

# **Impact of Stock Price Synchronization on Market Volatility: An Analysis of Pakistan**

By

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**MASTER OF SCIENCE IN MANAGEMENT SCIENCES  
(FINANCE)**



**DEPARTMENT OF MANAGEMENT SCIENCES  
CAPITAL UNIVERSITY OF SCIENCE AND  
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Pakistan**

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## **Certificate**

This is to certify that Miss Nadia Jamil has incorporated all observations, suggestions and comments made by the external evaluators as well as the internal examiners and thesis supervisor. The title of her thesis investigates impact of stock price synchronization on market volatility: an analysis of Pakistan.

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**Dr. Arshad Hassan**  
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## **Dedication**

This thesis is dedicated to my whole family especially my loving parents, my supportive husband Ali Majeed, children Ashar Ali & Abeeha Ali and my in-laws.

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I am very thankful to Allah almighty for providing me this opportunity and supporting me to accomplish my goal. I am thankful to my husband, my parents, my children and siblings for their patience and cooperation. Especially my sister in law late Nida Mohsin may Allah grant her high rank in jannah, without their support and motivation it would not be possible for me to do my thesis. I am grateful to my friends for supporting me in every stage of my work. I am highly gratified to my supervisor Dr. Arshad Hassan whose valuable suggestions and guidance played an important role in providing me confidence and motivation for the completion of my dissertation within the time. I am very thankful to Capital University of Sciences and Technology for giving me the platform to explore new dimensions in academia.

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## List of Abbreviations

SYNC	Synchronization
M <sub>2</sub>	Money Supply
OIL	Oil Return Volatility
TBILL	Treasury Bill Rate
XRATE	Exchange Rate Volatility
STOCK VOL	Stock Return Volatility
TO	Turnover Ratio

# **Impact of Stock Price Synchronization on Market Volatility: An Analysis of Pakistan**

## **ABSTRACT**

The focus of the study is to investigate the linkage between market volatility and stock price synchronization at country level and at market microstructure level. Data of companies listed on stock exchange and are part of KSE 100 index is used. From the total 100 companies 96 companies are selected depending on the availability of complete data for the considered period. Time period for the study is January 2000- June 2016. Money supply ( $M_2$ ), oil return volatility, monthly treasury bills rate and exchange rate return volatility are used as macroeconomic variables. First OLS is applied on the time series data for investigating the relationship between synchronized stock price movement, macroeconomic variables and market volatility in Pakistan stock market. Secondly, panel regression is applied to investigate the effect of stock price synchronicity on the idiosyncratic volatility. The findings of the study reveal that in the financial market of Pakistan, among the four macroeconomic variables only money supply has significant but negative impact on volatility in the presence of stock price synchronization. Negative relationship reflects that money supply instead of increasing investment in shares and reducing interest rate, raising inflation in the economy. At market microstructure level, study reports negative relationship between idiosyncratic return volatility and synchronization. High volatility in firm specific return is due to low stock synchronization at firm level. Individual stock synchronization ( $R^2$ ) is the ratio of firm-specific to market-level information. This shows that investors are rational decision makers. For investment decisions they incorporate more firm specific information as compared to market information.

***Keywords: Market Volatility, Stock Volatility, Stock Price Synchronization, Liquidity, Macroeconomic Variables***

***JEL Classification: E44 & G14***

# CHAPTER 1

## INTRODUCTION

Efficient financial markets guide and facilitate investor for the productive allocation of their funds through dissemination of relevant information. In emerging economies less economic information is processed by the stock markets. In such economies if prices move due to noise trading, poor property rights and political unrest then they can result in poor asset allocation and decline in economic growth. Greater investor protection, good corporate governance and efficient enforcement system by the state, can transmit company specific information into the share prices and consequently, co-movement of share prices reduces with the market. Morck et al. (2000) states that poor enforcement of property rights in the emerging economies decrease informed trading from the stock market, resulting in large market wide variation and high stock price synchronicity.

Saving and investment benefits are influenced by the market volatility. A certain portion of market volatility cannot be controlled; excessive volatility not supported by the economic fundamentals, reduces the signaling function and obstructs resource allocation. High market volatility can be good or bad. Bartram et al. (2012) states that increase in volatility if resulting from economic welfare like high risk taking by the firms, more investment in R&D at the firm level, new patents, innovation and growth then it is good. Volatility caused by noise trading and political unrest weakens economy and it is bad.

Emerging economies have more market volatility as compared to the developed economies. Volatile market gives the indication of speculative trading as speculator gain

from the volatile securities. Factors which are causing market volatility should be investigated. There are numerous factors that explain market volatility like crude oil (Bagchi, 2017), insider trading (Chiang, et al., 2017, Du et al., 2004), systematic risk (Chinzara et al., 2011), liquidity (Hameed et al., 2010), competition and premature trading (Deb and Liu, 2014), expected stock returns (Guo and Savickas, 2006), firm specific and herding by professional and amateur investors (Venezia et al.,2011), corporate corruption (Lau et al., 2013) and macroeconomic indicators (Pilinkus et al., 2010).

The main purpose of this study is to investigate the influence of synchronicity on market volatility and individual stock return volatility. The behavior of stock price co-movement is a vital issue in finance due to its important practical implications towards investment related decisions. stock price synchronicity carries stock prices away from the fundamentals due to lower reflection of firm's earnings information in stock returns (An and Zhang, 2013). Stock price synchronicity results when share prices are moving up and down together. Hsin and Tseng (2012) states in the market firm specific information when get difficult to retrieve, investor over weight country specific factors. This in turn increases stock price synchronicity. Further Durnev et al. (2003) said high variation of firm specific return predicts healthier functioning of stock markets. It tells that company specific information regarding its fundamentals is capitalized in the stock prices. It signals an efficient stock market rather than a noisy market.

Researchers have used various proxies for stock synchronicity among them is herding behavior by the investor which is an outcome of human bias. It takes place when individual investor instead of showing confidence on his own gathered information,

makes investment decision by following market trend. According to Beckmann, Menkhoff, and Suto (2008) collectivist societies show more herding behavior. Asset managers perform herding when they consider fundamental forces less important than psychological forces.

Secondly, study investigates the impact of macroeconomic variables on market volatility. Economic fundamental of country, exchange rate, corporate earnings, outstanding and overdue loans, large scale mergers and acquisitions and connection with the neighboring countries etc have strong influence on stock market (Shahbaz, Lean and Kalim, 2013). Analyst incorporate macroeconomic information for their earnings forecasts because for them it is expensive to retrieve firm specific information. High level of analyst activity increases stock return synchronicity due to less dependency on firm specific stock price movement (Chan et al., 2006).

Thirdly, the role of liquidity and industry attributes is examined on individual stock return volatility. The price formation process can be explored through research at market microstructure level and studying how information is integrated into security prices. Recent studies have found positive association of liquidity and market efficiency (Chung and Hrazdil, 2010).

### **1.5. Research Questions**

1. Whether stock price synchronicity increases market volatility in Pakistan equity market?
2. What is the impact of macroeconomic variables on stock market volatility?
3. Whether stock price synchronization affects stock at firm level?
4. Does stock liquidity affect the stock volatility of the firm?

5. Is volatility of stock return across industry different?

### **1.6. Objectives**

1. To provide insight about the impact of market synchronization on market volatility.
2. To explore the impact of exchange rate volatility, interest rate, treasury bill rates and money supply on market volatility.
3. To examine the relationship between stock synchronization with stock price volatility.
4. To explore the impact of stock liquidity on stock price volatility.
5. To compare the dynamics of volatility across industries.

