THE IMPACT OF EXCHANGE RATE VOLATILIYON ON DEMAND FOR PAKISTAN'S LEATHER GOODS EXPORTS TO CHINA

MUHAMMAD EJAZ AND Dr. TASNEEM ZAFAR[1]

ABSTRACT

This study examines the impact of exchange rate volatility on demand for Pakistan's leather and leather manufacture exports to China using the annual data for the time period from 1982 to 2014. The measure of exchange rate volatility is constructed in this research work through the moving average standard deviation of the real exchange rate. The Autoregressive Distributed Lag (ARDL) model is applied for analysis of long run and short run relationship among the variables. According to the long run results the impact of exchange rate volatility on demand for Pakistan's leather goods exports to China is found to be negative and statistically significant. As regards the short run dynamics, the coefficient of error correction term is found to be statistically significant with negative sign indicating the convergence towards the long run equilibrium. On the basis of the results obtained this study recommends that financial market in Pakistan should be developed to provide proper hedging facilities to the exporters for covering of the exchange rate risk.

1. INTRODUCTION

1.1 Background

Leather and Leather manufactures are the most widely traded products in the world. According to the statistics of International Trade Centre (ITC) the value of the leather goods being traded in the world annually is more than 80 billion US dollar. This value is expected to increase in the near future with the increase of world population and urbanization in developing countries. The basic input required in the production of leather is the hides/skins of animals. Due to the reduced consumption of red meat in developed countries, the supply of hides and skins have gradually declined there which has caused a reduction in the production of leather products in these countries. As pointed out by United Nations Industrial Development Organization in its report (2010) more than half of the raw material required for leather production now originates from developing countries. The developing countries, having large livestock, have become the major suppliers of hides/skins in the world.

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[1] Muhammad Ejaz < ejazbukhsh@yahoo.com > is Chairman Department of Economics at Govt. MAO College Lahore and Dr. Tasneem Zafar <tasneemzfr@gmail.com> is Chief Instructor at Civil Services Academy, Lahore.

Moreover, these developing countries are also usually labor abundant due to which labour cost is low in these countries. Thus because of the domestic availability of the raw material and low cost labour force in these countries, the world production of leather goods has gradually shifted from the developed to developing countries. The developing countries are now the key players in the world trade of leather goods.

Pakistan is also a developing country and has got competitive advantage in the production of leather and leather products on the basis of availability of indigenous resources in the form of hides/skins and cheap labour force. The leather industry in Pakistan occupies an important position. In the manufacturing sector it is the second largest export earning industry after textiles. Its contribution to the total export earnings is approximately one billion US dollar a year (Pakistan Economic Survey, 2014-15). This is an export oriented industry and most of the products produced by this industry namely Leather tanned, leather apparel, leather gloves and footwear are exported by Pakistan.

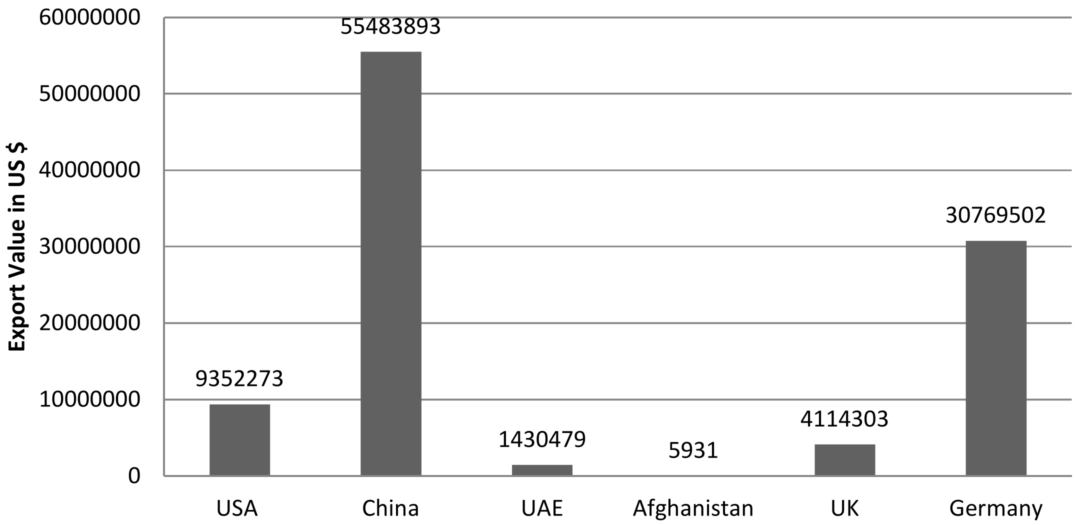
The major markets for Pakistan's exports are USA, China, UAE, Afghanistan, UK and Germany. Approximately 50% of Pakistan's total exports are directed towards these six countries. From the data given in table 1.1 it is evident that China is the second largest market for Pakistan's exports after USA. Among these six major trading partners China is also the largest importer of leather goods from Pakistan. The values of leather goods exported by Pakistan to its six major trading partners in the year 2014 are reflected in the graph 1.1.

Table 1.1: Major Export Markets of Pakistan

Country	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**
	% Share	% Share	% Share	% Share	% Share
USA	17	16	15	14	15
China	6	7	9	11	10
UAE	9	7	10	9	7
Afghanistan	8	9	10	8	7
UK	5	5	5	5	6
Germany	4	5	4	4	5
Total % Share of Above Countries	**49**	**49**	**53**	**51**	**50**

Source: Pakistan Economic Survey, 2014-15.

Figure 1.1: Pakistan's Leather & Leather Manufacture Exports To its Major Trading Partners in 2014



Source: Author's Computation using Data OF COMTRADE (SITC 61)

One of the important factors which could have an impact on the volume of exports of a country is the exchange rate and its volatility. As far as exchange rate is concerned its effect is not controversial. The increase in the exchange rate means depreciation of domestic currency which makes exports relatively cheaper and imports expensive and results in increasing the volume of exports. The reverse will be the situation in case of decrease in the exchange rate. However, as far as the volatility of exchange rate is concerned its impact is ambiguous. Both the theoretical and empirical studies have produced conflicting findings. Thus there is a need to explore the nexus between the exchange rate volatility and export flows further.

1.2 Problem Statement

China is the main strategic ally of Pakistan in the region. Pakistan has close and friendly diplomatic relations with China since 1950s. As indicated in table 1.1 above China is the second largest trading partner of Pakistan. Pakistan exports different products to China including leather and leather manufactures. Since China is one of the major trading partners of Pakistan, it becomes imperative to analyze as to what extent and in what direction the changes in exchange rates between Pakistani Rupee and Chinese Yuan are affecting the exports from Pakistan to China. If we examine the impact of exchange rate volatility on aggregate exports from Pakistan to China then there is strong possibility that the results obtained contain aggregation bias (Mckinsey, 1999 and IMF, 2004). However, if we examine the exports at disaggregate level by selecting some specific commodity for analysis a better insight about the relationship between exchange rate volatility and exports could be obtained. Therefore in order to examine this issue at disaggregate level the present research work is going to empirically investigate the effect of exchange rate volatility on the Pakistan's exports of leather and leather manufactures to China.

