COMPARISON OF VOLATILITIES IN BILATERAL EXCHANGE RATES OF PAKISTAN WITH SELECTED COUNTRIES

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Submitted in partial fulfillment of the requirements for the Master of Science degree in Economicsat the School of Economics, Faculty of Social Sciences, Quaid-i-Azam University, Islamabad

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2015


بسم الله الرحمن الرحيم

Dedicated To

I dedicate this work to my parents, who encouraged me for this work. I was nothing without their prayers and cooperation.

Acceptance by the Viva Voce Committee

This is to certified that this thesis submitted by Mr. Tariq Mahmood is accepted in its present form by the School of Economics Quaid-e-Azam University as satisfying all the necessary requirement for the partial fulfillment of the degree of M.Sc in the discipline of Economics

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Table of Contents

List of Tables

List of Figures

Abstract

This thesis examines the comparison of bilateral exchange rate volatility of Pakistan among selected countries. Whether bilateral exchange rate volatility exist or not, it is examined through F-test and Bartlett teat. For this purpose data from 2nd February 2004 to 10th July 2014 is taken for USA, UK, Canada, Euro, Switzerland, Japan, Sweden, Norway, Singapore, Malaysia, Kuwait, Hong Kong, Saudi Arabia, Qatar, Australia, Denmark and New Zealand on daily basis omitting irrelevant days. Results indicate that bilateral exchange rate volatility of Pakistan with these selected countries but relatively high with Japan, Saudi Arabia, USA and Denmark due to larger share of trade, worker remittances and loan rather than Singapore, Australia, Kuwait, and some other countries.

Keywords: Exchange rate volatility, F-test, Barlett's test

Chapter 1

Introduction

Exchange rate changes the actual prices of different commodities which are exchanged among different countries of the world. It determines the price actually paid when each deal takes place. On the other hand, inflation in domestic country also plays an essential role in shaping the shifting patterns of prices for each tradable good. There is an extensive argument that volatility of the exchange rates of mounting countries is one of the major sources of economic uncertainty around the world. The volatility in the currencies of developed nations has a significant impact on the budding nations such as Nigeria. In current years these swings have been huge, volatile and normally unconnected to underlying economic fundamentals specially in stock market (Omisakin O.A, 2009) .This has encouraged monetary establishment in mounting countries that stay close trade ties with the developed nations to get involved on totally ad hoc and periodic basis, without any clear sense of a sustainable equilibrium. Such exchange rate stability interference typically comes too late to stop severe currency misalignment and volatility. These imbalances, in turn, trigger major economic distortions, protectionist trade pressures, and predictably sharp currency reversals .Though, currency instability and volatility could only exist during flexible exchange rate system where the cross-country exchange rate is determined by the forces of demand and supply.

The liberalization of capital flows has been growing countries over the last three decades. This massive increase in the scale and variety of cross-border monetary transactions has obviously

increased the size of exchange rate movements in many countries with underdeveloped capital markets. Currency crises in budding markets, which have become more common in the last two decades, are especially notable cases of large exchange rate volatility (Shahkari*et al.* (2013)).

Further changes in the global economy may have condensed the impact of exchange rate volatility. The explosion of financial equivocation instruments over the previous 20 years could reduce firms susceptibility to the risks arising from volatile currency movements. In addition, for multinational firms, fluctuations in dissimilar exchange rates may have offsetting effects on their profitability (Insha and chiaraah (2013)). As a growing fraction of international transactions is considered by these multinational firms, exchange rate volatility may have a dilapidated impact on world trade. On the balance, it is not clear whether the main changes in the world economy over the precedent two decades have operated to decrease or increase the degree to which international trade is unfavorably affected by fluctuations in exchange rates. One aspect of this issue is the extent to which such volatility itself has altered, and another is the extent to which firms are sensitive to exchange rate risk and can take steps to lessen it at low cost. It is so necessary to examine new observed evidence at this issue, especially the uniformity of exchange rate volatility.

Exchange rate system varies with the level of fiscal development. All through the mounting world, the choice of exchange rate system stands as perhaps the mainly contentious feature of macroeconomic policy (Jin *et al.* (2002)). Observers, on the one hand, the strong international criticism of Africa's inflexible exchange rate system and on the other hand, West African policy makers are chastised for not doing sufficient to steady their country's highly volatile currency. Empirical evidences have shown that exchange rate volatility in twist is caused by both real and financial aggregate shocks (Claudio Morana(2009)). Up till now, despite the apparent

implications of the exchange rate regime to long- run growth and economic steadiness, the existing theoretical and observed literature on Africa (Nigeria in exacting considering the level of the country's economic addition through trade and foreign capital inflows) offers little leadership. The theoretical literature is mainly customized to richer countries with highly developed institutions and markets (Rault *et al.*2009), and there is approximately no conversation of long-run growth. According to different regimes of exchange rate different results are normally observed. Some countries prefer to peg their exchange rate up to their economic and financial conditions and some stimulate their major macro economic variables under nominal exchange rate (Stockman (2013))

Line of the study explains about the introduction of bilateral exchange rate volatility, its determinants and its impact on different major macroeconomics variable. It is explained through empirical studies of panel data of 10 years on daily basis. F- Test and Bartlett test are applied to check the equality of variance. The results show that the countries for which Pakistan has greater share of trade have more volatility in exchange rate.

Chapter 2

Review of Literature

2.1. Introduction

In this chapter bilateral exchange volatility will be examined. Furthermore impact of exchange rate volatility on macroeconomic variable, different exchange rate regimes and measures of exchange rate volatility will be examined.

2.2. Literature Review

The main purpose of present study is to compare the exchange rate volatility of Pakistan with other selected countries like Australia, America and Sweden etc. The following past studies relates this like Steenkamp*et al.*(2013) presented some simple measures of the short-term and cyclical volatility of the New Zealand real exchange rate. In short run exchange rate is less volatile but sometime overshoot. Another study which support the above argument Insha and Chiaraah (2013) conducted study to find the source of exchange rate volatility in Ghana by using annual data from period of 1980 t0 2012 using ARDL technique. Results tell us that government expenditure is positively correlated and debts (external and internal) are negatively correlated with exchange rate volatility.

2.2.1 Studies on Methods of Measuring Exchange Rate Volatilities

Erdemlioglu and Laurent (2012) find that three major effects are common in foreign exchange rate volatility; intraday data, autocorrelation, and discontinuities in prices. Since 1980's ARCH/GARCH models are commonly used to measure these jumps and these methods increase computing power and availability of high frequency data for upcoming researchers to improve volatility and jumps estimate.

Pandit and Vashisht *et al.* (2011) check the effect of volatility, liquidity and financial derivatives on stock market when index option acquired in different nation's stock market e.g. India, Taiwan, Malaysia, Hong Kong, Singapore, Thailand, and Korea. Conditional volatility in intra-day returns of each of the stock markets under study has been examined through the GARCH model while the liquidity effect has also been tested through t-test and Wilcoxon Signed Rank Test. The results stated the India, Malaysia and Singapore have no liquidity effect in the post crisis period while Hong Kong, Japan, Korea, Taiwan and Thailand found to have more liquidity effect in their stock markets.

Insha and chiaraah (2013) conduct a study to find the source of exchange rate volatility in Ghana by using annual data from period of 1980 t0 2012 using autoregressive distributed lag technique. Results tell us that government expenditure is positively correlated and debts (external and internal) are negatively correlated with exchange rate volatility.

Steenkamp *et al.* (2013) presented some simple measures of the short-term and cyclical volatility of the New Zealand real exchange rate. In short run exchange rate is less volatile but sometime overshoot. Monetary policy slightly affects the exchange rate but fiscal policy has greater impact in reduction of exchange rate volatility.

Akhtar and Hilton (1984) investigate a polynomial distributed lag method in their OLS estimate of the effects of exchange-rate volatility. These lags permit for postponed effects; traders might react to volatility from a preceding period just as they might react to current conditions. Using a within-period volatility measure, the authors put export size as a function of foreign income, foreign ability utilization (to capture non-price rationing), and relative prices. Similarly, they model import size as a function of domestic income, the ratio of foreign to domestic capacity utilization, and relative prices. By using data for the USA and Germany, they guess their models applying quarterly data over the period 1974-1981. The authors discover that volatility had a notably negative effect on German exports, German imports, and USA imports, but no effect on USA exports. Thus, their conclusions conform to the theory that increased risk lessens the trade flows.

Arize and Ghosh (1994) apply not only ARCH, however three extra measures of volatility in their study: a five-quarter moving-average standard deviation of exchange-rate growth; the recursive residuals from an AR (4) model of exchange-rate growth; and the residuals of an ARIMA (1,1,0) process fitted to the log of the exchange rate. The model incorporates income and relative price as extra determinants of US exports during the period 1970-1997, and finds that volatility had a negative and significant coefficient. Most importantly, after performing a number of structural stability tests, the authors bring to a close that the general export flow equation, often used without volatility in other studies, is unbalanced without a volatility term.

Cushman (1988) tests a number of different volatility measures. The tests comprise: the four-quarter standard deviation of percentage changes in R, the 12-month moving standard deviation of the similar measure, the nominal three-month exchange-rate expectations based on

the forward rate, and the 12-month moving standard deviation based on expectations. Quarterly data for the floating period for the UK, The Netherlands, France, Germany, Canada, and Japan demonstrate negative results for ten of the 12 flows, and those volatility measures based on the forward rate and assuming a "time-varying risk premium" come into view to have a slightly better significance level. Trade flows to Japan show a positive effect. Thus, these early analysis locate that exchange-rate uncertainty had had mixed results.

2.2.2 Studies on Exchange Rate Regimes and Exchange Rate Volatility

Omisakin (2009) analyzed the short run and long run dynamics for the country Nigeria using a reasonably long time series data on daily frequency basis. Using the Johannes co-integration technique, the results presented in the paper report no long run relationship between stock prices and exchange rate. Using the structural break data and short run analysis, the results showed very minor effect of stock prices on the exchange rate while the relationship found to be unidirectional. It is concluded that stock prices are not subject to any importance for the policy makers to design the exchange rate policy.

Egert and Zumaquero (2008) check the direct effect of exchange rate volatility on exports of different countries. It is examined that its indirect effect in different exchange rate regimes. The effect was checked at scrotal, bilateral and aggregate levels. It is resulted that there is different impact on exports depending upon size, direction and regime of exchange rate on different sectors and countries at different time periods.

Stokman (1995) studies major economic policies according to time changes under different exchange rate regimes. On the base 49 countries data different macro economic variables are compared under flexible and pegged regimes. Results indicate that flexible real exchange has

more volatile than pegged nominal ER. But studies examined the result that nominal ER plays a typical role in stimulating the macro variable.

2.2.3 Studies on comparison of Exchange rate volatilities:

Khan *et al.* (2012) explore after framework that exchange rate is taken into account very serious issue for developing countries. They take monthly data from 1971:01 to 2009:12 and use GARCH and least square dummy variable techniques to surmise the results. They also found that when Pakistan uses US dollar as vehicle currency the export and imports of Pakistan decline whereas when it brings into play domestic currency for trade, the imports and exports of host country become unaffected. They also exert negative impact in case of Pakistan.

Abdalla (2012) uses GARCH models to measure exchange rate volatility in nineteen Arab countries by using daily basis data from 1st January 2000 to 19th November 2011. By GARCH (1, 1) approach results explain that conditional variance is an explosive process for ten currencies out of nineteen and for seven currencies it is a persistent one (required mean reverting variance process). Finally it is concluded that through family of GARCH models exchange rate volatility can be feasibly modeled.

Insha and chiaraah (2013) conduct study to find the source of exchange rate volatility in Ghana by using annual data from period of 1980 t0 2012 using ADL technique. Results tell that government expenditure is positively correlated and debts (external and internal) are negatively correlated with exchange rate volatility.

Kriljenko and Habermeier (2004) examine the factors effecting exchange rate volatility. The data of foreign exchange markets and organizations was collected by IMF. They find that

decentralized dealer markets, regulations on the use of domestic currency by nonresidents, and limits on banks' foreign exchange positions are associated with lower exchange rate volatility.

Claudio Morana (2009) examines the causes of exchange rate volatility and what are the linkages between macroeconomics policies and exchange rate volatility. The results explain that there is strong negative causality from macroeconomic policies to exchange rate volatility.

