EXAMINING THE IMPACT OF EXCHANGE RATE VOLATILITY ON THE INTERNATIONAL TRADE OF PAKISTAN

Submitted By

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CERTIFICATE

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In the name of Allah, the most compassionate, the most merciful, kind and benevolent

Contents

List of Tables

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Dedication

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Chapter 1
INTRODUCTION

The arrival of the flexible exchange rate system in 1973 produced a significant volatility and uncertainty in exchange rates. The consequences of exchange rate volatility on trade have long been at the center of debate among the policy makers and researchers. This issue has also received considerable attention in international economics literature. Proponents of fixed rates argue that volatility and deviation from equilibrium values have persisted over sustained periods of time. According to their view, exchange rate volatility deters industries from engaging in international trade and compromises progress in trade negotiations. In contrast, proponents of flexible rates argue that exchange rates are mainly driven by fundamentals and that changes in fundamentals would require similar, but more abrupt movements in fixed parities. Therefore, a system of fixed rates would not reduce unanticipated volatility.

The study of the effect of exchange rate volatility on trade attracts attention due to its influence on the choice of exchange rate regime (flexible, fixed, and managed exchange rate system), decisions of economic agents seeking to maximize returns by trading currencies in manifold markets, and the overall efficiency with which the economy operates. The volatility of exchange rate also has productivity concerns (Corsetti *et al.* 2007).

Exchange rate volatility can affect trade directly through uncertainty and adjustment costs and indirectly through its effect on the structure of output and investment and on government policy. However, both theoretical and empirical studies yield contradictory propositions and evidences regarding the influence of exchange rate volatility on volume of trade.

Some studies hold the view that the uncertainty associated with high exchange rate volatility presents risk to a typical risk-averse firm and consequently reduces trade volume (Hooper and Kohlhagen (1978), Baron (1976a), and others). At the same time, there are strong arguments for positive effect of exchange rate volatility on trade, as presented in Frankle (1991) and De Grauwe (1988). Giovannini (1988) also points out that when financial markets are perfect, the expected profit might increase as a result of increased exchange rate risk if export prices are dominated in foreign currency. Further, in a general equilibrium framework, Bacchetta and van Wincoop (2000) show that trade is unaffected by the exchange rate regimes, which are characterized by different volatility patterns. The contradictory theoretical predictions find no further clarification in empirical studies, which yield mixed results on the effect of exchange rate volatility on trade volumes.

Doyle (2001), Martson (1990) and Dornbusch (1987), for example, associate conflicting observations from empirical studies of the effect of exchange rate volatility on bilateral trade flows to differences in firm characteristics and the market conditions under which firms operate. Atkeson and Burstein (2007) present ''pricing-to-market'' behavior of some firms as a reason for not fully passing realized costs to consumers when selling their products in foreign markets and, thus, the variation in firms' responses to uncertainty in exchange rates. Sercu and Uppal (2003) assert that the relationship between volatility in exchange rate and the volume of trade depends on the underlying sources of volatility.

Likewise, acknowledging the role that numerous factors (e.g., prices, incomes, geographic proximity, cultural, language barriers and trade agreements) may play in how exchange rate volatility affects bilateral trade flows, Barkoulas *et al.* (2002) attribute the observed differences in the impact of exchange rate volatility to variation in the causes of movements in exchange rate itself. Further, they indicate that volatility in exchange rate could arise from three different, but very related, components:

- Variation in fundamental factors (e.g., purchasing power of consumers, changes in technology);
- Variation in the microstructure foreign exchange market (e.g., portfolio shifts, excess speculation, bubbles and rumors, banLMagon effects and noise traders); and
- The noisy signal of potential future policy changes (e.g., relative money supply, output growth rates, interest rates, and inflation differentials) that also contaminate movements in the fundamental component of exchange rate.

In short, exchange rate movement can be classified into two components: fundamental (permanent) and microstructure (transitory).

To analyze the impact of exchange rate volatility on the volume of trade, Tadesse (2009) suggest the need to decompose changes in the exchange rate series into its components. The intuition behind this decomposition is that the responses of economic agents to uncertainties are perceived to arise mainly from changes due to fundamental factors and not much from changes in the transitory components. The decomposition thus enable one to account for the differences, if any, that economic agents may make in their trading arrangements when dealing with uncertainty in exchange rates they perceive are arising from different sources.

Pakistan is following a system of managed floating exchange rate since the year 1982 and a fixed rate system was operative prior to 1982. The empirical literature on the subject of exchange rate volatility is relatively scant in case of Pakistan. In the present study, we will decompose the changes in series of real bilateral exchange rates (RER) and real effective exchange rate (REER) into their transitory (nominal) and permanent (real) components using the methodology of Blanchard and Quah (1989). This will help us to analyze the proportion of forecast error variance of exchange rate series explained by real and nominal shocks with the help of variance decomposition obtained by structural VAR (vector auto regression) model of Blanchard and Quah (1989). The study is based on the monthly data of Pakistan's 27 major trade partners, covering the period July 1982 to December 2009. The trade partners on average cover 82.5% of Pakistan's trade. The trade partners included in the study are Bangladesh, Belgium, Canada, China, Denmark, France, Germany, Hong Kong, India, Indonesia, Iran, Italy, Japan, Korea, Kuwait, Malaysia, Netherlands, New Zealand, Saudi Arabia, Singapore, Spain, Sri Lanka, Switzerland, Turkey, the UAE, the UK and the USA.

Further, we also analyze how volatility in exchange rate components affects the volume of aggregate and disaggregate Pakistani exports and imports with its 27 trading partners.

This study deviates from earlier research in two ways. First, the data used are of higher frequency (monthly) and are disaggregated at country level, permitting evaluation of the impact of volatility in exchange rate components on trade across different countries.

Second, the reference countries are heterogeneous ranging from developed countries to developing countries. Countries like UK, USA, Canada, Germany, France and Belgium are large, developed, open economies and countries like Bangladesh, China, India, Indonesia, Iran and Malaysia are the developing countries of Asian region. Japan, Saudi Arabia, the USA and Malaysia are the main suppliers of imports to Pakistan and the USA, Germany, the UK, Japan, the UAE and Saudi Arabia are the main customers of Pakistan's exports. Based on its geographical location, Pakistan has close economic relations with the Middle East, Central Asia and South Asia. It is the main gateway to Central Asia and supplier to the

Emirates. Economic Integration with South Asia has been less effective in the past due to the strained relations with India on the Kashmir issue. However, recently notable steps have been taken by the South Asian Association for Regional Co-operation (SAARC), of which Pakistan is a member, to establish a South Asian Free Trade Area (SAFTA), including India, Bangladesh and Sri Lanka, all included in our study. The heterogeneity of the sampled countries allows the assessment of differences in the responses of traders from different countries to uncertainties in exchange rate.

Objective of study

- To decompose the real bilateral exchange rates and real effective exchange rate into their permanent (real) and transitory (nominal) components.
- To evaluate the relative contribution of forecast error variances of exchange rate series explained by real and nominal shocks.
- To estimate the volatility of real effective exchange rate, real bilateral exchange rate and of their components.
- To analyze the impact of exchange rate volatility on aggregate imports and exports of Pakistan.
- To examine the impact of exchange rate volatility on imports and exports of Pakistan at disaggregated (country) level for 27 major trading partners.
- To study the effects of permanent and transitory components of exchange rate on imports and exports at aggregate level and with each trading partner of Pakistan.

The above listed objectives indicate that this study will provide a detailed analysis on the relationship between exchange rate volatility and trade flows in case of Pakistan. The study attempts to shed light on this issue from a detailed analysis by taking aggregate and disaggregate country level data for Pakistan. It is hoped that the study will serve as a fresh contribution to knowledge in this area because to the best of our knowledge in case of Pakistan no empirical study utilizes high frequency disaggregated trade data to calculate and decompose the series of real effective exchange rate (REER) and real bilateral exchange rate into their components (transitory and permanent). Further, there is hardly any study that has investigated the impact of exchange rate volatility on Pakistan's trade at bilateral level so intensively.

The remaining part of the study is organized as follows. Chapter 2 discusses the theoretical and empirical literature related to the topic. Chapter 3 describes the methodology followed in this study that explains the relevant theoretical framework and the model estimated in this study. Issues related to data and construction of variables are discussed in Chapter 4. Chapter 5 presents the empirical results of the model estimated to analyze the imports and exports of Pakistan at aggregated and disaggregated (country) level. Chapter 6 concludes the study.

Chapter 2
LITERATURE REVIEW

2.1 INTRODUCTION

The past several decades have witnessed considerable research concerning structural decomposition of exchange rate and the impact of exchange rate volatility on the volume of international trade. This chapter comprises of three sections. In section 2.2 we concentrate on the studies concerning ER decomposition. In section 2.3 we provide theoretical aspects of exchange rate volatility and trade relationship, while in section 2.4 we present empirical literature on the relationship of exchange rate volatility and trade.

2.2 THEORY AND APPLICATION OF THE DECOMPOSITION OF EXCHANGE RATE

Exchange rate (defined as domestic currency price of one unit of foreign currency) between two currencies represents various aspects of the economies. It can be considered as a composite index of (and thus can be decomposed into) fundamental factors determining exchange rate behavior and the transitory component that arises from shocks in the microstructure aspect of the exchange market and future policy changes, which also affect movement in the fundamental component. Fundamental factors driving the exchange rate process are related to monetary policy in the sense that monetary authorities, having an information advantage relative to the public over future policy changes can influence the fundamentals. A general 'microstructure' shock to the exchange rate process is not observable by either the monetary authorities or public and is modeled as a white noise process. We generically refer to a shock as a general microstructure shock if it represents innovations to the exchange rate process arising from the effects of portfolio shifts among international investors [following Evans and Lyons (1999)], excess speculation, bubbles and rumors, banLMagon effects, or the effects of technical trading by chartists or 'noise traders'. Such shocks are generally short-term in nature and represent temporary excursions from the fundamental value of the exchange rate. In other words, they capture those exchange rate movements that cannot be explained by changing expectations of the underlying economic fundamentals, while the main feature of a permanent shock is that its effect on the time series lasts forever and never dies out.

The decomposition of exchange rate into its components directly implies that exchange rate uncertainty is not a truly exogenous variable (as assumed in other theoretical studies) but is rather a function of the underlying volatility in macroeconomic fundamentals.

Different techniques are available for the decomposition of a series into their permanent and transitory components. Beveridge and Nelson (1981) show how to decompose any ARIMA (*p*, 1, *q*) model into the sum of a random walk plus drift and a stationary component (i.e., the general trend plus irregular model). Another method of decomposing a series into a trend and a stationary component has been developed by Hodrick and Prescott (1997). Hodrick-Prescott (HP) decomposition technique forces the change in the trend to be as small as possible. This occurs when the trend is linear. Since the HP filter is a function that smoothes the trend, it has been shown to introduce spurious fluctuations into the irregular component of a series. Blanchard and Quah (1989) extend the univariate decomposition model of Beveridge and Nelson (1981) into a bivariate setting, in that way they link the two components of the series to the related macroeconomic variable.

Lastrapes (1992), Bayoumi and Eichengreen (1992), Evans and Lothian (1993), Enders and Lee (1997) and Ahmad *et al.* (2007) used Blanchard and Quah (1989) methodology. Lastrapes (1992) analyzed the six industrialized countries by using Blanchard and Quah (1989) approach. The study identified two types of structural disturbance, nominal shocks and real shocks; with the restriction that the nominal shocks have no long-run impact on the real exchange rate. The results indicate that real shocks account for the major part of both the real and nominal exchange rate fluctuations in six industrialized countries.

Bayoumi and Eichengreen (1992) distinguished between supply shocks and demand shocks by assuming that the supply shocks have permanent effects on exchange rates whereas the demand shocks have no effects whatsoever. Their empirical results for G-7 countries indicate that the shift from the Bretton Woods system of pegged exchange rates to the post-Bretton Woods float can be explained by modest increases in the cross-country dispersion of supply shocks.

Evans and Lothian (1993) decomposed real exchange rates of Germany, Italy, Japan and the UK vis-à-vis the US dollar and found that on average nearly 80% of the variations in the real exchange rates are attributed to permanent shocks and only 20% could be due to transitory shocks in the case of Germany, Italy, Japan and the UK. Enders and Lee (1997) decomposed real exchange rates of Canada, Germany and Japan vis-à-vis the US dollar and showed similar results.

Ahmad *et al.* (2007) examined decomposition of the nominal and real exchange rate into real and monetary shocks. In this study CPI and WPI are used alternatively to construct real exchange rate series. They focused their analysis on four countries: Bangladesh, India, Pakistan and Sri Lanka, which are major countries of South Asian region. Their result showed that real shocks explain a large portion of the forecast error variance of the real exchange rate series at any forecast horizon for three countries except Sri Lanka.

In an attempt to move beyond the purchasing power parity hypothesis, Alexius (2001) concentrated on two issues. The first concerns the causes of movements in real exchange rates by decomposing real exchange rates into a permanent (non-stationary) component and a transitory (stationary) component. The result indicates that supply shocks tend to dominate the long-run variance decompositions for each of the four Nordic countries under study. This suggests that productivity changes are the most important determinants of long-run movements in real exchange rates.

Dibooglu and Kutan (2001) used the structural vector autoregressive (SVAR) model to decompose real exchange rate and price movements into real and nominal shocks by assuming long-run neutrality of nominal shocks. For Hungary and Poland, their results indicate that real shocks had greater effect on exchange rate movements than nominal shocks in Hungary, but the opposite is true in Poland.

Sources of fluctuations in real and nominal US dollar exchange rates of selected emerging market economies (Chile, Colombia, Malaysia, Singapore, South Korea, and Uruguay) have been investegated in a study by Chowdhury (2004). Following the infinite-order moving average representation, the result indicated that real shocks (for capturing the exchange rate fluctuations) dominate nominal shocks for the exchange rate series examined.

Wang (2005) evaluated the evolution of China's real effective exchange rate. Three types of macroeconomic shocks, namely, supply, real demand, and nominal shocks, are identified and their impact on output, the real exchange rate, and relative prices are analyzed. The structural decomposition indicates that relative real demand and supply shocks account for most of the variations in real exchange rate changes during the estimation period where as supply shocks are at least as important as nominal demand shocks in accounting for real exchange rate movements.

Kempa (2005) decomposed the real exchange rates as well as relative price level and output movements into components associated with nominal shocks as well as shocks to aggregate supply and aggregate demand through structural vector autoregression (SVAR) analysis. The decomposition shows that nominal shocks account for less than one-third of overall real exchange rate variability even when the model is parameterized with low elasticities. Most of the remaining variability is accounted for by aggregate demand shocks. In a high-elasticity scenario, supply shocks gain slightly but most of the variability in exchange rates continues to be explained by aggregate demand shocks. At longer forecast horizons, in particular, the decomposition suggests that real exchange rate variability is mostly driven by shocks to aggregate demand, particularly in the longer run.

Narayan (2008) examined the importance of permanent and transitory shocks in exchange rate fluctuation by using a trend-cycle decomposition of the real exchange rate series. The study considered a set of developed G-6 nations: Japan, Canada, Italy, Germany, France, and UK. Variance decomposition analysis reveals that at short horizons (1-month) permanent shocks induce bulk of the movements in real exchange rates for Germany, France, Japan, Italy and the UK, vis-à-vis the US dollar; while transitory shocks were dominant in explaining Canada's real exchange rate.

Steinsson (2008) challenged the focus of the theoretical literature on monetary shocks and shifted the analysis to the role of real shocks as drivers of the real exchange rate. The study showed that in response to real shocks the real exchange rate exhibits a dynamic that matches the data in terms of volatility and persistence. By contrast, monetary shocks are unable to match the empirical persistence of real exchange rates.

Hamori and Tanizaki (2008) analyzed the sources of fluctuations in real effective exchange rates in six Sub-Saharan African countries i.e., Burundi, Ghana, Lesotho, Malawi, Nigeria, and South Africa. They found that real shocks play a dominant role in driving real exchange rate fluctuations in the Sub-Saharan African countries.

Juvenal (2009) investigated the role of real and monetary shocks in the exchange rate behavior using a structural vector autoregressive model of the US vis-à-vis the rest of the world. The shocks are identified using sign restrictions on the responses of the variables to orthogonal disturbances. These restrictions are derived from the predictions of a two-country Dynamic Stochastic General Equilibrium (DSGE) model. The study found that monetary shocks are unimportant in explaining exchange rate fluctuations. The contribution of demand shocks plays an important role but not of the order of magnitude often found in earlier studies.

Inoue and Hamori (2009) analyzed the sources of the exchange rate fluctuations in India by employing the structural VAR model. The analysis employed the trivariate VAR model, which is composed of the relative output of India and a foreign country (US or the euro area) and the nominal exchange rate and real exchange rate between India and a foreign country (US or the euro area). Using the methodology of Clarida and Gali (1994), they imposed three additional restrictions on the long-run multipliers while freely determining the short-run dynamics. The results show that real shocks have a persistent effect on both the real and nominal exchange rate movements. Moreover, they observed that real demand shocks play a key role among real shocks. Their results obtained by using either the US or the euro area as foreign countries were the same, indicating that the results are robust.

In a most recent study, Ok *et al.* (2010) explored the factors responsible for exchange rate fluctuations of the Cambodian riel and the Laotian kip against the US dollar. By using a structural vector autoregression (SVAR) model with the long-run neutrality restriction of nominal shocks on real exchange rates, they decomposed exchange rate movements into two components, real and nominal factors and examined the dynamic effects of real and nominal shocks. The empirical analysis shows that real shocks in direction of depreciation lead to real and nominal depreciation, while nominal shocks induce long-run nominal depreciation but real appreciation in the short-run.

2.3 RELATIONSHIP BETWEEN EXCHANGE RATE VOLATILITY AND TRADE: THEORETICAL ASPECTS

This part reviews the theoretical contributions made in the literature which develop models showing hypothetically how a trading firm reacts to exchange rate volatility. We begin our discussion with the example of a simple exporting firm to exemplify how (real) exchange rate volatility can have an effect on the level of the firm's exports. The simplest case described by Clark (1973) considers a competitive firm with no market power and producing only one commodity which is sold completely to one foreign market and the firm does not import any intermediate inputs. The firm is paid in foreign currency and converts the earnings of its exports at the current exchange rate, which varies in an unpredictable manner, as there are assumed to be no hedging possibilities, such as through forward sales of the foreign currency export earnings. In addition, because of costs in adjusting the scale of production, the firm makes its production decision in advance of the realization of the exchange rate and therefore cannot adjust its output in response to desirable or adverse shifts in the profitability of its exports arising from fluctuations in the exchange rate. In this situation the variability in the firm's profits arises exclusively from the exchange rate, and where the managers of the firm are harmfully influenced by risk, greater volatility in the exchange rate - with no change in its average level - leads to a reduction in output, and hence in exports, in order to lessen the exposure to risk.

Some other authors extended this basic model, e.g., Hooper and Kohlhagen (1978), Baron (1976a), Broll (1994) and Wolf (1995) who arrive at the same conclusion of a clear negative relationship between exchange rate volatility and the volume of trade.

This strong conclusion relies on a number of simplifying assumptions. First, it is assumed that there are no hedging possibilities either through the forward exchange market or through counterbalancing transactions. In case of developed economies where there are well-developed forward markets, specific transactions can be easily hedged, thus reducing disclosure to unanticipated movements in exchange rates. But it needs to be acknowledged that such markets do not exist for the currencies of most developing countries. Moreover, even in case of advanced economies the decision to continue to export or import would involve a sequence of transactions over time where both the amount of foreign currency receipts and outlays, as well as the forward rate, are not known with certainty.

Furthermore, there are several possibilities for reducing exposure to the risk of adverse exchange rate fluctuations other than forward currency markets (e.g., non-linear hedges like options and portfolios of options). The main point is that for a multinational firm taking part in a wide range of trade and financial transactions across a large number of countries, there are manifold opportunities to take advantage of offsetting movements in currencies and other variables. For example, there is a clear tendency for exchange rates to adjust to differences in inflation rates, and in today's advance world such adjustment may be more rapid than indicated by earlier studies. Thus, if exports are priced in a foreign currency that is decreasing in value, the loss to the exporter from the declining exchange rate is at least partially offset by the higher foreign-currency export price (Cushman, 1983 and 1986). In a similar way Clark (1973) noted that to the extent an exporter imports intermediate inputs from a country whose currency is depreciating, there will be some compensation to declining export returns in the form of lower input costs. Additionally, when a firm deals with a large number of countries, the tendency for some exchange rates to move in offsetting directions will offer a degree of protection to its overall exposure to currency risk. Lastly, as analyzed by Makin (1978), a finance viewpoint proposes that there are many possibilities for a multinational corporation to hedge foreign currency risks arising from exports and imports by holding a portfolio of assets and liabilities in different currencies.

One cause for depressing affect of exchange rate volatility on trade stems from the assumption that the firm cannot change factor inputs in order to adjust optimally to take account of movements in exchange rates. When this assumption is ignored and firms can adjust one or more factors of production in response to movements in exchange rates, increased volatility can in effect generate profit opportunities. This situation has been examined by Canzoneri *et al.* (1984), De Grauwe (1992), and Gros (1987). The effect of such variability depends on the interface of two forces at work. On one hand, if the firm can adjust inputs to both high and low prices, its expected profits will be larger with greater exchange rate variability, as it will sell more when the price is high, and vice versa. On the other hand, to the extent that there is risk aversion, the higher variation of profits has an adverse effect on the firm and creates a disincentive to produce and to export. If risk aversion is relatively low, the positive effect of greater price variability on expected profits offsets the negative impact of the higher variability of profits on firm, and the firm will raise the average capital stock and the level of output and exports. Utilizing a more general setting for the analysis of the behavior of a firm under uncertainty, Pindyck (1982) has also shown that under specific conditions, increased price variability can result in increased average investment and output as the firm adjusts to take benefit of high prices and to reduce the impact of low prices.

As mentioned by Clark *et al.* (2004), a feature of the relationship between trade and exchange rate volatility that needs to be pointed out is the role of 'sunk costs'. A great deal of international trade consists of differentiated manufactured goods that usually require major investment by firms to acclimatize their products to foreign markets, to set up advertising and delivery networks, and to set up production facilities, particularly designed for export market. These sunk costs would be inclined to make firms less responsive to short-run movements in the exchange rate, as they would tend to implement a 'wait and see' approach and continue to operate in the export market as long as they can recover their variable costs and wait for a turnaround in the exchange rate to regain their sunk costs.

Employing the finance literature of McDonald and Segel (1986) on real options, Dixit (1987) and Krugman (1989) have investigated the implications of sunk costs in the perspective of an 'options' approach, which has been applied by Franke (1991) and Sercu and Vanhulle (1992). The basic idea is that an exporting firm can be viewed as possessing an option to leave the export market, and a firm not presently exporting can be viewed as having an option to enter the foreign market in the future. The decision to enter or exit the export market involves taking into account not only explicit fixed and variable costs, but also the cost of exercising the option to enter or leave the market. The greater the volatility in exchange rates, the greater the worth of keeping the option, and hence the broader the range of exchange rates within which the firm stays in the export market, or stays out if it has not entered up till now. This suggests that increased exchange rate volatility would increase the sluggishness in entry and exit decisions.

Taking into account the firm's opportunity to (linearly) hedge its contractual exposure, other partial-equilibrium models such as Ethier (1973) and Baron (1976b) illustrate that exchange rate volatility may not have any impact on trade volume if firms can hedge using forward contracts. Viaene and De Vries (1992) extended this analysis to allow for the endogenous determination of the forward rate; in this case, exchange rate volatility has opposing effects on importers and exporters (who are on opposite sides of the forward contract) and they find that the net effect of exchange rate volatility on trade is ambiguous. Also De Grauwe (1988) shows that risk aversion is not sufficient to obtain a negative link between exchange risk and expected trade because, in general, an increase in risk has both an income effect and a substitution effect that work in opposite directions (Goldstein and Khan, 1985). Dellas and Zilberfarb (1993) make a similar point using a portfolio-choice model.

Barkoulas *et al.* (2002) employed a partial equilibrium approach to evaluate the effects of exchange rate uncertainty, which is modeled as emanating from three relevant sources: general microstructure aspects of the foreign exchange market, the fundamental forces driving the exchange rate process, or a noisy signal of the future policy innovations. They analyzed the effects of the exchange rate uncertainty introduced through these sources on both the volume and variability of trade flows using a simple signal extraction framework, in which rational economic agents form expectations about the one-period ahead exchange rate based on available information. They showed that the variance of microstructure shocks has negative effect on the level of trade flows while the variances of exchange rate fundamentals and the noisy signal of future policy innovations have an ambiguous effect on the level of trade flows. They further showed that the variability of trade flows reduces due to the exchange rate uncertainty originating from general microstructure shocks and the fundamental factors while variability increases due to the exchange rate uncertainty which relates to a noisy signal of policy innovations.