### **1.3. Significance of the Study**

This study is a novel attempt to investigate the impact of stock price synchronization and macro economic variables on market volatility in Pakistan. Pakistan is an emerging economy with three stock exchanges Lahore, Islamabad and Karachi. Karachi Stock Exchange is the largest financial market of Pakistan and established emerging equity markets. It faces huge fluctuations in stock prices. The risk–return relationship of Karachi Stock Exchange is very different. Pakistan is fighting back with social and political problems; it has prepared reforms by opening market for direct and indirect investments by foreign nationals and institutional investors with liberal terms in equity market. These reforms result in encouraging outcome (Nishat et al., 2004).

According to Raza et al., (2015) the investors notice that the market moves up or down drastically in a few sessions. KSE100 index in December 2008, in just 13 trading

sessions went down to 3,300 points from 9,187 points to 5,865 points. Later after two months, in just 19 trading sessions KSE100 index went up to 2,638 points from 5,707 points to 8,345 points. Therefore, market volatility in Pakistan should be investigated in depth.

This research guides the regulators to emphasis companies for transparent disclosure of firm-specific information because information disclosure fosters trading in the market and reduces stock price synchronization. It results in efficient working of stock market. The study also guide, the economic managers to take steps to manage macroeconomic variables that have the potential to affect market volatility.

This study also guide the investor regarding rational security analysis and incorporating those factors while making investment strategy which can influence stock price synchronicity and market volatility i-e encouraging informed trading. The study also leads how stock price volatility is influenced by stock price liquidity in the financial market and it tells about the effect of industry on the firm return volatility in Pakistan.

#### **1.4. Plan of the Study**

This study has been represented in five chapters as detailed below

Chapter no. 1: Introduction

Chapter no. 2: Literature review

Chapter no. 3: Research Methodology

Chapter no. 4: Data Analysis and Discussion

Chapter no. 5: Conclusion and Recommendations

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1. Stock Return Synchronicity and Firm Specific Information

Lagoarde-Segot and Lucey (2008) find that efficient market guides the investor towards productive allocation of investment. Unavailability of information regarding company performance raises uncertainty in the market. Therefore, investor starts focusing on behavioral patterns like herding, noise trading, technical analysis etc. At broader level, it results in economic instability and poor corporate control mechanism.

According to Bikhchandani and Sharma (2000) herding behavior is more likely to find in emerging economies. As information environment of emerging economies are opaque because of weak reporting system, accounting standards, less enforcement of regulations and costly acquisition of firm specific information.

Venezia, Nashikkar and Shapira (2011) investigate correlation between market volatility, return, volume and herding behavior. Herding behavior has positive relationship with market volatility. Herding is more common among amateur as compared to the professional investor. Herding caused by amateur investor has larger effect on market volatility as compared to professionals. Herding is caused due to lack of firm specific information. Therefore, incorporation of firm specific information, transparency and education can reduce market volatility and instability in the market. Culture also influences the behavior of an investor and that behavioral change affects the market volatility.

Chiang, Li and Tan (2010) find that herding arise when investor follow the actions of each other and make a collective decision. It takes the share prices away from their underlying fundamental factors. Under such circumstances when gap arises between market prices and firm specific information, arbitragers gain excess profits. In the long run herding behavior declines market efficiency. Comparison of the investor behavior between two markets 'A' (local investors of China dominates this market) and 'B' (dominated by the foreign investors from developed countries) reveals existence of herding behavior in the 'A' market. Institutional and dispersed investors go for rational decision making which reduces herding behavior in the stock markets. Limited information and more government intervention foster herding behavior. Herding behavior exists more in investors from emerging economies as compared to the developed economies.

Morck, Yeung and Yu (2000) report in developing countries stock price synchronization is higher as compared to the developed countries. Among all the variables such as market size, economy size, the co-movement of firm-level fundamentals and per capita GDP only lack of property rights protection by the government is the main factor behind the stock price synchronicity. It reduces the level of informed trading among the shares (inclusion of company specific information by the investors in share prices) and raises market volatility, which results in high synchronicity.

Chan and Hameed (2006) explores that, in the emerging economies security analysts provide more market wide information, which results in increasing stock price synchronicity. In such economies information environment is less transparent; information related to the company is not publically available due to the poor corporate

disclosure. Therefore, security analyst forecasts their earnings mostly on the basis of macroeconomic content. In the stock market, if firm related noise trading exist then the presence of large number of security analysts reduce that noise and it results in increasing stock price synchronicity.

Boubaker, Mansali and Rjiba (2014) studied the association of stock price synchronicity, crash risk and corporate ownership structure. Stock price synchronization and crash risk are not good for the healthy operations of the firm. Higher level of ownership control limits the stream of company specific information in to the market. These companies face high share crash risk as controlling shareholders can hide the flow of information up till a certain limit. Thereafter, bad news is revealed abruptly. They study that separation of cash flow and control right reduces the quality of company's financial reporting and information asymmetry arises between large and small investors. When controlling shareholders are vested with more cash flow right stock price synchronicity and crash risk reduces. Controlling shareholders with cash flow rights and concentrated ownership facilitate the environment of transferring firm level information into the market because they share common interest with minority investor. It facilitates informed trading and reduces stock price synchronicity.

Nguyen and Truong (2013) study the impact of cultural dimensions such as individualism and uncertainty avoidance on the cross country information content. Investors of individualistic culture have overconfidence, self-attribution biases and high preference for risk. Such investor shows aggressive behavior and trade on the basis of firm specific information. Stock markets of such countries show high level of information content. The result reports consensus for all the three dimensions taken

for calculating information content i-e  $R^2$ , variance of abnormal return and abnormal trading volume, when earnings are about to announce. The inclusion of information into the share prices depends upon the inherent differences among the behavior and risk preferences of international investors of each country. In individualistic culture investors are ready to take high risk, they have low uncertainty avoidance they are more inclined towards analyzing and processing individual firm level information.

Eun, Wang and Xiao (2015) argue that culture influence investor behavior in the stock market that causes stock price synchronicity. The study covers different dimensions like tightness versus individualism, trade openness and market openness. Countries with tight and collectivist culture exhibit more share price co movements as compared to the countries having loose and individualistic culture. Synchronicity occurs due to the high correlation of trading among the investors and weak information environment of the country. A country's information environment is essential for pricing of assets and efficient allocation of resources, which foster economic growth. Information environment of collectivist societies is more opaque as compared to the individualistic cultures. Value of  $R^2$  decreases in individualistic cultures due to increase in firm specific variation in stock returns as investors are more concerned about gathering and analyzing private information.

Chan, Hameed and Kang (2013) observe the positive impact of stock price synchronicity on liquidity due to information asymmetry. The study tests two hypothesis relative and absolute synchronicity that includes market volatility and idiosyncratic volatility (firm specific) to predict impact of stock price synchronicity on liquidity. Their results support both the hypothesis that under the relative synchronicity hypothesis,

stock co movement has positive relationship with liquidity. In case of absolute synchronicity hypothesis, stocks having more systematic volatility or beta are more liquid. Additionally, companies whose shares co-move industry wide are highly liquid.

Demirer and Kutan (2006) study support asset pricing model and market efficiency. In Chinese stock markets investor make investment decisions rationally. Herding behavior does not exist in the Shanghai and Shenzhen exchanges due to the informed trading. During the period of market stress individual returns show dispersion. Stock return dispersion is more when market is moving up and dispersions are lower when market is moving down. This indicates that stock return behave in similar fashion on the down side movement of market (bearish) as compared to the upside movement.

Bissessur and Hodgson (2012) investigate the impact of IFRS adoption by the Australian firms on stock price synchronicity. The results reveal decrease in synchronicity after the adoption of IFRS during first two post-IFRS years, but later on synchronicity increased during subsequent years. IFRS delivers more firm specific financial information and ignores industrial and general market information. Financial analyst for reliability and industrial comparability turn to industry or general market information, which increases stock price synchronicity.