Serge rey (2006) studies the impact of real and nominal exchange rate on exports of six MENA countries to different EU countries for the time period of 1970 to 2002 using ARCH model. It is concluded that the positive relation for four countries and negative relation for remaining two countries.

Stockman (1995) studies the major economic policies according to time under different exchange rate regimes. On the base of 49 countries data different macro economic variables are compared underflexible and pegged regimes. Results indicate that flexible real exchange has more volatile than pegged nominal ER, but studies examined the result that nominal ER plays a typical role in stimulating the macro variable.

Thursby and Thursby (1987) study the export values of 17 countries using annual data over theperiod1974-1982. In this model, the value of trade flows is broken into a price component and a quantity component. The determinants of trade flows are both countries' CPIs and GDPs; a variable that captures consumer tastes; relative export and import prices, transport costs; tariff rates (proxied by dummies for membership in trade blocs); the nominal exchange rate, and hedging opportunities. The estimate of volatility used is the standard deviation of the spot rate around a predicted trend; the estimation technique is OLS with lagged variables. The authors find that in the majority (10 out of 17) of cases, uncertainty has a negative effect on trade flows.

Brada and Mendez (1988) test the export values of 30 developed and less-developed countries as a function of foreign income, population, distance, and the existence of preferential trade agreements between each pair of nations. In order to avoid a dependence on a specific measure of volatility, simple dummy variables are used to denote fixed and floating exchange-rate regimes between each pair of countries. Many of the countries evaluated in the study were members of cooperative agreements such as the European Monetary system; many of the countries' currencies were pegged to the US dollar, and other currencies were allowed to hover to some degree. Using OLS for annual data over the time span 1973-1977, which includes both "tranquil" and volatile periods, the author's results verify the results of past research: that volatility lessen trade. Nevertheless, they conclude that this reduction is not as bad as the reduction of trade brought on by the limiting trade policies of countries that uphold fixed exchange rates.

Kumar and Dhawan (1991) who study the developing country of Pakistan using a bilateral specification in which export volume can be uttered as a function of importer's income, relative prices, the nominal exchange rate, and vagueness. It is examined that volatility in the nominal, but not the real, exchange rate is considerably negative; that a linear, rather than a log-linear, specification provides significant results.

Belanger *et al* (1992) seem additional into the US relationship with Canada, this time evaluating US imports from its major trading partner. Utilizing a novel nonparametric approach to measure volatility, the authors inspect the import volume of five sectors (food, industrial supplies, capital goods, automotive goods, and consumer goods) as a function of a substitution effect (relative

prices), a trade composition effect, a scale variable (output), and the volatility proxy. OLS (with lags and seasonal dummies) is applied to quarterly data over the period 1974-1983. The authors do not locate any significant effect with the possible exemption of capital goods.

2.2.4 Studies on impact of exchange rate volatilities on macroeconomic variables:

Omisakin (2009) analyzed the short run and long run dynamics for the country Nigeria using a reasonably long time series data on daily frequency basis. Using the Johannes co-integration technique, the results presented in the paper report no long run relationship between stock prices and exchange rate. Using the structural break data and short run analysis, the results showed very minor effect of stock prices on the exchange rate while the relationship found to be unidirectional. It is concluded that stock prices are not subject to any importance for the policy makers to design the exchange rate policy.

Serenis and Tsounis (2013) investigate that exchange rate volatility reduces the trade. It is examined that it increases the exports and terms of trade of Carotia and Cyprus. They use the quarterly data from 1990 to 2012 and apply moving average logarthim, co- integration, unit root test and ARDL test to exert the results. The results show that when volatility increases, it will lead to high profit through uncertainty.

Afridi *et al.* (2006) investigate the impact of bilateral exchange rate volatility on export growth between Pakistan and other trade partners and some other trading blocs e.g. SAARC, ASEAN, European and Asia-pacific regions. By using quarterly data from 1991;1to 2004;2 and through Co-integration , and error correction techniques results postulate that exchange rate volatility has negative effects with major trade partners; UK and US both in long run and short run and with

Australia, Bangladesh and Malaysia less effect and with New Zealand no empirically effect observed.

Goyal and Arora (2010) discuss the daily and monthly data of exchange rate to check the impact on other monetary variables such as interest rate. They also explain that if central bank change its reserves, the exchange rate volatility in short run decreases. Increase in liquidity charges trim down the monthly volatility. They also summarize that when state bank alternates monetary policy it causes exchange rate volatility. GARCH model based on dummy is used to surmise the above fallouts.

Shahkari. (2013) investigates the effect of exchange rate uncertainty on the value of export of saffron from 1979 to 2011 by using AR (1) generalized pattern and vector error correction model. It is shown that there is a negatively correlation between value of saffron and exchange rate uncertainty.

Jin *et al.* (2002) examine the effect of exchange rate volatility on wheat exports worldwide through modified gravity-type model. They compared short run and long run measures of exchange rate volatility. Both have negative relation with exchange rate volatility but greater negative effect in long run.

Yeyati and Sturzenegger (1999) classified the exchange rate using the cluster analysis technique. They compared these categories with the classifications of exchange rate made by IMF and explained the main discrepancies..

Rey (2006) studied the impact of real and nominal exchange rate on exports of six MENA countries to different EU countries for the time period of 1970 to 2002 using ARCH model. It is

concluded that the positive relation for four countries and negative relation for remaining two countries.

Rault *et al.* (2009) examined the determinants of exchange rate volatility in different countries for panel data for the time period of 1979 to 2004 using GMM model. It is explained that different macroeconomic shocks and international financial integration are the major determinants of exchange rate volatility.

Mahmood *et al.* (1996) study the determinant of real exchange rate in Pakistan. It is suggested that simultaneous equation model is best for this purpose. It is observed that monetary, real sector variables and trade of goods affect the real exchange rate equilibrium.

Sekantsi (2011) examines the ER volatility effects on South Africa export trade to America under floating era of 1995 to 2007. By using the GARCH technique and due to co-relation among variables using ARDL method it is explained that RER volatility has a negative and significance impact on the export of South Africa to America.

Javid and farooq (2009) examine the correlation between ER volatility and economic growth in Pakistan. By using the data from 1982-1 to 2007-4 and applying error correction technique as well as ARDL model it is concluded that exchange rate volatility causes domestic output performance more sensitive in long run than in short run.

Bahmani-Oskooee (2002) initiates both the exports and imports of Iran. Rather than using the official exchange rate for volatility proxy, the black-market rate is applied – noting that the gap between the two rates had turn out to be quite large. Employing a four-year moving standard divergence of percentage changes in the black-market exchange rate as volatility proxy, it is shown that black-market exchange-rate volatility has discouraged Iranian trade flows.

Tenreyro (2004) identifies a numeral of the evils associated with the gravity model of bilateral trade, including properties of the error term, and potential endogeneity–volatility may be partially determined by the level of trade. Using a pseudo-maximum likelihood procedure, she corrects for the relevant biases. Similarly, an instrumental variable method – modeled as a logit procedure – is used to get rid of endogeneity. Volatility is modeled as the standard deviation using the moving standard deviation method on the nominal exchange rate, and a gravity model examines exports as a function of distance, per capita GDP, population, area, and dummies for free-trade agreements, contiguity, common language, and colonial heritage. Analyzing 104 countries over the period from 1970-1997 using this nonlinear method, it is examined that nominal exchange-rate volatility has no effect on trade.

Koray and Lastrapes (1989) apply a VAR of the bilateral imports of the UK, France, Germany, Japan, and Canada from 1959-1985. The other seven variables in the VAR are the interest rate, the money supply, prices, income, the nominal exchange rate, and a moving standard deviation-based volatility proxy. The authors disclose a weak relationship, but concluded that, permanent volatility shocks dishearten imports.

Lee (1999) focuses on the value of US imports of durable goods from its G-7 partners, Belgium, Sweden, and Switzerland over the period 1973-1992. Employing a vector auto regression that includes durable-goods prices, the real exchange rate, US income, and a GARCH-based measure of volatility, it is discovered that uncertainty has had no discernible impact on imports.

Klein (1990) provides sectoral study that finds mixed results. By examining the value of US bilateral exports to the G-7 as a function of foreign income and the real exchange rate. The model applies OLS to a regression of exports on current and lagged income, real exchange rate,

and volatility – as well as five country-specific dummy variables, and interaction variables between the dummies and volatility. It is concluded that there is positive as well as negative results.

Table 2.1: Summary of Review of Literature

Reference	Hypothesis	Time Period of Analysis	Countries	Variables	Methodology	Conclusion
Khan *et al.* (2012)	Impact of exchange rate on imports and exports	1971-2009	Pakistan	Imports and exports	GARCH, Least square, and dummy	It is computed negative impact of exchange rate on imports and exports.
Serenis and Tsounis (2013)	Impact of exchange rate volatility on trade.	1990 to 2012	Croatia and Cyprus.	Exports and exchange rate	ARDL and Logarithm co integration techniques	The results show that when volatility increases, it will lead to high profit through uncertainty.
Erdemlioglu and Laurent (2012)	Impact of exchange rate volatility on prices	Since 1980	European countries	Prices ,and some other control variables	ARCH and GARCH techniques	The results show positive impact of ER fluctuations on prices.
Afridi and *et al.*(2006)	the impact of bilateral exchange rate volatility on export growth	2004;2 and from 1991;1	SAARC countries	Trade and export	Co integration and error correction model	Exchange rate volatility has negative effects on export growth.
Abdalla (2012)	the impact of exchange rate volatility on Arab economies	January 2000 to 19th Novembe r 2011	Arab economies	Macro variables	GARCH MODEL	It is concluded that through family of GARCH models exchange rate volatility can be feasibly modeled.
Goyal and Arora (2010)	Impact of exchange rate on monetary variables	Last 2 decades	India	monetary variables	GARCH MODEL	When state bank alternates monetary policy it causes exchange rate volatility.
Pandit and Vashisht *et*	the effect of volatility,	Last 3 decades	India, Taiwan,	Control variables	GARCH MODEL	In some cases volatility, financial derivatives and liquidity effect and

al.(2011)	liquidity and financial derivatives on stock market		Malaysia, Hong Kong, Singapore,			in some cases they don't effect…..
Omisakin *et al.* (2009)	Impact of volatility in short run and long run on growth	Last 2 decades	Nigeria	Prices and exchange rate	Johannes co-integration techniques	Results explain positive impact of ER volatility on economic growth.
Shahkari (2013)	the effect of exchange rate uncertainty on the value of export of saffron	1979 to 2011	West countries	Export and other control variable	Vector error correction model.	It is shown that there is a negatively correlation between value of saffron and exchange rate uncertainty.
Insha and chiaraah (2013)	the source of exchange rate volatility in Ghana	1980 t0 2012	Ghana	Govenament spending and debt	ADL technique	Results tell us that government expenditure is positively correlated and debts (external and internal) are negatively correlated with exchange rate volatility.
Kriljenko and Habermeier(2004)	the factors effecting exchange rate volatility	Cross section data	Foreign exchange market	Decentralized dealer market, regulations on domestic currency,	GARCH model	Included variables are associated with lower exchange rate volatility
Steenkamp *etal.* (2013)	simple measures of the short-term and cyclical volatility	1987 to 2012	New Zealand	Monetary and government policies	Graphical approach, unconditional realized volatility,	In short run exchange rate is less volatile but sometime overshoot.
Jin *et al. (2002)*	the effect of exchange rate	1978 to 1996	World-wide effect	Exchange rate and export	Gravity model and	. Long and short run have negative relation with exchange rate

	volatility on wheat exports				Dummy variables	volatility but greater negative effect in long run.
Yeyati and Sturzenegger (1999)	Measurement of exchange rate		IMF		Cluster analysis technique	By using cluster techniques explains main shortcomings in measurement of exchange rate.
Égert and Zumaquero(2008)	Direct effect of exchange rate volatility on exports	1972 to 2005	Ten central and eastern Eourapian countries	Exchange rate, export and import	GARCH model and dummy variable	It is examined that there is different impact on exports depending upon size, direction and regime of exchange rate on different sectors and countries at different time periods.
Morana(2009)	Causes of exchange rate volatility	1997 to 2007	Case study of Canada.		ARCH model	The result explains that there is strong negative causality from macroeconomic policies to exchange rate volatility.
Rey (2006)	The impact of real and nominal exchange rate on exports	1970 to 2002	Six MENA countries	Nominal and real exchange rate And export	ARCH model	It is concluded that the positive relation for four countries and negative relation for remaining two countries.
Raul*et al.* (2009)	The determinants of exchange rate volatility in different countries	1979 to 2004	Different developing countries	Policy regimes(G,T,M)	GMM model	Macroeconomic shocks and financial integrations are major determinants of ER volatility
Mahmood *etal.* (1996)	The determinant of real exchange rate in Pakistan	Cross sectional data	Pakistan	Monetary, real sector variables	Simultaneous equation model	. It is concluded that monetary, real sector variables and trade of goods affect the real exchange rate equilibrium.