The discussion of the impact of exchange rate volatility on trade up to this point has been within a partial equilibrium framework, i.e., the only variable that changes is some measure of the variability of exchange rate, and all the other factors that may have an effect on the level of trade are assumed to remain unchanged. However, the developments that cause movements in the exchange rate are expected to affect other aspects of the economic environment, which will in turn have an effect on trade flows. Thus, it may be crucial to consider the interactions of all the major macroeconomic variables to get a more complete picture of the relationship between exchange rate variability and trade in a general equilibrium framework.

Such an investigation has been provided by Bacchetta and Van Wincoop (2000). They developed a simple, two-country, general equilibrium model where uncertainty is caused by monetary, fiscal, and technology shocks, and they compared the level of trade and welfare for fixed and floating exchange rate systems. They reach two major conclusions. First, there is no clear relationship between the level of trade and the type of exchange rate arrangement. On the basis of the preferences of consumers regarding the tradeoff between consumption and leisure and the monetary policy rules pursued in each system, trade can be higher or lower under either exchange rate arrangement. As an illustration of the ambiguity of the relationship between exchange rate volatility and trade in a general equilibrium environment, a monetary expansion in the foreign country would depreciate its exchange rate, causing it to reduce its imports, but the increased demand generated by the monetary expansion could offset part or all of the exchange rate effect. Thus, the nature of the shock that causes changes in the exchange rate can lead to changes in other macroeconomic variables that offset the impact of the movement in the exchange rate.

Second, the level of trade does not offer a good index of the level of welfare in a country, and thus there is no one-to-one relationship between levels of trade and welfare in comparing exchange rate arrangements. In their model, trade is dependent upon the certainty equivalent of a firm's revenue and costs in the home market relative to the foreign market, while the welfare of the country is determined by the volatility of consumption and leisure.

Obstfeld and Rogoff (1998) also presented an investigation of the welfare costs of exchange rate variability. They expanded the "new open economy macroeconomic model" to an explicitly stochastic environment where risk has an impact on the price-setting decisions of firms, and therefore on output and international trade flows. They provided a helpful example wherein reducing the variance of exchange rate to zero by pegging the exchange rate could result in a welfare gain of up to one percent of GDP. An extension of this type of model to more realistic situations involving imperfect asset markets and investment by firms is provided by Bergin and Tchakarov (2003). They calculated the effects of exchange rate uncertainty for a broad variety of cases and find that the welfare costs are generally quite small, of the order of one tenth of one percent of consumption. However, they examined the implications of two cases where risk does matter quantitatively, of the order of the effect in the example cited above by Obstfeld and Rogoff (1998): first, where customers show substantial persistence in their patterns of consumption, such that welfare is unfavorably affected by abrupt changes in consumption. Second, where asset markets are asymmetric in that there is only one international bond, such that the country without its own bond is adversely affected.

Koren and Szeidl (2003) developed a model which clearly shows the interactions among macroeconomic variables. They explained that what matters is not the unconditional volatility of the exchange rate as a proxy for risk, as used in many empirical studies in the literature, but rather that exchange rate uncertainty should influence trade volumes and prices through the covariances of the exchange rate with the other major variables in the model. In this general equilibrium framework they emphasized that it is not uncertainty per se in the exchange rate that matters, but rather whether this uncertainty amplifies or reduces the firm's other risks on the cost and demand side, and ultimately whether it aggravates or moderates the risk faced by consumers. In addition, the study analyzed the extent to which local currency versus producer currency pricing by exporters affects the risks facing the firm; their empirical evidence suggests that risk is higher with the former pricing rule.

A general-equilibrium model where commodity markets are segmented so that there are deviations from Commodity Price Parity and changes in the real exchange rate is developed by Sercu and Uppal (2003). They model this segmentation by introducing a cost for shipping goods across countries – as in Samuelson's iceberg model of trade – similar to the work of Dumas (1992) and Sercu *et al.* (1995). Financial markets, in contrast, are assumed to be complete and perfectly integrated reflecting the fact that at least for developed countries, international capital markets are far less subject to restrictions than commodity markets. Thus, in their model consumers can make cross-border financial investments to finance or hedge future imports; likewise, firms can make optimal hedging decisions; and the prices of all contracts are determined in a general-equilibrium framework.

They pointed out that because both trade and exchange rate volatility are endogenous quantities it is misleading to relate one to the other as if one of them were exogenous. They show, via two examples, that even in a very simple model it is possible to have either a negative or a positive relation between trade and exchange rate volatility, depending on the source underlying the increase in exchange rate volatility.

2.4 EMPIRICAL LITERATURE ON THE RELATIONSHIP OF EXCHANGE RATE VOLATILITY WITH TRADE

There is plenty of empirical literature on the relationship between exchange rate volatility and international trade. It is not possible to discuss each and every study in detail. In order to provide a comprehensive review of literature we summarize the details of each study in information box given in Table 2.1.

Early studies based on aggregate data generally used OLS (Ordinary Least Square) to assess the sensitivity of the aggregate trade flows to a measure of exchange rate volatility. These studies found mixed results, e.g. Akhtar and Hilton (1984), Kenen and Rodrick (1986), Peree and Steinherr (1989) advocated a negative relationship while Gotur (1985), Bailey *et al.* (1987), Bailey and Tavlas (1988) showed that no significant relationship lies between exchange rate volatility and trade.

Most of aggregated studies listed above surveyed the trade of developed world, but the range of countries studied began to be extended to less developed countries. These studies; for example, Warner and Kreinin (1982), Corbo and Caballero (1989), Medhora (1990), Bahmani-Oskooee and Ltaifa (1992), Bahmani-Oskooee and Payesteh (1993) and Bahmani-Oskooee (1996); also led to mixed results.

Table 2.1 Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Hooper and Kohlhagen (1978)	Quarterly:1966:4-1975; USA, Germany	Standard deviation of 13 weekly observations in each quarter of spot and forward NER, average. abs. difference over 13 weeks /lagged value	OLS; Bilateral import volume	• Risk reduced imports in floating period • Negative impact on price
Abrams (1980)	Annual: 1973-1976, 19 Countrie	12-month standard deviation of percentage changes in exchange rate	OLS; Bilateral export value	• Significantly negative
Coes (1981)	Monthly: 1957-1974; Brazil	Index	OLS with lags; Export volume of 13 manufacturing and nine primary sectors	• All manufacturing significantly positive • Six agricultural goods significantly positive
Warner and Kreinin (1982)	Quarterly: 1957-70 ;1972-80;19 industrialized countries	Standard deviation of exchange rate	OLS; Aggregate export and import volume	• Significantly negative for two country and positive for another 2
Cushman (1983)	Quarterly: 1965-1977; USA with UK, France, Germany, Canada, Japan; and Germany with UK, France, Japan (14 flows)	Four-quarter standard deviation of expected growth rate of the NER relative to inflation	OLS; Bilateral export volume	• 3 out of 16 are positive • 7 out of 16 are negative
Akhtar and Hilton (1984)	Quarterly: 1974-1981; Germany, USA	Standard deviation of daily observations of NER in three-month period	OLS; Aggregate Export volume Import volume	• Significantly negative for all but US imports
Chan and Wong (1985)	Annual: 1977-1984; Hong Kong to USA, UK, West Germany	Four-quarter of percentage change of RER	OLS; Bilateral Export volume	• No effect
Gotur (1985)	Same as Akhtar-Hilton	Standard deviation of 12-month	OLS; Aggregate export volume	• Exports significant for USA and Germany. • Insignificant for imports and all other trade flows

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Thursby and Thursby (1985)	Yearly: 1973-77 G-7 plus Austria, Belgium, Denmark, Finland, Greece, Turkey The Netherlands, Norway, Portugal, South Africa, Spain, Sweden, Switzerland	Standard deviation of absolute percentage changes in NER and RER	OLS; pooled time series, Cross-section Bilateral Export value	• Insignificant at aggregate level • Positive and negative significant effects at bilateral level
Cushman (1986)	Quarterly: 1965-1977; 1973-1983; USA to UK, The Netherlands, France, Germany, Canada, Japan	Four-quarter moving standard deviation of RER	OLS; Bilateral export volume	• Significantly negative in 7 eq. • Significantly positive in 5 • Need to include third-country effects
Kenen and Rodrick (1986)	Quarterly:1979:1984; G-7 plus Belgium, The Netherlands, Sweden, Switzerland	Standard deviation of : monthly percentage change in REER 24- and 12-month; REER from log-linear trend equation; and REER from AR(1) process	OLS w/lags; Aggregate Import Volume	• Significantly negative
Maskus (1986)	Quarterly: 1974:2-1984:4; USA with Japan, UK, Germany, Canada	Price risk (inflation) plus NER risk	OLS; Sectoral Export volume of 1-digit SITC categories	• Trade reduced in machinery, transport, chemicals, misc. manufacturers.
Bailey *et al.* (1987)	Quarterly: 1973:1-1984:3; G-7 countries	Absolute percentage changes, moving standard deviation of both NEER and REER	OLS; Aggregate Export Volume	• 3 out of 33 regressions are significantly negative, • 30 have insignificant effect
De Grauwe (1987)	Quarterly/yearly: 1960 -69; 1973-84; Belgium, Canada, France, West Germany, Italy, Japan, Netherlands, Switzerland, UK, USA	Standard deviation of yearly growth rates of REX around the mean	SUR; Bilateral Growth rate of exports	• Negative effect on growth of trade
Grauwe and de Bellefroid (1987)	Yearly: 1960-1969; 1973-1984; G-7 plus Belgium, The Netherlands, Switzerland	Standard deviation of yearly growth rates (RER, NER) mean absolute percentage change of rates	OLS; Bilateral average yearly growth in exports	• Negative, Usually significant

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Thursby and Thursby (1987)	Yearly: 1974-1982; Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, The Netherlands, Norway, Sweden, Switzerland, UK, Canada, South Africa, USA	Standard deviation of spot rate around predicted trend	OLS (lags); Bilateral Export value	• Significantly negative for most
Belanger *et al* (1988)	Quarterly; 1976-87; Canada-U.S.	Squared of forecast error defined as 90- day forward spread	IVE, GIVE; U.S. export volume to Canada: 5 sectors	• Significant and negative in two sectors
Bailey and Tavlas (1988)	Quarterly;1975:1986; U.S	Measures: short-run volatility (absolute value of quarterly percentage change in real effective exchange rate) and misalignment (deviation between REER and FEER)	OLS; Aggregate U.S. export volumes	• No significant impact
Brada and Mendez (1988)	Annual; 5 years (1973 to 1977); bilateral trade among 30 DCs and LDCs	Dummies for fixed, floating period	OLS; Bilateral Export value	• Level of trade significantly higher in floating rate regime. • But volatility does reduce it
Cushman (1988)	Quarterly: 1974-1983; UK, The Netherlands, France, Germany, Canada, Japan	Four-quarter standard deviation of percentage changes in REX, 12-month moving standard deviation, Expectations based on forward rate: nominal three-month ex-rate expectations, 12 month moving standard deviation, monthly averaged to quarterly	OLS; Bilateral Export volume	• 10/12 bilateral flows were negative
De Grauwe and Verfaille (1988)	Annual:1979:1985; Bilateral trade among 15 industrial countries	variance of annual changes of real exchange rate	cross-section; Bilateral	• Level of trade significantly stronger within EMS than outside EMS
Corbo and Caballero (1989)	Yearly:(Time not specified) Chile, Colombia, Peru, Philippines, Thailand, Turkey	Four-quarter moving standard deviation of RER	OLS/IV; Aggregate export volume	• Negative effect
Koray and Lastrapes (1989)	Monthly:(1961-71; 1975-85) U.S. bilateral trade UK, France, Germany, Japan, Canada	12-month moving standard deviation in log RER	VAR; U.S. bilateral import from 6 countries (including Canada)	• Weak relationship, permanent volatility shocks depress imports.

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Peree and Steinherr (1989)	Yearly: 1960-1985;U.S., Japan, U.K., W.G., Belgium; UK, Belgium, Germany, Japan to USA	Two based on disparities (long-tem), 2 measures of long run uncertainty (misalignment)	OLS; Aggregate export volume and bilateral exports to U.S.	• Insignificant for U.S. aggregate equation, often significant (negative) in other equations
Klein (1990)	Yearly: 1978-1986; US exports to G-7	Trade-weighted average, Real bilateral	OLS Pooled with lags; Sectoral US export value of 1-digit SITC categories	• Seven positive out of 54 • Three negative out of 54
Lastrapes and Koray (1990)	Monthly: 1973:3-1987:12 ; USA	12-month moving standard deviation of REER	VAR, Aggregate export and import volumes	• Significantly negative for import but small in magnitude • No impact on exports
Medhora (1990)	Yearly: 1976-84; WAMU: Benin, Cote d'Ivoire, Niger, Senegal, Togo, Burkina Faso	Standard deviation of NEER w/in each year – weekly, monthly, and quarterly	OLS; Aggregate import volume	• No significant relationship
Asseery and Peel (1991)	Quarterly:1972-1987; Australia, Japan, U.K., U.S., W.G.	Residuals from ARIMA process fitted to log RER, squared residual from ARIMA process fitted to real exchange rate	Granger method of cointegration, Aggregate export volumes	• Significantly negative for all
Bini-Smaghi (1991)	Yearly and Quarterly:1976-84; W.G., France, Italy, intra-EMS trade Germany, France, Italy to EMS	Standard deviation: percentage weekly changes in EER, weekly rates of change of intra-EMS effective exchange rate within a quarter	OLS; Prices and Bilateral export volumes of manufactured goods to EMS countries	• Different specifications give different results • Significant and negative effects in volumes • Mostly significant effects on prices
Kumar and Dhawan (1991)	Quarterly:1974-1985 Pakistan	Standard deviation: within period, moving-average; Coefficient of variance (For REX, NEX, and changes in REX) Gini Mean Difference, 3rd country risk	OLS; Bilateral export volume	• Significantly negative if using NEX, not REX. • 3rd country risk improves explanation

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Belanger *et al.* (1992)	Quarterly: 1974-1987; USA from Canada	Forecast errors/non-parametric method	OLS Lags; U.S. import volumes From Canada: 5 sectors Food, Industrial supplies, Capital goods, automotive goods, and consumer goods	• No significant effect except possibly capital goods
Bleaney (1992)	Quarterly: 1979-1990; Germany to Japan, Switzerland, UK, USA, Italy, The Netherlands, Belgium, France	Standard deviation of level of RER over six-year period	OLS; Bilateral Export	• Significantly negative
Bahmani-Oskooee and Ltaifa (1992)	Yearly: 1959-1989; 86 countries: 19 developed, 67 LDCs	Standard deviation of percentage changes in REER	OLS , Aggregate export volume	• LDCs are more sensitive to exchange-rate volatility
Kumar (1992)	Annual: 1962-1987(88); U.S., W.G., Japan	Standard deviation of monthly percentage change in real exchange rate over 12- month period	Intraindustry trade, net trade and ratio of intraindustry to net trade	• Mixed results
Pozo (1992)	Yearly: 1900-1940 Britain to USA	GARCH, standard deviation of monthly percentage changes in REX	OLS; Bilateral real export volume	• Significantly negative
Savvides (1992)	Annual: 1973-86;62 countries	Standard deviation of change in exchange rate	Cross-section; Bilateral	• Unanticipated real exchange rate variability significant and negative
Bahmani-Oskooee and Payesteh(1993)	Quarterly: 1973-90 Greece, Korea, Pakistan, Philippines, Singapore, South Africa	Standard deviation of quarterly percentage changes in REER	Time series Granger method of co-integration Aggregate import and export volume	• No significant relationship between variables
Chowdhury (1993)	Quarterly: 1973:1-1990:IV G-7	Eight-quarter moving standard deviation of growth rate in REER	Granger method of co-integration; Aggregate export volume	• Significantly negative for all
Grobar (1993)	Annual:1963-1985; 10 LDCs	Standard deviation of: quarterly percentage change in RER, RER fitted to a trend, and RER from AR(1), ARCH	Panel: Pooled, Fixed effects Sectoral export volume	• SITC categories 5-8 Some significantly negative

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Frankel and Wei (1993)	Annual: 1980,1985,1990;63 countries	Standard deviation of first difference of log of nominal (and real) exchange rate	OLS and IV; Cross-section	• Small effect, negative in 1980 • Positive in 1990
Gagnon (1993)	Quarterly; U.S. trade with 5 countries	Based on regression for real exchange rate between U.S. and 5 industrial countries	Simulation analysis; Calibrated trade	• No statistically significant
Kroner and Lastrapes (1993)	Monthly;1973-89 (90);U.S., U.K., W.G., Japan, France	GARCH	GARCH-in-Mean, joint estimation; aggregate export volumes and prices	• Significantly negative for USA, UK. • Significantly positive for Germany, Japan
Arize and Ghosh (1994)	Annual: 1970-1997; USA	Four-quarter moving average standard deviation of quarterly exchange-rate growth; ARCH; recursive residuals from AR(4) of ex-rate growth; residuals of ARIMA(1,1,0) fitted to log of exchange rate	Time series Granger method of co-integration, Aggregate export volume	• Negative and significant • General equation needs volatility term to be stable
Caporale and Doroodian (1994)	Monthly:1974:1-1992:4;USA from Canada	GARCH	OLS; Bilateral import volume	• Significantly negative
Qian and Varangis (1994)	Monthly:1973-1990; Canada, Australia, Japan, UK, The Netherlands, Sweden	ARCH	OLS First differences; Aggregate export volume	• Significant for bilateral – negative (aggregate data showed that Sweden was positively affected)
Usman and Savvides (1994)	Yearly: 1973-1984 CFA franc zone countries to major importing countries	12-year standard deviation of percentage changes in RER	OLS Parks method, Sectoral export and import volume	• Cocoa, Coffee Significantly negative for most countries
Arize (1995)	Quarterly:1973:2-1992:IV, Denmark, The Netherlands, Sweden, Switzerland	Eight-quarter moving standard deviation of log of REER	Granger method of co-integration, Aggregate export volume	• Significantly negative for all short run and long run
Holly (1995)	Monthly:1980-1996; UK	GARCH	Johansen co-integration; Aggregate export volume	• Significantly negative on supply, not demand
Stokman (1995)	Quarterly: 1980 -1990; Belgium, France, Germany, Italy, The Netherlands to EC	Standard deviation of weekly percentage changes in NEER	OLS; Sectoral export volume; SITC categories 0 and 1, 2 and 4, 5, 6, 7	• Negative effect

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Arize (1996)	Quarterly: 1973:1-1992:2, Uk	Both EERs eight-quarter moving standard deviation	Granger method of co-integration, Aggregate export volume	• Negative effects • Equation without volatility needs volatility term to be stable
Arize (1997)	Quarterly: 1973:2-1992:4 G-7 countries	Eight-quarter moving standard deviation of log of REER	Granger method of co-integration, Aggregate export volume	• Significantly negative for all
McKenzie and Brooks (1997)	Monthly: 1973:4-1992:9; USA, Germany	ARCH	OLS; Bilateral exports imports	• Significantly positive • No difference between using REX, NEX
Arize (1998)	Quarterly: 1973:2-1995:1; Belgium, Denmark, Finland, France, Greece, The Netherlands, Spain, Sweden	log of eight-period moving average dev of REER minus predicted value, repeated using with difference between quarters	Granger method of co-integration, Aggregate import volume	• Finland: negative, but non significant • Greece, Sweden: positive and significant • Others negative and significant
Arize and Malindretos (1998)	Quarterly: 1973-1992; Australia, New Zealand	ARCH, recursive method: standard deviation of errors on lagged errors, REER	Granger method of co-integration, Aggregate export volume	• Positive for Australia • Negative for New Zealand
Arize and Shwiff (1998)	Quarterly:1973:2-1995:1; G-7	log deviation of REER from expected value given by an AR(4) process, predicted changes in REER	Granger method of co-integration, Aggregate import volume	• Significantly negative for 5/7 of the countries • Positive for Canada • Insignificant for Germany
Dell'Ariccia (1999)	Yearly:1975-1994; EU 15 plus Switzerland	Function of trade shares: standard deviation for NER and RER, forward error, range	Panel: Pooled, fixed effects, random effects; Bilateral Exports plus Imports	• All significantly negative
Doroodian (1999)	Quarterly:1973:2-96:3;India, Malaysia, South Korea	GARCH	ARMA; Aggregate export volume	• Significantly negative impact
Lee (1999)	Quarterly:1973-92; US from G-7 and Belgium, Sweden, Netherlands, Switzerland	GARCH	VAR; Sectoral import value	• Manufacturers no significant relationship

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Arize *et al.* (2000)	Quarterly: 1973-1996; 13 LDC's	Eight-quarter moving standard deviation of log REER	Johansen method of co-integration; Aggregate export volume	• Significantly negative in short run and long run for all
Chou (2000)	Quarterly: 1981-1996; China	GARCH of REER	Granger method of co-integration, ARDL bounds testing approach; Sectoral export volume of foodstuffs, industrial materials, mineral fuels, manufactured goods	• Using ECM: Significantly negative for all except food • Using ARDL: Positive for industrial materials
Rapp and Reddy (2000)	Monthly: 1975-1995; USA to G-7	12-month moving standard deviation of percentage changes in RER	Johansen method of co-integration; Exports of 8 sectors;1-digit SITC categories	• 18/39 significantly negative at 10 percent • 14 significantly positive
Aristotelous (2001)	Yearly: 1889-1999 Britain to USA	Dummies-fixed, Float; Moving standard deviation of growth in REER	Granger method of co-integration, Bilateral export volume	• No effect
Doyle (2001)	Monthly: 1979-1992; Ireland-UK	GARCH	Granger method of co-integration , Sectoral export volume; 15 SITC 2-digit sectors	• Significantly positive for most sectors and total
Iqbal *et al.* (2001)	Annual: 1972-1999. Pakistan	Moving standard deviation of 4 years	Johansen co-integration; Aggregate real imports	• Exchange rate volatility is inelastic. • Relative price is unit elastic
Sauer and Bohara (2001)	Yearly: 1973-1993; 91 countries: 25 Latin American, 25 African, 12 Asian, 22 LDCs	ARCH, eight-quarter moving SE from AR(1) of log(REER), eight-quarter moving SE of regression of log(REER) on t, t^	Panel Fixed and random effects; Aggregate export volume	• Significantly negative for Latin America, Africa, not DCs or Asia • Significantly negative for terms of trade
Sukar and Hassan (2001)	Quarterly: 1975-1993; USA	GARCH	Granger method of co-integration Aggregate export volume	• Significantly negative
Aristotelous (2002)	Quarterly : 1959:1-1997:4, USA to Canada, Japan, Germany, UK	Dummies-fixed, Float; Moving standard deviation of changes in REER	Granger method of co-integration, Bilateral export volume	• Significant effect for volatility • Significantly negative for regime dummy

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Bahmani-Oskooee (2002)	Quarterly: 1974:1-1994:4; Iran	Four-year moving standard deviation of percentage changes in RER	Johansen method of co-integration; Aggregate export and import volume	• Significantly negative
Cho *et al.* (2002)	Yearly: 1974-1995; G7 plus Belgium, The Netherlands, Switzerland	Ten-year standard deviation; Peree-Steinherr method	Panel: Fixed effects; Sectoral total trade (export + import)	• Agricultural significantly negative more significant than other sectors
Doganlar (2002)	Quarterly: 1980-96;Turkey, Korea, Malaysia, Indonesia, Pakistan	Four or eight-quarter moving standard deviation of RER	Granger method of co-integration; Aggregate export volume	• Significantly negative
Esquivel and Larrain (2002)	Annual:1973–1998; G3: Germany, Japan, USA, 40 LDC from Asia, Africa, Europe and Latin America	Twelve-month moving standard deviation, twelve-month coefficient of variation	Panel estimation; Aggregate, export	• G3 exchange rate volatility has negative impact on developing countries
Giorgioni and Thompson (2002)	Annual:1980-1996; USA to Egypt, Israel, Italy, Japan, Korea, Morocco, Pakistan, Philippines, Venezuela	12-month moving standard deviation of percentage changes in RER	Panel: Pooled, Fixed effects, Random effects; Sectoral export value of wheat	• Import volatility important • Exchange rate volatility not significant
Iqbal *et al.* (2002)	Annual: 1970-99; Pakistan	Four year moving standard deviation of nominal exchange rate.	Vector error-correction modeling; aggregate imports	• Exchange rate volatility is insignificant
Rahmatsyah *et al.* (2002)	Quarterly: 1970-97;Thailand bilateral exports and imports with USA and Japan	ARCH, GARCH, four-quarter moving standard deviation	Co-integration	• Negative impact for exports to Japan • Inconclusive for exports to USA
Vergil (2002)	Quarterly: 1973:2-1991:3; Turkey to USA, Germany, France, Italy	Variance of trend equation, 12-month moving standard deviation of percentage changes	Granger method of co-integration, Bilateral export volume	• Significantly negative to all but Italy • Significantly negative short run for Germany
Arize *et al.* (2003)	Quarterly:1973:2-1998:1; Burkina Faso, Colombia, Costa Rica, Jordan, Kenya, Korea, Myanmar, Pakistan, S. Africa, Venzuela	Eight-quarter moving standard deviation in log REER	Johansen method of Cointegration; Aggregate export volume	• Significantly negative for all

