Export Price Competitiveness in the Manufacturing Sector of Pakistan

By

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Dedicated to my loving parents

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Abstract

Competitiveness assessments are a vital component in evaluating a country's macroeconomic performance and sustainability of its policies. It is generally believed that exchange rate depreciation would stimulate exports and curtail imports, while exchange rate appreciation would be harmful for exports and encourage imports. In this research this prediction has been assessed by considering the existence of import content in the production of exportables and productivity gains. Export price competitiveness method is the main focus of this research.

At times favorable factors may not give rise to increased sales in foreign markets. Exchange rate movements affect exports through: its depreciation and variability (risk). Depreciation raises exports but the associated exchange rate risk could offset export gains. Therefore the effect of two factors is important to study simultaneously. It is argued that exchange rate risk depresses international trade. Greater exchange rate risk increases the riskiness of trade profits and the risk averse traders reduce trade. Exchange rate risk could lower exports due to profit risk but in some cases it may be possible to get positive effects of conditional variance on exports also.

Results of this study show that exchange rate depreciation raises export-price which indicate improvement in export competitiveness. On the other hand, exchange rate volatility erodes export competitiveness. In the manufacturing sector of Pakistan, given the exchange rate depreciation, the exchange rate volatility shows that the risk effect is dominating the depreciation effect. In case of Pakistan depreciation increases exports (traditional view) but the domination of exchange rate risk leads to a decrease in export competitiveness.

1. Introduction

In the era of globalization and regional integration countries worldwide are experiencing sharp increase in the flow of goods and services and the movement of capital and labour. The globalization of markets involves intensification of international competition that is forcing countries to be competitive in export markets.

Governments feel that they cannot realize goals of high national income and improved standard of living without achieving competitiveness for their export products. Therefore, competitiveness concerns stand high on the agenda of national governments and the concept of competitiveness has attracted a lot of attention. Concomitantly, competitiveness became a part of frequent policy-related discussions in worldwide forums. Improved competitiveness of economies, in general and of firms and their products in particular, is a need of the day. Consequently, the ability of firms to effectively compete in the world market is a major challenge for policy makers.

International competitiveness within the context of trade refers to a nation's trade advantage in comparison with the rest of the world and hence the ability of a country to expand its trade shares in the world market. The notion of the competitiveness of nations is a complex issue. The concept of competitiveness lacks a universally accepted definition as well as a broad consensus on the appropriate empirical measures. International trade performance has traditionally been used as the key indicator for the outcome of improved international competitiveness.

Competitiveness can be considered at different levels of aggregation: firm, industry, and country. Firm level analysis focuses on behavior and performance of firms. Competitiveness is frequently analyzed at industry level or "cluster" level. The competitiveness of an industry can be assessed by a comparison with the same industry in another region or country with which there is open trade (Depperu and Cerrato, 2005).

The conventional theory of international trade was based on the Ricardian doctrine of comparative cost advantage and later on the factor proportions theory

developed by Heckscher-Ohlin-Samuelson. On the other hand the new trade theory developed by Helpman (1981), Krugman (1979), and Lancaster (1980) was motivated by the failure of conventional trade theories to explain, some of the most significant facts about trade data. As Deardorff (1984) and Helpman and Krugman (1985) explain the new trade theory is about three major facts: the ratio of trade to GDP has sharply increased, trade has become more concentrated among industrialized countries, and trade among industrialized countries is largely intraindustry in nature.

The main point of disagreement between the new trade theory and traditional theory relates to policy recommendations needed for industrial development. New trade theory recognizes that history, random events and past government policies are important factors in shaping the country's trade pattern. Number of factors other than comparative advantage could influence a country's industrial capabilities such as increased market size, increasing returns in production, firm's access to input, firm's ability to take advantage of technological transfer (Rangasamy, 2003).

Based on new trade theories, Porter (1990) extended the argument as to how a country could play a strategic game and succeed in extracting high levels of gains from international trade. Interestingly, the Ricardian theory of comparative advantage gained a new dimension as Porter stressed on the development of innovative or comparative advantage by upgrading productivity to maintain higher export market shares. Hence, the concept of productivity that can manage to achieve higher levels of international competitiveness emerged. The concept of competitiveness has been controversial and is linked with two extremes: macroeconomic issues or microeconomic issues. It is argued that firms compete for export, not the nations (Krugman, 1994). Lall (2001) emphasizes that national competitiveness is a real issue that can be defined and measured. The concept of competitiveness covers a wide range: from production costs to exchange rates (Raymond, 2004).

Competitiveness is essential for promoting economic development and survival in this globalized world. A country with a small open economy, like Pakistan, needs active

participation in international trade in order to maintain a sustained economic growth rate, employment level, technical innovation and efficiency in resource allocation. The long-term survival of developing countries is dependent on their ability to compete with exports of similar products from other countries.

In a country like Pakistan where import content in the production of exportables is small, a depreciation of domestic currency that increases domestic price of exports would enable the country to experience high export volumes despite prices of imported raw materials in domestic currency have increased. Thus, exchange rate policies creating depreciating currencies generate favorable conditions for exports. At the same time, there are associated exchange rate risk that has the ability to counter the export gains both in terms of profitability and volume.

With the above background on export competitiveness, this thesis analyzes export-price competitiveness for Pakistan. More specifically, the thesis analyzes Pakistan's trade pattern in the world markets, factors affecting export-price competitiveness, the effects of exchange rate volatility on export-price, and impact of shocks on export-price competitiveness.

To achieve the above objectives, two models are adapted that use variables such as export-price index, import-price index, rate of export subsidies, unit business cost, and exchange rate risk.[1]

Last but not the least, it may be underlined here that the work on this thesis is motivated by the lack of empirical work on export-price competitiveness for the manufacturing sector of Pakistan.

[1]Besides export-price competitiveness index, the literature also provides other techniques to estimate competitiveness including: revealed comparative advantage, total factor productivity, factor share analysis, and constant market share technique. Export-price index is taken to indicate export competitiveness as it allows estimating changes in a country's competitiveness over time. This approach measures overall competitiveness as it is based on total demand in countries covered and total supply in the markets.

1.1 Objectives

The main objectives of this research are

- Analyzing Pakistan's trade pattern in the world markets
- Assessing factors affecting export-price competitiveness
- Analyzing the effects of exchange rate volatility on export-price, and impact of shocks on export-price competitiveness.

2. Literature Review

This chapter reviews the literature on competitiveness. The review finds that most of the studies focus on the concepts and subjects indirectly related to competitiveness or on particular aspects of competitiveness. For instance, while productivity growth has an intuitively apparent connection with competitiveness, the literature on productivity growth rarely presents a rigorous exposition of such a linkage.

Broadly speaking the literature on competitiveness can be divided according to the following methods: trade related: revealed comparative advantage (RCA) analysis, constant market share (CMS) analysis, productivity / efficiency-related: total factor productivity (TFP), stochastic production functions, and price-related: relative trade prices, unit labour cost and real effective exchange rate. Then there are studies that identify various determinants of competitiveness.

In the following, we review the literature in the above order.

2.1. Studies on trade-related measures

Trade-related measures include constant market share (CMS) and revealed comparative advantage (RCA) techniques. Some researchers have used Balassa's index of RCA, which is defined as the share of each commodity group in economy's total exports divided by the commodity group's share of total world exports. Estimates of RCA above (below) unity imply stronger (weaker) comparative advantage in the selected commodity group, given that export composition is not grossly distorted by government policies.

There are some empirical studies that analyze different techniques of measuring competitiveness and export performance. Mahmood (1981) has used CMS technique that provides useful information for analyzing export performance. His approach decomposes export growth into commodity composition, market diversification, growth in world trade, and export performance (the residual) to represent competitiveness effect. In addition, the analysis of export performance shows that changes in real effective exchange rates for exports have been instrumental in export promotion of various goods.

The analysis of export promotion effect provides information about control variables that are instrumental in making export policies, the author concludes.

Mahmood (2004) has analyzed comparative advantage/disadvantage of Pakistan's non- agriculture production sectors. He has used RCA approach to find shifts over time. RCA approach is not meant to capture the potential future comparative advantage of a country, as RCA indices are based on actual trade data. RCA indices estimated across time however, can point to direction in which pattern of comparative advantage is moving. Mehmood made an attempt to examine the extent to which Pakistan's leading non–agriculture product lines have shown a shift in comparative advantage away from traditional labour-intensive production to export of technology-based production activities. The findings indicate that Pakistan's low value-added export base has failed to create a solid foundation for an export led growth. Pakistan has failed to move from low value added unskilled labour-intensive to technology–intensive high value added manufacturing. Due to the trade liberalization, Pakistan's textile and clothing sector will come under increasing competitive pressure from lower cost producers. Given the current situation of Pakistan's revealed comparative advantage in non-agricultural exports, the study argues the outcomes of economic growth, exports, investment and employment depend on an industrial restructuring of Pakistan's manufacturing, and ability of the manufacturing sector to create, sustain and enhance its export competitiveness. Pakistan's non–agricultural sector witnessed competitive position of some of its sectors. Across all sectors these trends were not uniform. A revealed comparative advantage does not imply that non-agriculture sector is showing high growth in the world markets but in an ideal condition there would be the emergence of an export structure that has a heavy concentration of those industries that show high growth in the world market.

Hanif and Jafri (2006) have explored the relationship between financial sector development and international trade competitiveness in Pakistan. Balassa's RCA index has been constructed for Pakistan's textile sector. To examine the role of external finance to textile sector in determining its competitiveness two models have been estimated based on real effective exchange rate and on cotton production along with the share of textile in total

credit. Findings of the study show a stable and long-run relationship between RCA index and textile credit share in presence of traditional determinants of international trade competitiveness of textile sector. Results also show greater access to external finance has strong positive impact on the improvement of textile sector's competitiveness in short and long run.

2.2. Studies on productivity/efficiency-related measures

Some times national competitiveness is measured from labor productivity. Productivity/Efficiency-related measures include stochastic production functions and they also examine growth in total factor productivity (TFP). The World Bank also reports indicators relating to technology and productivity (WB, 2004).

Ara (2004) has assessed cost competitiveness of the manufacturing sector of Pakistan using composite price index for factor and non-factor inputs separately. Factor inputs are import unit value of machinery & transport, wages in manufacturing sector, etc. Non- factor input prices are wholesale price index of raw material, weighted average import unit value of crude materials and chemicals, wholesale price index of fuel and electricity, implicit GDP deflator, etc. The study compares trends in growth of factor and non-factor input prices with export price. Period covered is characterized by a major shift in economic policies after 1988. Growth in TFP has been measured using standard growth accounting framework. Findings of the study show that over period of 1972-73 to 2002-03, both factor and non-factor prices have grown at a rate higher than that of general price level as well as of export price. The growth in productivity is offsetting the negative impact of the growth in input factor prices and the growth in productivity itself depicts a declining trend. For the period of 1999-03, TFP growth failed to offset the extent to which input price increases outweighs increase in export price index.

2.3. Studies on price-related measures

Price competitiveness method is the main focus of this research. Price-related measures of competitiveness usually include relative trade prices, unit labour cost and real effective exchange rate. National competitiveness was referred as price

competitiveness (ADB, 2003). The most widely used measures are real effective exchange rate (REER) and unit labor cost (ULC). If a country's currency is under valued, its wage rate is low and labor productivity is same or higher then its products are competitive in terms of REER and ULC.

Chowdhury (2005) has measured intra-regional and international trade competitiveness. She has constructed indices of real exchange rate, the conventional measure of competitiveness for four major member nations of South Asian Association of Regional Cooperation (SAARC). Annual data for the period 1960-2000 have been used. The performance of the countries has been assessed in the aftermath of the formation of SAARC Preferential Trading Arrangement (SAPTA). Findings reveal that small countries like Bangladesh and Srilanka recorded higher gains by adopting libralized trade regimes. In case of India, intra-regional competitiveness has been continuously improving while international competitiveness of the tradeable sectors has not gained consistent improvement. In case of Pakistan competitiveness indices indicate low improvement from trade liberalization efforts.

Brunner and Cali (2006) reviewed unit value method to compare export quality across economies over time. They have analyzed the evolution of the indicators of export competitiveness and export quality of South Asian countries' (India in particular) manufacturing relative to a group of OECD countries. Comparative analysis has been done for manufacturing sector for four South Asian countries. South Asian countries (except Pakistan) have shown dynamic export pattern over the period relative to Indonesia and Thailand. Methodology adopted is export unit values cum real competitiveness analysis to the manufacturing sector of four South Asian countries with special focus on India. This study assesses the relative competitive position of a country by combining export analysis with a real competitiveness analysis. A country based data series have been constructed for manufacturing sector on the basis of four components of real competitiveness index such as: the evolution of real exchange rate, the relative changes in wage rates, the relative labour productivity growth and the relative changes in the per unit of standardized quality of a weighted sum of products. The export

competitiveness of South Asian countries (except Pakistan) has improved relative to the Southeast Asian comparators but not relative to OECD.

Nogami (2008) shows that price competitiveness is determined by relative price of the export product. He further argues that export competitiveness is influenced by five factors namely: exchange rate; degree of product imperfection; degree of imperfections in factor markets and marginal productivity of labor; technology level; and difference in capital labor ratio.

Some of the studies consider RER as a good proxy for assessing a country's degree of competitiveness in international markets. Edwards (1988) explores that economists and policy makers often debate on the issues concerning the behavior of real exchange rates in the developing world. Two main concerns regarding exchange rates have attracted attention of policy makers: understanding fluctuations in the real exchange rate and effectiveness of nominal devaluations as policy tools. Edwards (1988) investigates some aspects related to exchange rates in developing countries by developing theoretical models of equilibrium and disequilibrium exchange rate. The behavior of real exchange rates is investigated for large cross-section of countries while effectiveness of devaluation is assessed for 39 developing countries. A decline in RER (or real exchange rate appreciation) means that there has been an increase in domestic cost of producing tradable goods. If there are no changes in relative prices in rest of the world, this decline in RER shows a deterioration of the country's degree of international competitiveness and country produces tradable goods in less efficient way than before. An increase in relative price of tradables of RER (or real exchange rate depreciation) means an improvement in the degree of international competitiveness.

Edwards (1989) documents that the real exchange rate is defined as relative price of tradable with respect to non-tradable goods. RER is a good proxy for country's degree of competitiveness in international markets. RER measures the cost of domestically produced tradable goods. Some times changes in a country's degree of international

competitiveness are linked with technological progress, changes in external terms of trade, changes in taxation, etc.

