IMPACT OF EXCHANGE RATE VOLATILITY ON SECTORAL EXPORTS OF PAKISTAN: AN ARDL INVESTIGATION

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The thesis entitled "Impact of exchange rate volatility on sectoral exports of Pakistan: An ARDL investigation" submitted by Mr. Muhammad Aftab in partial fulfillment of M.S degree in Management Sciences with specialization in Finance, has been completed under my guidance and supervision. I am satisfied with the quality of student's research work and allow him to submit this thesis for further process as per IIU rules & regulations.

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IN THE NAME OF
ALLAH, THE MOST MERCIFUL AND BENEFICIENT

Dedication

"To my great parents who are praise worthy for their sustenance of me on right lines because I am today, only due to their untidy efforts for my sake"

ABSTRACT

This study attempts to investigate the impact of exchange rate risk on the exports demand of Pakistan to the rest of the world over quarterly data period 2003 to 2010. The previous studies in Pakistani context had examined this phenomenon on aggregated data which had made over generalization which are not appropriate for any specific sector, thus leading to unrevealed important information. This study is to find out the effects of exchange rate volatility on exports at sectoral level by using disaggregated data set. All the sectors proposed by state bank of Pakistan by commodity wise were taken to study the relationship at more minute level. The bound testing approach was used to study the relationship between exports and its determinants while Augmented Dickey Fuller (ADF) and Phillips Perron tests were used to test unit root of series and GARCH was used to measure exchange rate volatility. The results of this study show that exports are negatively influenced by exchange rate volatility and relative prices while positively affected by foreign income. This relationship holds for all sectors where bound testing revealed the existence of long run relationship although some equations results are not statistically significant. The findings can be used to form such policies which result into stabilized and competitive exchange rate, so that exports of Pakistan can be raised.

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DECLARATION

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No portion of the work, presented in this thesis, has been submitted in support of any application for any degree or qualification of this or any other university or institute of learning.

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ABBREVIATIONS

EXP:	Exports Trade
VOL:	Exchange Rate Volatility
I:	Industrial Production Index of Advanced Economies
RP:	Relative Prices

Chapter One:

Introduction

Introduction

After the downfall of Bretton Wood fix exchange regime in early 1970s, major economies of world started to move their regimes from fix to float exchange rate system. This shifting has attracted tremendous attention of researchers with their prime aim to investigate the effects of this new regime shift on trade. The general view that exchange rate movements reduce trade has resulted into the formations of monetary unions like European Union monetary unification and also motivated the central banks to intervene in currency markets (Bayoumi & Eichengreen, 1998). Microstructure models based on theoretical background propose the negative relation between exchange rate movements and export trade (Barkoulas, Baum, & Calgayan, 2002). This is the one side of coin which is quite simple; the other view of research is very ambiguous with no clarity. Behavioral models suggest that this ambiguity is due to different attitudes of export traders, the loss averse traders take exchange rate risk as substitution effect and they shift their trade investment from international to local markets while the more risk averse investors take it as an opportunity for income effect and they increase their trade to offset expected downfall in revenue (De Grauwe, 1988). The empirical research suggests that the difference in results on exchange rate effect on trade in research is due to different methodology, sampling periods and scenarios in studies (Hassan & Tufte, 1998). Another argument is that investors' hedge exchange rate risk in short run horizons but it's costly in long run (Pour & Moghaddasi, 2010). Short term exchange rate risk is easy to manage and cheaper while long run exchange rate is tricky and have very deep effects on trade (Cho et al., 2002) and it's also costly to mitigate short run risk, even in presence of hedge instrument due to expensiveness of forward exchange rate with high risk premium, thus exchange rate risk effects can't be eradicated (Vianne & De Vries,

1992). For developing countries hedging is very unsatisfactory and costly and especially for smaller companies which may face financial distress (Doroodian, 1999; Wei, 1999).

Exchange rate is a topic of much interest for researchers particularly for researchers in developing countries as it connects domestic market to the rest of the world being relative price and also defines the exchange power of a country (Aliyu, 2010). It provides cushion for internal and external balances over long run time period. However its deviation from equilibrium affects economy severely, although it still confusing what determines the equilibrium rate but there is increasing agreement in literature that its disequilibrium is not healthy for an economy (Aliyu, 2010). The prolong exchange rate risk makes firms attitude risk averse to trade thus it negatively affects the trade (Anderton & Skudelny, 2001). However studies show insignificant negative impacts of exchange rate volatility on trade which is not robust and even empirical and theoretical studies are not able to conclude that exchange rate stability promotes international trade (Hayakawa & Kimura, 2009).

Exchange rate risk study is very prime importance for those countries which have swapped their regime from fix to float (Ariz et al., 2008). The study of this phenomenon increases the understanding of exchange rate movements. Pakistan after a decade of struggle to move with pegged regime finally decided to adopt float exchange rate in 1982. In early of 1980s the Pak Rupee was branded to managed float and was pegged with United States dollar as chief anchor currency besides other basket of currencies. In 1998, Pakistani authorities embraced multiple exchange rate system to avoid financial crisis due to nuclear endeavors, so at that time Pakistan had three rates e.g. official rate pegged with United States dollar, floating interbank rate and a combination of these two rates (Composite rate). After recovery, these three rates were merged to one that was pegged with US dollar under certain band. In 2000, the band was removed and

now Pakistan is maintaining float rate, although intervention of central bank is still on question mark. The preceding studies found this decision very prudent and in favor of the broader interests of economy. One prominent study about right exchange rate regime for Pakistan is Husain (2006). He investigated the comprehensively the key determinants which finalize the choice of an exchange regime for a country. His findings suggest that float regime is the only right regime for a country like Pakistan. Exchange rate volatility influences on trade are studied in Pakistani context with major focus on aggregate level. Aggregate level studies dilute the individual specialty of a segment with the overall general view which has no concrete meanings for a specific sector. Specific industry level risk determination may increase our understanding about exchange rate movements as each industry have its own orientation and same is the matter with risk associated with that industry (Willet, 1986). A literature review of previous studies conducted so far, shows that no any study exists which have tried to study the effects of exchange rate variability on the different sectors of trade in Pakistan.

Besides this majority of studies which modeled exchange rate variability in Pakistani context have their dependent variable export trade while gross domestic product, importer's country income and exchange rate variability as explanatory variables; have reported exchange rate variability stationary while others non-stationary variables. There is consensus among economists that when variables are not stationary at level or stationary at different levels, traditional approaches like ordinary least square, integration are not appropriate and more advanced techniques like autoregressive distributed lag (ARDL) are more suitable to study the relationship as proposed by Pesaran et al., (2001). This is again paucity in Pakistani scenario regarding exchange rate studies.

1.1-Significance of the Study

This study is novel in two ways. Firstly it investigates the effects of exchange rate risk on sectorial level of trade which is non-existing in Pakistani literature, Secondly this study takes a up to date data set ranging quarterly over 2003 to 2010 which enhance our understanding about current exchange rate volatility relationship with trade. The data set is over small period due to unavailability of exports data at sectoral level in far past.

1.2-Objectives of study

This study has following objectives

- To divulge each sector of our export trade behavior in response to exchange rate volatility.

1.3-Organization of Study

The remainder of this study is arranged as follows. Introduction is followed by comprehensive review of literature which precedes methodology and finally this study ends with data analysis and conclusion.

Chapter Two:

Literature Review

2-Literature Review

Research on exchange rate volatility is so vast that several meta-analyses can be made. Some studies get popularity only due to this review of existing literature on this subject matter. One seminal work in this line is Mckenzie (1999). He makes a comprehensive review of existing studies on exchange rate volatility upshots on trade and tries to find the trends and some point of consensus among researchers on this issue which is an unresolved ones (as we earlier discussed the contention in introductory part). Theoretical literature argues that exchange rate risk make traders risk averse and compels them to reduce their trade due to uncertainty caused by volatility (Ethier, 1973) and make local trade favorable than international trade thus lessening the prospected benefits achieved through export trade to the world as a whole. The heat of this point is really felt by countries and major trade blocks all across the globe and different strategies are tried to reduce the unexpected exchange rate risk. European Union's introduction of Euro as common currency for European countries is the example of the severity of response to float exchange rate regime. Although exchange rate volatility is widely discussed in major trading unions worldwide due to its perceived threat to trade, yet empirical evidence is totally antagonistic to it. Empirical works which supports this argument are insignificant while the opposite ones results are significant and equivocal (Mckenzie, 1999).

Demers (1991) modeled uncertainty of exchange rate without loss aversion and concluded that firms disappointed with exchange rate behavior move towards reduction in physical capital, thus reducing the overall output for trade. Contrary to Demers (1991) model, Franke (1991) developed a model for a firm under uncertainity of exchange rate with neutral attitude towards risk, operating in monopolistic competition, which increases its trade in response to increase in exchange rate movements. De Grauwe (1988) has another perspecive on exchange rate volatility

with major concern with behavioral aspect. According to him exchange rate uncertainity influence on trade is all about the level of loss aversion. Traders who are slightly loss averse, they take exchange rate as a wake up alarm and convert their trade from international to local trade while those who are highly risk averse, they take it more serious by acting on positive hypothesis. They increase their export trade in search of a compensation for the fear of decrease in their revenue due to risk associated with exchange rate. The traders fear that volatility may exceed the price they receive from trade costs, so they try to offset break-even resulting into positive volatility coefficients (Sercu, 1992).

Broll (1994) expanded the previous theory which mostly based on single firm to multinationals which have production in one country and have market operations abroad. In response to exchange rate risk they reduce their production and thus export less to abroad and finally decrease in real output. In real world multinationals due to availabilty of forward market, hedge their future exchange rate uncertainity, thus finally having no any significant impact on their trade related with uncertainity of exchange rate. Vianne & De Vries (1992) examined the effects of exchange rate variation on exports and imports. They proposed that exchange rate risk reduces international trade but the results are different in case of availability of a developed forward market. Exchange rate movement shrinks the trade but mature forward market reduce this shrink (Clark, 1973; Bahmani-Oskooee & Hegerty, 2007). Forwad market mitigates the hurdles to trade associated owning to exchange rate uncertainity by hedging it. As trade is between two or more countries, exchange rate volatilty puts benefits to one party on the cost of loss to her counterpart,so volatility coefficient is negitive for one party and positive for the other one (Vianne & De Vries, 1992).

Most commoly used models to study exchange rate variation impact on trade are (i) Gravity model; according to which bilateral trade is positively associated with income of both trading partners and negitively linked with distence between them, (ii) Linder hypothesis; according to which trade of manufactured goods between two countries is negitively associated with the per capita income difference between them, and (iii) third country effect; which is the favorable substitute for a country, incase exchange rate uncertaininty increases with her existing trading partner. Although different studies have adopted different models, some of which are quite complex but interesting thing is that their findings are approximatly same as of standard model in which trade is taken dependent varible and income, price, exchange rate and exchange rate risk are adopted as explantory varibles (Mckenzie, 1999). Current studies have adopted simpler models resembling to standard models (Bahmani-Oskooee & Hegerty, 2007). Although some consensus is there in model specification, No agreement is there on sole measure of exchange rate volatiity (Bahmani-Oskooee & Hegerty, 2007).

Controversy is substantial in the methods utilized in measuring exchange rate volatility. Exchange rate risk is measured with different methods and each method has posibility to impact the significance of its relationship with trade. Pour & Moghaddasi (2010) used different methods to determined exchange rate valotility and found that methods has significant contribution in making exchange rate volatility ralionship with trade significant or insignificant. The volatility series should be stationary and this property is key to comprehend the uncertainity effects on trade (Pritchett, 1991) and ARCH-based measurement of volatility is the most efficient (Seabra, 1995). Pattichis (2003) studies the ARCH-based measurements for real and nominal exchange rate series for fifteen European countries and finds that all series are stationary generated through it. So if trade series are I(1), then volatility and trade flows has no co-

integeration (Pattichis, 2003). However this issue is resolved by bounds testing co-integeration approach proposed by Pesaran, Shin, & Smith (2001) which does not require stationarity testing.