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Bredin *et al.* (2003)	Quarterly: 1978-1998; Ireland-EU	Eight-quarter moving standard deviation of log of growth rate of REER	Granger method of co-integration, Sectoral export volume SITC 0-4, 5-8, 0-8 pooled	• Significantly positive for all in long run
Peridy (2003)	Annual: 1975-2000 G7-each member's main partners	GARCH, 12-period moving standard deviation of NER	Panel: SUR, GMM, Fixed Effects; Sectoral export demand and supply21 industries, three groups	• 58/64 Negative, 2 Significant • Significantly negative for all countries, • Varies across sectors and geographic areas
Clark *et al.* (2004)	1975-2000; Bilateral total trade data of panel data set which covers 178 Fund member countries and disaggregated Import for 98 industries.	Standard deviation of the first-difference of the monthly natural logarithm of the bilateral real exchange rate in the five years preceding year *t*.	Seemingly Unrelated Regression (SUR) disaggregated Import data at the SITC-4 level for 98 industries, 22 of them being classified as homogeneous and the remaining 59 as differentiated products	• Long-run and short run real exchange rate volatility has a statistically significant negative effect on trade albeit short run impact is smaller. • Exchange rate volatility has no significant effect on trade in the models with country-pair and time-varying country effects. • Exchange rate volatility indeed has a negative effect on trade in differentiated products, but not on trade in homogenous products
De Vita and Abbott (2004)	Monthly:1993-2001; UK to the rest of the EU14	Standard deviation of : weekly percentage changes in log NER, moving weekly percentage changes in log NER (AIC-maximizing of 2, 4, 6, 8); ARCH on NER; ARCH on RER	ARDL bounds testing approach; Sectoral export volume of Manufacturers, food, basic materials,services	• Only services significantly effected positive to Germany, Denmark, Sweden • Insignificant, for others
De Vita and Abbott (2004a)	Quarterly: 1987:1-2001:2 USA to Canada, Mexico, Germany, Japan, UK	Six-quarter moving average standard deviation of log level of RER	ARDL bounds testing approach to co-integration Bilateral export volume	• Significantly negative for Germany, UK, Mexico • Significant positive for Japan
De Vita and Abbott (2004b)	Quarterly: 1987:1-2001:2; USA	Six-quarter moving average standard deviation of log level of RER	ARDL Bounds Testing approach to co- integration Aggregate export volume	• No significant relationship

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Kemal (2004)	Annual: 1982-2004 Pakistan	GARCH	3SLS	• Insignificant and positive on exports • Negative and significant on imports
Mustafa and Nishat(2004)	Quarterly:1991:3-2004:2 Pakistan to SAARC (India and Bangladesh), ASEAN (Singapore and Malaysia), European (UK), and Asia-Pacific (Australia and New Zealand) and North America (US).	Standard deviation of Quarterly observations of RER in three-month period	Cointegration and Error Correction Technique	• The relationship between exports growth and exchange rate volatility for India and Pakistan is observed only in long run perspective. • For New Zealand and Malaysia no empirical relationship is observed between export growth and exchange rate volatility
Tenreyro (2004)	Annual: 1970-1997; 104 countries	Standard deviation of first diff of log of monthly exchange rate	Panel Pseudo-maximum likelihood Instrumental variable, Bilateral exports	• No effect
Arize *et al.* (2005)	Quarterly:1973-04; Bolivia, Colombia, Costa Rica, Dominican Republic Ecuador, Honduras, Peru, Venezuela	ARCH	Granger method of co-integration, Aggregate export volume	• Significantly negative in short run and long run for all countries
Cheong (2005)	Monthly:1976:1-2000:1; UK	GARCH	VAR; Sectoral data on UK manufacturing exports	• Exchange rate volatility discourage exports by risk-averse traders
Poon *et al.* (2005)	Quarterly:1973:2-2002: 2; Indonesia, Japan, S. Korea, Singapore, Thailand	12-period moving standard deviation of log REER	Johansen method of co-integration; Aggregate export volume	• Significantly negative for Japan, S. Korea, Singapore • Significantly positive for Thailand
Rey (2006)	Quarterly: 1970–2002 European Union countries	ARCH, GARCH, eight-quarters moving standard deviation	Co-integration for each country; Aggregate exports	• Negative relationship for Algeria, Egypt, Tunisia, Turkey • Positive for Israel, Morocco

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Zhang (2006)	Monthly:1989:01- 2002:12 For Japan, UK and Canada And 1989:01-1998:12 for France, Germany, and Italy	GARCH	Error Correction; Export volumes to the US from the other six G-7	Exports volume tends to increase when exchange rate volatility surpasses a certain threshold point.
Baak *et al.* (2007)	Quarterly, bilateral to USA and Japan, 1981–2004 Hong Kong, South Korea, Singapore and Thailand	Standard deviation of monthly exchange rate	Co-integration for each country;	• Negative impact in long-run and short-run, except for Hong Kong to Japan
Tenreyro (2007)	Annual:1970–97; 87 countries	Standard deviation of the first differences of the (log) monthly exchange rate	Panel estimation instrumental variables; bilateral exports	• Volatility does not have a significant impact on trade
Wangand Barrett (2007)	Monthly:1989–1998 Taiwan	GARCH-M	Co-integration; bilateral export to USA,	• Volatility affects agricultural trade but not the other sectors of the economy
Aliyu (2008)	Quarterly:1986:1-2006:4; non oil export trade in Nigeria	Standard deviation of each series of quarterly observation from the average nominal exchange rate of the naira vis-à-vis the US $	Cointegration, vector error correction (VEC)	• Naira exchange rate volatility was found to have an adverse effect on non oil exports
Arize *et al.* (2008)	Quarterly:1973–04; Bolivia, Colombia, Costa Rica, Dominican Republic, Ecuador, Honduras, Peru, Venezuela	ARCH	Co-integration for each country; aggregate exports	• Significant negative impact of volatility in short-run and long in all countries
Byrne *et al.* (2008)	Annual:1989: 00 for exports 1989: 01 for imports; UK, Germany, France, Italy, Netherlands, Spain	Standard deviation of first diff of log of exchange rate	Fixed and time effects; 22 sectors bilateral imports and exports	• Significantly negative effects with differentiated imports and exports • Insignificant for homogeneous goods
Chit (2008)	Quarterly:1982: 1 -2005: 1, bilateral exports China, Indonesia, Malaysia, the Philippines, Thailand	Standard deviation for the percentage changes of the real bilateral exchange over the interval of four quarters	Panel cointegration, generalized gravity model Fixed and Random effect estimation; panel data set of 20 bilateral observations	• Statistically significant negative impact on the bilateral exports of the major ACFTA countries. • Magnitude of the impact appears to be fairly small.

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Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Egert and Morales-Zumaquero (2008)	Annual and monthly:1993–2004; Bulgaria, Croatia, Czech-Republic, Hungary, Poland, Romania, Slovakia, Slovenia, Russia, Ukraine	Twelve-month moving standard deviation, dummy variables to capture regimes changes	Panel estimation fixed effects first differences and time series methods; aggregate and bilateral export	• Slovenia, Russia little evidence of negative impact • Romania weak evidence • All others strong evidence of negative impact
Ahmad (2009)	Monthly: 2003:5-2008:12, Bangladesh to 14 countries	Standard deviation of Quarterly observations of RER in three-month period	Cointegration and Error Correction methods, Bilateral export volume to 14countries	• No significant relation exist in short run as well as in long run
Lizardo (2009)	Annual:1985:2005; 28 Latin American and Caribbean countries	log of the first difference of the annual standard deviation of monthly real exchange rates	Gravity model, in a panel data context	• Significant exchange rate volatility has a negative impact on the economies of the region
Rahman and Serletis (2009)	Monthly:1973:1-2007:1;US, aggregate Exports	Conditional standard deviation of the forecast error of the change in the exchange rate	Multivariate GARCH-in mean	• Exchange rate uncertainty has a negative and significant effect on US exports
Fang (2009)	Monthly: 1979:1-2003:4; Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Taiwan Thailand to US	GARCH(1,1)	GARCH(1,1)-M model bilateral exports from eight Asian countries to the US	• Exchange rate risk affects exports asymmetrically. • Significantly negative in periods of depreciation • Significantly positive in periods of appreciation for all countries
Tadesse (2009)	Monthly:1989-2003; US to Canada, Germany, and Hong Kong	GARCH	Prais-Winstein Regression; bilateral imports and exports	• Volatility of permanent exchange rate have mixed results • Volatility of transitory have negative in most cases.

(Continues......)

Table 2.1 (Continued) Empirical Studies on Exchange Rate Volatility and Trade

Author (year)	Time span and country	Measure of Risk	Estimation Method and Specification of Dependent Variable	Main Findings/ Results
Chit and Judge (2009)	Quarterly: 1990:1-2006: 4 China, Indonesia, Malaysia, Philippines and Thailand	Standard deviation of the first difference of the logarithm of the real exchange rate, GARCH	G2SLS-IV, GMM-IV Panel exports of five emerging East Asian countries.	• Exchange rate volatility has a significant negative impact on the exports of emerging East Asian economies. • Less financially developed an economy is the more negative impact of exchange rate volatility on trade. • Nonlinear effect of exchange rate volatility holds.
Baum and Caglayan (2010)	Monthly:1980:1-1998:12; USA, UK, Canada, France, Germany, Italy, Japan, Finland, Netherlands, Norway, Spain, Sweden, and Switzerland with their trade partners	Bivariate GARCH	Multivariate GARCH; bilateral export	• Impact of exchange rate uncertainty on trade flows is indeterminate • Exchange rate uncertainty has a consistent positive and significant effect on the volatility of bilateral trade flows
Hall *et al.* (2010)	Quarterly: 1980:1-2006:4 Panel of 10EME's and 11DC's	log of the eight-quarter moving standard deviation of the real effective exchange rate GARCH	Generalized Method of Moments and Time Varying Coefficient, Panel Estimation exchange-rate volatility on exports	• In sample of eleven developing countries exchange rate volatility negatively affects exports • For ten EMEs no significant impact
Alam (2010)	Quarterly: 1979:3 -2005:4 Pakistan	GARCH and moving sample standard deviation of the growth rate of real effective exchange rate	ARDL Modeling Approach, Aggregate real export of Pakistan	• REER significantly negative • REER volatility adversely affect the aggregate exports of Pakistan

While the Ordinary Least Squares is widely used to estimate time-series, cross-sectional, and panel models, eventually modern and specific time-series analysis began to surpass OLS as the main econometric tool. The main goal of these relatively new techniques is to account for integrating properties of the variables so that the results are not considered spurious. VAR and especially error-correction models have become the most commonly employed estimation techniques. Lastrapes and Koray (1990) and Cheong (2005) used VAR but produced contradictory results.

Co-integration analysis continued to make inroads during the early 1990s. A bulk of studies used co-integration analysis on aggregate data. Chowdhury (1993), Arize and Ghosh (1994), Arize (1995), Arize (1996), Arize (1997), Arize *et al.* (2000), Arize *et al.* (2003) and Arize *et al.*(2008) found the trade-depressing impact of exchange rate volatility; Assery and Peel (1991) pointed out trade enhancing impact of exchange rate volatility and Rey (2006), Arize (1998), Arize and Malindretos (1998), and Arize and Shwiff (1998) showed mixed results.

Bahmani-Oskooee (2002) used an entirely different measure of exchange rate for Iran. Instead of officical exchange rate, the study used black-market rate for analysis. Similarly, Kemal (2004) used quite different technique of simultaneous equations model to examine the association of exchange rate instability with Pakistan's exports and imports. In a most recent study, Alam (2010), investigated the impact of exchange rate volatility on Pakistan's aggregate exports demand using ARDL (Autoregressive Distributed Lag) technique.

Not all the studies have used time-series analysis to estimate their models. Sauer and Bohara (2001), Esquivel and Larrain (2002) and Hall *et al.* (2010) used a panel-data model to estimate volatility's influence on the exports. All of them found that when the countries are evaluated together, the effect of volatility is significantly negative but Sauer and Bohara (2001) found mixed results when the countries are separated by region.

The studies of countries' aggregate trade flows produced important results. The well-known 'aggregation bias' seems a potential problem if a country's bilateral trade flows with different partners produce offsetting positive and negative effects that cancel each other out at the aggregate level. Thus, bilateral studies may provide a more accurate analysis, as they evaluate the bilateral exchange rate – which is the rate that is actually used by exporters and importers. Early studies based on bilateral trade data were performed by Hooper and Kohlhagen (1978), Cushman (1983), Cushman (1986), Cushman (1988), Bini-Smaghi (1991), Gagnon (1993) and De Grauwe and Verfaille (1988).

Different specification of 'Gravity Model' were used by Abrams (1980), Thursby and Thursby (1987), Frankel and Wei (1993), Savvides (1992), Kumar (1992), Brada and Mendez (1988), Dell Ariccia (1999), Chit (2008), Tenreyro (2004) and Tenreyro (2007) to analyze bilateral trade data of different countries.

A few early papers, Thursby and Thursby (1985), Mustafa and Nishat (2004), Ahmad (2009), De Grauwe (1987) and De Grauwe and de Bellefroid (1987) realized that trend may play a role in time-series models, possibly producing misleading results. To de-trend the data, these studies employ the growth of trade rather than the level or log level of these flows in their econometric analyses.

The disaggregation of total trade data by trading partners resulted in no change in the mixed conclusion produced by aggregate studies; some authors have disaggregated bilateral trade data between pairs of countries by either sector or by commodity with a hope that some significant results could be discovered. Important sectoral studies were performed by Coes (1981), Maskus (1986), Klein (1990), Belanger *et al.* (1992), Grobar (1993), Byrne *et al.* (2008), Stokman (1995), Rapp and Reddy (2000), Doyle (2001), Bredin *et al.* (2003), Chou (2000), Wang and Barrett (2007), De Vita and Abbott (2004a), Peridy (2003) and Tadesse (2009). These studies can be broken down into three groups: Those that disaggregate trade into as many diverse sectors as possible, those that focus on a single sector and investigate its specific properties, and those that disaggregated at commodity level.

Besides the studies reviewed above, a few studies have focused specifically on a single good or sector like Usman and Savvides (1994), Holly (1995), Lee (1999), Cho *et al.* (2002) and Giorgioni and Thompson (2002).

The above review of literature on decomposition of exchange rate and therotical and empirical literature on the relationship of exchange rate volatility and trade flows indicates that the issue of the nature of relationship between exchange rate volatility and trade (positive, negative or inconclusive) is still not settled. Further, the literature on Pakistan is quite scant and in our study we will try to shed light on this issue from detail analyses of Pakistan by taking aggregate and disaggregated country level data. We also incorporate real effective exchange rate and real bilateral exchange rates and their components as well as their volatility in aggregate and disaggregate form in terms of permanent and transitory parts.

Chapter 3
METHODOLOGY

3.1: INTRODUCTION

The methodology is divided into three parts. In the first part we explain the decomposition technique of Blanchard and Quah (1989) that we use to decompose the real effective exchange rate and real bilateral exchange rates into their transitory and permanent components. In second part we model the volatility in each component of exchange rate via a GARCH process. The third part explains the methodology that we use to examine the impact of volatility in exchange rate and its components on the aggregate and bilateral imports and exports of Pakistan.

3.2: The Decomposition of Real Exchange Rates

A series can be decomposed into their components by adopting different available techniques. Beveridge and Nelson (1981) show how to decompose any ARIMA (p, 1, q) model into the sum of a random walk plus drift and a stationary component (i.e., the general trend plus irregular model). Their methodology would incorrectly identify the trend and irregular components because it would force the two innovations to be perfectly correlated. In fact, the correlation coefficient between the two components can be any number in the interval -1 to +1. The problem is important because economic theory does not always provide the relationship between the two innovations. Yet, without a prior knowledge of the relationship between innovations in the trend and stationary components, the decomposition of a series into a random walk plus drift and a stationary component is not unique. Hodrick-Prescott (HP) decomposition technique forces the change in the trend to be as small as possible. This occurs when the trend is linear. Since the HP filter is a function that smoothes the trend, it has been shown to introduce spurious fluctuations into the irregular component of a series.

Blanchard and Quah (1989) provide a way to obtain the structural identification of a time series into temporary and permanent components by extending the univariate decomposition model of Beveridge and Nelson (1981) to a bivariate setting, thereby linking the two components of the series to the related macroeconomic variable, for example, linking the two components of the real effective exchange rate to the nominal effective exchange rate (and real bilateral exchange rate to the nominal bilateral exchange rate). In a univariate model, there is no unique way to decompose a variable into its temporary and permanent components. By using a bivariate VAR, however, Blanchard and Quah show how to decompose real GNP and recover the two pure shocks.

Blanchard and Quah (1989) decomposition methodology is applied in this section to decompose real effective exchange rate (and real bilateral exchange rate) into its transitory and permanent components. If, we ignore the intercept term, the bivariate moving average (BMA) representation of the real effective exchange rate $\{REER_t\}$ and nominal effective exchange rate $\{NEER_t\}$ sequences will have the form:

$$\Delta REER_t = \sum_{k=0}^{\infty} c_{11}(k)\,\varepsilon_{1t-k} + \sum_{k=0}^{\infty} c_{12}(k)\,\varepsilon_{2t-k} \tag{1}$$

$$\Delta NEER_t = \sum_{k=0}^{\infty} c_{21}(k)\,\varepsilon_{1t-k} + \sum_{k=0}^{\infty} c_{22}(k)\,\varepsilon_{2t-k} \tag{2}$$

In a more compact form the above system can be written as:

$$\begin{bmatrix} \Delta REER_t \\ \Delta NEER_t \end{bmatrix} = \begin{bmatrix} C_{11}(L) & C_{12}(L) \\ C_{21}(L) & C_{22}(L) \end{bmatrix} \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \tag{3}$$

where both endogenous variables are in logarithmic form, ε_{1t} and ε_{2t} are the independent white noise disturbances, each having a constant variance, and $C_{ij}(L)$ are the polynomials in the lag operator L such that the individual coefficients of $C_{ij}(L)$ are denoted by $c_{ij}(k)$.[1] For convenience, the time subscripts on the variances and co-variances terms are dropped and shocks are normalized, therefore: $\text{var}(\varepsilon_1) = 1$ and $\text{var}(\varepsilon_2) = 1$. If we call Ω_ε the variance-covariance matrix of the innovations, it follows that:

$$\Omega_\varepsilon = \begin{bmatrix} \text{var}(\varepsilon_1) & \text{cov}(\varepsilon_1, \varepsilon_2) \\ \text{cov}(\varepsilon_1, \varepsilon_2) & \text{var}(\varepsilon_2) \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \tag{4}$$

In order to use the Blanchard and Quah methodology, both variables must be in a stationary form. In our analysis, both $\{REER_t\}$and $\{NEER_t\}$ sequences are stationary at first differences. In contrast to Sims-Bernanke procedure (Sims (1986), and Bernanke (1986), Blanchard and Quah do not directly associate the $\{\varepsilon_{1t}\}$ and $\{\varepsilon_{2t}\}$ shocks with $\{REER_t\}$ and

[1] For example, the forth coefficient of $C_{21}(L)$ is $c_{21}(4)$.

$\{NEER_t\}$ sequences. Instead $\{REER_t\}$ and $\{NEER_t\}$ sequences are the endogenous variables, and the $\{\varepsilon_{1t}\}$ and $\{\varepsilon_{2t}\}$ sequences represent the exogenous variables. The present study interprets temporary shocks $\{\varepsilon_{2t}\}$ as primarily nominal disturbances (e.g. due to unexpected changes in money supply) and permanent shocks $\{\varepsilon_{1t}\}$ as primarily real disturbances (e.g. due to technology shocks). The coefficients of $C_{12}(L)$, for example, represent the impulse responses of a nominal (transitory) shock on the time path of change in the logarithm of real effective exchange rate $REER_t$.[2]

The key to decomposing the $\{REER_t\}$ sequence into its trend and irregular components is to assume that one of the shocks has a temporary effect on the $REER_t$ sequence. It is the dichotomy between the temporary and permanent effects that allows for the complete identification of the structural innovations from an estimated VAR. We assume that nominal (temporary) shocks have no long-run effect on the real effective exchange rate. Hence, the cumulative effect of a $\{\varepsilon_{2t}\}$shock on the first difference of the $\{REER_t\}$ sequence must be equal to zero in the long run and the coefficients $c_{12}(k)$ in equation (1) must be such that:

$$\sum_{k=0}^{\infty} c_{12}(k)\varepsilon_{2t-k} = 0 \qquad (5)$$

Since the monetary (transitory) and real (permanent) shocks are not observed, the problem is to recover them from the estimated VAR model. More details on VAR model are given in appendix 'A'. Given that the variables are stationary, we have a VAR representation of the form:

$$\begin{bmatrix} \Delta REER_t \\ \Delta NEER_t \end{bmatrix} = \begin{bmatrix} A_{11}(L) & A_{12}(L) \\ A_{21}(L) & A_{22}(L) \end{bmatrix} \begin{bmatrix} \Delta REER_{t-1} \\ \Delta NEER_{t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \qquad (6)$$

Or to use a more compact notation,

$$x_t = A(L)x_{t-1} + e_t$$

[2] Since the key assumption of the technique is that $(\varepsilon_{1t}, \varepsilon_{2t}) = 0$, you might wounder how it is possible to assume that aggregate demand and supply shock are indepensent. For details see Enders (2004).

where $x_t = \begin{bmatrix} \Delta REER_t \\ \Delta NEER_t \end{bmatrix}$, $e_t = \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix}$ and $A(L)$ is a 2×2 matrix with elements equal to the polynomials $A_{ij}(L)$ and the co-efficient of $A_{ij}(L)$ are denoted by $a_{ij}(k)$.[3]

The VAR residuals are composites of the pure innovations ε_{1t} and ε_{2t}. For example, e_{1t} is the one step ahead forecast error of $\{REER_t\}$, that is,

$$e_{1t} = \Delta REER_t - E_{t-1}[\Delta REER_t]$$

From BMA explained in equations (1) and (2), the one step ahead forecast error is $c_{11}(0)\varepsilon_{1t} + c_{12}(0)\varepsilon_{2t}$. Since the two representations are equivalent, it must be the case that

$$e_{1t} = c_{11}(0)\varepsilon_{1t} + c_{12}(0)\varepsilon_{2t} \qquad (7)$$

$$e_{2t} = c_{21}(0)\varepsilon_{1t} + c_{22}(0)\varepsilon_{2t} \qquad (8)$$

Combining (7) and (8) we get

$$\begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} = \begin{bmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{bmatrix} \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \qquad (9)$$

If $c_{11}(0)$, $c_{12}(0)$, $c_{21}(0)$ and $c_{22}(0)$ are known, it would be possible to recover ε_{1t} and ε_{2t} from the regression residuals e_{1t} and e_{2t}. Blanchard and Quah show that the relationship between equation (6) and the BMA model plus the long-run restriction of equation (5) provide exactly four restrictions that can be used to identify these four coefficients. The VAR residuals can be used to construct estimates of $\text{var}(e_1)$, $\text{var}(e_2)$ and $\text{cov}(e_1, e_2)$. Hence, there are the following three restrictions:[4]

Restriction 1

Given equation (7) and noting that $E(\varepsilon_{1t}, \varepsilon_{2t}) = 0$ we see that the normalization $\text{var}(e_1) = \text{var}(e_2) = 1$ means that the variance of e_{1t} is

$$\text{var}(e_1) = c_{11}(0)^2 + c_{12}(0)^2 \qquad (10)$$

[3] For example $A_{11}(L) = a_{11}(0) + a_{11}(1)L + a_{11}(2)L^2 + \ldots\ldots\ldots\ldots\ldots$

$A_{12}(L) = a_{12}(0) + a_{12}(1)L + a_{12}(2)L^2 + \ldots\ldots\ldots\ldots\ldots$

[4] The VAR residuals also have a constant variance-covariance matrix. Hence the time subscripts can be dropped.

Restriction 2

Similarly, if we use equation (8), the variance of e_{2t} will be

$$\text{var}(e_2) = c_{21}(0)^2 + c_{22}(0)^2 \tag{11}$$

Restriction 3

The product of e_{1t} and e_{2t} that is, the product of (7) and (8) is

$$e_{1t}\, e_{2t} = [c_{11}(0)\varepsilon_{1t} + c_{12}(0)\varepsilon_{2t}][c_{21}(0)\varepsilon_{1t} + c_{22}(0)\varepsilon_{2t}]$$

If we take expectation, the covariance of the *VAR* residuals will be

$$\text{cov}(e_1, e_2) = c_{11}(0)\, c_{21}(0) + c_{12}(0)\, c_{22}(0) \tag{12}$$

Thus, equations (10), (11) and (12) can be viewed as three equations in the four unknowns $c_{11}(0)$, $c_{12}(0)$, $c_{21}(0)$ and $c_{22}(0)$. The fourth restriction is embedded in the assumption that ε_{2t} has no long-run effect on the $REER_t$ sequence. The problem is to transform the restriction (6) into its VAR representation. For this purpose it is helpful to rewrite equation (7) as:

$$x_t = A(L)Lx_t + e_t$$

So that

$$[1 - A(L)L]x_t = e_t$$

The appendix 'B' shows that the resulting restriction is as follows:

Restriction 4

For all possible realizations of the ε_{2t} sequence, ε_{2t} shocks have only temporary effects on the $\Delta REER_t$ sequence (and $REER_t$ itself) if

$$\left[1 - \sum_{k=0}^{\infty} a_{22}(k)\, L^{k+1}\right] c_{12}(0) + \sum_{k=0}^{\infty} a_{12}(k) L^{k+1} c_{22}(0) = 0 \tag{13}$$

With this fourth restriction, there are four equations that can be used to identify the unknown values $c_{11}(0)$, $c_{12}(0)$, $c_{21}(0)$ and $c_{22}(0)$.