Gul, Kim and Qiu (2010) investigate the connection between corporate governance and share price synchronicity of Chinese firms. According to them, in the emerging markets firm related information can be productively integrated into the share prices by improving good governance at corporate level and providing investor protection at national level. The study suggest that reduction of ownership concentration,

government ownership, increasing participation by the foreign investors; audit quality and protection of institution level investors are the key factors in transparent flow of firm specific information and reducing synchronicity.

Jin and Myers (2006) narrate positive relationship between stock price synchronization and opaqueness. Opaque shares have high  $R^2$  and face crash risk due to the negative returns. Opaqueness is lack of information that cannot help investors to analyze operating cash flow, income and find out firm value. Due to opaqueness insider (managers) avail the opportunity to hold more cash flows when firm is going well. But during the situation of crisis when they abandon the residual claim and disclose news to outside investors, it results in crash risk resulting in large negative residual return. Valuable information disclosure by the firms results in transparency and lowering  $R^2$ . Poor countries have underdeveloped financial markets, poor investor protection of property right and have firms with less transparency. In such countries market risk is high.

Marhfor et al. (2013) report stock price synchronicity as a surrogate for price informativeness. Analyst coverage increases synchronicity due to reduction in firm specific information among the share prices. Insiders have edge over financial analysts in generating firm-specific information. Only in developed countries that have strong institutions, analysts have advantage of transferring industry level information into share prices. The study proved that developed economies behave differently as compared to the emerging economies.

Khandaker and Heaney (2008) uses classical synchronicity measure introduced by Morck et al. (2000) and reports that comparatively emerging and less transparent

economies exhibit more synchronicity. Common law and civil law country group exhibits less stock synchronicity than the post communist country. Likewise, emerging common law country and the emerging civil law country group has high synchronicity as compared to the emerging post communist countries.

Wurgler (2000) states that the efficient capital allocation results from less state ownership in the economy, incorporation of firm related information in domestic stock returns and with the legal protection of minority investors.

Alves, Peasnell and Taylor (2010) use  $R^2$  as a proxy of information for cross-country analysis. The study proves that  $R^2$  at a country level is not a good measure to capture the quality of information. Country's corporate governance and investor protection rights have strong influence on  $R^2$ . Annual  $R^2$  of particular country is dynamic. It changes significantly from year to year due to the rapid change in country corporate governance and investor protection regimes.

Li et al. (2004) state that market wide fluctuations are results of market openness. It brings specialization which convert industry effects on extensive market fluctuations. In emerging economies with good government or institutional integrity, capital market openness results in high firm specific variation and low co movement of share prices. According to them, total variation of an individual stock return can be classified as idiosyncratic variation; it is particularly related to the stock, and systematic variation caused by market returns. Co movement is systematic variation of total variation. Large systematic variation and small idiosyncratic variation results in large co movement of shares.

Lim and Brooks (2010) states emerging economies face more frequent price deviations from the random walk than developed economies, due to weak protection of property rights. Poor protection of property right increases insecurity issues of investors against exploitation by insiders (controlling share holders). In modern financial economics, arbitrage plays important role in restoring price deviations and keeping market efficient through informed trading. These investors only trade in the market if they earn profits. Otherwise noise traders dominate the market, taking prices away from random walk. This is also a sign of low level of information efficiency. Efficient market hypothesis states that share prices change randomly and should be unpredictable.

Kim and Shamsuddin (2008) argue that market efficiency depends upon the level of equity market development. Developed equity markets have high price efficiency because these facilitate efficient flow of information. Efficient market hypothesis is valid in developed economies. According to the EMH share prices must have random walk. Prices should incorporate and reflect all the relevant and accessible information at any particular time. Future prices can be forecasted from the current prices. Random walk of share prices call for marginal price raise to be uniform and independently distributed.

## **2.2. Volatility and Macroeconomic Factors**

Du and Wei (2004) find positive linkage of insider trading and market volatility after controlling volatility of real output growth, monetary and fiscal policies, and maturity of the stock market. The impact of insider trading on market volatility is large as compare to the volatility effect of other fundamentals. Exchange rate volatility and

inflation rate volatility are used proxies for monetary policy uncertainty. The results show that monetary policy is weak but positively associated with market volatility.

Kumar and Lee (2006) investigate the impact of retail trading patterns on stock return co movement. According to them role of investor sentiment is vital in financial markets. Systematic trading of retail investors results in co movement of stock returns. These results are not explained by macroeconomic variables and analyst earnings forecast revisions. The retail sentiment has strong influence on firms with higher arbitrage costs (i.e., liquidity betas, higher idiosyncratic risk, etc.) and for small stocks, value stocks, stocks with low institutional ownership, and stocks with lower prices.

Sayim, Morris and Rahman (2013) report the impact of individual investor sentiment on stock prices returns and volatility in the US auto, finance, food, oil and utility industry. Economic fundamentals only explains rational component of the sentiment. Irrational component of sentiment is unexplained. Individual investor sentiments make the stock returns and volatility systemic to financial market movements. Thus stable sentiments can reduce volatility and uncertainty from the stock markets.

Chinzara (2011) investigates South African domestic financial market and states that volatility of macroeconomic variables (short-term interest rates, gold price, exchange rates, inflation and oil price) have significant impact on market volatility (aggregated and at sector level). The relationship of macroeconomic variables and market volatility is bilateral. Exchange rate, treasury bill rate and the gold rate volatilities have positive whereas inflation has negative impact on market volatility. Among all the volatilities exchange rate and short-term interest rate are very vital. Financial crises strengthen the relationship of changes in macroeconomic variables on the stock market.

Kumar (2013) study the existence of spillover impact between stock price and exchange rate by exploring the three developing economies India, South Africa and Brazil. Bi-directional volatility spillover exists between stock and foreign exchange markets in the IBSA countries. As growing stock market would magnetize capital flows from foreign investors, they will sell the foreign currency for local currency. It will increase stock prices and will appreciate the exchange rates. Further, increase in stock index will bring incremental rise in wealth of domestic investors by this means increasing the demand for local currency and afterward boosting the local interest rates. The elevation of interest rates will push capital inflows, which increase exchange rates. Monetary and fiscal policies targeting the interest rates and exchange rates can get affected due to the booming stock market.

Walid et al. (2011) state that limited research work is done for investigating the linkage of foreign exchange rate changes and stock market volatility in emerging stock markets. The connection between stock and FX markets is regime dependent. Stock price volatility behaves- asymmetrically to events in the foreign exchange market.

Sohail and Hussain (2009) investigate both long and short run relationships between macroeconomic variables (consumer price index, real effective exchange rate, three month treasury bills rate, industrial production index, money supply M2) and stock prices in Lahore Stock Exchange. Results reveal that in the long run share prices reduce because of inflation. Industrial production index, real affective exchange rate and money supply have positive influence on stock returns.

Humpe and Macmillan (2009) uses standard discounted cash flow or present value model for examining long run influence of macroeconomic variables (industrial

production, the consumer price index, money supply, long-term interest rates) on stock prices in the US and Japan. Result report positive association of stock prices and industrial production for US firms. Share prices are negatively linked with the consumer price index and the long-term interest rate. An insignificant (positive) association exists between the US stock prices and the money supply. For the Japanese data, share prices are positively influenced by industrial production and negatively by the money supply. Industrial production is negatively influenced by the consumer price index and a long-term interest rate. In Japan economic downfall took place in 1990's and it result in liquidity trap.

Nishat et al. (2004) report “causal” relationship between stock market and the macroeconomic variables (output, inflation, money stock and interest rate). Industrial production has the strong positive impact on Pakistani stock prices.

Yoshino et al. (2014) stated that depreciation in domestic currency against foreign currency raises demand for country's product, due to the reduction in the prices of export product. Companies that have overseas product markets get benefit and prices of their shares appreciate. Likewise, decline in the currency value increase the cost of importing raw materials for domestic manufacturers, resulting in negative impact on their cash flow and on stock prices. For investigating the short run relationship arbitrage pricing theory (APT) links macroeconomic variables with stock market returns; it uses multiple risk factors for explaining asset returns. In order to focus on the long-run relationship discounted present value can be used.

