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A Time Series Analysis of Export, Import, and Economic Growth in Bangladesh

Keya, Farjana Quayum

University of Rajshahi

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A Time Series Analysis of Export, Import, and Economic Growth in Bangladesh



PhD Dissertation

*A dissertation submitted to the University of Rajshahi
in partial fulfillment of the requirements for the degree of*

**Doctor of Philosophy
in Economics**

Farjana Quayum Keya

**Institute of Bangladesh Studies
Rajshahi University**

June, 2014

A Time Series Analysis of Export, Import, and Economic Growth in Bangladesh



PhD Dissertation

Researcher

Farjana Quayum Keya
PhD Research Fellow
Institute of Bangladesh Studies
Rajshahi University, Rajshahi

Supervisor

Tariq Saiful Islam
M.A. (Rajshahi), M.A. (Waterloo, Canada), Ph.D. (Alberta, Canada)
Professor
Department of Economics
Rajshahi University, Rajshahi

**Institute of Bangladesh Studies
Rajshahi University**

June, 2014

Dedicated To

My Parents

and

My Grand Mother

Declaration

I hereby declare that the work submitted here as a dissertation entitled, “**A Time Series Analysis of Export, Import, and Economic Growth in Bangladesh**” for the degree of Doctor of Philosophy at the Institute of Bangladesh Studies, Rajshahi University is the result of my original research work and it has not been submitted in part or in full for any diploma or degree to any other university or institute. My indebtedness to other works/publications has been duly acknowledged at the relevant places.

Farjana Quayum Keya

Tariq Saiful Islam

M.A. (Rajshahi), M.A. (Waterloo, Canada), Ph.D. (Alberta, Canada)
Professor
Department of Economics
Rajshahi University, Rajshahi
Mobile: 01911-109250
Email: tariqsaiful@yahoo.com

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tgievBj : 01911-109250

Ref.

Date:

Certificate

This is to certify that the dissertation, “**A Time Series Analysis of Export, Import, and Economic Growth in Bangladesh**” is an original research work done by Farjana Quayum Keya for the degree of Doctor of Philosophy in Economics at the Institute of Bangladesh Studies, Rajshahi University under my supervision. The thesis has not been submitted elsewhere for any other degree. The references cited in it have been duly acknowledged.

Professor Tariq Saiful Islam,
M.A. (Rajshahi), M.A. (Waterloo, Canada),
Ph.D. (Alberta, Canada)

Supervisor

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Farjana Quayum Keya

Abstract

This is an integrated empirical study of export, import, exchange rate changes, and economic growth of Bangladesh. The study covers the period of thirty two years from 1981 to 2012. Theoretical models of export demand and import demand, on causality analysis between export and growth, and import and growth were carefully chosen and empirically estimated. The question of convergence of export and import in the long run was also formally looked into. The impact of exchange rate changes and economic growth was also thoroughly examined using specific functions. The export demand function showed that the main determinant was income of the importers of our exports. The import demand function provided evidence that our income was the main determinant of our imports. The causality analysis showed that Bangladesh had export-led growth and output-led import. The study of convergence showed that Bangladesh had clear possibility of convergence of export and import in the long run. The study of impact of fall in the external value of money, that is, a rise in exchange rate showed that it affected growth adversely and that this worked in conjunction with other variables like domestic credit, terms of trade, and government expenditure. Several policy suggestions emerged such as Bangladesh should emphasis export to richer countries, pursue a policy of export led growth and should control in increase in exchange rate as far as possible.

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Chapter 1

Introduction

The study of the external sector of an economy is very important. Such a study constitutes an analysis of export (X) and import (M), the divergence between the two, the relation between these two (X, M) and GDP. Also, whether or not the perennial trade deficit of Bangladesh is likely to be eased in future is a question of great significance. These issues can only be investigated empirically using appropriate econometric techniques. This is the objective of this study, that is, a thorough examination using an empirical econometric approach.

In Bangladesh, the value of import has always been greater than the value of export. As a result, there has always been a negative trade balance. This has resulted in sustained fall in the external value of our currency, which means a steady increase in exchange rate over the whole period. Since the fall in the external value of our currency is primarily a consequence of trade deficit, special focus is placed on this aspect in a separate chapter (Chapter 7) of the thesis.

1.1 Statement of the Problems

The questions to start with are about the determinants of imports and exports. Towards that end is to estimate aggregate import and export demand functions. The estimated coefficients of well articulated export and import demand functions will provide information on relative importance of the determinants. The information gained from these empirical demand functions will be interesting to both academicians and policy makers.

Some other important issues are to examine whether export caused growth (export-led growth) or growth caused export (growth-led export). Similarly, whether import caused growth (import-led growth) or growth led to import (growth-led import). Also, this study will examine whether the export-import difference existing for a long time likely to ease and trade deficit eradicated in future, that is, whether export and import are likely to converge in the future.

This thesis also examines the impact of increasing exchange rate on economic growth of Bangladesh. In doing so, both nominal and real exchange rates are considered. The results of this thesis on this subject are particularly important as latest data as well as data for a longer period and both nominal and real exchange rates are considered. Along with these, monetary and fiscal policy is also included. These are proxied by private credit and government expenditure, respectively.

Economists supporting the export-led growth hypothesis think that export can serve as an engine of growth. The relationship between export and economic growth has been a subject of much interest in the development and growth of literature. According to the neoclassical view, there is a strong relationship between export expansion and economic growth, and that export expansion is one of the main determinants of growth. This causality from export to economic growth has been labeled in the literature as export-led growth.

The export-led growth hypothesis suggests that export growth leads to higher economic growth through such means as facilitating the exploitation of economies of scale by specializing in production (Helpman and Krugman 1985). Thornton (1996), Feder (1982), Michaely (1977), Marino (1992) examined that the countries which are exporting a huge output result faster growth than other economies. The export growth

has a significant impact on technological improvements as well as other externalities. Rivera–Batiz, and Romer (1991), Romer (1990) concluded that due to international trade the number of specialized inputs will improve leading to an increase in economic growth rate as environment for international trade become favourable.

Ghartey (1993) argued that economic growth caused export growth if innovation and technological progress results in well - developed markets, which in turn improve export performance in the trade sector. Producers are likely to sell goods in international markets if domestic production increases faster than domestic demand. Thus economic growth causes export growth.

The main exports of Bangladesh are readymade garments and medicine, which require considerable import of machineries and other raw materials. So, imports have positive impact on economic growth. MacDonald (1994) argues that the imports of final and intermediate goods will force domestic producers to innovate and increase their efficiency to compete with foreign imports. Anoruo and Ahmad (2000), referring to Esfahani (1991) and Ram (1990), note that imports have positive influence on economic growth. Imports of capital goods are especially important for developing countries which depend on foreign capital for their economic development programmes. However, to be beneficial, imported capital must be productively engaged in the production of goods and services.

Piana (2001), while discussing exports, advocates that increasing exports raise production, GDP, and employment. In turn, through the Keynesian multiplier effect, it leads to higher consumption and production. Probably, imports will also rise as a consequence. On the other hand, Thangavelu and Rajaguru (2004) suggest that trade has an important impact on productivity and output growth in the economy, however it is imports that provide the important 'virtuous' link between trade and output growth.

The study of convergence of export and import through co-integration is a fairly new analytical development. This approach has been used, among others, to study the convergence of export and import. Several authors (Wijeweera 2005; Irandoust and Ericsson, 2004; Islam, Wadud, and Islam, 2008) used a similar approach.

1.2 Research Gap

In discussion of this external sector, greater emphasis is usually laid on export and we also hear much about it. Yet our import is greater than our export. In fact, import is nearly 1.4 times greater than export. This has led to continued fall in the external value of our currency, that is, a rise in the exchange rate, which has important implications. Also, the question of whether or not this divergence can be narrowed down in future remains to be looked into. There are several previous studies but the results are inconclusive. Studies for Bangladesh are also scanty. This warrants further study in the field.

1.3 Objectives of the Study

The core objective of this study is to investigate into the relationship between export, import, economic growth, and exchange rate change in Bangladesh. To achieve these, specific objectives of this study are:

- a) To estimate import demand function to see the relative importance of the determinants of import.
- b) To estimate export demand function to have an idea of the nature and relative importance of determinant of export.
- c) To examine the export-growth nexus and import-growth nexus using the Granger Causality analysis.

- d) To study the long- run convergence of export-import gap using the co-integration analysis.
- e) To examine the impact of increasing exchange rate on economic growth using both nominal and real exchange rate function.

These objectives are all pursued as thoroughly as possible and clear results are obtained using an empirical approach.

1.4 The Main Research Questions

The following are the leading research questions of this study:

- a) What are the important determinants of export of Bangladesh as can be found in the export demand function?
- b) What are the important determinants of import of Bangladesh as can be found in the import demand function?
- c) What is the line of causality between export and growth and import and growth?
- d) Is divergence between export and import likely to be erased in future?
- e) Is exchange rate likely to affect economic growth?

It is clear that the research questions follow from the research objectives. Each of these questions is taken up and the results stated in the empirical chapters (Chapters 6 and 7).

1.5 Research Hypotheses

This study tests the following hypotheses. It can be seen that the hypotheses follow from the objectives of the thesis. The hypotheses are:

- a) Exports are not affected by foreign income.
- b) Exports are not affected by relative prices

- c) Imports are not affected by real domestic income
- d) Imports are not affected by import prices
- e) Economic growth causes import growth.
- f) Import growth causes economic growth
- g) Economic growth causes export growth.
- h) Export growth causes economic growth.
- i) Import-export gap does not converge in the long-run.
- j) Increasing nominal exchange rate does not affect output growth
- k) Increasing real exchange rate does not affect output growth

The list is somewhat long. But this thesis being empirical in nature, all these hypotheses can and will be tested and results will be available in Chapters 6 and 7.

1.6 Rationale of the Study

The study of the external sector of an economy is very important. Such a study constitutes an analysis of export and import, the divergence between the two, the relation between these two (X, M) with GDP. Also, whether or not the perennial trade deficit of Bangladesh is likely to be eased in future is a question of great significance. The impact of exchange rate on economic growth needs careful examination.

These issues can only be investigated empirically using appropriate econometric techniques and real data. This is the objective of this study, that is, a thorough examination using an empirical econometric approach.

1.7 Methodology

This is a time series study for the period 1981 to 2012. Since this will be an econometric study of export, import, and economic growth, time series properties of data of all these and other relevant variables will be thoroughly examined. To explore

the impact of increasing exchange rate, appropriate econometric estimation will be done using a standard model.

The time series tests that will be undertaken are the tests of stationarity and co-integration. These will be done by using the Augmented Dickey-Fuller test and the Johansen test, respectively. The Granger Causality test will be used to determine whether export caused growth or vice versa. Similarly, it will be used to find whether import caused growth or vice versa.

Whether there is any possibility of the long standing trade deficit of Bangladesh to converge in the long-run will be examined using the co-integration tests between export and import. This methodology is being used by researchers of late and we follow this to shed light on this topic.

1.8 Data and their Sources

The data for this thesis will be collected from secondary sources such as the *Statistical Yearbook of Bangladesh* and *Statistical Pocket Book Bangladesh* published by the Bangladesh Bureau of Statistics, *Bangladesh Economic Review* published by the Ministry of Finance, *Bangladesh Economic Survey* published by the Government of Bangladesh, and *Economic Indicators* published by the Bangladesh Bank. Data from the *World Development Indicators* of the World Bank will be used.

For different estimations of this thesis the variables that will be used are export, import, GDP, and exchange rate. The research study is completely based on secondary data. The variables on aggregate export, aggregate import, and GDP data will be used from the *World Development Indicators* of the World Bank and exchange rate data from *Bangladesh Economic Review* for the 1981-2012 period.

1.9 Empirical Estimation

Since this is a time series analysis, standard procedure of this type of analysis will be used in obtaining empirical estimates. This will involve test of stationarity and co-integration. The Granger Causality test will also be used. For study of convergence of export and import, the co-integration test will be applied.

The impact of changes in exchange rate will be examined through estimation of nominal and real exchange rate functions and through examination of estimates of other variables, which are believed to act in conjunction with exchange rate. An important aspect here is the comparison of the estimates of the nominal and real exchange rate equations. Estimates of the real exchange rate will be done by the author herself.

For implementing these, several statistical softwares such as EViews, Shazam, and Microfit are available. Of these, *Eviews* will be used due to its familiarity and availability.

1.10 Organisation of the Thesis

This study is organised into eight chapters. These are

The first chapter provides an introduction to the study, its significance, the research problem, study objectives, methodology, data used, and their sources.

Chapter 2 presents a description of export, import, economic growth, and exchange rate changes in Bangladesh over time. This helps to understand the line of analysis subsequently undertaken and the econometric estimates obtained. There are many things in this chapter, which have not been formally looked at because this chapter provides a broader picture forming the background of the study.

Chapter 3 provides a selected literature on export, import, economic growth and exchange rate change. This section is divided into two parts. The first part contains a survey of works in this area throughout the world while the second part presents a review of the works on Bangladesh.

Chapter 4 provides the methodology of the study, the specification of model equations and estimation techniques. The export demand function, the import demand function, Granger causality analysis, convergence of export and import, and impact of exchange rate changes on output through estimation of exchange rate functions will form this chapter.

Chapter 5 deals necessary data that will be used as inputs for econometric estimation. For export demand function, data on foreign income, relative price will be needed. For import demand function, data on domestic income, domestic price, and past import will be needed. For causality study, data on export, import, and growth of output will be used. For study of convergence, data on export and import will be used.

Finally, for study of the impact of exchange rate changes on output, data on nominal and real exchange rate, government expenditure, private credit, and terms of trade will be needed. These will all obtained from secondary sources. The estimates of real exchange will be made by the author herself.

Chapter 6 describes the empirical results of this study on export demand function and import demand function, on causality between export and growth and import and growth. The empirical results on convergence of export and import in the long run are also presented and discussed in this chapter.

The empirical results on the relation between exchange rate and economic growth will be presented in Chapter 7. The key things that will be brought under focus are the role of factors other than the exchange rate. The differences in estimates when the nominal and the real exchange rates are used will be also looked into.

Chapter 8 contains the study summary, conclusion, and policy implications of this study and it concludes with some policy suggestions for growth in relation to export and import.

A comprehensive bibliography is given at the end of the thesis.

Chapter 2

Export, Import, Economic Growth, and Exchange Rate Changes in Bangladesh

In this chapter, an overview of export, import, exchange rate change, and output growth of Bangladesh is presented. This description has chiefly been based on recent data set of the variables of the Bangladesh economy. The materials used in this chapter have been taken from various issues of *Bangladesh Economic Review*, published by the Ministry of Finance and data from the various issues of the *Statistical Yearbook of Bangladesh* published by the Bangladesh Bureau of Statistics, *World Development Indicators* published by the World Bank, and the Bangladesh Bank.

This chapter contains discussion on balance of trade, export from Bangladesh, total import of Bangladesh, the growth of output. Discussion on exchange rate changes, foreign exchange reserve, trade policy, agreements and association, free trade area and finally the chapter summary follow.

2.1 Balance of Trade

Bangladesh had balance of trade deficit since its inception in 1971. By balance of trade is meant balance of visible trade. Although exports have risen imports have also gone up. As a result, balance of trade deficit continued to exist and often even increase.

Balance of trade situation for the recent 13 years are presented in Table 2.1. In earlier period, the amount of real exports was low but it is increasing gradually, which is shown in the second column of the table. Similarly, the real import was low in earlier period and it increased at a faster rate that is shown in third column of the table.

In 2000, trade deficit was 3544.19 million US dollar. In this year, exports and imports were 6403.56 million US dollar and 9947.75 million US dollar respectively. The trade deficit increased in 2001 due to large amount of import than exports. Trade balance recorded a deficit of 2866.69 million US dollar in 2003, and then the deficit was increasing. In 2007, trade deficit stood at 4835.68 million US dollar which was significant deficit than the previous years. After this, the trade deficit declined somewhat, but again this deficit increased and in 2012, the trade deficit was 4799.56 million US dollar. So, import has always been greater than export.

Table 2.1
Balance of Trade of Bangladesh, 2000 to 2012

(Constant 2005 million US dollar)

Year	Exports	Imports	Balance of Trade
2000	6403.56	9947.75	-3544.19
2001	7358.22	11063.52	-3705.30
2002	7188.91	9822.26	-2633.35
2003	7682.77	10549.46	-2866.69
2004	8645.94	11667.72	-3021.78
2005	9994.81	13891.43	-3896.62
2006	12575.57	16418.00	-3842.44
2007	14208.00	19043.46	-4835.46
2008	15207.92	18651.86	-3443.94
2009	15211.62	18166.60	-2954.99
2010	15354.83	18290.74	-2935.92
2011	19859.95	23623.79	-3763.84
2012	23264.61	28064.17	-4799.56

Source: *World Development Indicators*, World Bank, various issues.

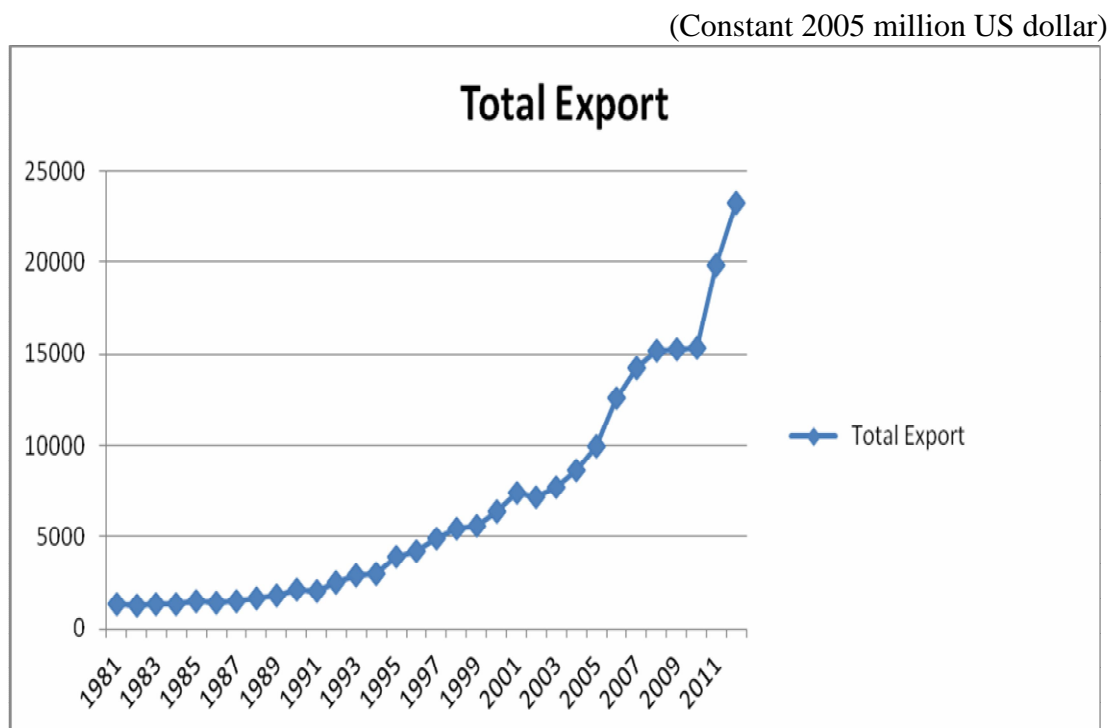
Although, there has always been balance of trade deficit, Bangladesh attained balance of payments surplus in recent years. This is primarily because of huge and growing amount of foreign remittances. Since, foreign remittance is likely to grow in future, Bangladesh may also be able to have the balance of payments surplus in the foreseeable future.

2.2 Exports from Bangladesh

Although the export earnings of Bangladesh are increasing, the value of import is always greater than the value of export. As a result, the consequence of trade deficit, that is, fall in the external value of our currency continued uninterrupted.

The export earnings of Bangladesh were 6403.56 million US dollar in 2000. It stood at 9994.81 million US dollar in 2005, which was higher than the previous all years. In 2012, the real aggregate export increased to 23264.61 million US dollar. Although the performance of export sector was robust in the earlier periods, exports declined for some years and increased further. On a cumulative basis however, export growth was still satisfactory as against in the previous year in the context of the contraction of global trade volume.

Figure 2.1
Real aggregate export for the period 1981 to 2012



Source: *World Development Indicators*, World Bank, various issues.

In Figure 2.1, it is observed that the total export increased slightly from 1981 to 1991. The export growth was more- or- less the same in this period. After 1991, total export increased sharply over the next period.

In the 1970s raw jute and jute goods were the major exported items. But after words raw jute lost its position gradually. At present, ready-made garments (RMG) have appeared as the largest item of export of Bangladesh.

In 2004 the export earnings from woven garments, knitwear, agricultural products, fertilizer and chemical products, frozen food, raw jute, jute goods, tea, leather, ceramic products, engineering products and footwear increased significantly. On the other hand, export earnings decreased only for petroleum. In 2008-2009, among the exported items, woven garments and knitwear were increased, while during this period raw jute, jute goods, leather and frozen food showed negative growth. In 2011-12, the exported item increased mainly for footwear, engineering products, woven garments and leather. But export earnings decreased in respect of raw jute, ceramic product, and jute goods. In the face of the global slowdown, the satisfactory growth in ready-made garments (RMG) and rising volumes of readymade garment exports, although the deepening of the global recession indicates decline in export earnings in the coming months. So, over the study period, it was seen that in the total exports, the contribution of readymade garments and knitwear is still higher (Bangladesh Economic Review, 2005, 2009, 2012).

Our commodity importer is mainly richer countries. The United States of America ranks first, Germany second and United Kingdom third. In the meantime, export markets have been created in Japan, Korea, South Africa and Turkey. Besides, due to the reduction of duties by India, Bangladeshi commodities are having gainful access to India.

Bangladesh exports only 4 percent of her total exports to SAARC countries. Among the SAARC countries, India is the prime destination for our export. So, it appears that the exports of Bangladesh will continue to be directed mainly towards the richer countries like the ones we mentioned above.

