

**IMPACT OF EXCHANGE RATE
VOLATILITY ON STOCK MARKET
DEVELOPMENT:
CASE OF PAKISTAN**

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Impact of Exchange Rate Volatility on Stock Market Development: Case of Pakistan

ABSTRACT

The Study aims to investigate the relationship between exchange rate volatility and stock market development of Pakistan. Study utilized annual data from 1980-2017. Volatilities are calculated by using quarterly data of real exchange rate using GARCH. Other independent variables included in the study are foreign direct investment, industrial production, broad money, GDP growth and real exchange rate. ARDL bound testing approach was used for econometric analysis. Results indicate strong negative significant effect of real exchange rate volatility on stock market development of Pakistan. While industrial production, broad money, GDP, FDI and real exchange rate demonstrated strong positive relation with stock market development. Based on the results, it is suggested that there is need to focus on controlling currency volatility in country and to provide such environment, which may facilitates the investments.

JEL code: F31; O16

Keywords: GARCH, Stock Market Development, ARDL

1. Introduction

Stock market (SM) of any country is a major contributing factor in economy's growth (Muktadir-Al-Mukit, 2012). Stock markets are responsible for bringing investment to capital dearth sector from sectors having huge amounts of capital to contribute in economy's growth. An effective stock market generates more investment opportunities at national and international level. Moreover, it attracts more savings and uses these savings to create grounds for more profitable economic activities. A well performing stock market is one, which facilitates both borrowers and lenders (Sohail and Hussain, 2009). Investors are able to collect capital from stock market at affordable cost. This reduced investor's risk of 'credit crunch' together with facilitation to investors to get information by easy means, lead to effective resource distribution in different sectors and faster economic growth (Mamun et al., 2013).

Stock market development gives picture of variations in stock market performance including changes in shares prices. According to Ma and Kao, (1998) small degree of changes in stock market prices cannot be avoided but large degree of fluctuations in stock exchange are harmful as it increases the risk of loss and may shatter investors' confidence. Risk averse investors may become reluctant to invest in market. Not all macroeconomic factors are responsible for stock market variations in case of emerging markets. Few macro

variables such as Exchange rate, interest rate and money supply have major impact on stock market (Krainer, 2002). Stock market development (SMD) being indicator of economic development, is taken into account while assessing economic growth of country. Volatility of different macroeconomic variables effect SMD differently. As some of them have positive effect while others have negative.

Globalization in the present world is creating ways for different economies to interact and to accelerate financial markets growth (Karunanayake, Valadkhani & O'Brien, 2009). Due to globalization, financial markets have become vulnerable to any shock occur in international financial markets (Subair, 2009). World has gone through different crises, affecting different macroeconomic factors. Exchange rate volatility (ERV) has both positive and negative repercussions in different economies.

Exchange rate (ER) directly affects international credibility of different firms by effecting firms input and output prices (Joseph, 2002). Exchange rate volatility is believed to impact stock market development as explained by the flow-oriented model, which is based on microeconomic foundations. The model maintains that a causal relationship runs from the exchange rate to market capitalization. In other words, exchange rate movements affect the market capitalization. Flow oriented model considers the capital flows to have an impact on international competitiveness of enterprises and profits of firms. The profits and international competitiveness of firms will have an influence on stock market. In other words, the model suggests that fluctuations in exchange rate influence the share value of domestic and multinational firms leading to influence stock market development. Exchange rate volatility affects the competitiveness of firms through their impact on input and output prices (Joseph, 2002). Adjasi and Biekpe (2007) held that in the stock oriented model, “the exchange rate equates demand and supply for assets (bonds and stocks). Therefore, expectations of relative exchange rate volatility have a significant impact on price movements of financially held assets. Thus, market capitalization movements may get influenced by exchange rate volatility.

Movements in ER effects the market prices and output, as well as market returns (Subair and Saliho, 2004). Pakistan has faced time to time changes in ER due to internal and external factors. Major factors of this exchange rate volatility in Pakistan are; political instability, terrorism, risky environment for investment, judiciary crises, debt (Sohail and Hussain, 2009).

Emerging markets including Pakistan’s stock market, has gained attention of investors. Financial crises increased the need to investigate ER and stock market relation

(Kasman, 2003). Li, Sarkar and Wang (2003) argued that, at international level where financial operations are done by using different exchange rates; ER variability plays an important role in affecting transactions and contributes to the stock market volatility. ER volatility is responsible for many investment decisions in stock market, as it may have positive or negative affect on returns.

Firms future cash flows depends on the foreign exchange rate variability. As ER appreciates, stock prices will decline as a result of exporter's loss. On other hand, importers will become better off due to ER appreciation. Moreover, reaction of importers and exporters after ER depreciation are different (Nieh, 2006). Ma and Kao (1990) augmented that influence of ER depreciation and appreciation differs in different countries depending on their trade policies. Exchange rate volatility not only influence international markets but also plays an important role in domestic markets volatility. Multinational companies are affected by ER changes as it creates changes in the profitability of the tasks done on international grounds. Meanwhile, domestic companies also import or export certain items in this way, ER changes also contributes to the variability in domestic market profits (Adjasi et al, 2008).

In recent years, exchange rate volatility have become the major issue in Pakistan. Since the adoption of floating exchange rate system in 1982, the exchange rate volatility increased tremendously. This increase in exchange rate volatility has several internal and external consequences for the economy (Khan et. al., 2014). In recent year 2018, it is seen that exchange rate of Pakistan showed quick fluctuation due to change in government and its policies. Pakistan exchange rate has increased to 120 Rs/\$ to 154 Rs/\$. Under this situation of Exchange rate it has become important to investigate its effect on Pakistan's stock market performance. Many researchers have studied the relationship between exchange rate and stock market development. Some of them studied interaction between stock prices and exchange rate while other investigated ER and stock market relation by taking in to account KSE-100 index as indicator of stock market development. But study on impact of exchange rate volatility on stock market development of Pakistan is not exclusively done by anyone. The only study for Pakistan is by Hajilee and Nasser (2014). Authors investigated currency volatility and SMD relation in emerging economies, considering 12 emerging economies including Pakistan using standard deviation method of calculating volatilities of real effective exchange rate for the period 1980-2010.

The present study aims at analyzing the impact of exchange rate volatility on stock market development of Pakistan using GARCH and Standard deviation (SD) techniques for generating real exchange rate volatilities by covering most recent period of 1980-2018. The

study also incorporates some important macroeconomic variables such as industrial production, broad money, GDP and FDI to examine the influence of such variables on stock market development. Therefore, this study is endeavor to fill the empirical research gap to look in to the short run as well as long run linkage of real exchange rate volatility with stock market development in Pakistan.

2. Literature Review

Emergence of capital markets in developing countries together with different exchange rate regimes adopted by countries to control exchange rate volatility, opened doors for research on the role of exchange rate volatility (ERV) in explaining stock market development. Also, frequent variability in exchange rates make markets more vulnerable to risk. This has increased importance of stock markets and exchange rate of countries.

Khalid (2017) empirically investigated short-run and long run impact of ER on SMD of Pakistan covering the period of 1990-2017. Findings of Johansen co-integration test concluded that interest rate effects SMD negatively while ER have positive impact on SMD. Raza and Kemal (2017) examined the daily movement of stock in Pakistan's stock market using daily data of KSE Index comprising of 1073 observations from 5 April 2010 to 2 October 2015. Authors concluded that global and political news have major impact on stock market movement as investors are sensitive to the daily news. Suriani et al (2015) investigated how Pakistan's exchange rate changes affects Pakistan's stock market. For estimation authors took monthly data of PSX and ER from January 2004 to December 2009. Results revealed that there exist no causal relationship.