With the identification of ε_{1t} and ε_{2t} sequences it is possible to obtain historical decomposition of each series. For example, set all $\{\varepsilon_{2t}\}$ shocks equal to zero and use the actual $\{\varepsilon_{1t}\}$ series to obtain a permanent change in $\{REER_t\}$:[5]

$$\Delta REER_t = \sum_{k=0}^{\infty} c_{11}(k)\varepsilon_{1t-k} \tag{14}$$

We will use the same procedure for decomposition of real bilateral exchange rates into its components.

3.3. Estimation of Exchange Rates Volatilities

Once the components of the exchange rate series are derived, we need to derive an appropriate measure for exchange rate volatility. In earlier studies, the usual practice is to define the standard deviation of the real exchange rate or the logarithm of real exchange rate as the measure for volatility. Although it is easy to calculate but volatility represented by standard deviation often cannot capture the persistence of the real exchange rate whose distribution is fat-tailed. As discussed in Poze (1992), the time varying variance generated from a general GARCH model better depicts the feature of heavy tailed distribution.

Engle (1982) was the first to present ARCH model. This model recommended that the variance of residuals at time t depends on the squared error terms of the past period. According to Engle (1995), one of the drawbacks of the ARCH specification is that it looked more like a moving average specification than an autoregression. Therefore, an innovative thought was provided by Bollerslev (1986), which was to include the lagged conditional variance terms as autoregressive terms. And it started a new family of GARCH models.

$$\Delta \ln R_t = \xi + v_t \tag{15}$$

$$v_t \backslash \Gamma_t \sim iidN(0,\phi_t) \tag{16}$$

$$\phi_t = \delta_o + \sum_{i=1}^{p} \sigma_i \phi_{(t-i)} + \sum_{l=1}^{q} \psi_l v_{(t-l)}^2, \tag{17}$$

where

[5] In doing so, it will be necessary to treat all $\varepsilon_{2t-i} = 0$ for $t - i < 1$.

$\Delta \ln R_t$: log first difference of real exchange rate (real effective exchange rate or real bilateral exchange rate and permanent and transitory parts of real effective exchange rate or real bilateral exchange rate alternatively.),

ξ : A constant term,

v_t : Error term with mean zero and variance ϕ_t,

Γ_t : Information set.

Equation (17) states that the value of the variance scaling parameter ϕ_t now depends both on past realization of the shocks (the q MA terms), which are captured by the lagged squared residual terms, and on past values of itself (the p AR terms), which are captured by lagged ϕ_t itself. If P=0 than the model will be reduces to ARCH (q). Measuring volatility by GARCH is consistent with Pozo (1992), Kroner and Lastrapes (1993), Carporale and Dordoodian (1994), Holly (1995), Dordoodian (1999), Lee (1999), Chou (2000), Doyle (2001), Sukar and Hassan (2001), Rahmatsyah *et al.* (2002), Peridy (2003), Kemal (2004), Cheong (2005), Poon *et al.*(2005), Rey (2006), Zhang (2006), Fang (2009), Tadesse (2009), and Alam (2010).

3.4. Model Specification for Impact of Exchange Rate Volatility on Trade

Following the approach to modeling long-run aggregate import demand function presented in Kenen and Rodrick (1986) and Gotur (1985), Pakistan's import demand function is specified as follows:

$$M_t = a_0 + a_1 Y_{(t-1)} + a_2 RER_{(t-1)} + a_3 VRER_{(t-1)} + u_{1t}, \quad (18)$$

where

M_t : Aggregate imports of Pakistan from its 27 th trading partners.

Y : Industrial production index of Pakistan. Doyle (2001), Caporal and Doroodian (1994) and Tadesse (2009) also used the industrial production index as a proxy for real income.

RER : Real exchange rate index of Pakistan,

$VRER$: Volatility of real exchange rate,

u_{1t} : Random error term.

We estimate five different version of equation (18). In the first equation we replace real exchange rate RER index and volatility $VRER$ with real effective exchange rate ($REER$) obtained from 27 trading partners and its volatility ($VREER$). The import demand function is now defined as follows:

$$M_t = b_0 + b_1 Y_{(t-1)} + b_2 REER_{(t-1)} + b_3 VREER_{(t-1)} + u_{2t} \quad (18a)$$

The second regression (18b) is obtained by estimating a separate import demand function for imports from each of 27 trading partners. We add one more variable in each bilateral equation, it is the real effective exchange rate obtained by excluding i^{th} country. As stated by Cushman (1986) that the effect of exchange rate volatility on bilateral trade flows depends not only the exchange rate risk experienced with the country under consideration but also on the correlation of exchange fluctuations in other countries.

It is specified by the following equation.

$$M_{i,t} = c_0 + c_1 Y_{(t-1)} + c_2 RER_{i,(t-1)} + c_3 REER_{i*,(t-1)} + c_4 VRER_{i,(t-1)} + u_{3t} \quad (18b)$$

where

$M_{i,t}$: Pakistan's imports from its i^{th} trading partner,

RER_i : Real bilateral exchange rate index of Pakistan with its i^{th} trading partner,

$REER_{i*}$: Real effective exchange rate with rest of the world (the 'third country'), obtained by excluding country i from the set of 27 trading partners, where i varies from 1 to 27.

$VRER_i$: Volatility of RER_i,

In third aggregate version we decompose real exchange rate (RER) and its volatility into their respective permanent and transitory components as given by the equation below.

$$M_t = d_0 + d_1 Y_{(t-1)} + d_2 RER^P_{(t-1)} + d_3 RER^T_{(t-1)} + d_4 VRER^P_{(t-1)} + d_5 VRER^T_{(t-1)} + u_{4t} \quad (18c)$$

where

RER^P : Permanent components of RER,

RER^T : Transitory component of RER,

$VRER^P$: Permanent component of the volatility in RER,

$VRER^T$: Transitory component of the volatility in RER.

In the next version we estimate the import demand function on aggregate basis by decomposing real effective exchange rate ($REER$) and its volatility ($VREER$) into their respective permanent and transitory components.

$$M_t = e_0 + e_1 Y_{(t-1)} + e_2 REER^P_{(t-1)} + e_3 REER^T_{(t-1)} + e_4 VREER^P_{(t-1)} + e_5 VREER^T_{(t-1)} + u_{5t} \quad (18d)$$

where

$REER^P$: Permanent component of real effective exchange rate ($REER$),

$REER^T$: Transitory component of real effective exchange rate ($REER$),

$VREER^P$: Permanent component of volatility in real effective exchange rate ($REER$),

$VREER^T$: Transitory component of volatility of real effective exchange rate ($REER$).

In the last version we estimate a separate import demand function for each of the 27 trading partners by incorporating the components of bilateral real exchange rate and its volatility. Real effective exchange rate of excluding i^{th} country is also incorporated here. The specification is given below.

$$M_{i,t} = f_0 + f_1 Y_{(t-1)} + f_2 RER^P_{i,(t-1)} + f_3 RER^T_{i,(t-1)} + f_4 REER_{i*,(t-1)} + f_5 VRER^P_{i,(t-1)} + f_6 VRER^T_{i,(t-1)} + u_{6t} \quad (18e)$$

where

RER^P_i : Permanent part of i^{th} country's bilateral real exchange rate,

RER^T_i : Transitory part of i^{th} country's bilateral real exchange rate,

$VRER^P_i$: Permanent part of volatility in i^{th} country's bilateral real exchange rate,

$VRER^T_i$: Transitory part of volatility in i^{th} country's bilateral real exchange rate.

Often, export receipt or import payments are not instantaneous. Thus import or export realization is based on prices (which depend on prevailing spot exchange rates), incomes, and market conditions observed at some earlier time. To account for this, one month lags (t-1) of all of the continuous explanatory variables are used. To smooth out wider fluctuations, if any, the two volatility components, the industrial production indices, and the exchange rate variable will be log transformed.

Following the literature, coefficient of industrial production of domestic country (Pakistan) is expected to be positive; it indicates that higher the economic activity in home country the higher the demand for imports under the assumption that imported goods are normal goods. The impact of the real effective exchange rate and real bilateral exchange rate ($REER$ and RER_i) is expected to be negative, as increase in exchange rate series implies depreciation of home currency and thus higher relative imports prices as compared to exports. The volume of imports is expected to decrease with the depreciation of home currency. As the price in the competing market increases the import from i^{th} country also increase, so the coefficient of $REER_{i^*}$ is expected to be positive. The coefficients of permanent and transitory components of real effective exchange rate and real bilateral exchange rate are expected to be negative. A priori, no expectation is maintained on the sign of the volatility in the permanent component of the real exchange rates. However, following Barkoulas *et al.* (2002) the coefficient estimate of the variable which represents volatility in the transitory component of the exchange market is expected to be negative.

Next, the export supply function is specified by the following equation:

$$X_t = \alpha_0 + \alpha_1 Y^*_{(t-1)} + \alpha_2 RER_{(t-1)} + \alpha_3 VRER_{(t-1)} + v_{1t} \tag{19}$$

where

X_t: Aggregate exports of Pakistan to its 27 trading partners,

Y^*: Combined (average) industrial production index of Pakistan's 27 trading partners.

v_{1t}: Random error term.

Similarly to imports functions, we estimate five different version of equation (19). In the same way as in imports, we replace real exchange rate RER index and volatility $VRER$ with real effective exchange rate ($REER$) obtained from its 27 trading partners and its volatility ($VREER$). The aggregate export demand function is now defined as follows:

$$X_t = \beta_0 + \beta_1 Y^*_{(t-1)} + \beta_2 REER_{(t-1)} + \beta_3 VREER_{(t-1)} + v_{2t} \tag{19a}$$

The bilateral export demand function for exports of Pakistan to each of its 27 trading partners is presented in regression equation (19b). We add one more variable in each bilateral equation, which is the real effective exchange rate obtained by excluding i^{th} country. It is specified by the following equation.

$$X_{i,t} = \gamma_0 + \gamma_1 Y^*_{i,(t-1)} + \gamma_2 RER_{i,(t-1)} + \gamma_3 REER_{i*,(t-1)} + \gamma_4 VRER_{i,(t-1)} + v_{3t} \qquad \text{(19b)}$$

where

Y_i^*: Industrial production index of Pakistan's i^{th} trading partners.

Similarly to imports function, in third aggregate version of export demand function we decompose real exchange rate (RER) and its volatility into their respective permanent and transitory components as given in the equation below.

$$X_t = \omega_0 + \omega_1 Y^*_{(t-1)} + \omega_2 RER^P_{(t-1)} + \omega_3 RER^T_{(t-1)} + \omega_4 VRER^P_{(t-1)} + \omega_5 VRER^T_{(t-1)} + v_{4t} \qquad \text{(19c)}$$

The export demand function on aggregate basis by decomposing real effective exchange rate ($REER$) and its volatility ($VREER$) into their respective permanent and transitory components is given by:

$$X_t = \lambda_0 + \lambda_1 Y^*_{(t-1)} + \lambda_2 REER^P_{(t-1)} + \lambda_3 REER^T_{(t-1)} + \lambda_4 VREER^P_{(t-1)} + \lambda_5 VREER^T_{(t-1)} + v_{5t} \qquad \text{(19d)}$$

A separate export demand function for each of 27 trading partners by incorporating the components of bilateral real exchange rate and its volatility is estimated by equation (19e). Real effective exchange rate of rest of the world, excluding the i^{th} country is also incorporated here. The specification is given below.

$$X_{i,t} = \mu_0 + \mu_1 Y^*_{i,(t-1)} + \mu_2 RER^P_{i,(t-1)} + \mu_3 RER^T_{i,(t-1)} + \mu_4 REER_{i*,(t-1)} + \mu_5 VRER^P_{i,(t-1)} + \mu_6 VRER^T_{i,(t-1)} + v_{6t} \qquad \text{(19e)}$$

One would expect that increase in income of trading partners will result in a greater volume of exports to those partners, thus the expected sign of the coefficient of foreign industrial production is expected to be positive. The relationship of real exchange rate with the volume of export is expected to be positive. It indicates that a higher value of real exchange rate (depreciation of Pak currency and appreciation of foreign currency) implies a lower relative export price, and as result the volume of exports increases. As the export price in the competing market decreases, the home country's export to the i^{th} country will decrease, so the coefficient of $REER_{i*}$ is expected to be negative. The effect of exchange rate volatility due to permanent components on the real exports is ambiguous. It can be positive or negative, depending on different theories, while the expected sign of the coefficient of transitory components is negative. All the import demand and export supply equations are estimated by Ordinary Least Square (OLS).

Chapter 4

DATA SOURCES AND CONSTRUCTION OF VARIABLES

The present study uses monthly data from 1982:07 to 2009:12. The data for nominal bilateral exports and imports are taken from various issues of *Statistical Bulletin* published by State Bank of Pakistan. The data on exchange rates, consumer price indices, unit value indices of import and export and indices of industrial production for Pakistan and its trading partners are taken from *International Financial Statistics (IFS)*. To obtain real imports and exports, we divide nominal values of aggregate and bilateral imports and exports by monthly import and export unit value indices, respectively. The unit value indices of import and export are available on quarterly basis; we convert these quarterly values into monthly values by log-linear interpolation. Measures of volatility due to the permanent and the transitory component of exchange rate series are also used as explanatory variables. Table 4.1 contains a detailed description of variables used in the analysis. The average share of Pakistan's import, export and total trade with its 27 trade partner for the given sample period are given in Table 4.2 in percentage form.

Table 4.1 Description of Variables

Notations	Description
Trading partners	The trade partners are: Bangladesh, Belgium, Canada, China, Denmark, France, Germany, Hong Kong, India, Indonesia, Iran, Italy, Japan, Korea, Kuwait, Malaysia, Netherlands, New Zealand, Saudi Arabia, Singapore, Spain, Sri Lanka, Switzerland, Turkey, U.A.E., UK, and USA. The trade partners on average cover 82.5% of Pakistan's trade.
Nominal exchange rate	The exchange rate, ER, is defined as the number of rupees per unit of i^{th} currency for $i = 1,\ldots,27$
Real exchange rate	The real exchange rates are obtained by adjusting nominal exchange rates with the ratio of foreign price level of the i^{th} country to domestic price level of home country, Pakistan. Consumer price index is used as a measure of the price level. $$RER = ER\left[\frac{P_f}{P_h}\right]$$ where, RER is direct quoted real exchange rate, P_h is home country's consumer price index and P_f is foreign country's consumer price index.

(Continues......)

Table 4.1 (Continued) Description of Variables

Notations	Description
Nominal effective exchange rate	Nominal effective exchange rate is an index (measured relative to a based period) of the geometric weighted average of the nominal exchange rates (ER) of Pakistan currency against the currencies of 27 major trading partners. It is defined in terms of domestic currency per unit of foreign currency. The trading partner's weights are defined in such a way that weights sum to unity, i.e., $\sum_{i=1}^{27} w_i = 1$ $NEER_t = \prod_{i=1}^{27} (V_{i,t})^{w_i} = (V_{1,t})^{w_1} (V_{2,t})^{w_2} \cdots (V_{27,t})^{w_{27}}$ where, $V_{i,t} = \frac{ER_{i,t}}{ER_{i,0}}$ and $w_i = \frac{X_i + M_i}{\sum_{i=1}^{27}(X_i + M_i)}$ The weights rely on the average geographical distribution of imports and exports of goods and services for the sample period. For the evaluation of degree of competitiveness of a country trade weights are more appropriate and provides a more general view as compared to import or export weights.
Real effective exchange rate	Real effective exchange rate of Pakistan has been calculated as weighted average of nominal bilateral rates adjusted for price changes. This is a multilateral consumer price index (CPI)-based REER of the currency of the Pakistan economy relative to its 27 partner countries. It is defined in terms of domestic currency per unit of foreign currency, so that an increase in REER is a real effective depreciation. $REER_t = \prod_{i=1}^{27} \left[\frac{RER_{i,t}}{RER_{i,0}} \right]^{w_i}$
M_t	M_t is the real imports of Pakistan in domestic currency units from its 27 trading partners. Real imports are obtained by deflating nominal imports by the index of unit value of imports.
$M_{i,t}$	$M_{i,t}$ is real imports of Pakistan in domestic currency units from its i^{th} trading partner. Real imports are obtained by deflating nominal imports from i^{th} country by domestic unit value index of imports.
X_t	X_t is the real exports of Pakistan in domestic currency units to its 27 trading partners. Real exports are obtained by deflating nominal exports by the index of unit value of exports.
$X_{i,t}$	$X_{i,t}$ is the real exports of Pakistan in domestic currency units to its i^{th} trading partners. Real exports are obtained by deflating nominal exports by the index of unit value of exports.

(Continues……)

Table 4.1 (Continued) Description of Variables

Notations	Description
Y	Y is the industrial production of Pakistan and is used as proxy for domestic income.
Y_i^*	Y_i^* is industrial production index of Pakistan's i th trading partners and is used as foreign income.
Y^*	Y^* is aggregate industrial production index of 27 trading partner which is obtained by adding industrial production of 27 countries and than converting it into index and is used as a proxy for world income.

Table 4.2: Average Percentage Share of 27 Trade Partners of Pakistan

Countries	Export Share as % of Total Export	Import Share as % of Total Import	Trade Share as % of Total Trade
Bangladesh	1.600	0.473	0.926
Belgium	1.876	1.227	1.489
Canada	1.539	1.085	1.297
China	2.096	5.679	4.234
Denmark	0.512	0.343	0.407
France	2.909	2.104	2.440
Germany	5.995	5.593	5.792
Hong Kong	4.938	0.518	2.367
India	1.052	1.410	1.262
Indonesia	0.780	1.533	1.232
Iran	1.900	1.809	1.776
Italy	3.427	2.604	2.917
Japan	5.649	9.827	8.116
Korea	2.070	2.684	2.439
Kuwait	0.705	6.565	4.195
Malaysia	0.510	4.555	2.897
Netherland	2.411	1.589	1.925
New Zealand	0.248	0.206	0.227
Saudi Arabia	3.852	8.461	6.594
Singapore	0.904	2.118	1.608
Spain	1.658	0.568	1.011
Sri Lanka	1.028	0.419	0.665
Switzerland	0.776	2.201	1.576
Turkey	1.052	0.581	0.760
UAE	6.059	6.572	6.308
UK	6.471	4.722	5.493
USA	17.050	9.186	12.534
Average share	79.067	84.631	82.487

CHAPTER 5
EMPIRICAL RESULTS

5.1 PRELIMINARIES

As a preliminary exercise, unit root test are applied to all variables at log level and logarithmic first difference to determine their stationarity. To achieve this, we apply the conventional Augmented Dickey Fuller (ADF) test with intercept, wherein the lag length of augmented terms is chosen by using the Schwarz Bayesian criterion (SBIC). The null hypothesis of a unit root is not rejected at conventional significance levels for all of the variables except Pakistan's imports from Bangladesh, Belgium, Canada, Denmark, France, Germany, Iran, Italy, Kuwait, Netherlands, New Zealand, Spain, Switzerland, Turkey, U.K and U.S.A; for Pakistan's exports from India, Indonesia, Iran, Kuwait, Netherlands, Saudi Arabia, Singapore; and for consumer prices of Belgium and Canada. The non-stationarity of real exchange rates implies that the purchasing power parity (PPP) appears to be violated in the long-run for the underlying countries. For the first logarithmic differences, the null hypothesis of a unit root is rejected at the conventional significance level. The results of unit root are reported in Table 5.1.

Given that real and nominal exchange rates are non-stationary at the level but stationary at the first-differences, the SVAR specification is appropriate to examine the dynamic effects of real and nominal shocks on real and nominal exchange rates. We use the first difference of the logarithms of each variable in the decomposition analysis.

5.2 VARIANCE DECOMPOSITIONS

A finite-order bivariate vector autoregressive model (VAR) is estimated for all the countries. The likelihood ratio test and lag exclusion test are used to choose the optimal lag length of VAR. Starting with a maximum lag of 60, formal tests indicate that the first lag is sufficient at conventional significance levels and VAR (1) model is the most appropriate for the system. After properly specifying the VARs, the restrictions are imposed given by equation (10) to equation (13) and the shocks are identified. Real and nominal exchange rates are represented by a dynamic combination of real and nominal shocks.

Table 5.1: Unit Root Tests

Countries		X	M	ER	RER	CPI	IP	*VRER*	$VRER^P$	$VRER^T$
Bangladesh	**Level**	-0.809	-13.447	-0.443	-2.393	0.229	2.023	-5.148	-6.437	-13.730
	1st diff.	-11.137		-12.524	-28.046	-11.978	-15.546			
Belgium	**Level**	-1.585	-4.618	-0.672	-2.001	-3.543	-2.003	-15.856	-21.934	-19.199
	1st diff.	-13.516		-12.611	-12.668		-3.298			
Canada	**Level**	-3.084	-8.612	0.244	-1.822	-4.692	-2.657	-15.818	-16.524	-9.710
	1st diff.	-3.805		-14.170	-14.676		-3.623			
China	**Level**	-0.921	-1.885	0.402	-1.926	-3.155	2.054	-18.089	-15.757	-16.942
	1st diff.	-12.042	-18.805	-15.196	-16.526	-4.379	-17.577			
Denmark	**Level**	-1.651	-3.819	-0.637	-2.064	-2.671	-2.510	-16.168	-12.304	-16.712
	1st diff.	-10.832		-13.855	-12.401	-2.984	-8.823			
France	**Level**	-2.738	-3.999	-0.382	-2.111	-1.945	-2.085	-16.438	-12.393	-7.656
	1st diff.	-4.674		-12.615	-12.703	-3.896	-3.211			
Germany	**Level**	-2.666	-4.512	-0.894	-1.840	-0.720	-1.911	-17.136	-7.568	-12.590
	1st diff.	-7.363		-12.564	-13.126	-17.986	-5.269			
Hong Kong	**Level**	-2.477	-2.714	0.0816	-1.857	-1.891	-2.051	-11.293	-13.714	-11.3716
	1st diff.	-17.730	-15.731	-12.023	-14.158	-2.520	-6.909			
India	**Level**	-4.549	-2.189	0.050	-1.228	-2.129	-1.553	-18.142	-17.997	-17.554
	1st diff.		-9.754	-16.191	-16.247	-3.296	-4.573			

(Continues.......)

Table 5.1(Continued): Unit Root Tests

Countries		X	M	ER	RER	CPI	IP	*VRER*	$VRER^P$	$VRER^T$
Indonesia	**Level**	-6.741	-1.792	-2.345	-2.359	-0.185	-1.798	-10.747	-4.663	-5.823
	1st diff.		-13.884	-14.009	-15.051	-9.842	-20.872			
Iran	**Level**	-4.405	-7.081	-1.202	-2.247	-0.874	-1.205	-13.274	-13.445	-12.970
	1st diff.			-12.885	-13.365	-18.300	-10.104			
Italy	**Level**	-1.452	-7.567	-0.033	-2.156	-2.659	-2.306	-14.800	-15.946	-7.520
	1st diff.	-11.604		-12.061	-11.956	-3.517	-3.504			
Japan	**Level**	-1.764	-3.294	-1.638	-2.461	-2.289	-2.767	-8.263	-6.345	-5.374
	1st diff.	-18.631	-14.574	-13.81	-13.723	-2.603	-6.570			
Korea	**Level**	-3.089	-2.647	-1.026	-1.999	-1.379	-1.710	-10.675	-7.194	-5.082
	1st diff.	-15.619	-14.644	-14.012	-13.806	-12.102	-4.932			
Kuwait	**Level**	-4.165	-3.777	-0.622	-1.723	0.664	-3.003	-14.961	-15.388	-13.222
	1st diff.			-13.450	-15.666	-21.118	-11.360			
Malaysia	**Level**	-3.132	-3.153	-0.498	-2.245	-0.289	-2.061	-5.268	-5.510	-7.818
	1st diff.	-17.290	-19.320	-8.729	-15.480	-15.132	-15.337			
Netherlands	**Level**	-3.450	-3.857	-0.802	-1.768	-0.033	-1.378	-16.867	-15.696	-11.603
	1st diff.	-11.178		-12.523	-14.917	-16.303	-4.677			
New Zealand	**Level**	-2.184	-3.679	0.053	-1.666	-3.365	-0.745	-15.215	-15.381	-14.7174
	1st diff.	-11.989		-13.606	-16.915	-26.156	-18.259			

(Continues.......)