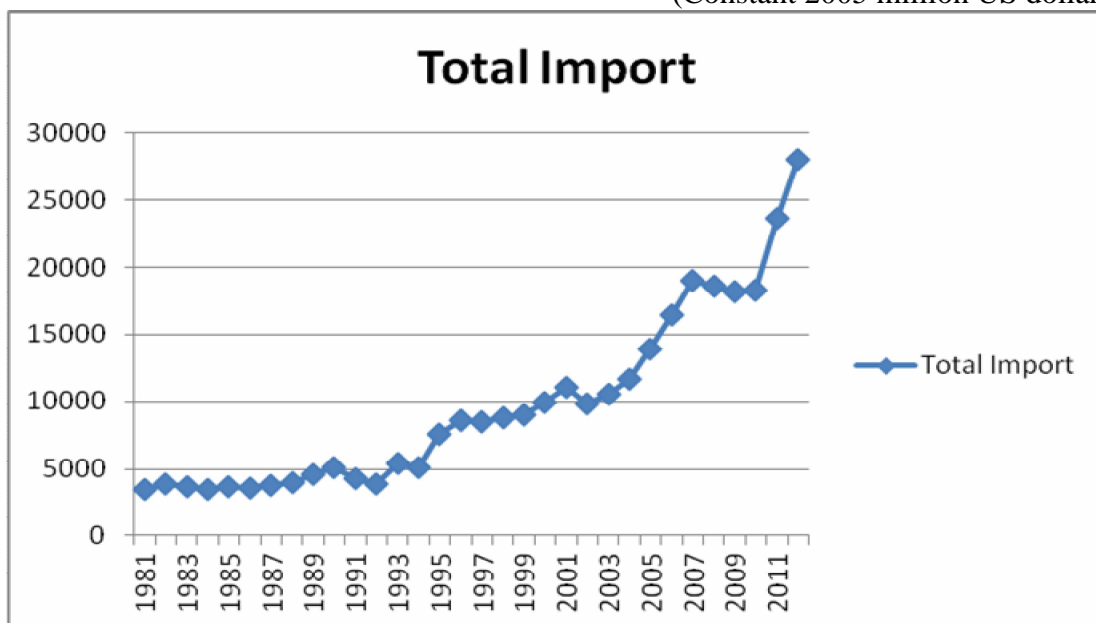
2.3 Total import of Bangladesh

If we see the last thirteen years of our study period it is seen that in 2000, the real aggregate import was 9947.75 million US dollar. In 2002 and in 2003, the total import was 9822.26 million US dollar and 10549.46 million US dollar respectively. Analysis of imports exposes that in 2003-04, the commodities such as cotton, wheat, edible oil, petroleum products, yarn, oilseeds, and capital machinery contributed to the overall growth of import payments. In the 2005, total import stood at 13891.43 million US dollar that was higher than the previous year. It was 19043.46 million US dollar in 2007 and in this year the following commodities contributed to the overall growth of import payments: capital machinery petroleum products, vegetable oil, oil seeds, cotton, yarn, clinker and fertilizer. The total import was 23623.79 million US dollar in 2011 and this year import cost was outstanding largely to high commodity price in the international market and the higher-than-expected import of food grains. Figure 2.2 shows the overall import situation of the country.

The features of real aggregate import for the period 1981 to 2012 is shown in Figure 2.2. From this figure it is clear that the total import increased more-or-less same from 1981 to 1989. But after 1989, the growth of total import increased over the period with some ups and downs.

Figure 2.2
Real aggregate import for the period 1981 to 2012

(Constant 2005 million US dollar)



Source: *World Development Indicators*, World Bank, various issues.

Import of other items including petroleum products, industrial raw materials and capital machinery also increased significantly during the period under report to meet the booming domestic demand. An analysis of imports shows that, the major commodities which contributed to the overall growth of import payments in 2010-11 are: rice, yarn, cotton, fertilizer, crude petroleum, petroleum products, staple fibre, wheat, clinker, capital machinery, and edible oil. In 2012, the total import stood at 28064.17 million US dollar. Due to the price hike of fuel in the global market and higher demand of fuel for electricity generation the import payments increased at the beginning of 2011-12. But it slowed down towards the end of the year as import of unimportant goods was discouraged. Imported goods category observed that, import payments for industrial raw materials, petroleum and petroleum products increased by 22.75 percent, 11.15 percent and 21.76 percent respectively, while import of capital

machinery and primary commodities decreased by 13.73 percent and 25.79 percent respectively (Bangladesh Economic Review, 2011, 2012).

It appears from the country wise import analysis that in term of the value of total imported commodities China occupied the first position, India was the second largest source of import while Malaysia, Japan and Singapore held the third, fourth and fifth position respectively. In 2011-12, 18.17 percent of the total imported commodities came from China, 13.39 percent from India and 4.82 percent from Singapore.

2.4 Growth of Output (GDP)

GDP growth rate in Bangladesh is continuously on rise and has become a puzzle to experts (both domestic and international) as the country went through political instability. Bangladesh GDP Growth Rate averaged 5.62 Percent from 1994 to 2012. GDP growth rate increased from 4.08 percent in 1994 to 6.7 percent in 2011 and 6.2 percent in 2012. Moreover it is expected that the growth rate will reach 8 percent by 2015 (Bangladesh Bank, Annual Report: 2012-2013). In this research, growth of output is examined in relation to other variables such as export, import, and exchange rate. Hence, a description of output is given here.

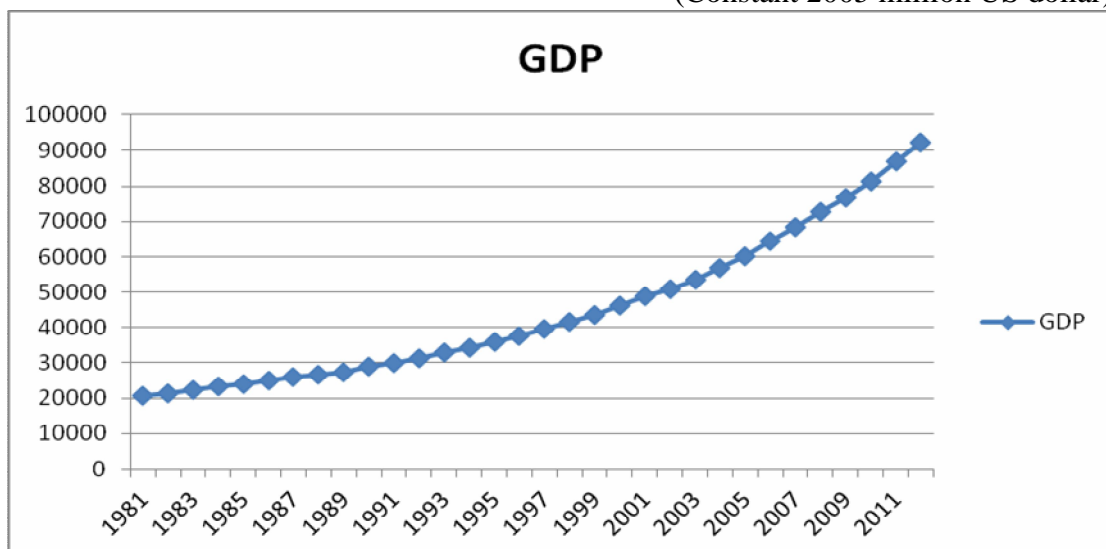
The real GDP was 20853.06 million U.S. dollar in 1981. After this period it was increased and in 1990 it reached to 28954.13 million U.S dollar. The real GDP became to 46268.66 million US dollar in 2000. In spite of huge damage in agriculture sector due to floods and undue rainfalls, mainly growth of industry and service sector will be able to achieve a GDP growth of 5.38 percent in 2004-05(Bangladesh Economic Review, 2005). In 2005 the real GDP was 60277.56 million US dollar. Due to stronger performance of agriculture, industry and service sectors, the GDP growth

surpassed its preliminary estimate in 2003-04, which is one of the highest growth rates achieved so far. With the creation of investment-friendly climate, the rate of national investment grew and the contribution of private sector to this investment is also good. In 2008 the real GDP became to 72639.53 million US dollar. Because of high base effect induced growth in agriculture sector the growth is still satisfactory in 2011-12 .Substantial growth in industry and service sector has contributed to overall GDP growth. In 2011-12, growth in agriculture, industry and service sectors has been estimated to 2.53 percent, 9.47 percent and 6.06 percent respectively (Bangladesh Economic Review, 2012). The growth was continuous, and in 2012, the amount reached on 92429.55 million U.S. dollar. Figure2.3 shows the trend of real GDP.

The real GDP of Bangladesh against years is plotted in figure 2.3. From 1981 to 1985 there was almost a same growth but it started to increase after 1985 and continued to increase to 2012. So this figure gives an indication of a steady increase in real GDP over the period. There is an apparent upward trend in the variable.

Figure 2.3
Real GDP for the period 1981 to 2012

(Constant 2005 million US dollar)



Source: World Bank, *World Development Indicators*, various issues.

2.5 Exchange Rate Changes

Bangladesh pursued a flexible exchange rate policy over a period of more than ten years. Before that, the exchange rate of Taka used to be adjusted from time to time to keep it competitive based on the rate of inflation. Since May 31, 2003, Bangladesh has taken firm steps to introduce fully market-based exchange rate regime where exchange rate is determined by the demand and supply of the currency. However, Bangladesh Bank engages in foreign exchange trading directly to stabilize exchange rate or to increase the reserve. After the introduction of floating exchange rate, the interbank exchange rate of Taka was almost stable against US dollar (Bangladesh Economic Review, 2005).

Although the US dollar remained stronger against Taka during late 2003 through April 2004 but the situation after that did not aggravate and Taka remained stable between May 2004 to August 2004. Rapid development of private sector with increased credit flow shows much higher growth in import of capital machinery and primary goods. Due to devastating flood and oil price hike in international market were mainly responsible for the main reason of the adverse situation of exchange rate but continued monitoring and supervision the exchange rate turned stable. Although the exchange rate was a little bit higher in open market compared to interbank market still there exists stability (Bangladesh Economic Review, 2005).

The exchange rate faced upward pressure up to December 2006 in 2006-07 due to higher growth of investment in private sector and import of petroleum and intermediate goods at higher price from the world market. Taka-US Dollar exchange rate starts to increase from mid-January 2007 for increase in export earnings, remittances and the tight monetary policy. During January to June 2007, Taka-US

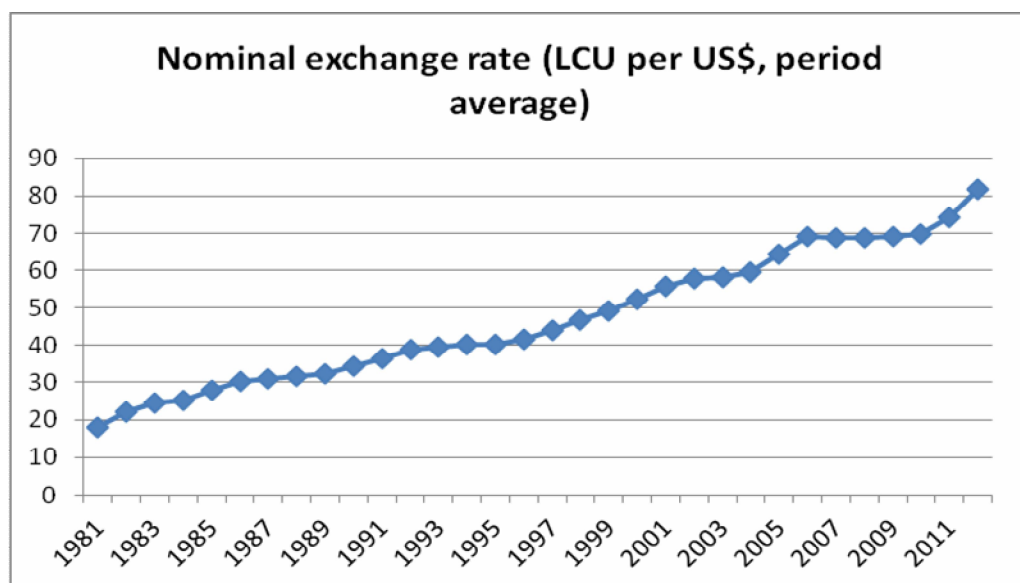
Dollar exchange rate increased. In Taka-US Dollar exchange, each dollar stood at Tk. 68.87 in June 2007 year-end, depreciating from Tk. 69.93 of June 2006 year-end (Bangladesh Economic Review, 2007).

The import payments as well as the export earnings slightly decreased due to global recession in the first quarter of 2009-10. Because of remittances the foreign exchange reserve remained adequate. Besides, the growth-oriented policies, efficient management of the monetary policy tools and timely interference in the money market by Bangladesh Bank made the exchange rate calm. In 2010-11, due to declining the remittance inflow and growing import payments the demand for foreign currency increased which resulted in slight depreciation of taka against dollar (Bangladesh Economic Review, 2011).

The weighted average interbank rate stood at Tk. 81.86 per US dollar in June, 2012 which was 74.23 as on 30 June 2011. Bangladesh Taka remained almost stable in 2011-12. Bangladesh experienced 8.16 percent depreciation of Taka against US dollar in the second quarter of this fiscal year. Taka regained its strength and appreciated due to adoption of prudent monetary policy. Strong growth of remittance and flow of foreign aid with rationalization of import payments and moderate growth of export helped keeping Bangladesh Taka competitive in this fiscal year. The features of nominal exchange rate changes for the period 1981 to 2012 is given below (Bangladesh Economic Review, 2013).

Figure 2.4 shows that the nominal exchange rate of Bangladesh has increased from beginning to the end of the study period. From 1981 to 1987, there was a steady growth. After this period the nominal exchange rate also increased in steady way to 2012.

Figure 2.4
Nominal Exchange Rate of Bangladesh, 1981 to 2012



Source: *World Development Indicators*, World Bank, various issues.

2.6 Foreign Exchange Reserve

Bangladesh Bank managed to keep stable the foreign exchange reserve position. The gross foreign exchange reserve of Bangladesh Bank reached 10364million US dollar at the end of 2012 which is 5.02 percent lower than 10912 million US dollar as compared to the previous year. To maintain the long term stability of the country's reserves and diversifying the external asset portfolio, the Bangladesh Bank invested in reputed corporate bonds, Treasury Bills of US Government and in short term deposit with highly reputed commercial banks. Table 2.2 shows the foreign exchange reserve position at the end of June 2000 to the end of June 2012 (Bangladesh Economic Review, 2013).

Table 2.2
Foreign Exchange Reserve

(In million US Dollar)

Year	Foreign Exchange Reserve
2000	1602
2001	1307
2002	1583
2003	2470
2004	2705
2005	2930
2006	3484
2007	5077
2008	6149
2009	7471
2010	10750
2011	10912
2012	10364

Source: Bangladesh Bank

2.7 Trade Policy

To moderate the impacts of global economic recession the Government has revised export and import policies. This has kept the negative impacts under control. The resulted in a substantial growth in foreign trade as the international trade made a turnaround in the post-recession period. The export and import policies, among them most important policy as given below:

2.7.1 Export Policy

The important features of the export policy are:

- i) To ensure a modern and liberal trade regime consistent with World Trade Organization (WTO) regime and globalisation.
- ii) To encourage the production of female labor-intensive exportable goods.
- iii) To facilitate the availability of the raw material for exportable products.
- iv) To increase productivity of diversified exportable products.

- v) To encourage the quality of product, the use of sustainable and environment-oriented technology, and improvement of the quality of design.
- vi) To promote the infrastructural facilities.
- vii) To give subsidy to the current exporters and to create a critical mass of new exporters.

These policies have generated some benefit and export of Bangladesh has definitely increased in a sustained manner.

2.7.2 Import Policy

The most important features of present import policy are as follows:

- i) The import policy should be compatible with the changes in the world market following the introduction of market economy and globalization under WTO.
- ii) Simplification of the procedures for import of capital machinery and industrial raw materials. This will promote the export and enhance competitiveness and skills.
- iii) Providing facilities for introducing technological innovation to cope with expanding modern technology.
- iv) To enhance the indigenous exports by facilitating backward linkages for export-oriented local industries;
- v) To ensure the supply of essential commodities in the national interest for emergency basis.

The import policy of Bangladesh had to traverse through a tight rope as straight forward reduction in import was not advisable since the export of Bangladesh was import oriented. Thus it was not reduction *par se*, but a rationalization of imports that formed the cornerstone of the import policy of Bangladesh.

2.7.3 Tariff Regime

In order to facilitate smooth implementation of the import policy, the Government of Bangladesh has been following the Most Favored Nation (MFN) tariff rate since FY 2000-01.

At present, three types of tariff concessions on these MFN rates are being provided. These are import under different trade agreements, imports of capital machinery and import of raw material. At present, tariff concessions are provided along with MFN tariff rate in respect of various goods (Bangladesh Economic Review, 2013).

2.7.4 Reduction of Tariff

Since 1991-92, the process of reducing import tariff rate in Bangladesh started and is still continuing in order to facilitate the indigenous industries and make it consistent with the world-wide tariff rate. The unweighted average import tariff rate in 1991-92 was 57.22% which has been reduced to 14.83% in 2011-12. At present, ad-valorem duties are being imposed on 99.50% tariff line. Specific duty is in existence at different rates on some products.

In Bangladesh, in addition to customs duty value added tax, regulatory duty, supplementary duty, advance income tax and advanced trade VAT are imposed on importable goods. In 2011-12 the supplementary duty was 20 percent, 30 percent, 45 percent, 60 percent, 100 percent, 250 percent, 350 percent and 500 percent. Advanced trade VAT has been increased to 4 percent from 3 percent. In addition, 5 percent regulatory duty has been imposed on the products, which should be included at 25percent custom duty slab during this fiscal year 2010-11 (Bangladesh Economic Review, 2013).

2.8 Agreements and Associations

In order to advance the external sector of Bangladesh, the country has entered into several trade agreements and associations. A list of these is given below:

2.8.1 Asia Pacific Trade Agreement (APTA)

In 1975, the “Bangkok Agreement” was signed among seven countries – Bangladesh, India, Lao-PDR; the Republic of Korea, Sri-Lanka and the Philippines with an aim to facilitate trade and commerce within the region. Thailand and the Philippines did not ratify the agreement but in 2001, China joined as a new member. In 2005 the “Bangkok Agreement” was renamed as the “Asia Pacific Trade Agreement (APTA)”.

In 2006, the third Round of Tariff negotiations concluded. Under this Round, Bangladesh and other LDCs got special tariff concessions on 587 items. China and South Korea granted to Bangladesh duty free access for 83 and 139 items. In October 2007 aiming at deepening and expanding the tariff benefits along with other issues such as Non-tariff Barriers, Trade Facilitation, Trade in Services, and Investment. In the meantime, three Framework Agreements: Agreement on Trade Facilitation, Agreement on Investment and Agreement on Liberalization of Trade in Services have been signed by the member countries (Bangladesh Economic Review,2013).

2.8.2 Trade Preferential System among OIC Countries (TPS-OIC)

In 1991, to expand trade on a priority basis, Framework Agreement on Trade Preferential System among OIC Countries (TPS-OIC) was signed and only 25 members ratified the Agreement. The Framework Agreement came into force in 2002 following the ratification of the Agreement by 10 members. The Trade Negotiation Committee (TNC) under TPS-OIC had completed its first round negotiation and

finalised the “Protocol on the Preferential Tariff Scheme” for the TPS-OIC (PRETAS). The protocol was ratified by Bangladesh and other member countries (Bangladesh Economic Review, 2013).

2.8.3 Preferential Trade Agreement among Developing Eight Countries (D-8)

An organisation for development cooperation among the following countries: Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Turkey was formed. This came to be known as D-8.

In a declaration, known as the Istanbul Declaration, the establishment of D-8 was announced officially in a Summit of Heads of State/Government in 1997. The D-8 Preferential Trade Agreement (PTA) was signed in 2006. The objectives of D-8 Organisation for Economic Cooperation are to improve member states’ position in the global economy, diversify and create new opportunities in trade relations, enhance participation in decision-making at international level, and improve standards of living.

The D-8 Preferential Trade Agreement (PTA) came into force in 2011. It is expected to enhance trade among the member countries. Bangladesh is yet to ratify the Rules of Origin because the member countries had not yet accepted Bangladesh’s proposal to reduce the value addition criteria to 30 percent from 40 percent.

Bangladesh signed and ratified the Agreement on Simplification of Visa Procedures for the Businessmen of D-8 Member Countries with Iran, Malaysia, Turkey and Pakistan. In 2011, the Multilateral Agreement among D-8 member countries on administrative assistance on customs matters was signed by Bangladesh, and it is in force now (Bangladesh Economic Review, 2013).

These policies have strengthened the foreign trade of Bangladesh besides integrating our economy with the rest of the world.

2.9 Free Trade Area (FTA)

In order to expand trading opportunity, Bangladesh has also entered several free trade areas. These are:

2.9.1 South Asian Free Trade Area (SAFTA)

The Agreement on South Asian Free Trade Area (SAFTA) was signed in 2004 in Islamabad, Pakistan with a view to extending cooperation in trade and economics among the SAARC member countries. The agreement came into force in 2006. The Tariff Liberalisation Program (TLP) of first phase started in 2006. The developing member states are supposed to reduce the tariff rates at 0%-5% for the items outside the Sensitive Lists by 2012.

India has reduced its tariff to 0% for all the items outside their Sensitive Lists. In 2011, India reduced its sensitive list to 25 for the LDCs member states. Pakistan set its tariff rates at 5 percent for the items beyond their Sensitive List for the LDC member countries. All the member states reduced their Sensitive Lists by 20 percent in the second phase effective from in 2012. Bhutan was exempted from reducing the Sensitive List because they had only 150 tariff lines in their Sensitive List. Sri Lanka is still in the process of reducing their Sensitive List. India also has reduced their Sensitive List for developing countries by 20 percent.