Pilinkus (2010) have focus on well developed stock markets for analyzing the relation between the country's macroeconomic factors and stock market index. The linkage of macroeconomic indicators and stock market return is strong in the long run.

### **2.3. Volatility and Market Liquidity**

Daouk, Lee and Ng (2006) report that good governance of capital market reduce the cost of equity, increases market liquidity (i.e., trading volume, market depth & US foreign investments) and market pricing efficiency (low stock price synchronicity and IPO under pricing).

Hsin et al. (2012) report that among emerging economies Pakistan has average stock synchronicity of 74.1% ranging from 62.9% to 80.6% and historical market volatility 10.5% is ranging from 6% to 14.5%. The turnover ratio of a market and stock return volatility are the vital determinant of price synchronicity. The study explores the linkage between country-specific factors and stock price synchronicity in emerging market system. Stock price synchronicity decreases with economic development (personal income, total market capitalization, financial market development and the number of listed stocks). Speculative market generates noise trading; include less firm-specific fundamentals into prices and results in higher stock price synchronicity. The study uses turnover ratio as proxy for measuring the tendency of speculative trades in the stock market. Higher turnover ratio signals, the occurrence of speculative trade and a market with fewer informed investors and higher market synchronicities.

Li and Wu (2006) findings are based on the mixture of distribution hypothesis MDH model. They found positive relationship of informed trading with volatility and

volume. Positive relationship exists between bid-ask spreads and intensity of information flow. Liquidity has negative effect on return volatility. Market microstructure theory states that, share price changes and volume are associated to the entrance of information to the stock market. It brings a vibrant price change process through the series of trades and transaction prices. Liquidity (noise) trading boost the depth of the market, which further reduces volatility and bid-ask spreads. It is inversely proportional to informed trading. Market having high liquidity-motivated trading volume have more random buy and sell orders that counterbalance each other.

Hameed, Kang and Viswanathan (2010) suggest that when the market making sector is facing capital tightness negative market returns diminish liquidity more as compare to positive returns that boost liquidity, with the result being strongest for high volatility firms.

Chordia, Roll and Subrahmanyam (2011) states the increase in turnover is connected with information-based trading, especially in stocks with high levels of institutional holdings (hedge funds). Intraday volatility has diminished and prices move closely to random walk in recent years, this indicates that market efficiency increases due to institutional trading. Increase in trading activity results in increasing the efficiency of price formation.

Ureche-Rangau and de Rorthays (2009) study the characteristics of Chinese stock market in terms of relationship between volatility and trading volume. The study incorporates the data of stocks that are part of SSE180 index. They report negative correlation between volatility and trading volume is firstly, due to the uninformed trading and secondly, due to the new and emerging financial market.

Carroll and Kearney (2012) studies the relationship between trading volume and return volatility. The study diagnosed that the trading volumes are positively related to the volatility of returns. This is due to the flow of market wide information in the market that is creating harmony between these two variables. Their results support mixture of distributions hypothesis (MDH). It states that with the change or arrival of new information in the market and changes in the variation of views among traders about the inference of new information for pricing, underlying stocks, trading volume fluctuates.

## **2.4. Volatility**

### **2.4.1. Market Volatility**

Campbell et al. (2001) investigate the stock volatility at country, industry and firm levels. The study suggests that GDP growth can be forecasted when all the volatility measures move together counter cyclically. Market volatility guides the other volatility series.

Verma and Verma (2007) discover that individual and institutional investor's sentiments are influenced by both rational and irrational (noise) factors. These sentiments have significant positive impact on stock market returns and negative impact on stock market volatility. Noise or irrational sentiment is a priced risk factor and results in high stock volatility.

Deb et al. (2014) state excess market volatility arises due to high level of competition among the market participants and premature trading by informed traders. Due to high level of competition in the market, inform traders when receive any initial signal which may be a speculation, start trading without any single delay. Though, they

can verify this noisy signal by waiting for one period. They don't want to lose business opportunity and start doing immature trading resulting in high market volatility. Market volatility results in reducing expected profits.

Umutlu, Akdeniz and Altay-Salih (2010) reveal financial liberalization reduces idiosyncratic and local volatilities and increases global volatility. The collective outcome of financial liberalization through volatility components is a net reduction in total volatility. However, financial liberalization disclose firm related information that increase idiosyncratic volatility when market development, liquidity, country and crisis effects, particularly for small and medium-sized emerging markets are controlled. Financial liberalization process provides benefits to the emerging markets by increasing the investor base in the market with foreign investors, increasing the precision of public information and reducing total volatility.

#### **2.4.2. Stock Volatility**

Roll (1988) states stock price variation is explained by general systematic (macroeconomic) factors, industry influence and unique events of the firm. Firm specific information has more power to explain asset-price movements. The volatility in monthly stock return is less than forty percent explained by all the explanatory factors. Even the daily return data is unsuccessful in explaining the remaining portion. Factors that can explain the remaining sixty percent and can give logical reason of unexplained component should be scrutinized.

Vlastakis and Markellos (2012) states that idiosyncratic and market-related information demand have significant positive effect on historical volatility both at

individual level and market level and trading volume. This relationship strengthens even when the supply of information and the market return are controlled. The impact of information demand on market activity increases when market is in state of “high return”. In the financial market, demand for information increase with the level of risk aversion. Risk seeker or risk neutral investor demand less information as compared to the risk-averse investor. Mixture of Distributions Hypothesis states that return volatility and trading volume are dependent on underlying information.

Louhichi (2011) study strong positive relationship between return volatility and trading volume. Two components of trading volume are used i-e trade size or number of transactions. The significant positive relationship between return volatility and trading volume exists due the number of trades. For market activity and for the information flow number of trades is a good proxy. Study finds information flow as a latent common factor affecting trading volume and stock prices volatility.

Chiang, Chung and Louis (2017) discover positive linkage of net insider selling and variation in stock return volatility. Insider purchase reduces stock return volatility whereas; insider selling increases the market volatility. The relationship between net insider sales and stock volatility gets stronger, when calculation of volatility is done near the declaration of earnings. Earnings declaration is vital corporate information event that take place frequently and on regular basis which further raises stock return volatility.

Lau, Demir and Bilgin (2013) state that emerging markets carry high stock return volatility. Result show after controlling liquidity, maturity of the markets, firm characteristics and economic variables countries with corrupt business environment have less volatile stock markets. Investor offer bribes to reduce the uncertainty faced by the

firms. As large corporate corruption results in accelerating the asymmetric information among market participants that decreases the stock market volatility. It gets easier to estimate the effect of the government policy change and remove the uncertainty that is imposed on a firm's performance.

Li et al. (2011) report positive linkage of volatility with small firm, high-turnover and highly leveraged firms in developing countries. A large foreign shareholder reduces volatility because they demand greater transparency, higher managerial accountability and less risk taking.

Blitz, Pang and Van Vliet (2013) provides evidence of subsistence of a volatility effect in emerging markets. The study reports combination of increased institutionalization and agency issues due to delegated portfolio management are the causes of volatility.

Bartram, Brown and Stulz (2012) state idiosyncratic volatility can be good or bad depending upon the factors causing them. If idiosyncratic volatility is caused due to instability or noise trading and political unrest it deteriorates welfare. Idiosyncratic volatility caused from high risk taking and more entrepreneurship results in improving welfare and increasing economic growth. Economic development and financial development cause greater volatility. Idiosyncratic volatility can be boosted due to investor protection, stock market development and innovation. Firm-level variables causing innovation and growth opportunities result in high idiosyncratic volatility. Higher idiosyncratic volatility of United States is associated with factors causing high economic welfare. U.S. firms take high risk, invest more in R&D, innovation and growth causing higher idiosyncratic volatility. According to them, idiosyncratic volatility decreases with capital account openness and development of bond market.