Bella *et al.* (2007) emphasize that competitiveness assessments are a vital component in evaluating a country's macroeconomic performance and sustainability of its policies. These assessments begin with an assessment of the real exchange rate level. The empirical analysis of real exchange rates has conceptual and methodological obstacles. Such obstacles may include major data weaknesses and structural breaks especially in context of low income countries. He emphasized that an appreciation of RER does not always mean loss of competitiveness and similarly RER depreciation does not always mean better competitiveness picture. The reason may be an increasing RER might reflect productivity gains in tradable sector. In case if productivity increases in non tradable sector, appreciation in RER is possible if country under consideration has fixed exchange rate system, non-tradable prices are sticky, and government does not apply accommodative policy. In conclusion, it can be said that competitiveness assessments based only on observation of RER evolution through time may be misleading.

Keyder *et al.* (2004) highlights the importance of unit labor costs in international trade as international competitiveness indicators. Two factors that affect unit labour cost are labour productivity and nominal wages. Productivity is the gross output or value added per person employed or in case of availability of working hours, productivity is taken as per hour worked. Unit labour cost is defined as nominal labor compensation divided by real value added. When labour costs are compared, unit labour cost indicators take into account productivity differences. An increase shows that labor cost rise by more than productivity gains and competitive position deteriorates. Unit labour cost reflects competitive advantage and disadvantage due to lower or higher labor cost. Unit labour cost is influenced by four factors: technology, fixed labour cost, capital-labor ratio and production parameter. The fixed labour cost is also influenced by policy and institutional environment.

2.3.1. *Empirical studies on price-related measures of competitiveness*

Some of the important studies that analyze the export-price competitiveness are developed by Abeysinghe and Yeok (1998), Fang and Miller (2007), Lakshmanan *et al*. (2007), and Harding (2001).

Abeysinghe and Yeok (1998) argue that exporters maintain competitiveness in the world market. To achieve this they reduce their profit mark-up in case of an appreciating currency. They conclude that if there is high import content of exports then exports are not adversely affected by the currency appreciation. It is so because the low import prices due to appreciation of currency reduce the cost of production of exportables. In the case of Singapore, the authors show productivity gains had not proved to be adequately large to add significantly to enhancing export price competitiveness. Thus, the domestic value added is not as significant as the import content in affecting export prices. Authors argue that in general, it is expected that exchange rate depreciation stimulate exports and curtail imports, while exchange rate appreciation discourages exports and encourages imports. Exports depend in varying degrees on imported raw materials and imported intermediate inputs. Import prices affect export prices directly. With the existence of direct link between import price and export price indices there is an indication that exporters benefit from lower import costs due to currency appreciation. This enables Singapore to increase its export volumes despite an appreciating currency.

Randveer and Rell (2002) analyse the relationship between the real effective exchange rate (REER) of Estonian Kroon and price/cost competitiveness of the economy. The study presents an overview of REER indices calculated for Estonia and assesses how better various REER indices are as proxies for change in price competitiveness of the country. To serve the purpose simple causality tests are used to see how much information REER indices contain concerning real variables such as trade flows and investments. The study further gives exchange rate misalignment by calculating equilibrium REER and the difference between the actual and equilibrium REER. The estimates of misalignments are used as proxies of price competitiveness. The quality of

these estimates is assessed by Granger and OLS tests between real variables and calculated misalignments. Export and import demand functions are also estimated in order to see the impact of difference between actual and estimated equilibrium REER on trade flows.

Vetlov (2002) identify the real exchange rate of Lithuanian Litas with alternative real exchange rate definitions and assessed the degree of misalignment of the real exchange rate in the country. The alternative measures of the real exchange rate in Lithuania are based on a number of factors such as Consumer Price Index (CPI), Producer Price Index (PPI), Gross Domestic Product (GDP) deflator, export deflator and unit labour cost. Statistical data of 15 countries, major foreign trade partners of Lithuania were used to calculate CPI and PPI based real effective exchange rates. The measures of real exchange rate are evaluated in terms of major macro economic variables such as domestic GDP, exports, imports, and foreign trade balance. Granger Causality test was applied and simple structural equations are estimated. Results show two real exchange rate measures, i.e., PPI and unit labour cost based real exchange rates performed better than other measures.

Harding (2001) has assessed the adequacy of measures of Australia's price competitiveness and structural change. The Reserve Bank of Australia (RBA) and the Treasury have constructed several measures of Australian price competitiveness. This study has assessed some underlying concepts and how well these indexes approximate these economic concepts, assess the quality of index construction and made available improved procedures for constructing these indexes.

Sherani (2004) contemplates the competitive gaps in Pakistan's tradeable goods sector are well-defined across a range of parameters like low labour productivity, low technology diffusion, operation of physical infrastructure constraints and high business costs.

Mahmood (2008) analyzes the determinants of real wage trends in the manufacturing sector of Pakistan. He finds out a fall in growth rate of real wages by comparing pre- structural adjustment program (SAP) and the SAP periods. The study formulates an algebraic relationship to determine the real wage change. The annual data are used from 1969-2001. Findings reveal that as compared to the pre-SAP period, the earlier period of SAP shows a fall in the growth rate of real wage. This decline is due to the smaller appreciation of the domestic exchange rate as the producer price level was higher than the consumer price level, and a rise in the growth rate of employment. A strong domestic exchange rate appreciation with sharp rise in growth of employment contributed to negative growth in real wages in the latter SAP years. At that time higher growth in output could not counterbalance the negative growth in real wage.

Siddiqui, *et al*. (1996) develop simultaneous equations model. They have examined whether the estimates of real exchange rate (RER) model has simultaneity bias. The findings reveal that both monetary and real variables affect the equilibrium path of RER significantly. Controlling only the monetary-side is not sufficient to maintain a competitive and stable RER. Another way to maintain a stable RER is controlling domestic prices instead of repeated devaluation of currency. Changes in nontraded goods sector affect RER significantly and policies used for efficient and optimal use of resources in this sector can play important role in maintaining competitive and stable RER.

Kemal, *et al.* (2002) examine empirically export–led growth hypothesis for five largest economies of the South Asian region: Bangladesh, India, Nepal, Pakistan and Sri Lanka. To determine the direction of causation between exports and output the Granger causality technique is applied within Vector-Auto Regressive (VAR) framework. Annual time series data on real exports and real GDP have been checked for stationarity. Different tests for the existence of unit-roots confirm that both real exports and real GDP are non-stationary processes integrated of order-1 for all five countries. Co-integration tests show the existence of long run equilibrium relationship between real exports and real GDP in all countries. Common stochastic trends present in real exports and real

GDP. The study confirms that export growth is instrumental in accelerating economic growth for all countries but through different channels. The evidence of short run and long run causality between export growth and economic growth shows several ways in which exports can have a positive effect on economic growth. The presence of short run causality is consistent with the Keynesian view, which postulates that changes in components of aggregate demand bring changes in aggregate output in the short run. In the long run, exports have beneficial effect on economic growth through a variety of channels.

2.3.2. *Empirical studies on exchange rate volatility/risk analysis*

At times over favourable factors do not give rise to increased sales in foreign markets. It may be seen that improving terms of trade brought about through exchange rate appreciation may leave export performance broadly unchanged (Durand and Giorno, 1987). This shows that out of the three main variables considered in this research, the exchange rate is expected to play an important role for export performance. In this context, the exchange rate risk needs due attention. It is commonly argued that exchange rate risk depresses international trade. Greater exchange rate risk increases the riskiness of trade profits, thus the risk-averse traders reduce the volume of trade. Moreover, recent literature demonstrates growing use of techniques that can model investor's attitude not only towards expected returns, but towards risk as well. The importance of exchange rate risk, therefore, cannot be ignored as the literature provides, in this regard, some useful insights that are discussed below. Some studies argue that if the exchange rate uncertainty exists and market participants are risk averse, they will reduce their market activities. In this way they will minimize their exposure to the effects of exchange rate volatility/risk. International transactions are realized after a time lag and contracts are dominated in terms of the currency of either exporting or importing country. Unanticipated changes in exchange rate may affect volume of trade through their effects on profits. The exchange rate risk may increase exporter's profit risk. If exchange rate volatility/risk increases, then profit risk rises. Since hedging against exchange rate risk is costly and if the exporters are risk averse the increase in profit risk reduces the benefits and volume of trade.

Ethier (1973) argues that exchange rate risk could lower exports due to profit risk. One of his important findings is that firm's revenue depends upon how the future exchange rate will cause the level of trade to become sensitive to exchange uncertainty. This will reduce the level of trade but will increase tradeoff of expected profit for a reduction in exchange rate risk.

Fang and Miller (2007) think that the simultaneous effects of changes in exchange rate on exports, and exchange rate risk on exports are important to study. Studying separately, they may produce biased inference. In this connection, Wilson and Tat (2001) confirm Abeysinghe and Yeok's finding of a weak relationship between changes in export and import prices. Their argument is that exchange rate risk provides another channel for exchange rate to affect exports in Singapore, showing that exchange rate risk reduces exports, while exchange rate depreciation does not. They find out relationship between exchange rate depreciation and exports in Singapore. Monthly data for the period of 1979-2002 are used. Time varying variance of data has been assessed and bivariate GARCH-M modeling technique has been used to estimate the effects of exchange rate depreciation and its risk on exports. Findings reveal that the positive but insignificant effect of exchange rate depreciation on exports, time varying real exchange rate risk shows a significant negative effect on exports of substantial magnitude, the exchange rate risk effect dominates the depreciation effect in magnitude which in turn leads to a negative net effect of exchange rate changes on export revenue.

Ozbay (1999) has investigated two factors of exchange rate uncertainty on exports for Turkey in the context of GARCH model. The technique has captured time varying conditional variance as a parameter generated from a time series model of conditional mean and variance of the exchange rate. The author thinks the high degree of volatility of exchange rate movements since the beginning of generalized floating exchange rate regime has led researchers to investigate such movements on trade flows. The empirical evidence shows that for 1988:II-1997:II period exports are adversely affected by the real exchange rate uncertainty. The empirical evidence does not indicate statistically significant relationship between imports and real exchange rate uncertainty. The results

reveal that real exchange rate and foreign income are significant in determining exports demand. Real exchange rate uncertainty significantly reduces the exports and it is not significantly effective for imports.

Klaassen (1999) explores a common argument that exchange rate risk depresses international trade but a large body of literature on this issue does not provide conclusive evidence. Concentrating on the time series analysis, he estimated that export decisions are mostly affected by the exchange rate distribution after one year. The riskiness of exchange rate at long prospect appears reasonably constant over time with only short term fluctuations. This makes it difficult to discover true effect of exchange rate risk on trade from the limited time series data. Literature provides two methods for such analysis, one is moving standard deviation in the past data. Other is the use of generalized autoregressive conditional hetroskedasticity (GARCH) model, given the popularity of this method to capture the strong volatility clustering in high frequency time series.

Klaassen (2004) argues that the exchange rate risk in developed countries does not exibit enough variability to determine its effect on exports and suggests studying the risk effect using the data on developing countries, for which more volatile exchange rate may exist.

Lakshmanan, *et al*. (2007) provides an analytical analysis of various parameters of manufacturing competitiveness of Indian economy. In Indian economy manufacturing exports dominate the export basket and account for nearly 70 percent of the total merchandise exports. The manufacturing exports have shown a rise since Indian economy started opening up in the 1980s.This study assesses the role of REER in India's manufacturing sector exports. The inverted REER approach has been used for the period 1980-81 to 2003-04. This approach validates that REER has been one of the factors in determining Indian exports. The results of inverted REER show that Indian manufacturing sector exports are becoming competitive in the global economy. Apart from REER, it is found that the global GDP is affecting India's manufacturing sector exports. The study estimates an empirical relationship among manufacturing exports,

REER, and world GDP for the period 1980-81 to 2003-04. An Ordinary Least Square (OLS) has been used to estimate the relationship. The results of this analysis shows that manufactured exports depend positively on the world GDP and negatively on the REER.

Chowdhury (1993) examines the impact of exchange rate volatility on the trade flows of G-7 countries. The paper analyzes the relationship between the volume of export and measure of exchange rate volatility using multivariate error-correction model. Time span used is 1973-1990 for each of the G-7 countries. The results show that exchange rate volatility has a significant negative impact on the volume of exports in each of the G-7 countries. In the empirical analysis the coefficients on volatility terms are high in all the countries except Italy and United Kingdom. This means the risk averse market participants react to exchange rate volatility by giving favoring domestic trade to foreign trade. Risk averse market participants may reduce their activities, change prices, or shift sources of demand and supply in order to minimize their exposure to the effects of exchange rate volatility/risk. This behavior can change distribution of output across many sectors in G-7 countries. A contrary evidence also exist as Kroner and Lastrapes (1993) discover positive effects of conditional variance on exports of France, Germany and Japan but negative effects for the UK and USA.

Bredin *et al.* (2002) have analyzed the short run and long run relationship between merchandise export volume and its determinants. The model is estimated for Irish exports to the EU using quarterly data using cointegration and error correction techniques. It explains the effect of exchange rate variability on expected profits and exports. They find out that exchange rate volatility has no effect on volume of trade in the short run and a significant positive effect in the long run.

Summarizing the above discussion (see also Table 2.1), it can be concluded that competitiveness assessments are a vital component in evaluating a country's macroeconomic performance and sustainability of its policies. Most of the empirical work in Pakistan for exploring possible relationship of competitiveness is done by construction of indices for the manufacturing sector, non-agriculture sector and financial

sector. Price competitive assessments begin with an assessment of the real exchange rate level. The empirical analysis of real exchange rates has conceptual and methodological obstacles. Such obstacles may include major data weaknesses and structural breaks. Some of the literature highlights the importance of unit labor costs for traded goods as international competitiveness indicators. Export-price-related measures have not been studied before in Pakistan. They usually include relative trade prices, unit labour cost and real effective exchange rate. All these indices are used in the present study to assess export-price competitiveness in the manufacturing sector of Pakistan. The effects of exchange rate movements are captured in import price index as the index is expressed in Pak rupees. Export price competitiveness method is important as this technique finds out whether an export firm is selling at a profit or not. The importance of exchange rate risk for exports cannot be ignored as the literature provides evidence on it. The effects of the two factors, exchange rate, and exchange rate risk on exports, are important to study simultaneously, for if they are used separately may lead to biased inference. Exchange rate risk could lower exports due to profit risk but it may be possible to get positive effects of conditional variance on exports also.