All the member states have already lifted the non-tariff and para-tariff barriers they are facing while exporting to the member states. SAFTA Committee of Experts has been working on it to reduce or eliminate those barriers.

Besides trade in goods, service sectors are also included in the SAARC. An agreement on SAARC trade in Services (SATIS) was signed in 2010. With a view to finalising the Schedules of Commitments all the member states have ratified the Agreement and exchanged initial Offer Lists and Request Lists (Bangladesh Economic Review, 2013).

2.9.2 The Bay of Bengal Initiative for Multi-sectoral Technical and Economic Cooperation (BIMSTEC)

Another agreement, known as the BIMSTEC Framework Agreement was signed in 1997 with a view to forming BIMSTEC Free Trade Area. Member countries are Bangladesh, India, Myanmar, Sri Lanka, Thailand, Nepal and Bhutan. Negotiations are going on in trade in goods, trade in services and investment sectors under this agreement. Thirteen sectors have been identified for cooperation under the agreement. These are- (1) trade and investment, (2) technology, (3) energy, (4) transport and communication, (5) tourism, (6) fisheries, (7) agriculture, (8) cultural cooperation, (9) environment and disaster management, (10) public health, (11) people to people contact, (12) poverty alleviation (13) counter terrorism and trans national crime (Bangladesh Economic Review, 2013).

Joining these free trade areas has broadened the position of Bangladesh in the international field in general and international trade in particular.

2.10 Chapter Summary

This chapter provides a background to the study. The main points it deals with are:

1. The exports of Bangladesh have steadily grown, rising from 1303.13 million U.S. dollar in 1981 to 23264.61 million U.S. dollar in 2012.
2. The imports of Bangladesh have also grown over always outstripping export.
3. The balance of trade of Bangladesh continued to be negative.
4. Balance of payments of Bangladesh, however, attained a surplus in recent years due mainly to foreign remittance, which continued to grow and reached 15 billion by 2014.

5. The nominal exchange rate continued to rise, and the external value of taka continued to fall, due mainly to the persistent trade deficit.
6. The discussion of trade policy showed that Bangladesh was consciously and successfully handling the challenges of international economic exchanges.
7. Bangladesh has entered into several trade agreements to advance the cause of its external trade.

Chapter 3

Literature Review

This chapter contains a review of works on export, import, exchange rate changes, and economic growth. The chapter is divided into two parts. The first part contains a survey of works in this area in general while the second part presents a review of the works on Bangladesh. Since there is a very large number of works, the review made here is restricted to the period from 1981 to 2012.

3.1 Review of Works in General

Feder (1983) analysed the sources of growth in the period 1964–1973 for a group of semi- industrialized less developed countries. An analytical framework was developed, incorporating the possibility that marginal factor productivities were not equal in the export and non-export sectors of the economy. Econometric analysis utilizing this framework indicated that marginal factor productivities were significantly higher in the export sector. The difference seemed to derive, in part, from inter-sector beneficial externalities generated by the export sector. The conclusion was, therefore, that growth could be generated not only by increases in the aggregate levels of labour and capital, but also by the reallocation of existing resources from the less efficient non-export sector to the higher productivity export sector.

Balassa (1985) studied of 43 developing countries in the 1973–78 period of external shocks, which showed that inter-country differences in the rate of economic growth were affected by differences in investment rates and by the rate of growth of the labour force, by the initial trade policy stance and by the adjustment policies applied, as well as by the level of economic development and the product composition of exports. The results showed that the policies adopted had influenced the rate of

economic growth the in developing countries. The results further indicated the possibilities for low-income countries to accelerate their economic growth through the application of modern technology in an appropriate policy framework as well as the advantages of relying on manufactured exports.

Jung and Marshall (1985) showed that previous empirical studies had interpreted results in regressions of output variables on export variables as providing support for an export promotion development strategy. Such an interpretation was questionable since these regressions provide no means of determining the direction of causality. This paper performed causality tests between exports and growth for 37 developing countries. The results cast considerable doubt on the validity of the export promotion hypothesis.

Dodaro (1993) employed individual country time-series analysis to test for the contemporaneous relationship between real export growth and real GDP growth as well as to establish the direction of causality between them. Their causality test offers very weak support for the contention that export growth promotes GDP growth. Support for the alternate contention that GDP growth promotes export growth was also weak although somewhat stronger than the former. Thus the evidence was weak with respect to the alternate notions of trade as an “engine” of growth and trade as a “handmaiden” of growth, suggesting the need to reconsider the whole relationship between exports and economic growth within the context of LDCs.

Khan, Malik, and Hasan (1995) investigated the direction of causation between exports growth and economic growth. This issue had been widely investigated in the past in the context of the suitability of export promotion versus import substitution as development strategies. The traditional practice had been

utilized and the Granger causality test to examine the direction of causality. Recent developments in econometric techniques had highlighted at least two shortcomings in the application of the standard Granger causality test. These included the stationary properties of the series and the co-integration of variables included in the analysis. The present paper, while investigating the direction of causation between exports growth and economic growth and using the Granger causality test, had taken into account these two shortcomings. The paper found stable, long-run two-way relationship between exports (as well as manufactured exports) and output, but a one-way stable relationship between output and primary exports. Furthermore, the paper also found a bi-directional causation between exports (both primary and manufactured) growth and economic growth. Based on these findings, it was recommended that export promotion policy with a major emphasis on manufactured exports must be vigorously pursued to achieve a higher rate of economic growth.

Mendoza (1997) examined a stochastic endogenous growth model in which terms-of-trade uncertainty affected savings and growth. The model explained the well-known positive link between growth and the mean rate of change of terms of trade, and predicts also that terms-of-trade variability affected growth. Increased terms-of-trade variability resulted in faster or slower growth depending on the degree of risk aversion, but in either case it reduced social welfare. These growth effects implied that welfare costs of macroeconomic uncertainty were much larger than first thought. Cross-country panel regressions provided strong support for the model's key predictions.

Levin and Raut (1997) showed that previous empirical research on the determinants of GDP growth had yielded conflicting results. Using a panel of 30 semi-industrialized developing nations over the period 1965–84, their analysis found

the same sensitivity to changes in sample period, selection of countries, and explanatory variables that had been apparent in earlier studies. However, their analysis yielded strong and robust evidence that this sensitivity was due to an interaction between average education and export orientation, which had been neglected by previous studies. These results indicated a high degree of complementarities between trade policies and education expenditures and provided new empirical support for the hypothesis that export orientation contributes to economic growth through increasing returns to scale and other sectoral productivity differentials and not merely by relaxing import capacity constraints. In addition, they found that growth in the manufactured exports/GDP ratio had a strong influence on economic growth, whereas growth in the ratio of primary commodity exports to GDP had a negligible influence, indicating that increasing returns and other efficiencies were mainly concentrated within the manufactured export sector. These findings provided further support for development policies that stimulated long-run economic growth by simultaneously promoting investment in human capital as well as investment in the manufactured export sector.

Senhadji and Montenegro (1998) estimated export demand elasticities for a large number of developing and developed countries, using time-series techniques that account for the nonstationarity in the data. The average long-run income and price elasticities were found to be approximately -1 and 1.5, respectively. Thus, exports did react to both the trade partners' income and relative prices. Africa had the lowest income elasticities for its exports, while Asia had both the highest income and price elasticities. The price and income elasticity estimates had good statistical properties.

Baharumshah and Rashid (1999) examined the relationship between export growth and income growth by including imports in the system of equations using the Johansen (1988) procedure and Vector-error correction (VEC) model. Real exports were disaggregated into manufacturing and agricultural exports. The results of the multivariate co-integration indicated the presence of a stationary long-run relationship between exports, imports and GDP. The estimated VEC models suggested economic growth was driven by exports. Test results also confirmed that economic growth caused export growth for manufacturing exports. Indeed, they found a feedback causal relationship between exports and economic growth for both the manufacturing and agricultural exports. The empirical findings indicated that an important determinant of long-run growth in the fast growing Malaysian economy was imports of foreign technology.

Sinha (1999) studied the relationship between export stability, investment and economic growth in nine Asian countries using time series data. The few previous time series studied in this area had not paid any attention to stationarity and co-integration issues. They found that in most cases, the variables were non-stationary in their levels and not co-integrated. These results raised serious doubts about the results of these studies. The results were not uniform across countries casting doubts about the validity of the numerous cross-section studies. For Japan, Malaysia, Philippines and Sri Lanka, they found a negative relationship between export instability and economic growth. For (South) Korea, Myanmar, Pakistan and Thailand, they found a positive relationship between the two variables. For India, they got mixed results. In most cases, economic growth was found to be positively associated with domestic investment.

This paper was one of the first attempts at studying the effects of export instability on economic growth using recent time series econometric techniques. In this paper, they used time series data to study the relationship between export instability and economic growth for the following nine Asian countries: India, Japan, (South) Korea, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka and Thailand. They got a variety of results for export instability and economic growth. For India, the results were mixed. For Japan, Malaysia, Malaysia, Philippines and Sri Lanka, the evidence suggested a negative relationship between export instability and economic growth. For 13 Korea, Myanmar, Pakistan and Thailand, the results showed a positive relationship between export and instability. These results showed that cross section studied which lump all countries together might lead to misleading conclusions because results differ among the countries. In most cases, the investment variable was found to be positively associated with economic growth.

Ekanayake (1999) used co-integration and error-correction models to analyze the causal relationship between export growth and economic growth in eight Asian developing countries using annual data from 1960 to 1997. The empirical results showed that bi-directional causality existed between export growth and economic growth in India, Indonesia, Korea, Pakistan, Philippines, Sri Lanka and Thailand. There was also evidence for export-led growth in Malaysia. Furthermore, there was evidence for short-run Granger causality running from economic growth to export growth in all cases except Sri Lanka. However, there was no strong evidence for short-run causality running from export growth to economic growth.

McPherson and Rakovski (2000) expanded on an earlier paper which had discussed the relationship between economic growth and exchange rate in Kenya. Based on data for the period 1970 to 1996, they analyzed the possible direct and

indirect relationship between the real and nominal exchange rates and GDP growth. They derived these relationships in three ways: within the context of a fully specified (but small) macroeconomic model, as a single equation instrumental variable estimation, and as a vector-autoregression model. The estimation results from the three different settings showed that there was no evidence of a strong direct relationship between change in the exchange rate and GDP growth. Rather, Kenya's rate of economic growth had been directly affected by fiscal and monetary policies, the availability of foreign aid and other economic variables, particularly the growth of exports. Together, these factors had tended to sustain a pattern of real exchange rate over-valuation, which had been unfavorable for growth. Their conclusion was that improvements in exchange rate management alone were not adequate for the revival of growth in Kenya, but had to be part of a broader program of economic reform.

Giles and Williams (2000) discussed relationships between exports and economic growth. One debate centered on whether countries should promote the export sector to obtain economic growth. An abundant empirical literature on this export-led growth (ELG) hypothesis had followed. They contributed to this literature in two ways. In this paper, they provided a comprehensive survey of more than one hundred and fifty export-growth applied papers. They describe the changes that had occurred, over the last two decades, in the methodologies used to empirically examine for relationships between exports and economic growth, and they provided information on the current findings. The last decade had seen an abundance of time series studies that focused on examining causality via exclusions restrictions tests, impulse response function analysis and forecast error variance decompositions. Their second contribution was to examine some of these time series methods. They showed that ELG results based on standard causality techniques were not typically robust to specification or method.

Ahmed, Butt, and Alam (2000) studied of export-driven economic growth analysis which investigated the direction of causality between export revenue and the growth of GDP, had been inconclusive. The major shortcoming with the bivariate causality analysis was the omission of other relevant variable, such as foreign debt servicing. Such omission can bias the empirical results. In this study, foreign debt servicing was introduced as a third variable within trivariate causality analysis of exports and economic growth for South and South-East Asian countries. The evidence indicates that, generally, there was no joint feedback affect between export revenue, external debt service and economic growth, with notable exception for India where unidirectional causality support ELG hypothesis and foreign loans appeared to be effective in enhancing GDP growth. The general conclusion was that both the export-driven GDP growth and GDP growth-led export promotion hypotheses were not being supported in all the cases examined, especially in the 1971–97 total period, except for India. Furthermore, the structural adjustment programmes, though removed some of the economic distortions and encouraged regular repayment of the external debt failed to enhance economic growth and result in lowering export revenue in these countries, particularly, these effect were more pronounced in the case of relatively poor countries, such as Bangladesh.

Ramos (2001) investigated the Granger-causality between exports, imports, and economic growth in Portugal over the period 1865-1998. The role of the import variable in the investigation of exports-output causality was emphasised, enabling one to test for the cases direct causality, indirect causality, and spurious causality between export growth and output growth. The empirical results did not confirm a unidirectional causality between the variables considered. There was feedback effect between exports-output growth and imports-output growth. More interestingly, there

was no kind of significant causality between import-export growth. Both results seemed to support the conclusion that the growth of output for the Portuguese economy during that period revealed a pattern associated with a small dual economy in which the intra-industry transactions would very limited.

Lee and Huang (2002) discussed process of economic development; different economic policies were adopted in accordance with particular circumstances. Therefore, conventional methods of time-series analysis might give misleading results if the problems associated with regime switches were not considered. The relationship between export growth and output growth was explored using a multivariate threshold model with regimes defined by the export-import ratio. In the cases of five countries that were recognised as being outward-oriented, they found that, except for Hong Kong, the relationship whereby exports lead output prevails in at least one regime for each of four of the countries being studied. The regime-based threshold autoregressive model thus appeared to possess certain advantages over the more conventional linear autoregressive model.

Yanikkaya (2003) demonstrated that trade liberalization did not have a simple and straightforward relationship with growth using a large number of openness measures for a cross section of countries over the last three decades. They used two groups of trade openness measures. The regression results for numerous trade intensity ratios were mostly consistent with the existing literature. However, contrary to the conventional view on the growth effects of trade barriers, their estimation results showed that trade barriers were positively and, in most specifications, significantly associated with growth, especially for developing countries and they were consistent with the findings of theoretical growth and development literature.

Musleh-Ud Din (2004) examined the export-led growth hypothesis for the five largest economies of the South Asian region using a multivariate time-series framework. The South Asian countries presented an interesting case study in view of their increasing outward orientation and adoption of export promotion policies as part of their growth strategies. A key feature of the study was the explicit incorporation of imports in the analysis to make allowance for their role in the export-economic growth relationship. While controlling for imports, the results indicated bi-directional causality between exports and output growth in Bangladesh, India, and Sri Lanka in the short-run. The study found long-run equilibrium relationships among exports, imports, and output for Bangladesh and Pakistan. However, for India, Nepal, and Sri Lanka, no evidence of a long-run relationship among the relevant variables is found. These results were in contrast to some earlier work that found the export-led growth hypothesis to be a long-run phenomenon for all countries in the region.

Kónya (2004) investigated the possibility of export-led growth and growth-driven export by testing for Granger causality between the logarithms of real exports and real GDP in twenty-five OECD countries. Two complementary testing strategies were applied. First, depended on the time series properties of the data, causality was tested with Wald tests within finite-order vector autoregressive (VAR) models in levels and/or in first-differences. Then, with no need for pre-testing, a modified Wald procedure was used in augmented level VAR systems. In both cases they experimented with alternative deterministic trend degrees. The results indicated that there was no causality between exports and growth (NC) in Luxembourg and in the Netherlands, exports cause growth (ECG) in Iceland, growth causes exports (GCE) in Canada, Japan and Korea, and there was two way causality between exports and growth (TWC) in Sweden and in the UK. Although with less certainty, they also

concluded that there was NC in Denmark, France, Greece, Hungary and Norway, ECG in Australia, Austria and Ireland, and GCE in Finland, Portugal and the USA. However, in the case of Belgium, Italy, Mexico, New Zealand, Spain and Switzerland the results were too controversial to make a simple choice.

Kandil (2004) examined the effects of exchange rate fluctuations on real output growth and price inflation in a sample of twenty-two developing countries. The analysis introduced a theoretical rational expectation model that decomposes movements in the exchange rate into anticipated and unanticipated components. The model demonstrated the effects of demand and supply channels on the output and price responses to changes in the exchange rate. In general, exchange rate depreciation, both anticipated and unanticipated, decreased real output growth and increases price inflation. The evidence confirmed concerns about the negative effects of currency depreciation on economic performance in developing countries.

Abou-Stait (2005) examined the export-led growth (ELG) paradigm for Egypt, using historical data from 1977 to 2003. During this period, Egypt has changed its economic philosophy from central planning and government intervention to one based on a free market economy. The paper employed a variety of analytical tools, including co-integration analysis, Granger causality tests, and unit root tests, coupled with vector auto regression (VAR) and impulse response function (IRF) analyses. The paper sets three hypotheses for testing the ELG paradigm for Egypt, (i) whether GDP, exports and imports were co-integrated, (ii) whether exports Granger cause growth, (iii) whether exports Granger cause investment. The paper failed to reject the first two hypotheses, while it failed to accept that exports Granger cause investment. In addition to the analysis of the 1977-2003 period, the paper looked briefly also at the impact of the economic reform undertaken in 1991, and whether the ELG hypothesis still held during the 1991-2003 sub-period.

Shirazi and Manap (2005) re-investigated export-led growth hypothesis for Pakistan. The paper employed co-integration and multivariate Granger Causality developed by Toda and Yamamoto (1995) to study the long-run and short run dynamics among exports growth, imports growth and real output growth over the period 1960 to 2003. The empirical results strongly supported a long-run relationship among import, export and output growth. The paper found feedback effect between import and output growth, and unidirectional causality from export to output growth. Nevertheless, this paper did not find any significant causality between import and export growth.

Keong, Yusop and Sen (2005) investigated the validity of the export-led growth hypothesis in the Malaysian economy using a more comprehensive sample period and a recent technique, which was, the bounds testing approach. Based on this model, both exports and labour force had stimulated positive adjustment to economic growth, whereas variables such as imports, exchange rate and the East Asian financial crisis were found to influence growth negatively. Moreover, a co-integrated relationship between exports and economic growth was detected in both the long and short runs. Further analysis showed that exports Granger-cause economic growth in the period of study. Thus, this study provided further evidence to support the export-led growth hypothesis in the Malaysian Economy.

Konya and Singh (2006) conducted this study on India. It was widely believed that export and import growth was crucial in providing the impetus for economic growth in developing countries and imports provided the important 'virtuous' link between trade and output growth. Therefore, their aim, here, was to address the export/import-led growth and growth-driven export/import hypotheses for India. In

spite of some ambiguity, the results clearly showed that exports and imports Granger-cause GDP, both individually and jointly, lending support to the export/import led growth hypotheses. There was also some indication of GDP and exports jointly Granger-causing imports, and GDP and imports jointly Granger-causing exports, but the growth driven export/import hypotheses seemed implausible. A possible reason for the results was the favourable trade environment of India.

Dutta and Ahmed (2006) investigated the behaviour of Indian aggregate imports during the period 1971-1995. In their empirical analysis of the aggregate import demand function for India, cointegration and error correction modelling approaches had been used. In the aggregate import demand function for India, import volume was found to be cointegrated with relative import price and real GDP. Their econometric estimates of the import-demand function for India suggest that import-demand was largely explained by real GDP, and was generally less sensitive to import price changes. Import liberalisation was found to have had little impact on import demand.

Nowak, Sahli, and Cortes-Jimenez (2007) thought that exports were generally assumed to promote long-term growth through two main channels. The first, known as the export-led growth (ELG) hypothesis, was by enhancing economy-wide efficiency. This mechanism had recently been applied to tourism services exports (the *tourism-led growth*, TLG, hypothesis). The second channel was the financing of imports of foreign capital goods, thus raising the level of capital formation. Although this channel turns out to be empirically important, no theoretical rigorous foundation had yet been provided. Moreover, it had never been investigated for tourism exports. This paper filled two gaps. On the theoretical side, it provided a clear justification of the role of capital goods imports in the link between exports and overall economic

growth. A model had been built to examine this so-called EKIG hypothesis (exports → capital good imports → growth) in which sustained economic growth was achieved by imports of foreign capital entirely financed through inbound tourism. This model highlighted a mechanism of international transmission of economic growth from the tourist.

Rehman (2007) studied the aggregate import demand function for Pakistan. Their findings suffer from the so-called 'spurious regression' problem. This study attempts to estimate the aggregate import demand function for Pakistan by employing Johansen and Juselius cointegration technique on the annual data for the period 1975-2005. Their results showed that there was long-run equilibrium relationship among variables and the stability tests indicate that import demand function remains stable over the sample period and hence the estimated results were appropriate for policy implications.

Uğur (2008) analysed empirically the relationship between imports and economic growth in Turkey. In order to make an elaborate examined of the import-economic growth relationship, import was decomposed to its categories and then a multivariate VAR analysis was used to determine the relationship. Empirical results derived from IRFs and VDCs showed that while there was a bidirectional relationship between GDP and investment goods import and raw materials import, there was a unidirectional relationship between GDP and consumption goods import and other goods import.

Ahmed, Cheng and Messinis (2008) disappointed economic performance of Sub-Saharan African (SSA) economies in the late 1980s prompted economic-wide policy reforms in the early 1990s. The primary objectives of these institutional and

structural changes were to promote trade and export activities, enhance foreign direct investment (FDI) inflows, and ease foreign access to SSA markets particularly for large multinational enterprises associated with more advanced technologies and better managerial and organizational practice. This study focused on the effect of exports, FDI and imports on economic growth in SSA, using the new autoregressive distributed lag (ARDL) approach and Pedroni estimation procedure which also allowed for heterogeneity across individual countries. It was found that exports and FDI had significant impact on economic growth. Granger-type causality tests showed the interrelatedness of exports, FDI, imports and income variables. The results also provided some evidence of existence of a two-stage causal chain of exports, imports and income. The paper called for more market-oriented policy changes in SSA countries to create a liberal environment for foreign trade and FDI.