Besides methods for volatility determination, others issues which are very important to consider which may effect the exchange rate risk relationship with trade are either use nominal or real exchange rate, type of trade to be investigated, sample period, assumption valid for data set, variables in study model, technique for exchage rate movement and trade relationship estimation and population of study either a country specific or number of countries and what number of countries in case of second (Mckenzie M. D., 1999). These issues have very importance in emperical studies and even called for the major contributors in contention existing in emperical literature (Hassan & Tufte, 1998). For example some research papers support the view that nominal exchnage rate should be used rather the the real one (Ethier, 1973; Hooper & Kohlagen, 1978). They argue that nominal exchange rate variance and relative prices influence real exchange rate and relative prices fluctuations is a separate, some additional risk faced by traders (Bini-Samghi, 1991). The proponents of real exchange rate argue that in short run changes in costs and revenues due to nominal exchange rate risk are compensated by changes in costs and prices (Gotur, 1985; Koray & Lastrapes, 1989). Contarary to these both schools of thought, a neutral school of thought also exists which holds the view that it does't matter either exchange rate risk is determined through nomnal or real, the results are the same for its relation with trade (Qian & Varangus, 1994; Mckenzie & Brooks, 1997; Pour & Moghaddasi, 2010). Morever none of these rates is dominent in literature (Bahmani-Oskooee & Hegerty, 2007).

Another common thing is the use of aggregate data for the studying uncertainity of exchange rate effects on trade which presume that volatility is uniform across the countries and sectors which in case if not true may lead to wrong results (Mckenzie, 1999). Considering the

importance of this fact, bilateral and sectorial data based studies are considered more appropriate. Hooper & Kohlagen (1978) study this phenomena. They reported that for the study of exchange rate uncertainity relation with trade, results are insignificant when they use aggregate data and findings are significant, when they use disagregated data. Bilateral studies gives results more fair than those based on aggregate data but these results are not so much superior to aggregate ones, so now studies are focusing on sectorial data which divulge more real picture of exchange rate movements link with the trade (Bini-Samghi, 1991). Each sector has its own peculiar characteristics which make it different from the rest of industry and when we take trade of all the sectors as a whole, we lose the important information regarding each sector (Bini-Samghi, 1991). Taking into account this aspect Belanger, et al., (1992) studied the volatility impact on US-Cananda bilateral trade. They suggest different results for different sectors which confirms the importance of studying effects of volatility of exchange rate by using sectorial trade rather the aggregate trade.

Another issue in exchange rate studies is sampling period. Inapropriate number of observations also yield misleading results. Akhtar, et al., (1984) comment about acceptance of negitive hypothesis in their study, is due to their inappropriate number of observations in their sample. Besides this stationarity testing negligence also leads misleading findings (Mckenzie, 1999). Satationarity is accentuated much by Asseery & Peel (1991) and these authors concludes that insignificant and misaligned results in previous research are due to not considering this issue.

Exchange rate risk has different concern for the trade partners. In simple words its something positive to one trading partner, meanwhile loss for the other depending upon the currency of trade. If the billing of export is in exporter's currency, volatility has positive effect

on export trade and negitive effect if the invoice is denominated in importers currency (Qian & Varangus, 1994).

Exchange rate uncertainity relationship with trade flows is measured with different technique starting from ordinary least square to more advanced techniques like panel regression and time series based techniques (Bahmani-Oskooee & Hegerty, 2007). OLS has problem of spurious regression which is eradicated with the invention of vector auto corelation and other advanced techniques. These new techniques like co-integeration has revolutinalized the effectiveness of research.

2.1 Exchange rate risk and Sectoral Trade

The ambiguity in results on exchange rate volatility and export trade relationship has directed research to study this realtionship on sectoral level rather the aggregate one, as each sector has its own specific risk (Bahmani-Oskooee & Hegerty, 2007). Aggregate data hide the relationships which are observable at sectorial level (Mckenzie, 1999).

Coes (1981) is the one of the first study which focuses on sectoral trade. He examines the effects of volatility on thirteen sectors of Brazilian trade. He finds that volatility has positive impact on manufacturing and agriculture sectors and negitive impact on food and beverages. (Maskus, 1986) studies US bilateral trade with Japan, United Kingdom, Germany and Canada and finds Germany trade is most affected by uncertainity. Bredin, Stilianos, & Murphy, (2003) investigates the impact of volatilty in Irish sectoral trade. They suggest that both multinational dominated and local industry dominated sectors show similar behaviour to volatility. The volatility coefficient is positive which shows that volatility may increase profit expectations of firms (Bahmani-Oskooee & Hegerty, 2007).

Screnis (2010) studies the sectotal trade of eleven European countries UK, Denmark, Austeria,Greece, Netherland, France, Italy,Ireland, Portugal, Finland, Sweden, for the period of 1973-2004. He uses two sectors leather and rubber with a rationale to find some effects as he can not find any effects on aggregate data. He uses moving average of real exchange rate for gauging volatility. Findings suggest the mixed results with majority of negitive volatility coefficients with few exceptions.

2.2 Exchange Rate Volatility and exports Literature in Pakistani context

Exchange rate volatility effects on trade studies in Pakistan are very few and these are based on aggregate data. First study in this regard is of Kumar & Dhawan (1991) which investigates the effect of exchange rate uncertaninity on Pakistani exports to the developed world. They use quartly data over 1974-1985 and find that nominal exchange rate rather real exchange rate adversly effects Pakistani exports. They also incoporated third country effect in their model and find that explanatory power of the their model is enhanced by it. Mustafa & Nishat (2004) study the regional markets interdepndence and structure for volatility of exchange rate and export trade of Pakistan. They use quarterly data over 1991 to 2004 to study bilateral trade with major countries of SAARC, ASEAN, Asia-Pecific and European regions by using error correction technique and cointegeration to study short run dynamics and long run relationships respectively. The findings show that exchange rate uncertainity adversly effects Pakistani exports with his major trading partners, United Kingdom and United States. Same results exist for Bangladesh, Austeralia and Singapore. For Malaysia and New Zeeland no emperical raltionship was found. Aurangzeb et al., (2005) study the volatity effects on exports of Pakistan. They study this phenomena by using aggregate data over the quaterly data of 1985-2001. They use same statistical techniques as used by (Mustafa & Nishat, 2004). They observed that exchange rate

movements significantly effects Pakistan's exports negitively. Aftab & Abbas, (2011) studied exchange rate risk effects on exports by using quarterly data set over the period 1982 to 2006 and reported that it affected pakistani exports negitively over their study data period.

Its interesting to note that in all studies observed by us in Pakistani context report that volatility is stationary at level while other varibles like exports, relative prices and GDP are not stationary at level. In these type of situations econometrician have recommended ARDL which does not require stationarity for studying relationships. Besides this, these studies have adopted aggregated data rather disaggregated to study volatility of exchange rate relation with exports.So sectoral data studies are absent and have not come under researcher knowledge.

2.3-Research Question

This study attempts to answer following question

- What is the impact of exchange rate volatility on sectoral exports of Pakistan?

Chapter Three:

Research Methodology

3. Research Methodology

Based on above literature export model is formulated for this study. The variables taken in this model are adopted from the studies on exports. On the pattern of Bredin, Stilianos, & Murphy, (2003), we adapted our export model. We incorporated industrial production index as proxy for foreign income as income data was not available on quarterly basis as prior done by Mustafa & Nishat, (2004). Our model is as following.

$$lnEXP_t = \beta_o + \beta_1 lnRP_t + \beta_2 lnI_{,t} + \beta_3 V_t + \varepsilon_{i,t} \quad (1)$$

where EXP is the quarterly exports (for individual sectors as listed in table-1) of Pakistan to all over the world for time t, RP is the relative price (is the ratio of domestic export price to the United States exports price) of exports for time t, I is the industrial production index of the advanced economies for time t and V is the exchange rate volatility for time t. Based on theory it is expected that coefficients $\beta_1<0$, $\beta_2>0$ while β_3 is ambiguous in theory.

All the data is retrieved from international financial statistics database of IMF (International Monetary Fund) and State Bank of Pakistan Statistics database over the quarterly time period 2003 to 2010.

All the variables are taken in natural logarithm to avoid sever skewness. We took all variables in nominal form instead of real ones as there is no any significant difference (Qian & Varangis,1994; Mckenzie,1999) and also nominal exchange rate is more effective in Pakistani scenario (Kumar & Dhawan, 1991). The volatility of exchange rate is measured by GARCH proposed by Bollerslev, (1986) based on the rationale that GARCH is the most appropriate measure of volatility as suggested by a comprehensive assesment of MATEI, (2009) on volatility measuring models.

GARCH is basically variant of ARCH methodology and Bollerslev (1986) argues that conditional variance in financial series is not only the function of its lagged error term but also the function of its lagged conditional variances.

$$h_t = \gamma_\circ + \sum_{i=1}^{r} \gamma_i \varepsilon^2_{t-i} + \sum_{i=1}^{s} \theta_i h_{t-i}$$

Therefore, GARCH (1, 1) process would be

$$h_t = \gamma_\circ + \gamma_1 \varepsilon^2_{t-1} + \theta_1 h_{t-1}$$

So GARCH model helps to explain the conditional variance with the help of past squared error term and conditional variance lag value. This also means that conditional variance at time 't' would be function of long run variances ε^2_{t-i} and also variances conditional on past information set (short run) or observed shocks i.e. h_{t-i}.

Stationarity of variables was checked by Augmented dickey fuller (ADF) and Phillips Perron (PP) unit root tests. Based on unit root tests results, most appropriate technique which opted to study the relationship between exchange rate uncertainty and export was auto regressive distributed lags (ARDL). This technique adoption was based on the logic that volatility series measured through GRACH are usually stationary while other export model variables are usually non-stationary. The co-integration requires that all variables should be stationary at same level or difference while ignoring this may lead spurious co-integration results as was raised by Pattichis, (2003). It should not be so that some variable are stationary at first difference and others at second difference, in such cases co-integration is not appropriate and auto regressive distributed lag (ARDL) is considered more appropriate. The novelty of this approach is that it does not require that variables of study are stationary or not (Pour & Moghaddasi, 2010).

3.1-ARDL Bound testing

ARDL is very unique approach with some more sophisticated benefits. The major and pertinent prominence of this approach is in the fact that it can work effectively irrespective of the scenario either data has unit root or not (Pesaran et al., 2001). This is the perhaps the best solution to the issue that Engle-granger and Johansen co-intergeration techniques require that all the variable should be stationary at same difference (Bahmani-Oskooee & Hegerty, 2007). Another advantage of bound testing is that one can investigate long term as well as short term relationships at same time. The hidden beauty of ARDL approach is that one study short run as well long run relationships without losing any important information from data (Waliullah et al., 2010). It also takes sufficient number of lags to leads towards general to specific framework of data modeling (Laurenceson & Chai, 2003). The most important edge of ARDL over standard co-integration is the freedom from larger specifications like number of endogenous and exogenous variables to be included, optimal lags number, different number of optimal lags for different variables and model can work even for a short number of observations (from 30 to 80 observations) (Duasa, 2007).