Sekantsi (2011)	The ER volatility effect's on south Africa export trade to America under floating era	1995 to 2007	South Africa and America	Export trade and floating exchange rate	GARCH technique	A negative and significance impact on the export of south Africa to America under floating exchange rate ragime.
Stockman(1989)	Major economic policies according to time changes under different exchange rate regimes.	1980 to 1988	49 countries	Macro economic variables	ARDL and from family of GARCH models	But studies examined the result that nominal ER plays a typical role in stimulating the macro variable.
Javid and farooq (2009)	The correlation between ER volatility and economic growth	1982-1 to 2007-4	Pakistan	Long and short run domestic output	Error correction technique and ADRL	. It is concluded that exchange rate volatility cause the domestic output performance more sensitive in long run than in short run
Akhtar and Hilton (1984)	The effects of exchange-rate volatility	1974-198 1	the USA and Germany	Export and foreign income	a polynomial distributed lag method in their OLS estimate	Their conclusions conform to the theory that increased risk lessens the trade flows.
Arize and Ghosh (1994)	extra measures of volatility	1970-199 7	US	Export	ARCH model	, the authors bring to a close that the general export flow equation, often used without volatility in other studies, is unbalanced without a volatility term
Bahmani-Oskooee (2002)	the effects of exchange-rate	Daily bases	Iran	exports and imports	Johansen method	Finds that black-market exchange-rate volatility has

	volatility applying an entirely diverse exchange rate.	data from 1996 to2001				discouraged Iranian trade flows.
Cushman (1988)	Different volatility measures	Monthly and quarterly data	Netherlands, France, Germany, Canada, and Japan	Expected nominal exchange rate, %age change in R and time varying risk premium.	12-month moving standard deviation based on expectations	These early analyses locate that exchange-rate uncertainty had had mixed results
Thursby and Thursby (1987)	Impact of Exchange rate on trade flows	1974-1982	17 countries	CPI, GDP, relative export and imports prices, transport cost, nominal ER, hedging opportunity	Dummy variables,standard deviation and OLS with lagged variables.	Volatility has negative effect on trade flows
Tenreyro (2004)	Determinant of ER volatility.	1970-1997	104 countries	Trade	Logit model	Results explain that nominal exchange-rate volatility has no effect on trade.
Kumar and Dhawan (1991)	The nominal exchange rate and importers income		Pakistan	Export volume and importer's income		It is examined that volatility in the nominal, but not the real, exchange rate is considerably negative.

2.3. Summary

From the above reviewed literature we can conclude that exchange rate volatility has a significance impact under different exchange regimes on major economic variables especially on trade flows. Different researchers use different techniques for measuring exchange rate variations in some specified countries

Chapter 3

Data

3.1 Introduction

In contemporary literature the data we have used to check volatility of exchange rate is based on daily bases return. We take the data of seventeen countries which belong to different continents like Asia, South America and different gulf countries. These are the countries from which we have taken the data it is mentioned below in the tabular form. The daily data is set from 2nd of February 2004 to 10th of July 2010, based on 2807 observation by omitting irrelevant days or holidays.

Table 3.1 List of Countries and their Currencies

Country	Currency	Abbreviation
United States of America	United Stat Dollar	USD
United Kingdom	Great Britain Pound	GBP
European countries	Euro	EUR
Canada	Canadian Dollar	CAD
Switzerland	Swiss Franc	CHF
Australia	Australian Dollar	AUD
Sweden	Swedish Krone	SEK
Japan	Japans Yen	JPY
Norway	Norwegian Krone	NOK
Singapore	Singapore Dollar	SGD
Denmark	Danish Krone	DKK
Saudi Arabia	Saudi Riyal	SAR
Malaysia	Malaysian Ringgit	MYR
Hong Kong	Hong Kong Dollar	HKD
New Zealand	New Zealand Dollar	NZD
Kuwait	Kuwait Dinar	KWD
Qatar	Qatari Riyal	QAR
UAE	UAE Dirham	AED

In above data it is mentioned those countries to whom exchange rate data has been taken for checking the volatility with Pakistan along with their returns and abbreviations also mentioned.

3.2Data and Sources

In this thesis, data for bilateral exchange rate on daily basis is collected from the business recorder. The daily data is set from 2nd of February 2004 to 10th of July 2010, based on 2807 observation by omitting irrelevant days or holidays.

3.3Descriptive Statistics

In this chapter we will examine how exchange rate volatility exists among below mentioned selected countries through data. For the description of data some main features also mentioned such as mean, minimum value, maximum value and standard deviation from the sample. These features are commonly used for the description of the data. Here kurtosis, sum, skewness and variance are ignored.

Table 3.2 Descriptive Statistics of the bilateral exchange rates

Bilateral exchange rate of Pakistan with	Currency	Obs.	Mean	S.D	Min. value	Max. value
United States of America	Pak rupee/United States Dollar	2807	75.71488	15.35	57.4	108.4
United Kingdom	Pak rupee/Great Britain Pound	2807	128.84	18.11	101.68	177.85
European countries	Pak rupee/Euro	2807	101.49	22.72	67.78	148.57
Canada	Pak rupee/Canadian Dollar	2807	69.95	18	41.39	103.61
Switzerland	Pak rupee/Swiss Franc	2807	72.34	23.60	43.55	121.44
Australia	Pak rupee/Australian Dollar	2807	66.44	20.44	39.42	103.65
Sweden	Pak rupee/Swedish Krone	2807	10.92	2.64	7.27	16.81
Japan	Pak rupee/Yen	2807	0.78	0.24	0.48	1.21
Norway	Pak rupee/Norwegian Krone	2807	12.58	2.94	8.05	18.11
Singapore	Pak rupee/Singapore Dollar	2807	53.98	16.25	33.46	86.57
Denmark	Pak rupee/Danish Krone	2807	13.62	3.04	9.10	19.91
Saudi Arabia	Pak rupee/Rayal	2807	20.18	4.09	15.31	28.90
Malaysia	Pak rupee/Malaysian Ringgit	2807	22.55	5.94	15.11	33.85
Hong Kong	Pak rupee/Hong Kong Dollar	2807	9.74	1.98	7.38	3.98
New Zealand	Pak rupee/New Zealand Dollar	2807	55.50	15.71	34.46	90.22
Kuwait	Pak rupee/Kuwait Dinar	2807	266.85	56.70	194.81	383.25
Qatar	Pak rupee/Qatari Riyal	2807	20.75	4.25	15.63	29.77

Table 3.3 Descriptive Statistics of the bilateral exchange rates volatility of Pakistan with selected countries

Bilateral exchange rate of Pakistan with	Currency	Obs.	Mean	S.D	Min. value	Max. value
United States of America	Pak rupee/United States Dollar	2807	1.270	0.2575	0.9630	1.8187
United Kingdom	Pak rupee/Great Britain Pound	2807	1.145	0.1609	0.9037	1.5807
European countries	Pak rupee/Euro	2807	1.2653	0.2433	0.8450	1.8522
Canada	Pak rupee/Canadian Dollar	2807	1.4150	0.3641	0.8373	2.096
Switzerland	Pak rupee/Swiss Franc	2807	1.3958	0.4553	0.8424	2.343.
Australia	Pak rupee/Australian Dollar	2807	1.4343	0.4413	0.8510	2.2376
Sweden	Pak rupee/Swedish Krone	2807	1.227	0.2970	0.8168	1.888
Japan	Pak rupee/Yen	2807	1.3464	0.4140	0.8436	2.0931
Norway	Pak rupee/Norwegian Krone	2807	1.2915	0.3027	0.8558	1.8580
Singapore	Pak rupee/Singapore Dollar	2807	1.4811	0.4464	0.9171	2.3750
Denmark	Pak rupee/Danish Krone	2807	1.2630	0.2825	0.8445	1.8460
Saudi Arabia	Pak rupee/Rayal	2807	1.2704	0.2774	0.9634	1.8187
Malaysia	Pak rupee/Malaysian Ringgit	2807	1.8453	0.3789	0.9636	2.1588
Hong Kong	Pak rupee/Hong Kong Dollar	2807	1.2717	0.2596	0.9634	1.8250
New Zealand	Pak rupee/New Zealand Dollar	2807	1.3013	.3684	.8079	2.1153
Kuwait	Pak rupee/Kuwait Dinar	2807	1.3194	0.2804	0.9632	1.8950
Qatar	Pak rupee/Qatari Riyal	2807	1.2785	0.2624	0.9630	1.8342

In this above data mean value shows average and standard deviation shows the volatility of bilateral exchange rate of Pakistan with above mention countries.

Chapter 4

Methodology

4.1 Introduction:

The key idea of this section is to provide facts about the methodology of estimation and calculation which is used in this study. In addition, it also provides information concerning the data periods and data sources which is accessed for the present analysis.

4.2 Construction of Exchange Rate Volatility Variable:

Volatility in exchange rate is calculated using the following formula:

$$VOL_{ij} = \sqrt{\frac{\sum\left(ER_{ij} - \overline{ER_{ij}}\right)^2}{N}}$$

Where VOL_{ij} represent volatility in the bilateral exchange rate, ER_{ij} is the bilateral exchange rate between country i and country$j$, and $\overline{ER_{ij}}$ represents the average bilateral exchange rate between the two countries. For the calculation of volatility in exchange rate series, present study uses i and j for the selected countries.

4.3 Comparison of variances

For comparison of variances in exchange rate series of countries we can used the tests developed to check the homogeneity of variance across different series. The test to check the homogeneity

of variance is the F test, Barlett's test. These tests are discussed one by one in the following sub sections:

4.3.1 F test for equality of variance

For comparison of variance in exchange rate series of each country we simply apply the F-test of equality of variance. The tests were also used by Atiqullah (1962) and Layard (1973). The null and alternative hypotheses for the test are

$$H_0: \delta_i^2 = \delta_j^2$$

$H_1: \delta_i^2 \neq \delta_j^2$, Two tailed test showing that both countries have unequal variance

$H_A: \delta_i^2 > \delta_j^2$, upper one tailed test show that the i^{th} country has greater variance than the j^{th} country

$H_A: \delta_i^2 < \delta_j^2$, lower one tailed test show that the i^{th} country has smaller variance than the j^{th} country

The test statistics are

$$F = \frac{\delta_i^2}{\delta_j^2} \; with \; \vartheta_1 = n - 1 \; and \; \vartheta_2 = m - 1 \; degree \; of \; freedom$$

Where, δ_i^2 show the variance in exchange rate series of i^{th} country and δ_j^2 show variance of exchange rate series of j^{th} country. Whereas n shows the number of observation in exchange rate series of i^{th}country and m shows the number of observation of exchange rate series in j^{th}country. The critical values for the above test is determined as, the null hypothesis is rejected if

$F_{(1-\frac{\alpha}{2})(n-1)(m-1)} < F$ OR $F > F_{\frac{\alpha}{2}(n-1)(m-1)}$ two tailed test

$F > F_{\alpha(n-1)(m-1)}$, upper one tailed test

$F < F_{(1-\alpha)(n-1)(m-1)}$, lower one tailed test

The F test for equality of variances we can test only two countries exchange rate series at a time for comparison.