Andersen and Babula (2008) reviewed the most cited empirical analyses of the relationship between international trade and economic growth and more recent empirical analyses of the link between trade and productivity growth. They concluded that there was likely to be a positive relationship between international trade and economic growth. There were, however, two caveats. First, they were concerned about the way problems of measurement error and endogeneity were handled in much of the empirical literature. The second caveat related to the ability of developing countries to gain productivity growth through trade liberalization. To do so, it might very well be necessary to invest in, e.g., education facilities, to ensure property rights and to build up institutions.

Rodrik (2008) showed undervaluation of the currency (a high real exchange rate) stimulated economic growth. This was true particularly for developing countries. This finding was robust to using different measures of the real exchange rate and different estimation techniques. He also provided some evidence that the operative

channel was the size of the tradable sector (especially industry). These results suggested that tradable goods suffer disproportionately from the government or market failures that keep poor countries from converging toward countries with higher incomes. He presented two categories of explanations for why this might be so, the first focusing on institutional weaknesses, and the second on product-market failures. A formal model elucidates the linkages between the real exchange rate and the rate of economic growth.

Çetintaş and Barişik (2009) analysed the relationships between export, import and economic growth for the 13 transition economies. Empirical results showed that there was a unidirectional causality from economic growth to export. Empirical findings showed that the growth-led export hypothesis was valid in those countries and growth was rather shaped by increase in import demand.

Olayiwola and Okodua (2009) examined the applicability of the export-led growth (ELG) hypothesis using empirical evidence from Nigeria. The bulk of FDI inflow into the country goes to the oil sector of the economy. But FDI from the perspective of *efficiency-seeking* indicated that foreign capital always aimed at taking advantage of cost-efficient production condition. There was the general belief that this motive was predominant in sectors where products were produced mainly for regional and global markets and competition was mostly based on price and not on quality differentiation. In Nigeria, the role of FDI in the non oil exports – growth nexus had hitherto been under-researched. This role, therefore, was the major focus of this study. A causality analysis of the relevant variables was undertaken in order to verify the relevance of the ELG hypothesis in the Nigerian economy. Empirical evidence from available data failed to support the export-led growth hypothesis in Nigeria.

Javed and Farooq (2009) investigated the relationship of economic growth and exchange rate volatility in Pakistan. The empirical relationship between exchange rate volatility and economic growth had been found while employing Error Correction techniques along with Auto Regressive Distributed Lag Model (ARDL). Notwithstanding, co-integration relationship between growth, exchange rate volatility, reserve money and manufacturing were detected in the long run except exports and imports. Conclusion suggested that domestic economic performance was very sensitive to the exchange rate volatility in the long-run period.

Pop-Silaghi (2009) examined the export-led growth hypothesis (ELG) and growth-led export hypothesis (GLE) for the Central and Eastern European Countries (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, Slovakia) through co-integration and causality tests. The estimation was carried out within finite-order vector autoregressive (VAR) models in levels, in first-differences and error correction models. When considered bivariate systems, causality from exports to GDP was obtained for Bulgaria, the Czech Republic, Estonia, Latvia and Lithuania. Causality from GDP to exports was indicated for Bulgaria, the Czech Republic, Estonia, Hungary, Lithuania, Romania and Slovenia. They also investigated if the above results still held when including the other relevant component of the foreign trade, i.e. imports. In trivariate systems, ELG remains valid in the Czech Republic only and becomes valid in Lithuania while GLE was validated in Hungary, Romania and Slovenia.

Uddin, Khan and Alam (2010) focused on the casual relationship between export, import and Gross Domestic Product (GDP) for Bhutan using annual data from 1980 to 2005. The Granger causality test and Co-integration Models were employed

taking care of stochastic properties of the variables. The co-integration analysis suggested that there was a long-run equilibrium relationship. The results of Granger causality test showed that there was a causal relationship between the examined variables. The causal nexus was unidirectional from export to import and GDP, and GDP to import only. Here export led growth was empirically proven in Bhutan.

Lee (2010) examined the short-run and long-run dynamic interactions between exports, imports and income for Pakistan within a multivariate framework. It showed that with the use of imports as an additional relevant variable in the empirical model, the researchers could had a better understanding on the effects of exports on economic growth. They found evidence to support import-led growth and export-led growth hypotheses in the long-run. In the short-run, they found evidence to support export-led growth, growth-led exports, import-led growth and growth-led imports hypotheses. This study suggested that exports and imports were important in fuelling the economic growth of Pakistan in the short-run.

Li, Chen, and San (2010) examined that development of foreign trade greatly affected GDP growth. Adopted modern testing methods like unit root, time-series co-integration analysis and error correction model for researching the causalities between foreign trade including total export and import with the collected 28-year statistical data of east China from 1981 to 2008, included total export and total import and GDP growth of east China. The result suggested that there exist long term or short term causality between GDP and total export and import as well as between GDP and export, foreign trade was the long term and short term reason of GDP growth, but no evidence could prove that there exists long term stationary causality between import trade and GDP. This paper finally provided with some instructive recommendations on how to develop the foreign trade of east China under the new global economy environment.

Amiri and Gerdtham (2011) introduced a new way of investigating linear and nonlinear Granger causality between exports, imports and economic growth in France over the period 1961-2006 with using geostatistical models (kriging and inverse distance weighting). Geostatistical methods were the ordinary methods for forecasting the locations and making map in water engineering, environment, environmental pollution, mining, ecology, geology and geography. Although, this was the first time which geostatistics knowledge was used for economic analyzes. In classical econometrics there did not exist any estimator which had the capability to find the best functional form in the estimation. Geostatistical models investigated simultaneous linear and various nonlinear types of causality test, which caused to decrease the effects of choosing functional form in autoregressive model. This approach imitated the Granger definition and structure but improve it to had better ability to investigate nonlinear causality. Results of both VEC and Improved-VEC (with geostatistical methods) were similar and showed existence of long run unidirectional causality from exports and imports to economic growth. However the F-statistic of improved-VEC was larger than VEC indicated that there were some exponential and spherical functions in the VEC structure instead of the linear form.

Hye and Boubaker (2011) investigated the export-led growth, import-led growth and foreign debt sustainability hypotheses in the case of Tunisia by using annual time series data for the period 1960-2008. Autoregressive Distributed Lag (ARDL) approach was employed to determine the long-run relationship or direction of long-run causality between exports, imports and GDP, and the strength of causal relationship was examined by using variance decomposition method. The results indicated unidirectional causality from exports to economic growth and bidirectional relationship between imports and economic growth. Thus, both export-led growth and

import-led growth were valid for Tunisia. On the other hand, there was bidirectional association between exports and imports. The long-run elasticity of exports with respect to imports was 1.02 and long-run elasticity of imports with respect to exports was 0.86. Thus, foreign debt was weakly sustainable in the case of Tunisia. The empirical findings of the study were important for policy makers of Tunisia in the formulation of trade policies.

Mishra (2011) focused that the era of open economy; nations were concerned with increasing the quality of life of their citizens. And, the quality of life mainly comes from the macro-economic prosperity. Thus, fast growth of gross domestic product had become the most important objective of any economy. There were various approaches to achieve this target of which one strategy was to promote exports of the country. At this juncture, an important issue immediately breaks the minds of economists and researchers, that was, whether export promotion leads to higher economic growth or economic growth promotes exports. Thus, this paper was an attempt to reinvestigate the dynamics of the relationship between exports and economic growth for India over the period 1970 to 2009. Applying popular time series econometric techniques of co-integration and vector error correction estimation, the study provided the evidence of stationarity of time series variables, existence of long-run equilibrium relation between them, and finally, the rejection of exported growth hypothesis for India by the Granger causality test based on vector error correction model estimation.

Kogid, Mulok, Ching, Lily, Ghazali and Loganathan (2011) used the bivariate co-integration and causality analysis based on the Engle-Granger two steps, Johansen, Toda-Yamamoto, and Hsiao's Granger procedures to analyze the relationship between the economic growth and the import in Malaysia from 1970 to 2007. Results showed

that there was no co-integration exists between economic growth and import, but there exists bilateral causality between economic growth and import. Results also showed that import could indirectly contribute to economic growth, and economic growth could also directly contribute to import. These findings might be vital for future economic growth policy.

They perceived that by improving the institutions or the way of how economy operates, they might be able to change their economic outcomes for the better. When institutions were weak, even places with abundant natural resources or other inputs would not promise a sustainable economic growth. To achieve a sustainable economic growth, good governance and well managed economic resources were crucial. The findings of this study showed that in the case of Malaysia, import had a paramount important role in spurring the growth of the economy especially in the short run. More emphasize should be accorded on this determining factor especially in the drafting of the long term economic growth policies of the country.

Bbaale and Mutenyo (2011) were guided by the hypothesis that it was not exports per se that matter, but different export components influenced growth differently. They considered a sample of 35 sub-Sahara African countries based on availability of data on the key variables. The Generalized Methods of Moments estimator was employed during the analysis. They found that it was the growth in agricultural exports, and not manufactured exports, which was significantly associated with per capita income growth in their sample. These countries should adopt policies that increase agricultural exports in the medium term as they designed strategies for increasing manufactured exports in the long term. Other factors significantly influencing growth were gross capital formation, capital goods imports, infrastructure, government consumption, and inflation rate, political systems and governance, and education.

Mehrara and Firouzjaee (2011) investigated Granger causality relationship between nonoil export and economic growth based on panel co-integration analysis for 73 developing countries during the period 1970-2007. Sample countries were categorized into two groups of oil dependent countries and nonoil developing countries. Also, for evaluating the causality direction, bi-variate and tri-variate specifications were applied. The results showed that in both bi- and tri-variate models, there was bidirectional long-run causality between export and GDP growth for both groups of countries. Also, bivariate model, there was bidirectional short-run causality between export and GDP growth for nonoil developing countries, however, for oil countries, there was no short run causality relationship between the variables, in any of the two models.

Rapetti, Skott and Razmi (2011) found a positive relationship between real exchange rate (RER) under-valuation and economic growth. Different rationales for this association have been offered, but they all imply that the mechanisms involved should be stronger in developing countries. Rodrik (2008) explicitly analyzed and found evidence that the RER-growth relationship is more prevalent in developing countries. They showed that their findings were very sensitive to the criterion used to divide the sample between developed and developing countries. They then used alternative classification criteria and empirical strategies to evaluate the existence of asymmetries between groups of countries and find that the effect of currency undervaluation on growth was indeed larger and more robust for developing economies. However, the relationship between RER undervaluation and per capita GDP was non-monotonic.

Abbas (2012) investigated causal relationship between GDP and exports for the period of 1975 to 2010. The aim of this study was to check affectivity of export promotion policy adopted by Pakistan during 1990s. Johansen test of Co-integration and Granger Causality employed to determine short run and long run causality. The result of Co-integration revealed existence of one positive co-integrating equation. The result of Causality test showed short run and long run causality run from GDP to exports. The result concluded that both in short and long run only growth in production cause exports growth. Government should attempt to develop production side, which in long run develop trade and economy.

Khan, Azra, Umar, Zaman, Ahmad and Shoukat (2012) used the Granger causality and co-integration tests to examine the long-run correlation among economic growth, exports and imports of Pakistan taking time series data for the time period 1972-2009. The results based on Error-Correction Model showed the existence of long-run correlation among exports, imports and economic growth. Both exports and imports were considered an essential part for economic growth of Pakistan. Moreover, economic growth had an important impact on exports and imports. A successful and sustained economic growth required growth of both exports and imports. The results of this research had important implications for macroeconomic policies of the nation.

Dreger and Herzer (2012) challenged the common view that exports generally contributed more to GDP growth than a pure change in export volume, as the export-led growth hypothesis predicts. Applying panel co-integration techniques to a production function with non-export GDP as the dependent variable, they found for a sample of 45 developing countries that: exports had a positive short run effect on non-

export GDP and vice versa (short-run bidirectional causality), the long-run effect of exports on non-export output, however, was negative on average, but there were large differences in the long-run effect of exports on non-export GDP across countries. Cross-sectional regressions indicated that these cross-country differences in the long-run effect of exports on non-export GDP were significantly negatively related to cross-country differences in primary export dependence and business and labor market regulation. In contrast, there was no significant association between the growth effect of exports and the capacity of a country to absorb new knowledge.

This paper challenged the conventional view that exports generally contributed more to GDP growth than the mere change in export volume, as the export-led growth hypothesis predicts. They first examined the nature of the growth effect of exports by applying panel co-integration methods to a production function model with non-export GDP as the dependent variable. Their results, based on data from 1971 to 2005 for 45 developing countries, showed that the short-run relationship between exports and non-export GDP was positive. In the long-run, however, an increase in exports led to a reduction in non-export GDP in developing countries, on average. This effect was robust to alternative estimation techniques, outliers, sample selection, and different sub periods. Nevertheless, there were large differences in the long-run effect of exports on non-export GDP across countries. More specifically, they found that an increase in exports was associated with a long-run decrease in non-export GDP in 69 percent of the countries; in 31 percent of the cases, an increase in exports was associated with a long-run increase in non-export GDP.

Allaro (2012) was aimed to scrutinize empirically the ELG (export-led growth strategy) on Ethiopia's economy. The causal relationship between export and

economic growth of the country was analyzed with the application of Granger (1969) causality test using annual data for the period 1974 to 2009. It revealed that the decline in economic growth in the country pre reform period coupled with the alarming population growth led to stagnation and even a continual decline in the income of the country. This led to closer scrutiny of export growth on economic growth to achieve a sustained economic growth. Since 1992, the economic growth policy of Ethiopian government was guided by the idea of export-led growth. The viewed of export-led growth conceives growth of exports as having a favorable impact on economic growth. According to this viewed, export expansion to foreign markets improved resource allocation and production efficiency. Export was claimed as the 'engine of growth'. The results of the study showed that there was evidence of uni-directional causality between export and economic growth for Ethiopia. Export growth causes economic growth. Thus, the results were favorably comparable to those obtained in the literature (Shan and Sun, 1998).

Javed, Qaiser, Mushtaq, Saif-ullaha and Iqbal (2012) examined the impact of total exports to GDP ratio, imports to GDP, terms of trade, trade openness, investment to GDP ratio, and inflation on the economic growth of Pakistan. The empirical analysis was conducted by using time series data from 1973-2010. Chow test is used to test the structural break and model fitness. The OLS (Ordinary Least Square) technique was used to detect the relationship between exogenous variables and endogenous variable. The estimated results showed that explanatory variables had positive and significant impact on the economy of Pakistan. The results also showed that an increase in the import of raw materials, the production, employment and output of the country was boosted up. Similarly, Trade openness had also positive and significant influenced on the economy of Pakistan. It concluded that international trade might play an important role to enrich the economy of Pakistan.

In a nut shell, international trade had positive impact on the economy of Pakistan. The economy Pakistan could be better if Government could adopt multipurpose strategies such as improvement in tax and revenue structure, improving fiscal, monetary policies and structural adjustments policies and eradicate anticompetitive market practices. Moreover, Govt should decrease the imports of costly products with suitable policies and prefer to prepare all required things inside the country.

Saad (2012) examined the econometric relationship between external public debt, exports and economic growth in Lebanon. This study empirically investigated the relationship between economic growth, exports and external debt of Lebanon through an econometric analysis over the period 1970-2010 with the inclusion of a fourth macroeconomic variable that was the exchange rate. The exports were introduced in the model to test the export-led growth hypothesis for Lebanon. They explored this relationship using the vector error correction models (VECM) and they employed Granger causality technique in order to investigate the presence of causality among these variables. The results showed that both short run and long run relationships exist among these variables. Moreover, the finding suggested, bidirectional Granger causality between GDP and external debt servicing, unidirectional Granger causality that runs from external debt to exports, unidirectional causality running from exports to economic growth, and unidirectional causality running from exchange rate to economic growth.

Alimi and Muse (2013) examined the role of export in the economic growth process in Nigeria. Time series data ranging from 1970 to 2009. The study employs unit root testing, co-integration analysis and VAR Granger Causality/Eogeneity Wald

Tests to analyze annual time series data from Nigeria. The study used three measures of export namely, Total export, Oil export and Non-Oil export. This enhanced the stability and robustness of results. The unit root test showed that both economic growth and export were integrated of orders, i.e. $1(1)$. The co-integration test confirmed for model 1 and model 2 (where total exports and oil exports were used respectively as proxy for Nigeria exports) that economic growth and export were co-integrated, indicating an existence of long run equilibrium relationship between the two as confirmed by the Johansen co-integration test results. However, there was no evidence of co-integration between export and economic growth for model 3. Granger causality was applied to test the causal relationship between GDP and economic growth. The resulted show that there was evidence of uni-directional causality between export and economic growth in Nigeria in three measures of exports and the direction of causality runs strictly from economic growth to exports. This study provided support for growth-led export in case of Nigeria. Thus effort should be direct towards policies that would be enhanced economic growth such as import substitution industrialization (ISI) strategy, in order to impact more on exports.

Xing and Pradhananga (2013) investigated the global financial crisis and the recent growth slowdown in the People's Republic of China (PRC). The argument was that the PRC was too dependent on external demand and that it needed to rebalance its economy toward domestic consumption. However, conventional measured of external demand—share of net exports and exports as a share of gross domestic product (GDP)—were biased and did not accurately measure the contribution of external demand to GDP growth. In this paper, they proposed two measures that were simple modifications of the conventional measures. They argued that their proposed measures provided a more accurate estimate of the vulnerability of the PRC economy

to external shocks, in the form of sudden drops in exports and foreign direct investment (FDI). Their estimates showed that in 2001 exports and FDI accounted for 18.2% of GDP growth and by 2004 the share had risen to 49%. During 2005–07, the contribution of exports and FDI to growth remained 38%–40%. Their estimates also showed that the impressive recovery of the PRC economy in the post-crisis period owed at least 53% of its growth to exports and FDI. Based on these results, they concluded that the PRC economy remains highly dependent on external demand in the form of exports and FDI, and rebalancing the economy toward domestic demand had not yet been achieved.

3.2 Review of Works on Bangladesh

In this section, the research works dealing with export, import, growth, and exchange rate on Bangladesh have been surveyed.

Kabir (1988) estimated the effect of exchange rate changes on the demand for imports and exports of Bangladesh. The emphasis in this study was placed on constructing import-demand and export-demand models, and then estimating the relevant elasticities. The demand functions were specified in the traditional multiplicative way, and estimated in a transformed log-linear form. Usually, exchange rate changes were introduced indirectly by expressing the prices in common currency units. In this paper, instead the direct specification of the exchange rate variable was made. This seemed to provide more information on the influence of exchange rate changes. Also the usually put constraint on relative price variable was removed from the specifications.

Tang (2002) examined the determinants of aggregate import demand behaviour in Bangladesh. In contrast with traditional import demand specification, the

final demand variable (Real Gross Domestic Product) was further disaggregated into private consumption, government consumption, expenditure on export goods, and gross domestic investment. The other determinant was relative price. The bounds testing approach and unrestricted error correction model were employed for analysis. The findings were first, a long run relationship exists among quantity of import demand and its determinants over sample period 1965 to 1998. Secondly, Bangladesh's import demand was influenced differently by various components of final expenditure, particularly expenditure on export goods. The results have important policy implication to improve external balance.

Mamun and Nath (2005) examined time series evidence to investigate the link between exports and economic growth in Bangladesh. Using quarterly data for a period from 1976 to 2003 the article found that industrial production and exports were co-integrated. The results of an error correction model (ECM) suggested that there was a long-run unidirectional causality from exports to growth in Bangladesh. This article examined time series evidence of export led growth in Bangladesh. While the analysis suggested that there was a positive long-run equilibrium relationship between exports and industrial production, there was no evidence of short-run causal relationship between these two variables. Furthermore, the long-run causality seems to run from exports to industrial production.

Chaudhary, Shirazi and Choudhary (2007) examined trade policy and economic growth for Bangladesh. The paper had employed co-integration and multivariate Granger Causality test developed by Toda and Yamamoto (1995) to study the long-run and short-run dynamics among exports growth, imports growth and real output growth over the period 1973 to 2002. Their results strongly supported a

long-run relationship among the three variables for Bangladesh. The results showed feedback effects between exports and output growth and also between imports and output growth in the short-run. A strong feedback effects between import growth and export growth had also been established.

Aziz and Horsewood (2008) focused on the empirical modelling of the major determinants of imports demand of Bangladesh using annual data. They, not only, critically examined the determinants of imports demand following conventional wisdom but have taken into account some plausible new determinants like foreign exchange reserves and final expenditure components also. The paper investigated the impact of trade liberalizations as well. They finally employed the equilibrium correction mechanism (ECM) to investigate the short-run dynamics of imports demand. The estimated results demonstrate that the real GDP and relative prices of imports were statistically significant and showed expected signs for Bangladesh. Relative imports prices was an important determinant of imports demand both in the short- and long-run. They find that the hypothesis of unit coefficient of income in the aggregate imports demand was apposite in Bangladeshi data. Trade liberalization could not make any special difference for the imports demand of the country. Finally, they argued on the basis of estimated results that the demand for Bangladeshi exports determines its aggregate imports demand.

Ahmed and Uddin (2009) investigated the causal nexus between export, import, remittance and GDP growth for Bangladesh using annual data from 1976 to 2005. The paper used time series econometrics tools to investigate the relationship adding import and remittance in the model. Study found limited support in favour of export-led growth hypothesis for Bangladesh as exports, imports and remittance cause

GDP growth only in the short run. The causal nexus was unidirectional. In spite the variables under consideration depict an increasing trend; this study found limited support in favour of the export-led growth hypothesis for Bangladesh. Time series analysis indicated exports, imports and remittance cause GDP growth in the short run but had no long run impact. Furthermore, the causal nexus was unidirectional. Long run GDP growth causes short run income growth but this affect was once again unidirectional. Using Johansen's multivariate approach to co-integration, and using imports and remittance as additional variables, their findings suggested that real GDP, real exports, real imports and real remittance were co-integrated for Bangladesh, implying a long run relationship amongst all these variables. However, the direction of short run and long run causality was unidirectional. This result was hardly surprising as Bangladesh embarked on import-substituting model of growth after independence in 1971 and the reforms of the external sector were more or less a recent phenomenon which was still going on.