For operationalizing the bound testing technique, it's necessary to mold the equation-01 in ARDL as follows.

$$\Delta EXP_t = \alpha_\circ + \sum_{i=1}^{p} \alpha 1\, \Delta EXP_{t-I} + \sum_{i=1}^{p} \alpha 2\, \Delta RP_{t-i} + \sum_{i=0}^{p} \alpha 3\, \Delta I_{t-i} + \sum_{i=0}^{p} \alpha 4\, \Delta Vol_{t-I} + \beta_1 EXP_{t-1} + \beta_2 RP_{t-1} + \beta_3 I_{t-1} + \beta_4 Vol_{t-1} + \mu_t \qquad (02)$$

All the variables in equation 02 are the same as defined in equation-01.

3.1.1-ARDL estimation method

In first step the long run relationship is diagnosed between the main variables of the model. The methodology to study long run estimates presumes that there is no long run relationship among the variables of study in its null hypothesis ($H_0 : \beta 1+\beta 2+\beta 3=0$). The null hypothesis is examined through bound testing based on standard Wald statistics or F-statistics and this testing takes one lower and one upper limit which is given by Pesaran, (2001) and for sample of small sizes Narayan, (2005) has devised a table of bounds. The F-statistics is calculated and seen in given boundery of table. If the F-statistics falls above the upper boundery, there exists long run relationship and null hypothesis is rejected and if it falls below the lower limit or within the limit then null hypothesis is accepted. Once its confirmed that there exists long run relation short run dynamics of long run relationship is estimated.

Chapter Four:

Data Analysis and Results

4.0-Data Analysis and Results

4.1-Descriptive Statistics

The descriptive statistics of the data are displayed in table-2A and table-2B. Descriptive statistics gives opportunity to see the data and way out some appropriate data screening strategy. Table-2 shows values in normal range as data is already converted into natural log form. Besides this the treatments of outliers make data smooth and workable for any statistical strategy of techniques which requires fulfillment of some crucial assumption as their crucial perquisites. Although these techniques can work even in absence of these assumptions but this makes the results spurious and any conclusions drawn based on these techniques remain null and void. According to some renowned econometricians even non-fulfillment of basic assumptions do not make the whole results completely spurious as one can't say in absence of the significance of t-statistics that results are completely void. There are at least some meanings in even non-significant results but definitely robustness of results is affected, so far the sake of making results more authentic and meaningful we took the headache of working out the descriptive statistics of the data at prior level of moving any further.

In next section line graph are drawn for individual series to view the each series behavior over the sample period of our data. These graphs divulge information e.g. either there is trend in data or not, either drift or not and either both drift and trend in data or not which helps us to adopt proper assumptions in diagnosing the unit root in series. By drift we mean when changes in graph occur gradually and by trend we mean either it's upward, downward or horizontal.

Table-2A. Descriptive Statistics

Name Variable	Statistics	Value	Name Variable	Statistics	Value
Live Animals and Animals Products	Mean	11.085	Articles of Stone, Plaster, Cement, Asbestos, Mica or similar Materials	Mean	9.895
	Median	11.099		Median	9.835
	SD	0.252		SD	0.281
Vegetable Products	Mean	12.899	Natural or Cultured Pearls, Precious or Semi-Precious Stones, Metals	Mean	8.841
	Median	12.903		Median	8.555
	SD	0.408		SD	0.746
Animal or Vegetable Fats, Oils and Waxes	Mean	10.166	Base Metals and Articles or Base Metal	Mean	10.995
	Median	10.134		Median	10.872
	SD	0.214		SD	0.491
Prepared Foodstuffs; Beverages, Spirits, Vinegar and Tobacco	Mean	11.217	Machinery and Mechanical Appliances	Mean	10.860
	Median	11.181		Median	10.872
	SD	0.412		SD	0.274
Mineral Products	Mean	12.518	Vehicles, Aircraft, Vessels and Associated Transport Equipment	Mean	9.253
	Median	12.626		Median	9.185
	SD	0.598		SD	0.428
Products of Chemical or Allied Industries	Mean	11.213	Optical, Photographic, Cinematographer, Measuring, Checking, Precision Apparatus	Mean	10.994
	Median	11.236		Median	11.026
	SD	0.239		SD	0.182
Plastics and Articles thereof; Rubber and Articles	Mean	11.154	Arms and Ammunition, Parts and Accessories	Mean	8.346
	Median	11.246		Median	8.122
	SD	0.332		SD	0.947

Table-2B. Descriptive Statistics

Name Variable	Statistics	Value	Name Variable	Statistics	Value
Raw Hide and Skins, Leather, Fur skins and Articles	Mean	12.324	Works of Arts, Collectors, Pieces, Antiques and Special Transactions	Mean	7.479
	Median	12.315		Median	7.430
	SD	0.122		SD	0.799
Wood and Articles of Wood	Mean	8.203	Industrial Production Index of Advanced economies	Mean	4.598
	Median	8.220		Median	4.601
	SD	0.343		SD	0.055
Pulp of Wood or of other Fibrous Cellulosic Material	Mean	9.187	Relative Prices	Mean	0.975
	Median	9.328		Median	0.996
	SD	0.477		SD	0.033
Textiles and Textile Articles	Mean	14.705	Exchange rate volatility	Mean	0.002
	Median	14.727		Median	0.001
	SD	0.093		SD	0.008
Footwear, Headgear, Umbrellas, Walking Sticks etc.	Mean	10.160	Total Exports	Mean	15.273
	Median	10.142		Median	15.275
	SD	0.226		SD	0.175

4.2-Unit root testing

As the data used in this studies is time series, so stationarity may not be there. Unit root testing is very important as per some studies regression results may be spurious in presence of unit root and for the sake of studying relationships and its helps to adopt any proper technique. To investigate either the series are stationary or unit root, mostly augmented dickey fuller (ADF) and Philip Perrons (PP) are used in literature. My literature survey shows that most recent works like (Pour & Moghaddasi, 2010) has used ADF as a test for unit root testing. Adopting same benchmarks we also used both these tests to check the unit root of the data. The results of ADF and PP tests unit root testing are shown in table-3. It's revealed that majority of series have unit root at level except Mineral Products and Exchange rate volatility series while all are stationary at first difference. The decision about the existence of drift and trend was taken through line graphs of individual series which are reported in appendix-01.

Table-3 Unit root testing

	ADF test		PP test	
Variables	t-statistics	Decision	t-statistics	Decision
Live Animals and Animals Products	-9.48*	I(1)	-15.04*	I(1)
Vegetable Products	-6.81*	I(1)	-4.73*	I(1)
Animal or Vegetable Fats, Oils and Waxes	-9.48*	I(1)	-15.04*	I(1)
Prepared Foodstuffs; Beverages, Spirits, Vinegar and Tobacco	-6.12*	I(1)	-6.83*	I(1)
Mineral Products	-6.63**	I(0)	-3.74**	I(0)
Products of Chemical or Allied Industries	-6.37*	I(1)	-6.67*	I(1)
Plastics and Articles thereof; Rubber and Articles	-5.76*	I(1)	-4.98*	I(1)
Raw Hide and Skins, Leather, Fur skins and Articles	-5.65*	I(1)	-7.36*	I(1)
Wood and Articles of Wood	-8.02*	I(1)	-7.70*	I(1)
Pulp of Wood or of other Fibrous Cellulosic Material	5.04*	I(1)	5.04*	(1)
Textiles and Textile Articles	-3.93*	I(1)	3.93*	I(1)
Footwear, Headgear, Umbrellas, Walking Sticks etc.	-4.53	I(1)	-10.29*	I(1)
Articles of Stone, Plaster, Cement, Asbestos, Mica	-8.41*	I(1)	-8.99*	I(1)
Natural or Cultured Pearls, Precious or Semi-Precious Stones	-5.76*	I(1)	-5.76*	I(1)
Base Metals and Articles or Base Metal	-5.42*	I(1)	5.42*	I(1)
Machinery and Mechanical Appliances	-5.79*	I(1)	-10.23*	I(1)
Vehicles, Aircraft, Vessels and Associated Transport Equipment	-8.53*	I(1)	-13.47*	I(1)
Optical, Photographic, Cinematographer, Measuring, Checking, Precision Apparatus	-8.48*	I(1)	-7.94*	I(1)
Arms and Ammunition, Parts and Accessories	-6.07*	I(1)	-10.28*	I(1)
Works of Arts, Collectors, Pieces, Antiques	-6.69*	I(1)	-6.71*	I(1)
Exports	-4.43*	I(1)	-4.32*	I(1)
Relative Prices	-2.82*	I(1)	-2.87*	I(1)
Industrial Production Index of advanced economies	-3.00*	I(1)	-5.07*	I(1)
Exchange Rate Volatility	-3.57*	I(0)	-3.55*	I(0)

This table shows unit root tests(ADF and PP) results. I(0) shows that unit root is absent at level while I(1) refers series is stationary at first difference. *, **, shows level of significance at 1% and 5% respectably. The decision about drift and trend was based on these series line graphs shown in appendix 01.

4.3- ARDL Bound Testing

We selected appropriate lags by adopting Schwarz Bayesian criterion (SBC) and general to specific strategy and once we got appropriate lags for a model, the results of F-statics of the model with critical value obtained from (Pesaran, Shin, & Smith, 2001) and (Narayan, 2005) are reported in table-4. We considered both 90% and 95% bounds from table CI (iii) case III in Pesaran et al, (2001) (2.45-3.52 and 2.86-4.04 respectably) and case III in Narayan, (2005) (2.75-3.99 and

3.35-4.77 respectably). As our number of observations are small, so we use Narayan, (2005) as our final decision rule for accepting or rejecting the null hypothesis of no long run relationship.

It was found that null hypothesis of no long run relationship was rejected in all models of sectoral trade except for four sectors (i. Products of Chemical or Allied Industries, ii.Plastics and Articles thereof; Rubber and Articles, iii.Wood and Articles of Wood, iv.Pulp of Wood or of other Fibrous Cellulosic Material), so it was found the existence of long run relationship between the exports and the dependent varibles of the study. For following equations of our study; i.total exports, ii. Live Animals and Animals Products, iii. Footwear, Headgear, Umbrellas, Walking Sticks etc., iv. Vegetable Products, v. Articles of Stone, Plaster, Cement, Asbestos, Mica or similar Materials, Oils and Waxes, vi. Natural or Cultured Pearls, Precious or Semi-Precious Stones, Metals, vii. Prepared Foodstuffs; Beverages, Spirits, Vinegar and Tobacco, viii.Base Metals and Articles or Base Metal, ix. Mineral Products, x. Machinery and Mechanical Appliances, xi. Vehicals, Aircraft, Vessels and Associated Transport Equipment, xii. Optical, Photographic, Cinematographer, Measuring, Checking, Precision Apparatus, xiii.Raw Hide and Skins, Leather, Fur skins and Articles thereof, xiv. Works of Arts, Collectors, Pieces, Antiques, xv.Textiles and Textile Articles and xvi. Animal or Vegetable Fats, the null hypothesis is rejected at 5% significance, while for Arms and Ammunition, Parts and Accessories equation, null hypothesis is rejected at 5% significance as per table CI (iii) case III in Pesaran, Shin, & Smith, (2001) but it rejected at 10% significance in case III in Narayan, (2005) while for equations of i. Products of Chemical or Allied Industries, ii.Plastics and Articles thereof; Rubber and Articles, iii.Wood and Articles of Wood, and iv.Pulp of Wood or of other Fibrous Cellulosic Material, null hypothesis of no long run relationship was not rejected.

In suceeding section the long run as well as short run analysis is executed. In long run analysis we estimated the long run coefficients but in short run analysis the error correction model was estimated which worked as bridge between short run and long run conection of two varibles.