Turkey adopted floating exchange rate (FER) after economic crises of 2001. Tursoy (2017) used auto regressive distributive lag (ARDL) model to examine co-integration between ER and stock prices in Turkey utilizing monthly data starting from January 2001 and ending on September 2016. ARDL results showed that variables are co-integrated. For a developing country like Zambia, Sichoongwe (2016) investigated relationship between exchange rate uncertainty and stock market performance of Zambia using time series data and GARCH technique. Results have shown that uncertainty of ER have negative impact on Zambia's stock market. Perera, (2016) analyzed the effect of ERV on stock market (SM) return volatility for emerging market of Colombo. Monthly data of all share price index (ASPI) of Colombo stock exchange was used covering the period of January 2010 to December 2015. Author concluded positive and significant relationship between euro ER and stock market and found negative and insignificant relationship in case of US Dollar and British pound. In another study, Quang Huy, (2016) analyzed ER and stock market

performance (SMP) relationship for Vietnam during 2005 to 2015. Granger causality test showed unidirectional relationship from SMP to exchange rate before the financial crisis period; while after crises the direction of relationship is opposite.

Poornima & Ganeshwari (2015) analyzed the ER affects on India's stock market. Daily data from July 2014 to 2017 was taken. Granger causality test showed unidirectional relationship between ER and NIFTY returns. Patel and Kaglawala (2013) studies the impact of ER on Bombay stock exchange (BSX) and national stock exchange (NSX) of India. Correlation, Regression and ANOVA tests for the study period from January 2005 to December 2012 showed that ER have very little impact on NSE nifty and BSE nexus.

Mwanza (2014) conducted study to analyze the impact of ER on stock market performance of Nairobi. Data was taken on different variables such as ER, stock prices of NSM, inflation and interest rate from January 2011 to December 2013. Results have shown that ER does not significantly affect stock market performance. Nguyen and Chkili (2014) used BRICS¹ countries data to test the relationship between Foreign exchange markets (FX) and stock market. Markov switching VAR model was utilized for analysis. Authors found no significant relationship between ER and stock market. However, Dahir et al, (2017) studied this relationship in BRICS countries for the time 2008-2015. Author used Wavelet model for estimation. Results indicated weak co-movement of ER and stock market in China while other countries showed opposite results.

Mlambo et al (2013) studied effects of ERV on Johannesburg Stock Exchange (JSE). Authors considered monthly South African data for the period of 2000 to 2010. Weak interaction between exchange rate volatility and JSE development is concluded. Moreover, there is negative relationship between prime overdraft and SMC. While positive impact of US interest rate on SMC is observed.

3. An Overview of Exchange Rate and Stock Market Capitalization in Pakistan

Table 1 shows different regimes adopted by Pakistan in different years. It can be seen that Pakistan started from fixed exchange rate system (FER) and now free-floating exchange rate system is prevailing in country. State bank of Pakistan or government is mainly responsible for Exchange rate regimes. Historically, from 1947 to 2019 Pakistan has gone through different exchange rate regimes.

¹ Brazil, Russia, India, China, South Africa.

Table 1. Exchange Rate Regimes in Pakistan	
Years	Exchange Rate Regime
1947-1982	Fixed Exchange Rate
1982-1998	Managed Floating Exchange Rate
1998-1999	New Exchange Rate Mechanism
1999-2000	Market-Based Unified Exchange Rate
2000 onwards	Free Floating Exchange Rate
Source: Janjua (2007).	

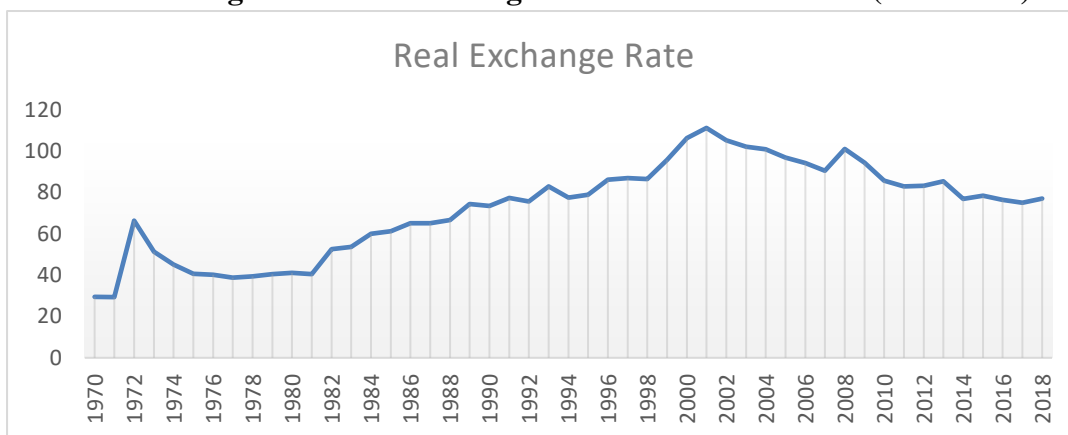
With main objective of achieving balance of payment (BOP) and to stabilize its trade, country had to adopt such exchange rate policy which facilitates the economic growth. Pakistan adopted FER in 1947. As Pakistani currency was linked to US dollar, appreciation of dollar in 1980s effected Pakistan's exports and its trade competitiveness. Pakistan, being newly established country needed to import machinery and other important products for the development of its economy. Due to currency devaluation imports were become expensive and it became difficult to import (Ijaz and Akhtar, 2017). Thus, Pakistan faced decline in its exports and instability in its BOP. Therefore, to maintain its BOP and stabilize its imports and exports Pakistan moved to managed floating exchange rate (MFER) in 1982 (Janjua, 2007).

Before adoption of managed floating exchange rate system, Pakistan was experiencing fiscal deficit and inflation. To resolve these issues currency was linked to 16 major countries' currencies, who were also trading partners of Pakistan. After adoption of managed floating ER on 8 January 1982, country experienced 26.8 % growth per year (Ijaz and Akhtar, 2017). After liberalization in 1991, Pakistan currency devalued against its trading partners. And during this time period country experienced inflation. Certain reforms were taken to attract foreign investments by opening markets for foreign investors and allowing people to hold foreign currency. Investors were allowed to have foreign accounts (Janjua, 2007). Main objectives behind adoption new exchange rate mechanism (NERM) were to reduce imports and to facilitate exporters and Pakistani nationals living and working abroad. Moreover, focus was also on reduction of inflation and debt. This policy harmed economic growth of country by discriminating between exporters and importers (Hussain et al, 2015). Market based unified ER was introduced in 1999. This ER system allowed SBP to take charge of foreign exchange sale and purchase. Pakistan adopted free float policy in 20 July 2000. Since adaptation of floating exchange rate system, ER of Pakistan is controlled by

proactive monetary policies of SBP. This exchange rate mechanism helps in stabilizing BOP (Kemal and Haider, 2005).

Figure 1 shows fluctuations in real exchange rate during the period of 1970 to 2018 of Pakistan. Since, 1947 to 1982 is marked as era of fixed exchange rate while from 1982 Pakistan followed managed exchange rate as Pakistan’s currency has depreciated. During the period of separation of East Pakistan, Country experienced structural changes that harmed Pakistan’s exchange rate from 1970 to 1971. From 1970 to 1978, RER of Pakistan showed appreciation of 8.71% on an average (Hussain, 2009). This appreciation in ER was due to war between Pakistan and India and other factors that contributed towards appreciation of exchange rate was capital inflows, double digit inflation and effect of oil price shock (Hussain, 2009).