Hossain, Haseen and Jabin (2009) analysed the relationship among exports, imports and GDP had been investigated by applying co-integration and error correction models using annual time series from 1973 to 2008 in Bangladesh. The paper addresses the issue of short run dynamics of exports-imports-income within a long run framework. The paper was an improvement over the earlier studies in terms of data used and techniques applied and dealing with specification bias resulting from omitted variables. The empirical evidence suggested that there was unidirectional causality from exports to income, which suggested that export promotion strategy could contribute to Bangladesh's economic growth. The increasing degree of Bangladesh's trade openness was justified by this fact. Again, the role of imports could not be ignored in examining the relationship between exports and economic growth as the empirical evidence

suggested that exports significantly affect import both in the long and short runs. It was important to note here that expansion of exports was not a guarantee for economic growth as exports was significantly affected by imports.

Uddin and Chakraborty (2009) examined financial development and international trade, developed from empirical growth literature, were identified as macroeconomic variables highly correlated with economic growth. This study employed the co-integration and Granger causality tests to investigate long-run relationship and the direction of causality between financial development, international trade and real income growth in Bangladesh. The estimation procedure also passes a battery of diagnostic tests indicated stability of the long run and short run estimates. The results of the study did not reveal any long-run relationship between economic growth and financial development as scaled by money supply and domestic credits, and between exports and economic growth. On the other hand, Granger causality test results suggested that the export- led growth hypothesis could be inferred for Bangladesh economy in the short run. However, both export and import growth cause changed in the money supply in the short run. The nexus was unidirectional. Long run GDP growth had an effect on income growth in the short run. Finally, this study had shown that import growth causes a change in the domestic credit in the short run. The findings of this paper had important implications for macroeconomic policies of the nation.

In this paper, they used time series econometric techniques to investigate the direction of causality between international trade (exports and imports of goods and services), financial development and economic growth in Bangladesh over the period 1975-2005. The main findings of the paper could be summarized as follows: First, the

results showed one-way causality from export growth to real GDP growth in Bangladesh. Second, the results did not provide sufficient evidence of a long-run causal relationship between economic growth and financial development as scaled by money supply and domestic credits, and between exports and economic growth. Third, Granger Causality test results revealed that both export and import growth cause changes in the money supply in the short run whereas the causality was unidirectional. Fourth, the empirical analysis suggested that long run GDP growth had an effect on income growth in the short run. Finally, this study had indicated that import growth causes a change in the domestic credit in the short run. Thus the domestic credit provided by the banking sector had been assumed to contribute to the growth of the Bangladesh economy.

Islam and Biswas (2009) compared the economic track records of the two different exchange rate regimes the “Fixed Exchange Rate” and the “Free Floating Exchange Rate System” in maintaining economic performance. This paper also considered relationships between exchange rate and Inflation and between exchange rate and GDP in Bangladesh. Bangladesh experienced of moving away from a currency board system to floating regime since 2003 offered a lesson worthy of attention from the point of view of efficiency of “Floating Rate System” in least developed countries like Bangladesh. “Floating exchange rate regime in Bangladesh contrasts with its neighbor’s currency board system. Experiences in Bangladesh and abroad showed that all that a government needs in this regard was to maintain confidence in the currency, secure currency's strength and ensure its full convertibility. As long as this was backed by sufficient reserve of the foreign exchanges and there was firm political and economic will, adoption of a successful free exchange rate regime is possible.

Bangladesh had introduced floating rate system to measure the rate at which the foreign currency was supposed to be exchanged. Many countries experienced devaluation of its currency after the introduction of floating exchange rate regime. Bangladesh had taken precautions before introducing that system. Foreign banks had set up independent treasury division to manage their assets and liabilities both local and foreign currencies. Local banks were yet to develop themselves to match the changed market condition, but one good indication was that they had started to realize the necessity for treasury division. The Bangladesh Bank was directing its efforts towards developing a competitive market. Most of the economists expected that floating exchange rate system would ensure export diversification, import substitution, trade liberalization as well as external financial support. Moreover, they viewed that it would ensure sound monetary management through control of inflation. The findings of the study and IMF study, nevertheless, explained “Given such pros and cons, the choice of exchange rate regime was not clear cut. What matters was a set of sound economic policies that remain consistent with any chosen exchange rate regime” (Hossain, 2002). To efficiently managed the unmanageable ‘free floating exchange regime’ in a least developed country like Bangladesh, Bangladesh Bank requires full legal independence and unquestionable intellectual competence to control inflationary development, restrain trade balance deficit and ensure economic growth.

Hye and Mashkooor (2010) estimated aggregate import demand function for Bangladesh economy by using the data of 1980 to 2008. Estimation evidence provided by using autoregressive distributed lag (ADRL) approach to cointegration and rolling window regression method to estimate the coefficient of each observation in the sample by fixing the window size. The estimation result confirmed long run relationship between imports, relative price and economic activity, and long run

economic growth elasticity was (0.93) positive and relative price elasticity in the long run (-0.29) is negative. In contrast regression results of rolling window method demonstrated that the long run elasticities of national income variable were vary in the range of 0.81 to 0.96 and the relative price elasticities were negative according to the theory except few years.

Manni and Afzal (2012) analysed the impact of trade liberalisation on Bangladesh economy between the periods 1980 to 2010. This research analysed the achievements of the economy in terms of important variables such as growth, inflation, export and import after trade liberalisation. The paper used simple Ordinary Least Square (OLS) technique as methodology for empirical findings. The analysis clearly indicated that GDP growth increased consequent to liberalisation. Trade liberalisation did not seem to had affected inflation in the economy. The quantitative analysis also suggested that greater openness had a favourable effect on economic development. Both real export and imports had increased with greater openness. Liberalisation policy certainly improved export of the country which eventually leads higher economic growth after 1990s. The findings of this study could be an interesting example for trade liberalisation policy study in developing countries.

Khondker, Bidisha and Razzaque (2012) explained the effects of exchange rate changes on economic growth in Bangladesh. It makes used of a Keynesian analytical framework to derive an empirical specification, carefully constructs a real exchange rate series, and employs cointegration techniques to determine the output response to taka depreciations. The results showed that in the long run a 10 per cent depreciation of the real exchange rate was associated with a 3.2 per cent rise in aggregate output. A contractionary effect was however observed in the short-run so

that the same magnitude of real depreciation would result in about half a per cent decline in GDP. While the long-run expansionary effect of real depreciations may appeal for considering the role of exchange rate policy as a development strategy, the evidence of very high degree of exchange rate pass-through to consumer prices would severely constrain such an option. For Bangladesh the need for maintaining external competitiveness and promoting growth remains a delicate task for policymakers as it involved managing an exchange rate regime accompanied by other consistent macroeconomic policies. Notwithstanding, rather than pursuing an effectively fixed nominal exchange rate until external imbalances become unsustainable, a more pragmatic approach will be to tolerate creeping depreciations that would avoid any significant contractionary effect in the short run while allowing for improved competitiveness and output growth in the long run.

3.3 Chapter Summary

1. This chapter contains a survey of works on export, import, exchange rate, and economic growth.
2. The first section of this chapter contains a survey of contributions in general, while the second section reviews works on Bangladesh.
3. There are a very large number of publications on export, import, exchange rate and growth in this topic. So, in order to save space, only works done since 1981 have been included.
4. These surveys include mostly empirical works, which is the main trust of this thesis.

Chapter 4

Models of Analysis

In this chapter, theoretical models and empirical specifications of various aspects of export, import, and economic growth, and exchange rate changes as related to growth are described. First, export and import demand functions are stated and explained. Then causality methodology of relationship between export and output, and import and output are described and elaborated. The third item is the issue of convergence of export and import in the long run for which appropriate methodology are presented and discussed. Lastly, models of analysis of the relationship between exchange rate and economic growth are stated and explained.

This is a time series study and, hence, time series properties of the relevant variables are examined. These include stationarity of the relevant variables, co-integration between different pairs and causality analysis between any two relevant variables. Also, time series properties of relevant variables of the function that examines impact of exchange rate and other variables on real output are examined.

4.1 Aggregate Import and Export Demand Functions

Below, the import demand function is stated and described first and then the export demand function is stated and explained.

4.1.1 The Import Demand Function

The import demand function is stated and explained first. The absolute price version is used, rather than the relative price version, of the import demand function. The absolute price version is easier to estimate and interpret. Here, aggregate import (M_t) is made a function of import price (PM_t), domestic price (PD_t), and real GDP

(Y_t). Usually, the log-linear form is used as that gives results in elasticity term, which has a more familiar meaning.

Following Doroodian *et al.* (1994), Sinha (1997), and Rehman (2007), an import demand function of the following form has been chosen for our estimation:

$$\ln M_t = a_0 + a_1 \ln Y_t + a_2 \ln P_{mt} + a_3 \ln P_{dt} \quad (4.1)$$

where

$\ln M$ = log of volume of imports

$\ln Y$ = log of real income

$\ln P_m$ = log of import prices

$\ln P_d$ = log of domestic prices

It is necessary to describe and explain each of the above variables. This is done now. The dependent variable, that is, volume of imports is obtained by converting the value of imports into real terms. This is done by dividing the nominal values of imports by appropriate deflator.

Similarly, real income is obtained by converting nominal income. Like income in an ordinary demand function, income here plays similar role. Our income is the main determinant of our imports, which are, of course, foreign goods. A positive relationship is expected between these two variables. In the empirical chapter (Chapter 6), these estimates are obtained, analysed, and compared.

Import price is another determinant of the import demand function. A negative relationship is expected. This is examined when the empirical results are obtained from the estimated import demand function. This is then analysed and compared.

Since the estimates are given in elasticity form, these have important policy implications, which are discussed at the appropriate place.

The domestic price is used as an explanatory variable though its relationship with imports is not certain as imports can go up even when domestic price also goes up. In fact, this has happened in the case of Bangladesh where both domestic price and import have simultaneously grown. This can be formally examined at the relevant place in Chapter 6.

If the last year's import is included as an explanatory variable, then the equation becomes:

$$\ln M_t = a_0 + a_1 \ln Y_t + a_2 \ln P_{mt} + a_3 \ln P_{dt} + a_4 \ln M_{t-1} \quad (4.2)$$

where

M_{t-1} is last year's import. This is included as a proxy for import habit persistence.

4.1.2 The Export Demand Function

Exports are treated analogously since the models are symmetric with respect to imports and exports. The demand for an individual country's exports depends on economic activity abroad and the relative price of exports. Following **Kabir**, 1988; Senhadji and Montenegro, 1998; Algieri, 2004 and others, the estimating equation in log-linear form can be written as:

$$\ln X = b_0 + b_1 \ln YA + b_2 \ln RPI \quad (4.3)$$

where

X = Quantity of exports demanded

YA = Average of the real incomes of country's trading partners (U.S.A., Germany, and U.K.)

RPI = Relative price index, that is, unit price of export of the country divided by the domestic price index of the leading country (here of U.S.A.).

The nominal value of exports was divided by the appropriate deflator to obtain real export, which is termed here quantity of export demanded.

The explanatory variable “average of the real incomes of country’s trading partners” was obtained by averaging the income of three leading importers of our goods. This income variable, if found significant, would imply that foreign income is the main determinant of our exports and our policy would be to target these countries for export expansion.

Relative price, which was obtained as a ratio of our price and that of U.S.A., is to be seen for its effect on imports. This is discussed at the appropriate place in our empirical Chapter (Chapter 6).

Here, b_1 and b_2 are the real income and the relative price elasticities of export-demand, respectively. This is because the equation is written in logarithmic form. The coefficient of b_1 is expected to have a positive sign, while that of b_2 is expected to be negative.

4.2 Causality Analysis: Causality between Export and Growth, and Import and Growth

The key questions that have been studied in this area are:

- (a) Causality between export and growth (peroxide by GDP), that is, whether growth is caused by export or export is caused growth.
- (b) Causality between import and growth (peroxide by GDP), that is, whether growth is caused by import or import is caused growth.

The Granger causality analysis—a method suggested by Nobel Laureate W.G. Granger is used in this study to derive answers to the above questions. Konya and Singh (2006, p.8) eloquently described the main spirit of the method thus:

“The concept of Granger causality, more precisely precedence, is based on the idea that a cause cannot come after its effect. More precisely, variable X is said to Granger- cause another variable, Y, if the future value of Y (y_{t+1}) is conditional on the past values of X ($x_{t-1}, x_{t-2}, \dots, x_0$) and thus the history of X is likely to help predict Y.”

Here it is determined whether X causes growth or is caused by growth. Similarly, it can be determined whether M causes growth or vice versa. Given the variables X, M, and GDP, the test can be implemented using the following equations:

$$X = \sum_{i=1}^n \alpha_i \text{GDP}_{t-i} + \sum_{j=1}^n \beta_j X_{t-j} + u_{1t} \quad (4.4)$$

$$\text{GDP} = \sum_{i=1}^m \lambda_i \text{GDP}_{t-i} + \sum_{j=1}^m \delta_j X_{t-j} + u_{2t} \quad (4.5)$$

Similarly, for import (M) and GDP causality, we have

$$M = \sum_{i=1}^n \alpha_i \text{GDP}_{t-i} + \sum_{j=1}^n \beta_j M_{t-j} + u_{1t} \quad (4.6)$$

$$\text{GDP} = \sum_{i=1}^m \lambda_i \text{GDP}_{t-i} + \sum_{j=1}^m \delta_j M_{t-j} + u_{2t} \quad (4.7)$$

Gujarati (Gujarati, 1995, p. 621) has described the possibilities thus:

- i. Unidirectional causality form X and GDP is indicated if the estimated coefficients on the lagged X in equation (3) are statistically different from zero as a group and the set of estimated coefficients in lagged GDP in equation (4) is not statistically different from zero.

- ii. Conversely, unidirectional causality from GDP to X exists if the set of lagged X coefficients in equation (3) is not statistically different from zero and the set of the lagged GDP coefficients in equation (4) is statistically different from zero.
- iii. Feedback, or bilateral causality, is suggested when the sets of X and GDP coefficients are statistically significantly different from zero in both regressions.
- iv. Finally, independence is suggested when the sets of X and GDP coefficients are not statistically significant in either of the regressions.

More generally, since the future cannot predict the past, if variable X (Granger) causes variable Y, then changes in X should precede changes in Y. Therefore, in a regression of Y on other variables (including its own past values) if we include past or lagged values of X and it significantly improves the prediction of Y, then we can say that X (Granger) causes Y. A similar definition applies if Y (Granger) causes X.

4.3 Convergence of Exports and Imports in the Long- run

There has been trade deficit in Bangladesh since its emergence as an independent nation. Is this trade deficit likely to narrow down and eventually vanish in the long-run? This question cannot be heuristically answered. Fortunately, a formal model has become available of late using which comments can be made regarding the possibility of long-run convergence of imports and exports. This is known as co-integration study of export and import, which will be used to formally answer the question of possibility of long-run convergence of export and import of Bangladesh.

Researchers (Irandoust and Ericsson, 2004; Wijeweera, 2005, and Islam, Wadud, and Islam, 2008) came to the conclusion that co-integration between exports and imports indicated long- run convergence of the two items. Cointegration can be studied by two methods. Of these, the first one is that of Engle and Granger (1987), which examines stationarity of the residual term, and hence is regarded as a residual based approach. The second method is due to Johansen (1991). In this study, we use the Johansen method for co-integration test as this is regarded as more advanced though Granger is the originator of the causality analysis.

4.3.1 Co-integration between Exports and Imports

The augmented Dickey-Fuller (ADF) test can be used to test for unit root of exports and imports. If it is found that both exports and imports suffer from the unit root problem, then that would imply presence of non-stationarity. If it is found that the problem of non-stationarity has become absent after taking first difference, which means that exports and imports are integrated of order 1. Then test of co-integration of exports and imports applying the Johansen method is done. If it is found that exports and imports are co-integrated, then that will imply that there is a long-relationship between the two, which in turn would imply that trade deficit will be self-correcting.

If two variables, here export (X) and import (M), are stationary of the same order a test can be made to see if they are co-integrated. Whereas stationarity shows short-run stability, co-integration shows long-run stability. A relationship can demonstrate short- run instability and can yet be stable in the long- run. If it is written like this where X and M stand for export and import, respectively:

$$u_t = X_t - \beta_1 - \beta_2 M_t \quad (4.8)$$

and if it is found that u_t is stationary then it can be said that the variables X and M are co-integrated. Co-integration can be tested by several methods. Of these, Johansen co-integration test is most well known and this test will be used in this study.

4.4 Exchange Rate Change and Economic Growth

Bangladesh has witnessed continuous rise in its exchange rate. The value of a U.S. dollar was only around 5.00 taka in 1971, when Bangladesh emerged as an independent country. The value of a dollar rose more or less continuously since then and today the value of a dollar is around 80 taka. Such a decline in the value of taka might have had an adverse effect on economic growth. In order to assess this impact, an econometric model has been used in this study that has been used by others before (Edwards, 1986; Odusola and Akinlo; 2001, Berg and Miao, 2010,).

The empirical model will show the relationship between real output, a measure of monetary policy captured by domestic credit, a proxy for fiscal policy in terms of public expenditure, terms of trade, and exchange rate changes. Inclusion of all these variables implies that exchange rate changes act in conjunction with other variables, and not alone.

4.4.1 Empirical Estimation of Output as a function of Exchange Rate and other Variables

The theoretical model represents the relationship between aggregate output and a number of other variables comprising NER, RER, a measure of fiscal policy, and an indicator of monetary policy. Many empirical studies (Atkins (2000), Edwards (1986), Rhodd (1993), and Upadhyaya and Upadhyay (1999), also include respective countries' terms of trade (TT). This is also done in this study.

After using logarithmic transformation, the empirical specification of the relationship between output and exchange rate and other variables can be written using both nominal and real exchange rate as:

$$\ln Y_t = \beta_0 + \beta_1 \ln (RGE_t) + \beta_2 \ln (RPCR_t) + \beta_3 \ln (TT_t) + \beta_4 \ln (NER_t) \quad (4.9)$$

where

\ln = stands for natural logarithm, time is denoted by subscript t ,

$\ln Y$ = log of real GDP

$\ln GE$ = log of real government expenditure

$\ln PCR$ = log of real credit to the private sector

$\ln TT$ = log of terms of trade and

$\ln NER$ = log of nominal exchange rate

$$\ln Y_t = \beta_0 + \beta_1 \ln (RGE_t) + \beta_2 \ln (RPCR_t) + \beta_3 \ln (TT_t) + \beta_4 \ln (RER_t) \quad (4.10)$$

where

$\ln RER$ = log of real exchange rate.

Although positive values of β_1 and β_2 are expected the sign of β_3 cannot be determined *a priori*. The coefficient β_4 capturing the effect of exchange rate change on real output growth is the main interest in this study. And its sign cannot also be predetermined.

The variable real GDP is the depending variable, which is explained with the help of the right hand side variables. This variable was obtained in the similar way we had derived this variable in the import demand function.

The sources of these data have been more elaborately mentioned in Chapter 5 but these are briefly mentioned here. The government expenditure data have been

taken from various government documents including the *Statistical Yearbook of Bangladesh*, *Statistical Pocket Book Bangladesh* published by the Bangladesh Bureau of Statistics. The real government expenditure was obtained by dividing nominal expenditure by appropriate deflator. It may affect output positively. This variable actually represents fiscal policy. Its true impact is likely to be seen clearly when empirical estimates are obtained.

The real credit to the private sector was obtained from the Statistical Yearbook of Bangladesh and the Statistical Pocket Book of Bangladesh. The data on credit to the private sector was initially obtained in current prices. Using the implicit GDP deflator these data were then converted into real terms. This variable is a proxy for monetary policy. This variable can affect output, most likely positively.

Another important determinant in the output equation is the terms of trade. Its impact will be known when the empirical estimates will be available. The terms of trade index has been estimated from the reported unit value indices for exports and imports. These have been taken from various issues of *Bangladesh Economic Review* published by the Government of Bangladesh. This provided time series data for Bangladesh.

Data on the nominal exchange rate, that is, the rate at which actual exchange takes place, were collected from the *World Development Indicators*. Fortunately, a complete series is available and this has been put to use in this study.

The data on real exchange rate will be constructed by the author of this thesis using a simplified method where U.S. domestic price was used as a proxy for foreign price and our domestic price was represented by the index of home price. The real exchange rate thus constructed resulted in fairly meaningful econometric estimates, which have been duly explained below.

4.4.2 Construction of the Real Exchange Rate from the Nominal Exchange Rate

The effects of changes in the external value of domestic currency can be viewed in terms of 'nominal' and 'real' exchange rate. The real exchange rate (RER) has two main interpretations, which are the purchasing power parity (PPP) and the trade theory definitions. According to the PPP theory, the domestic and foreign rates of inflation determine the exchange rate movements. When the ratio of domestic and foreign price changes, the exchange rate will also change. This method, that is, the PPP theory has been adopted for this study.

Hence, the RER is equal to the ratio of foreign prices (Pf) to domestic prices (Pd) multiplied by the nominal exchange rate, NER (local currency per unit of foreign currency) that is:

$$\text{RER} = (\text{Pf}/\text{Pd}).\text{NER} \quad (4.11)$$

The computation of RER requires use of two price indices. In this study, for the sake of simplicity, the ratio of domestic price index of Bangladesh and that of U.S.A. have been used. The use of the U.S. price was made as U.S.A. is the largest importer of our commodities.

4.5 Chapter Summary

1. The import demand function which is used in this study is described first. It has two versions. The first one shows that the import demand is a function of domestic real income, domestic price, and price of import. The second includes the variable, lagged import, which stands for habit persistence or past habit of imports.

2. The export demand function is stated after this, which shows that export demand is a function of income of the trading partners and relative price, that is, unit price of exports of the country divided by the domestic price index of the leading countries (in this study, the price index of U.S.A., which is the largest importer of goods from Bangladesh is used as a proxy of external price).
3. The causality analysis framework is stated in terms of pairs of relationship between export and output, and import and output.
4. To study possible convergence between export and import, the co-integration methodology is described.
5. The relationship between exchange rate and output growth is presented both in terms of nominal and real exchange rate.