Table-4: Bound testing

	F-st.	C.V.-5%		C.V.-10%		C.V.-5%**		C.V.-10%**	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
Total Exports	11.81	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Live Animals and Animals Products	18.82	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Vegetable Products	8.89	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Animal or Vegetable Fats, Oils and Waxes	9.14	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Prepared Foodstuffs; Beverages, Spirits, Vinegar and Tobacco	6.76	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Mineral Products	7.20	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Products of Chemical or Allied Industries	3.46	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Plastics and Articles thereof; Rubber and Articles	2.32	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Raw Hide and Skins, Leather, Fur skins and Articles	5.99	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Wood and Articles of Wood	3.88	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Pulp of Wood or of other Fibrous Cellulosic Material	3.19	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Textiles and Textile Articles	11.40	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Footwear, Headgear, Umbrellas, Walking Sticks etc.	5.12	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Articles of Stone, Plaster, Cement, Asbestos, Mica or similar	5.30	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Natural or Cultured Pearls, Precious or Semi-Precious Stones	6.76	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Base Metals and Articles or Base Metal	7.65	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Machinery and Mechanical Appliances	9.32	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Vehicles, Aircraft, Vessels and Associated Transport Equipment	12.88	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Optical, Photographic, Cinematographer, Measuring, Checking,	6.06	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Arms and Ammunition, Parts	4.43	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99
Works of Arts, Collectors, Pieces, Antiques	5.42	2.86	4.01	2.45	3.52	3.35	4.77	2.75	3.99

This table shows the F-statstics of each trade equation of this study with critical values given by Nayran and Pesaran

Source:: ** shows critical values by (Narayan, 2005) while non-asterisk are by (Pesaran et al, 2001)

4.3.1-Long Run Relationship Analysis

Once the co-integration was confirmed the long run estimated were taken working on following equation-02 in following procedure of adjustment

$$\Delta EXP_t = \alpha_\circ + \sum_{i=1}^{p} \alpha 1\ \Delta EXP_{t-1} + \sum_{i=1}^{p} \alpha 2\ \Delta RP_{t-i} + \sum_{i=1}^{p} \alpha 3\ \Delta I_{t-i} + \sum_{i=1}^{p} \alpha 4\ \Delta Vol_{t-1} + \beta_1\ EXP_{t-1} + \beta_2\ RP_{t-1} + \beta_3\ I_{t-1} + \beta_4\ Vol_{t-1} + \mu_t \quad (02)$$

As for long run relationship short run dynamics are ignored so all the delta sign variables were taken equal to zero

$$0 = \alpha_\circ + 0 + 0 + 0 + 0 + 0 + \beta_1\ EXP_{t-1} + \beta_2\ RP_{t-1} + \beta_3\ I_{t-1} + \beta_4\ Vol_{t-1} \quad (03)$$

By bringing dependent variable on left side

$$-\beta_1\ EXP_{t-1} = \alpha_\circ + \beta_2\ RP_{t-1} + \beta_3\ I_{t-1} + \beta_4\ Vol_{t-1} \quad (04)$$

To make dependent variable coefficient unit equation was divided by $-\beta_1$ on both sides

$$EXP_{t-1} = \alpha_\circ/-\beta_1 + \beta_2/-\beta_1\ RP_{t-1} + \beta_3/-\beta_1\ I_{t-1} + \beta_4/-\beta_1\ Vol_{t-1} \quad (05)$$

In table-5 all estimates of export equations are reported based on equation-05. For total export equation the coefficient of relative prices is negative and significant which shows that rise in relative prices leads to fall in exports demand. The coefficient of Industrial production index which we used here as proxy for income is positive and significant which indicates that increase in income activity abroad increase the demand for exports. The coefficient for volatility is negative and significant which proves that volatility affects Pakistani trade negatively. The

results are in line with export equation of all equations of sectors of our study where null hypothesis of no long relationship is rejected. Live animals and animal products, vegetable products, articles of stone plaster cement asbestos mica or similar, natural or cultured pearls precious or semi-precious stones, and base metals or articles of base metals optical photographic and cinematographer measuring checking equations have more in line results with total export equation .

Our results for other equations are somewhat different from these above due to significance which we discuss individually here. The equation for animal or Vegetable fats, oils and waxes has similar directions sign for its variable as total export equation but its coefficient results are not statistically significant, so one can't be statistically confident on such results. The results of prepared foodstuffs; beverages, spirits, vinegar and tobacco are in line with prior except coefficient of industrial production index is not statistically significant. Mineral products all coefficients are insignificant except the coefficient of volatility. Raw hide and skins, leather, fur skins and articles thereof has only industrial production index insignificant while pulp of wood or of other fibrous cellulosic material, textiles and textile articles and footwear, headgear, umbrellas, walking sticks have only exchange rate volatility coefficient significant. Machinery and mechanical appliances have both exchange rate volatility and relative prices coefficients significant and Vehicles, aircrafts, vessels and associated transport equipment as well as arms and ammunition parts have only exchange rate volatility coefficient insignificant. Work of arts, collections, pieces and antiques have all coefficients significant except the coefficients of relative prices.

4.5-Short term Dynamics

For measuring short run dynamics in long lun relationship following modifications were made in equation-02.

$$\Delta EXP_t = \alpha_\circ + \sum_{i=1}^{p} \alpha 1\ \Delta EXP_{t-1} + \sum_{i=1}^{p} \alpha 2\ \Delta RP_{t-i} + \sum_{i=1}^{p} \alpha 3\ \Delta I_{t-i} + \sum_{i=1}^{p} \alpha 4\ \Delta Vol_{t-1} + \beta_1\ EXP_{t-1} + \beta_2\ RP_{t-1} + \beta_3\ I_{t-1} + \beta_4\ Vol_{t-1} + \mu_t \quad (02)$$

As for capturing adjustments in short run dynamics ECM is operationalized and for this we operationalized following model from equation-02

$$\Delta EXP_t = \alpha_\circ + \sum_{i=1}^{p} \alpha 1\ \Delta EXP_{t-1} + \sum_{i=1}^{p} \alpha 2\ \Delta RP_{t-i} + \sum_{i=1}^{p} \alpha 3\ \Delta I_{t-i} + \sum_{i=1}^{p} \alpha 4\ \Delta Vol_{t-1} + ECM_{t-1} \quad (06)$$

The ECM series were taken from the difference of actual values of individual sector of exports, and the predicted values taken from model built on the basis of equation-05.

Error correction model expresses the rate of adjustments of short term fluctuations in long run relationship. In tables 6-A, B, C ECM for all models of sectoral trade is reported. These ECM estimates provides some extra support for complex and inconsistent link which belie exports and its determinants in a dynamic way. The ECM_{t-1} coefficients are negative and significant in most of the cases in our study and give additional support for authenticity of equilibrium relationship between the variables of study in long run. The coefficients reported for different equations in tables 6-A, B, C show, how much proportion of disequilibrium is corrected each quarter. For example ECM coefficient for total export equation reports that 46% disequilibrium in previous

quarter is adjusted in current quarter. This adjustment rate is highest (96%) in Articles of stone equation while it's the lowest (23%) in textile and textile articles equation.

Table-5: Long run estimates

Models	Intercept	RP	I	V
Total Exports	3.25 (1.85)***	-5.82 (-2.43)**	3.05 (2.33)**	-29.53 (-6.79)*
Live Animals and Animals Products	1.74 (7.69)*	-7.47 (-5.58)*	4.41 (5.23)*	-45.09 (-4.63)*
Vegetable Products	0.65 (0.17)	-10.20 (-2.32)**	4.77 (2.93)*	-43.78 (-3.22)**
Animal or Vegetable Fats, Oils and Waxes	5.11 (1.20)	-1.68 (-1.07)	1.63 (1.66)	-7.02 (-1.30)
Prepared Foodstuffs; Beverages, Spirits, Vinegar and Tobacco	7.29 (1.27)	-9.66 (-2.47)**	2.61 (1.41)	-22.33 (-2.08)**
Mineral Products	2.96 (0.95)	-1.47 (-0.55)	0.85 (0.66)	-24.87 (-4.72)*
Raw Hide and Skins, Leather, Fur skins and Articles thereof	2.83 (1.16)	-7.14 (-1.98)***	2.43 (1.18)	-75.38 (-3.36)*
Textiles and Textile Articles	3.64 (2.43)**	-4.25 (-1.45)	0.68 (0.39)	-51.91 (-5.21)*
Footwear, Headgear, Umbrellas, Walking Sticks etc.	1.53 (0.37)	-0.99 (-0.33)	1.56 (0.96)	-20.53 (-2.11)**
Articles of Stone, Plaster, Cement, Asbestos, Mica or similar	5.05 (1.05)	-8.00 (-2.74)*	2.70(2.00)**	-14.05(-1.85)***
Natural or Cultured Pearls, Precious or Semi-Precious Stones	7.75 (1.24)	-31.58 (-3.45)**	5.93(1.75)**	-33.92(-2.72)***
Base Metals and Articles or Base Metal	4.41 (1.15)	-22.81 (-3.57)*	5.86 (2.13)**	-32.34 (-3.29)**
Machinery and Mechanical Appliances	0.87 (0.18)	-6.16 (-1.79)***	3.42 (1.64)	-42.08 (-3.28)*
Vehicles, Aircraft, Vessels and Associated Transport Equipment	10.48 (2.73)*	-13.89 (-4.54)*	7.42 (5.39)*	-24.17 (-1.26)
Optical, Photographic, Cinematographer, Measuring, Checking,	0.45 (0.25)	-8.75 (-3.92)*	4.11 (3.64)*	-17.18 (-3.69)*
Arms and Ammunition, Parts	71.23 (3.72)*	-46.72 (-3.32)*	34.37 (3.73)*	-5.31 (-0.11)
Works of Arts, Collectors, Pieces, Antiques	122.41 (3.17)*	-13.96 (-0.79)	16.30(-2.08)***	-11.05 (-2.29)**

This table shows long run estimates for models of this study

Note: In table -5 *, **, *** shows 1%, 5% and 10% significance levels respectively

Table-6A: Short term estimates

Repressors	Coefficient	Std.Error	T-Ratio
C	1.75	0.23	7.61*
ΔRP	-2.91	1.29	-2.25
Δ I	0.77	0.36	2.13
Δ I(-1)	0.94	0.26	3.61*
Δ I(-2)	0.04	0.27	0.15
Δ I(-3)	0.99	0.28	3.53*
Δ VOL	-6.33	0.97	-6.52
ECM(-1)	-0.46	0.06	-7.67*
Live Animals and Animals Products			
C	0.45	0.08	5.62*
Δ RP	-3.57	3.44	-1.04
Δ I	7.88	0.97	8.12*
Δ VOL	-1.93	2.47	-0.78
Δ VOL(-1)	-16.01	5.80	-2.76*
Δ VOL(-2)	-3.47	4.46	-0.78
Δ VOL(-3)	-3.61	2.98	-1.21
ECM (-1)	-0.75	0.12	-6.03*
Vegetable Products			
C	3.83	5.60	0.68
Δ VEGETABLES(-1)	0.10	0.24	0.41
Δ RP	-8.61	7.25	-1.19
Δ I	0.79	1.69	0.47
ΔI(-1)	3.99	1.54	2.59**
Δ VOL	-9.47	4.95	-1.91***
Δ VOL(-1)	-7.77	6.16	-1.26
Δ VOL(-2)	3.89	4.61	0.84
ECM(-1)	-0.77	0.36	-2.13*
Animal or Vegetable Fats, Oils and Waxes			
C	1.03	0.16	6.44*
Δ WAXES(-1)	0.43	0.17	2.53**
Δ RP	-21.06	4.24	-4.97*
Δ I	0.23	0.94	0.24
Δ I(-1)	2.37	0.84	2.82*
Δ I(-2)	3.22	0.89	3.61*
Δ VOL	-11.39	3.31	-3.44*
ECM(-1)	-0.62	0.17	-3.64*
Prepared Foodstuffs; Beverages, Spirits, Vinegar and Tobacco			
C	1.16	0.21	5.52*
ΔRP	-19.59	6.42	-3.05*
Δ I	3.72	1.56	2.38**
Δ VOL	-7.62	4.58	-1.66
ECM (-1)	-0.84	0.15	-5.60*
Mineral Products			
C	0.09	0.04	2.25*
Δ RP	-4.46	5.26	-0.85
Δ I	0.52	1.27	0.41
Δ VOL	-3.42	1.86	-1.83***
ECM (-1)	-0.84	0.11	-7.64*