Figure 1: Real Exchange Rate Trend in Pakistan (1970-2018)



Source: International Financial Statistic (IFS)

From 1982 to 1988, Pakistan’s currency depreciated by 38.5% as Government converted it to managed float (Parveen et al, 2012). Taking in to account macroeconomic situation of country, some important adjustments were made by the authorities. Authorities also started evaluation of ER on daily basis. ER of Pakistan touched 21.27 Rs/\$ in August 1989. The period of 1990 to 1999 is generally considered as era of privatization and stagnation due to poor governance. As in Figure 1 we can see increase in RER from 1995 and it reached to its highest in 2000. During this period Pakistan economy faced debt crises, stagflation, persistent external and internal deficit resulting in increase in exchange rate. During 1999-2000, RER devaluation was 9.61 percent and nominal exchange rate devaluation was 10.64 percent. In the beginning of 1998 exchange rate reached to 44.05 Rs/\$ (Javed and Ahmed, 2016).

Exchange rate is reactive to countries economic situation and major events of country. When Pakistan held its nuclear experiment on 28th May 1998 (after India's nuclear experiment) Pakistan faced calamity after this experiment. Since, different donor nations started implementing sanctions on Pakistan. Imposition of sanctions after nuclear test 1998 created crises like situation in Pakistan. People started withdrawing currency from foreign currency accounts and capital investments started declining. SBP implemented two-tire ER system² as remedy to crises (Ijaz and Akhtar, 2017). On 20 July 2000, Pakistan started free float policy. Monetary policy of country played important role in managing the ER. As we can see in Figure 1, RER reached to its highest point in 2001. After 11 September 2001 workers remittances were increased which lead to increase the value of Pakistan's currency (Janjua, 2007). After 2001, RER of Pakistan started decreasing and devaluation in RER during 2000 to 2002 was 3.2% while an increase in value of real exchange rate by 6% was noted during 2003 to 2004. The economic indicators showed some noticeable development since the year 2001-02 and remained on improvement track till 2007, which helped the system to stabilize rupees from 59 to 60 per dollar till 2006-07 (Shah et al, 2015).

During 2008-2009, ER depreciation of 16.3% was witnessed. Pakistan economy faced incredible burden on ER during 2008 to 2009 due to political instability, loss of foreign exchange reserves and speculative activities in foreign exchange market (Pakistan economic survey, 2008/2009). As it is clear from the figure 3.3 that Pakistan currency appreciated after 2010. In 2013 ER reached to 94.54 rupees/\$. RER showed appreciation of 25% during 2010-2015 (Javed and Ahmad, December 2016). Due to political instability, poor governance and increasing debt burden in Pakistan exchange rate reached to 105.46 Rs/\$ in 2017 and kept increasing.

Focusing on stock market of Pakistan, in the beginning, there were three stock exchanges in Pakistan but KSE was the largest one. Most of the trading occurs in Karachi stock exchange which is about 60% and this aspect makes Karachi stock exchange Pakistan's leading stock exchange (Zaidi 2009). Figure 2 shows trend of SMC from 1980 to 2018. By 1960, KSE flourished but after 1970 due to political instability and the nationalization policies of Government it started facing recession. By 1990, market was set to be opened for foreign investors this decision uplifted the market. At that time KSE flourished and ranked 3rd in list of emerging markets. At this time, market capitalization and turnover of stock market have increased due to listing of 86 new industries. In the beginning, KSE-50 index was

² An ER in which country sets one rate for capital investments and another rate for imports and exports.

introduced but with the passage of time as stock market flourished, KSE-100 index was introduced (Ali & Afzal, 2010).

Figure 2: Stock Market Capitalization as percent of GDP trend in Pakistan (1980-2018)



Source: Emerging/Global Stock Markets Fact Book (various issues) and FRED

Stock market responded positively to liberalization measures and unprecedented increase in all indicators was observed in the first year of the opening of the market. The optimistic trends were seen in the first year. Market was ranked third in 1991 due to its performance (Husain and Qayyum, 2007). Yet, in terms of listings, the market expanded and leads to increase the turn over and market capitalization. Also, market had become better in terms of size and activity. Ratio of MC to GDP improved from 7-18 percent in the first year of liberalization and showed almost 26 percent improvement in next two years (Qayyum & Anwar, 2011). This increase in SMC can be seen in Figure 2 representing its first peak in 1993. In 1995 due to political and economic instability, Pakistani equity markets distorted. In August 1997 KSE established a 'Defaulting Companies Counter' for companies who defaulted under listing regulations of the Stock Exchange (Qayyum & Anwar, 2011). By 1997, KSE again started following the track of improvement due to government's action but then again started decreasing its points due to shock in the external markets. KSE-100 index declined by 1746.31 to 1609.16 points from 1 January 1998 to 28 January 1998 (Sohail & Hussain, 2009).

Stock market is sensitive to internal or external news. On 28th May 1998, Pakistan held its nuclear experiment, which lead to decline in KSE-100 index. PSX experienced rescission in remaining period of 1998 because different countries have imposed economic sanctions on Pakistan. Different conditions were imposed by Asian Development Bank, IMF

and World Bank. PSX faced severe decline of 765.74 by July 14, 1998. During this period, Government played positive role in uplifting the stock market activities by conducting contract with IMF. Merger of ER was also introduced by Government. In 2000, Security and exchange commission of Pakistan (SECP)³ executed various rules in order to expand PSX. They also conducted various operations to help SM growth. Moreover, SECP also worked on modernizing trade and focused on carry-over trade (COT)⁴ efficiency. SECP continued its efforts till 2003 by regulating the capital markets (Sohail & Hussain, 2009). In Figure 3.3 improving trend of SMC can be seen from 2001 onward. This upward movement of MC was due to better political situation (Raza et al, 2012).

In 2003, the turnover ratio of market has increased tremendously and market ranked first as the best performing market. But after this Pakistan experienced political unrest and decrease in economic activity which leads to decrease in performance of KSE. In the middle of 2005 stock market showed downward trend as the stock prices have decreased at that time PSX showed downward trend by 6939 points. Main reason of this downward trend was that most of the investors decided to buy today and sell in future and other factor behind this decline is that COT investors started withdrawing their funds (Sattar et al, 2018). KSE index showed tremendous increase in its index on 12 April 2005. During 2005, the market was already facing bearish trend when Pakistan faced problem of earthquake. Pakistan experienced severe earthquake on 8 October 2005 that affected our stock market in positive and negative ways. Due to this natural disaster KSE-100 index showed decline in its points and it kept decreasing till KSE-100 reached its lowest on October 21 by 8247 points. Food industry, cement industry and banks were most responsive to this earthquake. As in November 2005 stock market started growing and showed its best by remarkable increase in index points by 17 April 2006. This marvelous growth of stock market was due to two major sectors i.e. bank, and cement industry (Hannan et al, 2012).

After the earthquake, bank industry started growing rapidly and started making more profits by increasing the prices of shares. MC reached 27380.0 billion rupees at the end of 2006 (Hannan et al, 2012). Global recession started in the last quarter of 2007 and main factors behind this crises was globalization and advancement in technology all over the world. This global financial crisis marked negative impact on the PSX but this negative

³ SECP is the replacement of the erstwhile Corporate Law Authority (CLA), which was an attached department of the Ministry of Finance.

⁴ Investors with liquid cash are able to invest in **Carry over Trade (COT)** and generate high rate of interest. **COT** financing represents investment of funds towards financing of **carry forward trades on the** Stock Exchange.

impact was weak. This crisis also affected the stock market return volatility (Ali & Afzal, 2012). In 2009 KSE had 654 companies. KSE provided equal opportunities to both domestic and foreign investors and privatization also played key role in the progress of stock market. The period of 2009-10 is considered as recovery period of SM after financial crises. In 2009-10 SMC as percentage of GDP increased from 14.9% to 19.27% (Sattar et al, 2018).