Table 2.1 : *Review of Studies on Competitiveness*

Author	Country	Study Period	Method/Technique	Remark
Mahmood (1981)	Pakistan	1972-76	Trade related measure: • Constant market share analysis.	• Analyzed export performance • Control variables are instrumental in making export policies
Mehmood (2004)	Pakistan	1990-2000	Trade related measure: • Revealed comparative advantage (RCA) approach.	• Analyzed comparative advantage and disadvantage of Pakistan's non agriculture production sectors
Ara (2004)	Pakistan	1972-73 to 2002-03	Trade related measure: • Revealed comparative advantage (RCA) approach.	• Assessed cost competitiveness of manufacturing sector of Pakistan
Hanif and Jafri (2006)	Pakistan	1974-2004	Trade related measure: • Balassa Index	• Explored relationship of financial sector development and international trade competitiveness in Pakistan
Chowdhury (2005)	Bangladesh, India, Pakistan and Srilanka	1960-2000	Price related measure: • Construction of real exchange rate indices.	• Measured intra-regional and international trade competitiveness for four SAARC nations
Brunner and Cali (2006)	South Asian and OECD countries	1991-2002	Price related measure /Unit value method: • Comparative analysis	• Analyzed export competitiveness and export quality of South Asian countries manufacturing relative to OECD countries
Abeysinghe and Yeok (1998)	Singapore	1980-1993	Price related measure: • Price Competitiveness method	• Empirically shows export competitiveness in Singapore
Harding (2001)	Australia	1970-2000	Price related measure: • Price Competitiveness method and Real Trade Weighted Index of Exchange rate	• Assessed Australia's price competitiveness and structural change
Fang and Miller (2007)	Singapore	1979-2002	Price related measure: • Price Competitiveness method	• Finds relationship between exchange rate depreciation and exports in Singapore
Lakshmanan (2007)	India	1980-81 to 2003-04	Price related measure: • Price Competitiveness method	• Provides analytical analysis of parameters of manufacturing competitiveness in India
Chowdhury (1993)	G-7 countries	1973-1990	Price related measure: • Price Competitiveness method	• Examines exchange rate volatility on trade flows of G-7 countries.

3. An Overview of Pakistan's Economy

3.1. Pakistan's macroeconomy

Till the mid 1980's Pakistan's economy showed satisfactory growth records. After that there was a gradual decline. The annual growth rate of the GDP increased from 4.2 percent in 1972-75 to 5.4 percent in 1980-85. The lowest GDP growth 2.5 percent was observed in 1995-00 and then it increased (see Table 3.1).

Pakistan had achieved an average growth rate of over 5 percent over a four decade period ending 1988-89. The key features of Pakistan's economic history are: self sufficiency in food production, per capita income expanded more than six-fold in US Dollar terms, the country emerged as one of the leading producers of cotton and cotton textiles, it developed a diversified base of manufactured products for domestic and world markets, and its expansion of physical infrastructure.

These achievements in income, consumption, agriculture and industrial production were impressive and have lifted millions of people out of poverty levels. At the same time, afterwards, Pakistan missed opportunities that brought the largest setbacks in its economic history. The country moved backward in the 1990s in terms of growth, exports, revenues, and development spending and got entrapped into external and domestic indebtedness. This was due to both fundamental structural and institutional problems as well as due to poor governance and political instability. Due to the short tenure, governments were hesitant, to take economic decisions to stablize the economy. Moreover, the average lifespan of two to three years for governments was inadequate for implementing meaningful policy or institutional changes.

Table 3.1 : *GDP Growth Rates (%)*

Period	GDP growth rate
1972-75	4.2
1975-80	4.9
1980-85	5.4
1985-90	4.8
1990-95	4.0
1995-00	2.5
2000-05	4.2
2005-2008	6.8

Source: Author's calculation.

As far as external environment is concerned economic sanctions were imposed against Pakistan in May 1998 by the Western governments. By the late 1990s, Pakistan had entered almost a critical state of stagnation in its economy particularly in its external sector. There was a significant drop in workers' remittances, export growth was negative, the IMF's structural adjustment programme and the World Bank assistance were suspended, bilateral donors had terminated their aid while debt payments due were in far excess of the liquid foreign exchange resources the country possessed. At this stage the military government assumed power in October 1999. The initial period was devoted by the economic team of the new government in managing the economic crisis. A comprehensive programme of reform was designed and implemented to put the economy on the path of revival. The structural reforms included privatization, financial sector restructuring, trade liberalization, picking up pace towards deregulation of the economy and generally moving towards a market-led economic regime.

A stand-by IMF programme was introduced in November 2000, which was successfully implemented followed by a three-year Poverty Reduction and Growth Facility (PRGF), and completed in December 2004. Pakistan's economic turnaround during initial years of 2000s was impressive because the country was faced with a critical regional and domestic environment with constant threats to security, a prolonged drought, tensions with India, and high oil prices.

Pakistan's GDP growth was nearly 6.8 percent in 2006-07. In order to maintain growth, the government of Pakistan implemented second-generation reforms to strengthen institutions, improve the competitiveness of industry, smooth the progress of the private sector, build a competitive financial system, implement judicial and civil reforms, promote transparency in economic policy making and tried to strengthen the tax administration. The real GDP grew at the rate of 5.8 percent in 2007-08 but could not achieve the target which was 7.2 percent for 2007-08. In the fiscal year 2007-08 many political and economic events occurred in the country and on these grounds GDP growth of 5.8 percent seems satisfactory. In the year 2006-07, consumption, investment and net exports contributed 38.3 percent, 45 percent and 16.7 percent, respectively. But the

growth pattern of year 2007-08 was consumption led growth as it was driven by private consumption. The contribution of investment declined to 12 percent and net exports remained low with 20 percent negative contribution.

Currently four major challenges are faced by Pakistan's economy, diminishing growth, rising inflation, growing fiscal deficit, and widening of trade and current account deficit. Fiscal trade and current account deficits are mainly due to external shocks such as high oil prices, global financial crisis, etc.

Table 3.2 reveals that growth in total factor productivity (TFP) has increased in the 1980's but decreased in the 1990's. The trend reversed in the 2000's.This indicates that there are some productivity improvements experienced by the country, and this factor affects the competitiveness of Pakistan's exports. PPI and CPI growth rates show a decreasing trend till 1985-1990 and then there is a gradual increase. The unit business cost growth rate is negative. Its growth rate was minimum in 1972-75 then increased from 1985-90.It again decreased in 1995-97 and revived back afterwards. Compound growth rate of exports have shown some fluctuations but overall growth rate is positive. Export-price (P_x) shows an increasing trend over 1985-90 then a declining trend is observed over 1995-97. The growth rate of export prices has increased in 1999-03 and revived back in 2003-08. Import-price shows increase over 1975-80 then showed a sharp decline over 1990-95, then it revived back till 2003 but in 2003-08 there is again a decline.

Growth rate of employment cost shows increasing trend over 1985-90 and then a declining trend afterwards. It is negative in 1999-03 and 2003-08. Growth rate of cost of fuel is positive, shows increasing trend till 1980-85 but after that shows a declining trend and becomes negative in 2003-08. The last column shows rate of devaluation of Pak currency viz a viz US dollar.

3.2. Pakistan's Manufacturing Sector

Manufacturing is the second largest sector of Pakistan's economy. This sector is an important contributor to the GDP and accounts for 19 percent of the GDP. After independence, Pakistan adopted a policy of import substitution for the protection of domestic infant industries. Pakistan's manufacturing sector has shown impressive growth in the last few years. Even the manufactured exports in the 1960s were also higher than those of Malaysia, Thailand, Philippines and Indonesia. In the 1990s, the country had to undertake economic reforms due to international pressures. Economic reforms in the 1990s and the 2000s have eased business formation and access to capital, cut the cost of imported inputs and helped to create a competitive industry.

Manufactured industries experienced a sharper decline in the growth rate of its value added during 1989-2001, but sector growth was the highest during 2003-05, and then there was a decline afterwards. This rise and fall in growth rates can be attributed to rise and decline in competitiveness of the manufacturing sector. The overall manufacturing sector recorded a modest trend in its growth rates. The sector faced a growth rate of 11.0 percent in 2000-01 as against 18.1 percent in 2003-04, 19.9 percent in 2004-05, 8.6 percent in 2006-07, and 4.8 percent in 2007-08. Large scale manufacturing suffered from multiple factors including political instability, law and order unrest, power shortages, and higher energy and capital costs. In this backdrop, large scale manufacturing industries recorded a low growth rate of 4.8 percent in 2007-08 as compared to 8.6 in the year 2006-07.

Table 3.2: *Growth Rates and Devaluation Statistics*

(Percent)

	Growth Rates									
Period	**TFP**	**PPI**	**CPI**	**UBC**	**Exports**	**P_x**	**Pm**	**Employment Cost**	**Cost of Fuel**	**Rate Devaluation of Pak Currency viz a viz US Dollar**
1972-75	2.08	20.50	20.48	-14.46	-1.13	35.08	29.22	1.73	4.73	34.02
1975-80	-0.75	9.56	9.20	-12.81	3.70	8.89	38.75	4.30	6.27	0
1980-85	4.84	6.84	6.28	-5.51	6.28	4.68	6.17	5.63	11.53	8.89
1985-90	4.92	8.71	7.61	-4.46	9.31	7.59	7.06	7.23	9.26	6.79
1990-95	1.36	12.22	11.04	-12.8	4.80	9.49	6.21	1.266	3.75	7.85
1995-97	-1.25	8.81	9.77	-10.88	4.66	6.70	11.57	-1.06	3.40	11.91
1999-03	1.52	10.37	7.77	-2.15	8.83	-0.34	31.19	-3.17	9.14	4.45
2003-08	n.a	8.29	7.59	-4.73	5.83	6.64	8.54	-17.04	-2.28	1.36
Overall 1972-2008	1.81*	9.49	8.75	-7.53	5.27	10.64	10.02	0.106	7.51	7.61

Source: TFP growth 1972-97 taken from Mahmood and Siddiqui (2000), TFP growth 1999-03 from Ara (2004).

Note: * Overall average of TFP growth.

n.a stands for not available.

3.2. Pakistan's Exchange Rate Policy Regime

Since August 1947 to January 1982, Pakistan maintained a fixed – peg regime for its exchange rate. At first in 1947, the Rupee was linked to Pound Sterling but later as the U.S. dollar became dominant currency across the globe, Pakistan pegged the rupee to it. Upon IMF's recommendation, the pegged system was replaced by flexible[2] exchange rate mechanism, on January 8, 1982. Under the new system, State Bank of Pakistan (SBP) used to set a rate for Pakistani Rupee based on weighted average of the currencies of Pakistan's major trading partners. The period after that characterized with frequent small adjustments in rupee against US Dollar. The sinking informal market rate showed that the official parity rupee largely deviated from the underlying economic realities. Pakistan put the rupee on a controlled floating basis, with the currency linked to a trade-weighted currency basket.

Ever since the Rupee was allowed to 'manage float' in 1982, its value depreciated by 364 percent till May 27, 1998. Pakistan adopted two-tier exchange rate on July 22, 1998 which comprised of an official rate (pegged to U.S. dollar), a Floating Interbank Rate (FIBR), and a composite rate (combines the official and FIBR rates). The official exchange rate was determined by SBP while market forces of demand and supply determined FIBR.

On May 19, 1999 the two tier exchange rates were replaced with unified exchange rate and pegged to the U.S. within a certain band. Under the system, the practice of announcing the official rate was done away with and the determination of exchange rate was left to market forces influencing the interbank market. The rate prevalent in the inter-bank market is now officially taken as the nominal exchange rate at which all foreign exchange transactions take place. This band was removed by the State bank of Pakistan on July 20, 2000.

Currently Pakistan is maintaining a free floating[3] exchange rate regime. Under this regime, each bank quotes its own rate. Strong competition, however, means the

[2] Infact it was managed floating exchange rate.
[3] In practice, the system depends on interventions and it is managed float rate system.

exchange rates vary little among the banks. Under the prevailing Exchange Control Act, the State Bank of Pakistan on application may authorize any person or institution to deal in the foreign exchange market.

3.2.2. *Real Exchange Rate (RER)*

Real exchange rate is the cost of domestically produced tradables. It can be defined as the ratio of relative price of tradables (P_T) with respect to non tradables (P_{NT}). A fall in this ratio represents an appreciation of real exchange rate. Real exchange rate appreciation is identical with deterioration in a country's international competitiveness as it reduces the profitability of the traded sector and diverts resources from tradable sector to non tradable sector, as well as increasing the domestic cost of producing tradable goods. The measure of competitiveness is the relative price of a basket of foreign goods in terms of a basket of domestic goods. An increase in this ratio represents a real depreciation or an improvement in the international competitiveness of tradable production of the country (Chowdhury, 2005).

3.2.2. Real Effective Exchange Rate (REER)

Several studies found in literature use the real exchange rate while others use real effective exchange rate. Some times real exchange rate index that incorporate subsidies and taxes is called real effective exchange rate (Edwards, 1987). Real effective exchange rate considers factors such as domestic and foreign inflation (Razafimahega & Hamori, 2007). Considering the case of Pakistan we have captured exchange rate movement through import price index.

A nominal effective exchange rate (NEER) is weighted with trade weights of major currencies being traded in a country. A real effective exchange rate (REER) adjusts NEER by appropriate foreign price level and deflates by the home country price level.

The weighted average of a country's currency relative to basket of other major currencies adjusted for the effects of inflation. The weights are determined by comparing the relative trade balances, in terms of one country's currency, with each other country within the index. REER includes effects of subsidies, tariffs and GSP.

3.4. Pakistan's Trade Policy

A complex system of trade policy regime has been observed in Pakistan since independence. Import bans, quota, licensing requirements, other restrictions (including import of capital goods through licensing) were in place to protect local industry. These measures were supplemented with high tariffs (Siddiqui and Kemal 2002, and Table 3.3).

During the 1960-69 period efforts were made to remove anti-export bias. In the late 1970s gradual liberalization of trade regime was initiated. Pak rupee was devalued in 1972. During the 70's Export Bonus Voucher Scheme was replaced by free and tied lists. On some items, import and export duties were removed gradually and compensatory rebate scheme was introduced in 1976-77 (Kemal, *et al*., 2002). In the mid of 1980s, the non-tariff restrictions were binding, as the prices of imported goods were higher than the inlanded cost. In 1981, it was observed that about 41 percent of industrial value added was protected by import bans and 22 percent by various forms of import restrictions (Kemal, *et al*., 1994).

During the 1980s policies focusing on export led growth were followed, which included removal of anti export bias, reduction of non tariff barriers and moving towards a flexible exchange rate mechanism. The trade policy was liberalized and the producers were exposed to the global market to make the local industry competitive. Quota restrictions were also removed in the 1980s. In the 1990s, the restricted list was eliminated and items that were to be restricted due to Health and Safety Requirements and Procedural Requirements were added to the Negative List. Import licensing started declining from 1981 and then it was eliminated in 1993. Only a small portion of total imports was left with quantitative restrictions. Tariff rationalization during the nineties resulted in a decline in tariff rates on all categories of imports (Siddiqui and Kemal, 2002).