This table shows short run adjustments in long run relation of this study models

Note: In table 6- A *, **, *** shows 1%, 5% and 10% significance levels respectively

Table-6B: Short term estimates

Regressors	Coefficient	Std.Error	T-Ratio
Raw Hide and Skins, Leather, Fur skins and Articles			
C	1.87	0.35	5.34*
Δ RP	1.16	2.54	0.46
Δ I	0.51	0.67	-0.76
Δ I(-1)	3.48	0.83	4.19*
Δ VOL	-6.47	1.95	-3.32*
Δ VOL(-1)	-14.21	3.37	-4.22*
ECM (-1)	-0.34	0.06	-5.67*
Textiles and Textile Articles			
C	2.81	0.38	7.38*
Δ RP	-0.97	0.79	-1.23
Δ I	0.45	0.23	1.96***
Δ I(-1)	1.26	0.26	4.85*
Δ VOL	-3.48	0.65	-5.35*
Δ VOL(-1)	-5.01	1.10	-4.55*
ECM (-1)	-0.23	0.03	-7.66*
Footwear, Headgear, Umbrellas, Walking Sticks etc.			
C	0.05	0.06	0.83
Δ RP	-12.59	6.53	-1.93***
Δ I	2.10	1.57	1.33
Δ VOL	-0.10	5.13	-0.02
ECM (-1)	-0.54	0.16	-3.37*
Articles of Stone, Plaster, Cement, Asbestos, Mica or similar Materials			
C	0.21	0.05	3.86*
Δ RP	-13.37	4.07	-3.29*
Δ I	1.82	1.13	1.61
Δ I(-1)	0.25	0.91	0.27
Δ I(-2)	2.83	0.86	3.30*
Δ I(-3)	3.11	1.06	2.92*
Δ VOL	-6.01	3.09	-1.95***
ECM (-1)	-0.96	0.19	-5.05*
Natural or Cultured Pearls, Precious or Semi-Precious Stones, Metals			
C	2.97	0.69	4.29*
Δ RP	-5.34	7.11	-0.75
Δ I	6.63	1.74	3.81*
Δ VOL	-9.60	5.88	-1.63
ECM(-1)	-0.62	0.15	-4.13*

This table shows short run adjustments in long run relation of this study models

Note: In table 6- B *, **, *** shows 1%, 5% and 10% significance levels respectively

Table-6C: Short term estimates

Repressors	Coefficient	Std.Error	T-Ratio
Base Metals and Articles or Base Metal			
C	1.48	0.23	6.43*
Δ RP	-7.39	4.39	-1.68
Δ RP(-1)	-27.17	6.52	-4.17*
Δ I	0.22	1.49	0.15
Δ VOL	-7.02	3.58	-1.96***
ECM(-1)	-0.66	0.11	-5.98*
Machinery and Mechanical Appliances			
C	0.27	0.05	5.40*
Δ RP	-3.80	5.07	-0.75
Δ I	1.38	1.31	1.05
Δ I(-1)	4.77	1.08	4.42*
Δ VOL	-11.25	4.05	-2.78*
ECM (-1)	-0.69	0.10	-6.90*
Vehicles, Aircraft, Vessels and Associated Transport Equipment			
C	0.84	0.12	7.12*
Δ RP	-1.24	4.02	-0.31
Δ I	1.56	1.21	1.29
Δ I(-1)	0.20	0.87	0.23
Δ I(-2)	4.06	1.01	4.02*
Δ VOL	-9.48	2.70	-3.51*
Δ VOL(-1)	-27.51	4.39	-6.26*
Δ VOL(-2)	-30.78	3.73	-8.26*
ECM (-1)	-0.92	0.12	-7.66*
Optical, Photographic, Cinematographer, Measuring, Checking, Precision Apparatus			
C	0.17	0.03	5.66*
Δ RP	-4.34	1.61	-2.69*
Δ RP(-1)	-9.15	2.30	-3.98*
Δ I	0.93	0.60	1.56
Δ I(-1)	1.87	0.35	5.34*
Δ I(-2)	0.23	0.44	0.52
Δ I(-3)	1.26	0.39	3.21**
Δ VOL	-5.42	1.37	-3.96*
ECM(-1)	-0.63	0.12	-5.25*
Works of Arts, Collectors, Pieces, Antiques and Special Transactions			
C	28.84	6.25	4.62*
Δ RP	-48.34	13.61	-3.55*
Δ I	15.13	4.57	3.31*
Δ I(-1)	2.13	2.90	0.73
Δ I(-2)	6.61	3.09	2.14**
Δ I(-3)	8.54	3.06	2.79*
Δ VOL	-0.30	11.06	-0.03
ECM(-1)	-0.60	0.13	-4.62*
Arms and Ammunition, Parts and Accessories			
C	29.48	5.47	5.39
Δ ARMS(-1)	0.65	0.21	3.09
Δ RP	-24.61	23.03	-1.07
Δ I	39.63	13.03	3.04
Δ I(-1)	45.39	10.21	4.45
Δ I(-2)	39.14	9.62	4.07
Δ I(-3)	52.97	11.18	4.74
Δ VOL	-52.01	20.55	-2.53
Δ VOL(-1)	-16.31	02.77	-5.88
Δ VOL(-2)	-6.88	1.27	-5.40
Δ VOL(-3)	-5.47	0.98	-5.57
ECM (-1)	-0.58	0.23	-2.52*

This table shows short run adjustments in long run relation of this study models

Note: In table 6- C *, **, *** shows 1%, 5% and 10% significance levels respectively

Table7 Contribution of different sectors on total exports of Pakistan

Sector Name	Share in Total exports
01---Live Animals and Animals Products	1.55%
02---Vegetable Products	9.56%
03---Animal or Vegetable Fats, Oils and Waxes	0.60%
04---Prepared Foodstuffs; Beverages, Spirits, Vinegar and Tobacco	1.79%
05---Mineral Products	6.77%
06---Products of Chemical or Allied Industries	1.78%
07---Plastics and Articles thereof; Rubber and Articles	1.68%
08---Raw Hide and Skins, Leather, Fur skins and Articles	5.29%
09---Wood and Articles of Wood	0.09%
10---Pulp of Wood or of other Fibrous Cellulosic Material	0.24%
11---Textiles and Textile Articles	57.17%
12---Footwear, Headgear, Umbrellas, Walking Sticks etc.	0.61%
13---Articles of Stone, Plaster, Cement, Asbestos, Mica or similar Materials	0.48%
14---Natural or Cultured Pearls, Precious or Semi-Precious Stones, Metals	0.21%
15---Base Metals and Articles or Base Metal	1.51%
16---Machinery and Mechanical Appliances	1.23%
17---Vehicles, Aircraft, Vessels and Associated Transport Equipment	0.26%
18---Optical, Photographic, Cinematographer, Measuring, Checking, Precision Apparatus	1.38%
19---Arms and Ammunition, Parts and Accessories	0.17%
20---Works of Arts, Collectors, Pieces, Antiques and Special Transactions	0.06%

This table shows the contribution of sectors of our sample in the total exports of Pakistan during the sample period 2003 to 2010.

Table 7 Shows that the contribution of different sectors in our total exports trade. The point to note in this table is the major contribution of exports comes from few sectors which are textiles and textiles products, vegetable products, mineral products and Raw Hide and Skins, Leather, Fur skins and Articles. Textiles and textiles products formed the two third of Pakistani total exports which need more attention in terms of exchange rate volatility impacts than any other sector. Although exchange rate volatility coefficient is negative and significant in aggregated exports of Pakistan, it's negative in all sectors of export trade but its insignificant in three sectors

(i. Animal or Vegetable Fats, Oils and Waxes, ii. Vehicles, Aircraft, Vessels and Associated Transport Equipment and iii. Arms and Ammunition, Parts) which supports the rationale of this study. The insignificant sectors forms just 1% of total exports, so while drawing generalizations exchange rate volatility would remain negative contributor in exports. The coefficients of exchange rate volatility are large, but while making comment one should take into account that series ARMA effects are not taken into account being out of the scope of this study. Large coefficients can also be due to economic recession over the sampling period as economy is going on fall; the variables of same nature accentuate each other's behavior.

The nonexistence of relationship between exchange rate volatility and exports for following sectors (i. Products of Chemical or Allied Industries, ii. Plastics and Articles thereof; Rubber and Articles, iii. Wood and Articles of Wood, iv. Pulp of Wood or of other Fibrous Cellulosic Material) is also reinforcing finding relating the query of this study. These results are departure from the aggregated results. These four sectors form the 3.79% of aggregated exports of Pakistan, thus making new meanings and require further investigations. Some presumptions may be that these sectors may have developed themselves on a level that they have gotten freedom from being affected by exchange rate volatility as pointed by Vianne & De Vries (1992). One may also presume their peculiar behavior may be over the sample period of this study and they may show some direction over longer periods of time.

On the adjustments in short run fluctuations in long run relationships, these were 46% for aggregated exports while adjustments of individual sectors range over 23% to 96%. This also conforms to individuality in each sector which was the concern of this study.

The behavior of Pakistani Chemical sector is in line with Pour & Moghaddasi (2010). Overall behavior of negative link between exports and exchange rate risk, our findings are in line with Akhtar & Spence-Hilton (1984), Maskus (1986), Kumar & Dhawan (1991), Demers (1991), Broll (1994), Anderton & Skudelny (2001), Barkoulas et al. (2002), Mustafa & Nishat (2004), Aurangzeb et al. (2005), Aliyu (2010), Serenis (2010), Aftab & Abbas , (2011) and contrary to Coes (1981), Franke (1991), Sercu (1992), Pour & Moghaddasi (2010).

Chapter Five:

Conclusion

5-Discussion and Conclusion

This study attempted to divulge the impact of exchange rate volatility on the sectoral trade of Pakistan. The essence of this research is that it investigates the relationship of exchange rate volatility and export demand on disaggregated data over the period Q3:2003 to Q4:2010 and operationalize bounds testing proposed by Pesaran et al.,(2001). Our study chose twenty sectors of Pakistani exports identified by State bank of Pakistan on commodity basis. In all equations where cointegeration between variables existed, it was revealed that exchange rate volatility affects exports negatively. Although Volatility coefficients were insignificant in three sectors (i.Animal or Vegetable Fats, Oils and Waxes, ii.Vehicles, Aircraft, Vessels and Associated Transport Equipment and iii.Arms and Ammunition, Parts) but the coefficient direction was negative for all the sectors of exports. This may be due to individual specialty of each sector which can be investigated in future research. Another argument may be raised that these sectors may have developed themselves at such extent that they are free from exchange rate impetus. The others determinants of our exports model, relative prices affected trade negatively which is in line with as suggested by Aurangzeb et al. (2005), while the impact of foreign income increment affects export demand positively. In current study foreign income was used as proxy for gross domestic product (GDP) due to unavailability of quarterly GDP data, so the foreign income behavior was quite in line with that of GDP.

Results of this study show the impacts of exchange rate volatility are negative for all sectors of trade but while drawing implication on must understand the portion of each sector in the total exports trade of Pakistan. As shown in table 7, the major contributor in our exports trade is textile sector which makes the two third of total exports of Pakistan. The other notable contributors are vegetable products, mineral products and Raw Hide and Skins, Leather, Fur

skins and Articles. According to theory hedging facilities can eradicate the risk of exchange rate (Vianne & De Vries, 1992) , so the in short term initiative government can enhance export by providing or assisting hedging arrangements for the major prominent sectors of exports.