Chapter 5

Data for Econometric Estimation

In this chapter, data for econometric estimations are described. These include data in real terms on aggregate export, aggregate import, GDP, unit price of export and import, exchange rate, government expenditure, domestic credit, and terms of trade are collected from *Bangladesh Economic Review*, World Bank publication, *World Development Indicators*, Bangladesh Bureau of Statistics publications, *Statistical Yearbook of Bangladesh* and *Statistical Pocket Book Bangladesh*. Considering compatibility and availability, all data are stated in U. S. dollars.

In this study, no data was taken before 1981 due to non-availability of data of some of the variables under consideration. We did not explore the possibility of quarterly data on GDP and the other variables since those were not available for Bangladesh. As a result, we were left with only annual data, which we used.

Another important reason why this study used data from 1981 is because it is at about this time that the SAP (Structural Adjustment Policy), initiated and promoted by the World Bank and the IMF, began to be set in motion. This ushered in a new era of unregulated trade and we wanted to begin from here.

5.1 Export, Import, and GDP of Bangladesh, 1981 to 2012

The trend of real aggregate export, real aggregate import, and real GDP are described in the following pages in Table 5.1. The data of these variables are given for the period 1981 to 2012.

Table 5.1
Real Aggregate Export, Real Aggregate Import, and Real GDP of Bangladesh,
1981 to 2010

(Constant 2005 million U.S. dollar)

Year	Total Export	Total Import	GDP
1981	1303.13	3522.18	20853.06
1982	1245.07	3853.42	21348.63
1983	1360.06	3693.61	22206.01
1984	1347.22	3454.69	23356.43
1985	1453.63	3704.88	24109.27
1986	1436.92	3550.81	25133.57
1987	1464.23	3753.27	26071.62
1988	1620.60	4034.49	26634.56
1989	1764.86	4641.57	27330.35
1990	2078.76	5073.82	28954.13
1991	2014.50	4311.87	29921.01
1992	2454.58	3932.82	31428.77
1993	2856.95	5404.44	32866.44
1994	2962.04	5074.17	34208.94
1995	3872.10	7529.89	35893.75
1996	4184.79	8592.32	37552.74
1997	4876.50	8443.23	39575.92
1998	5474.39	8820.71	41644.76
1999	5597.74	9023.94	43672.54
2000	6403.56	9947.75	46268.66
2001	7358.22	11063.52	48708.87
2002	7188.91	9822.26	50859.57
2003	7682.77	10549.46	53532.75
2004	8645.94	11667.72	56889.52
2005	9994.81	13891.43	60277.56
2006	12575.57	16418.00	64273.56
2007	14208.00	19043.46	68404.97
2008	15207.92	18651.86	72639.53
2009	15211.62	18166.60	76809.88
2010	15354.83	18290.74	81471.73
2011	19859.95	23623.79	86936.94
2012	23264.61	28064.17	92429.55

Source: *World Development Indicators*, World Bank, various issues.

Data of these variables have been collected from various issues of World Bank publication, *World Development Indicators*. Table 5.1 contains four columns, year, real aggregate export, real aggregate import, and real GDP.

The second column shows the real aggregate exports in constant million U.S. dollar. In 1981, constant export was 1303.13 million U.S. dollar, and then it increased to 1453.63 million U.S. dollar in 1985. In 1990, it was 2078.76 million U.S. dollar and then its growth was fast. It increased 3872.10 million U.S. dollar in 1995. In 2000, the constant aggregate export was 6403.56 million U.S. dollar that was greater than the previous estimate.

It was 9994.81million U.S. dollar in 2005, and then its growth was quite fast. It increased 15207.92 million U.S. dollar in 2008. Finally, it became 23264.61 million U.S. dollar in 2012. The table 5.1 shows the real exports increased in a steady way.

The real aggregate import increased with some fluctuations in some years during the period of the study. In 1981, the constant aggregate import was 3522.18 million U.S. dollar, which increased to 3704.88 million U.S. dollar in 1985. In 1990, the real aggregate import rose to 5073.82 million U.S. dollar, but after 1991 the real aggregate import decreased for few years. In 1995, it was 7529.89 million U.S. dollar. In 2002, it was 9822.26 million U.S. dollar, which increased to 16418.00 million U.S. dollar in 2006. After that, it increased at a faster rate and gradually reached 18651.86 million U.S. dollar in 2008. Finally, the real import became 28064.17 million U.S. dollar in 2012. The nominal and real export and import, both increased during the period of the study but import was always greater than export.

The real GDP of Bangladesh has gone through a steady increase during the period 1981 to 2012. The real GDP in constant term is shown in column 4 of Table 5.1, which is measured in million U.S. dollar, and base year 2005. In 1981, the real GDP was 20853.06 million U.S. dollar. It was 24109.27 million U.S. dollar in 1985, and then it was gradually increased in 28954.13 million U.S. dollar in 1990. In 1995, the real GDP rose to 35893.75 million U.S. dollar, and in 2000, it was 46268.66 million U.S. dollar. The growth was continuous, and in 2006, the amount reached on 64273.56 million U.S. dollar. Finally, it became 92429.55 million U.S. dollar in 2012.

5.2 Unit Price of Export and Import, 1981 to 2012

Since we are dealing with aggregate export and aggregate import, we can only have an index of prices of these items. These are available in published sources and are given below in terms of unit prices.

The unit price of export and import for the period of 1981 to 2012 are described with the table 5.2. Data on these variables have been collected from various issues of *Statistical Yearbook of Bangladesh* and *Statistical Pocket Book Bangladesh* published by the Bangladesh Bureau of Statistics. Table 5.2 contains three columns, year, price index of export, and price index of import.

The second column shows the price index of export. Although there was some fluctuation in some years the price index of export increased during the period of the study. It was 100 in 1981, increased to 189.90 in 1985. But in 1990 the unit price of export decreased to 170.28. After that, it increased gradually and the trend continued even after the end of the period of the study. In 1995, the price index of export rose 264 and it gained 324.1 in 2000. It was 380.43 in 2005. Its increase was continuous and by the year 2012, the amount reached 552.

Table 5.2
Unit Price of Export and Import, 1981 to 2012

Year	Price Index of Export	Price Index of Import
1981	100	100
1982	95.56	111.65
1983	109.51	139.93
1984	131.66	140.65
1985	189.90	158.78
1986	162.68	178.35
1987	146.86	187.78
1988	163.95	201.55
1989	181.67	172.55
1990	170.28	195.75
1991	191.17	244.33
1992	231.00	254.51
1993	247.50	221.9
1994	259.5	250.87
1995	264	251.79
1996	270.9	257.27
1997	278.52	261.46
1998	305	281.24
1999	324.1	308
2000	324.1	310.71
2001	331.7	329.26
2002	332.3	330.31
2003	345.62	330.52
2004	376.63	363.66
2005	380.43	375.27
2006	386.13	390.04
2007	409.6	404.26
2008	454.5	512.6
2009	489.3	561.94
2010	518.4	578.51
2011	538	612
2012	552	640

Sources: *Statistical Yearbook of Bangladesh*, Bangladesh Bureau of Statistics, various issues.
Statistical Pocket Book Bangladesh, Bangladesh Bureau of Statistics, various issues.

The third column of table 5.4 shows the price index of import. In 1981, the price index of import was 100. It was 158.78 in 1985 and then it increased with some fluctuations in some years. In 1992, the price index of import was 254.51 and it rose 310.71 in 2000. Then the price index of imports continuously increased end of the period of the study. It was 404.26 in 2007 and finally reached 640 in 2012.

5.3 Average of GDP of three Countries and Relative Price Index (RPI), 1981 to 2012

For estimating the export demand function, the average GDP of the three leading countries where Bangladesh export is used. Also, the relative price index of Bangladesh and USA is used. Both these are given in Table 5.3 below.

The trend of average GDP in real term and relative price index for the period 1981 to 2012 are described in Table 5.3. The basic data of these variables have been collected from various issues of *World Development Indicators* published by the World Bank, *Statistical Yearbook of Bangladesh*, and *Statistical Pocket Book Bangladesh* published by the Bangladesh Bureau of Statistics.

From Table 5.3, it can be seen that the trend of average GDP in real term has gone through a steady growth in the study period. It was 2990524.17 million U.S. dollar in 1981 and then gradually increased to 3751444.85 million U.S. dollar in 1988. Its growth continued and in 1998, it increased to 5005336.66. Finally it became 6564940.10 million U.S. dollar in 2012.

Table 5.3
Average of GDP of three Countries and Relative Price Index (RPI), 1981 to 2012

Year	Average GDP of three Countries (US,UK and Germany) in million US\$	RPI (Relative price index, BD/USA)
1981	2990524.17	0.36
1982	2957284.47	0.35
1983	3072458.38	0.42
1984	3250879.96	0.51
1985	3374366.91	0.75
1986	3487283.43	0.56
1987	3599577.97	0.46
1988	3751444.85	0.48
1989	3884268.76	0.53
1990	3976615.97	0.46
1991	4005963.93	0.52
1992	4124582.81	0.62
1993	4211840.52	0.71
1994	4374287.56	0.71
1995	4489225.35	0.75
1996	4633407.13	0.76
1997	4817913.58	0.78
1998	5005336.66	0.91
1999	5210678.38	0.98
2000	5416597.79	1.00
2001	5481311.48	1.03
2002	5566169.53	1.04
2003	5700836.99	1.07
2004	5888945.36	1.12
2005	6061004.38	1.10
2006	6232837.98	1.07
2007	6371562.52	1.09
2008	6362684.18	1.14
2009	6141664.00	1.28
2010	6303346.19	1.30
2011	6428673.96	1.32
2012	6564940.10	1.35

Source: *World Development Indicators*, World Bank, various issues. *Statistical Yearbook of Bangladesh*, Bangladesh Bureau of Statistics, various issues. *Statistical Pocket Book Bangladesh*, Bangladesh Bureau of Statistics, various issues.

The third column of Table 5.3 shows that the relative price index increased during the period of the study with some early fluctuations. In 1981, the relative price was 0.36. It was 0.46 in 1990 and then gradually increased to 0.91 in 1998. The trend continued and reached 1.07 in 2003. In 2012, the relative price index rose 1.35.

5.4 Nominal Exchange Rate of Bangladesh, 1981 to 2012

The nominal exchange rate of Bangladesh is given below in Table 5.4. The exchange rate has continuously risen, often the rate of rise even accentuated. This can be seen below from Table 5.4.

Table 5.4 shows the nominal exchange rate of Bangladesh during the period 1981 to 2012. The data of the exchange rate has been collected from *World Development Indicators*. The nominal exchange rate is described below with the help table.

The nominal exchange rate of Bangladesh taka in terms of U.S. dollar has increased steadily during the period of the study. It was 17.99 U.S. dollar against Bangladeshi taka in 1981. In the next ten years, it increased gradually and stood at 36.60 U.S. dollar against taka in 1991. In 2001, it was 55.81 U.S. dollar against Bangladeshi taka. Finally, in 2012, it reached 81.86 U.S. dollar against taka. So, the nominal exchange rate of Bangladesh during the study period shows, it increased gradually and as a result our external value of money has continuously gone down.

Table 5.4
Nominal Exchange Rate of Bangladesh, 1981 to 2012

Year	Nominal exchange rate (LCU per US\$, period average)
1981	17.99
1982	22.12
1983	24.62
1984	25.35
1985	27.99
1986	30.41
1987	30.95
1988	31.73
1989	32.27
1990	34.57
1991	36.60
1992	38.95
1993	39.57
1994	40.21
1995	40.28
1996	41.79
1997	43.89
1998	46.91
1999	49.09
2000	52.14
2001	55.81
2002	57.89
2003	58.15
2004	59.51
2005	64.33
2006	68.93
2007	68.87
2008	68.60
2009	69.04
2010	69.65
2011	74.15
2012	81.86

Source: *World Development Indicators*, World Bank, various issues.

5.5 Real Exchange Rate of Bangladesh, 1981 to 2012

If relative prices are taken into consideration, the resulting exchange rate is called real exchange rate. This rate is academic rather than functional as trades are not, and cannot be, done using real exchange rate. However, this is often used in empirical estimation and we have used it for estimation of the exchange rate function.

There are two estimates of real exchange rate available. One of these was constructed by the authors of a very good paper on exchange rate and economic growth (Khondker, Bidisha and Razzaque, 2012). The authors did not report it in their paper and, hence, we had no access to this. Bangladesh Economic Review also begun to report what they call effective exchange rate. This, however, is only available for few recent years and, hence, could not cover the full period of our study. Therefore, we had to construct our own real exchange rate, which we did in simple manner.

The trend of real exchange rate of Bangladesh for the period 1981 to 2012 is described in table 5.5. The data construction of the variable is ours, which was done with the help of *World Development Indicators* and *Bangladesh Economic Review*. The real exchange rate in Bangladesh has steadily increased during the study period. It was 8.14 in 1981, and then gradually increased to 21.71 in 1988. In 1996, the real exchange rate rose to 32.76. The growth was continuous and in 2005, the amount reached 64.33. Finally, in 2012, the real exchange rate reached 121.21.

Table 5.5
Constructed Real Exchange Rate of Bangladesh, 1981 to 2012

Year	Real Exchange Rate
1981	8.14
1982	10.60
1983	12.51
1984	13.66
1985	16.11
1986	19.03
1987	20.51
1988	21.71
1989	22.34
1990	24.10
1991	26.03
1992	27.87
1993	28.33
1994	29.54
1995	31.75
1996	32.76
1997	35.41
1998	40.40
1999	43.90
2000	46.10
2001	48.95
2002	51.65
2003	53.60
2004	57.48
2005	64.33
2006	71.29
2007	75.56
2008	78.94
2009	84.05
2010	90.20
2011	103.06
2012	121.21

Source: Construction is ours based on relative prices obtained from WDI, Bangladesh Economic Review.

5.6 GDP Deflator Series

The GDP deflator enables us to scale down inflationary effect by dividing a series by it. The series is then expressed in real terms instead of nominal terms. The GDP deflator, which is used for different computation is given below.

Table 5.6 shows the GDP deflator series for the period 1981 to 2012. The data of the GDP deflator series has been collected from various issues of World Development indicators. Here the base year is 1996.

This GDP deflator series shows that in 1981 it was 34.88. It was 67.81 in 1988. In 1992, it was 85.88. In 1996, it can be seen that it is 100.0, which is the base year of the study. After another five years, the GDP deflator was 117.53 in the year 2001. In 2006, the GDP deflator was 146.04. Finally, it reached 223.46.

Table 5.6
GDP Deflator Series, Base = 1996

Year	GDP deflator
1981	34.88
1982	38.26
1983	41.51
1984	47.35
1985	52.63
1986	56.84
1987	63.02
1988	67.81
1989	73.57
1990	78.24
1991	83.40
1992	85.88
1993	86.12
1994	89.37
1995	95.94
1996	100.00
1997	103.09
1998	108.53
1999	113.58
2000	115.69
2001	117.53
2002	121.28
2003	126.77
2004	132.15
2005	138.86
2006	146.04
2007	155.95
2008	169.65
2009	180.72
2010	192.42
2011	206.91
2012	223.46

Source: *World Development Indicators*, World Bank, various issues

5.7 The Real Government Expenditure, Credit to the Private Sector and Terms of Trade of Bangladesh, 1981 to 2012

There are three explanatory variables of the exchange rate function. Data all these are given in Table 5.7.

The trend of government expenditure (GE), credit to the private sector (PCR) and terms of trade (TOT) of Bangladesh are described with the help of table. The data of government expenditure, credit to the private Sector and terms of trade are given for the period 1981 to 2012. Data of these variables have been collected from various issues of *Statistical Yearbook of Bangladesh*, *Statistical Pocket Book Bangladesh* published by the Bangladesh Bureau of Statistics and *Bangladesh Economic Review* published by the Government of Bangladesh.

In Table 5.7, the first column shows the real government expenditure of Bangladesh for the period of 1981 to 2012. The real government expenditure increased during the period of study with some fluctuations in first seven years. At the starting year of the study, it was 22.25 million U.S. dollar. In 1987, it became 20.46 million U.S. dollar. After this period the real government expenditure was gradually increased and in 1997, it reached 28.17 million U.S. dollar. After another ten years, it was 48.60 million U.S. dollar in 2007. Finally, it became 47.01 million U.S. dollar in 2012.

Table 5.7
Real Government Expenditure, Real Credit to the Private Sector and Terms of Trade of Bangladesh, 1981 to 2012
 (Constant 1996 million U.S. dollar)

Year	Real GE	Real PCR	TOT
1981	22.25	30.67	76.5
1982	20.44	28.16	62.9
1983	17.96	30.71	67.6
1984	17.04	40.71	81
1985	17.56	52.06	98.2
1986	21.46	49.49	80.1
1987	20.46	49.17	91
1988	21.92	51.66	104.7
1989	26.33	57.59	95.3
1990	24.70	58.72	92.8
1991	24.35	55.77	94.9
1992	23.43	56.38	96.2
1993	25.21	63.51	99.6
1994	25.48	67.00	102.3
1995	25.87	73.28	100.1
1996	28.44	79.66	100
1997	28.17	81.84	101.1
1998	29.16	85.29	103.1
1999	30.27	86.96	100
2000	30.80	88.97	88.4
2001	31.50	95.97	84.1
2002	31.33	99.43	80
2003	34.59	105.98	82.4
2004	34.88	115.65	82.1
2005	39.36	117.37	80.6
2006	41.08	120.90	81.5
2007	48.60	130.25	71.3
2008	52.19	150.43	71
2009	50.23	160.76	71.8
2010	54.59	184.72	72
2011	54.21	201.64	70.8
2012	47.01	185.87	70.1

Source: *Statistical Yearbook of Bangladesh*, Bangladesh Bureau of Statistics, various issues.
Statistical Pocket Book Bangladesh, Bangladesh Bureau of Statistics, various issues.
Bangladesh Economic Review, Government of Bangladesh, various issues.

The second column shows the real credit to the private sector of Bangladesh which is increased of this study period with some fluctuations. In 1981, it was 30.67 million U.S. dollar. In 1990, the real credit to the private sector became 58.72 million U.S. dollar. It was 88.97 in 2000, and then gradually increased to 120.90 million U.S. dollar in 2006. In 2012 the real credit to the private sector rose to 185.87 million U.S. dollar.

The third column shows the terms of trade of Bangladesh where the base year is 1996. The trend of terms of trade followed a different pattern. It has been quite fluctuating over the study period. The terms of trade of Bangladesh was 76.5 in 1981 and it increased to 80.1 in 1986. The trend continued only for the next two years and reached 104.7 in 1988. After this year it started to fluctuate and stood at 102.3 in 1994. After 1994, it decreased and reached to 88.4 in 2000 and 2006 it became 81.5. It decreased again and became 70.1 in 2012.

5.8 Chapter Summary

A summary of this chapter is given below.

1. Data on export, import, and GDP are presented in Table 5.1. All these data are in real term.
2. Unit prices of export and import is reported in Table 5.2.
3. Table 5.3 shows average GDP of three leading countries (U.S.A., Germany and U.K). Relative price of Bangladesh and U.S.A. are also given in this Table.
4. The nominal exchange rate is reported in Table 5.4.
5. Table 5.5 shows the real exchange rate constructed by the author of the thesis.
6. The real government expenditure, credit to the private sector and terms of trade of Bangladesh for the whole study period is reported in Table 5.7.

Chapter 6

Empirical Results

The empirical results in terms of econometric estimates are presented and analysed in this chapter. At first, the estimates related to the time series properties of the relevant variables are reported and discussed. Then the estimates of the import demand functions are presented. This is followed by estimate of the export demand function. The estimates related to causality between import and output and export and output are reported after this. The estimates involving convergence of export and import are then presented.

This section below which deals with the stationarity property and the section after that which contains a description of results on co-integration of different pairs of variables are somewhat mechanical but these are necessary in order to avoid spurious regression.

In this thesis, the problem of autocorrelation, which is quite common in time series studies, has been fully dealt with. It may be mentioned that doing regression analysis disregarding the problem of autocorrelation is likely to underestimate the true variance, lead to overestimation of R^2 , and render invalid the usual t and F tests (Gujarati, 1998). In this study, whenever the problem of autocorrelation arose, necessary corrections were made and fresh and more reliable estimates were presented.

6.1 Time Series Properties of Relevant Variables

This is a time series study. The data spans over three decade. These data are used for econometric estimation and causality test of various types. It is, therefore, necessary to examine their time series properties. It is necessary to meticulously do this for each variable. Unless these data pass the tests, these will generate spurious relationship and the whole set of estimates will come under question. Therefore, these tests are all done and reported below.

The first tests are on stationarity of the variables. If a variable does not pass this test on the first instance, then first, second, and subsequent differences of the variables are used to see if stationarity could be achieved. In the case of this study, stationarity was achieved in all cases after first difference and these are reported accordingly.

After the stationarity test, test of co-integration between different relevant pairs of variables are done and reported. It is to be emphasised here that regression and causality analysis can be done between variable only if they are co-integrated. Hence, these tests are all done and reported.

6.2 Test of Stationarity

The stationarity of a variable is examined by applying the Augmented Dickey-Fuller (ADF) test, which is now available in nearly all statistical and econometric softwares. In this study, the well known software EViews is used.

If the estimated ADF test value is found to be less than the critical values at different acceptable levels of significance then the hypothesis that implies presence of nonstationarity. If the ADF test value is greater than the critical values then the variable can be regarded as stationary and regression and causality analysis can proceed.

Before the advent of the time series econometrics, these aspects were not tested and, hence, the question of spurious regression remained unanswered and not dealt with. In this thesis this aspect is dealt with squarely and comprehensively.

6.2.1 Stationarity test for Real Exports (X)

The Augmented Dickey-Fuller test was used to see if stationarity problem existed or not. If it did, then first difference was taken and in all cases that brought about stationarity. The stationarity test results for export are given in table 6.1 below.