In the context of Pakistan economy, there are only few studies which have examined the impact of exchange rate volatility on Pakistan's exports (Kumar and Dhawan (1991), Mustafa and Nishat (2004), Aurangzeb et al (2005), Alam (2010), Aftab et al (2012) and Haseeb & Rubaniy (2014)). The majority of these studies used aggregate data and therefore their results are subject to aggregation bias (Bini-Smaghi (1991) and Langley et al (2000)). Aftab et al (2012) and Haseeb & Rubaniy (2014) did use disaggregate data but they did not examine the issue at bilateral level. As such there is no study to our knowledge which has analyzed the impact of exchange rate volatility on the leather and leather manufactures exports from Pakistan to China. Hence this research work will contribute to the existing knowledge about the relationship between exchange rate volatility and leather goods exports. The findings of this research work will be helpful both for the policy makers and the exporters of leather manufactures of Pakistan.

1.3 Research Objectives

The following are the objectives of this research work:

1. To empirically analyze the long run impact of exchange rate volatility on Pakistan's leather goods exports to China over the period 1982-2014.
2. To examine the short run dynamics in the form of error correction model.
3. To establish whether exchange rate volatility has positively or negatively affected Pakistan's leather goods exports to China.
4. To provide policy recommendations in the light of the findings of this research work.

This research work is organized as follows. The first section is about introduction of this study. The second section covers the literature review. The third section is about research design and methodology. The fourth section elaborates the empirical finding and results and the fifth section concludes this study with some policy recommendations.

2. LITERATURE REVIEW

The nexus between exchange rate volatility and trade flows attracted the attention of researchers after the breakdown of the Bretton Woods System in the early 1970s. Since then a large number of studies have been conducted on this issue. The relationship between exchange rate volatility and trade flows has been investigated both theoretically and empirically. However, the research so far done could not establish an unequivocal relationship between the aforementioned variables. In some studies it has been proved that the exchange rate volatility adversely affects the volume of trade while in others it has been shown that the impact of exchange rate volatility on trade flows could be positive. Moreover, there are such studies as well which could not establish any relationship between these variables. Hence the impact of exchange rate volatility on trade flows is still inconclusive. In the discussion to follow a brief review of the theoretical and empirical contributions made to the literature on this issue is provided.

2.1 Theoretical Models

The early theoretical models to explain the association between exchange rate volatility and volume of trade were developed by Ethier (1973) and Clark (1973). Ethier (1973) developed a model to study the behavior of the risk-averse firm engaged in international trade under exchange rate uncertainty. In his study he concluded that such a firm in anticipation of decline in its profits would reduce its volume of trade when faced with exchange rate volatility. Clark (1973) held similar views about the impact of exchange rate volatility on trade. Taking into account the risk-averse behavior of firms he argued that the exchange rate volatility would adversely affect the volume of trade in the absence of hedging facilities for covering the exchange rate risk. Thus these theoretical models postulated a negative relationship between exchange rate volatility and trade flows.

In contrast to the above studies, some other theoretical models attempted to explain a positive linkage between exchange rate volatility and trade. In this regard one important theoretical contribution to the literature is by De Grauwe (1988) who postulated that exchange rate volatility could have either positive or negative effect on the volume of trade depending upon the substitution or income effects. In fact De Grauwe (1988) decomposed the exchange rate volatility impact into income and substitution effects. He argued that under the substitution effect the risk-averse traders are tempted to reduce their exports because of the decline in their expected marginal utility from the export earnings whereas under the income effect the traders increase their exports in order to avoid a fall in their revenue. Thus substitution and income effects work in opposite directions. De Grauwe (1988) inferred that if the income effect dominates the substitution effect then there would be positive relationship between exchange rate volatility and trade flows. In the alternative case this relationship would turn out to be negative.

Another theoretical model by Franke (1991) analyzed the behavior of the trading firms under exchange rate volatility and provided support for the positive relationship between exchange rate volatility and volume of trade. Secru (1992) also showed that under the condition of exchange rate volatility the exporter could expect to receive the price greater than its costs which could work as an incentive for the firm to increase its exports. Brada & Mendez (1988) and Broll & Eckwert (1999) also hypothesized a positive link between exchange rate volatility and trade.

The above mentioned theoretical models are based upon certain assumptions about the risk taking attitude of traders, market structures, adjustment costs, and availability of hedging facilities etc. Depending upon the restrictive assumptions, these theoretical models have explained both the negative and positive relationship between exchange rate volatility and trade flows. Thus on theoretical grounds the issue is indeterminate. In order to explore this relationship further the empirical studies are reviewed in the following section 2.2.

2.2 Empirical Studies

Mckenzie (1999) and Bahmani-Oskooee & Hegerty (2007) have surveyed the empirical literature related to exchange rate volatility and trade extensively. A brief review of selected empirical studies is presented here. The first systematic analysis of exchange volatility and trade was done by Hooper and Kohlhagen (1978). They examined the bilateral trade of USA, Germany and some other developed countries for the period from 1965 to 1975. They obtained the results that exchange rate volatility did not have a significant impact on the volume of trade of these countries. Following the methodology used by Hooper and Kohlhagen, Cushman (1983) re-examined the issue after extending the sample size for the time period 1965-77. He found that out of 14 bilateral trade flows considered in his study six were proved to have negative relationship with exchange rate volatility.

Akhtar and Hilton (1984) studied the bilateral trade flows between Germany and USA for the period between 1974 and 1981 using data of quarterly frequency. They found negative impact of exchange rate volatility on the bilateral trade flows of both USA and Germany. Bailey et al (1986) examined the impact of exchange rate volatility on the exports of seven big OECD countries (i.e. Canada, France, Germany , Italy, Japan , UK and US) using aggregate export data for the time period from 1973 to 1984. They found positive relationship between exchange rate volatility and exports both in the short run and long run.

Koray and Lastrape (1989) investigated the impact of exchange rate volatility on the bilateral trade flows of United States with its five industrialized trading partners for the period 1959 to 1985. Their results revealed a weak relationship between exchange rate volatility and trade. Asseery and Peel (1991) pointed out that the inconclusive results obtained in this field of research were due to application of wrong estimation methodology on the time series data. Therefore, they analyzed the exports of Australia, Japan, Germany, US and UK over the period 1972-87 using the latest techniques being developed at that time (i.e cointegration and error correction). They found that exchange rate volatility had positive effect on the exports of these countries.

Chowdhury (1993) examined the relationship between exchange rate volatility and trade flows of G-7 countries through the error correction model. According to the findings of this study exchange rate volatility had negative impact on the exports of the G-7 countries. Mckenzie and Brooks (1997) investigated the relationship of exchange rate volatility and trade flows between US and Germany for the period from 1973 to 1993. They developed the model in which trade was made a function of income, prices and exchange rate volatility. Their results revealed positive link between exchange rate volatility and trade flows.