Table 5.1(Continued): Unit Root Tests

Countries		X	M	ER	RER	CPI	IP	*VRER*	*VRER*^{P}	*VRER*^{T}
Saudi Arabia	**Level**	-4.705	-1.398	-0.479	-2.374	2.422	-1.125	-14.839	-14.733	-8.886
	1st diff.		-15.598	-11.722	-14.053	-16.267	-6.352			
Singapore	**Level**	-4.283	-2.169	-0.841	-2.015	-0.258	-1.123	-14.578	-8.895	-14.608
	1st diff.		-15.187	-12.61	-13.569	-8.354	-6.821			
Spain	**Level**	-1.220	-8.866	0.242	-1.638	-3.363	-2.132	-14.179	-14.760	-7.543
	1st diff.	-8.374		-12.446	-12.162	-2.239	-2.784			
Sri Lanka	**Level**	-3.300	-14.135	-1.686	-0.838	-0.449	-1.408	-5.336	-3.876	-8.619
	1st diff.	-15.290		-14.764	-12.664	-13.753	-17.839			
Switzerland	**Level**	-3.429	-4.420	-0.716	-2.100	-2.225	-1.759	-17.495	-24.578	-11.459
	1st diff.	-19.267		-12.959	-13.134	-1.837	-4.273			
Turkey	**Level**	-2.666	-3.708	-2.211	-1.050	-2.306	-1.873	-8.837	-6.225	-8.750
	1st diff.	-15.210		-11.319	-12.134	-1.221	-6.229			
U.A.E	**Level**	-1.790	-2.274	-0.808	-2.439	-1.800	-1.536	-3.670	-3.943	-8.859
	1st diff.	-13.532	-16.301	-11.738	-14.427	-12.445	-7.219			
U.K	**Level**	-1.872	-4.542	-0.606	-1.664	-1.920	-2.134	-13.823	-11.425	-15.892
	1st diff.	-7.354		-12.674	-12.416	-3.031	-2.496			
U.S.A	**Level**	-3.090	-7.334	-0.808	-2.242	-1.949	-1.404	-3.670	-15.622	-15.579
	1st diff.	-٤.677		-11.735	-13.483	-11.396	-4.144			

Critical values are -2.571, -2.871 and -3.451 at 10 %, 5 % and 1% significance level respectively.

The variance decomposition obtained by using the structural shocks i.e; $\{\varepsilon_{1t}\}$ and $\{\varepsilon_{2t}\}$ sequences allows us to asses the relative contributions of the real and nominal shocks to forecast error variance of the real and nominal exchange rate series. The Variance decompositions (VDCs) provide a way to summarize the information contained in the moving-average (MA) representation. Table 5.2 summarizes the result of the VDCs for the first logarithmic difference of real and nominal exchange rates for the periods up to 24 months. Note that Table 5.2 reports only the relative contribution of forecasted error variance that can be explained by a real shock.

The results show that real shocks explain a large proportion of the forecast error variance of the real exchange rate series at any forecast horizon for REER (98% for first month and 93% for longer horizons) of Pakistan and real bilateral exchange rate of Pakistan (93.7% to 99.9%) with 26 trading partners in our sample with the exception of Bangladesh where this proportion is 87.2%.

These results imply that real shocks explain a substantial amount of the variance in the real exchange rates in each case. Other existing evidence also generally suggests that real shocks are important in explaining real exchange rate movements (Lastrapes, 1992; Evans and Lothian, 1993; Clarida and Gali, 1994; Enders and Lee, 1997; Dibooglu and Kutan, 2001; Chowdhury, 2004; Ahmad, 2007; Narayan, 2008; Hamori and Tanizaki, 2008; Inoue and Hamori, 2009; and Ok *et al.* 2010).

On the other hand, the contribution of real shock in explaining nominal effective exchange rate of Pakistan is 30.6 %. It explains a high contribution of bilateral nominal exchange rates (73% to 99%) for 23 trading partner of Pakistan. This percentage is relatively low for three trading partners; Turkey (60%), Bangladesh (46%) and Saudi Arabia (36%). The exceptional case is UAE where almost all variation in the forecast error variance of bilateral nominal exchange rate is explained by nominal shocks. This result does not seem surprising because U.A.E. has been following fixed exchange rate against U.S.A. over the entire sample showing very small changes without a small change in U.A.E./U.S.A exchange rate. The forecast error variance decompositions for the variations in the nominal exchange rate suggest that although real shocks account for much of the movement in the nominal exchange rates of many countries, the nominal shocks also play a sizeable role for few countries.

Table 5.2: Forecast Error Variance Decomposition of Real and Nominal Effective Exchange Rates with 27 Trading Partners

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in REER	Relative change in NEER
1-month	98.426	30.675
3-month	93.452	30.055
6-month	93.129	30.037
12-month	93.127	30.036
18-month	93.127	30.036
24-month	93.127	30.036

Real and Nominal Exchange Rates with Bangladesh

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	87.186	46.881
3-month	75.438	47.907
6-month	74.978	47.930
12-month	74.973	47.930
18-month	74.973	47.930
24-month	74.973	47.930

Real and Nominal Exchange Rates with Belgium

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.972	91.699
3-month	99.965	91.680
6-month	99.964	91.679
12-month	99.964	91.679
18-month	99.964	91.679
24-month	99.964	91.679

Real and Nominal Exchange Rates with Canada

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.999	84.324
3-month	99.998	84.068
6-month	99.998	84.065
12-month	99.998	84.065
18-month	99.998	84.065
24-month	99.998	84.065

Real and Nominal Exchange Rates with China

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	98.533	96.319
3-month	97.878	93.960
6-month	97.869	93.933
12-month	97.868	93.932
18-month	97.868	93.932
24-month	97.868	93.932

Real and Nominal Exchange Rates with Denmark

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.992	87.752
3-month	99.990	88.343
6-month	99.989	88.345
12-month	99.989	88.345
18-month	99.989	88.345
24-month	99.989	88.345

Real and Nominal Exchange Rates with France

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.959	89.550
3-month	99.950	89.777
6-month	99.949	89.780
12-month	99.949	89.780
18-month	99.949	89.780
24-month	99.949	89.780

Real and Nominal Exchange Rates with Germany

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.924	86.111
3-month	99.898	86.535
6-month	99.896	86.538
12-month	99.896	86.538
18-month	99.896	86.538
24-month	99.896	86.538

Real and Nominal Exchange Rates with Hong Kong

Forecast	Relative Contribution of Real Shocks to	
Horizon	Relative change in RER	Relative change in NER
1-month	96.272	82.176
3-month	95.378	80.519
6-month	95.329	80.472
12-month	95.328	80.471
18-month	95.328	80.471
24-month	95.328	80.471

Real and Nominal Exchange Rates with India

Forecast	Relative Contribution of Real Shocks to	
Horizon	Relative change in RER	Relative change in NER
1-month	99.958	81.584
3-month	99.939	80.975
6-month	99.938	80.973
12-month	99.938	80.973
18-month	99.938	80.973
24-month	99.938	80.973

Real and Nominal Exchange Rates with Indonesia

Forecast	Relative Contribution of Real Shocks to	
Horizon	Relative change in RER	Relative change in NER
1-month	97.647	88.547
3-month	97.244	88.978
6-month	97.146	88.969
12-month	97.145	88.968
18-month	97.145	88.968
24-month	97.145	88.968

Real and Nominal Exchange Rates with Iran

Forecast	Relative Contribution of Real Shocks to	
Horizon	Relative change in RER	Relative change in NER
1-month	98.100	98.689
3-month	97.059	98.303
6-month	97.056	98.301
12-month	97.056	98.301
18-month	97.056	98.301
24-month	97.056	98.301

Real and Nominal Exchange Rates with Italy

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.981	89.134
3-month	99.979	89.394
6-month	99.978	89.400
12-month	99.978	89.400
18-month	99.978	89.400
24-month	99.978	89.400

Real and Nominal Exchange Rates with Japan

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.891	90.565
3-month	99.856	91.199
6-month	99.855	91.201
12-month	99.855	91.201
18-month	99.855	91.201
24-month	99.855	91.201

Real and Nominal Exchange Rates with Korea

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.998	90.996
3-month	99.997	92.071
6-month	99.997	92.094
12-month	99.997	92.094
18-month	99.997	92.094
24-month	99.997	92.094

Real and Nominal Exchange Rates with Kuwait

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	97.728	75.799
3-month	96.448	76.187
6-month	96.443	76.189
12-month	96.443	76.189
18-month	96.443	76.189
24-month	96.443	76.189

Real and Nominal Exchange Rates with Malaysia

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.663	89.022
3-month	99.492	88.636
6-month	99.491	88.634
12-month	99.491	88.634
18-month	99.491	88.634
24-month	99.491	88.634

Real and Nominal Exchange Rates with Netherlands

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.728	81.958
3-month	99.597	82.624
6-month	99.596	82.628
12-month	99.596	82.628
18-month	99.596	82.628
24-month	99.596	82.628

Real and Nominal Exchange Rates with New Zealand

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	96.769	86.119
3-month	94.125	86.026
6-month	94.116	86.025
12-month	94.116	86.025
18-month	94.116	86.025
24-month	94.116	86.025

Real and Nominal Exchange Rates with Saudi Arabia

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	97.699	73.770
3-month	97.187	73.350
6-month	97.147	73.336
12-month	97.146	73.335
18-month	97.146	73.335
24-month	97.146	73.335

Real and Nominal Exchange Rates with Singapore

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	97.234	90.842
3-month	96.145	88.744
6-month	96.129	88.722
12-month	96.129	88.722
18-month	96.129	88.722
24-month	96.129	88.722

Real and Nominal Exchange Rates with Spain

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.334	81.479
3-month	99.224	82.839
6-month	99.209	82.851
12-month	99.208	82.850
18-month	99.208	82.850
24-month	99.208	82.850

Real and Nominal Exchange Rates with Sri Lanka

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.175	36.517
3-month	98.912	35.765
6-month	98.901	35.760
12-month	98.901	35.760
18-month	98.901	35.760
24-month	98.901	35.760

Real and Nominal Exchange Rates with Switzerland

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.781	88.995
3-month	99.718	89.474
6-month	99.715	89.475
12-month	99.715	89.475
18-month	99.715	89.475
24-month	99.715	89.475

Real and Nominal Exchange Rates with Turkey

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	97.447	60.302
3-month	97.528	57.705
6-month	97.322	57.324
12-month	97.308	57.326
18-month	97.307	57.327
24-month	97.307	57.327

Real and Nominal Exchange Rates with U.A.E

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	93.714	0.026
3-month	92.828	0.028
6-month	92.610	0.029
12-month	92.608	0.029
18-month	92.608	0.029
24-month	92.608	0.029

Real and Nominal Exchange Rates with U.K.

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	99.775	87.644
3-month	99.717	88.495
6-month	99.714	88.499
12-month	99.714	88.499
18-month	99.714	88.499
24-month	99.714	88.499

Real and Nominal Exchange Rates with U.S.A.

Forecast Horizon	Relative Contribution of Real Shocks to	
	Relative change in RER	Relative change in NER
1-month	98.592	80.011
3-month	98.389	78.759
6-month	98.349	78.701
12-month	98.348	78.700
18-month	98.348	78.700
24-month	98.348	78.700

5.3 ESTIMATION OF VOLATILITY

To estimate conditional volatility of real bilateral exchange rate, real effective exchange rate and the permanent and transitory components of real bilateral exchange rate and real effective exchange rate, the autoregressive process given by equation (17) is estimated for each adjusted absolute innovation series. The estimated values from each of these equations are used as conditional standard deviation or conditional volatility of the relevant variable. In most of cases GARCH (1, 1) process is found to be the best representation of the conditional volatility in the fundamental component while ARCH(1) best represented the transitory component. The results are reported in appendix C.

5.4 IMPACT OF PAK-US EXCHANGE RATE AND ITS VOLATILITY ON OVERALL TRADE

Table 5.3 explains the impact of the volatility of real exchange rate (in terms of rupees per US dollar) on the overall imports and exports of Pakistan. Looking first at the overall performance of the estimated regression models as represented by equations' diagnostics at the bottom part of Table 5.3, the R^2 statistics indicate that the estimated import and export equations have high explanatory powers. The import equation explains 86 percent of variation in imports while export equation explains 92 percent variation in exports. The regression F-statistics are highly significant for both the equations, indicating that the included variables are jointly significant in explaining the exports and imports decisions. The Lagrange multiplier (LM) statistics indicate that both the equations are free from autocorrelation.

Next, we analyze the coefficient estimates of explanatory variables one by one. First, we consider the variable of domestic output being measured by the index of industrial production. The index of industrial production of Pakistan (Y) is used in import demand function and aggregate index of industrial production (formed by industrial production indices of 27 trade partners) is used in export supply equation of Pakistan. These indices are used as proxies of home and foreign countries' income, respectively because GDP data on monthly basis are not generally available. The coefficients of these indices are positive, indicating that the improvement in economic activity at home encourages import from foreign countries and improvement in the overall economic activity of our trade partner's increases their demand for Pakistan's exports. The coefficient of these indices, though have theoretically consistent signs and are statistically significant for exports but insignificant for imports. The data of Pakistan's imports shows that our imports remain high irrespective of the level of economic activity.

Table 5.3: Effect of Pak-US Real Exchange Rate and its Volatility on Overall Trade of Pakistan

Variables	Pakistan's Imports (in logs)	Pakistan's Exports (in logs)
C	11.122*	10.896*
Log of domestic output Y (lagged)	0.001	
	(0.003)	
Log of foreign output (lagged)		0.061
		(0.845)
Log of RER with US dollar (lagged)	-0.201	0.137
	(-0.553)	(0.281)
Volatility in RER (lagged)	17.306	16.871
	(2.736)*	(2.051)**
AR(1)	0.401	0.479
	(7.444)*	(8.691)*
AR(2)	0.239	0.224
	(4.255)*	(3.796)*
AR(3)	0.327	0.266
	(6.174)*	(4.902)*
R^2	0.861	0.922
F	330.212	629.848
LM	22.05	17.17

Note: ***, **, * indicate significance at 10%, 5% and 1% level, respectively.

Coming now to the variable of real exchange rate (defined in terms of rupee per US dollar), its coefficient in imports equation is negative, indicating that the depreciation of rupee leads to a reduction in Pakistan's demand for relatively expensive imports from foreign countries. Its positive coefficient in exports equation shows that foreigners' demand for Pakistan's exports increases with depreciations of rupee. The signs of these coefficients are consistent with economic theory but their t-values show that both these coefficients are statistically insignificant.

Turning now to the volatility of real exchange rate, the results indicate that the volatility in real exchange rate with US dollar has a statistically significant trade-enhancing impact on both the aggregate imports and exports of Pakistan. These results are consistent with theoretical findings of Frankel (1991) and De Grauwe (1988).

Lastly, the coefficient of the autoregressive terms are highly significant with positive sign indicating that the decisions of importers and exporters do not change readily due to psychological, technological or institutional reasons.

Next we discuss Table 5.4 that explains the effect of disaggregated real exchange rate volatility on the overall trade of Pakistan. We decomposed real exchange rate into its components i.e., monetary or transitory component and real or permanent component. The volatility of each part is measured separately using GARCH model and is included in export and import equations as explanatory variables.

The regression diagnostics in last three lines of this Table indicate that both import and export models seem to fit the data reasonably well with high values of R^2 and F-statistics, implying high explanatory power of the model and joint significance of included regressors in these models, respectively. Further, estimates of both the regression equations are free of autocorrelation problem.

Table 5.4: Effect of Permanent and Temporary components of Pak-US Real Exchange Rate and their Volatility on Overall Trade of Pakistan

Variables	Pakistan's Imports (in logs)	Pakistan's Exports (in logs)
C	11.076*	10.728*
Log of domestic output Y (lagged)	0.004	
	(0.075)	
Log of foreign output (lagged)		1.686
		(10.412)*
Log of permanent part of RER with US dollar (lagged)	-0.206	0.627
	(-2.322)**	(2.613)*
Log of transitory part of RER with US dollar (lagged)	-0.825	0.995
	(-1.659)***	(1.66)***
Volatility in permanent part of RER (lagged)	22.608	0.172
	(1.995)***	(0.064)
Volatility in transitory part of RER (lagged)	8.784	-27.939
	(1.716)***	(-3.421)*
AR(1)	0.406	0.290
	(7.522)*	(5.952)*
AR(2)	0.224	
	(3.910)*	
AR(3)	0.331	0.437
	(6.172)*	(9.00)*
R^2	0.862	0.931
F	245.909	609.788
LM	12.04	11.98

Note: ***, **, * indicate significance at 10%, 5% and 1% level, respectively.

Now we look at the coefficient estimates one by one. Our results regarding the impact of output are similar to those in Table 5.3. The expansion of economic activity at home raises Pakistan's import demand while expansion of economic activity in foreign countries raises their demand for Pakistan's exports. The effect of domestic output on Pakistan's imports is insignificant but the effect of foreign output on Pakistan's exports is significant.

An important improvement comes in our results when we consider the variable of exchange rate. We have seen in Table 5.3 that this variable had theoretical consistent sign but its coefficients in both the equations were statistically insignificant. In the present case, however, when this variable is decomposed into its permanent and transitory parts, both these parts have theoretical valid and statistical significant effects in both the import demand and export supply equations. This shows that it is not just the change in Pakistan/US exchange rate that affects the decisions of traders but it is the nature of change i.e., permanent and transitory, in exchange rate that alters their decisions.

Now, we look at the impact of volatility of real exchange rate on Pakistan's trade. The results show a trade enhancing impact of both the permanent and transitory parts of volatility in real exchange rate on Pakistan imports. The export function shows that the volatility of real component of real exchange rate has an insignificant effect on exports but the volatility of nominal component has a significant negative effect on Pakistan's exports.

Lastly, the significant positive coefficients of lagged imports and exports in relevant equations show inertia in the decision making of traders.

5.5 IMPACT OF REAL EFFECTIVE EXCHANGE RATE AND ITS VOLATILITY ON OVERALL TRADE

In Table 5.5, we incorporate real effective exchange rate (as a proxy for a measure of external competitiveness) and its volatility in both import and export functions of Pakistan. The overall performance of both the import and export equations is good when we look at R-square and F-statistics. Further, there is no problem of autocorrelation in both the estimated equations.

Now coming to the coefficients of regressors, the variable of industrial production has a positive and significant effect on exports while its impact on imports is positive but insignificant.

The coefficients of real effective exchange rate indicate that the depreciation of home currency relative to its trading partners encourages Pakistan's exports and discourages its imports. Both the coefficients are statistically significant with the t-values of -1.656 in imports equation and 3.308 in exports equation. So, improvement in external competitiveness of our home currency promotes the overall trade of Pakistan.

Table 5.5: Effect of Real Effective Exchange Rate and its Volatility on Overall Trade of Pakistan

Variables	Pakistan's Imports (in logs)	Pakistan's Exports (in logs)
C	10.935*	10.720*
Log of domestic output Y (lagged)	0.002 (0.053)	
Log of foreign output (lagged)		1.674 (11.061)*
Log of REER (lagged)	-0.396 (-1.656)***	0.719 (3.308)*
Volatility in REER (lagged)	33.22 (0.836)	12.676 (0.262)
AR(1)	0.410 (7.598)*	0.294 (5.998)
AR(2)	0.225 (3.929)*	
AR(3)	0.310 (5.858)*	0.397 (8.190)*
R^2	0.859	0.928
F	324.225	845.494
LM	32.15	51.96

Note: ***, **, * indicate significance at 10%, 5% and 1% level, respectively.

The effect of volatility in real effective exchange rate is positive but insignificant in both the imports and exports equations. This insignificant effect may be due to the 'aggregation-bias' because a country's bilateral trade flows may produce offsetting positive and negative effects that cancel each other out at the aggregate level. Thus a bilateral study may provide a more accurate analysis, as it will evaluate a bilateral exchange rate, which is the rate that is actually used by exporters and importers. Hence, we will perform bilateral analysis of exports and imports of each of its 27 trading partners.

The autoregressive terms in the above estimated equation are highly significant with positive coefficients indicating gradual and persistent changes in the behavior of importers and exporters.

After analyzing the impact of real effective exchange rate and its volatility on Pakistan's trade, we incorporate real effective exchange rate and its volatility in terms of its components in Table 5.6. The overall performance of estimated regressions remains good showing high explanatory power of the model (in terms of high R^2) and joint significance of the estimated regressions (as shown by high F values). Further regression residuals are free from serial correlation.

The regression coefficients of output variable again obtain similar results as in above three tables that expansion in the economies of trading partners raises their demand for Pakistani products but economic expansion at home has no effect on Pakistan's demand for foreign products.

Further, both the components of real effective exchange rate indicate that an improvement in external competitiveness of Pak rupee improves its trade balance by encouraging its exports and discouraging its imports. Both the permanent and transitory parts have statistically significant coefficients consistent with economic rationale.

Moreover, the volatility of components of real effective exchange rate does not change our conclusions obtained on the basis of our results in Table 5.5 that the aggregation of trade flows with different trade partners leads to counterbalancing negative and positive effects of volatility on trade, leading to an insignificant impact of exchange volatility on trade flows. So it again shows the need to carry out bilateral analysis of the relationship of trade with exchange rate volatility.

Statistically significant and positive autoregressive terms indicate the lag in response of traders. This lag may be due to the habit persistence of customers or technological and institutional reasons.

Table 5.6: Effect of Permanent and Transitory components of Real Effective Exchange Rate and their Volatility on Overall Trade of Pakistan

Variables	Pakistan's Imports (in logs)	Pakistan's Exports (in logs)
C	11.014*	11.376*
Log of domestic output Y (lagged)	0.005 (0.010)	
Log of foreign output (lagged)		2.264 (4.251)*
Log of permanent part of REER (lagged)	-0.655 (-2.682)*	0.786 (2.431)**
Log of transitory part of REER (lagged)	-0.923 (-2.244)**	0.992 (1.706)***
Volatility in permanent part of REER (lagged)	3.324 (1.098)	0.221 (0.551)
Volatility in transitory part of REER (lagged)	-5.035 (-1.114)	-0.285 (-0.544)
AR(1)	0.375 (6.941)*	0.553 (9.818)*
AR(2)	0.261 (4.672)*	0.159 (2.362)**
AR(3)	0.339 (6.323)*	0.273 (4.869)*
R^2	0.867	0.926
F	256.685	494.673
LM	9.03	10.97

Note: ***, **, * indicate significance at 10%, 5% and 1% level, respectively.

5.6 IMPACT OF REAL BILATERAL EXCHANGE RATE AND ITS VOLATILITY ON BILATERAL IMPORT OF PAKISTAN

In Table 5.7 bilateral import functions with 27 trade partners are presented. The overall performance of the estimated bilateral import functions seems satisfactory in terms of explanatory powers of the models and joint significance of included explanatory variables. Further, the estimated models are free from the problem of autocorrelation.

Now coming to coefficient estimates of explanatory variables, we first look at the coefficient estimates of domestic output. The industrial production index of Pakistan is used as proxy of domestic output as GDP data are not available on monthly basis. The results indicate that in 15 out of 27 regression equations this variable has significant positive effect, implying encouragement of imports with improvement of economic activity. These 15 trade partners are Bangladesh, Canada, China, France, Germany, Hong Kong, India, Iran, Italy, Kuwait, Netherlands, New Zealand, Singapore, Spain and U.A.E.

Out of these countries China, Germany, Italy, Kuwait, Singapore, and U.A.E. acquire an important position among the major suppliers of imports to Pakistan (see Table 4.2).

Bangladesh, China, India and Iran are among our neighbors countries. This result affirms the global pattern of trade that one trades most with one's neighbors due to a number of reasons. The transportation costs between neighbors are bound to be lower than when countries are further away. Tastes and life styles are also often not very different and within geographical regions such cultural and social similarities are accentuated, allowing for an exchange of products to take place. There are also the economies of scale to be considered.

India acquires an important position as Pakistan's trading partners irrespective of the fact that India is seen by many as Pakistan's greatest enemy. In economic terms it makes complete sense. Even though, peace is the basic right of all citizens, trade is a purely economic activity, which may have political and social consequence. Trade is opportunistic for given equal conditions; firms and countries will conduct business with whoever appears to have the better product, price or terms.

In linking trade with peace, those who want peace between India and Pakistan misunderstand the nature and essence of both. Peace should be unconditional goal of both countries and their citizens, while trade will follow largely economic logic and arguments. If both complement each other, well and good; but it is a mistake to make either binding or conditional on the other.

Next, we examine the impact of bilateral exchange rate with respective country on the import demand of Pakistan. The impact of bilateral exchange rate is in general insignificant (for 20 out of 27 cases) and it has theoretically inconsistent sign for some trading partners, but wherever significant, it has theoretically consistent negative sign. The results indicate that the depreciation of rupee leads to a significant decrease in relatively expensive imports from Belgium, Denmark, France, Germany, Korea, New Zealand, and Switzerland.