According to Figure 3 from 2013 to 2014 we can see 5% increase in SMC as percentage of GDP. On 11 January, 2016, all three stock exchanges merged to create PSX which attracted both local and foreign investors for investment. From the year 2016 onward, increasing trend of SMC can be seen. Reason behind this marvelous performance of PSX over the mentioned time period is due to reforms commenced by the Securities and Exchange Commission of Pakistan (SECP). On June 2016 to May 2017 MC as percentage of GDP was 28.05% and increased to 27.69% which shows three times increase as compare to previous periods (Pakistan Economic Survey, 2016/17).

4. Methodology and Data

The main aim of the study is to empirically investigate the impact of exchange rate volatility on stock market development of Pakistan. Though, it is important to construct theoretical relationship between exchange rate volatility and stock market development. Taking in to account theoretical Background of study, there are two main models that explains the relationship between ER volatility and stock market development. Any fluctuations in Exchange Rate can affect stock prices of the country (Dornbusch and Fisher 1980). In language of Granger causality, causality runs from exchange rate volatility to stock market. Flow oriented model of exchange rate explains that exchange rate uncertainty effects the output of countries stock market. Wealth of local investors decreases, due to decrease in Stock prices which in turn reduces liquidity in an economy, leading to harm the rate of interest. Meanwhile, this interest rate reductions causes depreciation of currency due to increase in capital outflows (Adjasi, Harvey, Agyapong, 2008). Real currency appreciation may have negative impact on Domestic Corporation, because it may harm their competitiveness to export, while a real depreciation promotes exports in short run Solnick (1987).

Stock market development relation with ER is explained by taking in to account capital of stock market (Branson, 1983 and Frankel, 1983). Therefore, capital investments are significantly influenced by movements in Exchange rate. Thus, these Exchange rate fluctuations may affect stock prices or vice versa (Adjasi, Harvey and Agyapong, 2008). Chen et al. (1986) discussed that changes in inflation, interest rate, business activity and

exchange rate act as risk factors in Arbitrage pricing theory. Arbitrage theory explains that increase in interest rate may reduce stock prices by negatively effecting the present value of firm's future cash flows. Moreover, increase in interest rate also increase the capital inflows and, in this way, making exchange rate fall. Real interest rate fluctuation may create positive relationship between exchange rate and stock prices. In this way, this model explains that relationship between exchange rate and stock market (Mlambo et al. 2013).

To investigate the relationship of exchange rate variability with stock market development of Pakistan, this study followed Subair's (2009) model. Subair (2009) used the GARCH model to study the effect of currency on the market performance in Nigeria. The independent variables that are involved in this study are: Real Exchange rate (RER), Real exchange rate variability (VRER), Foreign Direct Investment (FDI), Industrial production (IP), Broad money (BM) and economic growth (GDPG). The empirical equation is given as follows;

$$SMD_t = \beta_0 + \beta_1 VRER_t + \beta_2 LRER_t + \beta_3 FDI_t + \beta_4 BM_t + \beta_5 LIP_t + \beta_6 GDPGR_t + \varepsilon_t \quad (1)$$

Casual relation between macroeconomic variables and stock market was first examined by the Litzenberger and Rama Swamy (1982). GARCH and standard deviation technique is utilized in order to calculate exchange rate volatility. Study will estimate equation (1) using real exchange rate volatilities calculated by GARCH.

Bollerslev 1986, introduced GARCH technique to calculate the predicted volatility based on conditional variances. GARCH technique is time varying and forward looking It considers previous values of the variable as opposed to ARCH and agree for more elastic lag structure (Bollerslev, 1986).⁵ In this approach, RER rest on its value in recent past and on the non-constant variance. GARCH is applied on quarterly data of RER and quarterly RER volatilities are calculated. In order to get annual volatilities average of quarterly volatilities is taken. Quarterly real exchange rate is calculated by taking in to account quarterly data of nominal exchange rate, CPI of USA and Pakistan and using this data in given equation.

$$RER = NER \times \frac{CPI_{US}}{CPI_{PK}} \quad (2)$$

Where NER is nominal ER. Moving average Standard Deviation (S.D) method is used to measure the realized volatility in real exchange rate. Standard deviation is time invariant through backward looking. Following Koray and Lastrapes (1989), Chowdhury (1993) and many other studies, we employed standard deviation of the logarithmic exchange rate series to measure moving average exchange rate volatility.

$$SMD_t = \beta_0 + \beta_1 RERV_t + \beta_2 FDI_t + \beta_3 BM_t + \beta_4 LIP_t + \beta_5 GDPGR_t + \varepsilon_t \quad (3)$$

⁵ See Engel 1982 for further details

Equation 3 is model 2 and is used to analyze stock market development and real exchange rate volatility relationship using RER volatilities calculated by standard deviation method. As volatilities are calculated using log of real exchange rate, so in this model we excluded independent variable LRER.

The most important and stable measure of stock market development is stock market capitalization (SMC) as percent of GDP. Positive aspect of this measure is that, as compared to other measure of development, it is not much recurring. SMC is more preferable measure of SMD in time series analysis as well as cross-country analysis. Shortcoming of stock market capitalization is that it do not covers data of equity raised but only covers equity listed (Ranjan and Zingales, 2001).

As far as relationship between variables is concerned, Malembo and Maritza (2013) testified a very weak interaction between exchange rate volatility and stock market. Study of Pornima and Ganishwari (2015) also indicated causal relationship between exchange rate and stock market. Khalid (2017) investigated relationship between exchange rate and stock market capitalization in Pakistan and found positive relation between these two variables. Ali et al. (2010) found no causal relation between exchange rate and stock market development. So, we expect the estimates of RE to be positive or negative depending on the situation of the currency whether it is depreciating or appreciating and whether people hold more or less domestic money and invest in stock market (Oskooee and Hajilee, 2013).

We know as Pakistan is the growing economy so the idea that investors become more sensitive regarding future of economy, they may invest more in order to have more. The interaction between FDI and stock market development has been broadly debated in the literature (Errunza, 1983; Gracia and Liu, 1999; Yartey and Adajasi, (2007) and Adam and Tweneboah, 2009). FDI may have positive or negative impact on the development of stock market. Adam and Twenebowh (2008) in their study find out that any shock in foreign direct investment may have significant impact on stock market development of a country. Kalim (2012) also debated interaction between Foreign Direct Investment and Stock Market Development in Pakistan. Kalim (2012) pointed out that Foreign Direct Investment plays vital role in Stock Market Development of Pakistan.

Many researchers examined casual relation between stock market development and Economic growth in different countries. Shahbaz, Ahmad, Ali (2008) studied impact of economic growth on Stock market development in case of Pakistan and found bidirectional relation between Stock Market Development and Economic Growth in long run and unidirectional causal relation from Stock Market Development to Economic Growth in case

of short run. Economic Growth can be accelerated by increasing the size of Stock market of country and by improving the condition of Market Capitalization of Country (Nazir, Nawaz, Gilani, 2010). Causality from economic growth to stock market development cannot be dismissed. It is believed that there exists a bidirectional relationship between these two variables (Nieuwerburgh et al., 2006; Bosworth, 1975).

Anaba, (2011) stated that total amount of money in an economy during some specific time is broad money. Authors also explained that for more capital investments there is need of broader money supply. Increase in money supply, increasing purchasing power of people as well as lead to increase capital investment (Olatunji, 2016). Therefore, sign of money supply is expected to be positive.