Arize et al (2000) examined the effect of exchange rate uncertainty on the exports from thirteen less developed countries using the Johansen Co-integration technique and the error correction model. Their results proved a negative relationship between exchange rate volatility and exports. Using the bounds testing approach developed by Pesaran et al (2001), De vita and Abbott (2004) investigated the impact of exchange rate volatility on US exports to Canada, Germany Japan, Mexico and UK for the time period from 1987 to 2001. They measured volatility as a moving average standard deviation of the real exchange rate. Their study found mixed results. In case of Germany, Mexico and UK the effect of exchange rate volatility was significantly negative while in case of Japan it turned out to be positive. Hence, the effect of exchange rate volatility was indeterminate.

Kasman and Kasman (2005) examined the effect of real exchange rate volatility on the exports of Turkey to its major trading partners over the period 1982-2001. They estimated the results by employing the cointegration and error correction approaches on the quarterly data for the period from 1982 to 2001. They found that exchange rate volatility had positively affected the volume of exports of Turkey in the long run. Employing the Autoregressive Distributed Lag Model, Sekantsi (2008) found negative relationship between exchange rate volatility and South African exports to US for the period 1995-2007.

Chit et al (2010) analyzed the link between exchange rate volatility and real exports of five East Asian emerging economies among themselves and to 13 other industrialized countries using quarterly data for the period from 1982 to 2006. This study estimated a gravity model and found that the exchange rate volatility had significantly negative effect on exports of these East Asian countries. Applying the ARDL methodology Srinivasan and Kalaivani (2013) examined the link between exchange rate volatility and real exports in India. They used annual time series data for the period from 1970 to 2011. The results of the study revealed negative relationship between exchange rate volatility and real exports both for the short run as well as the long run.

Serenis and Tsounis (2014) examined the impact of exchange rate volatility on the aggregate exports of two small countries namely Croatia and Cyprus by applying the ARDL methodology on the quarterly data for the period from 1990 to 2012. The results of the study revealed positive relationship between exchange rate volatility and exports of these two countries.

Bahamani-Oskooee et al (2014) investigated the impact of exchange rate volatility on the United States' trade flows (i.e. both exports and imports) with Spain over the time period 1962-2009. In order to avoid the aggregation bias this study used industry level data of US export and import. The findings of the study indicated that out of 74 US export industries only 35 were affected with exchange rate volatility (11 positively and 24 negatively) whereas the remaining appeared to be insensitive to the changes in exchange rate. Thus this study has shown that the impact of exchange rate volatility could vary from industry to industry.

As regards the empirical literature on Pakistan, there are only a few studies which have examined the impact of exchange rate volatility on Pakistan's exports (Kumar and Dhawan (1991), Mustafa and Nishat (2004), Aurangzeb et al (2005), Alam (2010), Aftab et al (2012) and Haseeb & Rubaniy (2014)). The majority of these studies used aggregate data and therefore their results are subject to aggregation bias (Bini-Smaghi (1991) and Langley et al (2000)). Aftab et al (2012) and Haseeb & Rubaniy (2014) did use disaggregate data but they did not examine the issue at bilateral level. Hence there is scope to explore this issue further in case of Pakistan using disaggregate data at bilateral level.

A summary of some selected studies on exchange rate volatility and trade is presented in the table 2.1 below.

Table 2.1 Exchange Rate Volatility and Trade: Summary of Selected Studies

Researcher (Year)	Sample Period	Estimation Technique	Impact of Volatility on Trade Flows
Akhtar and Hilton (1984)	Quarterly: 1974-1981	OLS	Significantly Negative
Bailey et al (1986)	Quarterly: 1973-1984	OLS	Significantly Positive
Thursby & Thursby (1987)	Annual: 1974-1982	OLS	Significantly Negative
Brada and Mendez (1988)	Annual: 1973-1977	OLS	Significantly Positive
Koray and Lastrapes (1989)	Monthly: 1961-1985	VAR	Negative, but weak
Kumar and Dhawan (1991)	Quarterly: 1975-1985	OLS	Significantly Negative
Chowdhury (1993)	Quarterly: 1973-1990	Granger Cointegratioin	Significantly Negative
Arize (1995)	Quarterly: 1973-1992	Granger Cointegration	Significantly Negative
McKenzie and Brooks (1997)	Monthly: 1973-1992	OLS	Significantly Positive
Doroodian (1999)	Quarterly: 1973-1996	ARMA	Significantly Negative
Doganlar (2002)	Quarterly: 1980-2002	Error Correction Model	Significantly Negative

De Vita and Abbot (2004)	Quarterly: 1987-2001	ARDL	Significantly Negative
Mustafa and Nishat (2004)	Quarterly: 1991-2004	Johansen Conitegration	Both Negative and no effect.
Kasman and Kasman (2005)	Quarterly: 1982-2001	Cointegration and ECM	Significantly Positive
Sekantsi (2008)	Annual: 1995-2007	ARDL	Significantly Negative
Ozturk and Kalyoncu (2009)	Quarterly: 1980-2005	Granger Cointegration	Both Negative and Positive
Chit et al (2010)	Quarterly: 1982-2006	Gravity Model	Significantly Negative
Verheyen (2012)	Monthly: 1992-2010	ARDL	Significantly Negative
Srinivasan and Kalaivani (2013)	Annual: 1970-2011	ARDL	Significantly Negative
Serenis and Tsounis (2014)	Quarterly: 1990-2012	ARDL	Significantly Positive

Source: Various Studies

From the empirical literature summarized in the above table it is evident that the impact of exchange rate volatility on trade flows is inconclusive. Some of the empirical studies are claiming negative relationship between exchange rate volatility and trade, some are showing positive link between these variables and some fail to prove any nexus between exchange rate volatility and trade. Hence there is scope for further analysis of this issue.

Moreover as shown in table 2.1, different estimation methods have been used in the literature to examine the relationship between exchange rate volatility and exports. However, Bahmani-Oskooee & Hegerty (2007) have strongly recommended that the future studies should rely on the ARDL bounds testing approach of Pesaran et al (2001) for analysis of this nexus. Therefore this research work is going to apply the ARDL Model to investigate the linkage between exchange rate volatility and Pakistan's leather and leather goods exports to the China.

3. RESEARCH DESIGN

3.1 Model Specification

In line with the export demand model developed by De Vita and Abbot (2004) this study specifies the following model to examine the impact of exchange rate volatility on the demand for leather goods exports from Pakistan to China over the period 1982-2014:

$$LNLEX_t = \beta_0 + \beta_1 LNRER_t + \beta_2 LNGDP_t + \beta_3 Vol_t + \varepsilon \tag{3.1}$$

In equation 3.1, LEX stands for leather and leather manufacture exports of Pakistan to China expressed in US $, RER is the real bilateral exchange rate between Pakistani rupee and Chinese Yuan, GDP represents the Gross Domestic Product of China, Vol is a measure of exchange rate volatility, LN is the symbol for natural logarithm, t is for time dimension and ε is the stochastic error term. The real exchange rate and GDP are expected to affect the leather goods exports from Pakistan to China positively. As regards the impact of volatility measure on the leather goods exports it could either be positive or negative. Hence, it is hypothesized that $\beta_1 > 0$, $\beta_2 > 0$ and $\beta_3 < 0$ or > 0.