4.3.2 Barlett's test

In case if we are dealing with more than two samples and want to checked the homoscedasticity across all the samples, then for this we can used the Barlett's test of equal variances developed by Bartlett (1935).The null and alternative hypothesis for the test is set as

$$H_0: \delta_1^2 = \delta_2^2 = \delta_3^2 = \cdots = \delta_k^2$$

$H_A: \delta_i^2 \neq \delta_j^2$, for at least one pair out of 1, 2 … k

The test statistics for the above hypothesis are

$$B = \frac{(N-k)lns_p^2 - \sum_{i=1}^{k}(n_i-1)lns_i^2}{1+\left(1/3(k-1)\right)\left[\left\{\sum_{i=1}^{k} 1/(n_i-1)\right\} - 1/(N-k)\right]}$$

Where, N is the total number of observation, k is the number variables or the number of countries for which we compare the variances, n_i is the number of observation in i^{th} country series of real exchange rate, s_i^2 shows the variance of i^{th} country exchange rate series and s_p^2 is the pooled variance which are computed as

$$s_p^2 = \frac{\sum_{i=1}^{k}(n_i - 1)s_i^2}{(N-k)}$$

The Barlett's test is based on chi-square distribution with $k-1$ degree of freedom. The critical region to reject the null hypothesis of homogenous variance areas, we reject the null hypothesis if

$$B > \chi^2_{(1-\alpha)(k-1)}$$

Where, α is the level of significance at which we test the null and alternative hypothesis? As chi-square distribution belongs from the normal family that why Barlett's test is more sensitive to the assumption of normality.

Chapter 5

Results and Results Discussion

5.1 Introduction

The first stage of analyzing the effects of bilateral exchange rate volatility consists of estimating the corresponding F-test and Barlett's tests for each currency. In this chapter mathematical and graphical explanation will be provided. It will tell that whether fluctuations in the exchange rate data of Pakistan exists or not.

5.2 Bilateral Exchange Rates

The thesis examines the fluctuations of bilateral exchange rate between Pakistan and 17 other countries in their own currency. The main theme of this paper is to examine the different exchange rate regimes for bilateral exchange rates and also its effect on macroeconomic variables.

5.3 Graphical Analysis

In this chapter through graphical analysis it will be shown whether exchange rate volatility exists or not. For this purpose data is divided in three parts i.e., annually, monthly and daily standard deviations. But here just monthly fluctuations are shown in graphs.

Figure 5.1: Volatility in Bilateral Exchange Rate of Pak-Rupee with US Dollar based on Monthly Standard Deviations of Bilateral Exchange Rates

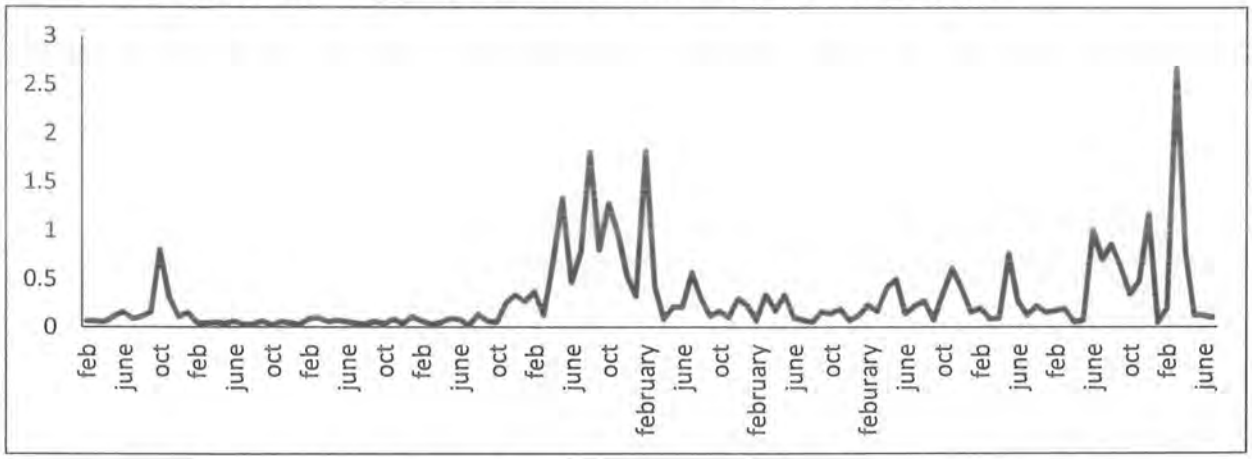


Figure 5.2: Volatility in Bilateral Exchange Rate of Pak-Rupee with British Pound based on Monthly Standard Deviations of Bilateral Exchange Rates

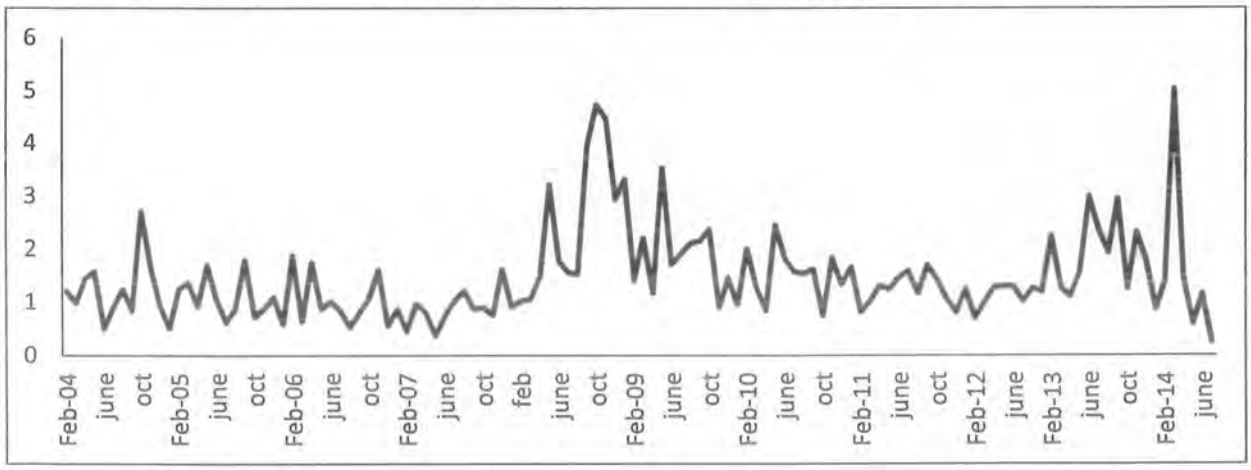


Figure 5.3: Volatility in Bilateral Exchange Rate of Pak-Rupee with Canadian - Dollar based on Monthly Standard Deviations of Bilateral Exchange Rates

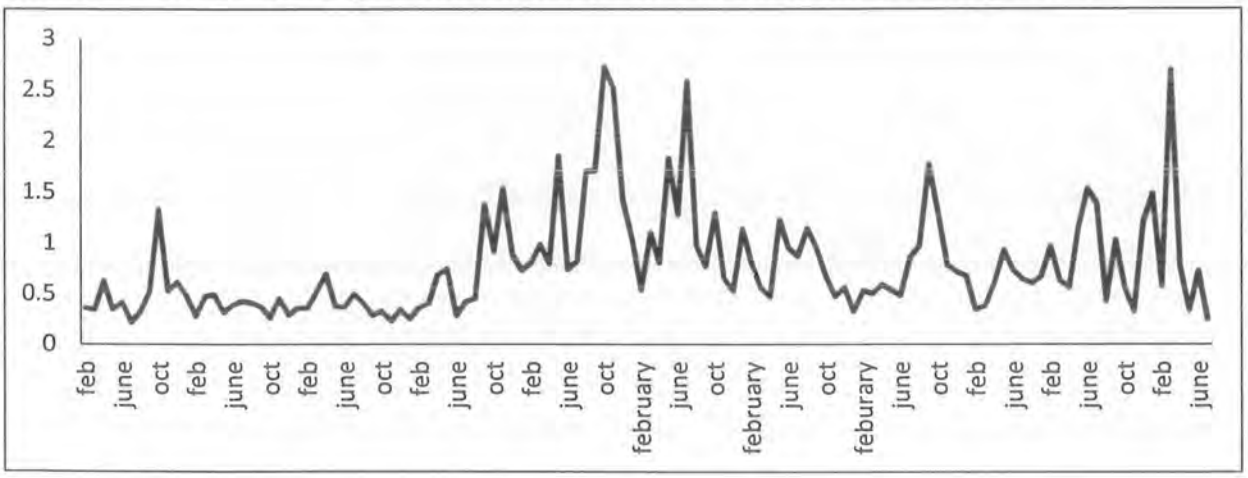


Figure 5.4: Volatility in Bilateral Exchange Rate of Pak-Rupee with Australian-Dollar based on Monthly Standard Deviations of Bilateral Exchange Rates

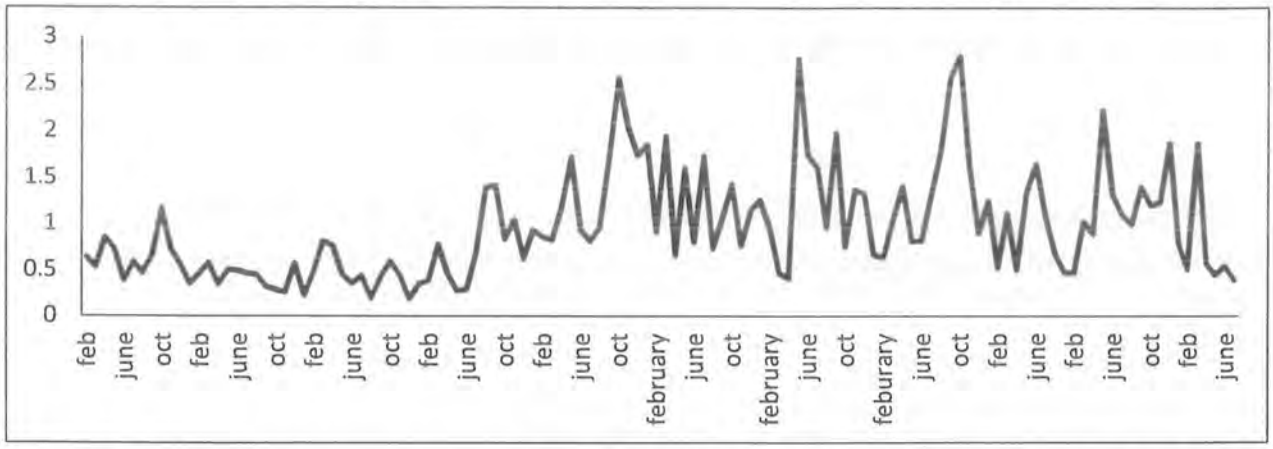


Figure 5.5: Volatility in Bilateral Exchange Rate of Pak-Rupee with Swiss-Franc based on Monthly Standard Deviations of Bilateral Exchange Rates

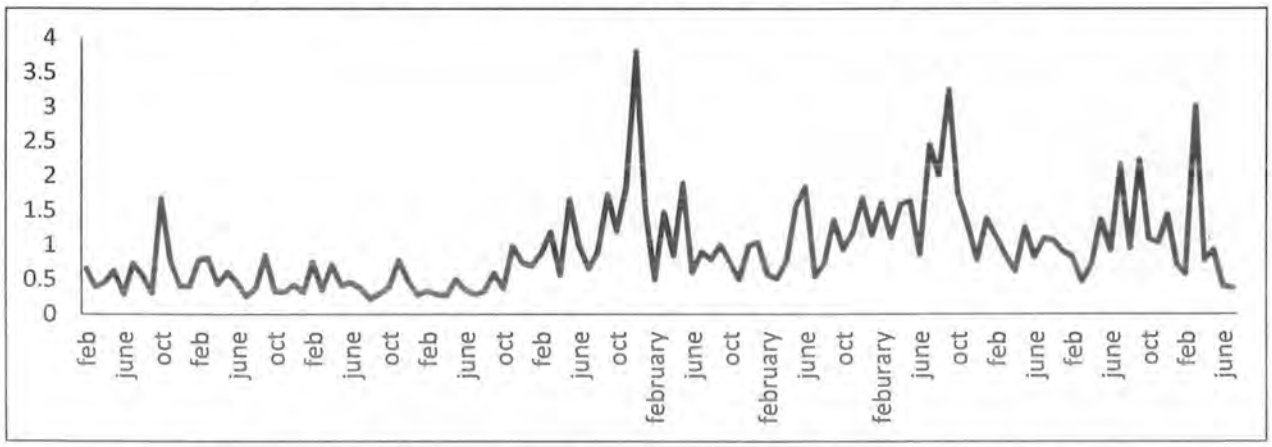


Figure 5.6: Volatility in Bilateral Exchange Rate of Pak-Rupee with Euro based on Monthly Standard Deviations of Bilateral Exchange Rates