Industries are one of important sector that contribute to economy's wealth. Stock prices are affected by industries output level. Various researches have worked on effect of industries output on stock market development. A positive relation is found in some countries including Pakistan (Hussain, 2009). Here, in this study coefficient sign is expected to be positive.

The study used annual data for Pakistan over the period 1970-2019. Furthermore, Exchange Rate is changed into logarithmic form to use for empirical assessment. The data explanation and the sources are provided in Table 4.3.

Stock market development can be measured by taking in to account volatility, concentration, size, liquidity, and integration with other countries capital markets. The full market value of all listed shares is known as market capitalization. Adam and Tweneboah (2009) market capitalization as a percentage of GDP is used as a proxy for stock market development. This measure is less subjective than other measures of stock market development (Garcia and Liu, 1999).

Table 2. Data Description and Sources		
Variables	Description	Data Sources
SMD	Stock Market Capitalization as percentage of GDP is used as Indicator of Stock Market Development.	Emerging/Global Stock Market Fact Book (various issues) and FRED.
RER	Real exchange rate measured as the nominal exchange rate adjusted for the foreign price level relative to the domestic price level.	International Financial Statistics (IFS) International Monetary Fund (IMF). ⁶
VRER	Real exchange rate volatility computed using GARCH measure.	IFS and IMF. ⁷
FDI	Foreign Direct Investment (% of GDP)	World Development Indicator (WDI), World Bank (WB).
BM	Broad money (% annual)	WDI and WD.
GDPGR	GDP growth (% annual)	WD and WDI.
IP	Industrial production (2010=100)	WDI.

Augmented Dickey Fuller test is used to check for stationarity of all variables. In literature, ADF test is most popular test (Ayat & Burrige, 2000). Hamilton (1994) and Elder & Kennedy (2001) both said that it is important to determine which modal is to be used in directing unit root. ADF test is applied on variables with intercept and also with trend and intercept.

Optimal lags are selected through lag length criteria. In our study, optimal lags to be included in ARDL are selected on the basis of SIC. ARDL approach is useful when variables are not integrated of same order. ARDL bound test help researcher to estimate data having different order of integration. Therefore, this technique has advantage over other techniques as it makes easy for researcher to get results of differently integrated variables. Another advantage of using ARDL is that it allows estimation of limited data (Pesaran et al, 2001). ARDL approach is more suitable than others measures of co-integration for its quality of being able to estimate small size data. In Bound test *F-statistic* values explain that whether relationship exists or not. Rule of thumb is that if *F-statistic* value is greater than the upper bound value it means there exists co-integration. ARDL. Equations of both models are given below.

⁶ Real exchange rate is measured by the author by using data from given source

⁷ Volatilities are measured by author by using data from given source

$$\Delta SMD_t = \beta_0 + \sum_{i=1}^k \beta_1 \Delta SMD_{t-i} + \sum_{i=1}^k \beta_2 \Delta VRER_{t-i} + \sum_{i=1}^k \beta_3 \Delta LRER_{t-i} + \sum_{i=1}^k \beta_4 \Delta FDI_{t-i} + \sum_{i=1}^k \beta_5 \Delta BM_{t-i} + \sum_{i=1}^k \beta_6 \Delta LIP_{t-i} + \sum_{i=1}^k \beta_7 \Delta GDPGR_{t-i} + \alpha_1 SMD_{t-1} + \alpha_2 VRER_{t-1} + \alpha_3 LRER_{t-1} + \alpha_4 FDI_{t-1} + \alpha_5 BM_{t-1} + \alpha_6 LIP_{t-1} + \alpha_7 GDPGR_{t-1} + \varepsilon_t \quad (4.8)$$

$$\Delta SMD_t = \beta_0 + \sum_{i=1}^k \beta_1 \Delta SMD_{t-i} + \sum_{i=1}^k \beta_2 \Delta RERV_{t-i} + \sum_{i=1}^k \beta_3 \Delta FDI_{t-i} + \sum_{i=1}^k \beta_4 \Delta BM_{t-i} + \sum_{i=1}^k \beta_5 \Delta LIP_{t-i} + \sum_{i=1}^k \beta_6 \Delta GDPGR_{t-i} + \alpha_1 SMD_{t-1} + \alpha_2 RERV_{t-1} + \alpha_3 FDI_{t-1} + \alpha_4 BM_{t-1} + \alpha_5 LIP_{t-1} + \alpha_6 GDPGR_{t-1} + \varepsilon_t \quad (4.9)$$

Where k is the optimal lag length which will be determined using Akaike Information Criteria (AIC) and Schwartz Information criteria (SIC), Δ is the difference operator, β_0 in each equation is the constant parameter, β_1 to β_7 are the vectors of the coefficients of the first difference lagged values of the variables controlled in the models, while α_1 to α_7 for each equation represent the coefficients of the level lagged values of variables captured in models.

The ARDL model consist of two parts, the first part of the equations with β_1 to β_7 stand for the short-run dynamics of the models, while the coefficients α_1 to α_7 represents the long-run relationship. Null hypothesis of model 1 is defined as;

$$H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = 0$$

Which tell us that there is no co-integration (no existence of long-run relationship) among the variables under consideration. Whereas the alternative hypothesis is defined as;

$$H_1 : \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq \alpha_7 \neq 0$$

Which signify the existence of co-integration presence or evidence of long-run relationship (Pesaran *et al.*, 2001). On other hand, Null hypothesis and alternative hypothesis for model 2 are given as

$$H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$$

$$H_1 : \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq 0$$

Short run relationship between dependent variable and control variables is identified using modified ARDL. ECM is applied using OLS technique. ECM test is applied to know speed of adjustment. The ECM models are represented as follows:

$$\Delta SMD_t = \beta_0 + \sum_{i=1}^k \beta_1 \Delta SMD_{t-i} + \sum_{i=1}^k \beta_2 \Delta VRER_{t-i} + \sum_{i=1}^k \beta_3 \Delta LRER_{t-i} + \sum_{i=1}^k \beta_4 \Delta FDI_{t-i} + \sum_{i=1}^k \beta_5 \Delta BM_{t-i} + \sum_{i=1}^k \beta_6 \Delta LIP_{t-i} + \sum_{i=1}^k \beta_7 \Delta GDPGR_{t-i} + \beta_8 ECM_{t-i} + \varepsilon_t \quad (4.10)$$

$$\Delta SMD_t = \beta_0 + \sum_{i=1}^k \beta_1 \Delta SMD_{t-1} + \sum_{i=1}^k \beta_2 \Delta RERV_{t-1} + \sum_{i=1}^k \beta_3 \Delta FDI_{t-1} + \sum_{i=1}^k \beta_4 \Delta BM_{t-1} + \sum_{i=1}^k \beta_5 \Delta LIP_{t-1} + \sum_{i=1}^k \beta_6 \Delta GDPGR_{t-1} + \beta_7 ECM_{t-1} + \varepsilon_t \quad (4.11)$$

Dynamical stability of model and no serial correlation of error term are the conditions of model. Breusch-Godfrey LM test helps to know whether there exists any serial correlation or not. While, to know the stability of model signs of error correction are taken in to account. If it's negative it means model is stable. The equation of ECM is also used to determine short run relationship of variables by using VECM technique from VAR. Moreover, long run relationship is observed through given equation of OLS. Long run results of model is observed by using ARDL co-integration and long run form. Where coefficient values tells about how much one variables movements can increase or decrease another variable.

Finally, CUSUM test is applied to check for stability. Graphical representation of CUSUM-Q and CUSUM test is given to know whether model is stable or not. And to check if model contains any structural break.