3.2 Data Sources and Variable Definitions

The data for variables included in this research work has been collected from different sources. First of all the data for the dependent variable i.e. leather and leather manufacture exports of Pakistan to China over the years 1982-2014 has been obtained in US dollar from the United Nations' COMTRADE database under the Standard International Trade Classification (Revision 2) at two digit level (product code 61). The data for the variable real exchange rate has been computed by the author using the following formula:

$$\text{Real Exchange Rate} = NER \times \frac{CPI^{CHN}}{CPI^{PAK}} \tag{3.2}$$

In the above equation 3.2 NER stands for nominal exchange rate which is measured as units of Pakistani rupees required to purchase one unit of Chinese Yuan whereas CPI represents the consumer price index of China and Pakistan respectively. The data for nominal exchange rate has been obtained from Pakistan Economic Survey (various issues), the data for CPI of China has been collected from IMF's World Economic Outlook database whereas the data for CPI of Pakistan is obtained from the World Bank's World Development

Indicators database. The data for the variable Gross Domestic Product (GDP) of China is also from the World Development Indicators database. The variable volatility is measured in this research work by moving average standard deviation using the following formula:

$$Vol_t = \left[1/2 \sum_{i=1}^{2} \left(LRER_{t+i-1} - LRER_{t+i-2} \right)^2 \right]^{1/2} \tag{3.3}$$

In this equation 3.3 the exchange rate volatility measure is constructed on the basis of the logarithmic values of real exchange rates. The number 2 mentioned above the summation sign in the equation is basically the order of the moving average standard deviation and t is the time indicator. After defining the variables the descriptive statistics of these variables are presented in the following table 3.1.

Table 3.1 Descriptive Statistics

	ΔLnLEX	**ΔLnRER**	**ΔLnGDP**	**VOL**
Mean	0.09	0.01	0.12	0.05
Median	0.16	0.01	0.12	0.04
Maximum	5.04	0.18	0.26	0.15
Minimum	-3.61	-0.21	-0.10	0.00
Std. Deviation	1.30	0.08	0.08	0.04
Observations	32	32	32	32

Source: Author's Calculations

In the above table 3.1 the symbol Δ is the first difference operator. The summary statistics of the variables LnLEX, LnRER and LnGDP have been computed after taking their first difference. The reason for taking their first difference is that these variables are non-stationary at level but become stationary at the first difference as shown in tables 4.1 and 4.2 of the next section. Therefore the summary statistics of these variables have been calculated after taking first difference of these variables. As regards the variable Vol it is found to be stationary at level, therefore its descriptive statistics have been computed in the level form.

3.3 Estimation Technique / Methodology

This is a time series study. One of the issues related to the time series analysis is the non-stationarity of the variables under consideration. Therefore it is important to apply appropriate tests to check the stationarity of the variables in order to avoid spurious regression results (Granger and Newbold, 1974). Stationarity carries the meaning that the mean, variance and covariance of the variable under analysis is constant and does not change over time. This research work will apply the commonly used Augmented Dickey Fuller and Phillips Perron tests for checking stationarity of the variable. These tests are also known as unit root tests.

The unit root tests help in determining the order of integration of the variables. On the basis of order of integration of variables appropriate econometric time series technique is selected. If all the variables are found to be integrated of order zero then the ordinary least square method is applied for estimation of parameters. If all the variables are found to be integrated of order one then Johansen Cointegration methodology should be selected for analysis. However, if the variables are found to be integrated of mixed order i.e. of order zero and order one but none of the variable is integrated of order two, then under such situation the appropriate time series technique to apply is the Autoregressive Distributed Lag (ARDL) Model of Pesaran et al (2001).

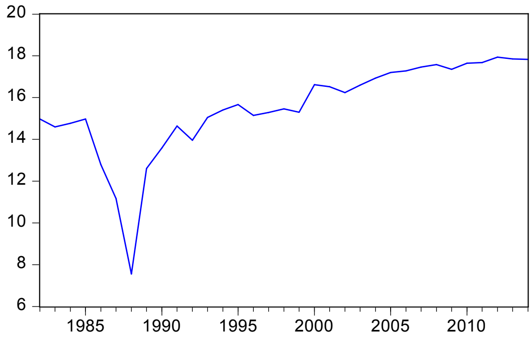
The Autoregressive Distributed Lag (ARDL) Model involves a two step procedure. In the first step cointegration among the variables is checked through the bounds testing approach. If cointegration is established then the long run and short run parameters are estimated in the second step. This methodology is suitable for small sample data set as indicated by Haug (2002). Taking into account the sample size, this research work is going to apply Autoregressive Distributed Lag (ARDL) Model for estimation purpose. After estimation of the long run and short results, this study will apply diagnostic tests to address the issues of normality, serial correlation, heterosckedasticity and functional form specification. Finally the CUSUM and CUSUM of Squares tests will be used to check the stability of the estimated parameters.

4. RESULTS AND DISCUSSION

4.1 Graphical Analysis

It is a common saying that a picture is worth a thousand words. This saying is quite applicable in economic analysis. A graphical presentation in economics can depict the underlying idea or concept easily which otherwise may require a long explanation in words. In time series analysis graphs are helpful in portraying the trend of the variable. Chatfield (2004) pointed out that "anyone who tries to analyze a time series without plotting it first is asking for trouble". Hence before proceeding further it is appropriate to have a look at the graphs of the variables being considered in this study. The figures 4.1 to 4.4 plots the variables of this research work in level form.