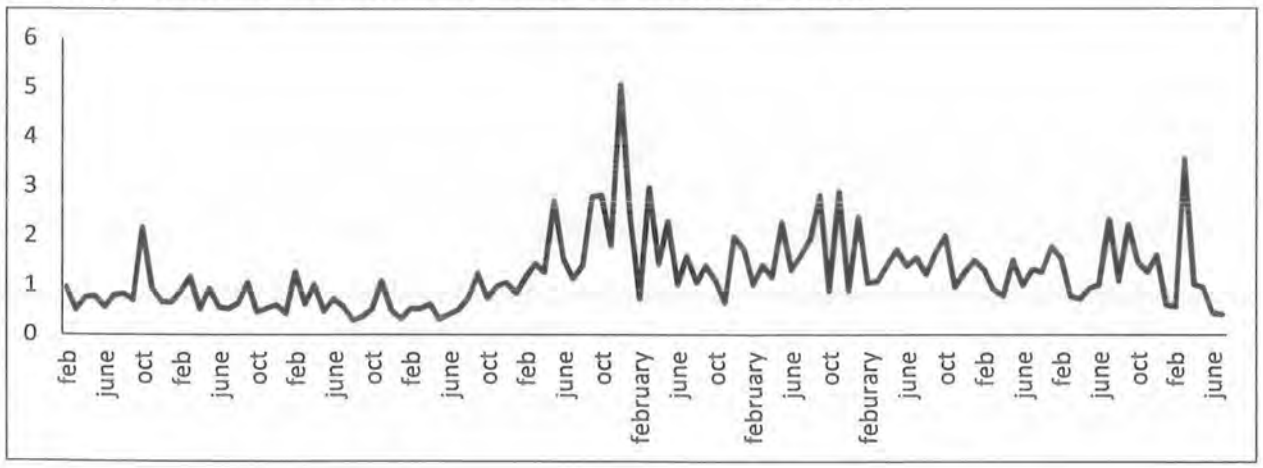
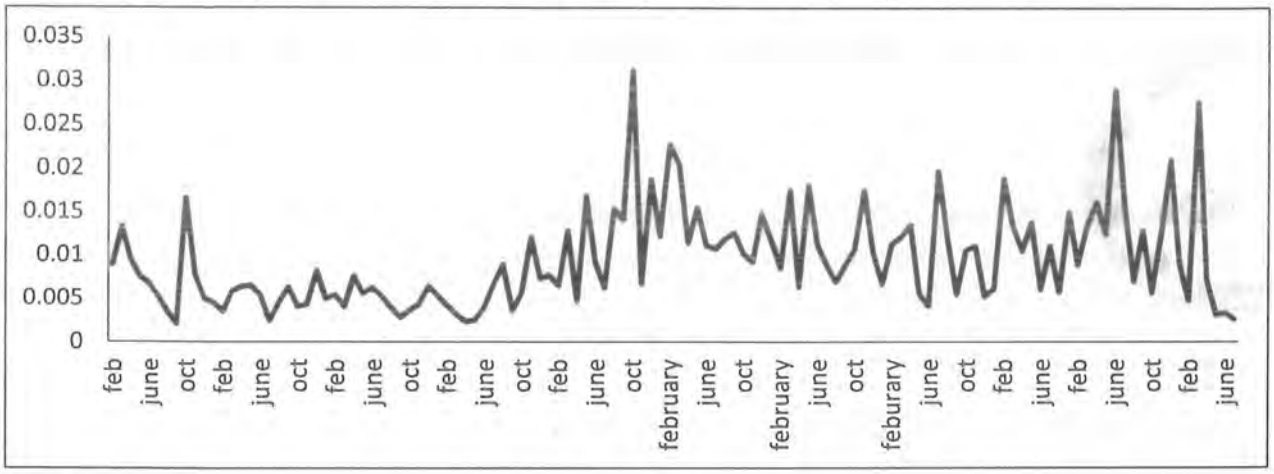


Figure 5.7: Volatility in Bilateral Exchange Rate of Pak-Rupee with Japanese-Yen based on Monthly Standard Deviations of Bilateral Exchange Rates



The trend of exchange rate series indicates that it has a positive trend over the time which means that Pakistani currency depreciated at every next moment. Although it favors Pakistan to increase exports theoretically but exports did not increase and trade deficit between FY 2014-15 has been increased to 13 billion US$. The main reasons for this deficit are political instability, deficit balance of payment, increasing debt to GDP ratio, growth rate of money and spending of government.

5.4 Comparison of Exchange Rate Volatilities:

To compare the bilateral exchange rate volatility of Pakistani rupee among different countries currency returns, two tests are being used. Whether variation in exchange rate exists or not if exist then which country case its more volatile and where it is less volatile

1st F test is being calculated.

Table 5.1 Results of F-test under the hypothesis ($H_0: \delta_i^2 = \delta_j^2, H_1: \delta_i^2 \neq \delta_j^2$)

Country	USA	UK	EUR	CD	SWD	AUS	SWE	JPN	NWY	SGR	DMK	SA	HK	KWT	MAS	NZ
UK	1.3919***															
EUR	2.1915***	1.5744***														
CD	1.3751***	0.9879	0.6275													
SWD	2.3633***	1.6978***	1.0784**	1.7186***												
AUS	1.7736***	1.2742***	0.8093	1.2898***	0.7505											
SWE	0.0297	0.0213	0.0135	0.0216	0.0125	0.0167										
JPN	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.008									
NWY	0.0369	0.0265	0.0168	0.0268	0.0156	0.0208	1.243***	150.7***								
SGR	1.1216***	0.8058	0.5118	0.8156	0.4746	0.6324	37.82***	4584***	30.4***							
DMK	0.0394	0.0283	0.018	0.0287	0.0167	0.0222	1.329***	161.1***	1.07**	0.04						
SA	0.071	0.051	0.0324	0.0516	0.03	0.04	2.395***	290.3***	1.93***	0.06	1.8***					
HK	0.0168	0.0121	0.0077	0.0122	0.0071	0.0095	0.566	68.62***	0.46	0.01	0.4	0.24				
KWT	13.645***	9.8031***	6.2264***	9.9233***	5.774***	7.6936***	460.2***	55776***	370	12.2***	346***	192***	812.8***			
MAS	0.1498	0.1076	0.0684	0.109	0.0634	0.0845	5.052***	612.4***	4.07	0.13	3.8***	2.11***	8.925***	0.01		
NZ	1.0477	0.7527	0.4781	0.7619	0.4433	0.5907	35.33***	4282***	28.4***	0.93	27***	14.8***	62.41***	0.08	6.99***	
QTR	0.077	0.0553	0.0351	0.056	0.0326	0.0434	2.596***	314.7***	2.09***	0.07	2***	1.08**	4.586***	0.01	0.51	0.1

Critical values $F_{\alpha/2}(n-1)(m-1)$are 1.1021, 1.0641, 1.0648 at 1%, 5%, 10% level of significance, respectively.
***, **, and * indicate significant at 1%, 5% and 10% level of significance, respectively.

Table 5.2.Results of F-test under the hypothesis ($H_0: \delta_i^2 = \delta_j^2, H_1: \delta_i^2 > \delta_j^2$)

Country	USA	UK	EUR	CD	SWD	AUS	SWE	JPN	NWY	SGR	DMK	SA	HK	KWT	MAS	NZ
UK	1.3919***															
EUR	2.1915***	1.5744***														
CD	1.3751***	0.9879	0.6275													
SWD	2.3633***	1.6978***	1.0784*	1.7186***												
AUS	1.7736***	1.2742***	0.8093	1.2898***	0.7505											
SWE	0.0297	0.0213	0.0135	0.0216	0.0125	0.0167										
JPN	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.008									
NWY	0.0369	0.0265	0.0168	0.0268	0.0156	0.0208	1.243***	150.7***								
SGR	1.1216***	0.8058	0.5118	0.8156	0.4746	0.6324	37.82***	4584***	30.4***							
DMK	0.0394	0.0283	0.018	0.0287	0.0167	0.0222	1.329***	161.1***	1.07*	0.04						
SA	0.071	0.051	0.0324	0.0516	0.03	0.04	2.395***	290.3***	1.93***	0.06	1.8***					
HK	0.0168	0.0121	0.0077	0.0122	0.0071	0.0095	0.566	68.62***	0.46	0.01	0.4	0.24				
KWT	13.645***	9.8031***	6.2264***	9.9233***	5.774***	7.6936***	460.2****	55776***	370***	12.2***	346***	192***	812.8***			
MAS	0.1498	0.1076	0.0684	0.109	0.0634	0.0845	5.052***	612.4***	4.07***	0.13	3.8***	2.11***	8.92***	0.01		
NZ	1.0477	0.7527	0.4781	0.7619	0.4433	0.5907	35.33***	4282***	28.4***	0.93	27***	14.8***	62.4***	0.08	6.9***	
QTR	0.077	0.0553	0.0351	0.056	0.0326	0.0434	2.596***	314.7***	2.09***	0.07	2.1***	1.08*	4.586***	0.01	0.51	0.1

Critical values $F_\alpha(n-1)(m-1)$are 1.0918, 1.0641, 1.0495 at 1%, 5%, 10% level of significance, respectively.

***, **, and * indicate significant at 1%, 5% and 10% level of significance, respectively.

Results of F-test as shown in table 5.1 and 5.2 indicates that all countries are used as a base country one by one and checked exchange rate volatility in Pakistan with respect to other countries. Value of F-tabulated is 1.0918, 1.0641, 1.0495 (under F test as two tailed) and 1.1021, 1.0641, 1.0648 (as one tail) at 1%, 5%, 10% level of significance, respectively (null hypothesis is variance of both nations are equal). For some countries Ho is rejected and for some countries Ho is accepted. Some countries has less volatile exchange rate with respect to Pakistan than other countries such as New Zealand, Malaysia and Switzerland. Some countries has more volatile exchange rate with respect to Pakistan than other countries such as Japan, USA and Sweden. The main reason for this contradictory result is the effects of other factors rather than currency return. If we examine the workers' remittances, trade share, and loans against the Japan and Saudi Arabia then it is cleared that they contain a major portion of these remittances. Bilateral exchange rate of Pak-Rupee with US-Dollar is greater than bilateral exchange rates of Pak-Rupee with Pound, Euro, Canadian Dollar, Swiss Franc, Australian dollar, Singapore Dollar, and Kuwaiti Dinar. On the other side, bilateral exchange rate of Pak-Rupee with US-Dollar is less than bilateral exchange rates of Pak-Rupee with Swedish Crone, Japanese Yen, Norwegian Crone, Danish Crone, Saudi Riyal, Hong Kong Dollar, Malaysian Ringgit, New Zealand dollar and Qatari Riyal. Bilateral exchange rate of Pak-Rupee with Japanese Yen and Swedish Crone is greater than all other bilateral exchange rates. Bilateral exchange rate of Pak-Rupee with Hong Kong Dollar is greater than all other bilateral exchange rates except by Japanese Yen. Bilateral exchange rate of Pak-Rupee with Kuwait-Dinar is less than all other bilateral exchange rates except Norwegian crone. Bilateral exchange rates of Pak-Rupee with other countries showed mixed results

Table 5.3 Results of F-test under the hypothesis ($H_0: \delta_i^2 = \delta_j^2, H_1: \delta_i^2 \neq \delta_j^2$)

Country	USA	UK	EUR	CD	SWD	AUS	SWE	JPN	NWY	SGR	DMK	SA	HK	KWT	MAS	NZ	QTR
USA																	
UK	2.56***																
EUR	0.826	0.323															
CD	0.5	0.195	0.6053														
SWD	0.32	0.125	0.3872	0.6397													
AUS	0.341	0.133	0.4121	0.6808	1.0642***												
SWE	0.752	0.294	0.9099	1.5033***	2.3499***	2.2081***											
JPN	0.387	0.151	0.4684	0.7739	1.207***	1.136***	0.5148										
NWY	0.726	0.283	0.8781	1.4507***	2.2677***	2.1308***	0.965	1.8746***									
SGR	0.333	0.13	0.4035	0.6667	1.0421***	0.9792	0.4435	0.8615	0.46								
DMK	0.831	0.325	1.0055	1.6613***	2.596***	2.440***	1.105***	2.146***	1.145***	2.4919***							
SA	1.001	0.391	1.2111***	2.001***	3.127***	2.939***	1.331***	2.585***	1.379***	3.001***	1.2***						
HK	0.984	0.384	1.1906***	1.9671***	3.0748***	2.8892***	1.308***	2.541***	1.356***	2.950***	1.18***	0.983					
KWT	0.844	0.33	1.021	1.6869***	2.6369***	2.4778***	1.1221***	2.1799***	1.163***	2.5304	1.02	0.843	0.8576				
MAS	0.462	0.18	0.559	0.9236	1.4437***	1.35***	0.6144	1.1934***	0.637	1.385***	0.56	0.462	0.4695	0.5475			
NZ	0.489	0.191	0.5914	0.9771	1.5274***	1.4352***	0.65	1.262***7	0.674	1.4657	0.59	0.488	0.4967	0.5792	1.058		
QTR	0.956	0.374	1.157***	1.911***	2.9882***	2.8078***	1.2716***	2.4702***	1.318***	2.8674***	1.15***	0.955	0.9718	1.1332***	2.07***	1.95***	

Critical Value:

$F_{\alpha/2}(n-1)(m-1)$are 1.1021, 1.0641, 1.0648 at 1%, 5%, 10% level of significance, respectively.