In order to further investigate the impact of exchange rate variable, we incorporate another measure of exchange rate. This variable is the real effective exchange

Table 5.7: Effect of Bilateral Exchange Rate and its Volatility on Bilateral Import of Pakistan

Variables	Pakistan Imports From: (in log form)								
	Bangladesh	**Belgium**	**Canada**	**China**	**Denmark**	**France**	**Germany**	**Hong Kong**	**India**
C	4.994	6.563	5.905	8.489	4.798	7.074	7.706	5.661	6.111
Log of domestic output Y (lagged)	0.293 (1.998)**	0.052 (0.497)	0.929 (4.637)*	0.378 (3.073)*	0.063 (0.324)	0.191 (1.861)***	0.187 (1.654)***	0.271 (1.987)**	1.761 (8.973)*
Log of RER with i^{th} country(Lagged)	-0.228 (-0.344)	-0.924 (-2.813)*	-0.759 (-1.153)	-0.527 (-1.183)	-0.946 (-1.991)**	-1.396 (-2.777)*	-1.164 (-3.175)*	-0.231 (-0.794)	-0.277 (-0.536)
Log of REER excluding i^{th} Country (lagged)	2.223 (3.776)*	3.093 (6.035)*	1.785 (2.822)*	0.579 (0.921)	0.482 (0.466)	1.114 (1.995)**	1.449 (2.325)**	1.238 (1.985)**	2.998 (5.574)*
Volatility in RER with i^{th} country (lagged)	-0.071 (-0.201)	4.379 (0.022)	-1.353 (-0.726)	-0.603 (-1.381)	0.974 (0.293)	-5.967 (-1.941)*	0.989 (0.400)	-2.811 (-2.579)**	0.288 (0.525)
AR(1)	0.152 (2.754)*	0.334 (6.341)*	0.243 (4.437)*	0.484 (8.748)*	0.274 (4.951)*	0.286 (5.246)*	0.460 (8.326)*	0.398 (7.183)*	0.241 (4.478)*
AR(2)				0.276 (4.621)*	0.166 (3.001)	0.219 (4.024)*	0.214 (3.934)*	0.200 (3.581)*	0.192 (4.319)*
AR(3)				0.213 (3.838)*					
R^2	0.277	0.482	0.249	0.892	0.246	0.286	0.479	0.637	0.828
F	23.814	60.283	21.356	377.177	17.397	21.351	48.955	93.677	256.533
LM	15.36	7.93	8.99	14.04	17.69	22.36	12.87	8.97	7.69

(Continues....)

Table 5.7: (Continued) Effect of Bilateral Exchange Rate and its Volatility on Bilateral Import of Pakistan

Variables	Pakistan Imports From: (in log form)								
	Indonesia	**Iran**	**Italy**	**Japan**	**Korea**	**Kuwait**	**Malaysia**	**Netherlands**	**New Zealand**
C	6.712	6.522	6.998	8.464	7.286	7.892	7.795	6.605	3.971
Log of domestic output Y (lagged)	-0.219 (-1.291)	0.743 (2.230)**	0.228 (1.672)***	0.065 (0.621)	0.005 (0.059)	0.717 (1.977)**	0.027 (0.174)	0.227 (1.655)***	0.538 (3.099)*
Log of RER with i^{th} country(Lagged)	-0.009 (-0.032)	0.083 (0.714)	0.138 (0.287)	-0.343 (-1.238)	-0.531 (-2.257)**	-1.426 (-0.838)	-0.997 (-1.387)	0.405 (0.895)	-0.856 (-2.156)**
Log of REER excluding i^{th} country (lagged)	0.989 (1.109)	2.015 (2.464)**	-0.013 (-0.018)	1.033 (1.892)***	1.617 (4.838)*	1.313 (0.840)	1.146 (2.089)**	1.271 (2.646)*	2.894 (4.923)
Dummy						-4.157 (-10.394)*			
Volatility in RER with i^{th} country (lagged)	0.956 (1.657)*	0.0154 (0.196)	0.525 (0.423)	-0.329 (-0.325)	6.914 (1.736)*	0.156 (0.068)	-0.213 (-0.635)	0.242 (0.582)	0.624 (1.657)***
AR(1)	0.441 (8.156)*	0.286 (5.408)*	0.287 (5.273)*	0.251 (4.505)*	0.325 (6.135)*	0.357 (6.422)*	0.362 (6.597)*	0.344 (6.546)*	0.481 (9.679)*
AR(2)	0.219 (3.763)*		0.209 (3.821)*	0.331 (6.095)*		0.175 (3.145)*	0.166 (2.888)*		
AR(3)	0.303 (5.687)*			0.161 (2.893)*			0.218 (3.986)*		
R^2	0.841	0.312	0.288	0.426	0.630	0.687	0.519	0.301	0.395
F	240.931	29.177	16.632	33.646	109.433	100.061	48.900	27.658	42.081
LM	13.71	14.29	10.04	13.19	35.72	70.47	13.69	7.51	22.81

(Continues....)

Table 5.7 (Continued) Effect of Bilateral Exchange Rate and its Volatility on Bilateral Import of Pakistan

Variables	Pakistan Imports From: (in log form)								
	Saudi Arabia	Singapore	Spain	Sri Lanka	Switzerland	Turkey	U.A.E.	U.K	U.S.A
C	8.347	6.989	5.477	5.117	5.583	5.612	7.967	7.718	8.367
Log of domestic output Y (lagged)	0.081 (0.536)	0.329 (2.896)*	0.249 (2.403)*	0.017 (0.178)	-0.104 (-0.666)	0.260 (1.010)	0.439 (2.091)**	0.081 (0.721)	0.156 (0.986)
Log of RER with i^{th} country (Lagged)	-0.845 (-0.781)	0.358 (0.831)	0.112 (0.425)	-0.372 (-1.283)	-1.266 (-2.371)**	-0.129 (-0.331)	-0.126 (-0.167)	-0.006 (-0.016)	-0.256 (-0.472)
Log of REER excluding i^{th} country (lagged)	1.646 (2.403)**	1.625 (2.909)*	-0.644 (-1.374)	0.050 (0.165)	-0.278 (0.316)	1.565 (2.934)*	1.876 (2.068)**	0.462 (0.695)	0.626 (1.002)
Volatility in RER with i^{th} country (lagged)	-1.212 (-1.207)	-0.631 (-0.552)	-1.129 (-0.998)	0.713 (0.718)	1.642 (2.397)*	-0.255 (-1.695)***	0.638 (0.255)	-0.213 (-0.886)	-0.931 (-0.514)
AR(1)	0.368 (6.642)*	0.336 (6.351)*	0.163 (2.980)*	0.190 (3.432)*	0.409 (7.451)*	0.277 (5.208)*	0.349 (6.549)*	0.368 (6.679)*	0.365 (6.574)*
AR(2)	0.341 (6.189)				0.227 (4.103)*		0.218 (3.981)*	0.220 (3.835)*	0.225 (4.051)*
AR(3)	0.188 (3.466)*						0.299 (5.611)*	0.212 (3.819)*	
R^2	0.746	0.605	0.267	0.296	0.509	0.353	0.761	0.457	0.261
F	102.394	98.453	14.632	16.878	55.210	35.065	144.961	38.153	18.844
LM	17.41	22.06	14.56	17.18	15.08	37.21	34.76	29.36	17.42

- * denotes significance at 1% level
- ** denotes significance at 5% level
- *** denotes significance at 10% level

rate obtained by excluding the trading partner under consideration from the calculation of real effective exchange rate. So this gives real effective exchange rate with the competing countries. The included 26 partners comprise a set of countries which we can call the 'third country' according to the terminology of three country model of international trade. So, here we have three countries i.e. Pakistan, the country under consideration and rest of the world comprising of the remaining 26 trading partners. An increase in this real effective exchange rate implies that imports from the excluded country are relatively cheaper as compared to the other 26 trading partners and using economic logic we should import more from this country. This variable has positively significant coefficient for 16 out of 27 countries, indicating that as price increase in competing market, we import more from the comparatively attractive country under consideration. This new variable improves our results regarding the impact of real exchange rate.

Next, we analyze the effect of real bilateral exchange rate volatility. Its coefficients indicate that this variable has a significant positive effect on Pakistan's imports from Indonesia, Korea, New Zealand and Switzerland, and has a significant negative effect on imports from France, Hong Kong and Turkey. In general our regression results show that our imports are insensitive to real bilateral exchange rate volatility. Our major imports comprise of industrial and agricultural capital goods, chemicals, oil products and it is by products, raw materials and food products. For most of these items our import demand is inelastic and this inelasticity of import demand may be a reason of insensitivity to exchange rate volatility.

A unique-event dummy for the duration of war in Kuwait is also included in our import function for Kuwait and it shows a significant negative impact on imports from Kuwait during this war time.

All the autoregressive terms are positive and statistically significant.

Next, we analyze Table 5.8, which shows bilateral import functions with decomposition of real bilateral exchange rate and its volatility in terms of the components. The regression diagnostics again indicate satisfactory performance of the estimated import demand functions.

Table 5.8: Effect of Permanent and Transitory Components of Bilateral Exchange Rate and their Volatility on Bilateral Import of Pakistan

Variables	Pakistan Imports From: (in log form)								
	Bangladesh	Belgium	Canada	China	Denmark	France	Germany	Hong Kong	India
C	4.997	6.783	5.992	8.515	4.766	6.399	7.945	5.641	6.090
Log of domestic output (lagged)	0.302 (2.056)**	0.041 (0.382)	0.960 (4.732)*	0.375 (3.03)*	0.006 (0.032)	0.171 (1.907)***	0.193 (1.695)***	0.251 (1.798)*	1.579 (7.224)*
Log of permanent part of RER with i^{th} country (lagged)	-0.360 (-0.541)	-0.914 (-2.746)*	-0.702 (-1.052)	-0.656 (-1.302)	-1.056 (-1.685)***	-1.349 (-2.626)*	-1.137 (-3.027)*	-0.219 (-0.739)	-0.493 (-0.788)
Log of transitory part of RER with i^{th} country (lagged)	-1.169 (-1.010)	-0.374 (-0.442)	-1.213 (-0.568)	-1.217 (-1.675)***	-2.885 (-2.339)**	-0.551 (-0.478)	-1.098 (-1.658)***	-0.866 (-0.677)	-1.831 (-0.988)
Log of REER excluding i^{th} country (lagged)	2.231 (4.478)*	3.134 (6.048)*	1.647 (2.566)**	0.444 (0.701)	-0.486 (-0.464)	1.139 (1.696)***	1.351 (2.124)**	1.320 (2.067)**	3.393 (5.471)*
Volatility of permanent part of RER with i^{th} country (lagged)	-0.064 (-0.258)	-1.304 (-0.594)	-1.403 (-0.887)	-0.412 (-1.388)	1.397 (0.289)	-3.417 (-0.364)	-1.995 (-0.489)	-2.131 (-2.289)**	-2.787 (-0.267)
Volatility of transitory part of RER with i^{th} country (lagged)	0.722 (0.150)	-3.066 (-0.981)	-0.986 (-1.714)*	1.052 (1.673)***	-6.618 (-0.145)	-4.526 (-2.142)**	-4.335 (-0.261)	-0.776 (-0.177)	1.881 (0.374)
AR(1)	0.150 (2.676)*	0.339 (6.372)*	0.243 (4.397)*	0.487 (8.763)*	0.273 (4.916)*	0.286 (5.213)*	0.461 (8.275)*	0.403 (7.197)*	0.221 (4.079)*
AR(2)				0.269 (4.474)*	0.176 (3.157)*	0.230 (4.183)*	0.223 (4.046)*	0.199 (3.536)*	0.320 (5.827)*
AR(3)				0.213 (3.907)*					
R^2	0.274	0.486	0.256	0.893	0.254	0.292	0.476	0.632	0.831
F	19.541	42.869	15.598	290.355	13.461	16.281	35.905	67.802	194.941
LM	16.94	17.23	9.59	18.31	17.47	13.09	9.67	7.95	12.56

(Continues….)

Table 5.8: Effect of Permanent and Transitory Components of Bilateral Exchange Rate and their Volatility on Bilateral Import of Pakistan

Variables	Pakistan Imports From:								
	Indonesia	Iran	Italy	Japan	Korea	Kuwait	Malaysia	Netherlands	New Zealand
C	6.699	6.524	7.065	8.435	7.275	7.896	7.789	6.674	4.084
Log of domestic output (lagged)	-0.221 (-1.304)	0.731 (2.222)**	0.225 (1.307)	0.065 (2.15)**	-0.003 (-0.040)	0.731 (1.987)**	0.036 (0.229)	0.201 (1.416)	0.558 (3.150)*
Log of permanent part of RER with i^{th} country (lagged)	0.153 (0.394)	0.071 (0.601)	0.131 (0.264)	0.186 (0.664)	-0.693 (-2.741)*	-1.495 (-0.867)	-0.827 (-1.098)	0.309 (0.666)	-0.823 (-2.014)**
Log of transitory part of RER with i^{th} country (lagged)	0.059 (0.048)	-0.239 (-0.589)	-0.369 (-0.301)	-1.626 (-2.474)**	-1.176 (-1.682)***	-2.721 (-0.768)	-0.351 (-0.226)	-0.542 (-0.532)	1.012 (1.239)
Log of REER excluding i^{th} country (lagged)	-1.371 (-1.502)	1.935 (2.396)**	0.082 (0.106)	1.173 (2.186)**	1.446 (4.175)*	1.397 (0.884)	1.096 (1.995)**	1.311 (2.684)*	2.893 (4.835)*
Dummy						-4.156 (-10.351)*			
Volatility of permanent part of RER with i^{th} country (lagged)	-2.699 (-0.175)	-0.414 (-0.187)	-0.294 (-0.096)	-0.551 (-0.221)	8.735 (1.674)***	-0.143 (-0.084)	-0.259 (-0.466)	-1.834 (-0.009)	0.962 (1.072)
Volatility of transitory part of RER with i^{th} country (lagged)	2.499 (1.656)***	0.009 (0.477)	-1.031 (-0.064)	-4.834 (-0.138)	-2.301 (-1.658)***	-0.921 (-0.068)	-0.207 (-0.025)	-7.390 (-0.748)	-6.953 (-1.783)***
AR(1)	0.442 (8.063)*	0.295 (5.514)*	0.291 (5.287)*	0.224 (4.007)*	0.308 (5.729)*	0.356 (6.357)*	0.359 (6.475)*	0.344 (6.484)*	0.487 (9.766)*
AR(2)	0.220 (3.768)*		0.223 (4.024)*	0.324 (6.027)*		0.175 (3.127)*	0.160 (2.743)*		
AR(3)	0.302 (5.633)*			0.198 (3.559)*			0.220 (3.974)*		
R^2	0.841	0.308	0.291	0.448	0.624	0.688	0.506	0.300	0.402
F	184.919	20.205	18.551	28.271	75.461	76.954	35.740	19.438	30.504
LM	16.31	13.71	12.32	14.45	31.48	10.63	14.07	12.80	23.64

(Continues....)

Table 5.8: Effect of Permanent and Transitory Components of Bilateral Exchange Rate and their Volatility on Bilateral Import of Pakistan

Variables	Pakistan Imports From: (in log form)								
	Saudi Arabia	Singapore	Spain	Sri Lanka	Switzerland	Turkey	U.A.E.	U.K	U.S.A
C	8.338	6.965	5.542	5.108	7.207	5.771	8.059	7.704	8.299
Log of domestic output (lagged)	0.085 (0.558)	0.329 (2.866)*	0.248 (2.561)**	0.037 (0.353)	-0.138 (-0.863)	0.504 (1.994)**	0.446 (2.153)**	0.058 (0.511)	0.150 (0.972)
Log of permanent part of RER with i^{th} country (lagged)	-0.881 (-0.774)	0.368 (0.836)	0.157 (0.646)	-0.438 (-1.695)*	-1.342 (-2.460)**	-0.383 (-0.945)	-0.417 (-0.521)	-0.036 (-0.088)	-0.311 (-0.570)
Log of transitory part of RER with i^{th} country (lagged)	-0.823 (-0.465)	0.607 (0.469)	-1.491 (-1.758)***	-1.238 (-1.248)	-2.647 (-2.363)**	-2.685 (-1.717)***	-1.023 (-0.681)	-0.577 (-0.729)	-0.467 (-0.798)
Log of REER excluding i^{th} country (lagged)	1.717 (2.473)**	1.626 (2.862)*	0.835 (1.995)**	0.011 (0.036)	-0.289 (0.326)	2.252 (4.01)*	1.893 (2.086)**	0.397 (0.589)	0.528 (0.838)
Volatility of permanent part of RER with i^{th} country (lagged)	-0.287 (-0.293)	-0.492 (-0.445)	1.470 (0.442)	0.949 (0.547)	-4.936 (-2.289)**	-4.016 (-2.074)**	-0.572 (-0.233)	-0.348 (-0.563)	1.444 (1.741)***
Volatility of transitory part of RER with i^{th} country (lagged)	-6.653 (-1.424)	2.587 (0.465)	-3.310 (-1.658)***	2.408 (0.179)	4.750 (0.470)	-1.498 (-0.023)	-0.636 (-0.683)	-1.036 (-0.085)	-1.879 (-1.991)**
AR(1)	0.365 (6.517)*	0.338 (6.329)*	0.114 (2.064)**	0.192 (3.452)*	0.400 (7.239)*	0.265 (4.897)*	0.233 (4.211)*	0.364 (6.531)*	0.362 (6.505)*
AR(2)	0.342 (6.108)*				0.241 (4.333)*		0.305 (5.628)*	0.218 (3.760)*	0.230 (4.193)*
AR(3)	0.189 (3.384)*							0.216 (3.847)*	
R^2	0.746	0.599	0.269	0.293	0.505	0.380	0.766	0.458	0.265
F	102.394	67.836	13.381	14.652	40.214	27.803	114.193	29.389	14.241
LM	14.65	15.57	10.01	13.75	17.94	29.69	25.52	28.36	17.37

Note: *, **, *** denotes significance at 1%, 5% and 10% level, respectively.

Our results regarding domestic output are similar to those in Table 5.7 that in general (15 out of 27 cases) an improvement in domestic economic activity raises domestic demand for imports.

The decomposition of real bilateral exchange rate into its components indicates that permanent part of real bilateral exchange rate has a significant negative impact on Pakistan's imports from Belgium, Denmark, France, Germany, Korea, New Zealand, Sri Lanka and Switzerland and transitory part has significant negative effect on China, Denmark, Germany, Japan, Korea, Spain, Turkey and Switzerland. Our conclusion of general insignificant impact of real bilateral exchange rate on imports is still maintained after this decomposition.

Regarding real effective exchange rate with competing markets, we obtain positively significant and theoretically consistent effect on imports from 18 countries, implying that an improvement in relative competitiveness of a trading partner in internal market induces its customers to import more from this country. For the remaining 9 countries this variable has no significant effect on bilateral imports.

Our general result about the insensitivity of Pakistan's imports with respect to bilateral exchange rate volatility is further strengthened by our results in Table 5.8. The permanent part of bilateral exchange rate volatility in general has a negative effect (21 out of 27 cases) but this negative impact is significant only for Hong Kong, Switzerland and Turkey. Its significant positive impact is observed for Korea and U.S.A.

The volatility of transitory component of real bilateral exchange rate has a trade depressing effect in 19 out of 27 cases but this negative effect is significant for only 6 countries i.e. Canada, France, Korea, New Zealand, Spain and U.S.A. A significant positive effect of transitory part of bilateral exchange rate volatility is observed for China and India.

Again like in Table 5.7, the unique-event dummy representing war period has a significant negative impact on imports from Kuwait during this war time.

The positive significant autoregressive terms indicate gradual adjustment in traders' decisions. This may be due to contractual requirements, tastes or technological reasons.

5.7 IMPACT OF REAL BILATERAL EXCHANGE RATE AND ITS VOLATILITY ON BILATERAL EXPORT OF PAKISTAN

Table 5.9 presents the export supply function of Pakistan for each of its 27 trading partners. The overall performance of these export supply functions is relatively better than the import demand functions, considering high explanatory power represented by high R^2 values and high F-statistics for joint significance of the included variables. Further, all exports functions are free from problem of autocorrelation.

Our first explanatory variable is foreign output. In each bilateral export supply function the index of industrial production of foreign country is used as proxy for the level of output of that country. The coefficient estimates indicate that this variable has a significant positive effect for 14 out of 27 customers of Pakistan implying that economic expansion raises demand for Pakistani products.

The coefficient of real bilateral exchange rate in these regression equation shows that depreciation of Pak rupee encourages demand for relatively cheaper exports of Pakistan.

The coefficient of real effective exchange rate with competing markets (exemplifying third country effect) indicates that Pakistan's exports to 15 out of its 27 trading partners is reduced if the price in the competing markets decrease. That is, Pakistan tends to reduce its exports to a country if the price in its other 26 trading partners rises.

The volatility of real bilateral exchange rate shows that this variable in general has insignificant effect on exports. It has a significant trade depressing effect on 7 countries: Canada, France, Hong Kong, Kuwait, Netherlands, Singapore and Sri Lanka. Excluding France, Hong Kong and Netherlands the share of Pakistan's exports with rest of four countries is quite low. This result shows general insensitivity of Pakistan's exports to the volatility of relevant bilateral exchange rates in bilateral export functions. Particularly for all these major exporters of Pakistan our results indicate insignificant impact of exchange rate volatility. The major customers of Pakistani products in international market are United States, Germany, United Kingdom, Japan, United Arab Emirates and Saudi Arabia. The chief export items to these countries include cotton,

Table 5.9: Effect of Bilateral Exchange Rate and its Volatility on Bilateral Export of Pakistan

Variables	Pakistan Exports to: (in log form)								
	Bangladesh	Belgium	Canada	China	Denmark	France	Germany	Hong Kong	India
C	6.349	6.434	6.359	6.600	4.728	7.116	7.707	7.890	5.914
Log of foreign output Y (lagged)	0.555 (3.233)*	0.303 (1.921)***	0.374 (1.211)	2.409 (7.777)*	0.174 (0.884)	0.271 (2.661)*	0.431 (2.906)*	0.334 (1.661)***	1.759 (5.164)*
Log of RER with i^{th} country (Lagged)	-1.089 (-1.471)	1.891 (4.829)*	0.761 (1.285)	1.467 (1.968)**	1.958 (5.260)*	1.194 (4.908)*	1.319 (7.817)*	1.676 (4.973)*	-0.326 (-0.393)
Log of REER excluding i^{th} country (lagged)	-2.558 (-3.934)*	-1.105 (-1.728)***	0.294 (0.495)	-1.269 (-1.682)***	-1.181 (-1.783)***	-1.235 (-3.256)*	0.119 (0.372)	0.959 (1.651)***	-1.018 (-1.684)
Volatility in RER with i^{th} country (lagged)	0.388 (0.921)	-0.372 (-0.271)	-0.820 (-1.665)*	0.930 (0.528)	2.745 (0.953)	-3.781 (-2.402)**	-1.014 (-0.543)	-1.297 (-1.716)***	-0.185 (-0.333)
AR(1)	0.283 (5.139)*	0.464 (8.344)*	0.611 (11.413)*	0.378 (7.312)*	0.204 (3.701)*	0.488 (9.993)*	0.244 (4.449)*	0.615 (11.051)*	0.455 (8.331)*
AR(2)	0.229 (4.209)*	0.229 (4.205)*	0.315 (6.071)*				0.200 (3.657)*	0.120 (2.154)**	0.197 (3.628)*
AR(3)									
R^2	0.631	0.904	0.914	0.641	0.458	0.849	0.867	0.874	0.649
F	91.066	502.379	565.281	114.472	54.392	361.470	349.344	369.297	98.377
LM	12.61	7.10	16.65	11.71	10.44	22.38	14.20	13.21	62.60

(Continues….)

Table 5.9 (Continued): Effect of Bilateral Exchange Rate and its Volatility on Bilateral Export of Pakistan

Variables	Pakistan Exports to: (in log form)								
	Indonesia	Iran	Italy	Japan	Korea	Kuwait	Malaysia	Netherlands	New Zealand
C	5.416	5.460	6.952	7.119	6.631	5.490	5.351	6.730	4.549
Log of foreign output Y (lagged)	0.567 (1.262)	-0.021 (-0.038)	0.033 (0.582)	0.049 (0.251)	0.275 (0.833)	1.252 (5.032)*	0.510 (2.746)*	0.718 (4.438)*	0.225 (0.876)
Log of RER with i^{th} country (Lagged)	-0.001 (-0.003)	0.088 (0.378)	1.030 (2.364)*	0.656 (1.727)***	1.871 (2.614)*	3.539 (2.595)*	1.069 (1.699)***	1.373 (4.160)*	0.283 (0.932)
Log of REER excluding i^{th} country (lagged)	-2.763 (-2.372)**	-0.494 (-0.351)	-0.481 (-0.762)	-0.392 (-0.673)	-1.160 (-1.117)	-2.341 (-1.694)***	-2.742 (-4.014)*	-2.127 (-5.087)*	3.139 (6.714)*
Dummy						0.638 (1.354)			
Volatility in RER with i^{th} country (lagged)	0.554 (0.422)	-0.047 (-0.878)	0.398 (0.715)	-0.507 (-0.575)	0.379 (0.661)	-2.105 (-1.733)***	-0.671 (-1.163)	-0.472 (-2.056)**	-0.868 (-0.185)
AR(1)	0.611 (13.734)*	0.536 (10.058)*	0.351 (6.418)*	0.463 (8.381)*	0.435 (7.83)*	0.472 (8.459)*	0.259 (4.782)*	0.379 (6.887)*	0.215 (3.943)*
AR(2)		0.317 (5.964)*	0.313 (5.369)*	0.311 (5.288)*	0.233 (3.991)*	0.200 (3.500)*		0.244 (4.378)*	
AR(3)			0.241 (4.181)*	0.189 (3.407)*	0.226 (4.146)*				
R^2	0.602	0.654	0.842	0.861	0.848	0.679	0.595	0.918	0.584
F	97.399	100.673	242.358	280.501	254.15	96.404	94.531	599.026	90.367
LM	10.42	21.05	22.66	23.62	20.62	9.30	16.51	22.59	15.18

(Continues….)