Figure 4.1 Log of Leather Goods Export



Figuer 4.2 Log of GDP of China

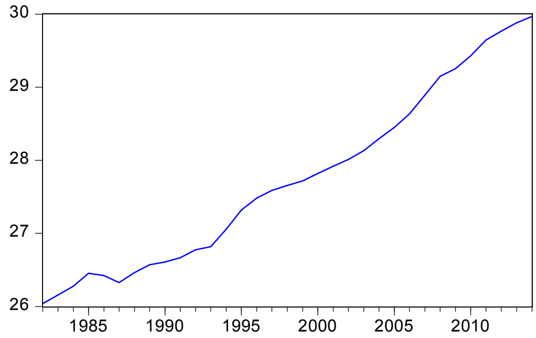


Figure 4.3 Log of Real Exchange Rate

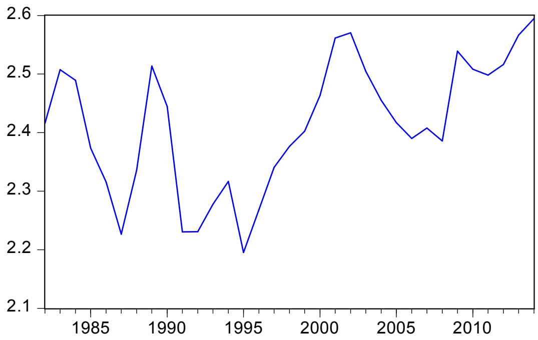
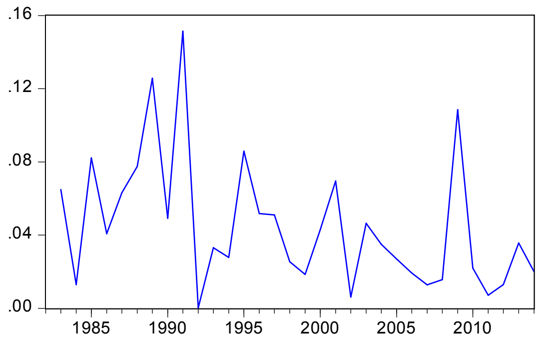


Figure 4.4 Volatility Measure_MASD



From the above graphs it can be inferred that the variables leather goods exports, GDP of China and real exchange rate contain some trend and are therefore non-stationary whereas the variable volatility measure is stationary because it does not seem to have a trend.

When we plot these variables in first differenced form the element of trend is eliminated and all the variables appear to be stationary. The graphs of the variables of this research work in differenced form are presented in figures 4.5 to 4.8 below.

Figure 4.5 Differenced Log of Leather Exports

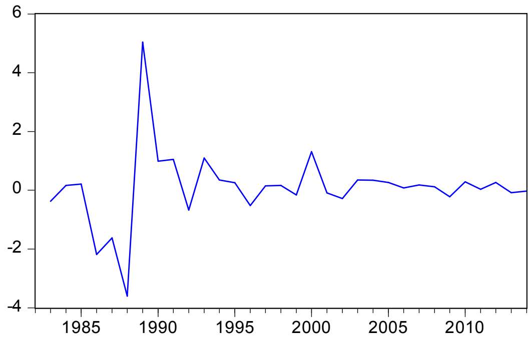


Figure 4.6 Differenced Log of GDP_China

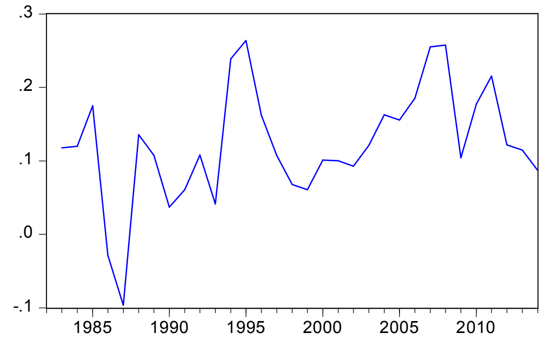


Figure 4.7 Differenced Log of Real Exchange Rate

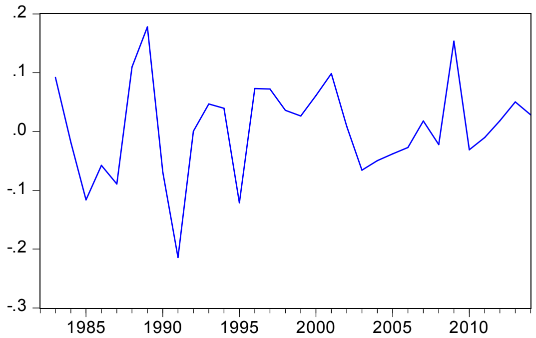
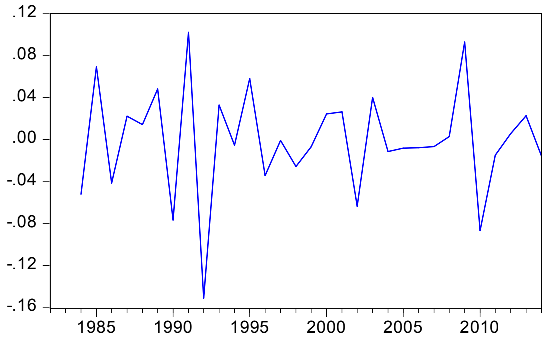


Figure 4.8 Differenced Volatility Measure_MASD



4.2 Unit Root Tests

After examining the graphs of the variables, we now proceed to formally check the stationarity of these variables and determine their order of integration. The tests used for checking the stationarity of variables are usually known as unit root tests. Two of these tests are Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test. The ADF is a parametric test whereas the PP is a non-parametric test. In case of small samples the PP test is more powerful than the ADF test (Mwangi et al, 2014). Both these tests are performed in three different forms i.e. (i) with constant (ii) with constant and trend and (iii) without constant and trend. The testing procedure for applying these tests is that first we estimate the equation with constant and trend and if trend turns out to be significant then this model is used for determining the stationarity of the variable. However, if it is found that trend is not significant then we move on to estimate the equation with constant only and if then the constant is also found to be insignificant then the equation without constant and trend is estimated. This is the procedure applied by Belloumi (2014) while testing the order of integration of the variables of his study. Following Belloumi (2014), this research work performs the ADF and PP unit root test in the same way. The results of the ADF and PP unit root test are presented in tables 4.1 and 4.2.

Table 4.1 ADF and PP Tests on the log level of Variables

	ADF Test			**PP Test**	
Variables	SIC Lag	t-statistic	Critical Value at 5%	t-statistic	Critical Value at 5%
LnLEX	0	-3.11[b]	-3.56	-2.86[b]	-3.56
LnRER	0	-1.81[a]	-2.96	-1.72[b]	-3.56
LnGDP	1	-2.05[b]	-3.56	-1.46[b]	-3.56
VOL	0	-6.60[b]	-3.56	-7.64[b]	-3.56

a Model without trend
b Model with constant and trend
Source: Author's Computation

Table 4.2 ADF and PP Tests on First Difference of Variables

	ADF Test			**PP Test**	
Variables	SIC Lag	t-statistic	Critical Value at 5%	t-statistic	Critical Value at 5%
D(LnLEX)	3	-3.17[c]	-1.95	-6.71[c]	-1.95
D(LnRER)	0	-4.86[c]	-1.95	-5.47[c]	-1.95
D(LnGDP)	0	-3.41[a]	-2.96	-3.48[a]	-2.96
D(VOL)	4	-4.69[c]	-1.95	-29.91[c]	-1.95

a Model without trend
b Model with constant and trend
c Model without constant and trend
Source: Author's Computation

According to both the ADF and PP tests results reported in table 4.1 the variables LnLEX, LnRER and LnGDP are non-stationary at level whereas the variable of volatility measure i.e. Vol is found to be stationary at level. However, in the first difference form all the variables become stationary as shown in table 4.2. Hence it is concluded that the variables LnLEX, LnRER and LnGDP are integrated of order one i.e. I(1) whereas the variable VOL is integrated of order zero.