The big sectors like textiles can also learn from the experience of multinational corporations (MNCs). MNCs have their locations in one country while operations in many countries. Being big in size they have learnt to work under exchange rate risk. Some studies like Broll (1992) suggested that MNCs decrease their exports in response to exchange rate risk but in real world it does not happen so due availability of hedging arrangements and also MNCs are in position to make such costly agreements. Pakistani textile sector being big in size can afford these kind of hedging arrangement and can reduce the perils of exchange rate.

The small size sectors which are too small can be more advanced than the big ones. Here is the example of sports goods produced in Sialkot worth mentioning. Sports goods maker have worked more on the quality of their products which has helped them to earn the name for themselves for their work and also good perception about Pakistan. Pakistani made footballs have got prominence in Fédération Internationale de Football Association (FIFA) world cup events. This is the results of branding accompanies with quality assurance.

This example demands the need from all sectors of our exports to work on developing their brands which can help to stand our industries in the world and be more resilient to exchange rate related risks.

The implications of this study for government is that it should work out a balanced approach towards exchange rate. There is great need of such policies which can promote a stable exchange rate. It's worth mentioning that stability comes when trade balance is in surplus side.

The trade balance of Pakistan is on deficit side in of very bad form. According to trade figures of 2010, our imports are 32.71 billion US dollar while exports are 20.29 billion US dollars which depicts the huge size of trade deficit. The Government can again start the same industrialization process as started in 1990s which helped to produce more than our needs and so led towards exports.

5.1 Limitations and Future Research

The limitation of this study is small data set due to non-availability of data on disaggregated level for long previous periods. Besides, the time period of this research is such that country was facing high uncertainty due to political instability and war on terrorism.

Future study can take into account the behavior of emerging and developed economies exports sectors in response to exchange rate variations which can lead to understanding the competitiveness of different sectors of each economy.

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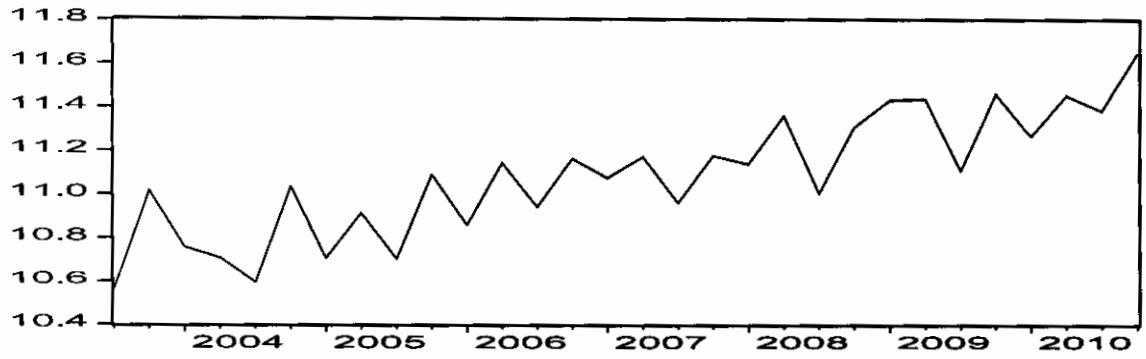
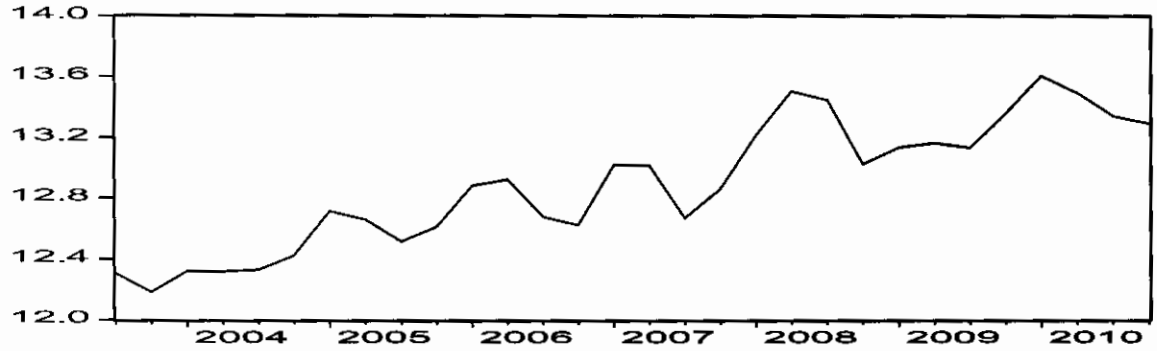
APPENDICES

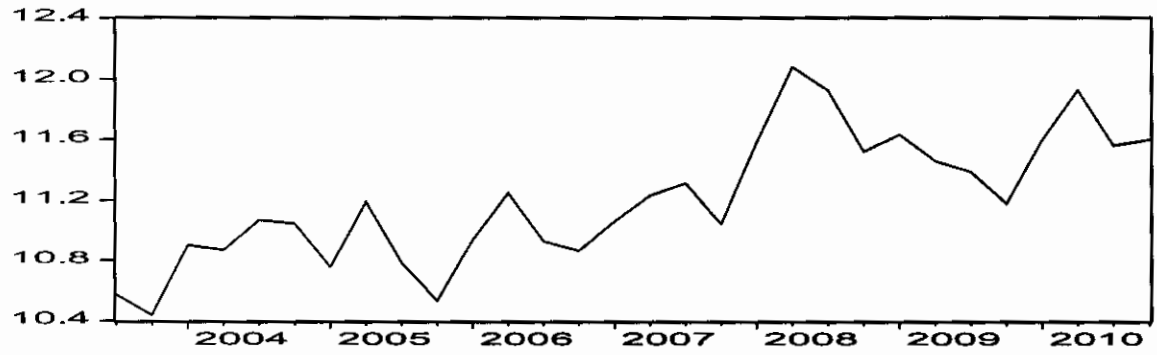
Appendix A- Data Line Graphs



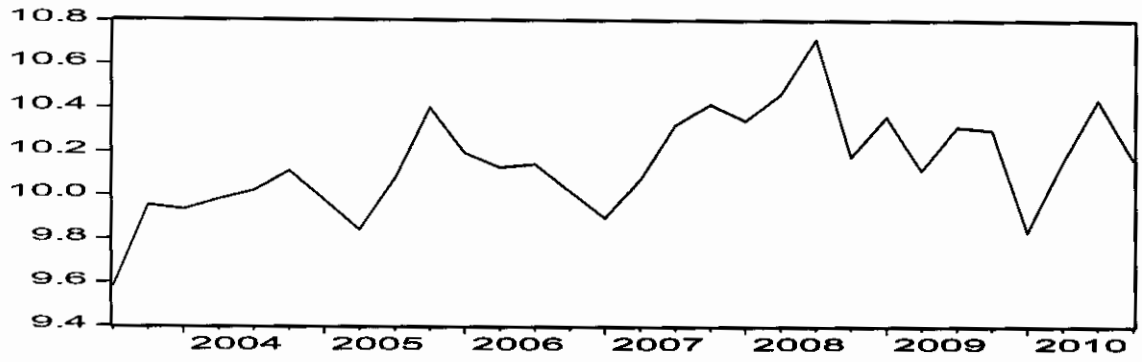
Live Animals and Animals Products



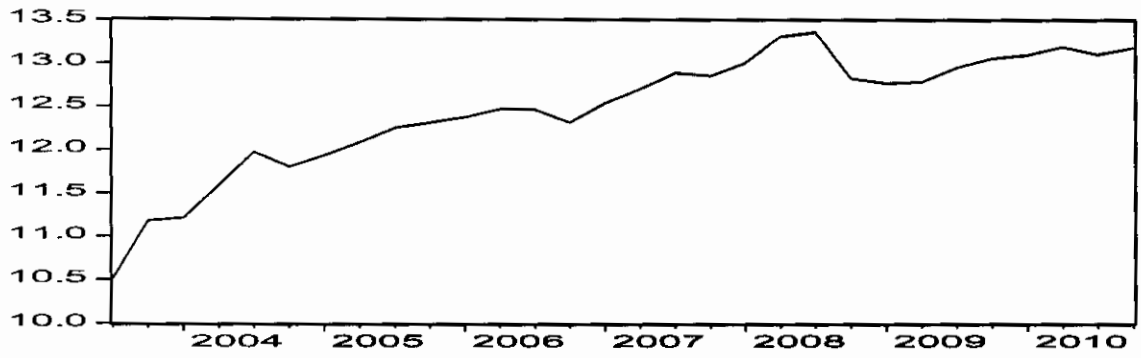
Vegetable Products



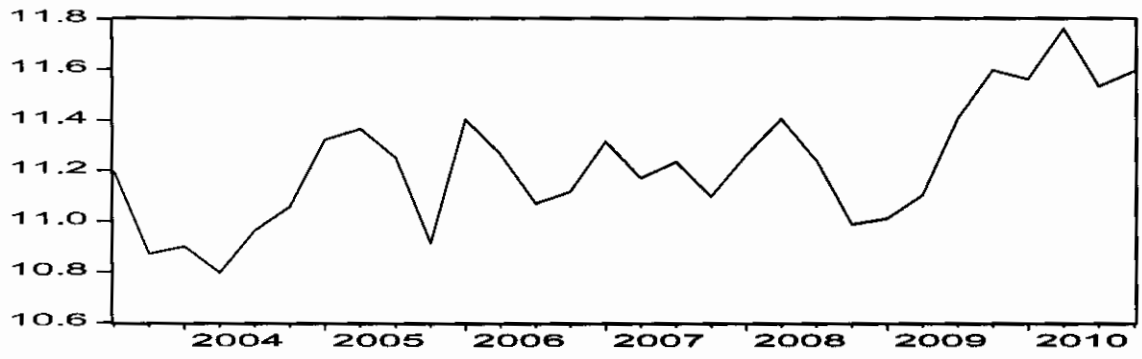
Animal or Vegetable Fats, Oils and Waxes



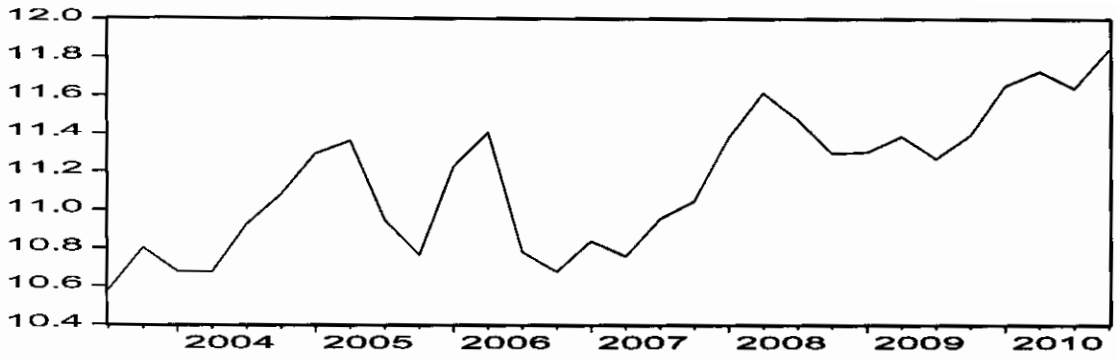
Prepared Foodstuffs; Beverages, Spirits, Vinegar and Tobacco