Lee and Liu (2011) report U-shaped relationship between price informativeness and idiosyncratic return volatility. Idiosyncratic return volatility consists of two components. One is caused by noise trading while the second is caused by informed trading resulting from firm specific fundamentals. With the price informativeness first component is reduced. The second component first reduced and then increased with the price informativeness. The study suggests that opinions regarding information content of idiosyncratic volatility are mixed. Researchers have used idiosyncratic return volatility for measuring level of information incorporated into the stock price. Some state high level of idiosyncratic volatility is due to more informative prices, others suppose that higher idiosyncratic volatility is due to low price informativeness.

## **CHAPTER 3**

### **METHODOLOGY**

This research work is focused on studying the stock return volatility in Pakistan. It is carried out in two steps. At the initial stage, the impact of macroeconomic variables and stock price synchronization is investigated on market volatility. Secondly, impact of stock price synchronization and stock liquidity is examined on individual stock return volatility.

#### **3.1 Sample Selection**

Data of companies listed on stock exchange and are part of KSE 100 index is used. KSE 100 index represents all the companies engaged in production and service sectors of Pakistan. From the total 100 companies 96 companies are selected depending on the availability of complete data for the considered period. Macroeconomic variables selected are exchange rate volatility, monthly treasury bill rates, money supply and oil prices returns volatility. Verma et al. (2007) suggest that stock market returns and volatility are affected by economic fundamentals.

#### **3.2. Data Collection**

Time period for the study is January 2000- June 2016. Daily share price data is used for calculating the daily stock returns, market returns, oil returns and exchange returns. Calculations for the each variable are then made on monthly basis. For calculating market volatility, daily data of KSE 100 index is used from 2000-2016. Daily data of share prices and KSE 100 index is gathered from Karachi stock Exchange

website, daily foreign exchange rate data is taken from IMF, data of treasury bills, money supply are collected from State Bank of Pakistan.

**Table 3.1. No. of Companies and Respective Industries**

<b>Sr. No.</b>	<b>Sector</b>	<b>No. Of Companies</b>
1.	Oil & Gas Exploration Companies	4
2.	commercial banks	14
3.	Technology & Communication	3
4.	Power Generation & Distribution	5
5.	Real Estate investment Trust	1
6.	Fertilizer	7
7.	Cement	9
8.	Transport	1
9.	Inv. Banks / Inv. Cos. / Securities Cos.	1
10.	Oil & Gas Marketing Companies	5
11.	Food & Personal Care Products	5
12.	Cable & Electrical Goods	1
13.	Engineering	1
14.	Textile Weaving	1
15.	Textile Composite	4
16.	Insurance	5
17.	Pharmaceuticals	2
18.	Synthetic & Rayon	1
19.	Close - End Mutual Fund	1
20.	Tobacco	2
21.	Glass & Ceramics	1

22.	Modarbas	1
23.	Automobile Assembler	4
24.	Chemical	2
25.	Paper & Board	1
26.	Refinery	2
27.	Leasing Companies	1
28.	Automobile Parts & Accessories	1
29.	Sugar & Allied Industries	1
30.	Miscellaneous	3
31.	Textile Spinning	1
32.	Leather & Tanneries	2
33.	Woolen	1
34.	Vanaspati & Allied Industries	1
35.	Jute	1
	<b>Total</b>	<b>96</b>

### 3.3. Measurement of Variables

#### 3.3.1. Return

Both market and share price returns are calculated on daily basis by following the same method

$$R = \ln ( I_t / I_{t-1} )$$

R here represents the market or individual company's return for the specific day.  $I_t$  is the current and  $I_{t-1}$  is the last closing value of KSE 100 Index or the specific company.

### **3.3.2. Market Volatility**

Market volatility is calculated by taking the standard deviation of daily market returns within the month.

$$\text{Mkt. Vol}_t = \sqrt{\sum \sigma_t^2}$$

### **3.3.3. Stock Volatility**

$$\text{Stock Vol}_{i,t} = \sqrt{\sum \sigma_{i,t}^2}$$

Where  $\sigma_{i,t}^2$  is the variance of share i at time t. It is calculated on monthly basis. Stock volatility is calculated by taking the standard deviation of daily stock return of company i during the month.

### **3.3.4. Oil Volatility**

$$\text{Oil Vol}_t = \sqrt{\sum \sigma_t^2}$$

Daily data of oil prices has been used for calculating rate of change. Oil volatility is calculated by taking the standard deviation of daily oil price returns within the month.

### **3.3.5. Exchange Rate Volatility**

Exchange rate volatility is calculated by taking the standard deviation of daily return on currency within the month. PKR in term of Dollars is used as exchange rate. Daily data of exchange rate is used for calculating rate of change.

$$\text{XRate Vol}_t = \sqrt{\sum \sigma_t^2}$$

### 3.3.6. Money Supply

Natural log of M<sub>2</sub> monthly data is used as money supply.

### 3.3.7. Treasury bills

Monthly data of treasury bill rates is used.

### 3.3.8. Synchronization

This study is based on the synchronization measures introduced by Morck et al. (2000). According to them synchronized stock price behavior is observed through the calculation of mean and median of daily portion of stocks that move in the same direction (fall/ rise) within a given month for each cross section.

$$\text{Synchronized Stock Price Movements (Mean)} = \frac{1}{T} \sum_t \frac{\text{Max}(n_{j,t}^{\text{Up}}, n_{j,t}^{\text{Down}})}{n_{j,t}^{\text{Up}} + n_{j,t}^{\text{Down}}}$$

$$\text{Synchronized Stock Price Movements (Median)} = \text{Median} \left( \frac{\text{Max}(n_{j,t}^{\text{Up}}, n_{j,t}^{\text{Down}})}{n_{j,t}^{\text{Up}} + n_{j,t}^{\text{Down}}} \right)$$

Logistic transformation is applied as the values of stock price synchronicity have bounded values (0.5, 1) which are not suitable for regression.

$$\varphi = \log [(f-0.5) / (1-f)]$$

In order to study the effect of individual stock i synchronicity on the share volatility of i company synchronicity is calculated through R<sup>2</sup> method.

$$R_{it} = \alpha_i + \beta_i r_{mt} + \varepsilon_{it}$$

Here  $R_{it}$  is the return of stock  $i$  in month  $t$ , and  $r_{mt}$  is a market return. Higher the value of  $R^2$  higher will be the stock price synchronicity and less amount of firm specific information is incorporated in the shares (Chan et al., 2006).  $R^2$  is the ratio of firm-specific to market-level information. Countries with higher average  $R^2$  are considered less efficient (Daouk et al., 2006). Studies have used  $R^2$  as a proxy for stock price informativeness (Alves et al. 2010, Jin et al. 2006, Marhfor et al. 2013 and Nguyen et al. 2013). Logistic transformation is applied as the values of stock price synchronicity have bounded values (0.5, 1) which are not suitable for regression.

$$\text{Transformed } R^2 = \ln (R^2_i / (1 - R^2_i))$$

### **3.3.9. Turnover Ratio**

Turnover ratio measures the liquidity of shares

$$\text{Share Turnover} = \frac{\text{Number of Times Shares of Company } i \text{ Traded in a Month}}{\text{Number of Shares Outstanding of Company } i}$$

### **3.4 Econometric Model**

The econometric models that are used in the study are as follow

#### **3.4.1. Stock Price Synchronization and Market Volatility**

First OLS is applied on the time series data for investigating the relationship between market volatility and synchronized stock price movements in Pakistan.

$$Volatility_t = \beta_0 + \beta_1 Sync_{.t} + \beta_2 TBILL_t + \beta_3 LOGM_{2t} + \beta_4 \Delta OIL_t + \beta_5 \Delta XRATE_t + e_t$$

(3.1)

Subscripts t represents the monthly data of market volatility, share price co-movement and macroeconomic variables exchange rate volatility, interest rate, oil prices volatility and money supply.

