stock Liquidity in Pakistani Equity Market

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CERTIFICATE

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I Komal Altaf hereby state that my M. Phil thesis titled Impact of Stock Price Synchronicity on Stock Liquidity in Pakistani Equity Market is my work and has not been submitted previously by me for taking any degree from this University Pakistan Institute of Development Economics, Islamabad or anywhere else in the country/world.

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Dedicated to My Loving Mother

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All and every kind of praise for Almighty Allah who is the creator of time, universe, knowledge, and everything within and beyond the edge limits of these things. Every respect and reference is for His Holy Prophet Muhammad (Peace Be Upon Him), who is the origin and source of knowledge, who enabled us to recognize our creator and guided us to differentiate between darkness and brightness. From the core of my heart, I am thankful to my Allah who enabled me to complete this dissertation.

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ABSTRACT

This study examines the impact of stock price synchronicity (SPS) and monetary policy with institutional ownership as a moderating variable on stock liquidity. The study uses a sample of 72 non-financial companies listed at the Pakistan Stock Exchange (PSX) from 2003 to 2019. The study uses stock liquidity as a dependent variable, and it is measured by using two proxies turnover ratio and liquidity ratio for robustness. Results from both the turnover ratio and liquidity ratio show robust results. Findings of the random effect model show that SPS improves stock liquidity, and a significant relationship also exists between stock liquidity and monetary policy which are consistent with the previous studies. The study also finds a positive relationship between institutional ownership and stock liquidity. The study finds that investors invest in those stocks which co-move with the market, as the Pakistani equity market is less developed relative to developed markets and investors do not have adequate information about stocks due to low information disclosures by the firm. Therefore, SPS increases stock liquidity. The results of this study can be used by investors, shareholders, managers, financial analysts, and market makers.

Keywords: Stock price synchronicity, turnover ratio, liquidity ratio, monetary policy, institutional ownership, Pakistan Stock Exchange

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LIST OF ABBREVIATIONS

SPS	Stock Price Synchronicity
LR	Liquidity Ratio
TR	Turnover Ratio
PSX	Pakistan Stock Exchange
FS	Firm Size
Lev	Leverage
Rt_ Vol	Return Volatility
REM	Random-Effects Model
FEM	Fixed Effects Model

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CHAPTER 1

INTRODUCTION

Investors want three things from the markets: liquidity, liquidity, and liquidity (Handa and Schwartz, 1996). Stock liquidity plays a significant role in the fair price discovery process of an asset and is considered an important topic in the literature of finance since the global financial crisis (GFC). Liquidity is referred to as ease to trade large quantities of securities while having a little price impact by incurring a low trading cost. It also plays an important role in the measurement of the growth and efficiency of the market (Singh, Gupta, & Sharma, 2015). Efficient Market Hypothesis (EMH) states that in efficient capital markets, stock prices reflect all available information, either macroeconomic or firm-specific. Chordia, Roll, and Subrahmanyam (2008) state that poor stock liquidity is associated with a greater degree of market inefficiency.

The increase in information incorporation of company-specific variables leads the stock prices to co-move with the market and it affects stock's trading activity, which therefore affects its liquidity (Baruch, Karolyi, & Lemmon, 2007). If the stock price co-move with the market, it increases the R-square of market model regression known as stock price synchronicity (SPS). The SPS will be lower when stock price incorporates more firm-specific information or idiosyncratic component of the firm and indicates the relative amount of company-specific information impounded into the stock prices (Roll, 1988). Investors closely analyze the lower SPS and as it is costly for them to obtain the firm-specific information from many perspectives. They will choose not to invest in stocks that reflect more of the idiosyncratic component of the firm. Therefore, they will invest in a stock that reflects higher co-movement with

the market, and hence the stocks of those firms will be more liquid (Baruch & Saar, 2009).

Given the importance of stock liquidity, it is imperative to explore what determines stock liquidity in the financial markets. Xing and Anderson (2011) argue that SPS reflects firm-specific information. Liu (2013) argues that stocks with a large increase in the number of institutional investors result in increased stock liquidity and this effect is more prominent in the stocks subject to more asymmetric information. According to Cheng (2007), firm size, more **scattered/dispersed** ownership structure, less critical information asymmetry, higher-margin trading utilization, the more absorption of investor's perceptions, and the liquidity of the entire market positively affects the liquidity of the stock.

The theoretical reasoning of this study is related to the study of Chan, Hameed, and Kang (2013) that explains how SPS can affect the liquidity of stocks. They hypothesize that under the relative synchronicity hypothesis, a positive relationship exists between stock return co-movement and liquidity.

This study takes the perspective that SPS mirrors firm-specific information and considers SPS for the firm's related variables to find its impact on stock liquidity, and results confirmed that SPS improves stock liquidity. Furthermore, the study also proposes that this effect is more prominent in the presence of institutional investors. The study also confirms that institutional ownership plays a moderating role between stock liquidity and synchronicity.

1.1 Problem Statement

Liquidity is considered to be the essence of the stock market. The liquidity of stock greatly affects the investment decision of the investor as a large number of investors

prefer to invest in a highly liquid stock. It also plays an important role to measure the trading activity of a firm in the market. If a firm's liquidity is correct, then it will help in fair price discovery in the market, and also increases efficiency.

In developed countries, firms disclose adequate information, have better corporate governance practices, and are subject to good analyst coverage which boosts the confidence of investors to invest in those capital markets and so their liquidity is high. To the best of the author's knowledge, only Chan et al. (2013) investigated the effect of SPS on stock liquidity. However, the sample is only limited to the U.S market. Due to different changes in social, political, and economic conditions, it is not possible to generalize the results of this study for the Pakistani stock market where the financial market is not much developed.

In Pakistan, investors have lower protection rights with less possibility to acquire firm-specific information as relative to the developed market, there are low information disclosures by the firm. Moreover, the financial analyst does not provide information as efficiently to investors as in developed markets. According to Javed (2012) generally in the Pakistani equity market, companies do not move on their fundamentals because of less efficiency and they move on market fundamentals (Javed, 2012).

Considering these factors, investors consequently choose to invest in stocks that co-move more with the market because it is least possible for them to obtain firm-specific information due to many factors and cost is dominant in that.

Thus, this study is devoted to exploring the role of SPS in explaining stock liquidity in the Pakistani equity market and how institutional ownership can boost this effect.

1.2 Research Question

This study has the following research questions:

1. Whether SPS affect the liquidity of stock?
2. Whether institutional ownership affect stock liquidity?
3. What is the impact of monetary policy on the liquidity of individual stock?
4. What is the moderating effect of institutional ownership in examining the relationship between SPS and stock liquidity?

1.3 Research Objectives

This study has the following research Objectives:

1. To investigate the impact of SPS on stock liquidity of the firms listed on PSX.
2. To examine the role of institutional ownership in explaining the liquidity of the stock.
3. To explore the relationship between monetary policy and liquidity of the individual stock.
4. To provide insight into the moderating effect of institutional ownership in examining the relationship between SPS and stock liquidity.

1.4 Significance and Contributions of the Study

This study makes a substantial contribution to the literature by studying how SPS can affect the liquidity of a stock. The Pakistani equity market is an emerging market and observed phenomenal growth in the last decade. It attracts a large number of investors who prefer to invest in highly liquid stocks. But due to poor corporate governance practices and inadequate information disclosures, not equal information is available to the market makers. These unique conditions demand that there should be a measure on which investors can rely as it is costly for them to obtain firm-specific information.

In this scenario, investors rely on SPS which shows the idiosyncratic component of the firm and they prefer to invest in stocks that co-move with the market.

The findings of the study are helpful for investors, shareholders, managers, financial analysts, and market makers in many ways: firstly, this study will contribute to the literature of SPS and stock liquidity. Secondly, this study will help investors to identify the most liquid stock and will enable them to decide which stocks to acquire and which to dispose of. Thirdly, this study will be useful for the firms in the way that they could have a better understanding of ownership structure. The study will enable market participants to have a better understanding of important micro and macro-economic factors affecting stock's liquidity. This study will be the pioneering work to explore the impact of SPS on stock liquidity with the moderating effect of institutional ownership along with a monetary policy for the firms listed on PSX.

1.5 Research Gap

Many studies attempt to find the impact of individual firm-specific variables on stock liquidity. The variables include firm size, ownership structure, information asymmetry, and margin trading utilization, company policy of information disclosure to investors, company's debt usage, and some of the financial ratios of the company. In a study by Xing and Anderson (2011), they argue that all firm-specific information is reflected by SPS. So, rather than individually checking all these firm-specific variable's impact on stock liquidity, SPS can be used as an alternative.