In 1991, licensing requirement for freely importable goods was removed. Quantitative restrictions were also removed in 1993-94. Several measures were taken to improve infrastructure for exports (Kemal, *et al*., 1994). During the 1990s number of SROs (statuary regulatory orders) were also withdrawn. Restrictions on exports were removed except on a few primary goods. Export financing was provided to small, medium and large enterprises engaged in exports of manufacturing products and to the indirect exporters (Kemal, 2003). The trade policy was primarily oriented towards liberalizing imports to enhance capacity utilization and to boost exports. Trade policy of 1999-2000 has come up with various concessions and tax relief to expand and diversify the country's export base. The focus was on removing barriers which inhibited exports. Since 1999, Pakistan has adopted an export-led growth strategy which is being managed through successive trade policies. The policy also meets the challenges of World Trade Organization (WTO) agreements.

Pakistan's economy has seen a revival in the 2000s. Macroeconomic management and structural reforms have contributed to high real GDP growth. In trade policy of (2001-2002), the focus has been placed on attaining higher degree of product and market diversification by strengthening institutional support mechanism, reducing anti-export bias and improve export culture in the country. The policy tries to upgrade productive capacity of the country and facilitates the new emerging small and medium size exporters.

The trade policy of the year (2002-03) focused on maximum participation of all the stakeholders for trade promotion and industrial growth. The policy was guided by market driven forces, aimed to liberalize the economy and provide incentives for reducing the cost of doing business in Pakistan. In the year 2002, reforms have been carried out in almost all sectors of the economy as a result Pakistan's total trade has grown. Higher levels of exports and higher level of investment were seen in the country. Increase in investment has increased productive capacity, but also improved competitiveness. Efforts have been made to rationalize tax rates, broaden the tax base,

shift tax incidence from imports to consumption and income, improve efficiency of tax administration and realize tax collection.

Trade policy (2003-04) seeks to upgrade productive capacity and degree of products for sustained growth in export earnings. The policy was launched to enable exporters to acquire franchises and the Export Promotion Bureau was helping exporters to get finances at economical markup rates.

Trade policy (2004-05) aimed to enhance export proceeds by improving world market share of Pakistan's core exports in major markets. The focus was on sustainable value addition through capacity building and capability enhancement of exporters. The policy strives to achieve product geographic diversification, besides reducing the cost of doing business in Pakistan.

Pakistan is a founding member of the GATT 1947 and has been a strong supporter of an open, transparent and rule-based multilateral trading system. Most of its trade is conducted on Most Favoured Nations (MFN) basis but the current global trading system suffers from several distortions that adversely affect trade opportunities for developing countries. Pakistan is pursuing a range of Regional Trade Agreement (RTA's) with varying levels of tariff concessions and provisions for greater integration with different partner countries. All the RTA's which Pakistan has signed, have provisions for deeper tariff cuts and for expanding the scope of economic cooperation. Pakistan is also continuing to unilaterally liberalize its tariff rates. The simple average of its applied MFN rate in 2006-07 was 15.0% compared to 20.4% in 2001-02. Presently, average mean tariff is 14.5%, import weighted tariff 8% and average effective rate at 7.6%. Most of Pakistan's tariffs are bound at low applied rates; in most other cases applied rates are much lower than the bound rates. Trade liberalization is desirable for the long term growth of any economy, but in the short term, there can be some pressures on a few domestic sectors. The country is looking forward enhancing the competitiveness of its products and firms. For this purpose Export Processing Zones (EPZs) were established in the country. In year 2004-05, units operating in EPZ were given permission to import

goods from abroad as well as tariff area. These units could export up to 20% of their total production to tariff areas in Pakistan and 80% to foreign countries.

Trade policy (2005-06) focused at trade competitiveness indicators, promotion of exports, internal commerce, strengthening of National Tariff Commission and reducing cost of transportation. The rapid economic growth strategy was announced in 2005-06 and continued in trade policy of 2006-07. A special focus of trade policy of (2006-2007) was on increased market access, trade with neglected regions of the world, strengthening of trade promotion infrastructure, and emphasis on skill development in export-oriented industry.

In (2008-09), there is a large trade gap of US $ 20.77 billion, and the strategy to enhance exports is the best method to resolve this problem. The export target for 2008-09 has been fixed at US$ 22.10 billion, which represents a growth of 15% over our last year's exports. Trade policy will also provide tax and duty exemptions on all inputs for exports, including machinery under the Duty and Tax Remission Export (DTRE) scheme. It has also decided to participate in re-negotiations on the South Asian Free Trade Agreement and the Regional Agreement on Trade in Services among the South Asian Association for Regional Cooperation countries. Import strategy for 2008-09 addresses the problem of the large trade gap and is designed to facilitate imports that will serve to increase the competitiveness of our exports. Those imports are needed to be facilitated that are for the benefit of people and ensure sufficient supply of essential commodities such as food items at affordable prices (See, M/o Commerce).

Table 3.3:*Pakistan's Trade Policy Initiatives*

Year	Major Initiative/Step
1947	• Pakistan became member of GATT
1959	• Export Bonus Scheme was introduced in late 1959.
1960s	• Efforts made to eliminate anti export bias.
1970s	• Implementation of three important measures of trade liberalization. • Movement toward more uniform exchange rates for exports. • Rupee devaluation • Export Bonus Voucher Scheme was replaced by free and tied lists for imports • Export duties on several items were removed gradually.
1980s	• Pakistan initiated reforms in trade regime. • Quota restrictions were removed. • Banned and restricted lists replaced the free and restricted lists. • Measures were introduced to facilitate import of items required by export oriented industries. • Quantitative restrictions applicable to some industries replaced by tariffs. • Compensatory rebates were provided on manufactured goods, afterwards they were withdrawn. • The Federal Export Promotion Board was reactivated.
1990s	• Restricted List eliminated and restricted items have been added to the Negative List. • Licensing requirement for freely importable goods removed. • Quantitative restrictions removed. • Import licensing was eliminated.

Source: Based on : (Siddiqui and Kemal, 2002) and (Kemal, *et al*., 1994).

Table 3.3 (Cont.) : *Pakistan's Trade Policy Initiatives*

Year	Major Initiative/Step
1990s	• Pakistan signed the Uruguay Round Agreement that established WTO • Import policy specifies negative list of 121 products • Certain restrictions were relaxed • 20.2 percent of output in manufacturing sector was restricted through import policy • Export bans were imposed agricultural products, manufactured output including textile, cement and fertilizer etc. are subject to different types of restrictions.
2000s	• Import of capital goods declined to 25 percent • Freight subsidy up to 25 %for new products and new markets. • Pakistan Export Finance Guarantee Agency has been set up in private sector to facilitate SMEs. • Maximum tariff rate has been brought down to 25 % and number of tariff slabs have been reduced from 5 to 4. • Decision of establishing two export zones established with modern export zone • 25% freight subsidy on exports to encourage exports of non traditional products to new markets. • All goods considered freely importable and exportable except prohibited goods. • Units operating in EPZ were allowed to import goods from abroad as well as tariff area. • These units could export up to 20% of their total production to tariff areas in Pakistan and 80% to foreign countries. • Assistance for quality standards certification • Concessional rate of withholding tax for export of services • Strengthening of National Tariff Commission • Development of SME sector • Modified Freight subsidy Scheme. • Allowing re-export of imported goods in original and un processed form. • Establishment of Expo Centres at Islamabad, Peshawer and Quetta. • Establishment of warehousing city. • Providing assistance for quality standards certification. • Strengthening of trade promotion infrastructure • Provision of physical infrastructure • Scheme of export – oriented units introduced • Establishment of Export Skills Development Council • Conversion of existing training institutes into technological & Skill Development Resource Centers. • EPB has been replaced with Trade Development Authority of Pakistan. • Export target fixed at US$ 22.10 Billion • Tax and duty exemptions on all inputs for exports, including machinery under the Duty and Tax Remission Export (DTRE) scheme.

Source: Based on Economic Survey (various issues).

4. Model Description and Methodology

4.1. Model description

In order to achieve the objectives of this study, we use two models, namely exchange rate depreciation and export price competitiveness model; and exchange rate volatility and export competitiveness model.

Model I- Exchange Rate Depreciation and Export Price Competitiveness:

Following Lipsey (1994), Abeysinghe and Yeok (1998) and Razafimahega and Hamori (2007), we use export price index (P_x) to reflect export-price competitiveness. This index allows estimating changes in a country's competitiveness over time. The long run relationship of the model is given in Equation (1)

$$LnP_{x,t} = \alpha_0 - \alpha_1 \text{LnP}_{m,t} - \alpha_2 \text{LnUBC}_t - \alpha_3 \text{LnSBRT}_{x\,t} - LnP_{x,t}(-1) \quad (1)$$

The model describes the relationship among four variables, i.e., export price index (P_x), import price index (P_m), unit business cost (UBC) and export subsidies ($SBRT_x$).

More specifically, we shall follow Abeysinghe and Yeok methodology with certain adjustments as necessary to fit particularities of Pakistan's economy by decomposing P_x into the following three parts: (i) import price index (P_m), which reflects cost of imported raw materials and intermediate inputs used in the production of exportables. As P_m is expressed in Pak rupees it also captures the effect of nominal exchange rate movements, (ii) unit business cost (UBC), which is a composite index of unit labour cost, and fuel and utilities cost, (iii) export-related subsidies ($SBRT_x$) that reflect the extent to which price paid by foreign importers of the exportable is reduced. It may be noted here that P_x is expressed in Pak rupees.

Theoretically, we expect a high positive correlation between P_x and $P_{m,}$ with a rising trend. We establish here that this correlation is mainly because of depreciation of Pak currency that affects both prices simultaneously and to the extent of import content (of course which is small) in the production of exportables. Moreover, correlation is also high somewhat because of a positive trend in growth in total factor productivity as noted earlier.

The general version of the model is given in Equation (1), it is based on the theory of cointegration technique developed by Granger (1981 and 1983), Granger and Weiss (1983), and Engle and Granger (1987). Cointegration techniques are used to establish long run relationship between variables. An equilibrium relationship exists when variables in the model are cointegrated. In this connection two conditions are important: data series of each variable must be integrated of the same order. Second is the existence of stationary linear combination.

The model proposed here is taken in first-difference to take account of stationarity issue. Empirical technique adopted is cointegration analysis.

$$\Delta \ln P_{X,t} = \beta_1 \Delta \ln P_{m,t} + \lambda_1 \Delta \ln UBC_t + \lambda_3 \Delta \ln SBRT_t + \gamma EC_{t-1} + \varepsilon_t \quad \ldots \qquad (1a)$$

where,

$P_{x,t}$	Export price index in year t,
$P_{m,t}$	Import price index in year t,
$SBRT_{x,t}$	Export subsidies in year t,
UBC_t	Unit business cost in year t,
EC_{t-1}	Error correction term, and
ε_t	Error term.

Some alterations introduced in the Abeysinghe and Yeok model are that, firstly because of non availability of data, we use UBC (based on employment cost and cost of electricity and fuel) and do not include governmental rates and fees. Secondly, we use $SBRT_{x,t}$ which is not included in the Abeysinghe and Yeok model. The reason for using this variable is that it captures the impact of export promotion policies.

In order to estimate the short run and long run dynamics of the model we use error correction (EC) mechanism. Error correction term essentially reveals adjustment towards equilibrium, and combines short run and long run properties of the data to investigate both causal patterns. This mechanism thus is most appropriate to discuss our hypothesis.

Error correction (EC) term can be defined as the following.

$$EC_t = LnP_{x,t} - \alpha_0 - \alpha_1 LnP_{m,t} - \alpha_2 LnUBC_t - \alpha_3 LnSBRT_{xt} \quad \ldots \quad (2)$$

In the presence of nonstationary time series data test for cointegration is applied. This is because we are interested in investigating long run relationship between export competitiveness and exchange rate movements—this includes Engle Granger causality and Johansen multi-variate cointegration approaches. Test for cointegration thus shows which variables of the model form a co-integrating relationship. Needless to say that the cointegrated variables have Error Correction Model (ECM) representation. Cointegration analysis thus provides a formal basis for estimating short run and long run relationships.

Model II- Exchange Rate Volatility and Export Competitiveness Model:

The effects of exchange rate or exchange rate risk on exports if worked out separately may give biased inference, provided they jointly affect exports. This necessitates the simultaneous inclusion of exchange rate and its risk in export-price competitiveness model, which is described in the following.

Generalized Autoregressive Conditional Hetroscedasticity (GARCH) models specify the relationship between means and variances (Engle et al. 1987). In these models residuals are decomposed into two parts: homoscedastic and hetroskedastic. Hetroscedastic part indicate conditional moments because they provide close approximation to the form of hetroscedasticity. GARCH (p,q)-M is the advanced version of the GARCH models, where p and q are restrictions of the model. GARCH (p,q)-M models allow the conditional mean to depend on its own conditional variance. In this study GARCH (1, 2)-M is applied based on Akaike Information Criterion (AIC) and Schwarz Criterion (SC) criteria.

To investigate volatility in exchange rate, the GARCH (1,2)-M model given below will be used to capture the effects of the exchange rate risk through import prices on export-price competitiveness.

$$P_{x,t} = \phi_o + \phi_1 P_{m,t} + \phi_{21} SBRT_{x,t} + \phi_3 UBC_t + \phi_4 f(\delta_t^2) + U_t \quad \ldots \quad (3)$$

$$\delta_t^2 = \alpha_O + \alpha_1 \mu_{t-i}^2 + \beta \delta_{t-i}^2 \quad \ldots \quad (4)$$

The model shows two equations. The mean equation (3) shows the relationship between export-price competitiveness $P_{x,,t}$ and $P_{m,.t}$, $SBRT_x$ and UBC. In addition, the coefficient ϕ_4 measures the trade-off between exchange rate risk and export competitiveness. In other words it explains the compensation to exporter for facing exchange rate risk. The variance equation (4) captures the effect of volatility (fluctuation) in export competitiveness due to the exchange rate risk captured by import–price.

To investigate the effects of shock, impulse response function (IRF) approach is employed. IRF traces the effects of a shock to one endogenous variable on the other variables in the vector autoregressive (VAR).

4.2. Data and estimation procedure

Data have been collected from the Censes of Manufacturing Industries (CMI), Statistical Year Book of the Federal Bureau of Statistics (FBS), International Financial Statistics (IMF) and CBR Year Book (Central Board of Revenue, renamed as Federal Board of Revenue). Variables needed for the estimation of the two models are export price index (P_x), import price index (P_m), export subsidies ($SBRT_x$), and unit business cost (UBC). Annual log transformed data are used from 1970 to 2008 for estimating the model of export price competitiveness. Indices used are based on 1990-91=100.

All time series data are tested for stationarity using the Augmented Dicky Fuller (ADF) test. Stationarity is required to smooth the data in which mean and variance should move around a single point.