***, **, and * indicate significant at 1%, 5% and 10% level of significance, respective

Results of F-test as shown in table 5.3 indicate the index of comparison of bilateral exchange rate of Pakistan among selected countries. In this index exchange rate of 1st January 2005 is used as a base and checked the variance in exchange rate of all countries against Pakistan. Applying f-test on this index diverse results are computed. Value of F-tabulated is 1.1021, 1.0641, 1.0648 at 1%, 5%, 10% level of significance, respectively (null hypothesis is variance of both nations are equal). While examining the bilateral exchange rate of Pak rupee with US dollar against bilateral exchange rate of Pak rupee with UK pound, Saudi Riyal and Hong Kong dollar, it is cleared that there is a significant impact which means there is volatility, contrary to all other countries. Bilateral exchange rate of Pak rupee with UK pound against all countries is showing insignificant impact, it means H_o is accepted. Switzerland, Australia, Japan and New Zealand bilateral exchange rate of Pak rupee with Swiss franc, Japanese yen, Australian dollar and New Zealand dollar is showing significant impact with all other countries.

Table 5.4.Results of F-test under the hypothesis ($H_0: \delta_i^2 = \delta_j^2, H_1: \delta_i^2 > \delta_j^2$)

Country	USA	UK	EUR	CD	SWD	AUS	SWE	JPN	NWY	SGR	DMK	SA	HK	KWT	MAS	NZ
USA																
UK	2.56***															
EUR	0.82	0.323														
CD	0.5	0.195	0.605													
SWD	0.32	0.125	0.387	0.63												
AUS	0.341	0.133	0.412	0.68	1.06*											
SWE	0.752	0.294	0.909	1.50***	2.34***	2.20***										
JPN	0.387	0.151	0.468	0.77	1.20***	1.13***	0.51									
NWY	0.726	0.283	0.878	1.45***	2.26***	2.13***	0.96	1.87***								
SGR	0.333	0.13	0.403	0.67	1.042	0.97	0.44	0.86	0.46							
DMK	0.831	0.325	1.005	1.66***	2.59***	2.44***	1.10***	2.14***	1.14***	2.4***						
SA	1.001	0.391	1.21***	2.0***	3.12***	2.93***	1.33***	2.58***	1.37***	3.0***	1.2					
HK	0.984	0.384	1.19***	1.96***	3.07***	2.88***	1.30***	2.54***	1.35***	2.95***	1.18	0.983				
KWT	0.844	0.33	1.02	1.68***	2.63***	2.47***	1.12***	2.17***	1.16***	2.53***	1.02	0.843	0.857			
MAS	0.462	0.18	0.559	0.92	1.44***	1.35***	0.61	1.19***	0.63	1.38***	0.56	0.462	0.469	0.547		
NZ	0.489	0.191	0.591	0.97	1.52***	1.43***	0.65	1.26***	0.67	1.46***	0.59	0.488	0.496	0.579	1.058	
QTR	0.956	0.374	1.157***	1.91***	2.98***	2.80***	1.27***	2.47***	1.31***	2.86***	1.15***	0.955	0.971	1.133***	2.07***	1.96***

Critical values $F_\alpha(n-1)(m-1)$are 1.0918, 1.0641, 1.0495 at 1%, 5%, 10% level of significance, respectively.

***, **, and * indicate significant at 1%, 5% and 10% level of significance, respectively.

Results of F-test as shown in table 5.4 indicate the index of comparison of bilateral exchange rate of Pakistan among selected countries. In this index exchange rate of 1st January 2005 is used as a base and checked the variance in exchange rate of all countries against Pakistan. Applying f-test on this index diverse results are computed. Value of F-tabulated is 1.0918, 1.0641, 1.0495 at 1%, 5%, 10% level of significance, respectively (null hypothesis is variance of both nations are equal). While examining the bilateral exchange rate of Pak rupee with US dollar against bilateral exchange rate of Pak rupee with UK pound, Saudi Riyal and Hong Kong dollar, it is cleared that there is a significant impact which means there is volatility, contrary to all other countries. Bilateral exchange rate of Pak rupee with UK pound against all countries is showing insignificant impact, it means H_0 is accepted. Switzerland, Australia, Japan and New Zealand bilateral exchange rate of Pak rupee with Swiss franc, Japanese yen, Australian dollar and New Zealand dollar is showing significant impact with all other countries

Table 5.5.Results of Bartlett-test under the hypothesis ($H_0: \delta_i^2 = \delta_j^2, H_1: \delta_i^2 \neq \delta_j^2$)

Country	USA	UK	EUR	CD	SWD	AUS	SWE	JPN	NWY	SGR	DMK	SA	HK	KWT	MAS	NZ
UK	766.35***															
EUR	421.12**	143.3***														
CD	70.85***	0.01***	151***													
SWD	503.54***	194.3***	3.99***	203.21***												
AUS	227.2***	41.08***	31.34***	45.3***	8464***											
SWE	6144.9***	70.27***	8257.6***	6994.3***	21854***	7682***										
JPN	19442***	2036***	21642***	20335***	7871***	21049***	9616***									
NWY	5574.1***	6445***	7665.8***	6413***	380.9***	7094***	33.09***	10217***								
SGR	9.22***	32.65***	309.01***	29.07***	7689***	146***	6449***	19764***	5874***							
DMK	5400.3***	6268***	7484.6***	6235.6***	6110***	6964***	56.48***	10402***	3.1***	204***						
SA	3915.9***	4738***	5911.1***	4707.08***	6100***	5359***	519***	12040***	296.4***	7665***	239.9**					
HK	7670.6***	8572***	9821.2***	6538.9***	1030***	9238***	224***	8055***	422.8***	9.22***	495.8**	1348***				
KWT	3839.5***	3060***	2077.2***	3087.8***	1926***	2521***	13325***	2672***	1218***	5911***	1252***	10892***	14196***			
MAS	2219.8***	2938***	4008.7***	2910.3***	4194***	3499***	1669***	14124***	1279***	1926***	1168***	382**	2847***	8830***		
NZ	1.52***	56.42***	373.9***	51.7***	451.8***	192.2***	6268***	1973***	5656***	9238***	5112**	4030***	7757***	3727***	2317***	
QTR	7020.3***	5534***	5699***	4503***	9895***	5150***	615.7***	12265***	372***	192***	309***	4.5***	1490***	1066***	305***	3833***

Values in parenthesis are P-Values.

***, **, and * indicate significant at 1%, 5% and 10% level of significance, respectively.

At first stage, variance of all nations calculated and at second stage pooled variance of all nations across the all countries calculated. Finally by using barlett's formula value of B is calculated. Null hypotheses (equality of variance) and alternative hypotheses (non equality of variance) are used for this purpose. Here barlett's test is compared to chi distribution and p-value at different level of significance. Results of barlett's test indicate that Ho is rejected against every country at 1%, 5% and 10% level of significance. So it can be concluded that bilateral exchange rate volatility of Pakistan against these countries UK, USA, Euro, Canada, Sweden, Australia, Japan and Norway, show significant results. Bilateral exchange rate of Pakistan with South Africa has less volatile with bilateral exchange rate of Qatar than all others. Bilateral exchange rate of Pakistan with UK has less volatile with bilateral exchange rate of Canada with others. Bilateral exchange rate of Pakistan with Euro has less volatile with bilateral exchange rate of Sweden Norway and Denmark. Bilateral exchange rate of Pakistan with japan has more volatile than other countries bilateral exchange rate.

Table 5.6.Results of Bartlett-test under the hypothesis ($H_0: \delta_i^2 = \delta_j^2, H_1: \delta_i^2 \neq \delta_j^2$)

Country	USA	UK	EUR	CD	SWD	AUS	SWE	JPN	NWY	SGR	DMK	SA	HK	KWT	MAS	NZ
UK	598***															
EUR	25.8***	852.6***														
CD	33.08***	1692.9***	174.9***													
SWD	865.1***	992.7***	3.78***	203.2***												
AUS	777.2***	2470***	534.1***	103.0***	2.7***											
SWE	56.79***	2605.6***	8257.6***	6994.3***	497***	7682***										
JPN	609.3***	2000.8***	21642***	20335***	25.3***	21049***	50.5***									
NWY	71.8***	1047***	7665.8***	6413***	4457***	7094***	0.8976***	272***								
SGR	806.4***	2516.1***	309.0***	29.0***	1.187***	146***	57.1***	272.5***	413.7***							
DMK	23.9***	844.7***	239.9***	6235.6***	615.8***	6964***	7.87***	339.7***	12.8***	565.4***						
SA	0.0027	597.1***	5911.1***	4707.0***	866.5***	5359***	57.1***	610.5***	72.2***	807.7***	24.2***					
HK	0.0018	618.3***	9821.2***	6538.9***	841.9***	9238***	50.5***	589.4***	64.7***	783.1***	19.9***	.002				
KWT	20.1***	822.9***	2077.2***	3087.8***	635***	2521***	9.3***	415.6***	15.9***	74.1***	0.1***	20.89***	16.5***			
MAS	408.2***	1845.4***	4008.7***	2910.3***	94***	3499***	164.8***	21.9***	141.8***	101.8***	238.3***	409***	392.7***	250.7***		
NZ	351***	1736.8***	373.9***	51.7***	124.9***	192.2***	129.1***	38***	108.8***	583.9***	195.2***	352***	336.5***	206.5***	2.265***	
QTR	70.9***	645.2***	5699***	4503***	811.6***	5150***	42.8***	563.6***	56.2***	413.7***	25.2***	1.67***	.003	12.2***	37.39***	98.76***

***, **, and * indicate significant at 1%, 5% and 10% level of significance, respectively

At first stage, variance of all nations calculated and at second stage pooled variance of all nations across the all countries calculated. Finally by using barlett's formula value of B is calculated. Null hypotheses (equality of variance) and alternative hypotheses (non equality of variance) are used for this purpose. Here barlett's test is compared to chi distribution and p-value at different level of significance. Results of barlett's test indicate that Ho is rejected against every country at 1%, 5% and 10% level of significance. So it can be concluded that bilateral exchange rate volatility of Pakistan against all countries is present. Over the time Pakistani currency depreciated against all countries. Results show that bilateral exchange rate of Pakistan with UK, Euro, Japan, Kuwait, New Zealand, Norway, Qatar, Sweden, Denmark, Singapore, Hong Kong, Malaysia, Switzerland is significant. Bilateral exchange rate of Pakistan with Saudi Arabia shows insignificant results with Hong Kong. Bilateral exchange rate of Pakistan with USA shows significant result else Saudi Arabia, UK, Euro, Singapore, Denmark, New Zealand, Malaysia, Norway, and Japan.