This study aims to test that a higher SPS will lead to higher stock liquidity. Chan et al. (2013) test the same relationship but that is in the context of NYSE listed companies and no research has done to test the same relationship in developing/emerging economies. Moreover, the current study will use another variable, institutional

ownership as a moderator between SPS and stock liquidity to check whether it increases or decreases the liquidity of the stock. Therefore, this study is devoted to filling this gap and attempts to find the impact of SPS and monetary policy on stock liquidity.

1.6 Organization of the Study

This thesis is classified into the following chapters. Chapter 2 contains the literature review which gives the theoretical and empirical discussion on SPS and monetary policy relationship with stock liquidity. Chapter 3 discusses the data description, methodology, and related control variables.

CHAPTER 2

Literature Review

2.1 Theoretical Background

The word "synchronicity" means that events are "meaningful coincidences". This term comes from the literature of Psychology and was the first time coined in 1920, by Carl Jung. Jung formally discussed this term in 1952 in a paper named "Synchronizität als ein Prinzip akausaler Zusammenhänge" (An Acausal Connecting Principle). In this paper, Jung defined synchronicity "an acausal connecting principle in which events, both large and small, in the external world might align to the experience of the individual, perhaps mirroring or echoing personal concerns or thoughts". Jung believes that events are may be connected by meaning just like they are connected to causality.

SPS is relatively a new concept in the Finance literature and gains researchers' attention in the last decade, therefore little work done in this regard. Mainly, two threads of literature are found who interpret R^2 differently. One strand defines high SPS as less informative stocks as they incorporate less firm-specific information (Morck, Yeung & Yu, 2000; Wurgler, 2000; & Durnev et al., 2003). The other body of literature, for example, Dasgupta, Gan, and Gao (2010) and Kelly (2014) argues that quick integration of information into stock prices decreases idiosyncratic return volatility and increases R^2[1].

Literature is devoted to SPS in both developed (Morck et al, 2000; Xing & Anderson, 2011; Chan et al., 2013; Kelly, 2014; Chan & Chan, 2014) and emerging economies (Chan & Hameed, 2006; Khandaker & Heaney, 2008; Khakender, 2011; Farooq & Hamouda, 2016; Farooq & ElBannan, 2019) which discusses several dimensions of

[1]R^s is a widely used measure for determining SPS following Roll (1988) and Morck et al. (2000).

SPS. Fewer studies make an effort to check SPS in Pakistan. Primarily Chan & Hameed (2006) are the first ones who investigate SPS in Pakistan among other emerging countries. Later on, a series of researchers worked on this (Fraz & Hassan 2017; Zia 2017; Rasheed et al., 2018).

Chan et al. (2013) inspect the impact of synchronicity on the liquidity of the companies listed at the New York Stock Exchange (NYSE) as identified by the CRSP, from January 1989 to December 2008. The findings of the study suggest that SPS has a substantial and positive impact on stock liquidity, which means the more stock co-moves with the market the more it will increase liquidity. So, stocks with less idiosyncratic information have less information asymmetry. Liu (2013) find a positive relationship between institutional ownership and stock liquidity. Goyenko and Ukhov (2009) argue that a positive relationship between monetary policy and stock liquidity exists. Fernandez-Amador et al. (2011) report that expansionary (restrictive) monetary policy positively (negatively) affects stock liquidity.

2.2 Review of Literature

Amihud (2002) define liquidity in financial markets, as "ease of trading". It is related to stock returns and it reflects the ability to quickly buy and sell an asset with little price impact and with a minimal trading cost. Stock liquidity is a multi-dimensional phenomenon and a key attribute for the smooth functioning of financial markets.

There are several reasons for understanding the possible effects and determinants of stock liquidity. For example, in the functioning of the capital market liquidity plays a vital role, as investors' supply or demand liquidity when they enter the market. Secondly, liquidity is a factor that influences both aggregate returns i.e. market and individual stock return. Thirdly, any variation in market liquidity could lead to

financial crises. A decline in stock liquidity is a sign of a crisis in the real economy (Næs, Skjeltorp, & Ødegaard, 2011).

For understanding liquidity's role in financial markets, it is pertinent to understand its determinants. It is categorized into two type's namely firm-specific (idiosyncratic) and macroeconomic factors. Several studies have been done and they investigate how different factors contribute to an increase/decrease in stock liquidity. According to Xing and Anderson (2011), SPS reflects firm-specific information.

In capital markets, SPS measures the extent or degree to which stock co-moves with the market. In the finance literature, stock price informativeness is measured by using R square measure commonly known as SPS (Jin & Myers, 2006; Marhfor et al., 2013; Li, Rajgopal, & Venkatachalam 2014). The debate on SPS was initiated with Roll (1988). The shreds of evidence are still inclusive that either R-square is a measure of noise or information in the stock market (Chan & Chan, 2014; Gassen, Skaif, & Veenman, 2018). In both cases, whether R-square is an alternative of stock price informativeness or noise, SPS will affect the stock liquidity (Chan et al., 2013).

In the beginning, Roll (1988) has discussed the phenomenon of stock price co-movement by using R square and used multiple variables along with market factors for a large sample of the US firms listed in the US stock market. The results indicate that stock price movements depend on market factors and firm-specific factors. The study further suggests that asset pricing regressions based on single market factors have low explanatory powers, as public news is not a single source of all firm related information that incorporates into stock prices.

West (1988) presents a model that explains that when there is more information flow, prices converge towards fundamental value. Incorporation of more information into

stock prices will result in a fair discovery of stock price, high R-square value, and future price stability.

Extending the work of Roll (1988), Durnev et al. (2003) empirically observe the importance of incorporating firm-specific information or idiosyncratic component in explaining the low SPS. The study suggests that when informed investor trade by capitalizing private information, and it results in lower stock synchronicity, then it signals that the stock prices are following the fundamental value of the firm reflecting efficient capital markets.

Firm-specific information helps the investors in making portfolio choices, the good information environment incorporates public information into stock prices the moment it announces and the private information incorporate into prices via trading (French & Roll, 1986). Higher the private information means less synchronization of the stock with the market which resulted in the reduction of R-square and informed traders capitalize the private information into stock prices through trading (Durnev et al., 2003).

Baruch and Saar (2009) and Baruch, Karolyi, and Lemmon (2007) demonstrate that stock return movement with the market affects a stock's trading activity, which therefore affects its liquidity. The underlying idea behind this is that relative to firm-specific information, stock co-movement measures market-wide information. It is relatively easier for market makers and investors to observe market-wide information as it is publicly available than observing the firm-specific information.

Subrahmanyam (1991) reveals to introduce a broad basket of securities as it offers a favored trading medium for uninformed liquidity traders as well since adverse selection costs are more in markets where individual securities trade. This supports

the notion that in the basket of securities, firm-specific returns diversified away and are generally affected by the systematic returns, and consequently, are more liquid.

Chan et al. (2013) argue that an upsurge in market beta or systematic volatility improves stock liquidity. They suggest that the more stock co-move with the market the more it will increase liquidity. Stocks with less idiosyncratic information have less information asymmetry, and an increase in SPS will result in a decrease of illiquidity. Furthermore, the study suggests that industry-wide component in returns also lessens the adverse selection cost and result in improved liquidity besides market co-movement.

Organizations are categorized into different types of institutional investors (Hsu & Koh 2005). Institutional ownership of a firm is reflected throughout of total outstanding shares, the total number of shares held by the institutional investors. It is argued that institutional owners have more information than individual investors as they hold a large number of shares.

Institutional owners affect stock liquidity in two ways. Firstly, institutional owners seem to turnover their portfolios more often as compare to other investors. When investors more often turnover their portfolios, transaction cost decreases which means buying and selling of shares increase and that leads to an increase in liquidity (Rubin, 2007). Secondly, Institutional owners have large amount of shares that leads to access to inside information. This informed trading reduces information cost for outside traders and hence increases trading activity and liquidity (Demsetz, 1986).

Cao and Petrasek (2014) argue that institutional investors influence the liquidity of shares more than individual investors because they have more information. The study reports a significant and positive relationship between stock liquidity and institutional

investors and Boujelbene, Bouri, and Prigent (2014) also confirms the same relationship. Liu (2013) also argues that stocks with a large increase in the number of institutional investors result in increased stock liquidity and this effect is more prominent in the stock subject to more asymmetric information.