Table 5.9 (Continued): Effect of Bilateral Exchange Rate and its Volatility on Bilateral Export of Pakistan

Variables	Pakistan Exports to: (in log form)								
	Saudi Arabia	Singapore	Spain	Sri Lanka	Switzerland	Turkey	U.A.E.	U.K	U.S.A
C	7.151	5.646	6.106	6.158	5.617	5.902	7.829	7.874	9.293
Log of foreign output Y (lagged)	0.311 (1.752)***	0.301 (1.064)	-0.111 (-0.676)	0.725 (3.008)*	-0.638 (-1.327)	0.311 (0.589)	0.875 (2.551)**	0.129 (0.661)	2.356 (8.375)*
Log of RER with i^{th} country (Lagged)	1.551 (2.234)**	2.833 (2.265)**	1.979 (3.664)*	-0.610 (-0.846)	-0.355 (-0.670)	2.276 (3.529)*	0.014 (0.019)	1.012 (5.127)*	0.732 (1.996)**
Log of REER excluding i^{th} country (lagged)	0.382 (1.021)	-0.590 (-0.450)	1.092 (1.098)	1.267 (2.077)*	-0.646 (-0.687)	-4.269 (-3.302)*	0.317 (0.318)	-1.496 (-4.219)*	-1.262 (-4.014)*
Volatility in RER with i^{th} country (lagged)	-0.479 (-0.454)	-2.863 (-2.261)**	0.789 (0.663)	-2.183 (-1.654)***	-9.011 (-1.276)	-0.118 (-0.586)	-1.351 (-0.551)	0.241 (1.181)	-0.474 (-0.525)
AR(1)	0.410 (7.524)**	0.492 (9.143)*	0.434 (7.898)*	0.521 (9.268)*	0.383 (6.817)*	0.579 (10.356)*	0.303 (5.671)*	0.455 (9.052)*	0.333 (6.046)*
AR(2)	0.227 (4.167)**	0.308 (5.697)*	0.205 (3.730)*	0.142 (2.579)*	0.251 (4.389)*		0.251 (4.684)*		0.255 (4.692)*
AR(3)							0.340 (6.391)*		
R^2	0.427	0.636	0.778	0.786	0.538	0.839	0.751	0.879	0.949
F	39.626	93.235	187.331	196.425	61.973	277.303	136.935	469.655	1001.318
LM	6.39	16.12	6.80	5.17	17.32	5.70	14.56	12.47	5.22

Note: *, **, *** denotes significance at 1%, 5% and 10% level, respectively.

cotton yarn, raw cotton, rice, fish and fish preparations, leather and hides, sports and surgical goods. Raw wool, tobacco, fruits and vegetables are also exported to some of these countries (See Appendix D).

Thus, our export market appears to be the developed countries with well developed financial markets. The main findings of Chit and Judge (2009) suggest that the effect of exchange rate volatility on exports is conditional on the level of financial sector development: the more financially developed an economy, the less its exports are adversely affected by exchange rate volatility. Financial sector development provides a mechanism for firms to mitigate the effect of exchange rate volatility. Pakistan is a developing country and level of its financial sector development is lagging behind the level of financial sector's development of its exporters. Our result seems contradictory with the findings of Chit and Judge (2009).

Most of Pakistan's exports belong to the category of homogeneous products and this offers help to explain our results. According to Raucl (1999) higher exchange rate volatility can be viewed as an increase in a type of transaction costs in international trade. This, in turn may add noise to the price signal and hence make it more difficult and more costly for buyers and sellers in the international market to find the right match for trading goods. However, a given increase in search costs could play a different role in the overall transaction cost for trade in homogeneous products verses differentiated products. For homogeneous products such as wheat, cotton, rice, etc., an importer is not concerned with who the producer is, as products are easily comparable and price is the primary decision factor. On the other hand, heterogeneous products such as digital cameras or tennis shoes tend to be 'branded' as there are additional characteristics other than price that would affect importers purchase decision. For relatively more differentiated products, such as machine tools, price would also not necessarily be the key factor affecting the purchase decision. Raucl (1999) presented some evidence suggesting that a given increase in transaction costs has a bigger negative effect on the volume of trade in differentiated products than in homogeneous products. Though Raucl (1999) did not look into the effect of exchange rate volatility on trade but the logic given by him implies that a given increment in exchange rate volatility would dampen trade in differentiated products more than trade in homogeneous products.

Broda and Romales (2003) contained a theoretical model that assumes this difference on the effect of exchange rate volatility. The authors also reported some evidence demonstrating that exchange rate volatility deters trade in differentiated products more than trade in homogeneous products. Further Clark *et al.* (2004) also presented the empirical evidence that exchange rate volatility in general discourages trade but it affects differentiated products more than homogeneous products.

So we can conclude that the insignificant effect of exchange rate volatility on Pakistan's exports is mainly due to the homogeneous nature of most of our exports rather than highly developed financial sector.

The behavior of our exports also shows the gradual changing behavior as indicated by significant autoregressive terms.

Our results regarding the behavior of Pakistan's exports are further strengthened by our empirical findings presented in Table 5.10 that contains disaggregation of bilateral exchange rates and their volatilities in their respective transitory and permanent components. Apart from satisfactory performance of estimated export supply functions (in terms of regression diagnostics R^2, F-statistics and Durbin Watson statistic, given in the last three lines of Table 5.10) regression results regarding output of foreign country indicate that an expansion of economic activity in foreign countries in general increases their demand for Pakistan's exports and this effect is significant for 14 out of 27 foreign countries. The positively significant coefficient with India highlights the reality that trade is mainly guided by economic rationale rather than sentiments.

The decomposition of real bilateral exchange rate into its components in each export supply function implies that the permanent part of real bilateral exchange rate shows significantly higher supply of relatively cheaper exports to 18 out of 27 foreign customers. The transitory component has a significant positive effect on our exports to 13 foreign countries. Thus, with depreciation of rupee the general competitiveness of Pakistan increases, which encourages its exports to foreigners.

The variable of real effective exchange rate against competing countries implies that in 14 out of 27 export supply functions the loss of competitiveness of Pakistan's exports due to relatively higher prices reduces the demand for Pakistani products by foreign countries.

Table 5.10: Effect of Permanent and Transitory Components of Bilateral Exchange Rate and their Volatility on Bilateral Export of Pakistan

Variables	Pakistan Exports to: (in log form)								
	Bangladesh	Belgium	Canada	China	Denmark	France	Germany	Hong Kong	India
C	6.362	6.265	6.457	6.619	4.626	7.748	7.529	7.888	6.027
Log of foreign output (lagged)	0.552 (3.430)*	0.316 (2.00)**	0.346 (1.116)	2.412 (7.749)*	0.173 (0.873)	0.247 (2.418)**	0.459 (3.072)*	0.321 (1.846)***	1.686 (4.835)*
Log of permanent part of RER with i^{th} country (lagged)	1.282 (1.773)***	1.936 (4.891)*	0.183 (0.273)	1.231 (1.669)***	1.975 (5.281)*	1.171 (4.792)*	1.313 (7.900)*	1.691 (5.002)*	-0.201 (-0.229)
Log of transitory part of RER with i^{th} country (lagged)	2.220 (2.053)**	1.628 (2.437)**	1.275 (1.193)	-1.401 (-0.661)	1.165 (1.215)	1.873 (3.103)*	1.136 (2.68)*	1.303 (1.228)	1.211 (0.551)
Log of REER excluding i^{th} country (lagged)	-2.535 (-4.566)*	-1.061 (-1.657)***	0.087 (0.148)	0.993 (1.144)	-1.241 (-1.859)***	-1.253 (-3.293)*	0.104 (0.331)	-0.986 (-1.681)***	-0.594 (-0.587)
Volatility of permanent part of RER with i^{th} country (lagged)	0.737 (0.032)	-0.448 (-0.286)	-0.676 (-1.659)***	-0.556 (-0.467)	0.201 (0.485)	-1.456 (-2.942)*	1.351 (0.468)	0.641 (0.838)	0.629 (0.596)
Volatility of transitory part of RER with i^{th} country (lagged)	5.391 (0.139)	-0.396 (-1.764)*	-2.112 (-1.851)***	1.013 (0.382)	1.836 (0.462)	-1.113 (-1.681)***	1.763 (0.142)	-0.425 (-1.741)***	-0.349 (-0.687)
AR(1)	0.261 (4.672)*	0.464 (8.243)*	0.596 (11.282)*	0.376 (7.256)*	0.203 (3.636)*	0.489 (9.664)*	0.232 (4.098)*	0.611 (10.795)*	0.448 (8.144)*
AR(2)	0.213 (3.915)*	0.233 (4.238)*	0.366 (6.989)*				0.197 (3.545)*	0.122 (2.151)*	0.206 (3.758)*
AR(3)									
R^2	0.642	0.904	0.915	0.636	0.449	0.844	0.863	0.873	0.655
F	70.637	372.609	427.771	79.297	36.947	245.137	249.788	270.938	74.969
LM	14.46	16.06	16.62	14.46	17.90	13.44	14.89	52.10	25.52

(Continues....)

Table 5.10: Effect of Permanent and Transitory Components of Bilateral Exchange Rate and their Volatility on Bilateral Export of Pakistan

Variables	Pakistan Exports From: (in log form)								
	Indonesia	Iran	Italy	Japan	Korea	Kuwait	Malaysia	Netherlands	New Zealand
C	5.548	5.457	6.966	7.057	6.606	5.483	5.357	6.714	4.438
Log of foreign output (lagged)	0.591 (1.306)	-0.093 (-0.165)	0.032 (0.562)	0.007 (0.04)	-0.018 (-0.043)	1.227 (4.877)*	0.508 (2.688)*	0.715 (4.376)*	0.183 (0.692)
Log of permanent part of RER with i^{th} country (lagged)	-0.397 (-0.625)	-0.007 (-0.027)	1.006 (2.214)**	0.321 (0.750)	0.895 (0.967)	3.638 (2.622)*	1.099 (1.470)	1.479 (4.452)*	0.279 (0.902)
Log of transitory part of RER with i^{th} country (lagged)	4.028 (1.611)	-0.187 (-0.408)	0.815 (1.079)	-0.485 (-0.591)	-0.322 (-0.199)	6.018 (2.481)**	3.464 (1.759)***	1.936 (3.245)*	-0.657 (-0.731)
Log of REER excluding i^{th} country (lagged)	-2.395 (-2.00)**	-0.329 (-0.232)	-0.459 (-0.718)	-0.531 (-0.902)	-1.635 (-1.527)	-2.307 (-1.655)***	-2.794 (-4.023)*	-1.99 (-4.762)*	-3.221 (-6.771)*
Dummy						0.616 (1.295)			
Volatility of permanent part of RER with i^{th} country (lagged)	-0.284 (-0.868)	-2.744 (-1.656)***	2.308 (0.299)	-0.614 (-0.277)	-0.598 (-0.071)	-1.016 (-0.957)	-0.412 (-0.415)	-0.571 (-0.49)	0.462 (0.427)
Volatility of transitory part of RER with i^{th} country (lagged)	-3.401 (-1.099)	-0.011 (-0.849)	-0.123 (-0.088)	0.916 (0.286)	-0.537 (-0.226)	-0.765 (-0.882)	-0.894 (-0.542)	-3.159 (-0.590)	1.881 (0.410)
AR(1)	0.614 (13.781)*	0.542 (10.082)*	0.353 (6.372)*	0.461 (8.242)*	0.453 (8.143)*	0.476 (8.468)*	0.272 (4.993)*	0.377 (6.734)*	0.220 (3.991)*
AR(2)		0.307 (5.713)*	0.308 (5.195)*	0.316 (5.336)*	0.251 (4.275)*	0.198 (3.402)*		0.236 (4.229)*	
AR(3)			0.242 (4.146)*	0.181 (3.221)*	0.239 (4.400)*				
R^2	0.600	0.657	0.838	0.861	0.846	0.681	0.594	0.915	0.581
F	68.025	75.698	180.582	217.099	191.154	74.569	66.367	429.301	62.720
LM	19.46	25.67	21.88	19.06	43.65	8.44	35.48	25.24	12.01

(Continues….)

Table 5.10: Effect of Permanent and Transitory Components of Bilateral Exchange Rate and their Volatility on Bilateral Export of Pakistan

Variables	Pakistan Exports From: (in log form)								
	Saudi Arabia	Singapore	Spain	Sri Lanka	Switzerland	Turkey	U.A.E.	U.K	U.S.A
C	7.128	5.669	6.013	6.314	3.751	6.163	7.940	7.859	9.287
Log of foreign output (lagged)	0.307 (1.812)***	0.317 (1.139)	-0.103 (-0.621)	0.920 (3.602)*	-0.588 (-1.190)	0.476 (0.910)	0.848 (2.593)*	0.151 (0.769)	2.282 (8.217)*
Log of permanent part of RER with i^{th} country (lagged)	1.348 (1.861)***	2.956 (2.428)**	2.005 (3.669)*	1.232 (1.601)	-0.380 (-0.700)	2.071 (3.239)*	-0.093 (-0.124)	1.075 (5.313)*	0.811 (2.153)**
Log of transitory part of RER with i^{th} country (lagged)	0.348 (0.243)	4.469 (2.377)**	2.910 (2.068)**	2.703 (1.822)***	-1.441 (-1.305)	2.887 (1.506)	-0.281 (-0.198)	1.167 (1.979)**	0.912 (2.282)**
Log of REER excluding i^{th} country (lagged)	-0.404 (-1.037)	0.265 (0.207)	1.026 (1.021)	1.398 (2.552)*	-0.649 (-0.681)	-4.769 (-3.742)*	0.551 (0.578)	-1.330 (-3.621)*	-1.267 (-4.081)*
Volatility of permanent part of RER with i^{th} country (lagged)	0.355 (0.356)	-2.757 (-2.084)**	2.554 (0.735)	-6.804 (-2.673)*	3.823 (1.720)***	-4.301 (-1.491)	-1.723 (-0.740)	0.655 (1.735)***	6.872 (0.112)
Volatility of transitory part of RER with i^{th} country (lagged)	-3.715 (-0.755)	-4.054 (-0.660)	8.132 (0.367)	9.643 (0.613)	-1.713 (-0.165)	0.383 (0.525)	-1.581 (-0.174)	-0.411 (-0.043)	-0.118 (-0.148)
AR(1)	0.409 (7.463)*	0.500 (9.221)*	0.435 (7.785)*	0.581 (12.347)*	0.389 (6.826)*	0.635 (14.511)*	0.297 (5.798)	0.466 (9.065)*	0.328 (5.826)*
AR(2)	0.233 (4.272)*	0.285 (5.221)*	0.208 (3.754)*		0.255 (4.376)*		0.231 (4.475)*		0.250 (4.544)*
AR(3)							0.360 (7.031)*		
R^2	0.431	0.645	0.775	0.783	0.543	0.840	0.766	0.877	0.948
F	29.894	71.621	135.977	164.132	46.785	238.753	114.377	324.273	727.079
LM	6.01	12.82	6.78	5.06	25.35	5.92	19.13	14.98	5.21

Note: *,**,*** denotes significance at 1%, 5% and 10% level, respectively.

The permanent part of volatility of real bilateral exchange rate has a significant trade depressing impact on our exports to Canada, France, Iran, Singapore, Sri Lanka and trade enhancing impact on exports to Switzerland and U.K. The transitory component of exchange rate volatility in general has a trade depressing effect but this effect is significant for Belgium, Canada, France, and Hong Kong only. These results again highlight that our exports to a foreign country change little with volatility of its bilateral exchange rate. This may be due to homogeneous nature of our export.

Further, due to contractual liabilities, preferences or technological factors the exports are changing gradually over time.

5.8 RECAPITULATION AND MAIN CONCLUSION

In summary, our empirical results indicate the following: First, volatility in real exchange rates arising from transitory components (shocks due to innovations in the microstructure aspect of the foreign exchange market and/or policy innovations) have a consistent negative (trade-depressing) effect on the volume of trade.

Second, the effect of the volatility due to fundamental component of exchange rate on the volume of trade is mixed (sometimes negative and sometimes positive) and is not consistent across country pairs. Consistent differences between the effects of volatility on the volume of bilateral trade due to the fundamental and the transitory components of exchange rate could arise from differences in how traders view trading risks that arise from various sources, and thus the arrangements they make in dealing with such risks.

For example, if traders view past volatility in exchange rates as largely driven by shocks in the microstructure aspect of the foreign exchange market and/or policy shocks, they may refrain from hedging against exchange risk - a possible result of the speculation that such shocks are transitory in nature, and, hence, reduce the amount of trade. On the other hand, if they view a larger proportion of past volatility as being due to shocks (changes) in the fundamental elements driving the exchange rate process and perceive to be potentially long-lasting, traders may (may not) engage in hedging activities to protect their revenue from falling, and thus generate a rise (fall) of the volume of goods they are trading.

The third-country effects suggest that rest of the world (26 trading partners of Pakistan excluding the country under consideration) serve as an alternate market for most of the bilateral country analysis of imports and exports. The inclusion of third-country exchange rate effects measures substantially improves the explanation of trade. While the direction of the effects of exchange rate volatility as measured by the variability of bilateral exchange rates becomes somewhat less certain, the calculations strongly suggest that the third-country effects are important determinants of the imports and exports levels under consideration. Exclusion of these effects, therefore, will give rise to biased estimates its noted earlier by Cushman (1986).

In bilateral import analysis, the income elasticities are greater in bilateral equations of Canada, India, Iran, Kuwait and New Zealand. While real exchange rate elasticities are higher in Belgium, Canada, Denmark, France, Germany, Kuwait, Malaysia, New Zealand, Saudi Arabia and Switzerland.

In bilateral export equations, income elasticities are high in China, India, Kuwait, Netherland, USA, UAE and Srilanka. Exchange rate elasticities are higher with bilateral export to Asian and developed countries. Pakistan need to be export more to Asian countries and developed countries in order to export growth.

CHAPTER 6

SUMMARY AND CONCLUSION

The purpose of this study has been to contribute to the relatively scant empirical literature on the relationship of exchange rate volatility and trade flows in Pakistan. For this purpose, we follow the approach of Barkoulas *et al.* (2002) that the observed differences in the effects of exchange rate volatility on trade can be attributed to the causes of movements in exchange rate itself. In general, there are just two components of exchange rate movement fundamental (permanent) and microstructure (transitory). To analyze the impact of exchange rate volatility on the volume of trade, we decomposed changes in the series of real bilateral exchange rate and real effective exchange rate into their two components. This decomposition is obtained by using the technique of Blanchard and Quah (1989), to decompose the changes in the series of real bilateral exchange rate and real effective exchange rate into their transitory and permanent components. And the volatility in each component is measured by GARCH process.

The study is based on the data of Pakistan's 27 trading major partners over the time span of July 1982 to December 2009. These trade partners on average cover 82.5% of Pakistan's total trade. There are two distinguishing features of this study. First, the data used are of higher frequency (monthly) and are disaggregated at country level, permitting reliable evaluation of the impact of volatility in exchange rate components across different countries. Second, the reference countries are heterogeneous. The heterogeneity of the sample countries allows the assessment of differences in the responses of traders from different countries to uncertainties in exchange rates.

In order to analyze the impact of exchange volatility on the overall and bilateral import demand and export supply of Pakistan with the included trading partners, the methodology of Kenen and Rodrick (1986) and Gotur (1985) has been followed with some modifications.

The study has been innovative in terms of introducing the 'third-country' effect by incorporating a real effective exchange rate obtained by excluding the reference country from the calculation of real effective exchange rate. There is no other study in case of Pakistan that has formally analyzed this third country effect on the volume of trade.

The result of variance decomposition shows that larger portions of the variations in real effective exchange rate and real bilateral exchange rates are explained by real shocks. This finding is consistent with earlier studies for other countries (Lastrapes, 1992; Evans and Lothian, 1993; Clarida and Gali, 1994; Enders and Lee, 1997 etc.). The contribution of real shocks in explaining the variations in nominal effective exchange rate and nominal bilateral exchange rate is also quite high but we cannot ignore the role of nominal shocks as it also explain a sizeable portion of variations in certain exchange rate series.

The estimated overall imports and exports functions show that home and foreign economic activities have positive impact on imports and exports of Pakistan respectively. The bilateral analyses of import and export show the same results. This finding indicates that the improvement in economic activity at home encourages import from foreign countries and improvement in the economic activity in foreign countries increases their demand for Pakistan's exports.

The result indicates that exchange rate depreciation leads to a reduction in Pakistan's demand for relatively expensive imports from foreign countries. While its positive sign in export equation shows that foreigners' demand for Pakistan's exports increases with the depreciation of rupee. Both of these effects are statistically insignificant, though consistent with economic theory. But when we decompose exchange rate into its permanent and transitory components than it shows significant results which point out that imports and exports are not only depend on change in exchange rate but also on the nature of change i.e., permanent or transitory. When we use real effective exchange rate in import and export equation, it produces significant and theoretically consistent results regarding economic theory.

The volatility of exchange rate has a significant trade enhancing impact on the overall import and export of Pakistan. The volatility in both the permanent and transitory components of real exchange rate has trade enhancing impacts on Pakistan imports. The export function shows that the volatility of real component of real exchange rate has an insignificant effect on exports but volatility of nominal component has a significant negative effect on Pakistan's exports. The volatility of real effective exchange rate has no effect on overall imports and exports of Pakistan, and volatility of real effective exchange rate components show the same results.

The bilateral exchange rate is in general found to be insignificant in explaining variations in imports from most of the countries, while the corresponding effects on exports are mostly positive and significant.

It follows from the results that 'third country effect needs to be considered at bilateral level. Bilateral equations without third-country effects will give rise to biased estimates. 'Third country effect' positively effects to imports of underlying country while negatively to exports of the country under consideration, implying that an improvement in relative competitiveness of a trading partner induces its customers to import more from this country and export less to the underlying countries.

Another factor included in bilateral trade analysis is volatility of real bilateral exchange rate. In general it shows that our imports and exports are insensitive to real bilateral exchange rate volatility. For most of our imported goods, our demand is inelastic and this inelasticity of import demand may be a reason of insensitivity of Pakistan's bilateral imports and exports to the volatility of real bilateral exchange rate. Our results are contradictory to the findings of Chit and Judge (2009) which shows that the effect of exchange rate volatility on exports is conditional on the level of financial sector development: the more financially developed an economy, the less its exports are adversely affected by exchange rate volatility. The volatility of components of real exchange rate provides the same results.

Given that shocks arising from the transitory components largely represent temporary excursions of prices from the fundamental value of the currency under consideration, consistently negative impacts of uncertainty due to these shocks on trade volumes suggest that exchange rate movements that cannot be explained by changing expectations about the underlying economic fundamentals lead to reduction in trade. This implies that despite the heterogeneity in their decisions, many economic agents do not seem to engage in hedging against exchange risk that is not attributed to the basic economic fundamentals. Thus, an increase in uncertainty associated with exchange rate fluctuations believed to have been caused by changes in factors other than the economic fundamentals lowers the volume of trade.

The results have two important implications. First, as discussed by Barkoulus *et al.* (2002), exchange rate uncertainties emanating from different but closely related sources namely the fundamentals and innovations in the market microstructure or policy shocks, have different effects on the volume of international trade flows. Second, traders of most countries respond to uncertainties due to shocks in the transitory components of the foreign exchange market or future policy changes by reducing the volume of trade. The answer to why they respond differently to uncertainties arising from different sources, however, calls for further empirical investigation.

A few policy implications that emerge from this study are discussed as follows:

Shocks because of fundamentals are mostly anticipated and there is no need to be worry about it but there is need to consider the shocks of demand side (transitory shocks) by following consistent monetary policy in which monetary policy should be anticipated. If monetary policy is stable and consistent than the magnitude can be easily accessible by which the real exchange rate volatility reduces trade and shocks are absorbable. Further, there is need to adopt measure like regulation of financial market, portfolio diversification, increase the banking system efficiency and use of hedging to control volatility risk. More attention should be paid to promote trade within the regional block SAARC and toward the foreign to minimize the cost and obtain gains from trade.