Since the variables under consideration in this research work have different order of integration, the suitable time series estimation technique to use in this situation is the Autoregressive Distributed Lag Model developed by Pesaran and Shin (1999) and Pesaran et al (2001).

4.3 ARDL Bounds Testing Approach

The ARDL approach of cointegration is used for checking the long run and short run relationship among the variables of this research work. This estimation technique has certain advantages over the other cointegration methods like Engle & Granger (1987) and Johansen and Juselius (1990). First of all in the ARDL approach it is not required that all the variables be integrated of the same order. This methodology can be applied even when some of the variables are integrated of order one and some of order zero. However, none of the variable should be of order two i.e. I (2). Another advantage of ARDL approach as pointed out by Harris and Sollis (2003) is that it provides unbiased estimates of the long run model even in the presence of endogenous regressors. Moreover, the ARDL cointegration approach is also suitable for small sample data set as indicated by Haug (2002).

The equations for the ARDL model of this research work are specified as under:

$$D(\ln(LEX_t) = a_{01} + b_{11}\ln(LEX_{t-1}) + b_{21}\ln(GDP_{t-1}) + b_{31}\ln(RER_{t-1}) + b_{41}\ln(VOL_{t-1})$$

$$\begin{aligned} &+\sum_{i=1}^{p} a_{1i} D(\ln(LEX_{t-i})) + \sum_{i=1}^{q} a_{2i} D(\ln(GDP_{t-i})) + \sum_{i=1}^{q} a_{3i} D(\ln(RER_{t-i})) \\ &+\sum_{i=1}^{q} a_{4i} D(\ln(Vol_{t-i})) + \varepsilon_{1t} \end{aligned} \tag{4.1}$$

$$D(\ln(GDP_t) = a_{02} + b_{12}\ln(LEX_{t-1}) + b_{22}\ln(GDP_{t-1}) + b_{32}\ln(RER_{t-1}) + b_{42}\ln(VOL_{t-1})$$

$$\begin{aligned} &+\sum_{i=1}^{p} a_{1i} D(\ln(GDP_{t-i})) + \sum_{i=1}^{q} a_{2i} D(\ln(LEX_{t-i})) + +\sum_{i=1}^{q} a_{3i} D(\ln(RER_{t-i})) \\ &+\sum_{i=1}^{q} a_{4i} D(\ln(Vol_{t-i})) + \varepsilon_{2t} \end{aligned} \tag{4.2}$$

$$D(\ln(RER_t) = a_{03} + b_{13}\ln(LEX_{t-1}) + b_{23}\ln(GDP_{t-1}) + b_{33}\ln(RER_{t-1}) + b_{43}\ln(VOL_{t-1})$$

$$\begin{aligned} &+\sum_{i=1}^{p} a_{1i} D(\ln(RER_{t-i}) + \sum_{i=1}^{q} a_{2i} D(\ln(GDP_{t-i}))+) + \sum_{i=1}^{q} a_{3i} D(\ln(LEX_{t-i})) \\ &+\sum_{i=1}^{q} a_{4i} D(\ln(Vol_{t-i})) + \varepsilon_{3t} \end{aligned} \tag{4.3}$$

$D(\ln(VOL_t) = a_{04} + b_{11}\ln(LEX_{t-1}) + b_{24}\ln(GDP_{t-1}) + b_{34}\ln(RER_{t-1}) + b_{44}\ln(VOL_{t-1}) +$

$$\sum_{i=1}^{p} a_{1i} D(\ln(Vol_{t-i})) + \sum_{i=1}^{q} a_{2i} D(\ln(GDP_{t-i})) + \sum_{i=1}^{q} a_{3i} D(\ln(RER_{t-i})) + \sum_{i=1}^{q} a_{4i} D(\ln(LEX_{t-i})) + \varepsilon_{4t} \tag{4.4}$$

In the above equations 4.1 to 4.4 all the variables are as previously defined. In these equations ln(.) represents natural logarithm, D stands for the first difference and ε_{it} are the stochastic error terms. In the ARDL model the existence of cointegration among variables is tested through bounds F-test. The F test is applied to check the joint significance of the coefficients of the lagged level variables under the null hypothesis of H_0: $b_{1i} = b_{2i} = b_{3i} = b_{4i} = 0$ against the alternate hypothesis that H_1: $b_{1i} = b_{2i} = b_{3i} = b_{4i} \neq 0$. The critical values for this test have been developed by Pesaran et al (2001) at two different levels i.e. lower level and upper level. If the calculated F statistic exceeds the upper critical value then the null hypothesis of no cointegration is rejected. If the F statistic value lies below the lower critical bound then we cannot reject the null hypothesis and if the value of F statistic falls between the lower and upper bounds then the test becomes inconclusive. As is evident from the equations 4.1 to 4.4 ARDL cointegration test is applied by treating each variable as a dependent variable in turn. The results of the ARDL bounds test are presented in the table 4.3.

Table 4.3 ARDL Bounds Tests Results

Dependent Variable	Critical Values	F-statistic	Outcome
F_{LEX} (LEX\GDP, RER,VOL)		7.49	Cointegration
F_{GDP} (GDP\ LEX, RER,VOL)		2.08	No Cointegration
F_{RER} (RER\ LEX, GDP ,VOL)		5.74	Cointegration
F_{VOL} (VOL\ LEX, GDP , RER)		16.37	Cointegration
Lower Critical Value at 5%	**3.23**		
Upper Critical Value at 5%	**4.35**		

Source: Author’s Calculations.

From the results given in table 4.3 it is clear that cointegration is proved when we treat the leather goods exports (LEX) , the real exchange rate (RER) and the volatility measure (Vol) as dependent variable because in these cases the values of calculated F statistics are greater than the upper critical values at 5% level of significance. Only in one case when we treat GDP as a dependent variable we find that cointegration is not established. Hence in three out of four cases cointegration is proved among the variables of this research work. Since the objective of this research work is to examine the impact of exchange rate volatility and other variables on the leather goods exports from Pakistan to China, therefore the model in which leather goods exports (LEX) is treated as dependent variable will be analyzed further to obtain long run and short estimates.

After confirming the existence of long run relationship among the variables of this study through the ARDL bounds test approach the next step is to estimate the long run parameters. For this purpose the following ARDL (p, q_1, q_2, q_3) model is specified:

$$\mathrm{Ln}\,(\mathrm{LEX}_t) = \mathrm{a}_0 + \sum_{i=1}^{p} a_{1i} \ln(LEX_{t-i}) + \sum_{i=0}^{q_1} a_{2i} \ln(RER_{t-i}) + \sum_{i=0}^{q_2} a_{3i} \ln(GDP_{t-i}) + \sum_{i=0}^{q_3} a_{4i} \ln(Vol_{t-i}) + \varepsilon_t \tag{4.5}$$

The lags for the ARDL model specified in equation 4.5 are selected using the Akaike information criterion. The estimated long run coefficients of the ARDL model are reported in the following table 4.4.