Jacoby and Zheng (2010) conduct a study on stocks and document that liquidity improves with higher ownership dispersion and this relationship was found even in small stocks listed on AMEX/NYSE. Baber et al. (2012) attempt to study the relationship between liquidity, liquidity risk, and institutional investors. The findings of the study report that institutional ownership shows larger stock liquidity. Blume and Keim (2012) provide evidence in the context of the US market that cross-sectional variation in stock market illiquidity is due to institutional participation. According to Baker and Stein (2004), institutional investors reduce liquidity risk and increase the liquidity of stocks. Chordia, Roll, and Subrahmanyam (2000) and Hasbrouck and Seppi (2001) found that among stocks significant co-variations in liquidity exist. For instance, correlated trading patterns may exhibit by institutional investors who possess similar investing styles.

Researchers focus on two hypotheses; adverse selection and trading hypothesis while studying the relationship between stock liquidity and institutional investors. The adverse selection hypothesis states that institutional investors have more information than other investors which causes reduced liquidity and more information asymmetry (Kyle, 1985; O'Hara, 2003). On the other hand, the trading hypothesis reveals that as investors turn to their portfolio, transaction cost decreases, and liquidity increases (Hasbrouck & Schwartz, 1988).

Literature suggests that monetary policy also impacts stock liquidity. Chordia, Roll, and Subrahmanyam (2001) find that trading activity and liquidity of the stock mainly

affected by the long and short-term interest rates, market return, and volatility. Fernandez-Amador et al. (2011) explore that expansionary (restrictive) monetary policy also contributes to an increase (decrease) in stock market liquidity. In a contractionary monetary policy state bank increases interest rate that increases inflation rate. When inflation increases people have less money to invest in the stock market. Therefore, stock market liquidity decreases (Boachie et al., 2016).

Goyenko and Ukhov (2009) demonstrate that monetary policy predicts stock market liquidity, whereas Chordia, Roll, and Subrahmanyam (2005) report modest predictive power of monetary policy for stock liquidity. Söderberg (2008) uses 14 macroeconomic variables to assess their impact on stock market liquidity and provides mixed evidence. Chung, Elder, and Kim (2013) find that following the news announcement liquidity decreases immediately. Sensoy (2016) argues that for developed countries, the monetary policy increases stock liquidity.

According to Cheng (2007), firm size, more dispersed ownership structure, less critical information asymmetry, higher-margin trading utilization, the more absorption of investor's perception, and the liquidity of the entire market positively affects the liquidity of the stock. Jiang et al. (2014) suggest that better corporate governance practices lead to improved stock liquidity.

The above literature shows that firm-specific variables and institutional ownership along with monetary policy have an impact on stock liquidity. For example, Goyenko and Ukhov (2009) and Chordia et al. (2000 &2005) report that monetary policy does influence stock liquidity. Chan et al. (2013) report a positive impact of SPS on individual stock liquidity. Moreover, Liu (2013) and Cao and Petrasek (2014) argue that stocks with a large increase in the number of institutional investors result in increased stock liquidity. Therefore, this study will see the impact of SPS on stock

liquidity with the moderating effect of institutional ownership. Furthermore, to capture macroeconomic factor impact on stock liquidity monetary policy proxy reverse repo is used.

CHAPTER 3

Data Description and Methodology

3.1 Data Description

3.1.1 Population and Sample

The study covers a period of about 17 years from 2003 to 2019. The sample size comprises firms listed in KSE-100. We excluded insurance companies, banks, and other financial institutes due to their different nature of business and financial behavior. Also, firms having missing observations and do not have data for a given period are excluded. Eventually, we left with a final sample of 72 non-financial firms that have all relative information for our analysis is used in this study. A list of firms used in this study is given in Appendix A.

Secondary data is used for empirical analysis. The source of data is the business recorder, State Bank of Pakistan (SBP) website, and PSX website mainly for the data of stock prices, stock volume, and market capitalization. All other variables' data is collected from the financial statements of the firms.

3.2 Model Specification

Following Chan et al. (2013), to test stock liquidity this study estimates the following regression equation:

$$\boldsymbol{Stock\ LIQ_{i,t}} = \boldsymbol{\alpha} + \boldsymbol{\beta_1 SPS_{i,t}} + \boldsymbol{\beta_2\ inst\ own_{i,t}} + \boldsymbol{\beta_3 RRR_t} + \boldsymbol{\beta_4}\left(\boldsymbol{SPS_{i,t}} \times \boldsymbol{Ins\ own_{i,t}}\right) + \boldsymbol{\beta_5 FS_{i,t}} + \boldsymbol{\beta_6\ Rt.Vol_{i,t}} + \boldsymbol{\beta_7\ Lev_{i,t}} + \boldsymbol{\varepsilon_{i,t}} \quad (3.1)$$

$\boldsymbol{SPS_{i,t}}$ is stock price synchronicity of stock i during time t , $\boldsymbol{RRR_t}$ is reverse repo rate (a proxy of monetary policy) during time t, $\boldsymbol{SPS_{i,t}} \times \boldsymbol{Ins\ own_{i,t}}$ is the interaction term used in the study. The remaining three are controlled variables used in the study

in which $\boldsymbol{FS_{i,t}}$ is the firm size of stock i during time t, $\boldsymbol{Rt.Vol_{i,t}}$ is the return volatility of stock i during time t, and $\boldsymbol{Lev_{i,t}}$ is the leverage of stock i during time t. $\boldsymbol{Stock\ LIQ_{i.t}}$ is the dependent variable measured using two proxies namely, liquidity ratio (LR) and turnover ratio (TR) to cover different aspects of liquidity and also to find robustness.

$$\boldsymbol{Liquidity\ Ratio_{i,t} = \alpha + \beta_1 SPS_{i,t} + \beta_2\ inst\ own_{i,t} + \beta_3 RRR_t + \beta_4\left(SPS_{i,t} \times Ins\ own_{i,t}\right) + \beta_5 FS_{i,t} + \beta_6\ Rt.Vol_{i,t} + \beta_7\ Lev_{i,t} + \varepsilon_{i,t}} \quad (3.1.1)$$

$$\boldsymbol{Turnover\ Ratio_{i,t} = \alpha + \beta_1 SPS_{i,t} + \beta_2\ inst\ own_{i,t} + \beta_3 RRR_t + \beta_4\left(SPS_{i,t} \times Ins\ own_{i,t}\right) + \beta_5 FS_{i,t} + \beta_6\ Rt.Vol_{i,t} + \beta_7\ Lev_{i,t} + \varepsilon_{i,t}} \quad (3.1.2)$$

3.2.1 Panel Data Regression Model

The current study is based on the panel data, a combination of both "cross-sectional and time-series data". Panel data gives more degree of freedom, less collinearity, more information, and more efficiency. Panel data employed three basic techniques and these models talk about intercept behavior. These techniques include the common effect model, the fixed-effect model, and the random effect model.

3.2.1.1 Common Effect Model

Common Effect Model is also known as the pooled OLS method. In this model, both slope and intercept remain constant over the time-series and cross-section.

3.2.1.2 Fixed Effect Model

Fixed Effect Model (FEM) is applied when there is a possibility that the issue of association may arise between the individual-specific intercept and the other regressors.

$$\boldsymbol{Cov\ (\alpha_i,\ X_{i,t}) \neq 0} \quad (3.2)$$

This model uses fixed dummies to solve the problem of heterogeneity.

The equation for the fixed effects model is as follow:

$$\boldsymbol{Y_{it} = \beta_o + \ \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \ \beta_k X_{kit} + \alpha_i + \ u_{it}} \quad (3.2.1)$$

Where, Y_{it} is a dependent variable, β_o is intercept, X_{1it} is the first independent variable, X_{2it} is the second independent variable, α_i is unobserved heterogeneity, and u_{it} is a combined cross-section and time-series error term. In FEM, α_i is an individual-specific intercept.

3.2.1.3 Random Effect Model

The fixed Effect Model is criticized because it captures individual-specific effects using fixed dummies, it involves a large number of parameters with a large cross-section set. "Due to this, the problem of loss of a degree of freedom occurs. The intercept term is the random effect model that expresses time-variant dummy variables."

This model is appropriate to use where the regressors are uncorrelated with the intercept of each cross-sectional unit.

$$\boldsymbol{Cov\left(\epsilon_i,\ X_{i,t}\right) = 0} \quad (3.3)$$

The equation for the random-effects model is as follow:

$$\boldsymbol{Y_{it} = \beta_o + \ \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots + \ \beta_k X_{kit} + \epsilon_i + \ u_{it}} \quad (3.3.1)$$

Where, Y_{it} is a dependent variable, β_o is intercept, X_{1it} is the first independent variable, X_{2it} is the second independent variable, ϵ_i is unobserved heterogeneity, and

u_{it} is the error term of cross-sectional and time-series data. In REM, ϵ_i is a random firm-specific error term.