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APPENDIX A

In the two variable VAR (Vector Autoregression) case, we can let the time path of one variable be affected by its own past realizations and the current and past realizations of another variable and vice versa. Consider the simple bivariate system:

$$REER_t = a_{10} - a_{12}NEER_t + \beta_{11}REER_{t-1} + \beta_{12}NEER_{t-1} + \varepsilon_{rt} \quad (1a)$$

$$NEER_t = a_{20} - a_{21}REER_t + \beta_{21}REER_{t-1} + \beta_{22}NEER_{t-1} + \varepsilon_{nt} \quad (2a)$$

Where, $REER_t$ be the real effective exchange rate and, $NEER_t$ be the nominal exchange rate; and it is assumed that (1) Both $REER_t$ and $NEER_t$ are stationary; (2) ε_{rt} and ε_{nt} are white noise disturbances with standard deviations of σ_r and σ_n respectively; and (3) ε_{rt} and ε_{nt} are uncorrelated white noise disturbances.

Equations (1a) and (1b) constitute a first- order vector autoregression because the longest lag length is unity. These equations are not reduced form equations, since $REER_t$ has a contemporaneous effect on $NEER_t$ and $NEER_t$ has a contemporaneous effect on $REER_t$. We can write the above system of equations as follows:

$$Ax_t = A_o + A_1 x_{t-1} + \varepsilon_t$$

Where

$$A = \begin{bmatrix} 1 & a_{12} \\ a_{21} & 1 \end{bmatrix}, \quad x_t = \begin{bmatrix} REER_t \\ NEER_t \end{bmatrix}, \quad A_0 = \begin{bmatrix} a_{10} \\ a_{20} \end{bmatrix}, \quad A_1 = \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix} \textit{and } \varepsilon_t = \begin{bmatrix} \varepsilon_{rt} \\ \varepsilon_{st} \end{bmatrix},$$

After premultiplication by A^{-1}, we can obtain VAR model in Standard form:

$$x_t = B_0 + B_1 x_{t-1} + e_t \quad (3a)$$

Where: $B_0 = A^{-1}A_0$

$B_1 = A^{-1}A_1$

$e_t = A^{-1}\varepsilon_t$

For notational purposes, we can define b_{i0} as element i of the vector B_0, b_{ij} as the element in row i and column j of the matrix B_1 and e_{it} as the element i of the vector e_t. Using these new notations, we can rewrite (1a) and (2a) in the equivalent form:

$$REER = b_{10} + b_{11}REER_{t-1} + b_{12}NEER_{t-1} + e_{1t} \qquad (4a)$$

$$NEER_t = b_{20} + b_{21}REER_{t-1} + b_{22}NEER_{t-1} + e_{2t} \qquad (5a)$$

To distinguish between the systems represented by (1a) and (2a) versus (4a) and (5a), the first is called the structural VAR and the second is called a VAR in standard form. It is important to note that the error terms (i.e. e_{1t} and e_{2t}) are composites of the two shocks ε_{rt} and ε_{st}; since these are white-noise processes, it follows that both $t\,e1$ and $t\,e2$ have zero means, constant variances, and are individually serially uncorrelated.

APPENDIX B

$$\left[1 - A(L)L\right]x_t = e_t$$

or $$x_t = A(L)x_{t-1} + e_t$$

$$\left[1 - A(L)L\right]x_t = A_0 + e_t$$

Denote the determinant of $\left[1 - A(L)L\right]$ by the expression D, the above equation can be written as

$$\begin{bmatrix} \Delta REER \\ \Delta NEER \end{bmatrix} = 1/D \begin{bmatrix} 1 - A_{22}(L)L & A_{12}(L)L \\ A_{21}(L)L & 1 - A_{11}(L)L \end{bmatrix} \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix}$$

or, by using the definitions of the $A_{ij}(L)$ we get

$$\begin{bmatrix} \Delta REER \\ \Delta NEER \end{bmatrix} = 1/D \begin{bmatrix} 1 - \sum a_{22}(k)L^{k+1} & \sum a_{12}(k)L^{k+1} \\ \sum a_{21}(k)L^{k+1} & 1 - \sum a_{11}(k)L^{k+1} \end{bmatrix} \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix}$$

where the summations run from *k=0* to infinity.

Thus the solution for $\Delta REER_t$ in terms of the current and lagged values of e_{1t} and e_{2t} is

$$\Delta REER = 1/D\left[1 - \sum_{k=0}^{\infty} a_{22}(k)L^{k+1}\right]e_{1t} + 1/D\left[\sum_{k=0}^{\infty} a_{12}(k)L^{k+1}\right]e_{2t}$$

Replacing

$$e_{1t} = c_{11}(0)\varepsilon_{1t} + c_{12}(0)\varepsilon_{2t}$$

$$e_{2t} = c_{21}(0)\varepsilon_{1t} + c_{22}(0)\varepsilon_{2t}$$

We get

$$\Delta REER = 1/D\left[1 - \sum_{k=0}^{\infty} a_{22}(k)L^{k+1}\right]\left[c_{11}(0) + c_{12}(0)\varepsilon_{2t}\right] + 1/D\left[\sum_{k=0}^{\infty} a_{12}(k)L^{k+1}\right]\left[c_{21}(0) + c_{22}(0)\varepsilon_{2t}\right]$$

Now the restriction that the ε_{2t} shocks has no long run effect on $\Delta REER_t$ is

$$1/D\left[1-\sum_{k=0}^{\infty}a_{22}(k)L^{k+1}\right]c_{12}(0)\varepsilon_{2t}+1/D\left[\sum_{k=0}^{\infty}a_{12}(k)L^{k+1}\right]c_{22}(0)\varepsilon_{2t}=0$$

or

$$\left[1-\sum_{k=0}^{\infty}a_{22}(k)L^{k+1}\right]c_{12}(0)+\left[\sum_{k=0}^{\infty}a_{12}(k)L^{k+1}\right]c_{22}(0)=0$$

APPENDIX C

GARCH Table of Real Effective Exchange Rate

	ξ	$\ln R_{(t-1)}$	δ_o	$v^2_{(t-1)}$	Log likelihood
REER		0.983	0.0005	0.163	755.795
	-0.0007	(153.129)*		(2.164)**	
Permanent part of REER	-0.002	0.234	0.0005	0.231	765.251
		(4.181)*		(2.536)*	
Transitory part of REER	0.022	0.326	0.0036	0.743	1296.99
		(3.125)*		(6.404)*	

GARCH Table of Real Bilateral Exchange Rate

	Bangladesh	**Belgium**	**Canada**	**China**	**Denmark**	**France**	**Germany**	**Hong Kong**	**India**
ξ	0.0015	-0.003	-0.0005	0.003	-0.003	-0.003	-0.002	0.001	0.0003
$\ln R_{(t-1)}$	0.963	0.989	0.987	0.960	0.990	0.989	0.991	0.992	0.991
	(59.736)*	(200)*	(158.43)*	(305.26)*	(211.85)*	(192.90)*	(198.67)*	(336.45)*	(95.574)*
δ_o	2.65E-05	0.0006	0.0003	0.0001	0.0006	0.0006	0.0007	0.0001	0.0004
$v^2_{(t-1)}$	0.184	0.104	0.235	3.368	0.103	0.080	0.047	0.292	0.289
	(5.503)*	(1.737)***	(2.855)*	(14.107)*	(1.855)***	(1.954)**	(1.671)***	(4.491)*	(2.687)*
$\phi_{(t-1)}$	0.783							0.274	
	(27.54)*							(2.862)*	
Log likelihood	727.852	734.875	821.314	734.175	735.075	735.525	719.196	905.038	788.123

GARCH Table of Real Bilateral Exchange Rate

	Indonesia	Iran	Italy	Japan	Korea	Kuwait	Malaysia	Netherlands	New Zealand
ξ	-0.039	0.054	-0.004	0.001	-0.0005	0.0001	-0.002	-0.002	-0.002
$\ln R_{(t-1)}$	0.893	0.942	0.988	0.984	0.989	0.989	0.953	0.987	0.992
	(161.38)*	(858.34)*	(196.06)*	(193.44)*	(161.45)*	(160.48)*	(93.174)*	(140.21)*	(162.91)*
δ_o	0.0001	0.0001	0.0005	0.0002	0.0001	0.0002	9.54E-05	0.0006	0.001
$v^2_{(t-1)}$	1.331	3.933	0.199	0.091	0.666	0.298	0.298	0.258	0.248
	(6.70)*	(25.61)*	(2.710)*	(1.958)**	(13.16)*	(4.495)*	(4.440)*	(5.080)*	(3.412)*
$\phi_{(t-1)}$	0.247			0.577	0.350		0.459		
	(4.830)*			(2.181)**	(11.75)*		(5.781)*		
Log likelihood	649.168	367.515	736.690	690.965	784.019	876.229	860.702	712.718	632.556

GARCH Table of Real Bilateral Exchange Rate

	Saudi Arabia	Singapore	Spain	Sri lank	Switzerland	Turkey	U.A.E	U.K	USA
ξ	0.003	0.0004	-0.003	-0.001	-0.002	-0.006	-0.008	-0.001	0.001
$\ln R_{(t-1)}$	0.974	0.988	0.993	0.995	0.988	1.004	0.945	0.999	0.989
	(82.860)*	(223.057)*	(218.843)*	(184.793)*	(183.475)*	(193.56)*	(61.640)*	(216.766)*	(239.03)*
δ_o	0.0001	0.0002	0.0005	6.19E-05	0.0007	0.0008	6.58E-05	0.0004	0.0001
$v^2_{(t-1)}$	0.325	0.313	0.220	0.151	0.025	0.485	0.064	0.408	0.377
	(3.949)*	(3.980)*	(2.285)*	(2.520)*	(1.856)***	(5.954)*	(1.677)***	(4.870)*	(4.576)*
$\phi_{(t-1)}$				0.732			0.850		
				(6.371)*			(6.428)*		
Log likelihood	941.676	869.384	734.443	790.112	705.725	634.820	721.104	735.32	956.565

GARCH Table of Permanent Part of Bilateral Exchange Rate

	Bangladesh	Belgium	Canada	China	Denmark	France	Germany	Hong Kong	India
ξ	-8.24E-05	-0.0004	0.001	0.0007	-0.0001	-8.15E-05	-0.0002	0.0004	0.001
$\ln R_{(t-1)}$	0.361	0.222	0.232	0.245	0.321	0.293	0.228	0.123	0.033
	(6.824)*	(3.850)*	(3.323)*	(2.190)**	(5.898)**	(5.462)*	(3.830)*	(2.478)**	(1.825)***
δ_o	0.0001	0.0003	0.0003	0.0009	0.0006	0.0003	0.0003	0.0001	0.0002
$v^2_{(t-1)}$	0.566	0.046	0.260	0.066	0.062	0.041	0.033	0.393	0.694
	(6.690)*	(1.719)***	(3.696)*	(1.788)***	(1.758)***	(1.850)***	(2.447)**	(4.329)*	(5.574)*
$\phi_{(t-1)}$	0.464	1.303		0.067	0.296	0.319	0.544		
	(7.337)*	(8.578)*		(2.113)**	(2.305)**	(2.233)**	(3.442)*		
Log likelihood	677.440	730.964	818.292	687.132	675.139	770.220	719.132	931.025	812.276

GARCH Table of Permanent Part of Bilateral Exchange Rate

	Indonesia	Iran	Italy	Japan	Korea	Kuwait	Malaysia	Netherlands	New Zealand
ξ	-0.0009	0.003	-0.0002	0.0001	-0.0001	0.0006	-0.0003	1.50E-21	-0.0001
$\ln R_{(t-1)}$	0.484	0.355	0.306	0.412	0.448	0.042	0.138	1	0.241
	(8.753)*	(1.669)***	(5.630)*	(7.142)*	(5.554)*	(1.738)***	(2.764)*	(4.614)*	(3.695)*
δ_o	3.16E-05	0.015	0.0005	0.0001	0.0001	0.0002	4.14E-05	2.38E-35	0.001
$v^2_{(t-1)}$	0.574	0.132	0.099	0.070	0.529	0.323	0.179	0.171	0.118
	(8.140)*	(2.396)**	(1.835)***	(1.763)***	(8.802)*	(5.040)*	(5.822)*	(57.873)*	(2.096)**
$\phi_{(t-1)}$	0.508	0.166		0.737	0.404		0.701		
	(11.734)*	(1.735)***		(4.973)*	(1.804)***		(16.440)*		
Log likelihood	869.486	179.767	760.814	743.05	779.501	882.205	870.037	12541.62	633.503

GARCH Table of Permanent Part of Bilateral Exchange Rate

	Saudi Arabia	Singapore	Spain	Sri lank	Switzerland	Turkey	U.A.E	U.K	USA
ξ	0.001	0.00025	-6.61E-05	6.85E-05	-3.81E-05	-0.0004	3.79E-05	0.0002	0.006
$\ln R_{(t-1)}$	0.092	0.085	0.405	0.210	0.373	0.294	0.220	0.359	0.121
	(1.670)***	(1.745)***	(7.661)*	(3.782)*	(7.133)*	(5.426)*	(3.286)*	(5.722)*	(2.045)**
δ_o	0.0001	9.20E-05	0.0003	2.58E-05	0.0006	0.0001	8.20E-05	0.0002	0.009
$v^2_{(t-1)}$	0.294	0.329	0.171	0.112	0.014	0.139	0.077	0.331	0.231
	(3.762)*	(4.115)*	(1.857)***	(2.249)**	(1.804)***	(2.521)**	(1.665)***	(3.655)*	(3.316)*
$\phi_{(t-1)}$		0.365		0.824	0.270	0.627	0.802	0.229	
		(2.802)*		(9.485)*	(2.081)**	(4.032)*	(4.565)*	(1.773)***	
Log likelihood	892.871	892.173	828.505	827.298	776.299	759.448	737.637	794.762	264.619

GARCH Table of Transitory Part of Bilateral Exchange Rate

	Bangladesh	Belgium	Canada	China	Denmark	France	Germany	Hong Kong	India
ξ	0.001	-0.001	-0.001	0.001	-0.002	-0.003	-0.002	-0.001	-0.001
$\ln R_{(t-1)}$	0.005	0.392	0.486	0.148	0.283	0.320	0.180	0.274	0.429
	(2.110)**	(8.745)*	(8.730)*	(1.692)***	(5.150)*	(6.869)*	(3.014)*	(4.049)*	(8.977)*
δ_o	0.001	4.54E-06	2.67E-07	0.001	4.53E-05	1.09E-05	3.16E-06	1.02E-05	4.01E-06
$v^2_{(t-1)}$	0.481	0.095	0.313	0.049	0.116	0.085	0.153	0.506	0.160
	(4.642)*	(9.771)*	(3.807)*	(1.685)***	(1.751)***	(2.716)*	(2.386)**	(6.802)*	(2.209)**
$\phi_{(t-1)}$			0.371					0.275	
			(2.709)					(4.376)*	
Log likelihood	722.748	1562.616	1846.913	819.356	1152.991	1420.142	1582.818	1256.671	1547.951

GARCH Table of Transitory Part of Bilateral Exchange Rate

	Indonesia	Iran	Italy	Japan	Korea	Kuwait	Malaysia	Netherlands	New Zealand
ξ	0.002	0.005	-0.003	-0.004	-0.001	-0.001	-0.004	-0.001	-0.003
$\ln R_{(t-1)}$	0.008	0.236	0.050	0.596	0.201	0.107	0.233	0.167	0.105
	(1.999)**	(14.472)*	(1.728)**	(11.931)*	(3.745)*	(1.883)***	(3.496)*	(2.727)*	(1.693)***
δ_o	3.74E-05	8.43E-05	3.40E-06	5.40E-06	5.40E-06	1.15E-05	2.19E-06	4.78E-06	0.000176
$v^2_{(t-1)}$	3.716	20.333	0.086	0.097	0.597	0.645	0.513	0.163	0.199
	(10.367)*	(24.162)*	(1.724)***	(1.659)***	(5.928)*	(5.836)*	(5.457)*	(2.674)*	(2.494)**
$\phi_{(t-1)}$	0.052		0.626	0.767	0.352		0.513		
	(4.240)*		(2.421)**	(4.718)*	(4.564)*		(16.383)*		
Log likelihood	814.024	416.854	1393.299	1191.158	1283.306	1317.955	1402.52	1514.733	919.231

GARCH Table of Transitory Part of Bilateral Exchange Rate

	Saudi Arabia	Singapore	Spain	Sri lank	Switzerland	Turkey	U.A.E	U.K	USA
ξ		-0.00117	-0.00431	-0.00229	-0.004	-0.003	-0.001	-0.003	-0.007
$\ln R_{(t-1)}$	0.122	0.168	0.369	0.094	0.419	0.135	0.154	0.457	0.106
	(4.251)*	(2.769)*	(6.427)*	(1.696)***	(7.569)*	(4.041)*	(7.290)*	(9.317)*	(1.729)***
δ_o	9.36E-06	5.23E-05	5.33E-05	2.71E-06	1.12E-05	7.41E-05	1.98E-05	3.58E-05	0.007
$v^2_{(t-1)}$	0.753	0.282	0.149	0.375	0.003	0.792	1.550	0.202	0.230
	(6.755)*	(3.635)*	(1.815)***	(5.478)*	(2.110)**	(6.926)*	(7.609)*	(2.327)**	(3.283)*
$\phi_{(t-1)}$				0.444					
				(6.718)*					
Log likelihood	1360.175	1108.359	1121.191	1418.113	1166.843	993.799	1171.859	1178.875	306.615

APPENDIX D

MAIN EXPORT PRODUCTS OF PAKISTAN

The major stuff of Pakistan exports are given in the following list:

1. Cotton

In export items of Pakistan cotton export is at the top of list. As exporters of cotton products and cotton, Pakistan ranking is first in Asia while second in the world. Export of raw cotton, cotton cloth and cotton yarn together contribute a large amount of the total export earning of Pakistan. Karachi with the cotton growing hinterland has almost the monopoly of the trade.

(a) Cotton Cloth

In our export list cotton fabrics are at the top. Every year we export a large quantity of cotton cloth. Export of cotton cloth has gone higher enough as due to increased demand. Some of the main buyers of cotton cloth are U.K, U.S.., U.S.S.R., Hong Kong, Japan, Singapore, W. Germany and Sudan.

(b) Cotton Yarn

Another main export item of Pakistan is Cotton Yarn. Its export is growing every year. Main buyers of Pakistani cotton yarn are Japan, U.K, Hong Kong, W. Germany, U.S.A., Sri Lanka, and Burma.

(c) Raw Cotton

Pakistan produces excess quantity of best quality long staple American Upland Cotton which is very much demanded all over the world. Important customers of our raw cotton are U.K., China, Japan, Hong Kong, Belgium, Indonesia, Italy, Singapore and Bangladesh.

2. Rice

Pakistan has emerged as one of the most important exporters of rice. In the previous years rice was at the top of Pakistan export items but due to variation in the world market, its demand has decreased. Pakistan exported best qualities like Basmati and Irri-6. We exports rice to almost all the Gulf States and Middle Eastern, European, East Asian and some African countries.

3. Carpets, Rugs and Mats

Pakistan exports very fine quality carpets (both hand and machine made) rugs and mats and is earning a large amount of foreign exchange. Their demand is increasing due to heavy competition in world's market. U.S.A. is a chief customer of Pakistani carpets, rugs and mats. Other buyers are mostly European countries including France, U.K., Italy, Switzerland, W. Germany, Belgium etc.

4. Fish and Fish Preparations

Pakistan exports fish as fresh, canned and dried. Main customers of shrimps are Japan and U.S.A. while canned fish locates its market mostly in W. Europe. Other main buyers of Pakistani fish and fish preparation are Middle Eastern and South Asian countries (especially Sri Lanka).

5. Leather and Hides

Pakistan produces a large amount of hides and skin. Export of hides and skin has gained important markets Italy, Spain, Japan, France, China, Romania, and W. Germany etc. due to leather industries in our country.

6. Synthetic Textile Products

In various foreign countries Pakistani Synthetic Textile Products are very admired. The main customers are Middle Eastern, African and South American countries.

7. Petroleum Products

Pakistan has 3 oil refineries where a number of petroleum products are being produced by importing crude petroleum. Some of the surplus products are exported to India, Turkey, Sri Lanka, Singapore etc.

8. Sports Goods

Pakistan exporting sports goods to more than 100 countries mainly to France, W. Germany, Italy, U.K., U.S.A., etc.

9. Surgical Instruments

Pakistan exports surgical equipments to America, Canada, China, and Japan.

In addition the above pointed out items, Pakistan exports a large quantity of miscellaneous items like raw wool, tobacco, fruits, vegetables etc. to different countries.

PAKISTAN MAJOR IMPORT ITEMS

Following are the chief import products of Pakistan:

1. Mineral Oil

In mineral oil requirements, Pakistan production does not meet its requirements. For to full fill demands Pakistan import a bulky amount of mineral oil from different. We import mineral oil from Iran, Saudi Arabia, U.A.E and other Middle East countries.

2. Machinery

For to meet the demands of different industries, Pakistan imports various kind of machinery from Japan, U.S.A. and European countries.

3. Edible Oil

Pakistan production of edible oil is not self sufficient. Even though the government has taken various measures to enhance the production of oil seeds, but in spite of all these efforts our country is still deficient in edible oil. So to meet the deficiency, we have to import an enough amount of edible oil e.g. soybean oil from U.S.A. and palm oil from Indonesia and Malaysia.

4. Chemicals and Drugs

Pakistan has an agrarian economy, so spray of different chemical is necessary in order to get higher yield. We import different kinds of drugs and chemicals from various countries. Our main importer countries for chemicals and drugs are Japan, Germany, U.S.A, U.K, and other European countries.

5. Dyes and Colors

A various number of dyes and colors are used as raw material in different industries like textile, inting etc. we imports different kinds of colors and dyes in order to meet the demand of all these industries. These colors and dyes are mainly imported from Japan, U.K., and U.S.A. etc.

6. Tea

Pakistan is not self sufficient in tea production. This deficiency is removed by importing huge amount of tea from various countries. Sri Lanka, Bangladesh, India and Kenya are the main suppler of tea to Pakistan.

7. Electric Goods

We need various kinds of electrical goods. Our electrical industries are not in the position to meet our requirements of electrical goods. In order to full fill the demands we have to import a large number of electric goods from Japan, S.A., U.K. and other European countries.

8. Transport Equipments

Pakistan requires a various kinds of transport equipments such as buses, cars, rickshaws, motorcycles etc. Due to their high enough demand they are imported from Japan, Italy and other countries.

9. Paper and Paper Products

A large amount of news print paper and other kinds of paper are imported from Canada, Japan, Sweden, and U.S.A. etc. Before 1971, our requirements were fulfilled from eastern wing as we had a number of paper mills in that part. Yet, after 1971 some paper mills were set up in the western wing but they are still deficient in paper especially in paper for newspaper industry.

DIRECTION OF TRADE

The worlLMide attention of Pakistan's trade can be generally classified to the following main groups of countries:

1. West European Countries

Belgium, France, W. Germany, Netherlands U.K., and other Scandinavian countries are included in West European countries. These countries are chief customers of Pakistan export goods e.g. cotton cloth, carpets, rugs, sports goods and many other items and we import machines, electric goods, chemicals and various other items from these countries. Our imports are larger in comparison than our exports to these countries so balance of trade is in favour of these countries.

2. Middle East Countries

In this group Saudi Arabia, Iraq, U.A.E. and other Arab countries are included. These countries are the top buyers of our export goods, such as rice, cotton cloth and various other items while we import mineral oil and different other items from these countries. Our export to these countries has declined to some extent due to oil crises and Iran-Iraq war, while our imports from these countries have increased enough. Therefore, due to heavy imports from these countries, the balance of trade is in their favour.

3. Asian Countries

China, Hong Kong, Indonesia, Japan, Malaysia, Singapore, and various other countries can be included in this group. The balance of trade goes in the favour of these countries due to decreasing exports to these countries every year and increasing imports. Top buyer of Pakistan exports among Asian countries are Japan. But we have to import large amount of machinery, chemicals, transport equipments and various other items from Japan. Moreover Japan we also do trade with others Asian countries, like we import palm oil from Malaysia and Indonesia and Tea from Sri Lanka and Bangladesh.

4. North American Countries

The countries which are considered in this group are Canada, Mexico, U.S.A. and some other countries. Pakistan exports to North American countries are not progressive, but we import so many kinds of goods, such as machinery, electrical goods, soybean oil and our armed forces and various other items requirements are also fulfilled from these countries. Our imports are almost three times more than our exports. So due to all these circumstances the balance of trade remains in favour of these countries.

5. R.C.D. Countries

Iran, Turkey and newly Independent Central Asian Republics namely Tajikistan, Uzbekistan, Azerbaijan and Turkmenistan are included in this group. Pakistani exports to Turkey and Iran are quite enough. Although all these countries are trying to make their balances of trade favorable, but in spite of various measures taken by the concerned countries still Pakistan's imports are greater than exports, so the balance of trade remains to the favour of these countries.

6. East European Countries

Eastern Europe such as Poland, U.S.S.R., Romania, Hungary, Yugoslavia, Greece and others countries are includes in this group. We export large amount of our export goods such as rice, cotton cloth, sports goods, carpets and various other items to these countries, but our imports are comparatively less than our exports, so balance of trade is in favour of our country.

Besides the above we do trade with so many African, central and South American countries and also the various Asian and Oceania countries.