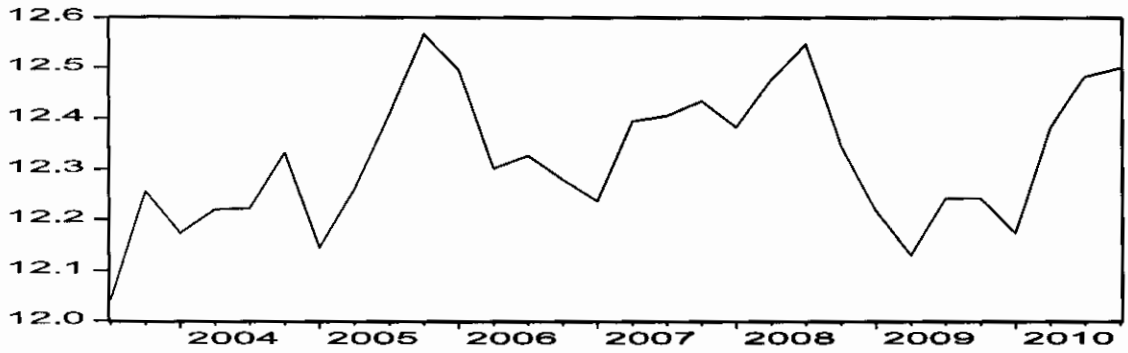
Mineral Products



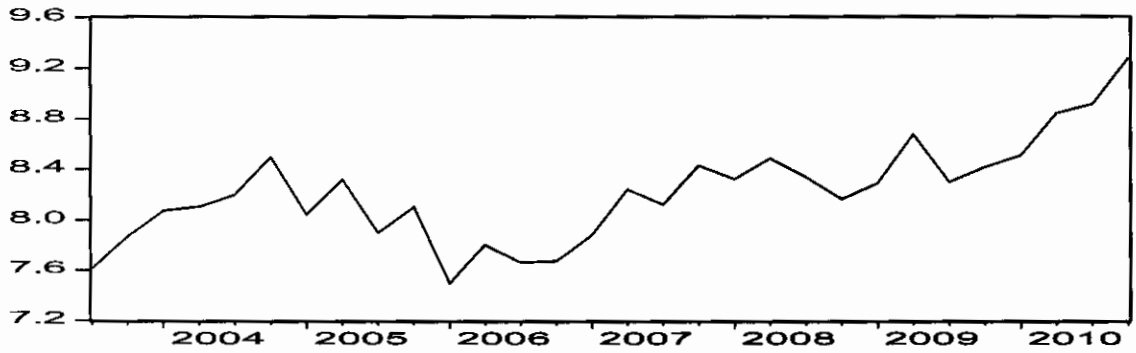
Products of Chemical or Allied Industries



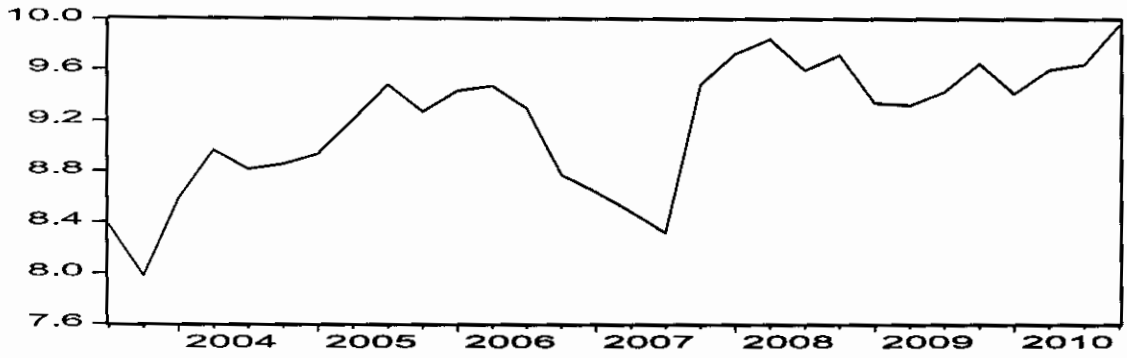
Plastics and Articles thereof; Rubber and Articles



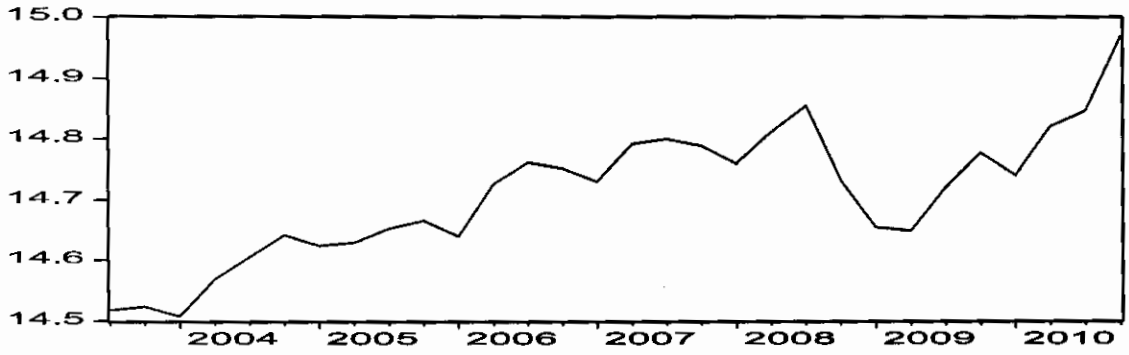
Raw Hide and Skins, Leather, Fur skins and Articles



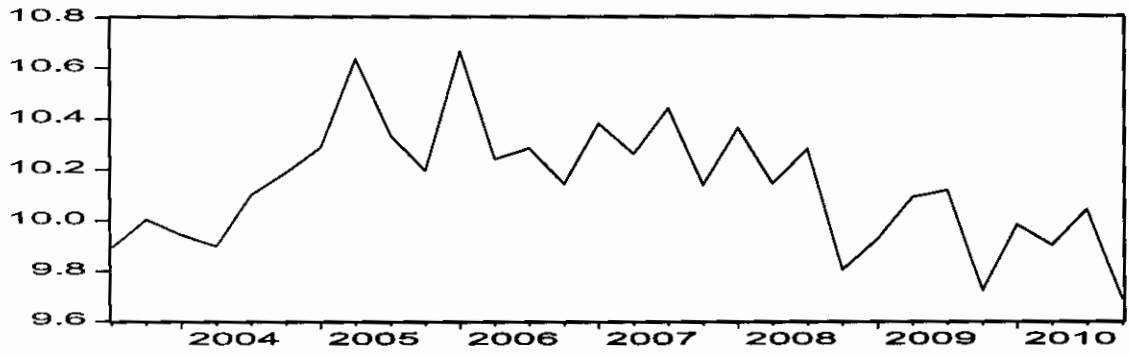
Wood and Articles of Wood



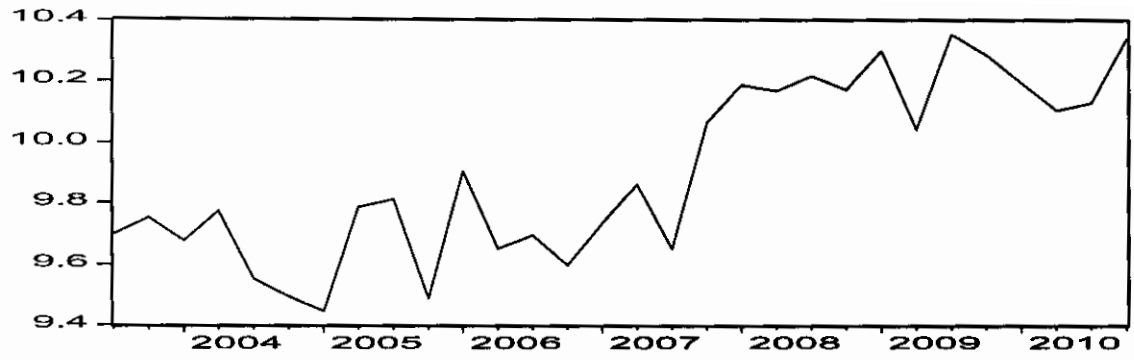
Pulp of Wood or of other Fibrous Cellulosic Material



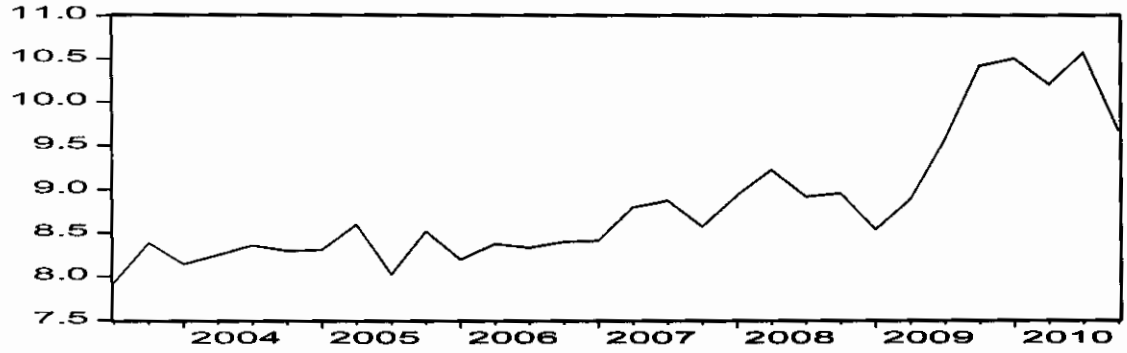
Textiles and Textile Articles



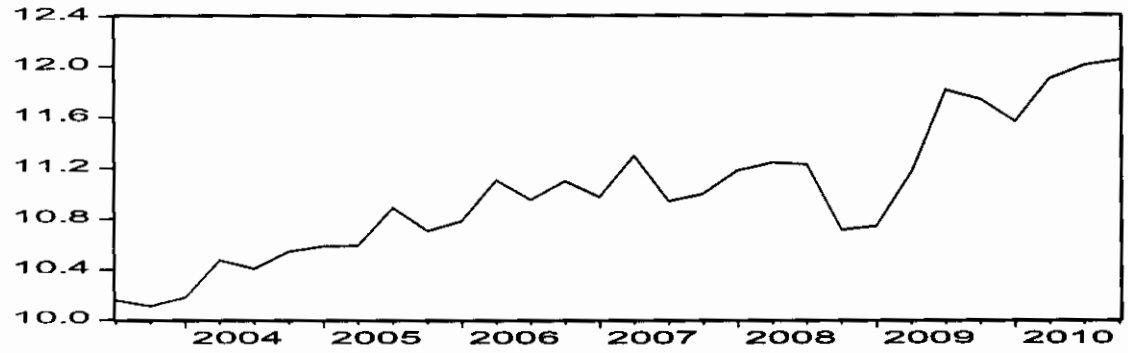
Footwear, Headgear, Umbrellas, Walking Sticks etc.