In REM, the intercept values of individual units are drawn from a much larger population with a constant mean, where the means of each individual are considered as deviations from the constant mean. In REM, it is possible to have time-variant regressors that are not possible in FEM because of the problem of the "collinearity" of these variables with the subject-specific intercept.

3.2.1.4 Choice among FEM and REM through "Hausman Test"

For the selection between the fixed-effect model and random- effect model, various criteria are mentioned in the literature. However, this study follows Hausman (1978), a statistical test for the selection between both models. This statistical test is advantageous over any other judgmental criteria.

The Hausman statistical test for the selection of "fixed effect" and "random effect" follows the following model.

$$\boldsymbol{w = (\tilde{\beta}_{FEm} - \tilde{\beta}_{REM})'\left[v(\tilde{\beta}_{FEM}) - v(\tilde{\beta}_{REM})\right]^{-1}(\tilde{\beta}_{FEm} - \tilde{\beta}_{REM}) \approx \chi^2} \qquad (3.4)$$

The above equation checks both models statistically to explain the better one. The selection criteria follow the model with more consistent results and a statistical approach of chi-square.

3.3 Variable Description

3.3.1 Dependent Variable

3.3.1.1 Stock Liquidity

This study uses stock liquidity (specifically an individual firm's liquidity) as a dependent variable. Stock liquidity is an important factor that considers investment in

stocks. Due to the ambiguous nature of stock liquidity, it is not possible to measure directly, and proxies are used to measure it.

The study uses two proxies for measuring stock liquidity. These are liquidity ratio and turnover. Other liquidity measures which this study does not consider are those which require microstructure data related to a transaction, bid-ask spreads, quotes, and CRSP data which are not available in Pakistan.

3.3.1.1.1 Turnover Ratio

Following Datar, Naik, and Radcliffe (1998), Aitken and Forde (2003), Barinov (2014), and Prommin et al. (2014), this study uses the turnover ratio to measure stock liquidity. This proxy is measured using outstanding shares and share traded (volume) data during a week. Turnover shows how many times a stock changes its owner. The higher the turnover ratio is, the more liquid the stock is.

The following formula is used for measuring the turnover ratio

$$\boldsymbol{Stock\ Liquidity\ (Turnover\ Ratio)} = \frac{\boldsymbol{Vol_{i,t}}}{\boldsymbol{N_{i,t}}} \qquad (3.5)$$

i= stock of the individual firm

t= time during which stock traded

Where,$\boldsymbol{N_{i,t}}$ depicts the total number of outstanding shares and $\boldsymbol{Vol_{i,t}}$ is the volume of shares traded of stock $\boldsymbol{i}$ traded during time $\boldsymbol{t}$. Bartov and Bodnar (1996) argue that the volume of shares traded is related to information asymmetry. When the level of information asymmetry increases, it may lead to a lower trading volume because uninformed traders do not prefer to invest in these stocks. A higher turnover ratio means an increase in the liquidity of a stock.

3.3.1.1.2 Liquidity Ratio

Liquidity ratio (LR) is the ratio of the total trading volume to the absolute value of the stock return. Amihud, Mendelson, and Lauterbach (1997) and Berkman and Eleswarapu (1998) use the liquidity ratio as a proxy for stock market liquidity and focus on the effect of information asymmetry on liquidity. Kluger and Stephen (1997) recommend that this ratio captures the notion that markets are characterized by depth, width, and flexibility. LR is based on the concept that more stock liquidity could absorb a large amount of trading volume without a significant price change. Thus, the higher the liquidity ratio, the higher the market liquidity or depth.

$$\boldsymbol{LR} = \sum_t \{\boldsymbol{Vol}_{i,t}\} / \sum_t |\boldsymbol{R}_{i,t}| \qquad (3.6)$$

i= stock of the individual firm

t= time during which stock traded

Where, $\boldsymbol{Vol}_{i,t}$ is the daily volume, $|\boldsymbol{R}_{i,t}|$ the absolute value or daily stock returns.

3.3.2 Independent Variable

3.3.2.1 Stock Price Synchronicity

SPS is used as an independent variable in this study. SPS is defined as the degree to which stock co-moves with the market. Emerging markets have more openness and sound institutions that increase firm-specific information and reduces synchronicity overtime. Whereas, countries with less developed markets tend to have a high value of synchronicity. This time-varying property of synchronicity shows that as the market develops over time the value of synchronicity decreases (Li et al., 2003; Campbell et al., 2001).

Firstly, there is a Roll's model for measuring stock price non-synchronicity (or firm-specific price variation). This model is used in both theoretical and empirical large bodies of literature. According to Roll (1988) stock return variation can be decomposed into three different components: variation related to the industry, variation related to market, and variation related to firm specification. Synchronicity is captured from variation related to the market, and variation related to the industry, and both of these two measure systematic variation. It can be estimated by R-square, where R-square is the coefficient of determination from the following regression model.

$$\boldsymbol{R_{i,j,t} = \alpha_{i,0} + \beta_{i,m}\left(R_{m,t}\right) + \beta_{i,j}R_{j,t} + \varepsilon_{i,t}} \qquad (3.7)$$

where:

$\boldsymbol{R_{i,j,t}}$ is the return of firm i in industry j at time t

$\boldsymbol{R_{m,t}}$ is the market return at time t

$\boldsymbol{R_{j,t}}$ is the return of industry j at time t

However, there are two issues in computing synchronicity from the traditional CAPM suggested by Roll (1988). First of all, in the emerging market, few industries are more dominant than others causing difficulty to separate these industries' effect from the market effect. Moreover, industry returns calculated from the few companies may reflect the company's specific news rather than industry news. Therefore, the addition of industry return in equation (3.7) can cause spurious results. Secondly, R-square may not serve as an appropriate dependent variable as the value of R-square is naturally bounded within the interval unit [0, 1].

To yield a dependent variable with a more normal distribution, Morck et al. (2000) suggested using the unbounded logarithmic transformation of $\left(\frac{R^2}{1-R^2}\right)$. Thus, this study follows the research of Morck et al. (2000) for estimating stock price synchronicity.

The measure of SPS uses the following regression equation

$$R_{i,t} = \alpha_{i,0} + \beta_{i,m}\left(R_{m,t}\right) + \varepsilon_{i,t} \qquad (3.8)$$

In the above equation, the dependent variable $R_{i,t}$ is the return of stock i during week t and the independent variable $R_{m,t}$ is the returns of the corresponding market index m for the same week t.

R-square obtained from the estimation of Equation (3.8) is used as follows to compute stock price synchronicity (SPS).[2] A low value of SPS indicates more firm-specific information.

$$SPS = \text{Log}\left(\frac{R^2}{1-R^2}\right) \qquad (3.8.1)$$

3.3.2.2 Monetary Policy

Monetary policy is commonly examined through the interest rate or money aggregate in the existing literature. Central banks use monetary aggregate to control the current money supply but the target monetary policy rate shows the future stance of the government's monetary policy. SBP announces the policy rate after every 2 months. This announcement of a new monetary policy sends new information to the market that affects the liquidity of stocks.

[2] Prior literature uses log of the value obtained from Equation (3.8) as a measure of synchronicity (Piotroski and Roulstone, 2004; Jin and Myers, 2006; Hutton et al., 2009; Yu, 2011; Farooq and Ahmed, 2014, and Kan and Gong; 2018). This log transformation is performed because synchronicity is used as an independent variable in the analysis. Log transformation converts a bounded variable into a continuous variable.

To capture the monetary policy stance of SBP. Following the study of Fernandez-Amador et al. (2011) this study uses overnight reverse repo-rate as an instrument of monetary policy. The reverse repo-rate is closest to the government's target monetary policy rate. It is the rate at which the commercial banks lend money to the central bank of a country. The current study uses twelve months of reverse repo rates and then convert them into annual by taking an average. An increase (decrease) in the reverse repo rate shows a decrease (increase) in the money supply in the market, which means contractionary (expansionary) monetary policy and a decrease in stock liquidity. In a contractionary monetary policy state bank increases interest rate that increases inflation rate. When inflation increases people have less money to invest in the stock market. Therefore, stock market liquidity decreases (Boachie et al., 2016).

3.3.2.3 Institutional Investors (Moderating Variable)

Organizations are categorized into different types of institutional investors (Hsu & Koh 2005). Institutional ownership of a firm is reflected through the total number of shares held by the institutional investors divided by the total outstanding shares. The measure has been used in extensive studies such as Shah (2009), Hassan and Ahmed (2012), Cao and Petrasek (2014), and Ajina et al. (2015).