Table 6.1
Stationarity test for X (real exports)

Null Hypothesis: X has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	1.354064	0.9983
Test critical values: 1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

It is seen that the calculated value, 1.354064 at the level stage is less than the critical values at all three levels of significance, which implies that the unit root problem exists. So, the first difference is taken to see if the stationarity problem vanishes after that.

6.2.2 Stationarity test for Real Exports (X) after first difference

After the first difference is taken, the relevant estimates are given in Table 6.2.

It is now seen that the calculated value, -5.700365 is higher in absolute term than all critical values at all three acceptable significance levels.

Table 6.2
Stationarity test for X (real exports) after first difference

Null Hypothesis: D(X) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.700365	0.0001
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

This means that the unit root problem is now gone, and the variable qualifies for regression analysis.

6.2.3 Stationarity test for Real Imports (M)

The stationarity problem is tested by the use of the Augmented Dickey-Fuller (ADF) test. If the problem existed then first difference was taken. The stationarity test results for imports are given in table 6.3 below.

Table 6.3
Stationarity test for Real Imports (M)

Null Hypothesis: M has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	0.664502	0.9893
Test critical values:		
1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

It is seen that the calculated value, 0.664502 at the level stage is less than the critical values of all three levels of significance, which implies that the unit root problem exists. So, the first difference is taken to see if the stationarity problem vanishes after that.

6.2.4 Stationarity test for Real Imports (M) after first difference

When the first difference is taken, the relevant estimates are given in table 6.4. It is seen now that the calculated value, -5.443638 is higher in absolute term than all critical values at all three levels.

Table 6.4
Stationarity test for Real Imports (M) after first difference

Null Hypothesis: D(M) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.443638	0.0001
Test critical values:		
1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

This implies that now the unit root problem is gone and the variable qualifies for regression analysis.

6.2.5 Stationarity test for Real Income (Y)

The stationarity problem is tested by the use of the Augmented Dickey-Fuller (ADF) test. If the problem existed then first difference was taken. The Table 6.5 shows the stationarity test results for income.

Table 6.5
Stationarity test for Y (real income)

Null Hypothesis: Y has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.785753	0.9563
Test critical values:		
1% level	-4.284580	
5% level	-3.562882	
10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

Here, the calculated value, -0.785753 at the level stage is less than the critical values all three levels of significance, which implies that the unit root problem exists. Now, the first difference is taken to see if the stationarity problem vanishes after that.

6.2.6 Stationarity test for Y (real income) after first difference

After first difference is taken, the relevant estimates are given in Table 6.6. It is seen now that the calculated value, -6.428736 is higher in absolute term than all critical values at all three levels.

Table 6.6

Stationarity test for Y (real income) after first difference

Null Hypothesis: D(Y) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.428736	0.0001
Test critical values: 1% level	-4.296729	
5% level	-3.568379	
10% level	-3.218382	

*MacKinnon (1996) one-sided p-values.

So, the unit root problem is gone and the variable qualifies for regression analysis.

6.2.7 Stationarity Test for CPI (consumer price index)

The Augmented Dickey-Fuller test was used to see if stationarity problem existed or not. If it did, then first difference was taken. The Stationarity test results for consumer price index are given in table 6.7 below.

Table 6.7

Stationarity Test for CPI (consumer price index)

Null Hypothesis: CPI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.417451	0.5610
Test critical values: 1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

It is seen that the calculated value, -1.417451 at the level stage is less than the critical values at all three levels of significance, which implies that the unit root problem exists. So, the first difference is taken to see if the stationarity problem vanishes after that.

6.2.8 Stationarity test for CPI (consumer price index) after first difference

When the first difference is taken, the relevant estimates are given in table 6.8. It is seen now that the calculated value, -3.280999 is higher in absolute term than critical values at 5% level, which means that now the unit root problem is gone.

Table 6.8
Stationarity test for CPI (consumer price index) after first difference

Null Hypothesis: D(CPI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.280999	0.0249
Test critical values:		
1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

6.2.9 Stationarity test for MP (import Prices)

The stationarity problem is tested by the use of the Augmented Dickey-Fuller (ADF) test. If the problem existed then first difference was taken. The Stationarity test results for import prices are given in table 6.9 below. It is seen that the calculated value, -0.173435 at the level stage is less than the critical values at all three levels of significance, which implies that the unit root problem exists.

Table 6.9
Stationarity test for MP (import prices)

Null Hypothesis: MP has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.173435	0.9314
Test critical values:		
1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Now the first difference is taken to see if the stationarity problem vanishes after that.

6.2.10 Stationarity test for MP (import prices) after first difference

When the first difference is taken, the relevant estimates are given in Table 6.10. It is seen now that the calculated value, -5.785939 is higher in absolute term than all critical values at all three levels.

Table 6.10
Stationarity test for MP (import prices) after first difference
Null Hypothesis: D(MP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.785939	0.0000
Test critical values: 1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

This means that the unit root problem is now gone.

6.3 Test of Co-integration

Co-integration is a very important concept. Unless the two variables are co-integrated, regression between them is not valid. Nobel Laureate, C.W.J. Granger delivered his Nobel Lecture on co-integrated variables. Modern statistical software such as the one we used, that is, EViews, can easily test co-integration between two variables. In this thesis, co-integration between different pairs of relevant variables for both regression and causality were carefully examined and reported. Fortunately, all relevant pairs of this study were found to be co-integrated and the estimates of this study stand on strong econometric foundation.

After the variables have all passed the test of stationarity, the next step is to conduct tests of co-integration between pairs of variables for regression and causality purpose. This is done below.

6.3.1 Test of Co-integration between M and Y (imports and income)

The results of co-integration tests are given below in Table 6.11 for imports and income and it is found that these two variables are co-integrated. Thus these qualify for both regression and causality analyses.

Table 6.11
Test of Co-integration between M and Y (imports and income)

Date: 12/18/13 Time: 20:21 (Eq 3)
Sample (adjusted): 1983 2012
Included observations: 30 after adjustments
Trend assumption: Linear deterministic trend
Series: M Y
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 *	0.532397	34.97951	15.49471	0.0000
At most 1 *	0.333589	12.17545	3.841466	0.0005

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

While the test of stationarity is a short-run matter, the test of co-integration refers to the long-run. Its presence not only implies validity of regression between any two pairs of variables but also indicates stability of the estimates.

6.3.2 Test of Co-integration between M and MP (imports and import prices)

The results of co-integration tests are given below in Table 6.12 for imports and import prices and it is found that these two variables are co-integrated. Thus these qualify for both regression and causality analyses.

Table 6.12

Test of Co-integration between M and MP (imports and import prices)

Date: 12/10/13 Time: 20:30

Sample (adjusted): 1983 2012

Included observations: 30 after adjustments

Trend assumption: No deterministic trend (restricted constant)

Series: M MP

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 *	0.482883	33.71963	20.26184	0.0004
At most 1 *	0.371552	13.93506	9.164546	0.0058

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

6.3.3 Test of Co-integration between M and CPI (imports and consumer price index)

The results of co-integration tests are given below in Table 6.13 for imports and consumer price index and it is found that these two variables are co-integrated. Thus these qualify for both regression and causality analyses.

Table 6.13

Test of Co-integration between M and CPI (imports and consumer price index)

Sample (adjusted): 1983 2012

Included observations: 30 after adjustments

Trend assumption: Linear deterministic trend

Series: M CPI

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 *	0.415464	16.82908	15.49471	0.0313
At most 1	0.023745	0.720957	3.841466	0.3958

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

6.4 The Import Demand Function

Bangladesh is a country of prolonged and uninterrupted trade deficit. Although the exports of Bangladesh have steadily increased, the result was achieved as a result of increased input. The ingredients of our main export—the ready-made garments (RMG) are nearly all imported. The only domestic ingredient is cheap supply of labour.

It is, therefore, worthwhile to closely examine the determinants of imports of Bangladesh. For this two standard aggregate import demand functions have been estimated in this study and the results are presented and analysed.

The import demand function resembles the usual demand function where demand is shown as a function of prices and income. However, in the case of the import demand function it is a function of domestic income, domestic price, and import price. That is, the function has now taken into consideration international links.

In the equation that is estimated in this study, the variables are given in logarithmic form. This means that the estimated coefficients are all elasticities. Economically, this interpretation is more meaningful because economists usually prefer to talk in terms of percentage changes, which leads to elasticity.

In studies like this, incidence of autocorrelation is quite common. This can be checked by the D-W statistic. When autocorrelation was found, this was removed by the Cochrane-Orcutt iterative method. This was done using the software EViews.

6.4.1 Estimated Import Demand Function

Here is the computer output of the estimated import demand function. From here we can know the relative importance of the determinants of imports. Below, Y stands for real income, MP stands for import price, and DP denotes domestic price.

Table 6.14
Estimated Import Demand Function

Dependent Variable: M
Method: Least Squares
Date: 01/10/14 Time: 19:41
Sample: 1981 2012
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y	1.879940	0.237433	7.917760	0.0000
MP	-1.049806	0.264488	-3.969196	0.0005
DP	0.515163	0.292254	1.762723	0.0889
C	-7.239647	1.855270	-3.902206	0.0005
R-squared	0.979109	Mean dependent var		8.964375
Adjusted R-squared	0.976871	S.D. dependent var		0.656614
S.E. of regression	0.099859	Akaike info criterion		-1.653644
Sum squared resid	0.279212	Schwarz criterion		-1.470427
Log likelihood	30.45830	F-statistic		437.4373
Durbin-Watson stat	1.231917	Prob(F-statistic)		0.000000

The import demand function can be written as

$$\ln M_t = a_0 + a_1 \ln Y_t + a_2 \ln P_{mt} + a_3 \ln P_{dt}$$

and the estimated import demand function is given below

$$\ln M_t = -7.24 + 1.88 \ln Y_t - 1.05 \ln P_{mt} + 0.51 \ln P_{dt} \quad (6.1)$$

(-3.90)
(7.92)
(-3.97)
(1.76)

$$R^2 = 0.9791$$

$$D-W = 1.2319$$

where

$\ln M$ = log of volume of imports

$\ln Y$ = log of real income

$\ln P_m$ = log of import prices

$\ln P_d$ = log of domestic prices

It is seen from equation (6.1) that the coefficient of income is found to be positive. The value is 1.88, which means that import demand with respect to income

is elastic. Statistically, the estimated coefficient is found to be highly significant, where the t-value is 7.92.

Now this estimate is compared to some earlier ones. Rehman (2007) obtained an estimate of 0.069 for Pakistan. This is much lower than ours. This means that propensity to import out of income is much higher in Bangladesh than in Pakistan. In another work, Kabir (1988) found for Bangladesh a value of 1.71 for an earlier period. This shows that the elasticity has increased somewhat over time our estimate being 1.88. Dutta and Ahmed (2006) obtained an estimate of 1.48 for India, which is similar to the one obtained in this study.

The coefficient of import price is found to be negative elastic (-1.05) where the t-value is -3.97, which is statistically significant. This is an expected result in line with earlier studies. For example, Rehman (2007) had obtained a value of long-run elasticity of -0.50. Kabir (1988) obtained an estimate of -0.34 for Bangladesh. Dutta and Ahmed (2006) found a value of -0.47 for India. Compared to these values, our value is somewhat high. This perhaps implies the intensity of import demand of Bangladesh, which is clear from the fact that Bangladesh imports much more than it exports and also that the exports of Bangladesh, namely, readymade garments and drugs are highly import dependent.

The coefficient of domestic price is found to be positive. This implies that imports had gone up even when domestic price increased. This is counter to the result obtained by Rehman, but the result is not implausible and appears to be in line with the real economic situation in Bangladesh where imports had gone up even when domestic price increased. Kabir (1988) had obtained a value of 0.45 for Bangladesh

form an earlier period. The value of R-squared was found to be 0.98, which is quite high and satisfactory. The estimates show that the D-W statistic is 1.23, which falls within the zone of indecision. So, the problem of autocorrelation need not worry us.

6.4.2 Estimated Import Demand Function with Lagged Import

Here is the computer output of the estimated import demand function, which includes lagged import as an explanatory variable. This is done to include past habit and delayed impact of import. Below, MP stands for import price, DP denotes domestic price, and LM stands for lagged import.

Table 6.15
Estimated Import Demand Function with Lagged Import

Dependent Variable: M				
Method: Least Squares				
Date: 12/25/13 Time: 22:12				
Sample: 1981 2012				
Included observations: 32				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y	0.981303	0.337909	2.904047	0.0073
MP	-0.985796	0.227550	-4.332219	0.0002
DP	0.684981	0.255672	2.679137	0.0124
LM	0.452378	0.135781	3.331665	0.0025
C	-2.795216	2.075843	-1.346545	0.1893
R-squared	0.985196	Mean dependent var	8.964375	
Adjusted R-squared	0.983002	S.D. dependent var	0.656614	
S.E. of regression	0.085606	Akaike info criterion	-1.935521	
Sum squared resid	0.197867	Schwarz criterion	-1.706500	
Log likelihood	35.96833	F-statistic	449.1953	
Durbin-Watson stat	1.851416	Prob(F-statistic)	0.000000	

The estimated import demand function with lagged import for the whole period is reported below.

The import demand function with lagged import is stated as

$$\ln M_t = a_0 + a_1 \ln Y_t + a_2 \ln P_{mt} + a_3 \ln P_{dt} + a_4 \ln M_{t-1}$$

and the estimated equation is

$$\ln M_t = -2.79 + 0.98 \ln Y_t - 0.98 \ln P_{mt} + 0.68 \ln P_{dt} + 0.45 \ln M_{t-1} \quad (6.2)$$

(-1.35) (2.90) (-4.33) (2.68) (3.33)

$$R^2 = 0.985$$

$$D-W = 1.8514$$

where

$\ln M$ = log of volume of imports

$\ln Y$ = log of real income

$\ln P_m$ = log of import prices

$\ln P_d$ = log of domestic prices

$\ln M_{t-1}$ = log of last year's import

This estimate is similar in sign but not in magnitude. There are several differences, which are described and explained. Let us examine those one by one.

The value of income elasticity is 0.98. The coefficient of import price is found to be negative and nearly one (-0.98). The coefficient of domestic price is positive. The coefficient of M_{t-1} is positive. The coefficient of lagged import is 0.45, where the t-value is 3.33. This means that present period's import is related to the past period. This may imply persistence of the "habit" factor.

Table 6.15 shows that the value of D-W is 1.85. So, the problem of autocorrelation is absent here. The value of R^2 was found to be 0.985, which was quite high and satisfactory.

6.5 The Export Demand Function

The export demand function is similar to a normal demand function in the sense that it is a function of income and price. However, income here refers to external income, that is, income of our leading importers. Similarly, by price is meant relative price, that is, ratio of foreign and domestic price. In this study, income of the foreign countries was given as the average of income of the three leading importers of Bangladesh such as U.S.A, Germany, and U.K. This is given below.

6.5.1 Estimated Export Demand Function

The computer output of the estimated import demand function is stated below. From here we can know an idea of nature and the relative importance of the determinants of exports. Below, AGDP denotes average of the real incomes of three leading countries.

Table 6.16
Estimated Export Demand Function

Dependent Variable: X				
Method: Least Squares				
Date: 01/11/14 Time: 22:34				
Sample: 1981 2012				
Included observations: 32				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGDP	3.082961	0.452878	6.807493	0.0000
RPI	0.319504	0.286837	1.113890	0.2745
C	-38.86655	7.025735	-5.532026	0.0000
R-squared	0.956647	Mean dependent var	8.387188	
Adjusted R-squared	0.953658	S.D. dependent var	0.942989	
S.E. of regression	0.203000	Akaike info criterion	-0.262162	
Sum squared resid	1.195060	Schwarz criterion	-0.124749	
Log likelihood	7.194595	F-statistic	319.9665	
Durbin-Watson stat	0.227324	Prob(F-statistic)	0.000000	

The estimated export demand function for the study period is presented here.

The export demand function can be written as

$$\ln X = b_0 + b_1 \ln YA + b_2 \ln RPI$$

and the estimated function is given below

$$\ln X = -38.87 + 3.08 \ln YA + 0.32 \ln RPI \quad (6.3)$$

(-5.53) (6.81) (1.11)

$$R^2=0.9566$$

$$D-W=0.2273$$

where

X = Quantity of exports demanded

YA = Average of the real incomes of the country's leading trading partners

RPI = Relative price index, i.e. price of exports of our country (PX) divided by the price index U.S.A. representing the trading partners.

The estimated equation shows that the coefficient of average of the real incomes is 3.08, which shows income elasticity, is highly significant where the t-value is 6.81. But the estimated coefficient of relative price is not statistically significant as indicated by the t-value, which is found to be 1.11.

It is found that income of the importing countries is the most dominant factor of our exports. This compares well with the real picture. Our importers are the richer countries of the world led by U.S.A., Germany, and U.K. An earlier study on Bangladesh by Kabir (1988) found a value of 1.42 for average of the real incomes, which corroborates our finding. Again, for relative price, Kabir (1988) found for a value -0.59 compared to our value of 0.32, which was not found significant statistically. Relative price of export was not found to be significant.

The estimated export demand function shows that the value of D-W statistics is 0.23, which implies that there is problem of autocorrelation in the estimate. Hence, an estimate corrected for autocorrelation is given below.

6.5.2 Estimated Export Demand Function with Autocorrelation Problem Corrected

The estimates presented above shows presence of autocorrelation problem as seen in the D-W statistics. The problem is now corrected and the estimated using the AR(1) process. Use of the AR(1) reduces the degree of autocorrelation. When we used AR(1), the value of D-W statistic increases from 0.23 to 1.74, implying absence of autocorrelation.

The computer output of estimated demand function with autocorrelation problem corrected is given below. This is also giving us an idea of nature and the relative importance of the determinants of exports.

Table 6.17
Estimated Export Demand Function with Reduced Autocorrelation Problem

Dependent Variable: X				
Method: Least Squares				
Date: 01/11/14 Time: 22:36				
Sample (adjusted): 1982 2012				
Included observations: 31 after adjustments				
Convergence achieved after 21 iterations				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGDP	3.982239	0.627080	6.350445	0.0000
RPI	0.159717	0.149659	1.067212	0.2953
C	-52.81251	9.751433	-5.415871	0.0000
AR(1)	0.827302	0.092551	8.938835	0.0000
R-squared	0.991488	Mean dependent var		8.426452
Adjusted R-squared	0.990542	S.D. dependent var		0.931606
S.E. of regression	0.090599	Akaike info criterion		-1.844829
Sum squared resid	0.221622	Schwarz criterion		-1.659798
Log likelihood	32.59485	F-statistic		1048.344
Durbin-Watson stat	1.743509	Prob(F-statistic)		0.000000

The estimated export demand function with corrected autocorrelation of this thesis is given below.

$$\ln X = -52.81 + 3.98 b_1 \ln YA + 0.16 b_2 \ln RPI \quad (6.4)$$

(-5.42) (6.35) (1.07)

$$R^2 = 0.9915$$

$$D-W = 1.7435$$

The coefficient of average of the real incomes is found 3.98, where the t- value is 6.35, which is statistically significant. The estimated coefficient of relative price is 0.16, which is not statistically significant. The result of this estimation is similar to our previous estimates.

So, the problem of autocorrelation is now tackled and the revised estimates are given in Table 6.17 where the D-W statistic is now 1.74. This shows that the estimates are free from autocorrelation.

6.6 Causality Tests between Export (X) and Output (Y) and Import (M) and Output (Y)

It is a very important question whether growth of GDP caused export growth or vice versa. Similarly, it is an important question whether growth of GDP caused import growth or vice versa. Using the Granger causality method, these questions are pursued and empirical results are presented and discussed. The estimates of the Granger causality test for both export and growth and import and growth are given below.

6.6.1 Causality Tests between Import (M) and Output (Y)

Causality test between import and output growth can be written as

$$M = \sum_{i=1}^n \alpha_i \text{GDP}_{t-i} + \sum_{j=1}^n \beta_j \text{M}_{t-j} + u_{1t} \quad \dots\dots\dots (6.5)$$

$$\text{GDP} = \sum_{i=1}^m \lambda_i \text{GDP}_{t-i} + \sum_{j=1}^m \delta_j \text{M}_{t-j} + u_{2t} \quad \dots\dots\dots (6.6)$$

The empirical estimates are given in Table 6.18.

Table 6.18
Causality Tests between Import (M) and Output (Y)

Pairwise Granger Causality Tests

Date: 12/25/13 Time: 11:37

Sample: 1981 2012

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
Y does not Granger Cause M	30	6.77107	0.00447
M does not Granger Cause Y		2.32788	0.11827

It can be found from Table 6.18 that null hypothesis Y (output) does not Granger cause M (import) is rejected at the 5% level. But the null hypothesis of M does not Granger causes Y is accepted. So, the causality test results show that Y Granger caused M, that is, growth of GDP caused import growth. So, here it is a case of output-led import.

This result could be due to the fact that output in Bangladesh grew as a result of continued growth of import—both in the manufacturing sector and in the agricultural sector. Our exports consist of 95 percent industrial product (ready-made-garments), which are very import intensive. The machineries and raw materials for this sector have to be imported. Only thing that Bangladesh has of its own is cheap labour. For our agricultural sector, Bangladesh has, of late, become very dependent on imports such as fertilizer, pesticide, power pump, tractors and even improved seeds.

6.6.2 Causality Tests between Export (X) and Output (Y)

Causality test between export and output growth can be written as

$$X = \sum_{i=1}^n \alpha_i \text{GDP}_{t-i} + \sum_{j=1}^n \beta_j X_{t-j} + u_{1t} \quad \dots\dots\dots (6.7)$$

$$\text{GDP} = \sum_{i=1}^m \lambda_i \text{GDP}_{t-i} + \sum_{j=1}^m \delta_j X_{t-j} + u_{2t} \quad \dots\dots\dots (6.8)$$

The empirical estimates are given in Table 6.19.