4.2.1. *Construction of Variables*

A. Unit Business Cost (UBC)

The unit business cost index is constructed by taking into account ULC and services cost. For services cost, cost of fuel and electricity are taken from CMI, which is divided by the value added of large scale manufacturing industries.

Unit labour cost is calculated as a ratio of employment cost to value added of large scale manufacturing industries using data obtained from the Census of Manufacturing Industries (CMI). Data limitations in calculating ULC are also there. Data for employment cost are not accessible for all years. The CMI is periodically published. To fill data gaps we used interpolation technique.

B. Subsidies (SBRT)

Subsidies data are taken from the Central Board of Revenue. All the data on subsidies were divided by total manufactured goods exported to obtain export subsidy rate (export subsidy and rebate).

4.2.2. *Estimation Procedure*

Following procedure is adopted for estimation of the two models reported earlier.

1- Augmented Dickey Fuller (ADF) test non stationary is applied .

2- Longrun relationship is estimated by Ordinary Least Square (OLS) procedure.

3- Pair wise causal relationship by Engel-Granger (EG) causality test is estimated.

4- Johansen cointegration test is applied based on following steps:

   4.1 Vector Autoregressive (VAR) model.

   4.2 Checking lag length.

   4.3 Cointegration.

   4.4 Vector Error Correction (VEC).

5- Exchange rate risk analysis done by applying Generalized Autoregressive Conditional Hetroscedasticity (GARCH).

6- Impulse response functions (IRF) are checked.

5. Empirical Results

This chapter provides empirical findings of the analysis of determinants of export-price competitiveness, long run and short run relationships of export competitiveness and its determinants. The time varying effect on export competitiveness and exchange rate volatility is captured by applying GARCH (1, 2)-M. Finally the effects of shocks are assessed by impulse response functions. Accordingly, the chapter is divided into three parts: exchange rate depreciation and export competitiveness; exchange rate volatility and export competitiveness; and impulse response functions.

5.1. Exchange Rate Depreciation and Export Competitiveness

A relationship of export competitiveness with its determinants is established here. The analysis will essentially enable us to assess the determinants of export competitiveness in terms of their importance.

5.1.1 *Unit-Root Test*

Prior to conducting the tests of causality, first step is to check the stationarity[4] properties of the data. Augmented Dickey-Fuller (ADF) and t-tests are used to examine all the four time series for the presence of unit root (Dickey and Fuller, 1979).

[4] It is important to check whether the time series are stationary or non-stationary before econometric estimation because use of non-stationary variables in estimation may generate spurious relationship (Asterieou and Hall, 2007).

Table 5.1: ***ADF Unit Root Test for Stationarity***

Variable	At level	At log first difference
$\mathbf{P_x}$	-3.15	-3.36*
$\mathbf{P_m}$	-2.80	-4.40*
$\mathbf{SBRT_x}$	-2.58	-3.91*
UBC	-2.26	-5.97*

Note: * indicate statistical significance at 1% level.

The results of the ADF testing are reported in Table 5.1.[5] All the series are tested as non-stationary at level, however, the series turn out to be stationary at log first difference.

The ADF test indicates the acceptance of the unit root hypothesis at level that is the time series has a unit root. All the series have lower than critical values which imply the presence of unit roots in all variables. The results indicate the first differences of variables of export price, import price, export subsidies rate and UBC are on a stationary process, as the null hypothesis of unit root is rejected. Hence these series are integrated of order 1, i.e., d(1). These results indicate the use of Johansen cointegration technique is suitable because all the time series: export price, import price, $SBRT_x$ and UBC, are integrated in the same order.

5.1.2. Long Run Relationship

The long run relationship is estimated by regressing export-price on import-price, export subsidies and UBC. The OLS technique is used for this purpose. The results are reported in Table 5.2.

The regression results show that import prices are positively associated with export price competitiveness. There is a statistical significant relationship between export prices and import prices. The subsidies given to exporters also influence positively to export competitiveness but they turned out to be statistically insignificant in this analysis. The unit business cost is negatively affecting the export competitiveness. In the following, we elaborate these results.

[5] Preferred test for cointegration is ADF test (Engle and Granger, 1987).

Table 5.2 ***Long Run Relationship between Export Competitiveness and its Determinants***

Variable	Coefficient	t-stat
Import Price (P_m)	0.71*	5.89
Export Subsidies ($SBRT_x$)	0.03	1.36
Unit Business Cost (UBC)	-0.49*	-2.17
Export Price (-1)	0.22**	1.71
Constant	2.15	2.09
Adjusted R^2	0.98	
Durbin-Watson stat	1.74	
F-statistic	676.45	

Note: * indicate statistical significance at 1% level.
** indicate statistical significance at 5% level.

In the presence of a continually depreciating currency, a positive relationship between P_x and P_m indicates that despite rising prices of imported inputs[6], exporters are able to improve export-price competitiveness for their products. This is because of the low import content[7] in the production of exportables that enabled exporters to increase export volumes by 5.27% per annum over the period of study. This finding enables us to conclude that with lower import content exchange rates depreciation play a favorable role to improve export competitiveness. Besides favorable exchange rate changes, simultaneous productivity gains have positively contributed in the improvement of export-price competitiveness. This can be noted from the overall growth in total factor productivity reported in Table 3.2, of course, with the exception of a few years when the growth in productivity was negative. All in all, this led us to conclude that when positive changes in domestic value added outweigh the negative effect of import content due to devaluation then the result is improvement in export-price competitiveness.

Impact of subsidies on export competitiveness is insignificant. Normally, export subsidies are instrumental in increasing export competitiveness in the presence of learning by doing. Besides, intra-industry knowledge spill over associated with this process can also stimulate competitiveness. But all of these are apparently missing in Pakistan's manufacturing industries. Therefore, the results about the relationship do indicate of ground reality.

The unit business cost has turned out to be highly significant in explaining export competitiveness. It may be underlined here that export firms face cost-price squeeze due to intense competition at the global market place. Pakistani firms often clamor about their loss in competition due to increase in cost of doing business in the country. Contrary to their complaint we found that UBC grew negatively (-7.54 % per annum) over the study period. This fact supports our finding of a continuous growth in export.

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[6] We have used here imported crude material price index. We have also tried alternative specifications by using chemicals; and average of crude materials and chemicals price index. These results are reported in the Annexure table II and III respectively.

[7] Between 1987 and 2001 Badar (2006) found import content in production of exportables as 18%.

In the above regression lag dependent export-price is also introduced. Introducing lag dependent variable in the regression improves the explicative powers of the model. The idea behind is to see whether there is inertia behind export pricing. In this regression analysis lag value of export-price takes into account the effects of the previous year/one-period lag. The coefficient of lag dependent export variable is positive which shows the effect of a one period lagged export prices on current period export prices, which is statistically significant. The inertia in the model predicts that it allows for gradual adjustment of export prices.

5.1.3. *Theory of Cointegration*

Having established the fact that all the variables are integrated of order one, the next step is to test for cointegration between the variables on levels. Two time series are cointegrated when a linear combination of time series is stationary, even though each series may individually be nonstationary. Nonstationary time series do not return to their long run average values following a disturbance, it is therefore important to transform them to stationary processes, other wise regressing one nonstationary process on another nonstationary process can cause spurious results.

To investigate the relationship among export-price, import-price, UBC, and subsidies, the long run relation is estimated by using the Engle-Granger's (EG) cointegration and Johansen methods. In the existence of nonstationary time series the recommended approach to test for Granger Causality is Co-integration and Error-Correction framework [Engle and Granger (1987)]. Time series data in this analysis fulfill the requirement of nonstationarity and is integrated of order one.

5.1.4. *Pair-wise Granger Causality Test*

Within a vector autoregression (VAR) framework, the concept of Granger causality is used to examine the relationship among export-price, import-price, export subsidies, unit business cost (whether the variables have common stochastic trend or not).

Granger causality is concerned with short run forecastability. For a pair of series to have an attainable equilibrium, there must be some Granger causation between them to provide necessary dynamics. If the lagged series have non-zero coefficients then there is causality in both directions (Maddala and Kim,1998). Test of Granger causality is based on the following VAR model.

$$X_t = \alpha_0 + \sum_{i=1}^{m} \alpha_i X_{t-i} + \sum_{j=1}^{n} \beta_j y_{t-i} + \mu_t$$

$$Y_t = \alpha_0 + \sum_{i=1}^{p} \gamma_i y_{t-i} + \sum_{j=1}^{q} \gamma_i X_{t-i} + \mu_t'$$

Table 5.3 reports the results of Granger causality test. Column 3 shows F-statistic for the joint significance of variables. F-statistic is useful to find the presence of causality. The significance of F-Statistic at 5% level shows that there is unidirectional long run causal relationship between import-prices and export-prices. The significance of F-statistic at 10% shows there is causal relationship between $SBRT_x$ and export-prices. The F-statistics is insignificant in case of UBC and export-price and indicate no causal relationship between UBC and export-prices.

Table 5.3: ***Granger Causality Test***

Direction of causation	*No. of observations*	*F-Statistic*	**Probability**
Import Price to Export Price	36	3.69**	0.036
Export Price to Import Price		0.458	0.636
$SBRT_x$ to Export Price	36	3.272***	0.051
Export Price to $SBRT_x$		0.515	0.602
UBC to Export Price	36	0.154	0.857
Export Price to UBC		0.505	0.608

Note: ** indicates statistical significance at 5% level.
*** indicates statistical significance at 10% level.

5.1.5. *Johansen Cointegration Test*

The purpose of cointegration test is to determine whether a group of nonstationary time series is cointegrated or not. The cointegration procedure developed in Johansen (1991) and Johansen and Juselius (1990) are performed to determine the nature of longrun cointegrating relationship in the model. The testing of null hypothesis for non co-integration against the alternative hypothesis, which means the existence of co-integration.

The Johansen-procedure is preferred over Engle and Granger's (1987) regression based technique because it fully captures the underlying time series properties of the data and provides estimates of all the co-integrating vectors that exist within a vector of variables. It shows whether the system consists of a unique cointegrating vector or a linear combination of several cointegrating vectors. Johansen's procedure applies maximum likelihood to the VAR model.

$$Y_{1t} = \mathrm{A}_1 Y_{t-1} + ... + \mathrm{A}Y_{t-k} + U_t \qquad \text{for, } t = 1, \ldots, \mathrm{T}$$

where, $\mathrm{Y_t}$ is an n-vector of I(1) variables (Maddala and Kim, 1998).

A- VAR Estimates

The vector autoregression (VAR) model is one of the most successful and easy to use model for the analysis of multivariate time series. It is a natural extension of the univariate autoregressive model to dynamic multivariate time series. The VAR model has proven to be especially useful for describing the dynamic behavior of economic and financial time series and for forecasting. It often provides superior forecasts to those from univariate time series models and elaborate theory-based simultaneous equation models.

B- Lag selection

Lags are specified as lags of first difference terms used in auxiliary regression, not in terms of levels. Lag length is selected using Akaike Information Criterion (AIC) and Schwarz Criterion (SC) criteria. In this case lag length is selected as 1. The results are reported in Table 5.4.

C- Johansen test (VAR cointegration)

Johansen (1988) and Johansen and Juselius (1990) derived the likelihood ratio test for the hypothesis of r cointegrating vectors or $\Pi = \alpha\beta'$.Johansen procedure has two test statistics for testing cointegrating rank. These two tests are Trace test and maximum Eigen value test.

The likelihood ratio test statistic for the null hypothesis that there are at most r cointegrating vectors against the alternative of more than r cointegrtaing vectors is the trace test as given below:

$$Trace = -T\Sigma_{i=r+1}^{p} \ln(1-\lambda_i)$$

Where $\lambda_{r+1,\ldots,} \lambda_p$ are p-r smallest estimated eigen values.

The likelihood ratio test statistic for the null hypothesis of r cointegrating vectors is the maximal eigenvalue test and is given by

$$\lambda_{\max} = -T\ln(1-\lambda_{r+1})$$

Johansen test provides trace test and maximum eigenvalue test (Tables 5.5 and 5.6). Table 5.5 shows, with the null hypothesis of cointegration (r=0) among the variables, the Trace statistic is 58.27, which is greater than 54.07 critical value at 5%. Hence it rejects the null hypothesis r=0 in favour of alternative hypothesis r≥1. The procedure is carried out by selecting lag 1 and the assumption of including constant without trend.

Table-5.4: ***Statistics for VAR Lag Order Selection***

Lag	FPE	AIC	SC	HQ
0	1.41e-05	0.1803	0.358	0.241
1	1.34e-08*	-6.783*	-5.894*	-6.476*
2	1.96e-08	-6.443	-4.843	-5.890
3	2.76e-08	-6.201	-3.890	-5.403

*indicates lag order selected by the criterion.

FPE: Final Prediction Error
AIC: Akaike Information Criterion
SC: Schwarz Information Criterion
HQ: Hannan-Quinn Information Criterion

Table 5.5: ***Trace Test Statistics***

Null Hypothesis	Alternative Hypothesis	Eigen value	Trace Statistic (Probability)	95% Critical Value
r=0	r≥1	0.555	58.27 (0.02)	54.07
r≤1	r≥2	0.423	29.08 (0.19)	35.19
r≤2	r≥3	0.171	9.27 (0.71)	20.26
r≤3	r≥4	0.067	2.51 (0.67)	9.16

Note: Probability reported in parenthesis. r denotes number of cointegrating vectors.

Table 5.6: ***Maximum Eigen value Test***

Null Hypothesis	Alternative Hypothesis	Eigen value	Maximum Eigen value	95% Critical value
r=0	r=1	0.555	29.19 (0.04)	28.58
r≤1	r=2	0.423	19.81 (0.10)	22.29
r≤2	r=3	0.171	6.76 (0.69)	15.89
r≤3	r=4	0.067	2.51 (0.67)	9.16

Note: Probability reported in parenthesis.

r denotes number of cointegrating vectors.

For maximum eigen value test (Table 5.6) the null hypothesis of no cointegration (r=0) is rejected at 0.05 level of significance in favour of specific alternative, that there is one cointegrating vector, r=1.

However, the null of atmost one cointegrating vector cannot be rejected in favour of r=2. It can be concluded that there is only one cointegrating vector based on trace statistics and eigenvalue at 0.05 level.

The purpose is to see if all the variables in the model enter into a longrun equilibrium relationship. This procedure follows testing linear restrictions on the cointegrating vectors after normalization. The hypothesis of longrun exclusion of each variable is tested using a likelihood ratio test. If the test statistic exceeds 95% critical value then the coefficients are significant. This shows longrun equilibrium relationship.

The empirical support for one cointegrating vector implies that there exists a stable linear long run relationship of export competitiveness with its determinants. Moreover all the four variables export price, import price, export subsidies and UBC are cointegrated and follow a common longrun path.