This study considers NIT/ ICP, mutual funds, shareholders holding 10%, public sector companies and corporations, banks, development finance institutions, non-banking finance companies, insurance companies, takaful, modarabas, and pension funds as institutional owners.

To calculate institutional ownership, the following formula is used:

$$\boldsymbol{Inst.Own} = \frac{\boldsymbol{Total\ No.of\ share\ held\ by\ institution}}{\boldsymbol{Total\ outstanding\ shares}} \qquad (3.9)$$

3.3.3 Control Variables

To explore the role of SPS in explaining stock liquidity, firm-specific control variables which account for the heterogeneity in the level of information asymmetry between firms as well as other observable factors that might influence a firm's stock liquidity. Following Atawnah et al. (2018) this study controls the firm size, return volatility, and leverage.

3.3.3.1 Firm Size (FS)

Heflin et al. (2005) argue that illiquid companies have weak market capitalization. Therefore, a positive relationship is expected between liquidity and the size of the firm. Various proxies have been used for measuring firm size. Rajan and Zingales (1995) used sales proxy and Ataullah et al. (2012) used total assets to measure firm size. Firms' market capitalization varies by a large scale making them unparalleled. To make firms comparable with each other, this study measures firm size through the natural logarithm of year-end market capitalization.

$$\boldsymbol{Firm\ size = ln[mak\ cap]} \qquad (3.10)$$

3.3.3.2 Leverage (Lev)

According to Harris and Raviv (1991) high, leveraged firms are monitored by debt holders which reduces information asymmetry. Cao and Petrasek (2014) argue that lenders can withdraw their finance at any time. Therefore, high leverage is associated with illiquidity. Titman and Wessels (1998) measured leverage through the book value of debt over the market value of equity plus the book value of debt. However, this study measures leverage through the ratio of interest-bearing debt over the total market value of equity. The reason behind this is that in Pakistan, the major source of

debt is commercial banks rather than the bond market as the bond market of Pakistan is not well-established.

$$\boldsymbol{Lev} = (\boldsymbol{Interest\ bearing\ debt/Total\ Mak\ val\ of\ equity}) \qquad (3.11)$$

Where, interest-bearing debt includes notes payable, bank loans, and bonds payable. The market value of equity is the market capitalization of the firm.

3.3.3.3 Return Volatility (Rt. Vol)

Due to inventory and adverse selection risk, bid-ask spreads are positively affected by the return volatility (Stoll, 1978). According to Chae (2005) and Espinosa et al. (2008), a negative relationship between liquidity and price volatility exists. Return volatility is measured through the proxy of the average annual stock returns by taking their standard deviation. A positive association is expected between return volatility and stock liquidity.

$$\boldsymbol{Ret\ Vol} = \boldsymbol{SD|Avg.Stock\ returns|} \qquad (3.\ 12)$$

CHAPTER 4

Results and Discussion

4.1 Descriptive statistics

For explaining data's behavior and type, descriptive statistics are used. It gives the descriptive details of all the variables used in the study. The mean value shows the central tendency, whereas the standard deviation shows how much data is away from the mean point. The outliers in data are identified by maximum and minimum values.

Table 4.1 Descriptive Statistics

	Obs	Mean	Std. Dev	Minimum	Maximum
LR	1,223	6.580055	1.467587	4.97507	9.604102
TR	1,197	0.369683	0.430554	0.013015	2.484133
Synch	1,221	-2.238417	2.176096	-15.82007	1.629014
Lev	1,224	0.346685	0.22342	0.02596	0.86976
Rt. Vol	1,223	0.127856	0.125872	.1041131	1.916647
FS	1,212	17.12793	4.619918	8.1305	22.50500
Ins Own	891	0.14066	0.16288	0.0021	0.6895607
RRR	1,224	0.096054	0.023884	0.062500	0.140833

Note: The turnover ratio is measured by dividing the volume of shares by the total number of outstanding shares. The liquidity ratio is measured by dividing total trading volume by the absolute value of the stock return. Monetary policy, institutional ownership, and leverage is measured in percentage. Firm size is calculated by taking a log of the market capitalization of the firms. Return volatility is measured by taking the standard deviation of absolute returns.

Table 4.1 shows descriptive statistics of all the variables. Two proxies are used for measuring liquidity i.e. turnover ratio and liquidity ratio. Out of 1,197 observations

for turnover ratio, the maximum value is 2.484133 and the minimum value is 0.013015. Out of 1,223 observations of liquidity ratio, the maximum value is 9.604102and minimum value is 4.97507. The mean value of synchronicity is -2.238417 with a standard deviation of 2.176096. The mean value of institutional ownership shows that on average 0.14066 shares are held by institutional investors with a standard deviation of 0.16288. The control variables firm size (FS), return volatility and leverage indicate the mean value of 17.12793, 0.127856, and 0.346685 respectively with standard deviation 4.619918, 0.125872, and 0.22342.

4.2 Correlation Analysis

Table 4.2 Correlation Analysis

	LR	**TR**	**Synch**	**IO**	**RRR**	**Lev**	**Rt. Vol**	**FS**
LR	1.0000							
TR	0.6216	1.0000						
Synch	0.4074	0.3950	1.0000					
IO	0.0081	-0.051	0.0140	1.0000				
RRR	-0.095	-0.050	-0.003	-0.008	1.0000			
Lev	0.0176	0.0029	0.0333	-0.005	0.0544	1.0000		
Rt. Vol	-0.031	-0.018	-0.073	0.0083	0.0606	0.0022	1.0000	
FS	0.2025	0.0009	0.2189	0.1404	-0.377	-0.050	-0.067	1.0000

The correlation matrix in Table 4.2 shows the degree of association among all the variables. The table depicts that none of the variables has a high correlation with each

other. The highest correlation value is 0.4074 between synchronicity and liquidity ratio. Explanatory variable synchronicity has a positive correlation with both proxies of liquidity. The correlation value of synchronicity with liquidity ratio (LR), and turnover ratio (TR) is 0.4074, and 0.3950 respectively. Monetary Policy (RRR) has a negative association with both proxies of liquidity and synchronicity. The values are -0.095, -0.050, and -0.003. Leverage (Lev) has a negative relation with institutional ownership (IO). Return volatility (Rt. Vol) has a negative association with synchronicity and the proxies of liquidity. The third control variable firm size (FS) has a positive correlation with both proxies of liquidity and synchronicity whereas a negative relation with monetary policy, return volatility, and leverage is found.

4.3 Regression Analysis

To find the impact of independent variables on both proxies of liquidity, pooled ordinary least square (OLS) regression is run for panel data analysis. Stock liquidity which is the dependent variable is measured through two proxies turnover ratio, and liquidity ratio. The independent variables are monetary policy (Mon Pol), synchronicity (Synch), institutional ownership as a moderating variable. Three variables firm size (FS), leverage (Lev) and return volatility (Rt. Vol) were used as control variables in the pooled OLS model. Two regression equations run in STATA. Results with both proxies of stock liquidity, turnover ratio, and liquidity ratio show robustness. A total of 72 non-financial firms are used from 2003 to 2019 in estimating the multivariate regression equation.

4.3.1 Hausman Test

The Hausman test is applied in panel data analysis for appropriate model selection in the panel data analysis. This test suggests the best and suitable model for the study that either uses a fixed effect or random effect.

Table 4.3 Hausman Test

Test Summary	Chi-square	Prob.
Cross-Section Random	1.47460	0.1334

H0: Random effect model is appropriate

As the prob. of Chi-square is greater than 0.05 which suggests not to reject the null. Therefore, the random effect model is the appropriate model to use in this study.

4.3.2 Common Coefficient Model

First of all, in the common coefficient model, a pooled OLS regression is run for synchronicity, monetary policy, institutional ownership, and dependent variable turnover ratio. The second equation employs liquidity ratio as the dependent variable. A sample of 72 non-financial firms for a period of 2003 to 2019 is used. The common coefficient model is based on the assumption that slope and intercept coefficients are constant across time-series and cross-sections.

Results for 72 non-financial firms with liquidity ratio as the dependent variable are shown in Appendix B. Results indicate that both explanatory variables and such as synchronicity (Synch) and monetary policy (RRR) have a significant impact on liquidity ratio (LR). The coefficient value for synchronicity is 0.15264 and -0.3145 for monetary policy with a p-value of 0.040 and 0.003 respectively. The p-value of 0.275 indicates that the moderating variable institutional ownership has an insignificant impact on the liquidity ratio. The interaction term (Syn*IO) has an

insignificant impact on the liquidity ratio as its p-value is 0.775 and the coefficient value is 0.26243. Firm size has a positive and significant impact on liquidity ratio with the coefficient value 0.08228, and p-value 0.000. Two control variables return volatility (Rt. Vol) and leverage (lev) has an insignificant impact on the liquidity ratio. The coefficient values for return volatility are 0.42413 and leverage is -0.5824 with p-value 0.156 and 0.260 respectively. The adjusted R-square value shows that a 65.46% variation in liquidity ratio is explained by the desired independent and control variables. The F-statistic value is 70.56734 which is statistically significant, suggesting the overall model as good fit.