Figure 5.8: Volatility in index of Bilateral Exchange Rate of Pak-Rupee with US Dollar based on Monthly Standard Deviations of Bilateral Exchange Rates

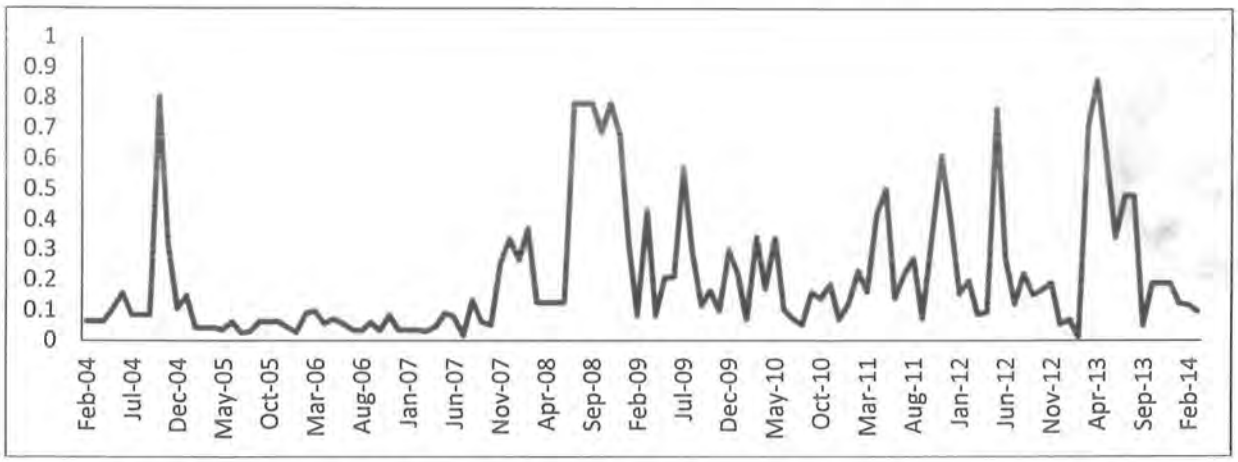


Figure 5.9: Volatility in index of Bilateral Exchange Rate of Pak-Rupee with British Pound based on Monthly Standard Deviations of Bilateral Exchange Rates

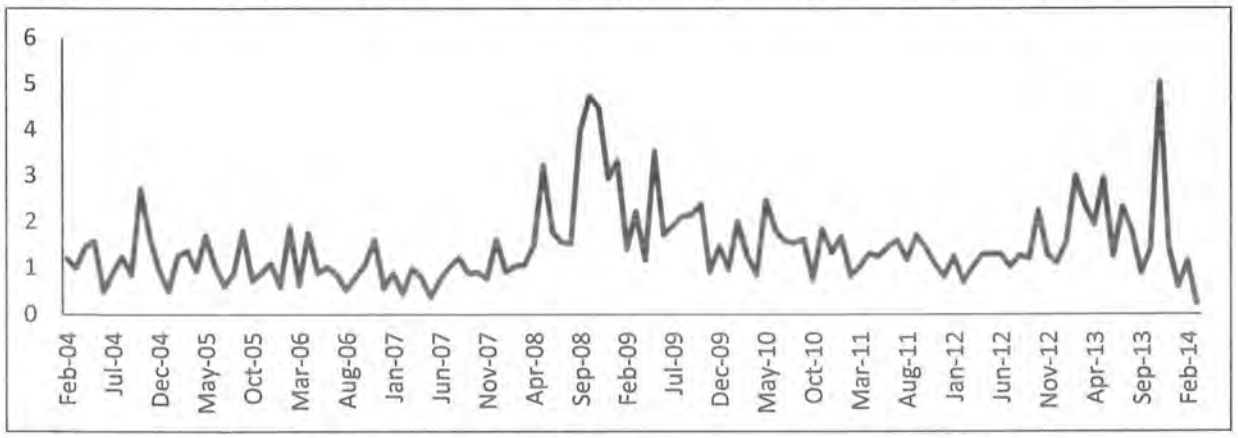


Figure 5.10: Volatility in index of Bilateral Exchange Rate of Pak-Rupee with Canadian-Dollar based on Monthly Standard Deviations of Bilateral Exchange Rates

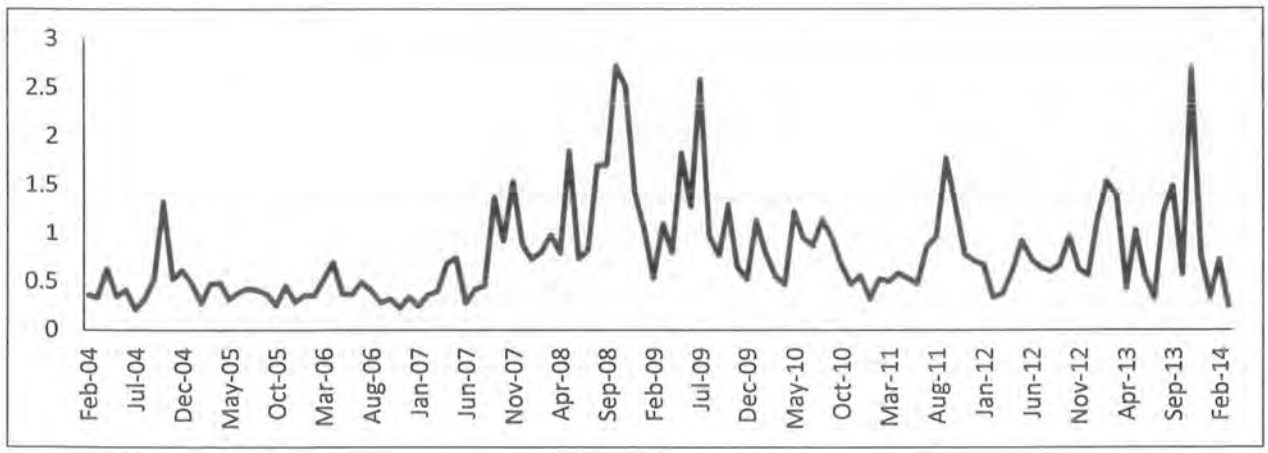


Figure 5.11: Volatility in index of Bilateral Exchange Rate of Pak-Rupee with Australian-Dollar based on Monthly Standard Deviations of Bilateral Exchange Rates

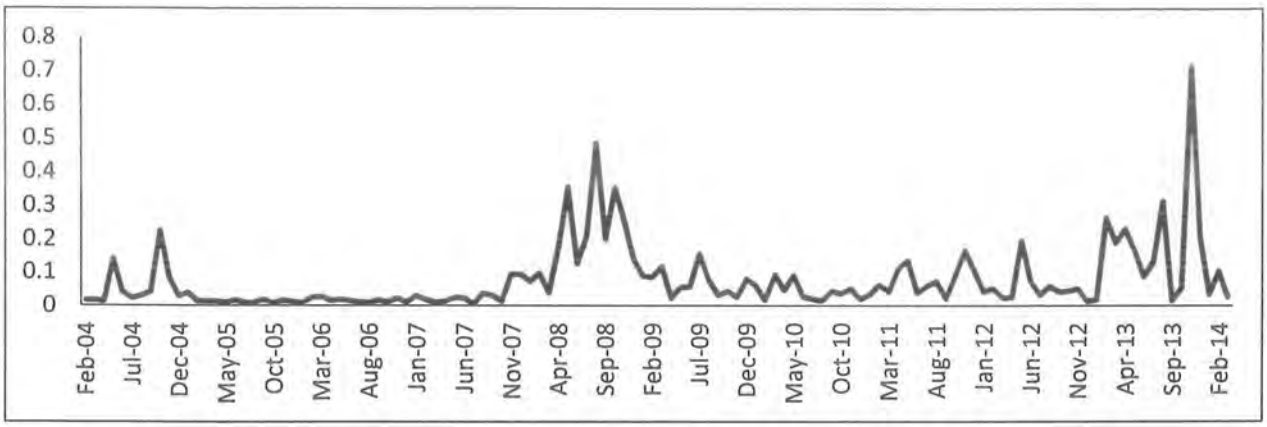


Figure 5.12: Volatility in index of Bilateral Exchange Rate of Pak-Rupee with Japanese-Yen based on Monthly Standard Deviations of Bilateral Exchange Rates

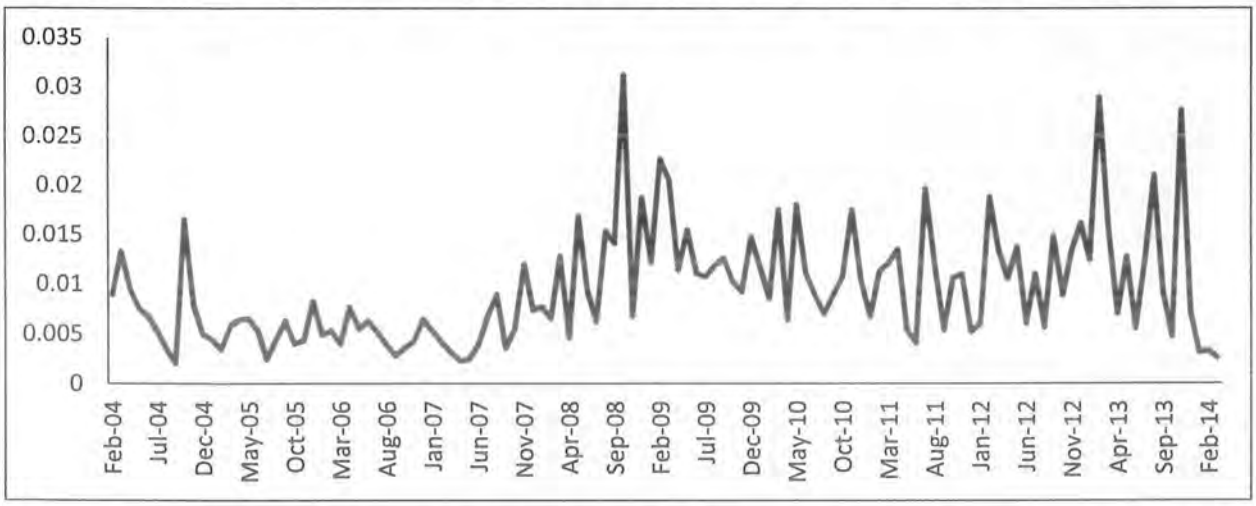


Figure 5.13: Volatility in index of Bilateral Exchange Rate of Pak-Rupee with Euro based on Monthly Standard Deviations of Bilateral Exchange Rates

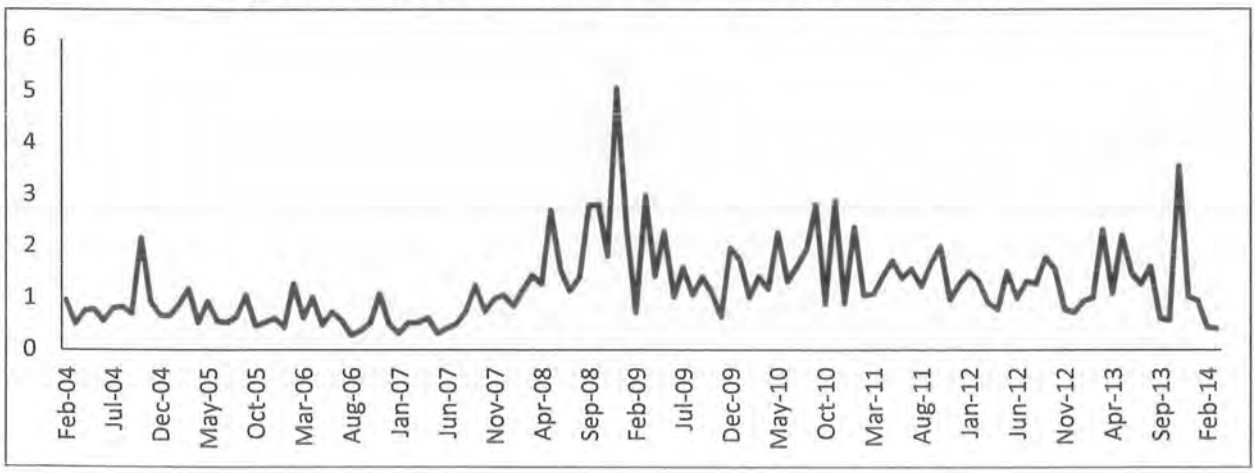
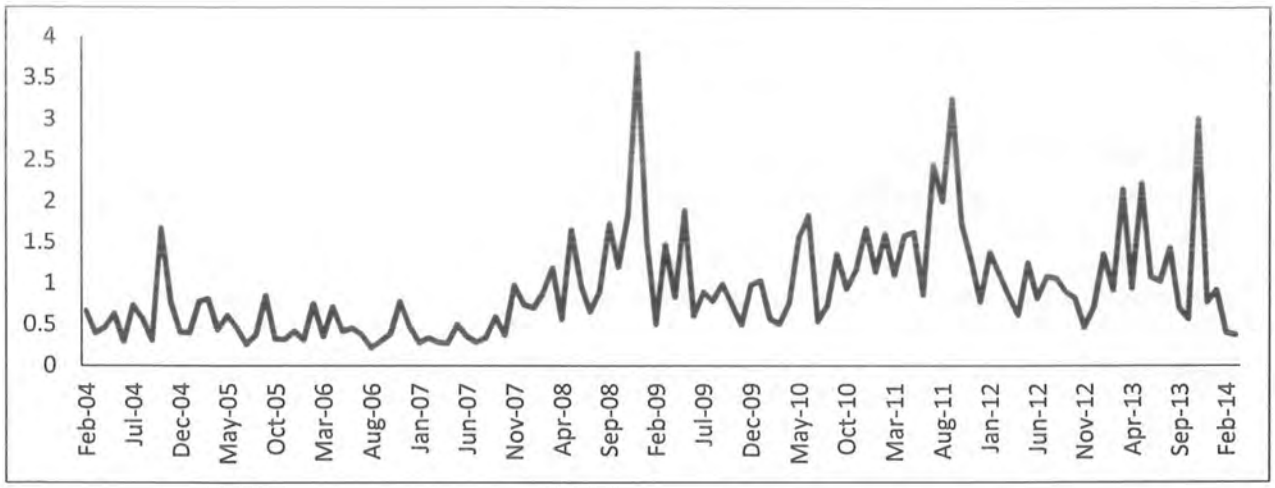