Cointegrating Vectors and Likelihood Ratio Test

After finalizing the number of cointegrating vectors, and Likelihood Ratio Test explains the existence of negative or positive relationship among variables.

$$P_x = 0.72\ P_m + 0.08\ SBRT_x - 0.86\ UBC \quad \ldots \quad (5)$$

(0.10) (0.04) (0.41)

In equation (5) Likelihood Ratio test of cointegrating vector is normalized on export price. This is done by setting the estimated coefficient on P_x equal to -1 and dividing each cointegrating vector by negative of estimated P_x coefficient. The results show positive relationship of import-price and $SBRT_x$, while UBC has a negative relation with export-price. The result of this normalization also yields estimates of long run elasticities. Import-price and $SBRT_x$ are positively related to export-price. The long term elasticity estimate ranges from a low of 0.08 of import-price to high of 0.86 of UBC. The

coefficient of the error correction term is the adjustment elasticity, which, for stability must be negative. This indicates that when the system is not at long-run equilibrium, it will be moving towards it.

Johansen procedure enables us to show adjustments through adjustment coefficient results which show the magnitude and direction of adjustment to move again towards equilibrium. Results show coefficients of export price, import price and export subsidies are significant. The insignificance of UBC implies weak exogeneity (that is the variable is not determined within the system), otherwise it is endogenous. The weak exogeneity of UBC means that it is the initial receptor of external shocks, and it in turn will transmit the shocks to other variables in the model. As a result the equilibrium relationship will get disturbed. The adjustment back to equilibrium can be inferred from the signs and magnitude of coefficients in VEC model. The weak exogeniety of UBC may be due to the effect of government policies on labour costs and varying costs of fuel and electricity due to external shocks.

Table 5.7: ***Adjustment Coefficients***

Variables	Coefficients	Standard Error
ΔP_x	0.53*	0.113
ΔP_m	0.42*	0.116
$\Delta SBRT_x$	0.57*	0.233
ΔUBC	0.01	0.057

Note: * indicate statistical significance at 1%.

** indicates statistical significance at 5%.

*** indicates significance at 10%.

D- Error Correction Model

The error correction model (ECM) was first introduced by Sargan (1964) and has been popularized by Davidson *et al.* (1978). ECM is viable alternative to the VAR model. An ECM combines the short run dynamics with the long run properties of the data and provides ways for investigating both short run and long run causal patterns. The ECM shows the convergence of the system to the long run equilibrium implied by cointegtating regression. The coefficient of Error Correction Model includes information about whether the past values of variables affect the current value of the variables under study. The size and statistical significance of the co-efficients of the Error Correction Model measures the tendencies of each variable to return to equilibrium. The ECM measures short run dynamics while cointegration relationship gives long run relationship (Madalla and Kim, 1998).

The vector error specification (VEC) only applies to cointegrated series, and for this purpose Johansen cointegration test has been applied prior to VEC specification. This confirms that the variables are cointegrated and determines the number of cointegrating equations.

The cointegration term is known as the error correction (EC) term as the deviation from the long-run equilibrium is corrected gradually through a series of partial short-run adjustments. In EC equation, the estimated results show the coefficients of import-price and export subsidies are statistically significant. The coefficient of UBC is insignificant.

To determine the direction of causality, the Error Correction Model technique is used. An error correction model investigates short run and long run causal patterns. The Error correction model will adopt the following system for four variables.

$$\Delta P_x = \alpha_1 + lagged(\Delta P_x, \Delta P_m, \Delta SBRT_x, \Delta UBC) + \lambda_1 e(-1)$$

$$\Delta P_m = \alpha_2 + lagged(\Delta P_x, \Delta P_m, \Delta SBRT_x, \Delta UBC) + \lambda_2 e(-1)$$

$$\Delta SBRT_x = \alpha_3 + lagged(\Delta P_x, \Delta P_m, \Delta SBRT_x, \Delta UBC) + \lambda_3 e(-1)$$

$$\Delta UBC = \alpha_4 + lagged(\Delta P_x, \Delta P_m, \Delta SBRT_x, \Delta UBC) + \lambda_4 e(-1)$$

Where $e(-1)$ is the lagged value of the error-correction term. The error correction term captures the long run relationship while the short run relationship is captured by the lagged values of the differenced terms.

The VEC is estimated for all the four variables for the sample period 1970-2008 and one period lag is introduced. It presents the short run dynamic relationship in error correction models, which indicate error correction (built in adjustment mechanism) such that any change in variables adjusts the long run and short run equilibrium in export performance of manufacturing sector. The R^2 ranges from 0.06 to 0.50 (see Table 5.8). These R^2 values are normal for regressions based on first difference in variables. The coefficients of the first difference terms are short run elasticities because the variables are in natural logarithms. The partial short run coefficients for export-price and export subsidies are significant at 1% level.

Table 5.8: ***Causality based on Error Correction Models***

Error Correction Estimates in Short run

	lag	ΔP_x	ΔP_m	$\Delta SBRT_x$	**ΔUBC**
CointEq1		-0.534*	-0.424*	-0.571*	-0.019
		[-4.710]	[-3.638]	[-2.446]	[-0.345]
Δp_x	1	0.105	0.355*	0.213	-0.057
		[0.638]	[2.093]	[0.627]	[-0.691]
ΔP_m	1	0.098	-0.240	-0.273	0.093
		[0.447]	[-1.068]	[-0.606]	[0.993]
$\Delta SBRT_x$	1	-0.137***	-0.135***	0.106	-0.031
		[-1.599]	[-1.535]	[0.606]	[-0.725]
ΔUBC	1	0.177	0.165	-1.076	-0.068
		[0.498]	[0.451]	[-1.470]	[-0.383]
R^2		0.50	0.23	0.16	0.06

Note: t-values reported in parenthesis. * indicate statistical significance at 1%.*** indicate statistical significance at 10%.

5.2. Exchange Rate Volatility and Export Competitiveness

From the above analysis it is evident that in case of Pakistan exchange rate depreciation clearly improves export-price competitiveness. The unexpected devaluations and appreciation can have significant impact on export-price competitiveness. For a stable and sustained export growth, it is important to understand the effects of exchange rate risk on export competitiveness before considering exchange rate change as a policy option.This section argues that exchange rate risk provide another channel to affect export competitiveness. In the literature there emerge two views: traditional view is that exchange rate depreciation stimulates exports and curtails imports, while the recent view is that exchange rate risk hampers exports, providing a rational for foreign exchange policies to reduce exchange rate fluctuations (Fang and Miller, 2004).

Exchange rate risk could have positive or negative effects or zero effect. If this effect is negative it may offset or even dominate positive contributions from depreciation.Exporters react differently to the exchange rate and its associated risk (Fang *et al.,* 2005). The effect of exchange rate volatility depends on trader's attitude to risk which may be risk averse or risk neutral. If traders are risk neutral, exchange rate uncertainty will be an opportunity to increase profits, thereby boosting trade flows (Franke, 1991). In case when exchange rate uncertainty leads to profit risk the demand for exports falls. The net effect on exports include exchange rate depreciation and its volatility (Fang and Miller, 2004). Conditions vary across countries and each country evaluates the issue based on its own merits. Exchange rate depreciation typically improves exports but its contribution is generally small. Exchange rate volatility can be assessed by different methods: absolute percentage change method, the moving average of standard deviation, deviations from trend, the residual from an autoregressive integrated moving average (ARIMA) model, and (G)ARCH-type model. Exchange rate volatility will be assessed by employing GARCH-M (1,2) technique in the following section. (G)ARCH-type models allow us to capture non-constant time varying

conditional variance, and it describes volatility clustering and other charesteristics of financial time series, such as excess kurtosis and fat-tailedness (Cheong, *et al.* 2002).

5.2.1. *ARCH and GARCH Models*

ARCH models consider two distinct specifications—one for the conditional mean and one for the conditional variance. The ARCH model of volatility clustering expresses the conditional variance of the regression error as a function of squared regression errors. The GARCH model augments the ARCH model to include lagged conditional variances as well. ARCH and GARCH models are estimated by the method of maximum likelihood. An important application of ARCH and GARCH models is to measure and forecast the time varying volatility. In developing an ARCH model, two distinct specifications are considered—one for the conditional mean and one for the conditional variance.

The GARCH (p,q) process defined as

$$\sigma_t^2 = \omega + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2 + \sum_{i=1}^{q} \alpha_i \mu_{t-i}^2$$

$$i = 1,....,q, j = 1,....p$$

The conditional variance is the linear function of q lags of the square of the error terms or the ARCH terms and p lags of the past values of conditional variance or the GARCH terms.

The risk behavior of exchange rate is estimated and captured by GARCH (1, 2)-M model which is selected by applying AIC and SC criteria. GARCH (1, 2)-M model adds a hetroscedasticity term in the mean equation as it allows the conditional mean to depend on its own conditional variance (Enders, 1995). GARCH (1, 2) technique adopted for this research is frequently used to measure risk because it is parsimonious (limited variables) explanation of the risk. This model allows conditional mean to depend on its own conditional variance.

The model consists of two equations. The mean equation captures the objective relationship. The mean exchange rate equation explains autoregressive process which means previous exchange rates effect current rate and captures effect of risk on competitiveness. Variance equation captures volatility of risk and GARCH (1, 2)-M equation explains how much variance (risk) is effected by past lag residuals.

Table 5.9 shows the effects of exchange rate fluctuation on export competitiveness. In this model, import-price index (P_m) captures variability in exchange rate. In estimating GARCH-M, several specifications of ARCH and GARCH term are tried. The specification with GARCH (1, 2)-M is adopted to capture the risk effect, while this selection is based on AIC and SB criteria. The GARCH-M term is positive and significant indicating that exchange rate risk has positive and significant compensation, and effects export competitiveness.

Exchange rate depreciation raises export price which reflect risk averse behaviour of Pakistani exporters who are will decrease export-price in presence of exchange rate risk. This result enables us to see effect of exchange rate depreciation and exchange rate risk. It can be said that the effect of exchange rate depreciation and exchange rate risk is negative as exchange rate volatility is significant for export-price. The effect supports the view that depreciation stimulates exports but exchange rate risk discourages export .The risk averse exporter reduces export volumes and this reduction reduces his profits. Import price and export subsidies affect export competitiveness positively and are statistically significant. The unit business cost negatively influence the export competitiveness but it is significant at 5 %.

Variance equation explains how much variance (risk) is affected by the past lag residuals and how much is influenced by past variance. In Table 5.9 GARCH terms are significant at 10 % and this shows previous variance (risk) is significantly contributing to current variance (risk).

Table 5.9: ***Export Competitiveness with GARCH (1, 2)-M***

Variables	Coefficients	Z-statistics
Mean Equation		
GARCH-M	0.108***	2.073
C	1.480***	1.884
P_m	0.522**	9.366
$SBRT_x$	0.071**	3.894
UBC	-0.365**	-2.182
Export(-1)	0.374**	7.205
Variance Equation		
C	0.0014***	0.619
ARCH(1)	0.804	1.486
GARCH(1)	-0.298***	-1.708
GARCH(2)	0.385***	1.695
Adjusted R-squared	0.98	

Note: * indicate statistical significance at 1%.
** indicates statistical significance at 5%.
*** indicates statistical significance at 10%.

5.3. Impulse Response Functions

Impulse response function (IRF) technique is applied here, which is based on unrestricted VAR analysis discussed earlier in order to quantify the impact of shocks of import-price, export subsidy and unit business cost on export-price competitiveness. IRF measure the time profiles of the effects of shocks at a given point in time on the future values of variables in dynamic system. The technique allows estimating impulse response function based on Choleski decomposition of the covariance matrix of the residuals in VAR. The order of variables is import-price, export subsidies and unit business cost. The technique is employed in two directions: impulse response analysis of export-price to import-price to export subsidies and UBC; and Impulse response analysis of import-price to export-price, UBC to export-price, and export subsidies to export-price.

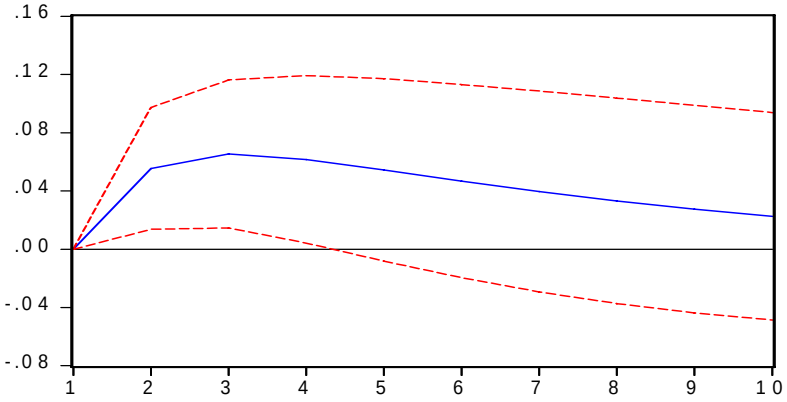
The VAR is estimated with one lag and a constant. Figure I represent the plot of impulse response function to a unit shock estimated as export price to import price, export subsidies and UBC. The size of shock is scaled such that export competitiveness rises by one standard error.

The first diagram in Figure I reports that the response of export-price to import-price is positive and converges towards equilibrium. It shows that a shock of import price on export-price shows an increase up till third period but gradually decreases afterwards. It is clear that shock of P_m is observed to become half after third period. The second diagram explains response of export-price to export subsidies is positive. It shows that a shock of export subsidies cause a slight increase in export price at first then stays positive. It remains higher than the initial level. This impact of export subsidies is permanent. The third diagram shows response of export price to due to a shock in UBC. The export-price decreases till second period and remains lower than initial level. The impact of UBC is permanent. The results thus show export competitiveness is affected positively by import price and export subsidies and negatively by UBC.

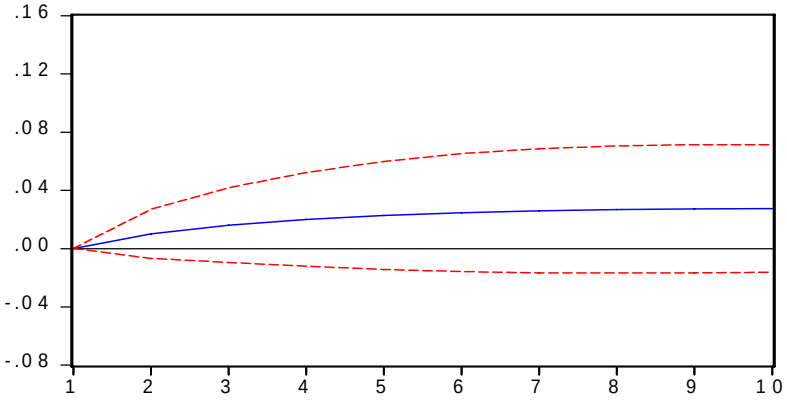
Fig I

Response to Cholesky One S.D. Innovations ± 2 S.E.