In the second regression equation, turnover ratio is used as a dependent variable, and results are shown in Appendix C. Results show that synchronicity has a positive and significant impact on liquidity ratio with coefficient value 0.725099 and p-value 0.0000. Monetary policy (RRR) also has a significant but negative impact on liquidity ratio with a coefficient value of -0.076200 and a p-value of 0.0488. The p-value of 0.6480 indicates that the moderating variable institutional ownership has an insignificant impact on the liquidity ratio with a coefficient value of 0.032188. The interaction term (Syn*IO) has an insignificant impact on a turnover ratio with a coefficient value of 0.178464, and a p-value of 0.7371. Firm size has a positive and significant impact on liquidity ratio with a coefficient value of 0.256473, and a p-value of 0.0010. Two control variables return volatility (Rt. Vol) and leverage (lev) has an insignificant impact on the liquidity ratio. The coefficient values for return volatility are 0.002516 and leverage is -0.014611 with a p-value of 0.7841 and 0.4641 respectively. The adjusted R-square value shows that a 70.76% variation in liquidity ratio is explained by the desired independent and control variables. The F-statistic value is 253.6784 which is statistically significant, suggesting the overall model as fit.

4.3.2 Random Effects Model

To identify the relationship among stock liquidity proxies, synchronicity, monetary policy, and institutional ownership, pooled OLS regression is used. It is assumed in the random effect model that the intercept is random not fixed, in each cross-section. Hausman test (between random and fixed effect) is applied to choose the best and appropriate model for this study. The insignificant value of chi-square confirms that the random effect model is the best model for this study. For the random effect model, an equation is again estimated with liquidity ratio (a proxy of stock liquidity) as the dependent variable. In the current model equation, synchronicity (Synch), institutional ownership (Ins Own) monetary policy (RRR) are used as independent variables whereas firm size (FS), leverage (Lev), return volatility (Rt. Vol) are used as control variables. Institutional ownership is used as a moderator between SPS and stock liquidity. All the control and independent variables are regress on the liquidity ratio.

The results in Table 4.4 indicate that synchronicity and monetary policy both are significantly correlated with liquidity ratio. The coefficient value for synchronicity is 0.037443 with a p-value of 0.0011, it signifies that a one-unit increase in synchronicity will lead to a marginal increase in liquidity ratio by 0.037443. Another explanatory variable monetary policy (RRR) also has a significant but negative impact on stock liquidity with a coefficient value -0.37427 and p-value 0.0023. It signifies that if the monetary policy increases by one unit then the liquidity ratio will decrease by -0.37427 unit. Institutional ownership has a positive and significant impact on liquidity ratio with a coefficient of 0.043920 and a p-value of 0.0000. Interaction term has also significant and positive impact on turnover ratio with a co-efficient value of 0.124378 and p-value 0.0061.

In control variables, firm size (FS) has a positive and significant impact on liquidity ratio with the coefficient value 0.0703438, and p-value 0.0000. Return volatility has a significant but negative impact on liquidity ratio with coefficient values -0.34241. Leverage has a negative and insignificant impact on the liquidity ratio. Adjusted R-square value 0.654645 indicates that a 65.46% variation in the liquidity ratio is explained by all explanatory variables. The value of the F-statistic is 70.56734 with (Prob) F-statistics= 0.000000 indicate that the model is correctly specified.

Table 4.4: Random Effects Model

Liquidity Ratio as DV

Variables	Coefficients	Std. Deviation	t-statistics	Prob.
C	-.0757462	0.3319516	-0.23	0.820
Synch	0.037443	0.0114106	3.28	0.0011
Ins Own	0.043920	0.008064	5.45	0.000
Syn*IO	0.124378	0.04521	2.75	0.0061
RRR	-0.37427	0.122432	-3.06	0.0023
Lev	-0.4648	0.1024799	-4.54	0.0000
Rt. Vol	-0.34241	0.007396	-4.63	0.0000
FS	0.0703438	0.011471	6.13	0.0000

R-Square	0.664055		
Adj. R-square	0.654645	Pooled unbalanced Observations	885
F-Statistic	70.56734	No. of Firms 72	
(Prob) F-Statistics	0.000000		

The results in Table 4.5 indicate that synchronicity, institutional ownership, and monetary policy are significantly correlated with liquidity ratio with a p-value less

than 0.05 and the t-value is greater than 1.96. The coefficient value for synchronicity is 0.05109 with a p-value of 0.006, which signifies that a one-unit increase in synchronicity will lead to a marginal increase in the turnover ratio by 0.05109. Another explanatory variable monetary policy (RRR) also has a significant but negative impact on stock liquidity with a coefficient value of -0.2262 and a p-value of 0.000. It signifies that if the monetary policy (RRR) increases by one unit then the liquidity ratio will decrease by -0.226200. Institutional ownership also has a positive and significant impact on the liquidity ratio with a coefficient value of 0.17218 and a p-value is 0.041. The interaction term also positively and significantly affect liquidity ratio with a co-efficient value of 0.27845.

In control variables, only firm size (FS) has a positive and significant impact on liquidity ratio with a coefficient value of 0.02357, and p-value 0.0000. Return volatility has a significant but negative impact on liquidity ratio with coefficient values -0.1746 and p-value 0.0000. Leverage has a negative and insignificant impact on the liquidity ratio as its p-value is 0.258. Adjusted R-square value 0.707571 indicates that a 70.76% variation in the liquidity ratio is explained by all explanatory variables. The value of the F-statistic is 253.6784 with (Prob) F-statistics= 0.000000 indicate that the model is correctly specified.

Table 4.5: Random Effects Model

Turnover Ratio as DV

Variables	Coefficients	Std. Deviation	t-statistics	Prob.
C	-0.09612	0.13977	-0.68	0.491
Synch	0.05109	0.01841	2.78	0.006
Ins Own	0.17218	0.08413	2.05	0.041
Syn*IO	0.27845	0.13206	2.11	0.035
RRR	-0.2262	0.03708	-6.10	0.000
Lev	-0.0262	0.02313	-1.13	0.258
Rt. Vol	-0.1746	0.04945	-3.53	0.000
FS	0.02357	0.00361	6.52	0.000

R-Square	0.710371		
Adj. R-square	0.707571	Pooled unbalanced Observations	879
F-Statistic	253.6784	No. of Firms	72
(Prob) F-Statistics	0.000000		

4.3.3 Fixed Effect Models

Fixed effect models are based on the assumption that coefficients of a slope will remain constant whereas intercept varies over the cross-section. In the multivariate regression equation, all independent and control variables are regressed with liquidity ratio to check whether independent variables synchronicity, institutional ownership, and monetary policy has an impact on liquidity or not.

The results in Appendix D tell that synchronicity and monetary policy both are insignificantly correlated with liquidity ratio with a p-value greater than 0.05 and a t-value of less than 1.96. The coefficient value for synchronicity is 0.18530, and for

monetary policy (RRR) is -0.205485. Moderating variable institutional ownership has a positive but insignificant impact on liquidity ratio as its p-value is 0.9028. The interaction term is also insignificant as its p-value is 0.7204.

Firm size (FS) is the only variable that has a positive and significant impact on liquidity ratio with the coefficient value 0.064343, and p-value 0..0000. Return volatility and leverage both have an insignificant impact on liquidity ratio. Adjusted R-square value 0.679432 indicate that 67.94% variation in the liquidity ratio is explained by all explanatory variables. The value of the F-statistic is 18.28538 with (Prob) F-statistics= 0.000000 indicate that the model is correctly specified.

The results in Appendix E shows the results of the fixed effect model with the turnover ratio as the dependent variable. Among all variables, only firm size (FS) has a positive and significant impact on liquidity ratio with a coefficient value of 0.320365, and a p-value of 0.0020. Synchronicity and monetary policy (RRR) both are insignificantly correlated with liquidity ratio. The coefficient value for synchronicity is 0.087873, and for monetary policy (RRR) is -0.161915. Moderating variable institutional ownership also has a positive but insignificant impact on liquidity ratio as its p-value is 0.8954. The interaction term has an insignificant impact on the turnover ratio as its co-efficient value is 0.177452. Return volatility and leverage both have an insignificant impact on the liquidity ratio. The adjusted R-square value 0.730184 indicates that a 73.02% variation in the liquidity ratio is explained by all explanatory variables. The value of the F-statistic is 26.69165 with (Prob) F-statistics= 0.0000 indicate that the model is correctly specified.