### 3.4.2. Stock Price Synchronization and Firm Level Volatility

Secondly, panel regression is applied to investigate effect of stock price synchronicity on the volatility of individual firm returns. Umutlu et al. (2010) stated that idiosyncratic volatility is an important part of aggregated total volatility. It is directly influenced by the change in the information environment.

$$Volatility_{i,t} = \beta_0 + \beta_1 Sync_{i,t} + \beta_2 Turnover\ ratio_{i,t} + \beta_3 I + e_{i,t}$$

(3.2)

Subscripts i represent cross sections, companies included in KSE 100 index and t represents months. Here volatility of individual firm is taken as dependent variable. Which is the standard deviation of daily share returns of the company i within the month. Synchronization here is calculated through  $R^2$ . Higher the value of  $R^2$  higher will be the synchronization in stock i price. Industry dummy 'I' is used to check the industry effect on stock price variation.

There are three methods for running simple linear panel data model i-e common constant effect, fixed effect and random effect. In the common constant effect model the value of intercept is same for all the cross sections. It is assumed that all the cross

sections in the data have similar traits. In the fixed effect model there are specific constant for every cross section. It is also called least squares dummy variables (LSDV). For different constants it uses dummy variable for each group. Standard F-test (fixed effect likelihood ratio test) is used for deciding fixed effect against common constant OLS method.

$$F = \frac{(R^2_{FE} - R^2_{CC}) / (N-1)}{(1 - R^2_{FE}) / (NT - N - K)}$$

$R^2_{FE}$  is R-square of fixed effect model,  $R^2_{CC}$  is R-square of common effect model, N is number of cross sections, K is number of explanatory variables and NT is total number of observations. If calculated value of f-statistics > 1.96 (critical value) then fixed effect model is appropriate for usage over common effect model.

In panel data fixed effect account all effect specifically related to a particular cross section like geographical factors, any other factor vary among cross section but not varying over time. When maximum existing data related to the cross sections is collected (balanced panel) then fixed effect model works best.

$$Volatility_{i,t} = \beta_i + \beta_1 Sync_{i,t} + \beta_2 Turnover\ ratio_{i,t} + e_{i,t}$$

(3.3)

In the random effect model the constant for each cross section is separate but it exhibit random pattern i-e constant of cross section is not fixed. Random effect model assumes that each cross section vary in its error term. It is helpful when limited number of observations is gathered related to the cross section.

$$\beta_i = \beta + V_i$$

$$Volatility_{i,t} = (\beta + V_i) + \beta_1 Sync_{.i,t} + \beta_2 Turnover\ ratio_{.i,t} + e_{i,t}$$

$$Volatility_{i,t} = \beta + \beta_1 Sync_{.i,t} + \beta_2 Turnover\ ratio_{.i,t} + (V_i + e_{i,t})$$

(3.4)

The Hausman test is used for making the selection decision between fixed effect and random effect model.

$$H = (\hat{\beta}^{FE} - \hat{\beta}^{RE})' [Var(\hat{\beta}^{FE}) - Var(\hat{\beta}^{RE})]^{-1} (\hat{\beta}^{FE} - \hat{\beta}^{RE}) \sim \chi^2(k)$$

(3.5)

Large value of Hausman statistic reflects that fixed effect model is more appropriate as compared to the random effect model.

## CHAPTER 4

### DATA ANALYSIS AND DISCUSSION

The behavior of the data is captured by using measure of central tendency and measure of dispersion.

#### 4.1. Descriptive Statistic of Time Series Data

Table 4.1 reports the results of descriptive statistics i-e mean, median, standard deviation etc.

**Table 4.1. Descriptive Statistics of Time Series Data**

	<b>MKT RETURN</b>	<b>SYNC</b>	<b>TBILL</b>	<b>Log M<sub>2</sub></b>	<b>Δ OIL</b>	<b>Δ XRATE</b>
<b>Mean</b>	0.011333	-6.545450	0.008362	8.328216	0.022309	0.001559
<b>Median</b>	0.009730	-5.806187	0.007900	8.391052	0.019930	0.000858
<b>Maximum</b>	0.032357	0.935484	0.012500	9.459136	0.077107	0.020313
<b>Minimum</b>	7.57E-05	-12.88511	0.004800	7.181592	0.006814	0.000000
<b>Std. Dev.</b>	0.005974	1.707692	0.001999	0.672059	0.010486	0.002237

Number of observations for each variable on monthly basis are 198. Average (median) value of market volatility is 0.0113 (0.009730) with the maximum value 0.0324 and minimum 0.0000757, with the standard deviation 0.006. Which shows over the time the values of market volatility has shown less variation. Likewise, for synchronization average (median) value is -6.545 (-5.806) with maximum value 0.935 and minimum

value -12.88511. SYNC has a standard deviation of 1.707692, which shows that values of stock price synchronicity reflect extensive variation over the time. TBILL average (median) value is 0.008362 (0.007900) with maximum value 0.012500 and minimum value 0.004800. The value of standard deviation is 0.001999. M2 average (median) value is 8.328216 (8.391052) with maximum value 9.459136 and minimum value 7.181592. Standard deviation is 0.672059. Average (median) of OIL is 0.022309 (0.019930), with maximum value 0.077107, minimum value 0.006814 and standard deviation 0.010486. XRATE average (median) value is 0.001559 (0.000858) with maximum value 0.020313 and minimum value 0.0000. Standard deviation is 0.002237 that reveals low level of deviation.

#### **4.2. Correlation Analysis of Time Series Data**

The correlation analysis is done to explain the probability of multicollinearity in the data. The presence of multicollinearity may lead to biased results. Table 4.2 represents the results of correlation analysis.

**Table 4.2. Correlation Matrix of Time Series Data**

	<b>SYNC</b>	<b>MKT RETURN</b>	<b>Log M2</b>	<b>Δ OIL</b>	<b>TBILL</b>	<b>Δ XRATE</b>
<b>SYNC</b>	1.000000					
<b>MKT RETURN</b>	-0.119825	1.000000				
<b>Log M<sub>2</sub></b>	0.083550	-0.392835	1.000000			
<b>Δ OIL</b>	0.098380	0.177993	-0.145344	1.000000		
<b>TBILL</b>	0.016052	0.003798	0.027084	0.123104	1.000000	
<b>Δ XRATE</b>	-0.064150	-0.025456	0.020445	0.185594	0.344264	1.000000

The values in the above table reflect that multicollinearity does not exist in the sample. Synchronization has weak negative relation with the market volatility and exchange rate. It has weak positive relation with the money supply, oil volatility and Treasury bill. Market volatility has weak negative relationship with money supply and exchange rate and weak positive relationship with oil volatility and Treasury bill rates.

### **4.3. Impact of Stock Synchronization and Macroeconomic Variables on Market Volatility**

Table 4.3 represents the results of multivariate regression analysis performed to explain the impact of synchronization and macroeconomic variable on the market volatility.