Figure 5.14: Volatility in index of Bilateral Exchange Rate of Pak-Rupee with Swiss-Franc based on Monthly Standard Deviations of Bilateral Exchange Rates



Chapter 6

Conclusion

Our main intention in this thesis is to compare the bilateral exchange rate volatility of Pakistan among the selected countries. For this purpose data of 17 selected countries USA, UK, Euro, Japan, Switzerland, Sweden, Canada, Denmark, Qatar, Saudi Arabia, Malaysia, Australia, Kuwait, Singapore, New Zealand, Hong Kong and Norway is taken from 2nd February 2004 to 10thJuly 2014 and examined whether fluctuations in exchange rate exist or not. We checked the level of volatility in different countries and if there is high or low volatility in any country, than we find the reasons for this. We checked the volatility by using f-test and Bartlett test and index of bilateral exchange rate volatility of Pakistan rupee against all other countries again by F-test and Bartlett test. Japan, Saudi Arabia, USA and Denmark have high volatility rather than Australia, Singapore, New Zealand and Kuwait. There are some factors causing the volatility which are trade share, balance of payments, workers' remittances and FDI. Pakistan's share in world imports has ranged from a minimum of 0.12 percent in 1980 to a maximum of 0.18 percent in 1992. In 2002/03, it was 0.17 percent, suggesting that Pakistan's export performance was influenced by the exchange rate volatility when using the PKR in trade with underdeveloped partners, there is no volatility impact in either the short or long run.

Pakistan's exports to Japan stood at US$478 million while imports from Japan were at US$1,432 million during the year 2013. Similarly the net inflow of Foreign Direct Investments from Japan was US$34.5 million of which Foreign Direct Investment (FDI) accounted for 87 percent which much more than any country such as New Zealand and Singapore. USA is also major trade and

aiding partner to Pakistan means any change in such factors cause very much variability in exchange rate.

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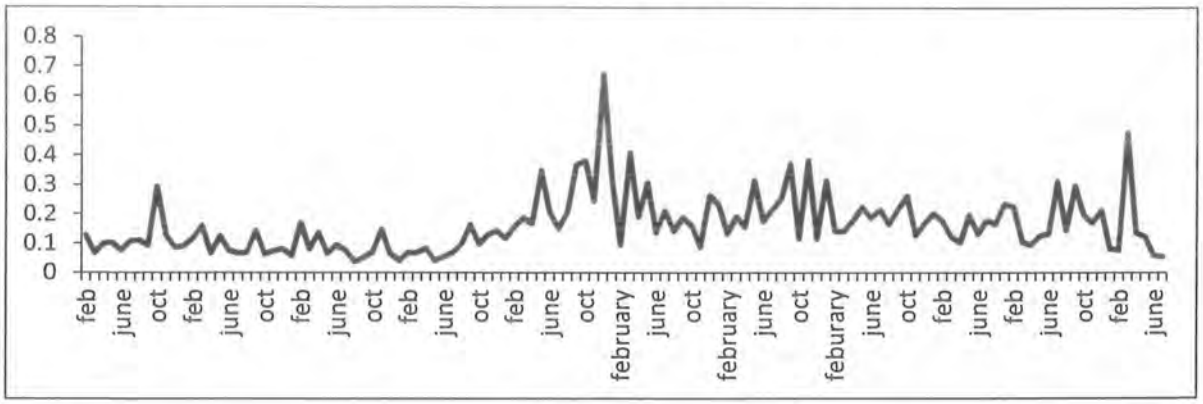
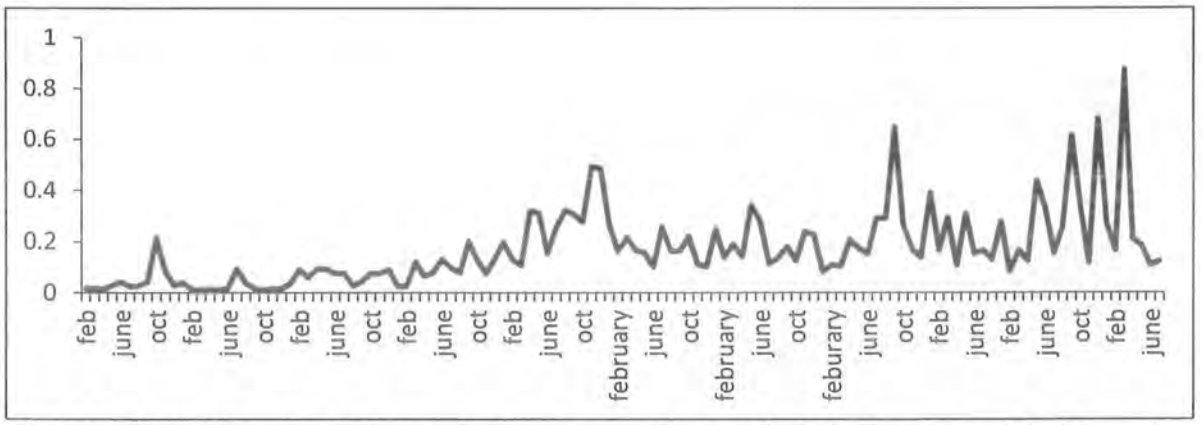
Appendices

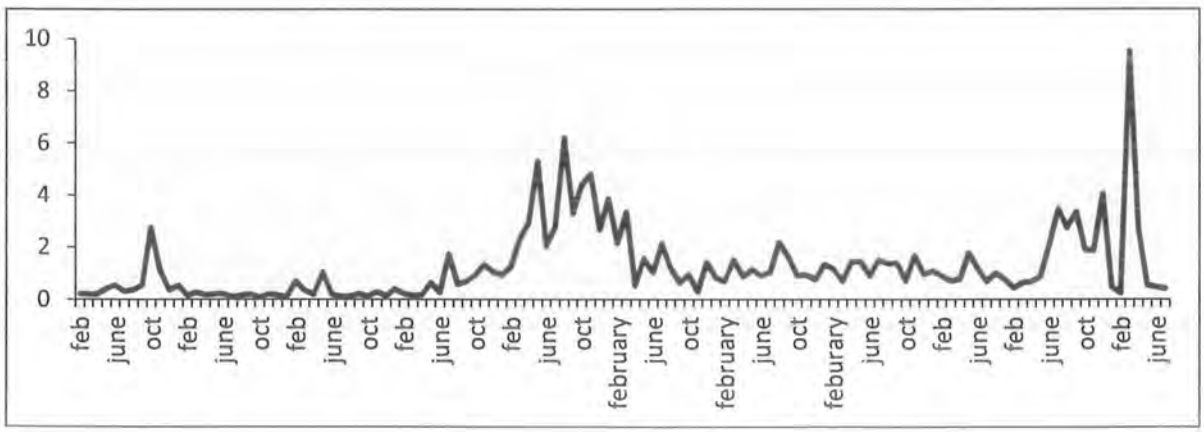
AppendixA1: Volatility in Bilateral Exchange Rate of Pak-Rupee with Danish krone based on Monthly Standard Deviations of Bilateral Exchange Rates



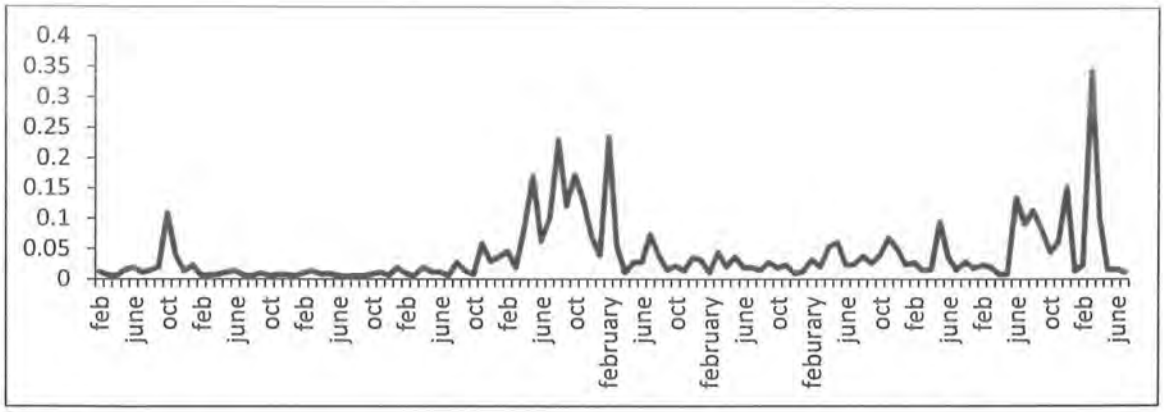
AppendixA2: Volatility in Bilateral Exchange Rate of Pak-Rupee with Malaysian Ringgit based on Monthly Standard Deviations of Bilateral Exchange Rates



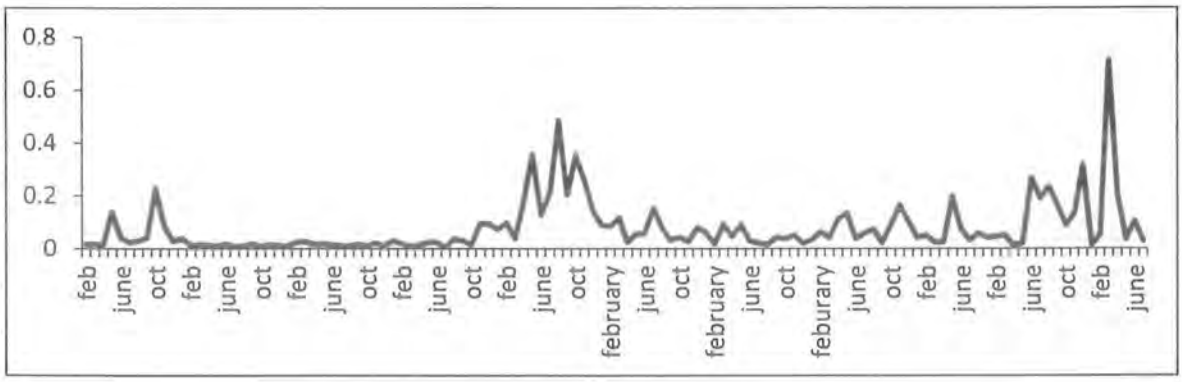
AppendixA3: Volatility in Bilateral Exchange Rate of Pak-Rupee with Kuwait Dinar based on Monthly Standard Deviations of Bilateral Exchange Rates



AppendixA4: Volatility in Bilateral Exchange Rate of Pak-Rupee with Hong Kong Dollar based on Monthly Standard Deviations of Bilateral Exchange Rates



AppendixA5: Volatility in Bilateral Exchange Rate of Pak-Rupee with Saudi Riyal based on Monthly Standard Deviations of Bilateral Exchange Rates



AppendixA6: Volatility in Bilateral Exchange Rate of Pak-Rupee with Singapore Dollar based on Monthly Standard Deviations of Bilateral Exchange Rates