4.4 Results Discussion

This section discusses the results of the random-effects model because the final appropriate model from the Hausman test is the Random Effect model for this study. The purpose of this study is to evaluate what is the impact of synchronicity, monetary policy, and institutional ownership on stock liquidity. It also attempts to find the role of institutional ownership as a moderator between SPS and stock liquidity.

A previous study in a developed market such as Chan et al. (2013) finds that there exists a positive relationship between synchronicity and stock liquidity. But it is still vague that what kind of relationship exists between stock price synchronicity and stock liquidity in the Pakistani market. Therefore, this study tries to find out this relationship in the Pakistani equity market. Furthermore, it also tries to find the relationship between monetary policy and individual stock liquidity. Institutional ownership is used as a moderating variable with the opinion that institutional owners have more information than individual stockholders. So, stocks that are held by institutions will be more liquid.

To identify the impact of synchronicity, monetary policy, and institutional ownership on stock liquidity, a random effect regression equation of pooled ordinary least square (OLS) is run.

The first objective of this study is to test whether there exists any relationship between SPS and stock liquidity. A significant and positive relation of SPS with both proxies of stock liquidity indicate that SPS does affect stock liquidity. The finding of this study is consistent with the study of Baruch and Saar (2009), Chan et al. (2013) that those stocks which co-move more with the market are more liquid. It is difficult for

investor to observe firm-specific information Therefore, they prefer to invest in a stock that highly co-move with the market. Hence, those stocks are more liquid.

The second objective of the study is to find the impact of institutional ownership on turnover ratio, and liquidity ratio. The study finds a positive and significant impact of institutional ownership on liquidity which is in-line with the findings of Liu (2013), and Boujelbene et al. (2014) that institutional ownership positively affects stock liquidity. The rationale behind this is that institutional owners such as (mutual funds, insurance companies, modarbas, banks, investment companies, public sector companies, NIT/ICP, and shareholders with more than 10% shareholding) have more information than individual investors.

The rationale behind this relationship is that institutional owners affect stock liquidity in two ways. Firstly, institutional owners seem to turn over their portfolios more often as compared to other investors. When investors more often turn over their portfolios, transaction cost decreases which means buying and selling of shares increase and that leads to an increase in liquidity (Rubin, 2007). Secondly, Institutional owners have a large number of shares that lead to access to inside information. This informed trading reduces information cost for outside traders and hence increases trading activity and liquidity (Demsetz, 1986).

Another objective of the study is to find the moderating effect of institutional ownership in examining the relationship between SPS and stock liquidity. The findings of the study confirm that institutional ownership does play a moderating role between SPS and stock liquidity. In the Pakistani equity market, there is plenty of firm-specific information available in the market but unfortunately not enough to attract investors toward the firm's fundamentals and it is costly for investors to acquire

firm-specific information. Therefore, investors invest more in those stocks which co-move more with the market.

Generally, in the Pakistani market, SPS is higher as compare to developed markets because companies do not move on their fundamentals because of inefficiency and they move on market fundamentals (Javed, 2012). It is argued that institutional owners have a large number of shares that lead to access to inside information and this informed trading reduces information cost (Demsetz, 1986). So, when this comes as a moderator it means that the part of the information which SPS unable to address also gets addressed, and hence the liquidity of stock increases more.

A study by Goyenko and Ukhov (2009) states that monetary policy affects stock liquidity, which this study also confirms that monetary policy affects stock liquidity as findings of this study indicate a negative but significant impact of monetary policy on both proxies of liquidity (turnover ratio and liquidity ratio). The proxy used for measuring monetary policy effect is the reverse repo rate (RRR).

The reason behind this negative relation is when RRR increases then the banks' incentive to lend central bank increases, which is contractionary policy. Whereas, a decrease in the reverse repo rate shows an increase in the money supply in the market. In an expansionary monetary policy, state bank decreases interest rate that results in a decrease in inflation rate. When inflation decreases people have more money to invest in stock market. Therefore, stock market liquidity increases (Boachie et al., 2016). Therefore, when the reverse repo rate decreases, liquidity of the stock increases.

These findings are also consistent with the study of Fernandez-Amador et al. (2011) in which expansionary (contractionary) monetary policy is found to be associated with increased (decreased) stock liquidity.

The first control variable firm size (FS) has a positive and significant impact on stock liquidity. This result is consistent with Stol (2000) study and in favor of the argument that a big company that is analyzed by more analysts has more attraction towards investors, as larger firms disclose more information which helps in reducing information asymmetry and improving liquidity ratio. The negative and insignificant impact of leverage on liquidity is consistent with previous findings such as Oduol (2011), Prommin et al. (2014), and Ali, Liu, and Su (2016). The negative and significant relationship between return volatility and stock liquidity is also consistent with the previous study of Amiram et al. (2016) in which the same relationship was reported by the researchers.

Overall, random effect regression results for both equations one with a turnover ratio as a dependent variable and the other one liquidity ratio as a dependent variable indicates that monetary policy and SPS affect stock liquidity. Besides, it is also found that institutional ownership plays a moderating role between stock liquidity and SPS. Institutional investors have more information than individual investors and when institutional ownership comes as a moderator between SPS and stock liquidity, this relationship boosts up. The results indicate that both of these two variables can predict stock liquidity. These shreds of evidence are also supported by much of the previous studies in which the same relationship is also confirmed.

CHAPTER 5

Conclusion

The purpose of this study is to investigate the impact of stock price synchronicity, and monetary policy on stock liquidity. It also tries to find whether stock becomes more liquid or illiquid with institutional ownership as a moderating variable between stock price synchronicity and stock liquidity. For this purpose, the study has used a sample of 72 non-financial firms listed on KSE-100 from 2003 to 2019. Stock liquidity is used as a dependent variable, which is measured by two proxies, liquidity ratio, and turnover ratio. The proxies are used for checking robustness as well. Stock price synchronicity, monetary policy, and institutional ownership are used as independent variables with firm size, leverage, and return volatility as control variables in the study. In multivariate regression analysis, a random effect model is applied to find the impact of independent variables on both proxies of liquidity. Overall, the findings of this study are supported by Chan et al. (2013) that stock price synchronicity positively affects stock liquidity.

Results with both proxies of liquidity (turnover ratio and liquidity ratio) show the same effect. The findings of the study suggest that there exists a positive and significant relationship between SPS and stock liquidity in either case i.e. (liquidity ratio and turnover ratio). It means that when stock price synchronicity increases, stock liquidity also increases, and the results are consistent with the prior research. Secondly, this study observed a negative but significant impact of monetary policy in which reverse repo rate is used as an instrument and this result is also consistent with the prior research. It is based on the notion that when the reverse repo rate increases, the money supply decreases in the economy, and this contractionary monetary policy is reported to have a negative relationship with the liquidity of stock in prior studies

as well. The moderating variable, institutional ownership shows a significant impact on stock liquidity. This finding is consistent with the prior studies which also report a positive and significant relationship between liquidity and institutional ownership.

Based on the findings of this study, it is argued that stock price synchronicity causes an improvement in the liquidity of a stock. The more stock co-moves with the market, the more liquid it will be as the Pakistani market is subject to information asymmetry due to poor corporate governance practices and information disclosures, and therefore investors choose to invest more in more liquid stocks. This is the first study in its nature to find the impact of stock price synchronicity on liquidity in the Pakistani equity market. A previous study is only of Chan et al. (2013) in this context but that is in the context of NYSE. Therefore, this study concludes that stock price synchronicity has the same effect on stock liquidity in the Pakistani equity market, such as it is in a developed market. This study is useful for investors who want to know about investing in stocks listed at PSX.

5.1 Policy Recommendations

The study finds that most of the stocks in which investors invest are those which co-move with the market. Therefore, policymakers and financial regulators should ensure timely disclosure of firm-specific information by the firms.

5.2 Future Directions

This study mainly focused on examining the impact of SPS on stock liquidity in the Pakistani equity market. Future researches can address the following recommendations.

i. This study collectively uses modarbas, banks, investment companies, public sector companies, NIT/ICP, and shareholders with more than 10%

shareholding in the company as institutional investors. Although the relationship between stock liquidity and institutional ownership is significant. However, in future studies, the individual effect of these institutions can be check.

ii. Another direction is that this study only checked the relative effect of stock price synchronicity proposed by Chan et al. (2013) on stock liquidity, but in the future absolute synchronicity hypothesis that whether stocks with higher systematic volatility or beta are more liquid or not can be tested.

iii. This study uses a reverse repo rate as a proxy of monetary policy. In the future, some other proxy can be used to check the same effect.

iv. The current study only checks the effect in the equity market, in the future, the same relation can be tested in the financial sector. Last but not least, for more diversified results, this study may be extended by adding some more countries like the Asian countries, or also a comparison between developed and developing countries can be made.