5. Results and Discussions

Results of real exchange rate volatility measured through three various techniques: Moving Standard Deviation (MSD) which provides observed volatility, Generalized Autoregressive Conditional Heteroscedasticity (GARCH) are presented here. The moving standard deviation is a time varying measure of exchange rate volatility which accounts for high and low uncertainties in exchange rate. The exchange rate volatility series is obtained by employing four quarter moving standard deviation of the series of real exchange rate in log form. Exchange rate volatility is also measured through GARCH and standard deviation technique. As studies on effect of economic volatilities on different sectors mostly used GARCH and SD technique to calculate volatilities.

The graphical representation of the forecasted real exchange rate volatility measured through GARCH technique is presented in Figure 3. The Graph shows the forecasted volatility in real exchange rate for Pakistan during 1980 to 2017. Forecasted volatility is relatively higher during the specified period. It is because the ex-ante (forecasted) volatility are based on the market estimates of previous forecasted volatility which increases the volatility in both periods. The figure illustrates persistency in exchange rate volatility over the time with highest peak observed during 2009. During 2008-2009, ER depreciation of 16.3% was witnessed. Pakistan economy faced incredible burden on ER during 2008 to 2009 due to

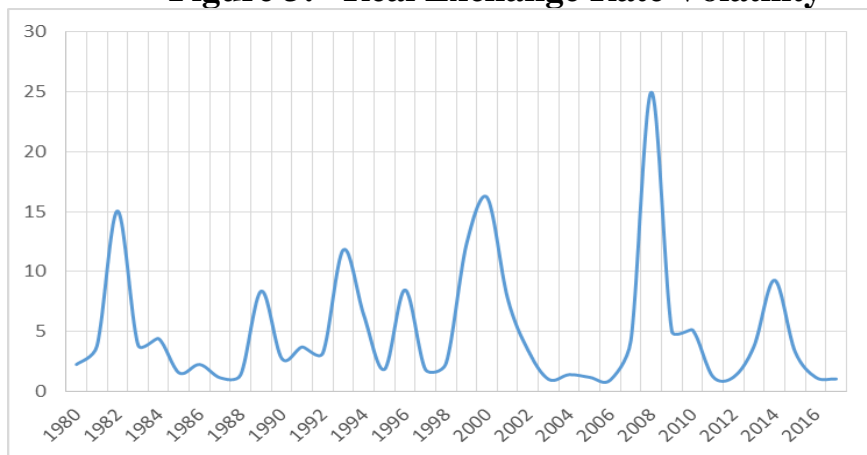
political instability, loss of foreign exchange reserves and speculative activities in foreign exchange market (Pakistan economic survey, 2008/2009).

Pakistan currency appreciated after 2010. In 2013 ER reached to 94.54 rupees/\$. Real exchange rate showed appreciation of 25% during 2010-2015 (Javed and Ahmad, 2016). Due to political instability, poor governance and increasing debt burden in Pakistan ER reached to 105.46 Rs/\$ in 2017 and kept increasing.

Autoregressive conditional Heteroscedasticity (ARCH) effect is determined by using ARCH-LM test. The null hypothesis of ARCH-LM test of no ARCH effect is accepted, as probability values are insignificant. In Table 3 coefficients of GARCH and ARCH terms are significant at 1% while probability values of constant term is also significant, which shows that RER volatility contains persistent shocks.

Before going for estimation of variables it is important to construct statistical analysis of variables. Table 4 gives descriptive statistics of variables consisting of 37 observations of annual data from 1980-2017. Table 5.2 shows that mean value of our dependent variable is 17.42 with standard deviation (SD) of 12.30.

Figure 3: Real Exchange Rate Volatility



Parameter	Coefficient	Probability
α	0.8548	0.0000
β	0.2577	0.0000
γ	0.5822	0.0001
F-stat ARCH LM test	1.0798	0.3004

Note: α , β and γ are ARCH, GARCH and constant terms respectively.

	SMD	LRER	VRER	FDI	LIP	BM	GDPGR	RERV
Mean	17.423	1.8517	5.0314	4.0674	1.7325	47.095	4.8996	15.262
Median	15.514	1.8612	3.3694	4.3596	1.6992	45.900	4.8464	4.4648
Maximum	46.537	2.0177	24.975	6.8447	2.1204	58.867	10.215	106.968
Minimum	2.7100	1.5711	0.9462	1.2345	1.2108	38.594	1.0143	1.1498
Std. Dev.	12.309	0.1091	5.1940	1.5549	1.2108	6.1545	2.0986	26.5107
Skewness	0.7824	-0.890	2.0393	0.0256	0.2592	0.3313	0.2006	2.0705
Kurtosis	2.7849	3.4454	7.3348	2.0747	-0.1600	1.9911	2.69376	6.07115

While mean value of our focus independent variable, which is RER volatility calculated by GARCH is 5.031 with standard deviation of 5.19 and mean value of RER volatility calculated by standard deviation is 15.262 with standard deviation of 26.51. Looking at the values of skewness. It is concluded that all variables are positively skewed except log of RER which is negatively skewed. In Table 5.1 Kurtosis values of variables are indicating that LRER, RER volatility and FDI are leptokurtic⁸ while others are Platickurtic⁹.

ADF Stationarity test is applied to check for order of integration. Test is applied on all variables individually to check each variables order of integration. Table 5 explains order of integration of variable with intercept and with trend and intercept. Table 5 shows that dependent variable is stationary at 1st difference. As some variables are stationary at level and some at 1st difference. This allows the use of ARDL technique for estimation. Table 6 presents results of VAR lag order selection. According to HQ and LR 1st lag is selected and while SC and FPE selected 2nd lag as optimal lag. Here, in this study lag is selecting by SC criteria.

⁸ Higher peak

⁹ Lower peak

Table 7 and 8 reports results of bound test for both models. Both Results rejects the null hypothesis of no co-integration and indicates that there exist long run relationship between dependent and independent variables. As values of F-statistic are greater than lower and upper bound values.

Table 5: Results of the ADF Test			
Variables	Test statistic		
	Level	1st difference	Decision
SMD	-2.22	-7.023***	I(1)
LRER	-3.29**	-5.851***	I(0)
VRER (GARCH)	-6.891**	-4.050**	I(0)
FDI	-2.79*	-4.043**	I(0)
LIP	-1.072	-3.800*	I(1)
BM	-1.766	-5.084***	I(1)
GDPGR	-3.88***	-7.669***	I(0)
RERV(SD)	-2.581	-4.477**	I(1)

Note: * indicates significance level. * For 10%, ** for 5% and *** for 1% level of significance.

Table 6 VAR Lag Order Selection Criteria					
Lags	LR	FPE	AIC	SC	HQ
0	NA	12.2514	22.3706	22.6817	22.4780
1	295.722*	0.00373	14.2108	16.7065	15.0770*
2	63.3933	0.00368*	13.8483	18.5143*	15.4590
3	48.5660	0.0044	12.9124*	19.7560	15.27488

Note: * shows lag order

Table 7. ARDL Bound Test (Model 1: Using GARCH volatilities)				
Test-statistic	Value	Critical value Bounds		
		Significance	Lower Bound	Upper Bound
F-statistic	6.10	10%	2.12	3.23
		5%	2.45	3.61
		2.5%	2.75	3.99
		1%	3.15	4.43

Table 8. ARDL Bound Test (Model 2: Using SD volatilities)				
Test-statistic	Value	Critical value Bounds		
		Significance	Lower Bound	Upper Bound
F-statistic	5.26	10%	2.26	3.35
		5%	2.62	3.79
		2.5%	2.96	4.18
		1%	3.41	4.68

Table 9 and 10 explains short run relationship between Pakistan SMD and macroeconomic indicators. Results of both models proved negative significant relationship between SMD and volatility of ER. Results proved negative significant short run effect of real ER uncertainty on development of PSX. Short run results of ARDL for ER are also same as expected. On other hand, coefficient signs of all variables present in model are according to our expectations. ECM value in our results fulfills condition of significance and negative sign. Speed of adjustment of variables is 0.86%.