Table 4.4 Long Run Estimates of ARDL (4,2,2,1) Model

Variable	Coefficient	t-Statistic	Probability
$\mathrm{Ln(GDP)}_{\mathrm{China}}$	0.5090	1.5105	0.1504
Ln(RER)	5.8189	1.9646	0.0671
Vol	-18.0052	-2.2452	0.0392
C	-13.3187	-2.4348	0.0270

Source: Author’s Computation.

The long run results given in table 4.4 indicate that both the real exchange rate in level form and the exchange rate volatility have a significant impact on the leather and leather manufacture exports from Pakistan to China. As expected the impact of real exchange rate is positive and statistically significant. According to the estimated parameters one percent increase in the real exchange rate would increase the leather goods exports from Pakistan to China by more than 5 percent. The impact of China's GDP is not found to be statistically significant. However, the sign of GDP's impact is, as expected, positive and as such it is in conformity with theoretical underpinnings. As regards the effect of exchange rate volatility it is found to be negative and statistically significant. According to results one percent increase in exchange rate volatility could depress Pakistan's leather & leather manufacture exports to China by 18 percent. The negative association found between exchange rate volatility and exports in this research work is consistent with the findings of earlier studies.

Having examined the long run relationship among the variables, now we proceed to analyze the short dynamics through the error correction representation of the ARDL model. The Engle-Granger Representation theorem (1987) provides the basis for such short run analysis. According to this theorem a set of variables which are cointegrated can be expressed in the form of error correction model (Gujarati, 2012). Therefore following vector error correction model is specified for this research:

$$\begin{aligned} D(\ln(LEX_t)) = a_0 &+ \sum_{i=1}^{p} a_{1i} D(\ln(LEX_{t-i})) + \sum_{i=1}^{q} a_{2i} D(\ln(GDP_{t-i})) + \sum_{i=1}^{q} a_{3i} D(\ln(RER_{t-i})) \\ &+ \sum_{i=1}^{q} a_{4i} D(\ln(Vol_{t-i})) + \alpha ECT_{t-i} + \varepsilon_{1t} \end{aligned} \tag{4.6}$$

$$\begin{aligned} D(\ln(GDP_t)) = a_0 &+ \sum_{i=1}^{p} a_{1i} D(\ln(GDP_{t-i})) + \sum_{i=1}^{q} a_{2i} D(\ln(LEX_{t-i})) + + \sum_{i=1}^{q} a_{3i} D(\ln(RER_{t-i})) \\ &+ \sum_{i=1}^{q} a_{4i} D(\ln(Vol_{t-i})) + \varepsilon_{2t} \end{aligned} \tag{4.7}$$

$$\begin{aligned} D(\ln(RER_t)) = a_0 &+ \sum_{i=1}^{p} a_{1i} D(\ln(RER_{t-i}) + \sum_{i=1}^{q} a_{2i} D(\ln(GDP_{t-i}))+) + \sum_{i=1}^{q} a_{3i} D(\ln(LEX_{t-i})) \\ &+ \sum_{i=1}^{q} a_{4i} D(\ln(Vol_{t-i})) + \varepsilon_{3t} \end{aligned} \tag{4.8}$$

$$\begin{aligned} D(\ln(VOL_t)) = a_0 &+ \sum_{i=1}^{p} a_{1i} D(\ln(Vol_{t-i})) + \sum_{i=1}^{q} a_{2i} D(\ln(GDP_{t-i})) + \sum_{i=1}^{q} a_{3i} D(\ln(RER_{t-i})) \\ &+ \sum_{i=1}^{q} a_{4i} D(\ln(LEX_{t-i})) + \varepsilon_{4t} \end{aligned} \tag{4.9}$$

In the above equations the variables are same as already defined. The parameters a_{1i}, a_{2i}, a_{3i} and a_{4i} represent the short run dynamics and α in equation 4.6 is the error correction term. The short run results of the ARDL model are presented in the table 4.5.

Table 4.5 Error Correction Representation of ARDL (4,2,2,1) Model

Regressor	Coefficient	t-statistic	Probability
D(ln(LEX$_{t-1}$))	0.3740	2.0179	0.0607
D(ln(LEX$_{t-2}$))	0.7165	3.8646	0.0014
D(ln(TEX$_{t-3}$))	0.4022	1.8093	0.0892
D(ln(GDP))	3.1321	1.3296	0.2023
D(ln(GDP$_{t-1}$))	9.1948	3.5479	0.0027
D(ln(RER))	3.6238	1.0930	0.2906
D(ln(RER$_{t-1}$))	6.4272	2.4353	0.0270
D(ln(VOL))	-7.4587	-0.9979	0.3332
ECT$_{t-1}$	**-1.0887**	**-4.7149**	**0.0002**

Source: Author's Computation

According to the results in table 4.5 the impact of GDP and Real Exchange Rate (RER) on leather goods exports from Pakistan to China is positive in the short run as well. However, this impact is not instantaneous. The coefficients of both GDP and RER become statistically significant at the first lag. As regards the short run effect of exchange rate volatility on leather goods exports it is negative but not statistically significant. Thus the direction of the impact of the explanatory variables on the dependent variable is the same as found in the long run results discussed above.

An important variable to examine in the table 4.5 is the Error Correction Term (ECT). The error correction term basically indicates the speed of adjustment to long run equilibrium. The model under analysis could be described to be converging towards long run equilibrium if the value of this variable is found to be negative and statistically significant. As is evident from the table 4.5 the error correction term has the required negative sign and it is also highly statistically significant. Thus it can be inferred that any short run deviations are very much likely to converge towards the long run equilibrium. The value of ECT is -1.0887 which means that about 100 percent of the disequilibrium of the previous time period is corrected in the current time period. This shows a very good speed of adjustment. It is pertinent to point out here that Banerjee et al. (1998) indicated that a highly significant error-correction term is a further proof for the existence of a stable long run relationship. Since the error correction term of this study is also highly significant it can be stated that there exists stable long run relationship among the variables of this research work.

After analyzing the long run and short relationships among the variables, this study performs four diagnostic tests to underpin the validity of estimated parameters. The results of these tests are reported in table 4.6.

Table 4.6 Diagnostic Tests Results

Test	Chi Square Statistic	Probability
Jarque Bera Test	0.85	0.65
White Heteroskedasticity Test	16.27	0.18
Breusch-Godfrey Serial Correlation Test	0.19	0.67
Ramsey RESET Test	71.03(F statistic)	0.00

Source: Author's Computation.

According to the results in table 4.6 the model used in this study passes the diagnostic tests of normality, heteroskedasticity and serial correlation but it could not pass the functional form specification test. However, this is not unusual. Pesaran et al (2001), the developers of the ARDL model, also reported that the model they estimated fail to pass the specification test. They indicated that such functional form mis-specification could occur due to the presence of non-linear effects or asymmetries in the adjustment process. Moreover, Isik (2010) also encountered similar problem about functional form specification while applying the ARDL model for analysis. Since the model of this study passes the majority of the diagnostic tests, it can be described as the good fit one.