**Table 4.3. Impact of Stock Synchronization and Macroeconomic Variables on Market Volatility**

	<b>Coefficients</b>	<b>t-Statistic</b>	<b>P-value</b>
<b>Intercept</b>	0.036109	4.425117	0.0000
<b>SYNC</b>	-0.000150	-0.547410	0.5847
<b>Log M<sub>2</sub></b>	-0.003174	-4.233469	0.0000***
<b>Δ OIL</b>	0.037786	0.627190	0.5313
<b>TBILL</b>	-0.031537	-0.120205	0.9044
<b>Δ XRATE</b>	0.025085	0.150027	0.8809
<b>AR(1)</b>	0.364464	5.193307	0.0000
<b>R-squared</b>	0.274651	<b>Adjusted R-sq.</b>	0.251745
<b>Durbin-Watson</b>	2.050531	<b>F-statistic</b>	11.99077
<b>Standard Error</b>	0.005123	<b>Prob(F-statistic)</b>	0.000000

\*\*\* Significant at 1%, \*\* Significant at 5%, \*Significant at 1%

The diagnostic test reveals that data has heteroskedasticity and autocorrelation. In order to fulfill the requirements of regression first these issues were addressed through HAC. First order autoregressive term is used in the model to address autocorrelation. The Durbin Watson value improved to 2.05. Results reveal that synchronization has negative but insignificant impact on market volatility. At country level share co movements does not affect market volatility. Among the macroeconomic variables money supply has significant but negative impact on the market volatility. Increase in money supply reduces market volatility. Oil prices volatility, Treasury bill, exchange rate

returns volatility has insignificant impact on market volatility in the context of Pakistan. The value of adjusted  $R^2$  shows that independent variables are explaining 25% variation in dependent variables. According to the results, volatility in returns of oil prices and exchange rate has no influence on market volatility. These results are consistent with Lau, Demir and Bilgin (2013) that economic factors are unsuccessful in explaining the reason of volatility in market returns. Sohail et al. (2009) also report insignificant positive impact of treasury bills rate on stock returns in long run.

Additionally increase in money supply reduces market volatility.  $M_2$  is broad money representing money supply or liquidity in the market. It is controlled by the central bank for achieving economic and political goals of the government. At the country level, increase in money supply reduces market volatility. It results in increasing inflation (demand pull or cost pull inflation). Money supply raises market volatility by reducing interest rate, generating more investments, boosting production activities and portfolio adjustment that would boost the demand for stocks.

Humpe et al. (2009) reported that in Japan money supply has negative relationship with stock prices. Increase in money supply during the 1990's results in reduction of the interest rate that is incapable of pulling the economy of Japan out of crash or preventing share prices from declining. Money supply, influence share prices by three means: first, money supply is linked with unexpected increase in inflation and future inflation improbability and thus, negatively connected to the stock price; second, supply of money has positive influence on share price, if it boosts economic activities. Finally, portfolio theory propose that positive relationship exists between  $M_1$  and share

prices if it results in portfolio shift i-e shifting of money from noninterest bearing asset (cash in hand) to financial assets like in corporate equities.

#### 4.4. Impact of Stock Synchronicity and Liquidity on Stock Volatility

In the second step panel data analysis has been done to investigate the factors affecting volatility at the firm level. Table 4.4 reports the results of descriptive statistic for firm level data.

**Table 4.4. Descriptive Statistics of Panel Data**

	<b>STOCK VOL</b>	<b>SYNC</b>	<b>TURNOVER</b>
<b>Mean</b>	0.027269	-2.075642	0.100804
<b>Median</b>	0.021278	-1.568938	0.009886
<b>Maximum</b>	1.646236	3.141576	8.738794
<b>Minimum</b>	0.000000	-78.76011	0.000000
<b>Std. Dev.</b>	0.049093	2.476814	0.339669

For panel regression number of observations for each variable is 16577. Mean (median) value of stock return volatility is 0.027269 (0.021278). Standard deviation of firm specific return volatility is 0.049093 and Turnover is 0.339669. This shows less variation in the data. Mean (median) value of turnover ratio is 0.100804 (0.009886). Synchronicity is having very large variation 2.476814 this shows that cross sections have dispersed values. Mean (median) value of stock synchronicity is -2.075642 (-1.568938). Table 4.5 reports the results of correlation matrix.

**Table 4.5. Correlation Matrix of Panel Data**

	<b>STOCK VOL</b>	<b>SYNC</b>	<b>TURNOVER</b>
<b>MKT</b>	1.000000		
<b>SYNC</b>	-0.052405	1.000000	
<b>TURNOVER</b>	0.015344	0.142326	1.000000

Weak negative correlation exists between idiosyncratic return volatility and synchronicity. Positive weak correlation exists between idiosyncratic return volatility and turnover.

#### **4.5. Cross section Panel Regression Analysis**

In order to make decision between common effect model and fixed effect model, redundant fixed effect likelihood ratio is performed. Cross section chi square is significant so fixed effect model is preferred over common effect model. The fixed effect model assumes that all cross sections in the sample have different intercepts but same slopes. Table 4.6 reports the results of fixed effect and Hausman tests for the selection of model for cross sections.

**Table 4.6. Fixed Effect and Hausman Test for Cross Sections**

<b>Redundant Fixed Effects Tests</b>		
Effects Test	Statistic	Prob
Cross-section F	2.569526	0.0000***
Cross-section Chi-square	243.755718	0.0000***
<b>Correlated Random Effects - Hausman Test</b>		
Test Summary	Chi-Sq. Statistic	Prob.
Cross-section random	21.929959	0.0000***

\*\*\*Significant at 1%, \*\* Significant at 5%, \*Significant at 10%

Hausman test revealed that cross section random is significant therefore it is concluded that the fixed effect model be used. Table 4.7 reports the results of cross section fixed effect model.

**Table 4.7. Cross-Section Fixed Effects Equation**

	<b>C</b>	<b>SYNC</b>	<b>TO</b>
Coefficient	0.025515	-0.000678	0.003453
t-statistic	47.55609	-3.954444	2.721729
Prob.	0.0000	0.0001***	0.0065***
R <sup>2</sup>	0.017826	Adjusted R <sup>2</sup>	0.012045
F-Statistic	3.083368	Standard Error	0.048796
Prob (F-Statistic)	0.000000		

\*\*\* Significant at 1%, \*\* significant at 5%,\*Significant at 10%

At firm level Sync has significant but negative relation with the firm specific volatility. When individual firm  $i$  returns co-move with the market returns 1% then it results in reducing firm  $i$  volatility i-e reducing the company specific return variation or idiosyncratic risk.  $R^2$  measures level of firm specific information in the share prices over market level information. According to Chan et al. (2006) and Roll et al. (1998) firms having more volatile returns generate more firm-specific information and they get less influenced by industry and market wide information. The negative relationship between stock return volatility and stock return synchronicity reported in the result shows that, in the market investors are trading by incorporating more firm level information over market level information into the share prices. That reduces stock return co movement with the market returns. Further it increases return volatility at the firm level.

TO has significant positive impact on firm  $i$  volatility. 1% increase in TO i-e liquidity of firm  $i$  share increases its stock volatility. Results are in consensus with the findings of Umutlu et al. (2010) that uses turnover ratio as a proxy for stock liquidity in terms of value traded. The study discovers that liquidity increases the trade of individual stock resulting in higher stock's volatility. Due to incorporation of firm specific information relative to market information, synchronicity with market is reducing resulting in increase of firm returns variance. Li et al. (2011) also reports positive relation between turnover ratio and firm level volatility. Chordia, Roll and Subrahmanyam (2008) argues that liquidity increase market efficiency by including firm-specific information into stock prices.

Adjusted  $R^2$  value reveals 1.2% overall variation in dependent variable because of variation in independent variables.

#### 4.6. Time Period Panel Regression Analysis

Table 4.8 reports the results of fixed effect and Hausman tests for the selection of model over the period.

**Table 4.8. Fixed Effect and Hausman Test over the Period**

<b>Redundant Fixed Effects Tests</b>		
Effects Test	Statistic	Prob
Period F	20.011822	0.0000***
Period Chi-square	3575.570869	0.0000***
<b>Correlated Random Effects - Hausman Test</b>		
Test Summary	Chi-Sq. Statistic	Prob.
Period random	5.445904	0.0657*

\*\*\* Significant at 1%, \*\* Significant at 5%, \*Significant at 10%

In order to make decision between common effect model and fixed effect model redundant fixed effect likelihood ratio is performed. Period chi square is significant, fixed effect model is selected over common effect model. Hausman test is significant therefore; fixed effect model is selected over random effect model. Over the period cross sections in the sample have different intercepts but same slopes.