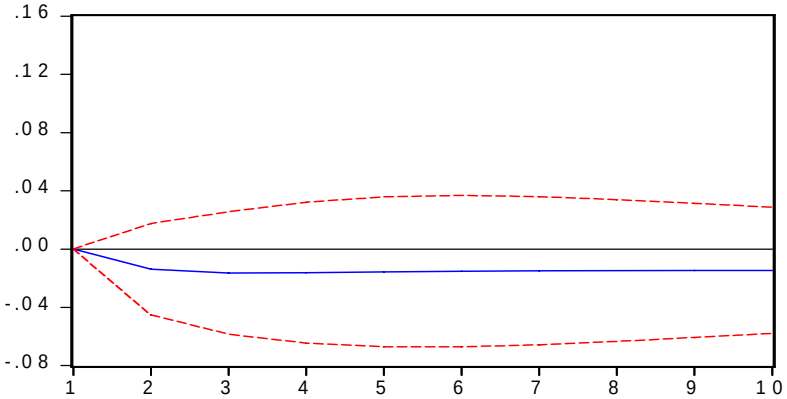
Response of P_X to P_M



Response of P_X to $SBRT_x$



Response of P_X to UBC



6. Conclusion and Policy Recommendations

Main aim of this thesis was to study export-price competitiveness of Pakistan's manufacturing sector. More specifically, it focuses on the assessment of Pakistan's trade position in the world market, empirically testing the importance of price of imported raw materials and intermediate inputs, productivity improvements, business costs, subsidies and the changing impacts of exchange rate for export-price competitiveness of the country, and investigating the effects of exchange rate volatility (risk) on export competitiveness.

The empirical analysis is performed in two parts: assessment of exchange rate changes on export-price competitiveness of Pakistan's manufacturing sector, and exchange rate risk analysis for export competitiveness.

Export-price is used to indicate export competitiveness. From our analysis import-price, unit business cost and exchange rate depreciation (as captured in import price) are found as important determinants of export competitiveness.

The relationship between export-price and import-price needs a special mention. This is because the lower import content in the production of exportables allows exchange rate depreciation to significantly impact favorably the export-price competitiveness. In addition to exchange rate changes, productivity gains also contribute to enhance export competitiveness. Thus positive changes in domestic value added in the presence of currency adjustment play an important role in improving export-price competitiveness. The analysis thus shows that exchange rate adjustments have direct impact on Pakistan's export prices and it is an important component that reflects international competitiveness of the domestic export-oriented manufacturing industries.

It needs to be underscored here that exporters react differently to the exchange rate and its associated risk. For this purpose the export competitiveness analysis is extended with a focus on exchange rate risk analysis through GARCH (1, 2)-M. The effect of exchange rate risk/volatility depends on exporter's attitude to risk, which may be

risk averse or risk neutral. The main advantage of exchange rate risk analysis is to see whether the exporters are affected by exchange rate risk or not. Findings of GARCH (1, 2)-M analysis reveal that exchange rate risk has positive and significant compensation, effecting export competitiveness. This shows that in case of Pakistan the traditional view (Mundell-Flemming model) holds true when studied in isolation i.e. exchange rate depreciation stimulates exports and curtails imports. But this is only a part of the explanation. At the same time we find that the exchange rate risk deteriorates export competitiveness.

The net effect on export competitiveness thus includes both the exchange rate depreciation and its risk/volatility. We find that the exchange rate depreciation stimulates exports but the exchange rate risk plays a significant role in influencing export price that results into weak export growth. Impulse response functions that assess the impact of shocks to export-price competitiveness show positive and statistically significant relationship with import-price and export subsidies while UBC shows a negative relationship.

The empirical results of this research lead to several policy implications. Our analysis shows significance of import-price (also reflecting changes in exchange rate), export subsidies on export competitiveness. Policymakers thus need to carefully watch movements in import prices, export subsidies and exchange rate.

There is a need to create a synergy between trade policy and exchange rate policy. Reduction in exchange rate fluctuations (stabilized exchange rate) and reducing anti-export bias (reduction in tariff, removal of quantitative restrictions on imports) will be desirable policy instruments. Besides export promotion policies will be useful to reduce anti-export bias and make exports more competitive.

Exchange rate volatility affects exports through exporter's responses to perceived risk. Policy makers may consider prudent foreign exchange market interventions since

exchange rate risk factor do offset positive effects of depreciation, if exporters start behaving as risk averse exporters.

On the policy front, not only timely adjustments to exchange rate are important in order to maintain and improve export-price competitiveness but ensuring continuous improvement in total factor productivity is also necessary. We further offer the following suggestions for policy making:

- UBC turned out to be a significant variable and is negatively growing a good omen. We therefore suggest that the government may take such policy measures that ensure smooth availability of fuel and electricity at competitive rates.
- We strongly support the policy of the government of Pakistan of moving away from subsidies to the provision of "public goods" (infrastructure and trade facilitation) for enhancing export competitiveness. In this regard, we recommend that the government ensures provision of efficient and quality public goods.
- We recommend that the government may take measures to enable exporting firms in upgrading and meeting international standards by streamlining technology development. This would enable industries to achieve high growth in total factor productivity.

Limitations of the Analysis

Getting reliable data on wages and employment cost to construct unit labour cost is quite difficult. The only source to obtain employment cost is CMI, but it is periodically published, as such we had to interpolate and extrapolate the data.

Data on crude materials, the index of unit value import, is used as a proxy for import-prices (we have also performed our analysis for import price of chemicals, and by combining import prices of chemicals and crude materials. These analyses are reported in Annexure II and III).

In this study data on the manufacturing sector of Pakistan is used at the aggregate level. Future studies can perform such analysis for major export commodities to enhance understanding about issues faced by the export sector. Analysis can also be extended by considering major export partners of Pakistan.

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Annexure I

Annexure I includes the following tables

1- Vector Autoregressive Estimates

2- Variance Decomposition Table

3- Impulse Response to Cholesky One S.D Innovation

Table1: Vector Error Correction Estimates

Cointegrating Eq:	CointEq1			
EXPORT(-1)	1			
CRLN(-1)	-0.813631			
	-0.07239			
	[-11.2389]			
SBRT(-1)	-0.080852			
	-0.03279			
	[-2.46588]			
UBC(-1)	0.81131			
	-0.2848			
	[2.84875]			
C	-3.761765			
Error Correction:	D(EXPORT)	D(CRLN)	D(SBRT)	D(UBC)
CointEq1	-0.849795	-0.45827	-0.38789	-0.06755
	-0.17563	-0.18704	-0.3863	-0.0916
	[-4.83858]	[-2.45019]	[-1.00413]	[-0.73741]
D(EXPORT(-1))	0.295618	0.392442	0.182843	-0.03122
	-0.17257	-0.18378	-0.37957	-0.09001
	[1.71302]	[2.13539]	[0.48171]	[-0.34684]
D(CRLN(-1))	-0.059077	-0.31213	-0.21763	0.094797
	-0.2264	-0.24111	-0.49797	-0.11809
	[-0.26093]	[-1.29456]	[-0.43702]	[0.80278]
D(SBRT(-1))	-0.107407	-0.1337	0.140305	-0.02636
	-0.08235	-0.0877	-0.18114	-0.04295
	[-1.30422]	[-1.52444]	[0.77458]	[-0.61360]
D(UBC(-1))	0.200269	0.202629	-1.07167	-0.071
	-0.34594	-0.3684	-0.76089	-0.18043
	[0.57892]	[0.55002]	[-1.40846]	[-0.39349]
C	0.093856	0.104604	0.130085	-0.00168
	-0.02839	-0.03023	-0.06244	-0.01481
	[3.30627]	[3.46019]	[2.08343]	[-0.11343]
R-squared	0.552597	0.250438	0.127394	0.087117
Adj. R-squared	0.47803	0.125511	-0.01804	-0.06503
Sum sq. resids	0.377614	0.428256	1.826822	0.102725
S.E. equation	0.112192	0.119479	0.246767	0.058516
F-statistic	7.410723	2.004676	0.875958	0.572586
Log likelihood	30.95145	28.68616	2.575153	54.38419
Akaike AIC	-1.386192	-1.26034	0.190269	-2.68801
Schwarz SC	-1.122272	-0.99642	0.454189	-2.42409
Mean dependent	0.102902	0.094284	0.146398	0.00068
S.D. dependent	0.155289	0.127766	0.244571	0.056702
Determinant resid covariance (dof adj.)	1.94E-08			
Determinant resid covariance	9.33E-09			
Log likelihood		128.4883		
Akaike information criterion	-5.58268			
Schwarz criterion		-4.35106		

Table 2: Variance Decomposition

Variance Decomposition of EXPORT:

Period	S.E.	EXPORT	CRLN	SBRT	UBC
1	0.1241	100	0	0	0
2	0.159286	86.73778	12.1026	0.404979	0.754643
3	0.18483	76.12341	21.4703	1.056816	1.349476
4	0.203724	69.59451	26.82631	1.833446	1.745732
5	0.217864	65.57116	29.69424	2.692798	2.041805
6	0.228674	62.96853	31.12911	3.608231	2.294135
7	0.237139	61.18759	31.72724	4.556454	2.528708
8	0.243929	59.89842	31.82864	5.51648	2.756457
9	0.249499	58.91322	31.63552	6.470111	2.981157
10	0.254165	58.12152	31.27295	7.40232	3.20321

Variance Decomposition of CRLN:

Period	S.E.	EXPORT	CRLN	SBRT	UBC
1	0.123913	38.00774	61.99226	0	0
2	0.16822	34.251	65.54395	0.147593	0.05746
3	0.196291	32.64341	66.79476	0.43173	0.130091
4	0.215517	31.98226	66.98047	0.823897	0.213374
5	0.229271	31.76673	66.61911	1.304138	0.310028
6	0.239436	31.76562	65.95871	1.853983	0.421682
7	0.247161	31.86304	65.13332	2.455463	0.548177
8	0.253185	31.99756	64.22303	3.091472	0.687938
9	0.257999	32.1359	63.27928	3.746343	0.838474
10	0.261936	32.26043	62.33644	4.406306	0.996823

Variance Decomposition of SBRT:

Period	S.E.	EXPORT	CRLN	SBRT	UBC
1	0.225234	0.984186	1.171581	97.84423	0
2	0.308404	0.563251	5.161126	93.73751	0.53811
3	0.368602	0.699027	8.390056	89.38537	1.525551
4	0.416188	1.013094	10.70933	85.60962	2.667951
5	0.455106	1.375896	12.32733	82.50567	3.791108
6	0.487476	1.739137	13.44456	80.0012	4.815104
7	0.514668	2.08407	14.20933	77.99307	5.713528
8	0.53767	2.403858	14.72603	76.38393	6.486179
9	0.557235	2.696802	15.06772	75.09144	7.144041
10	0.573955	2.963471	15.2858	74.04898	7.701754

Variance Decomposition of UBC:

Period	S.E.	EXPORT	CRLN	SBRT	UBC
1	0.053871	0.927367	8.22719	0.825426	90.02002
2	0.067143	2.24058	14.4168	0.783645	82.55898
3	0.073388	2.991074	17.57365	0.727216	78.70806
4	0.076479	3.398278	19.11056	0.682923	76.80824
5	0.078047	3.624007	19.85782	0.656012	75.86216
6	0.07886	3.754196	20.22335	0.645056	75.3774
7	0.079295	3.832666	20.40278	0.646588	75.11796
8	0.079536	3.882101	20.49048	0.65693	74.97048
9	0.079677	3.914616	20.53247	0.672926	74.87998
10	0.079763	3.936905	20.55149	0.692139	74.81947

Cholesky Ordering: EXPORT CRLN SBRT UBC

Table 3: Impulse Response to Cholesky (d.f. adjusted) One S.D Innovation

Response of EXPORT:

Period	EXPORT	CRLN	SBRT	UBC
1	0.1241	0	0	0
2	0.081279	0.055414	0.010137	-0.01384
3	0.063233	0.0653	0.016071	-0.01642
4	0.053654	0.061637	0.019998	-0.01623
5	0.047317	0.054409	0.022742	-0.01564
6	0.042475	0.04673	0.024671	-0.01518
7	0.038491	0.039546	0.025991	-0.01491
8	0.035094	0.033116	0.026834	-0.01477
9	0.032141	0.02747	0.027299	-0.01469
10	0.029546	0.022565	0.027464	-0.01461

Response of CRLN:

Period	EXPORT	CRLN	SBRT	UBC
1	0.076393	0.097563	0	0
2	0.0621	0.095021	0.006463	-0.00403
3	0.053714	0.084785	0.011162	-0.00582
4	0.047723	0.073313	0.014708	-0.007
5	0.042933	0.062512	0.017402	-0.00799
6	0.038895	0.052871	0.019426	-0.00888
7	0.035406	0.044443	0.020908	-0.00965
8	0.032351	0.037143	0.021948	-0.0103
9	0.029656	0.030857	0.022627	-0.01082
10	0.027263	0.025465	0.023011	-0.01122

Response of SBRT:

Period	EXPORT	CRLN	SBRT	UBC
1	-0.022345	-0.02438	0.222793	0
2	0.006037	-0.06569	0.198796	-0.02262
3	0.020348	-0.08056	0.179692	-0.03951
4	0.028374	-0.08456	0.163833	-0.05048
5	0.03309	-0.08356	0.150334	-0.05684
6	0.035819	-0.0801	0.138643	-0.05992
7	0.037251	-0.07543	0.128382	-0.06076
8	0.037801	-0.07024	0.119278	-0.06014
9	0.037743	-0.06493	0.111127	-0.05859
10	0.037263	-0.05974	0.103772	-0.05647

Response of UBC:

Period	EXPORT	CRLN	SBRT	UBC
1	-0.005188	0.015452	0.004894	0.051112
2	-0.008608	0.020278	0.003373	0.033309
3	-0.007751	0.01722	0.001959	0.022739
4	-0.006138	0.013089	0.000883	0.015925
5	-0.004688	0.009581	0.000122	0.011332
6	-0.003567	0.006934	-0.0004	0.008166
7	-0.002741	0.005019	-0.00074	0.005959
8	-0.002144	0.003656	-0.00095	0.00441
9	-0.001712	0.002691	-0.00108	0.003318
10	-0.001399	0.00201	-0.00115	0.002543

Cholesky Ordering: EXPORT CRLN SBRT UBC

Annexure II

Annexure II includes following tables:

1. Long run Relationship Model (Data on chemicals are used as representative to import price)
2. Pair wise Granger Causality Test
3. Johanson Cointegration Test
4. Vector Error Correction Estimates
5. GARCH Model