Table 9 Short Run Results (Model 1: Using GARCH volatilities)				
Variables	Coefficients Values	Standard error	t-states	Probability
D(VRER)	-0.5172**	0.2170	-2.383	0.0262
D(LRER)	25.0202	25.2474	1.692	0.1048
D(FDI)	0.9304	0.8214	1.1327	0.2695
D(LIP)	12.5258	58.986	0.9063	0.3746
D(GDPGR)	0.9791	0.9437	1.0374	0.3108
D(BM)	1.4316	0.4352	0.2166	0.8304
ECM(-1)	-0.860	0.1291	-6.660	0.000

Note: * indicates significance level. * For 10%, ** for 5% and *** for 1% level of significance

Table 10. Short Run Results (Model 2: Using SD volatilities)				
Variables	Coefficients Values	Standard error	t-states	Probability
D(RERV)	-0.124*	0.174	-0.710	0.085
D(FDI)	1.543	3.412	0.452	0.655
D(LIP)	78.237	65.060	1.202	0.242
D(GDPGR)	1.698*	0.888	1.910	0.069
D(BM)	1.769*	0.431	1.784	0.088
ECM(-1)	-0.865	0.178	-4.848	0.000

Note: * indicates significance level. * For 10%, ** for 5% and *** for 1% level of significance.

After concluding that there exists co-integration between variables, we established long run and short run relationship between dependent and control variables. Table 11 explores the long run relationship between exchange rate volatility and stock market, taking volatilities calculated by GARCH. Long run results of exchange rate volatility calculated by GARCH can be explained as follows, 1% increase in real exchange rate volatility deteriorates stock market development of Pakistan by 0.60% and 1% increase in LNER increase stock market development by 25.6%. In Pakistan study of Shah, Kousar and Amir, (2012) explained that 1% change in rate of exchange effect Pakistan market development by 27.5%. Khalid, (2017) found positive interaction between Pakistan stock market and ER. Rasheed, (2012) explained positive effect of RER on Pakistan stock market, that when RER depreciates it increases the competitiveness of local markets and hence, exports increases causing stock market to perform more efficiently. When there is appreciation of exchange rate, exporters do not only lose their competitiveness in world market, but also a reduction in sales revenue and profits thus leading to the decline in the stock prices. A panel study proved ER and SM are positively related and effect is from exchange rate to stock market development (Abdalla and Murinde, 1997).

Table 11 shows that FDI, GDPGR, IP and BM have positive long run effect on stock market development. This study results for IP, BM and ER supports previous study results of Sohail and Hussain, (2009). Sohail and Hussain, (2009) took real effective exchange rate, money supply, inflation and industrial production as independent variables and found positive significant affect for all except inflation in Pakistan. long run results for FDI can be interpreted as, 1% increase in FDI inflows, GDPGR, IP and BM improves stock market development of Pakistan by 1.08%, 1.13%, 18% and 1.25% respectively. While same direction of results for BM and IP is seen in South Africa (Mlambo, Maridza and Sibanda, 2013).

**Table 11 ARDL Long-Run Results
(Model 1:Using GARCH volatilities)**

Independent Variables	Coefficient Values	Standard Error	T-values	Probability values
FDI	1.0814	0.4419	1.151	0.261
GDPGR	1.1379	1.1105	1.024	0.316
VRER	-0.6011**	0.2823	-2.129	0.044
LRER	25.662***	20.614	3.379	0.002
LIP	18.383***	10.333	3.004	0.000
BM	1.2569***	0.4419	2.844	0.009
C	-189.84	35.069	-4.604	0.000

Note: * indicates significance level. * For 10%, ** for 5% and *** for 1% level of significance.

Table 12 explores the estimation results of model 2. These are consistent with the expected results as volatilities calculated by standard deviation also showed negative relation between SMD and RER volatility. As 1% increase in exchange rate volatility may bring 0.22% decrease in stock market development. While other variables in model showed positive relation. Hajilee and Nasser, (2014) panel study on VRE effect on SMD in China, Venezuela, Mexico and Pakistan indicated negative effect of exchange rate uncertainty on SMD by using ARDL approach and including log of exchange rate, volatility of ER and income as independent variables. Hajilee and Nasser, (2014) also interpreted that fluctuations in currency helps people to decide about investment. Negative relation of variables is also seen in Ghana stock exchange, as depreciation of ER improves returns of market (Adjasi, Harvey and Agyapong, 2008). Economists in Turkey also believe that ER of country have adverse effect on Turkey stock market as increase in ER decrease stock prices (Kasman, 2003). The higher coefficient values of LRER and VRER can be justified by certain other studies. For Nigeria, Osamwonyi, (2012) study showed very high coefficient values for ER. As 1% increase in ER lead to increase Nigerian market index by 125.1%. As stock market index is used as proxy of development in Nigerian market.

**Table 12. ARDL Long-Run Results
(Model 2: using SD volatilities)**

Independent Variables	Coefficient Values	Standard Error	T-values	Probability values
FDI	1.748	2.284	0.765	0.452
GDPGR	1.961*	1.122	1.746	0.095
RERV	-0.223**	0.097	-2.288	0.032
LIP	24.017***	11.045	3.622	0.001
BM	0.632	0.454	1.391	0.178
C	-96.024	37.996	-2.527	0.019

Note: * indicates significance level. * For 10%, ** for 5% and *** for 1% level of significance.

ARDL long run results for FDI can be interpreted as, 1% increase in FDI inflows, GDPGR, IP and BM improves stock market development of Pakistan by 1.74%, 1.96%, 24% and 0.63% respectively. While same direction of results for BM and IP is seen in South Africa (Mlambo, Maridza and Sibanda, 2013). Eva and Stenius, (1997), Abdullah and Hayworth, (1993), Nishat and Shaheen, (2004) results proved strong long run positive significant impact of industrial production on stock markets of countries.

Issahaku, Ustarz and Domanband, (2013) explained how money supply helps in better performance of stock markets. Authors explained this channel by taking broad money supply in to account. Authors interpreted that when there is an increase in broad money supply it increases the purchasing power of people. There will be more amount available for investment, improving stock market performance. Alatiqi and Fazel, (2008) showed that supply of money effects markets through interest rate channel and found unidirectional causality running from Money supply to SM's.

Results shows strong positive significant effect of FDI on stock market development. FDI inflows improves liquidity, creating more cash inflows and also overcomes for shocks occurring due to less savings and investments. Hence, improving market capitalization (Issahaku, Ustarz and Domanband, 2013). Adam and Tweneboah, (2009), Halalmeh and Sayan, (2010), Kalim and Shehbaz, (2009), Nazir, Nawaz and Gilani, (2010) also found strong significant positive relation between FDI and stock market development. Kalim, Ali & Shehbaz, (2012) and Raza et al, (2012) explained positive effect of FDI on Pakistan stock market. As it generates more investments opportunities in different sectors of economy.

In estimated results of both models, Economic growth is having a positive affect on stock market development. Enisan and Olufisayo, (2009) provided that how economic growth leads to market development such as, when there is an improvement in real sector of

economy it facilitates the well-functioning of markets. Efficiently working economy creates demand for effective financial market instruments and markets respond to this demand. This is known as “Demand Following” channel and it is unidirectional channel. Another channel is explained by Schumpeter, (1912) which explains bidirectional link called “Feedback” channel. It provides that when countries stock markets are well developed in boost up the economic growth as more products, savings and investments will be available. However, improvement in an economy may increase demand for financial services. This is how variables are interdependent. Study of Hussain and Mehmood, (2013) study for Pakistan, supports positive effect of GDP growth on SMD of Pakistan.