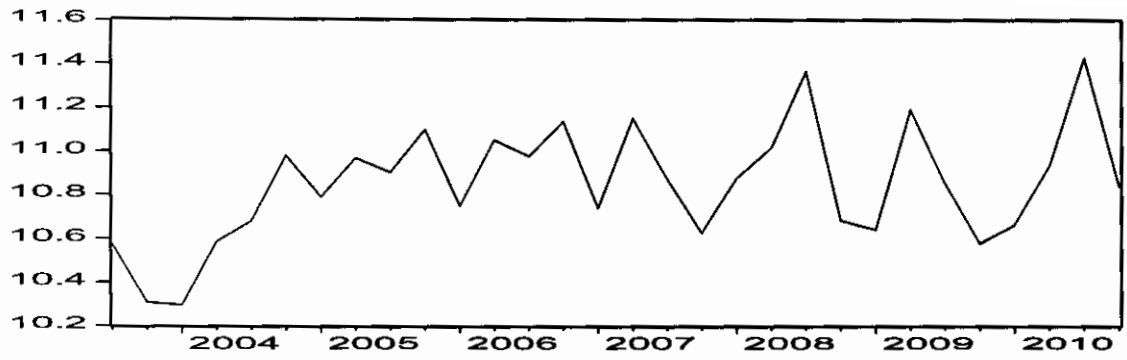
Articles of Stone, Plaster, Cement, Asbestos, Mica or similar Materials



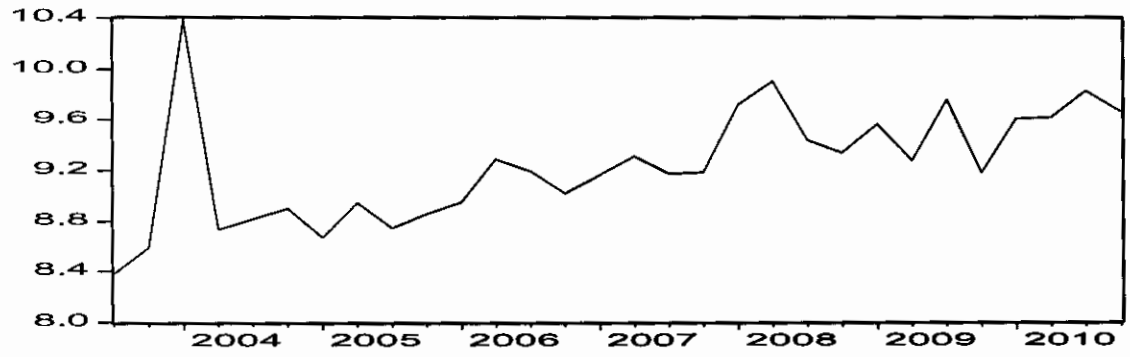
Natural or Cultured Pearls, Precious or Semi-Precious Stones, Metals



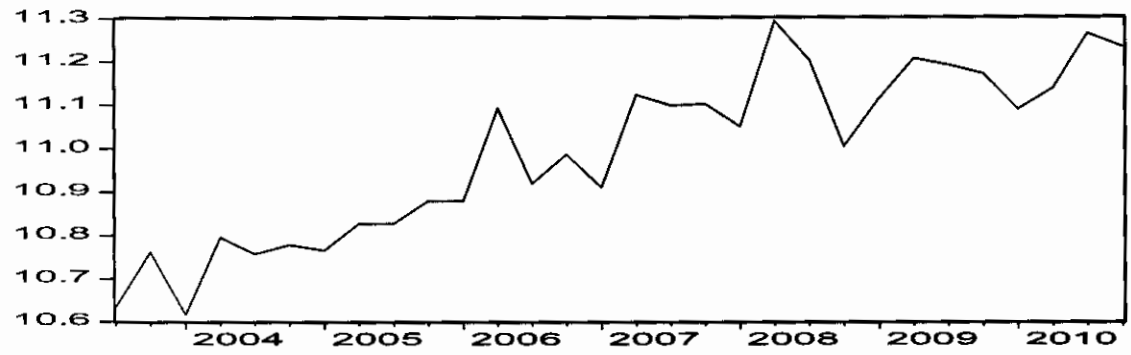
Base Metals and Articles or Base Metal



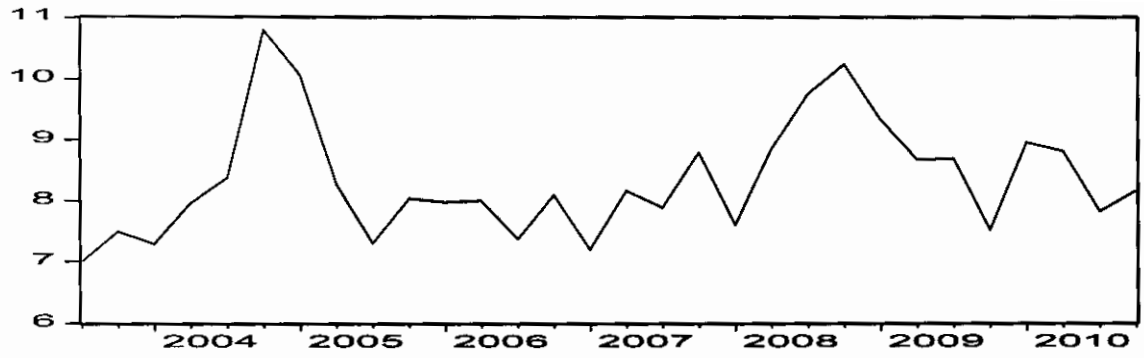
Machinery and Mechanical Appliances



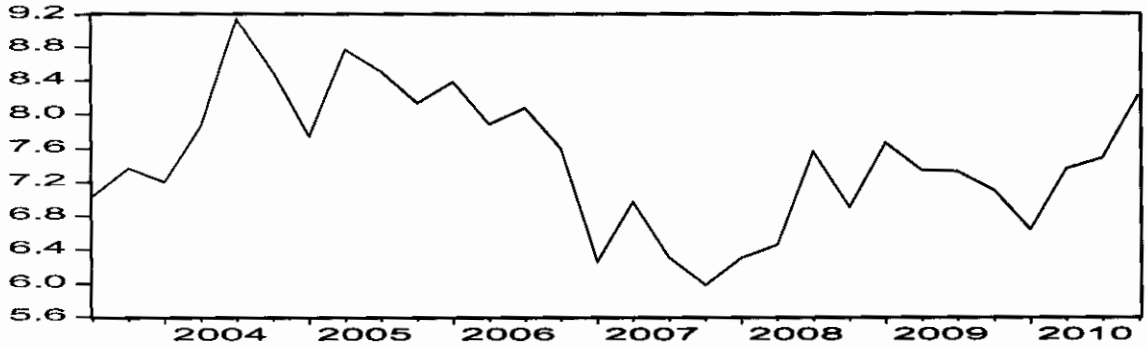
Vehicles, Aircraft, Vessels and Associated Transport Equipment



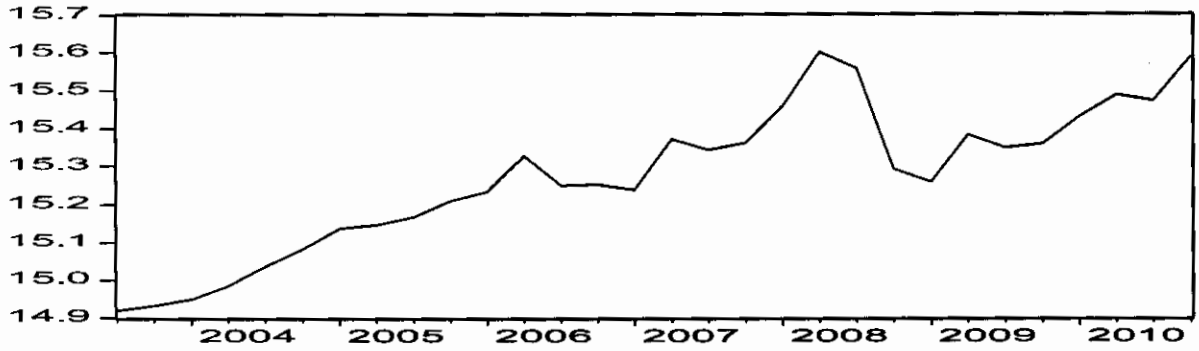
Optical, Photographic, Cinematographer, Measuring, Checking, Precision Apparatus



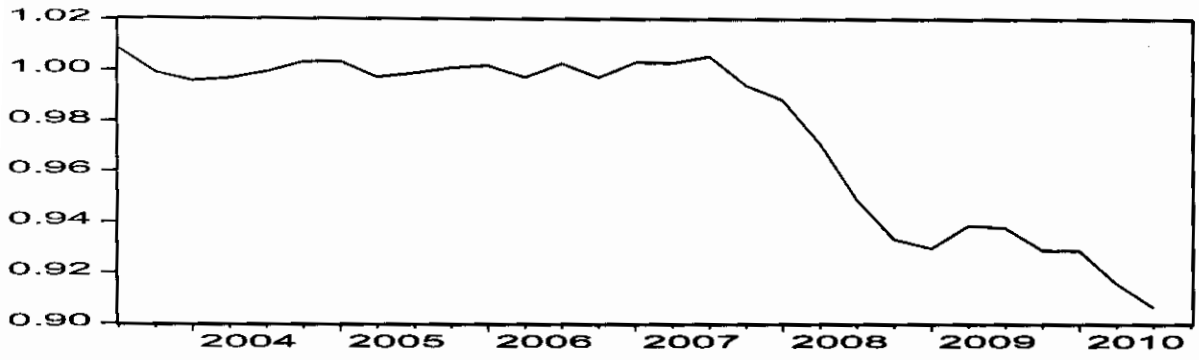
Arms and Ammunition, Parts and Accessories thereof



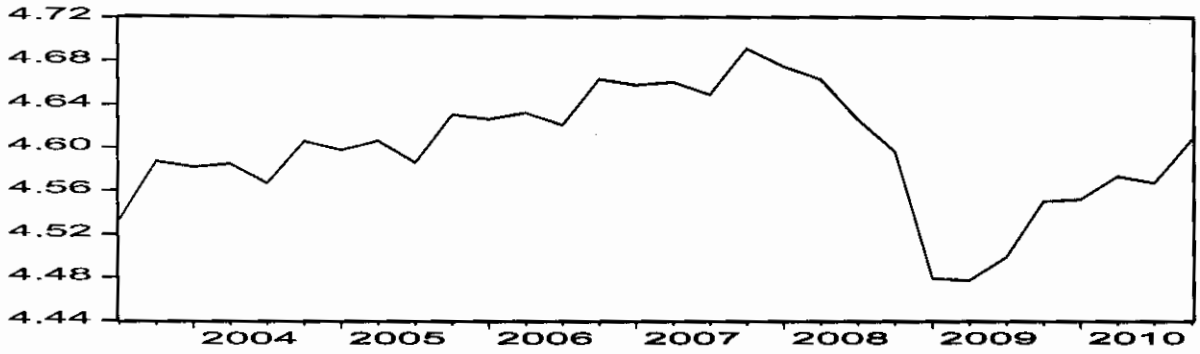
Works of Arts, Collectors, Pieces, Antiques



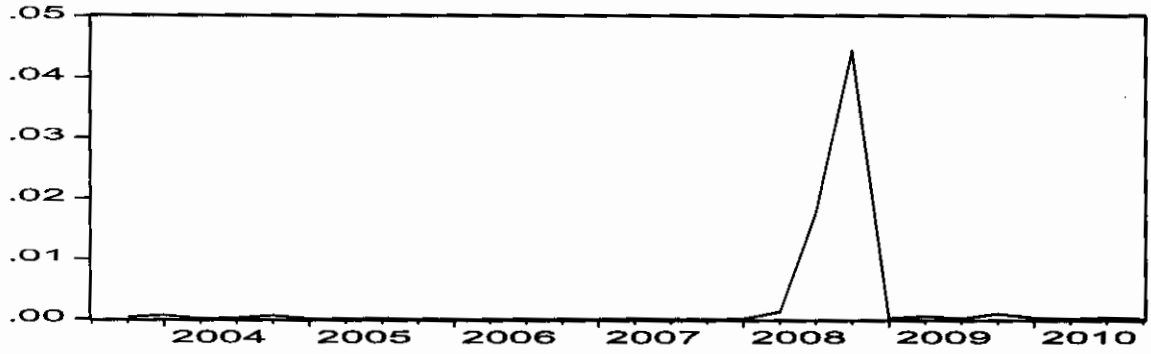
Total Exports



Relative Prices



Industrial Production Index



Exchange rate Volatility