Table 1: Longrun Relationship

Dependent Variable: EXPORT
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.12358	1.514891	2.061917	0.048
CHSLN	0.618467	0.164906	3.750418	0.0008
SBRT	0.033004	0.043825	0.75309	0.4573
UBC	-0.55509	0.321546	-1.7263	0.0946
EXPORT(-1)	0.198274	0.204336	0.970333	0.3396
AR(1)	0.188226	0.230716	0.815835	0.421

R-squared	0.985398	Mean dependent var	4.624156
Adjusted R-squared	0.982965	S.D. dependent var	0.861915
S.E. of regression	0.112497	Akaike info criterion	-1.38078
Sum squared resid	0.379665	Schwarz criterion	-1.11686
Log likelihood	30.85396	F-statistic	404.9109
Durbin-Watson stat	1.538761	Prob(F-statistic)	0

Inverted AR Roots	0.19

Table 2: Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Probability
CHSLN does not Granger Cause EXPORT	36	3.81165	0.03311
EXPORT does not Granger Cause CHSLN		5.89995	0.00674
SBRT does not Granger Cause EXPORT	36	3.27235	0.05136
EXPORT does not Granger Cause SBRT		0.51584	0.60204
UBC does not Granger Cause EXPORT	36	0.15491	0.85715
EXPORT does not Granger Cause UBC		0.50518	0.60828

Table 3: Johanson Cointegration Test

Series: EXPORT CHSLN SBRT UBC
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.585219	58.77764	47.85613	0.0034
At most 1	0.396748	27.09751	29.79707	0.0993
At most 2	0.169158	8.902371	15.49471	0.3745
At most 3	0.060091	2.231015	3.841466	0.1353

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.585219	31.68013	27.58434	0.014
At most 1	0.396748	18.19514	21.13162	0.1227
At most 2	0.169158	6.671356	14.2646	0.5287
At most 3	0.060091	2.231015	3.841466	0.1353

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized

by b'*S11*b=I):

EXPORT		CHSLN	SBRT	UBC
	7.186469	-5.378337	-0.117631	8.679468
	-8.378245	7.938289	-0.241534	-9.306093
	-3.073649	2.738472	-0.192656	11.56092
	-2.042745	5.250281	-1.939764	-6.871954

Unrestricted Adjustment Coefficients (alpha):

D(EXPORT)	-0.093305	0.01235	-0.019477	-0.013524
D(CHSLN)	-0.033105	-0.038546	-0.011736	-0.018732
D(SBRT)	-0.086218	0.060887	-0.021723	-0.040657
D(UBC)	-0.012683	0.013352	-0.019211	-0.001111

1 Cointegrating Equation(s):		Log likelihood	123.5156

Normalized cointegrating coefficients (standard error in parentheses)

EXPORT	CHSLN	SBRT	UBC
1	-0.748398	-0.016368	1.207751
	-0.07695	-4.21E-02	-0.33034

Adjustment coefficients (standard error in parentheses)

D(EXPORT)	-0.670535
	-0.14278
D(CHSLN)	-0.237908
	-0.1387
D(SBRT)	-0.6196
	-0.27805
D(UBC)	-0.09115
	-0.069

Table 4: Vector Error Correction Estimates

Cointegrating Eq:	CointEq1			
EXPORT(-1)	1			
CHSLN(-1)	-0.601645 -0.14021 [-4.29100]			
SBRT(-1)	-0.018117 -0.07667 [-0.23631]			
UBC(-1)	1.226896 -0.6019 [2.03837]			
C	-7.639661 -2.81868 [-2.71036]			
Error Correction:	D(EXPORT)	D(CHSLN)	D(SBRT)	D(UBC)
CointEq1	-0.317394 -0.06491 [-4.89007]	-0.239768 -0.05813 [-4.12498]	-0.381956 -0.11514 [-3.31731]	-0.009421 -0.03028 [-0.31112]
D(EXPORT(-1))	0.339117 -0.15827 [2.14268]	0.661991 -0.14174 [4.67061]	-0.030791 -0.28076 [-0.10967]	-0.038592 -0.07384 [-0.52264]
D(CHSLN(-1))	-0.328334 -0.16585 [-1.97968]	-0.330422 -0.14853 [-2.22466]	-0.045441 -0.29422 [-0.15445]	0.082066 -0.07738 [1.06058]
D(SBRT(-1))	-0.142562 -0.09442 [-1.50990]	-0.185299 -0.08456 [-2.19146]	0.024427 -0.16749 [	-0.028322 -0.04405 [-

			0.14584]	0.64294]
D(UBC(-1))	0.406457	0.55678	-1.005581	-0.038834
	-0.37685	-0.33749	-0.66852	-0.17582
	[1.07856]	[1.64978]	[-1.50419]	[-0.22087]
R-squared	0.424804	0.489514	0.270249	0.060915
Adj. R-squared	0.350586	0.423644	0.176088	-0.060258
Sum sq. resids	0.485472	0.389346	1.527752	0.105673
S.E. equation	0.125142	0.112069	0.221996	0.058385
F-statistic	5.723676	7.431599	2.870065	0.50271
Log likelihood	26.42895	30.40073	5.793207	53.87481
Akaike AIC	-1.190497	-1.411152	-0.044067	-2.715267
Schwarz SC	-0.970564	-1.191219	-0.175866	-2.495334
Mean dependent	0.102902	0.115234	0.146398	0.00068
S.D. dependent	0.155289	0.147619	0.244571	0.056702

Determinant resid covariance (dof adj.)	2.61E-08
Determinant resid covariance	1.44E-08
Log likelihood	120.7329
Akaike information criterion	-5.318496
Schwarz criterion	-4.21883

Table 5: GARCH-M Model

Dependent Variable: EXPORT
Method: ML - ARCH (Marquardt) - Normal distribution
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1)

	Coefficient	Std. Error	z-Statistic	Prob.
GARCH-M	0.430246	0.253341	1.69829	0.0895
C	2.989152	1.246572	2.397897	0.0165
SBRT	0.021507	0.040838	0.526645	0.5984
UBC	-0.55849	0.28369	-1.96867	0.049
CHSLN	0.605833	0.137228	4.41479	0
EXPORT(-1)	0.253745	0.117997	2.15043	0.0315
	Variance Equation			
C	0.010938	0.003556	3.075831	0.0021
RESID(-1)^2	0.380471	0.208245	1.827033	0.0677
GARCH(-1)	-0.61847	0.225221	-2.74606	0.006
R-squared	0.986998	Mean dependent var		4.557437
Adjusted R-squared	0.983283	S.D. dependent var		0.941787
S.E. of regression	0.121768	Akaike info criterion		-1.59669
Sum squared resid	0.415166	Schwarz criterion		-1.20484
Log likelihood	38.53873	F-statistic		265.6871
Durbin-Watson stat	1.717626	Prob(F-statistic)		0

Annexure III

Annexure III includes following tables:

1. Long run Relationship Model (Data on Crude materials and Chemicals are used as representative to import price)
2. Pair wise Granger Causality Test
3. Johanson Cointegration Test
4. Vector Error Correction Estimates
5. GARCH Model

Table 1: Longrun Relationship

Dependent Variable: EXPORT
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.963034	1.188844	2.492366	0.0184
CRCHSLN1	0.748309	0.147998	5.056223	0
SBRT	0.03669	0.034447	1.065128	0.2953
UBC	-0.597343	0.257183	-2.322639	0.0272
EXPORT(-1)	0.130613	0.174385	0.748992	0.4597
AR(1)	0.184454	0.238587	0.773109	0.4455

R-squared	0.990215	Mean dependent var	4.624156
Adjusted R-squared	0.988584	S.D. dependent var	0.861915
S.E. of regression	0.092093	Akaike info criterion	-1.781031
Sum squared resid	0.254432	Schwarz criterion	-1.517111
Log likelihood	38.05855	F-statistic	607.1634
Durbin-Watson stat	1.660304	Prob(F-statistic)	0

Inverted AR Roots	0.18

Table 2: Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Probability
CRCHSLN1 does not Granger Cause EXPORT	36	3.40003	0.04624
EXPORT does not Granger Cause CRCHSLN1		1.87942	0.16967
SBRT does not Granger Cause EXPORT	36	3.27235	0.05136
EXPORT does not Granger Cause SBRT		0.51584	0.60204
UBC does not Granger Cause EXPORT	36	0.15491	0.85715
EXPORT does not Granger Cause UBC		0.50518	0.60828
SBRT does not Granger Cause CRCHSLN1	36	3.79341	0.0336
CRCHSLN1 does not Granger Cause SBRT		0.713	0.49803
UBC does not Granger Cause CRCHSLN1	36	0.08613	0.91769
CRCHSLN1 does not Granger Cause UBC		2.23582	0.12386
UBC does not Granger Cause SBRT	36	2.06462	0.14396
SBRT does not Granger Cause UBC		0.66935	0.51929

Table 3: Johansen Cointegration Approach

Trend assumption: Linear deterministic trend
Series: EXPORT CRCHSLN1
SBRT UBC

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.579213	53.26219	47.85613	0.0143
At most 1	0.331309	22.09959	29.79707	0.293
At most 2	0.165206	7.612017	15.49471	0.5078
At most 3	0.030403	1.111476	3.841466	0.2918

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.579213	31.1626	27.58434	0.0166
At most 1	0.331309	14.48757	21.13162	0.3264
At most 2	0.165206	6.500541	14.2646	0.5498
At most 3	0.030403	1.111476	3.841466	0.2918

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

EXPORT	CRCHSLN1	SBRT	UBC
8.998418	-7.170768	-0.473349	8.766056
-7.271791	7.102133	0.593754	-6.320507
-3.27767	2.896159	0.370462	12.13698
4.778044	-7.995539	1.65107	7.54349

Unrestricted Adjustment Coefficients (alpha):

D(EXPORT)	-0.10015	0.009854	0.020185	0.004808
D(CRCHSLN1)	-0.049714	-0.014772	-0.001256	0.013359
D(SBRT)	-0.055807	-0.094899	-0.032005	-0.02034
D(UBC)	-0.010337	0.009869	-0.019551	0.00067

1 Cointegrating Equation(s): Log likelihood 133.5841

Normalized cointegrating coefficients (standard error in parentheses)

EXPORT	CRCHSLN1	SBRT	UBC
1	-0.796892	-0.052604	0.974177
	-0.06422	-0.03197	-0.2642

Adjustment coefficients (standard error in parentheses)

D(EXPORT)	-0.901195
	-0.17079
D(CRCHSLN1)	-0.447351
	-0.14998
D(SBRT)	-0.502171
	-0.36461
D(UBC)	-0.093015
	-0.08537

Table 4: Vector Error Correction Estimates

Cointegrating Eq:	CointEq1			
EXPORT(-1)	1			
CRCHSLN1(-1)	-0.796892			
	-0.06422			
	[-12.4083]			
SBRT(-1)	-0.052604			
	-0.03197			
	[-1.64523]			
UBC(-1)	0.974177			
	-0.2642			
	[3.68722]			
C	-4.865043			
Error Correction:	D(EXPORT)	D(CRCHSLN1)	D(SBRT)	D(UBC)
CointEq1	-0.901195	-0.447351	-0.502171	-0.093015
	-0.17079	-0.14998	-0.36461	-0.08537
	[-5.27678]	[-2.98276]	[-1.37730]	[-1.08960]
D(EXPORT(-1))	0.484507	0.531845	0.189582	-0.048042
	-0.18054	-0.15854	-0.38543	-0.09024
	[2.68368]	[3.35455]	[0.49187]	[-0.53237]
D(CRCHSLN1(-1))	-0.250961	-0.302014	-0.151324	0.14691
	-0.23915	-0.21001	-0.51055	-0.11954
	[-1.04941]	[-1.43808]	[-0.29640]	[1.22900]
D(SBRT(-1))	-0.106185	-0.15691	0.128567	-0.025038
	-0.08323	-0.07309	-0.17768	-0.0416
	[-1.27586]	[-2.14690]	[0.72360]	[-0.60187]
D(UBC(-1))	0.382038	0.333737	-1.046805	-0.06977
	-0.35046	-0.30777	-0.7482	-0.17518
	[1.09009]	[1.08438]	[-1.39909]	[-0.39828]
C	0.094671	0.104097	0.125251	-0.006214
	-0.02935	-0.02578	-0.06266	-0.01467
	[3.22535]	[4.03849]	[1.99879]	[-0.42352]

R-squared	0.539062	0.412851	0.153043	0.136218
Adj. R-squared	0.462239	0.314993	0.011884	-0.007745
Sum sq. resids	0.389037	0.300021	1.773126	0.0972
S.E. equation	0.113877	0.100004	0.243114	0.056921
F-statistic	7.016945	4.218875	1.084186	0.946201
Log likelihood	30.41501	35.0918	3.112165	55.37937
Akaike AIC	-1.356389	-1.616211	0.160435	-2.743298
Schwarz SC	-1.092469	-1.352291	0.424355	-2.479378
Mean dependent	0.102902	0.104261	0.146398	0.00068
S.D. dependent	0.155289	0.120828	0.244571	0.056702

Determinant resid covariance (dof adj.)	1.46E-08
Determinant resid covariance	7.03E-09
Log likelihood	133.5841
Akaike information criterion	-5.865784
Schwarz criterion	-4.634158

Table 5: GARCH-M Model

Dependent Variable: EXPORT
Method: ML - ARCH (Marquardt) - Normal distribution
GARCH = C(7) + C(8)*RESID(-1)^2 + C(9)*GARCH(-1) + C(10)
*GARCH(-2)

	Coefficient	Std. Error	z-Statistic	Prob.
GARCH-M	0.30124	0.510254	0.590372	0.5549
C	2.356634	0.881972	2.672006	0.0075
CRCHSLN1	0.685765	0.087731	7.816692	0
SBRT	0.037908	0.02966	1.278101	0.2012
UBC	-0.509369	0.190111	-2.679321	0.0074
EXPORT(-1)	0.229052	0.090212	2.539049	0.0111
	Variance Equation			
C	0.004416	0.004047	1.091044	0.2753
RESID(-1)^2	0.452261	0.32881	1.375446	0.169
GARCH(-1)	-0.29589	0.305474	-0.968627	0.3327
GARCH(-2)	0.26037	0.314466	0.827974	0.4077

R-squared	0.989949	Mean dependent var	4.557437
Adjusted R-squared	0.986599	S.D. dependent var	0.941787
S.E. of regression	0.109023	Akaike info criterion	-1.728053
Sum squared resid	0.320924	Schwarz criterion	-1.29267
Log likelihood	41.96899	F-statistic	295.4881
Durbin-Watson stat	1.616664	Prob(F-statistic)	0