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Appendix A: List of Firms

S. No.	COMPANY NAME	SECTOR
1	ATTOCK CEMENT PAKISTAN LTD	Cement Sector
2	BESTWAY CEMENT LTD	Cement Sector
3	CHERAT CEMENT COMPANY LTD	Cement Sector
4	D G KHAN CEMENT COMPANY LTD	Cement Sector
5	FAUJI CEMENT COMPANY LTD	Cement Sector
6	GHANI GLASS LTD	Cement Sector
7	INTERNATIONAL INDUSTRIES LTD	Cement Sector
8	KOHAT CEMENT COMPANY LTD	Cement Sector
9	LUCKY CEMENT LTD	Cement Sector
10	MAPLE LEAF CEMENT FACTORY LTD	Cement Sector
11	TARIQ GLASS INDUSTRIES LTD	Cement Sector
12	ARCHROMA PAKISTAN LTD	Chemical Sector
13	DAWOOD HERCULES CORPORATION LTD	Chemical Sector
14	ENGRO CORPORATION LTD (PAKISTAN)	Chemical Sector
15	FAUJI FERTILIZER BIN QASIM LTD	Chemical Sector
16	FAUJI FERTILIZER COMPANY LTD	Chemical Sector
17	ICI PAKISTAN LTD	Chemical Sector
18	LOTTE CHEMICAL PAKISTAN LTD	Chemical Sector

19	PACKAGES LTD	Chemical Sector
20	ATTOCK REFINERY LTD	Energy Sector
21	BYCO PETROLEUM PAKISTAN LTD	Energy Sector
22	MARI PETROLEUM COMPANY LTD	Energy Sector
23	NATIONAL REFINERY LTD	Energy Sector
24	PAKISTAN OILFIELDS LTD	Energy Sector
25	PAKISTAN STATE OIL COMPANY LTD	Energy Sector
26	SHELL PAKISTAN LTD	Energy Sector
27	COLGATE-PALMOLIVE (PAKISTAN) LTD	Food & Beverages
28	ISMAIL INDUSTRIES LTD	Food & Beverages
29	JDW SUGAR MILLS LTD	Food & Beverages
30	MURREE BREWERY COMPANY LTD	Food & Beverages
31	NATIONAL FOODS LTD	Food & Beverages
32	NESTLE PAKISTAN LTD	Food & Beverages
33	PAKISTAN TOBACCO COMPANY LTD	Food & Beverages
34	PHILIP MORRIS (PAKISTAN) LTD	Food & Beverages
35	RAFHAN MAIZE PRODUCTS CO LTD	Food & Beverages
36	RAFHAN MAIZE PRODUCTS CO LTD	Food & Beverages
37	UNILEVER PAKISTAN FOODS LTD	Food & Beverages
38	ABBOTT LABORATORIES PAKISTAN LTD	Healthcare
39	GLAXOSMITHKLINE PAKISTAN LTD	Healthcare
40	HIGHNOON LABORATORIES LTD	Healthcare

41	SEARLE COMPANY LTD	Healthcare
42	SHIFA INTERNATIONAL HOSPITALS LTD	Healthcare
43	AL-GHAZI TRACTORS LTD	Industry
44	ATLAS HONDA LTD	Industry
45	BATA PAKISTAN LTD	Industry
46	FEROZE1888 MILLS LTD	Industry
47	GUL AHMED TEXTILE MILLS LTD	Industry
48	HONDA ATLAS CARS (PAKISTAN) LTD	Industry
49	IBRAHIM FIBRES LTD	Industry
50	INDUS MOTOR COMPANY	Industry
51	KOHINOOR TEXTILE MILLS LTD	Industry
52	MAHMOOD TEXTILE MILLS LTD	Industry
53	MILLAT TRACTORS LTD	Industry
54	NISHAT CHUNIAN LTD	Industry
55	NISHAT MILLS LTD	Industry
56	PAK ELEKTRON LTD	Industry
57	PAK SUZUKI MOTOR CO LTD	Industry
58	PAKISTAN INTERNATIONAL AIRLINE CORP	Industry
59	PAKISTAN NATIONAL SHIPPING CORP	Industry
60	PAKISTAN SERVICES LTD	Industry
61	SAPPHIRE FIBRES LTD	Industry

62	SAPPHIRE TEXTILE MILLS LTD	Industry
63	SERVICE INDUSTRIES LTD	Industry
64	THAL LTD	Industry
65	ALTERN ENERGY LTD	Power
66	DAWOOD LAWRENCEPUR LTD	Power
67	HUB POWER COMPANY LTD	Power
68	JAVEDAN CORPORATION LTD	Power
69	K-ELECTRIC LTD	Power
70	SUI NORTHERN GAS PIPELINES LTD	Power
71	SUI SOUTHERN GAS COMPANY LTD	Power
72	PAKISTAN TELECOMMUNICATION COMPANY LTD	Telecom

Appendix: B (Liquidity Ratio as Dependent Variable)

Common Coefficient Model

Variable	Coefficients	Std. Error	t-statistics	Prob.
C	-.09874	0.36619	-0.27	0.787
Synch	0.15264	0.07410	2.06	0.040
Ins Own	0.04812	0.04408	1.09	0.275
Syn*IO	0.26243	0.91632	0.29	0.775
RRR	-0.3145	0.10641	-2.96	0.003
Lev	-0.5824	0.51647	-1.13	0.260
Rt. Vol	0.42413	0.29896	1.42	0.156
FS	0.08228	0.015381	5.35	0.000

R-square	0.664055		
Adj. R-square	0.654645	Pooled unbalanced Observations	885
F-Statistic	70.56734	No. of Firms	72
(Prob) F-Statistics	0.000000		

Appendix: C (Turnover Ratio as Dependent Variable)

Common Coefficient Model

Variable	Coefficients	Std. Error	t-statistics	Prob.
C	-0.089325	0.145510	-0.61	0.5391
Synch	0.725099	0.105108	6.90	0.0000
Ins Own	0.032188	0.070583	0.46	0.6480
Syn*IO	0.178464	0.532073	0.34	0.7371
RRR	-0.076200	0.038603	-1.97	0.0488
Lev	-0.014611	0.019941	-0.73	0.4641
Rt. Vol	0.012516	0.045734	0.27	0.7841
FS	0.256473	0.075742	3.39	0.0010
R- square	0.710371			
Adj. R-square	0.707571	Pooled unbalanced Observations		879
F-Statistic	253.6784	No. of Firms		72
(Prob) F-Statistics	0.000000			

Appendix: D (Liquidity Ratio as Dependent Variable)

Fixed Effects Model

Variable	Coefficients	Std. Error	t-statistics	Prob.
C	0.481008	0.301608	1.59111	0.1114
Synch	0.185304	0.301695	0.61457	0.5396
Ins Own	0.037266	0.30215	0.12067	0.9028
Syn*IO	0.340125	0.947365	0.36421	0.7204
RRR	-0.205485	0.22798	-0.9032	0.3683
Lev	-0.10278	0.632294	-0.1647	0.8711
Rt. Vol	0.155103	0.28396	0.55465	0.5850
FS	0.064343	0.012471	5.16020	0.0000

R- square	0.718739		
Adj. R-square	0.679432	Pooled unbalanced Observations	885
F-Statistic	18.28538	No. of Firms	72
(Prob) F-Statistics	0.000000		

Appendix: E (Turnover Ratio as Dependent Variable)

Fixed Effects Model

Variable	Coefficients	Std. Error	t-statistics	Prob.
C	0.581064	0.190680	3.051111	0.0024
Synch	0.087873	0.795546	0.110011	0.9122
Ins Own	0.085768	0.652011	0.131529	0.8954
Syn*IO	0.177452	0.566948	0.312543	0.7543
RRR	-0.161915	0.137868	-1.17504	0.2414
Lev	-0.212269	0.218272	-0.974274	0.3319
Rt. Vol	0.010743	0.034348	0.312773	0.7554
FS	0.320365	0.103778	3.094951	0.0020

R- square	0.758605		
Adj. R-square	0.730184	Pooled unbalanced Observations	879
F-Statistic	26.69165	No. of Firms	72
(Prob) F-Statistics	0.000000		