Table 4.9 reports the results of fixed effect model chosen on the basis of hausman test.

**Table 4.9. Period Fixed Effect Model**

	<b>C</b>	<b>SYNC</b>	<b>TO</b>
Coefficient	0.023684	-0.001544	0.003784
t-Statistic	48.92305	-10.47501	3.563296
Probability	0.0000	0.0000***	0.0004***
R <sup>2</sup>	0.196660	Adjusted R <sup>2</sup>	0.186898
F-Statistic	20.14640	Standard Error	0.044268
Prob (F-Statistic)	0.000000		

\*\*\* Significant at 1%, \*\* significant at 5%, \*Significant at 10%

Sync has significant negative impact on volatility of firm i returns. Increase in sync is reducing volatility over the time. TO has significant positive impact on volatility. Increase in TO increases volatility over the time. Adjusted R<sup>2</sup> value reveals that 18.7% variation in dependent variable is because of variation in independent variables.

#### **4.7. Least Square Dummy Variable Analysis for Industry Effect**

Table 4.10 reports the results of least square dummy variable analysis to explain the difference in volatility among cross industries.

**Table 4.10. LSDV Analysis for Industry Effect**

<b>Variable</b>	<b>Coefficient</b>	<b>t-Statistic</b>	<b>Prob.</b>
C	0.022473	21.29237	0.0000
SYNC	-0.000742	-4.510718	0.0000***
TURNOVER	0.003677	3.196336	0.0014***
AUTO_ASSEM	-0.001412	-0.697820	0.4853
AUTO_PARTS	0.008793	2.424076	0.0154***
CABLE_ELECT	0.010098	2.786153	0.0053***
CEM	0.004119	2.633619	0.0085***
CHEM	-0.000579	-0.216999	0.8282
ENG	-0.004527	-0.713834	0.4753
FERT	-0.002122	-1.109747	0.2671
FOOD	0.013509	6.770686	0.0000***
GLASS	0.004171	1.147712	0.2511
IBANK	0.009792	2.702857	0.0069***
INS	0.001821	0.955490	0.3393
JUTE	0.003577	0.984368	0.3249
LEAS	-0.000217	-0.059799	0.9523
LEATHER	0.008259	2.971357	0.0030***
MFUNDS	-0.002083	-0.496327	0.6197
MISC	0.008760	3.856107	0.0001***

MODARBA	-0.003675	-0.779326	0.4358
O_G	-0.000618	-0.290355	0.7715
O_G_MKT	-0.001302	-0.682429	0.4950
PAP	0.001960	0.540829	0.5886
PHARM	0.005988	2.243423	0.0249**
POW	-0.001085	-0.511517	0.6090
RESTATE	-0.014775	-1.087235	0.2769
SPINNING	0.004850	1.330960	0.1832
SUGAR	0.007120	1.958723	0.0502**
SYNTH	0.001782	0.491216	0.6233
TECH_COM	0.005870	2.400073	0.0164**
TEXT_COMP	0.007035	3.483473	0.0005***
TEXT_WEAV	-0.010900	-3.007614	0.0026***
TOB	0.008573	3.199679	0.0014***
TRANS	0.026390	2.985781	0.0028***
VANASPATI	0.004289	1.181053	0.2376
WOOLEN	0.005124	1.410311	0.1585
REF	0.002879	1.081782	0.2794

\*\*\* Significant at 1%, \*\* Significant at 5%, \*Significant at 10%

R-squared	0.012138
Adjusted R-square	0.009988
Prob(F-statistic)	0.000000
Durbin-Watson stat	1.407218

In order to examine the effect of industry on the firm return volatility, industry dummy is used and commercial bank is excluded from the sample for representing as benchmark. Result shows that among the 34 sectors probability of 14 sectors is significant. Food, investment banks, leather, miscellaneous, pharmaceutical, sugar, automobile parts, cable & electronics, cement, telecommunication, textile composite, tobacco and transportation sectors have positive and significant coefficients that verify idiosyncratic movement. Returns of these sectors are similar to commercial banks. Returns of textile weaving are different from commercial banks as its coefficient is significant and negative. Coefficients of Sync and TO are also significant. Companies whose stock returns co-move with market returns face low return volatility and those having high turnovers will have high volatilities.

## **CHAPTER 5**

### **CONCLUSION AND RECOMMENDATIONS**

Pakistan is a developing nation having three stock exchanges LSE, ISE and KSE. Among the three KSE is the big stock market. These markets are integrated to form Pakistan Stock Exchange in 2016. The focus of the research was to investigate market volatility and stock price synchronization at country level and at market microstructure level. According to efficient market hypothesis share prices must have random walk and they should disseminate all the relevant information timely. Market volatility is good as well as bad. For this we need to investigate the factors causing that volatility. At the broader level, the determinants of market volatility are stock price synchronization, money supply (M2), exchange rate volatility, monthly treasury bill rate and crude oil price volatility.

The findings of the study reveal that in financial market of Pakistan, among the four macroeconomic variables only money supply has significant but negative impact on volatility in the presence of stock price synchronization. Negative relationship reflects that money supply instead of increasing investment in shares and reducing interest rate, raising inflation in the economy. Stock price synchronization shows negative but insignificant impact on market volatility. Nishat et al. (2004) states empirical evidence concerning the causal relationship between share prices and macro variables is not convincing.

At market microstructure level, panel regression reflects fixed effect for the cross sections and over the period study.  $R^2$  reflects the incorporation of firm specific

information over macroeconomic information in the shares. Negative relationship between idiosyncratic return volatility and synchronization is report. High volatility in firm specific return is due to low stock synchronization at firm level. This shows that investor for investment decisions incorporate more firm specific information as compared to market information. These results are consistent with Eun et al. (2015). Informed trading encourages rational decision making for investment decisions and returns of individual stock show high dispersion (Demirer et al., 2006). Co movement is systematic variation of total variation. Large systematic variation and small idiosyncratic variation results in large co movement of shares (Li et al., 2004). Likewise, idiosyncratic return volatility has positive relationship with the stock liquidity (TO). It gives the signal of inform trading in the market. Rational decision making takes place at the firm level.

Industry effect is examined by forming industry dummy “I”. Result shows food, investment banks, leather, miscellaneous, pharmaceutical, sugar, automobile parts, cable & electronics, cement, telecommunication, textile composite, tobacco and transportation sectors have positive and significant coefficients. Returns of these sectors are similar to commercial banks. Returns of textile weaving are different from commercial banks as its coefficient is significant and negative.

### **5.1. Recommendation and Policy Implication**

Government in order to make efficient operation of financial markets should revise their monetary policy. Policy should boost production and promote more investment opportunities that have positive impact on stock market returns. Financial regulators and policy maker should emphasize on more company specific disclosure of

information. It will boost inform trading through transparency. Investor should be thought about synchronization and liquidity of stock as these have influence on volatility of stocks. More synchronized stocks have less volatility whereas; high liquidity is an indicator of high volatility. Steady flow of information in the share prices are necessary for efficient functioning of the stock markets and growth.

## **5.2. Limitation**

At the macro level, relationship between synchronicity and market volatility become insignificant. This shows that there are some missing variables which should be the part of analysis. Various other factors like investor culture and sentiment can be incorporate in the study. As Roll et al. (1998) states that psychological factors can better explain the volatility of asset prices as compared share price in formativeness. Venezia et al. (2011) states that culture has strong influence on market volatility. Lack of government interference in the financial markets (Gul et al. 2010) and increase of investor protection can result in reducing synchronicity and market volatility (Morck et al., (2000); Wurgler et al., (2000)). The study used turnover ratio for measuring liquidity of shares, any other proxy can be used in order to study the impact of liquidity on idiosyncratic volatility. There is need of continuation of research in this domain.

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