Brown et al, (1975) introduced CUSUM and CUSUM of square test to know the stability of ARDL model. Here figure 4 and 5 indicates that model is stable and there are no structural breaks in model as blue line do not cross the red lines in both tests. As the blue line in Figures shows CUSUM line and red lines are bound values at 5%. Pesaran and Pasaran, (1997) also used CUSUM test to check stability of their model.

Table 13 and 14 accepts null hypothesis of no serial correlation as probability value of R-square is insignificant. Variables are integrated of different order but the dependent variable is I (1) which fulfills ARDL condition. Bound test proved co-integration between regresses. On other hand, estimations of long run and short run effect confirmed strong negative impact of currency volatility on stock market capitalization in both models. Signs of direction of interaction between macro-economic indicators and PSX were in support of prior studies. It is seen that effect of volatility calculated by GARCH is slightly more than that of standard deviation. It is seen that this direction of effect is not only observed in Pakistan but some other countries are also experiencing negative interaction of SMD and ERV. It is provided that currency depreciation encourages exports of local industry and hence prices of stocks increase. The model is stable and is not serially correlated. Overall, all hypothesis of study is accepted on the basis of estimation outcome.

Figure 4
CUSUM test and CUSUM Square Q test

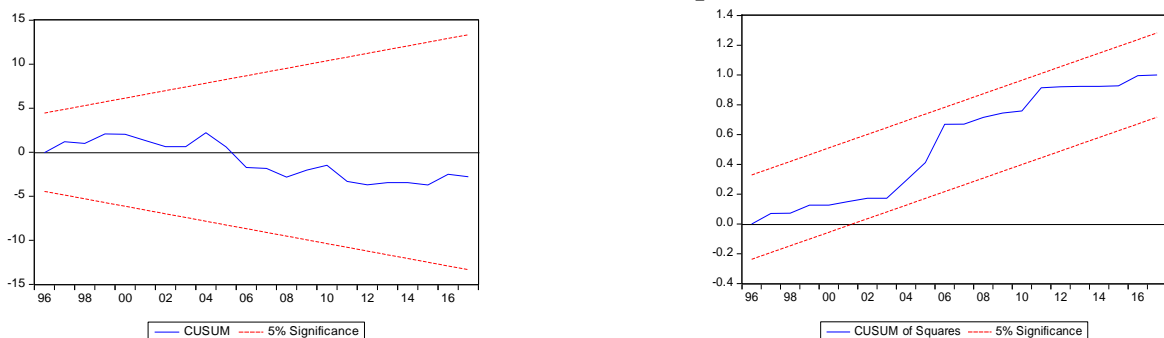
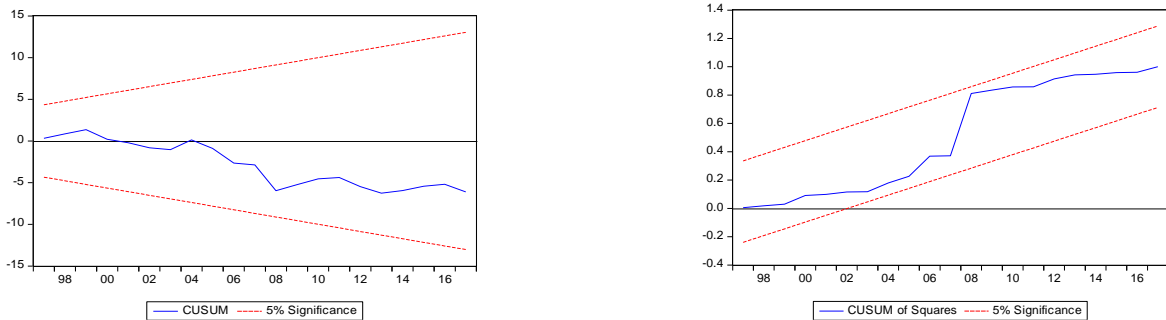


Figure 5
CUSUM test and CUSUM Q test (model 2)



6. Conclusions and Policy Implications

Link between different macro indicators and markets have been explored by many researchers. Studies are not only limited to developed countries but many have done efforts to explore this interaction in Emerging Economies. Pakistan comes under emerging economies and is focus of this study. Pakistan has experienced number of ER policies, uncertainties in economic condition and fluctuations in ER during past 4 to 5 decades. It is known that stock markets being one of important macro-indicator of economic growth, have gone through bullish and bearish trend. It has become important to find out exclusively that how in long run and how in short run, exchange rate of Pakistan is responsible for stock market development. Study results proves flow oriented model of ER and market relationship.

Table 13. Breusch-Godfrey Serial Correlation LM Test (Model 1: Using GARCH volatilities)			
F-statistic	0.930	Probability	0.410
Obs*R-squared	3.065	Probability. Chi-Square	0.216

Table 14. Breusch-Godfrey Serial Correlation LM Test (Model 2: Using SD volatilities)			
F-statistic	0.880	Probability	0.545
Obs*R-squared	11.001	Probability. Chi-Square	0.138

This study utilized annual data from 1980-2017 for all variables in model. ARDL bound outcomes shows co-integration exists. Volatility of ER is measured using GARCH. It is seen that variables IP and BM have significant positive long run effect on SMD. While FDI

and GDPGR also positively influence stock market development. Focus variable of this study is volatility of ER which showed that less volatile ER may improve the Pakistan stock market performance as it will generate more investments. And more volatile ER have adverse effect on Pakistan stock market development. On other hand, depreciation of real exchange rate have adverse effect on stock market while appreciation of real exchange rate improves stock market performance. Study demonstrate that there is strong evidence of exchange rate and stock market development relationship. The outcomes are in line with various researchers. It is believed that, there are some other factors that contribute to currency volatility in Pakistan. Study provided brief review of ER regimes and ER fluctuations during selected time. As well as, give theoretical and empirical evidence of study.

Pakistan has been facing number of challenges such as unemployment, currency volatility, budget deficit, political uncertainty, unequal distribution of wealth and others.

With this background, study has some policy recommendation.

1. The result shows that increase in exchange rate volatility decreases stock market development in Pakistan due to the risk attached with the uncertain movement in exchange rate so a stable exchange rate could be an effective policy instrument to improve performance of stock market.
2. Policy makers should make such policies which stabilize the volatile condition of exchange rate in Pakistan as it have adverse effect on stock market performance. It is suggested that such monetary policies should be introduced in country which facilitates investment and improves the competitiveness of market. In this way, stabilizing Pakistan stock market performance facilitates exchange rate of country. It also provides helpful information to foreign investors regarding exchange rate risks and investment. Policy makers must focus on strategies that can help to reduce exchange rate volatility so that people's confidence level for portfolio investment can be established.
3. Certain reforms or actions should be done for maintaining stable political and economic environment in country in order to reduce exchange rate uncertainty.
4. More exports should be encouraged and imports should be discouraged which in turn effect the exchange rate of country in a positive way.
5. As study indicated positive significant relation of industrial production with Pakistan stock market. Policy makers must accelerate such economic activities that boost up industrial production

6. As study showed positive relation between FDI and stock market development, FDI inflows must be utilized in profitable ways and to increase capital. Pakistan has been experiencing strong unemployment. FDI inflows will open the doors of employment leading to generate more domestic incomes and savings.
7. This study incorporated linear regression. Further studies can be done by using nonlinear regressions and by dividing the time period in to before and after liberalization time period. Trends explained in study can be used to have more obvious view on ER movements and SMD movements.

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