After examining the goodness of a fit, the next step is to check the parameter stability through the CUSUM (Cumulative Sum of Recursive Residuals) and CUSUMSQ (Cumulative Sum of Squares of Recursive Residuals) tests proposed by Brown et al (1975).

4.4 Parameter Stability Test

To confirm the stability of the estimated parameters this study applies the CUSUM and CUSUMSQ tests proposed by Brown et al (1975). These tests are of graphical nature. In order to prove parameter stability the plots of CUSUM and CUSUMQ should remain within the lines of 5 percent level of significance. Figures 4.9 and 4.10 reflect the graphs of CUSUM and CUSUMQ tests.

Figure 4.9: Graph of CUSUM

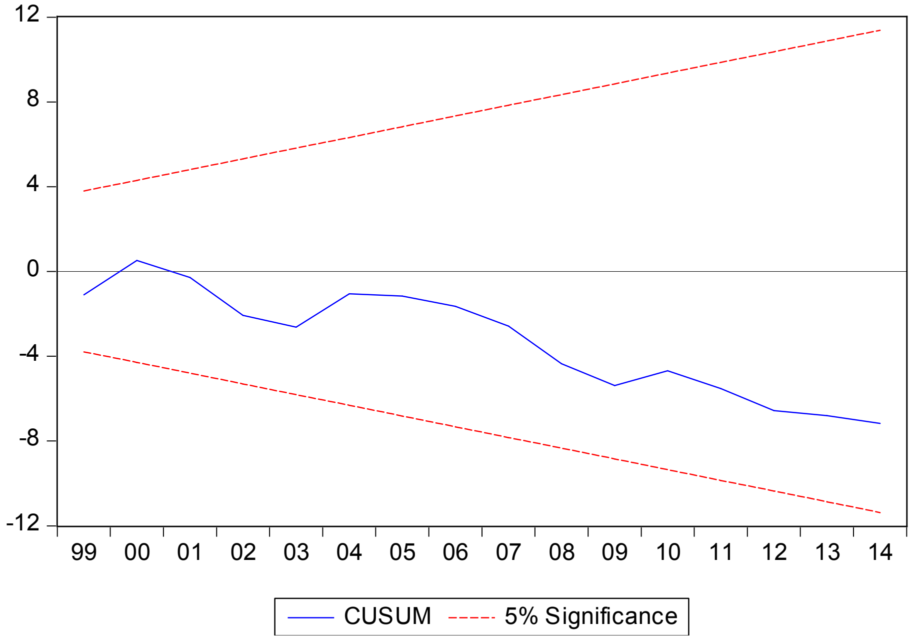
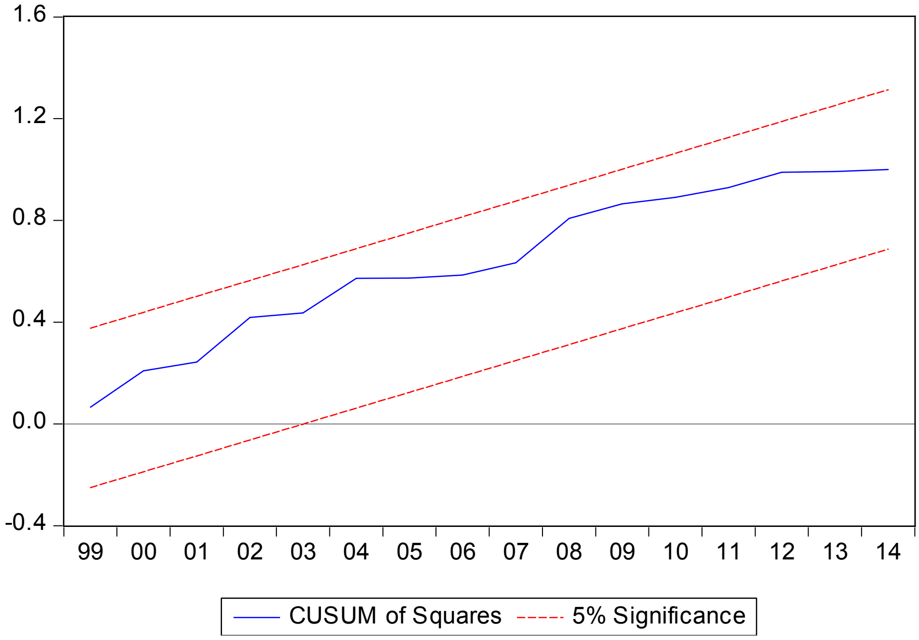


Figure 4.10: Graph of CUSUMQ



It is evident from the graphs 4.9 and 4.10 that parameter stability is proved because the CUSUM and CUSUMQ lines remain within the 5% level of significance band. Hence it is concluded that the estimated parameters remain stable over the entire sample period.

5. CONCLUSION AND POLICY RECOMMENDATIONS

This research work has analyzed the impact of exchange rate volatility on the demand for leather goods exports of Pakistan to China over the time period from 1982 to 2014. Being a time series analysis it is necessary that in the first instance the order of integration of the variables under consideration be checked to avoid spurious regression results. This study applied Augmented Dickey-Fuller and Phillips Perron Tests for this purpose. The results of both these tests showed that the variables of this study have different order of integration. Three variables were found to be integrated of order one whereas one variable was found to be integrated of order zero. In this situation the suitable time series methodology to apply is the Autoregressive Distributed Lag (ARDL) Model. Therefore this study has explored the nexus between exchange rate volatility and Pakistan's leather goods exports to China using the Autoregressive Distributed Lag (ARDL) Model.

According to the long run results of the ARDL model, the impact of the real exchange rate on the leather goods exports from Pakistan to China is found to be positive and statistically significant. The reason for this positive association could be attributed to the fact that the increase in real exchange rate indicates depreciation of Pakistani rupee vis-à-vis Chinese Yuan which could increase the competitiveness of Pakistan's leather goods exports in the Chinese markets. On the other hand the effect of China's GDP on the demand for Pakistan's leather goods exports is, as expected, positive but insignificant. The insignificance of GDP variable suggests low income elasticity for Pakistan's leather goods exports to China. As regards the variable exchange rate volatility its impact on Pakistan's leather goods exports to China is found to be negative and statistically significant. This negative impact could be due to the fact that in Pakistan economy financial market is not fully developed to provide proper hedging facilitates to exporters for covering their exchange rate risk.

In view of the findings of this study it is recommended that in order to boost Pakistan's exports steps should be taken for the development of the financial market in Pakistan so that proper hedging facilities could be made available to the exporters for covering of risk in international transactions arising from the unexpected changes in the exchange rates. Moreover, some measure should also be taken to diversify Pakistan's exports so that such goods may be exported whose income elasticity is high.

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