Table 6.19
Causality Tests between Export (X) and Output (Y)

Pairwise Granger Causality Tests

Date: 01/08/14 Time: 19:10

Sample: 1981 2012

Lags: 3

Null Hypothesis:	Obs	F-Statistic	Probability
Y does not Granger Cause X	29	1.60127	0.21768
X does not Granger Cause Y		2.46565	0.08906

From Table 6.19, it can be found that the null hypothesis Y (output) does not Granger cause X (export) is accepted, but at the 10% level null hypothesis X does not Granger cause Y (output) is rejected. So, the causality test results show that X Granger causes Y, that is, export growth caused output growth. So, here it is a case of export-led growth. This is a fairly well established result and similar result was obtained by other authors.

It appears that the driving force behind output growth was the growth of export. Bangladesh, therefore, should steadfastly pursue a vigorous policy of export growth. In fact, the export of Bangladesh has been growing in recent times in spite of facing many obstacles.

6.7 Convergence between Export (X) and Import (M)

Bangladesh had trade deficit since its emergence as an independent nation in 1971. An important question is whether this deficit is likely to remain as it is or gradually converge in future. An answer to this question will depend on who is giving it. If the opposition political party, whichever party it may be, gives the answer, then it is likely to say that this deficit will persist as the opposition usually want to posit a gloomy economic future. The party in power, on the other hand, would like to argue

that the trade deficit will be wiped out in future. Such answers are not the task of a doctoral research.

A formal answer to this question based on real data can be given in terms of a very powerful new methodology. It has been argued by different authors (Irandoost and Ericsson, 2004; Wijeweera, 2005, and Islam, Wadud, and Islam, 2008) that if export and import are found to be co-integrated, then the difference is likely to be wiped out in future.

Table 6.20
Convergence Test Results between Export (X) and Import (M)

Date: 12/25/13 Time: 11:46
 Sample (adjusted): 1983 2012
 Included observations: 30 after adjustments
 Trend assumption: No deterministic trend (restricted constant)
 Series: X M
 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 *	0.529934	33.38233	20.26184	0.0005
At most 1 *	0.300831	10.73589	9.164546	0.0250

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Having confirmed stationarity of the relevant variables, it is necessary to see if the pairs are co-integrated or not. We are considering export (X) and import (M). Hence, we can write:

$$u_t = X_t - \beta_1 - \beta_2 M_t \quad (6.9)$$

and find that u_t is $I(0)$ or stationary then the variables export and import are co-integrated.

If the trace statistic is greater than the critical value at 1% or 5% level of significance then the relevant null hypothesis is rejected and alternative hypothesis is accepted. Co-integration test results between export (X) and import (M) are given in Table 6.20. It is seen that the trace statistic is greater than the critical value. This means that the null hypothesis of no co-integration is rejected and the alternative hypothesis is accepted at the 5% level. Hence, trace statistic indicate that there are two co-integrating equations at 5% level. So, there is a long- run stability or equilibrium relationship between these two variables (export and import), which means that this two are co-integrated.

The economic implication of this result is quite profound. It implies that the long standing gap between export and import is likely to converge in the foreseeable future. This result is based on past data and it is likely to hold true unless unforeseen policy measures and other factors jeopardise it. This result can be regarded as a silver lining in the otherwise gloomy horizon of Bangladesh, which has experienced trade deficit since its emergence as an independent nation in 1971.

6.8 Chapter Summary

1. The estimated import demand function showed that import price was an important determinant of import and it was negatively related to import.
2. Domestic income was also found to be an important determinant of import, the two variables being positively related.
3. Lagged import was also a significant variable implying that past import and habit were important.

4. Estimates of export demand function showed that foreign income was the most important determinant of export. The real data confirmed this by showing that Bangladesh exported mostly to the richer countries such as U.S.A., Germany and U.K.
5. Causality test showed that output Granger caused import, implying that import growth was output-led.
6. Another result confirmed many earlier results that Bangladesh had export-led output growth.
7. Test of co-integration showed that trade deficit was likely to be erased as export and import are likely to converge in future.

Chapter 7

Exchange Rate and Economic Growth

The external value of the currency of Bangladesh has been continuously falling since the country came into being in 1971. Such a fall in the external value of the Bangladesh currency can affect the economy of Bangladesh. This is empirically examined in this study using appropriate models and econometric techniques.

Besides nominal exchange rate, the real exchange rate is also used in the econometric estimation in this thesis. Below, the concepts of nominal and real exchange rates are discussed and clarified. It should, however, be mentioned that while for research purpose, the real exchange rate is often used, trade actually takes place under nominal exchange rate and any change in the nominal rate can affect trade.

In this thesis, impact of exchange rate—both nominal and real— on output is considered, This is done along with other variables such as government expenditure, which stands for fiscal policy and private credit, which represents monetary policy and terms of trade, which explains international trade. Together, these also answer the question whether or not exchange rate can act alone or act in conjunction with other factors.

This exercise here is quite different from the export and import demand analysis. There, the main thrust was to examine the relative importance of the determinants of imports and exports and hence these two variables appeared as dependent variables. But in the case of exchange rate this variable appears as one of the explanatory variables of output.

7.1 The Nominal Exchange Rate and the Real Exchange Rate

Nominal exchange rate is defined as the value of the domestic currency in terms of a particular foreign currency. For Bangladesh, the value of the domestic currency, that is taka, is usually expressed in terms of the U.S. dollar though the value of taka in terms of currencies of other countries is also available in statistical publications of our country. In terms of our currency, the value of a U.S. dollar was 7.30 taka in 1972. By 1982, it became 20.06 taka, which by 1992 became equal to 38.14 taka. In 2002, the value of a U.S. dollar stood at 57.43 taka, and the present value in 2014 is around 80.00 taka per dollar. It is thus seen that an increasing amount of taka was needed to get a dollar over time, implying a steady fall in the external value of our currency.

The difference between nominal and real exchange rate was explained in Chapter 4. So, it is repeated here briefly. The effects of changes in the external value of domestic currency can be viewed in terms of ‘nominal’ and ‘real’ exchange rate. According to the Purchasing Power Parity (PPP) theory, which we adopted for this study, the domestic and foreign rates of inflation determine the exchange rate movements. When the ratio of domestic and foreign price changes, the exchange rate also changes.

Real exchange rate that has been used in this study was constructed by the author of this thesis. There was another real exchange rate series constructed by Khondker, Bidisha and Razzaque (2012), which was also constructed by the authors themselves. This series was not available in their paper and hence we did not have access to it. There is another series available in *Bangladesh Economic Review*, published by the Ministry of Finance, Government of Bangladesh. We did not use it as it did not cover the whole period of our research. This point was also mentioned in Chapter 5.

7.2 Time Series Properties of Relevant Variables

The method of studying time series properties of the relevant variables is the same as in Chapter 6. So, it is not repeated here, only the statistical results are mentioned.

7.3 Test of Stationarity

The well known test of stationarity is the Augmented Dickey-Fuller (ADF) test, which is now available in nearly all statistical and econometric soft-wares, including the *EViews*.

When the estimated ADF test value is found to be less than the critical values at different acceptable levels of significance then the hypothesis that there is no stationarity cannot be rejected. If it is found that the ADF test value is greater than the critical value then the variable can be said to be stationary and regression analysis can proceed.

7.3.1 Stationarity test for RY (real income)

The Augmented Dickey-Fuller test was used to see the stationarity problem. If the stationarity problem existed then first difference was taken. The stationarity test results for real income are given in table 7.1 below.

Table 7.1
Stationarity test for RY (real income)

Null Hypothesis: Y has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.785753	0.9563
Test critical values:		
1% level	-4.284580	
5% level	-3.562882	
10% level	-3.215267	

*MacKinnon (1996) one-sided p-values.

It is seen that the calculated value, -0.785753 at the level stage is less than the critical values at all three levels of significance, which implies that the unit root problem exists. So, the first difference is taken to see if the stationarity problem vanishes after that.

7.3.2 Stationarity test for RY (real income) after first difference

After the first difference is taken, the relevant estimates are given in Table 7.

2. It is now seen that the calculated value, -6.428736 is higher in absolute term than all critical values at all three acceptable significance levels.

Table 7.2
Stationarity test for RY (real income) after first difference

Null Hypothesis: D(Y) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.428736	0.0001
Test critical values:		
1% level	-4.296729	
5% level	-3.568379	
10% level	-3.218382	

*MacKinnon (1996) one-sided p-values.

This means that the unit root problem is now gone, and the variable qualifies for regression analysis.

7.3.3 Stationarity test for RGE (real government expenditure)

The stationarity problem is tested by the use of the Augmented Dickey-Fuller (ADF) test. If the problem existed then first difference was taken. The stationarity test results for real government expenditure are given in table 7.3 below. It is seen that the calculated value, - 0.191325 at the level stage is less than the critical values of all three levels of significance, which implies that the unit root problem exists.

Table 7.3

Stationarity test for RGE (real government expenditure)

Null Hypothesis: RGE has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.191325	0.9296
Test critical values:		
1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Now the first difference is taken to see if the stationarity problem vanishes after that.

7.3.4 Stationarity test for RGE (real government expenditure) after first difference

When the first difference is taken, the relevant estimates are given in table 7.

4. It is seen now that the calculated value, -4.785794 is higher in absolute term than all critical values at all three levels.

Table 7.4

Stationarity test for RGE (real government expenditure) after first difference

Null Hypothesis: D (RGE) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.785794	0.0006
Test critical values:		
1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

This implies that now the unit root problem is gone and the variable qualifies for regression analysis.

7.3.5 Stationarity test for RPCR (real private bank credit)

The stationarity problem is tested by the use of the Augmented Dickey-Fuller (ADF) test. If the stationarity problem existed then first difference was taken. The Table 7.5 shows the stationarity test results for real private bank credit.

Table 7.5
Stationarity test for RPCR (real private bank credit)

Null Hypothesis: RPCR has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.681621	0.8370
Test critical values: 1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Here, the calculated value, -0.681621 at the level stage is less than the critical values all three levels of significance, which implies that the unit root problem exists. So, the first difference is taken to see if the stationarity problem vanishes after that.

7.3.6 Stationarity test for RPCR (real private bank credit) after first difference

After first difference is taken, the relevant estimates are given in Table 7.6. It is seen now that the calculated value, -4.250961 is higher in absolute term than all critical values at all three levels, which means that now the unit root problem is gone.

Table 7.6
Stationarity test for RPCR (real private bank credit) after first difference

Null Hypothesis: D(RPCR) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.250961	0.0024
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

So, the variable qualifies for regression analysis.

7.3.7 Stationarity test for TOT (terms of trade)

The Stationarity test results for terms of trade are given in table 7.7 below. It is seen that the calculated value, -1.541540 at the level stage is less than the critical values at all three levels of significance, which implies that the unit root problem exists.

Table 7.7
Stationarity test for TOT (terms of trade)

Null Hypothesis: TOT has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.541540	0.4997
Test critical values: 1% level	-3.661661	
5% level	-2.960411	
10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Now, the first difference is taken to see if the stationarity problem vanishes after that.

7.3.8 Stationarity test for TOT (terms of trade) after first difference

When the first difference is taken, the relevant estimates are given in table 7.

8. It is seen now that the calculated value, -6.117118 is higher in absolute term is higher in absolute term than all critical values at all three levels.

Table 7.8
Stationarity test for TOT (terms of trade) after first difference

Null Hypothesis: D(TOT) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.117118	0.0000
Test critical values: 1% level	-3.670170	
5% level	-2.963972	
10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

This means that now the unit root problem is gone and the variable qualifies for regression analysis.

7.3.9 Stationarity test for NER (nominal exchange rate)

The Augmented Dickey-Fuller test was used to see the stationarity problem. If the stationarity problem existed then first difference was taken. The Stationarity test results for nominal exchange rate are given in table 7.9 below.

Table 7.9
Stationarity test for NER (nominal exchange rate)

Null Hypothesis: ER has a unit root

Exogenous: Constant

Lag Length: 3 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.698175	0.8314
Test critical values: 1% level	-3.689194	
5% level	-2.971853	
10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

It is seen that the calculated value, -0.698175 at the level stage is less than the critical values at all three levels of significance, which implies that the unit root problem exists.

7.3.10 Stationarity test for NER (nominal exchange rate) after first difference

When the first difference is taken, the relevant estimates are given in Table 7. 10.

It is seen now that the calculated value, -4.265299 is higher in absolute term than all critical values at all three levels, which means that the unit root problem is now gone.

Table 7.10
Stationarity test for NER (nominal exchange rate) after first difference

Null Hypothesis: D(ER) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.265299	0.0024
Test critical values: 1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

7.3.11 Stationarity test for RER (real exchange rate)

The Augmented Dickey-Fuller test was used to see the stationarity problem. If the stationarity problem existed then first difference was taken. The Stationarity test results for nominal exchange rate are given in table 7.11 below.

Table 7.11
Stationarity test for RER (real exchange rate)

Null Hypothesis: RER has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.020680	0.9490
Test critical values:		
1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

It is seen that the calculated value, -0.020680 at the level stage is less than the critical values at all three levels of significance, which implies that the unit root problem exists. So, the first difference is taken to see if the stationarity problem vanishes after that.

7.3.12 Stationarity test for RER (real exchange rate) after first difference

When the first difference is taken, the relevant estimates are given in Table 7.12. It is seen now that the calculated value, -3.643581 is higher in absolute term than critical values at 5% level.

Table 7.12
Stationarity test for RER (real exchange rate) after first difference

Null Hypothesis: D(RER) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic based on SIC, MAXLAG=7)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.643581	0.0109
Test critical values:		
1% level	-3.679322	
5% level	-2.967767	
10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

So, the unit root problem is now gone, and the variable qualifies for regression analysis.

7.4 Results of Co-integration Tests

When the stationarity test is complete, the next step is to conduct co-integration test between different pairs of variables for regression purpose. This is done below.

7.4.1 Test of Co-integration between RY and RGE (real income and real government expenditure)

The results of co-integration tests are given below in Table 7.13 for real income and real government expenditure. It is found that these two variables are co-integrated. Thus these qualify for both regression and causality analyses.

Table 7.13
Test of Co-integration between RY and RGE (real income and real government expenditure)

Date: 03/10/14 Time: 16:25
Sample (adjusted): 1983 2012
Included observations: 30 after adjustments
Trend assumption: Linear deterministic trend
Series: Y RGE
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 *	0.391304	26.61561	15.49471	0.0007
At most 1 *	0.323452	11.72255	3.841466	0.0006

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

7.4.2 Test of Co-integration between RY and RPCR (real income and real private bank credit)

The results of co-integration tests are given below in Table 7.14 for real income and real private bank credit and it is found that these two variables are co-integrated. Thus these qualify for both regression and causality analyses.

Table 7.14
Test of Co-integration between RY and RPCR (real income and real private bank credit)

Date: 03/10/14 Time: 16:24
Sample (adjusted): 1983 2012
Included observations: 30 after adjustments
Trend assumption: Linear deterministic trend
Series: Y RPCR
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 *	0.591697	45.07660	15.49471	0.0000
At most 1 *	0.454912	18.20427	3.841466	0.0000

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

7.4.3 Test of Co-integration between RY and TOT (real income and terms of trade)

The results of co-integration tests are given below in Table 7.15 for real income and terms of trade and it is found that these two variables are co-integrated. Now, these qualify for both regression and causality analyses.

Table 7.15
Test of Co-integration between RY and TOT (real income and terms of trade)

Date: 03/10/14 Time: 16:26
Sample (adjusted): 1983 2012
Included observations: 30 after adjustments
Trend assumption: Linear deterministic trend
Series: Y TOT
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 *	0.591970	35.28997	15.49471	0.0000
At most 1 *	0.244154	8.397531	3.841466	0.0038

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

7.4.4 Test of Co-integration between RY and NER (real income and nominal exchange rate)

The results of co-integration tests are given below in Table 7.16 for real income and nominal exchange rate of trade. It is found that these two variables are co-integrated. Thus these qualify for both regression and causality analyses.

Table 7.16
Test of Co-integration between RY and ER (real income and exchange rate)

Date: 01/08/14 Time: 22:17
 Sample (adjusted): 1983 2012
 Included observations: 30 after adjustments
 Trend assumption: Linear deterministic trend
 Series: Y ER
 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 *	0.472830	24.39447	15.49471	0.0018
At most 1 *	0.158793	5.187521	3.841466	0.0227

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

7.4.5 Test of Co-integration between RY and RER (real income and real exchange rate)

The results of co-integration tests are given below in Table 7.17 for real income and real exchange rate and it is found that these two variables are co-integrated. So, these qualify for both regression and causality analyses.

Table 7.17
Test of Co-integration between RY and RER (real income and real exchange rate)

Date: 01/19/14 Time: 20:53
Sample (adjusted): 1983 2012
Included observations: 30 after adjustments
Trend assumption: Linear deterministic trend
Series: Y RER
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 *	0.456910	27.06513	15.49471	0.0006
At most 1 *	0.253001	8.750741	3.841466	0.0031

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

7.5 Output as a function of Nominal Exchange Rate and other Variables

Output is explained first as a function of nominal exchange rate, government expenditure, private credit, and terms of trade. This is the nominal exchange rate analysis. The estimates are presented below.

7.5.1 Estimated Output as a function of Nominal Exchange Rate and other Variables

In this study, the estimates using the nominal exchange rate and other dependent variables are obtained first and presented below. After this, the estimates using the real exchange rate and other variables are presented here. The computer printout of the estimated output as a function of nominal exchange rate and other variables are given in Table 7.18.

Table 7.18
Estimated Output as a Function of Nominal Exchange Rate and other Variables

Dependent Variable: RY
Method: Least Squares
Date: 03/10/14 Time: 16:31
Sample: 1981 2012
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGE	0.236839	0.082010	2.887929	0.0075
RPCR	0.359448	0.078259	4.593064	0.0001
TOT	-0.331039	0.063568	-5.207607	0.0000
NER	0.425344	0.082106	5.180404	0.0000
C	8.105593	0.350616	23.11816	0.0000
R-squared	0.992918	Mean dependent var	10.60844	
Adjusted R-squared	0.991869	S.D. dependent var	0.451622	
S.E. of regression	0.040723	Akaike info criterion	-3.421457	
Sum squared resid	0.044775	Schwarz criterion	-3.192436	
Log likelihood	59.74331	F-statistic	946.4324	
Durbin-Watson stat	1.187659	Prob(F-statistic)	0.000000	

The functional relationship that has been designed can be written as

$$\ln Y_t = \beta_0 + \beta_1 \ln(RGE_t) + \beta_2 \ln(RPCR_t) + \beta_3 \ln(TT_t) + \beta_4 \ln(NER_t)$$

The estimated output as a function of nominal exchange rate and other variables is given below.

$$\ln Y_t = 8.11 + 0.24 \ln(RGE_t) + 0.36 \ln(RPCR_t) - 0.33 \ln(TT_t) + 0.43 \ln(NER_t) \quad (7.1)$$

(23.12) (2.89) (4.59) (-5.21) (5.18)

$$R^2 = 0.9929$$

$$D-W = 1.1876$$

where

$\ln Y$ = log of real income

$\ln RGE$ = log of real government expenditure

$\ln RPCR$ = log of real private credit

$\ln TT$ = log of terms of trade

$\ln \text{NER} = \log$ of nominal exchange rate

The estimates of Table 7.18 show that output is positively related to real government expenditure, real private credit, nominal exchange rate, and negatively related to terms of trade. All these coefficients are found to be statistically significant. This has the important implication that exchange rate changes affect growth **in conjunction** with monetary and fiscal policy and terms of trade.

Positive relationship between government expenditure and output was a highly expected result as government expenditure spearheaded growth of output through infrastructural and other related development. Bangladesh witnessed tremendous infrastructural development in recent decades, which included mega projects like the Jamuna bridge. The forthcoming Padma bridge does not come under the purview of this study but it is a reflection of Bangladesh's commitment to infrastructural development.

Positive relationship between bank credit and output growth is well expected as development of nearly all sectors was the result of considerable amount of increase in bank credit. The monetary sector in Bangladesh has expanded considerably, and of late in a multifarious manner and left a positive imprint on the economic growth of the country.

Terms of trade of Bangladesh found to be negatively related to output growth. Since terms of trade were found to have fallen steadily, a negative relationship between these two variables was expected. Our results confirm this.

The sign of the nominal exchange rate coefficient requires some clarification. The coefficient is found to be positive. This is because nominal exchange rate was written as taka per U.S. dollar. This rose over time, meaning a steady fall in the external value of our currency. So, while the external value of money fell, the money

required to get a U.S. dollar continuously increased. Posited against rising output this generated a positive sign.

The value of D-W statistic was found to be 1.18, which fell in the zone of indecision. Hence, presence of autocorrelation was not certain.

7.6 Output as a function of Real Exchange Rate and other Variables

The real exchange rate is the same as the nominal exchange rate except that in place of nominal exchange rate, we have real exchange rate now. It may be recalled that the real exchange rate used here was constructed by the author of the thesis herself.

7.6.1 Estimated Output as a function of Real Exchange Rate and other Variables

When output is posited against real exchange rate along with other variables, similar results are obtained. These are presented in Table 7.19. It is, however, vitiated by presence of autocorrelation as is evident from low value of 0.95 of the D-W statistic.

Table 7.19
Estimated Output as a function of Real Exchange Rate and other Variables

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGE	0.205940	0.086806	2.372421	0.0251
RPCR	0.282400	0.099978	2.824623	0.0088
TOT	-0.334448	0.067234	-4.974378	0.0000
RER	0.315290	0.068590	4.596746	0.0001
C	9.042118	0.394025	22.94807	0.0000
R-squared	0.992079	Mean dependent var		10.60844
Adjusted R-squared	0.990905	S.D. dependent var		0.451622
S.E. of regression	0.043069	Akaike info criterion		-3.309411
Sum squared resid	0.050084	Schwarz criterion		-3.080390
Log likelihood	57.95057	F-statistic		845.3980
Durbin-Watson stat	0.951536	Prob(F-statistic)		0.000000

The resulting relationship for the real exchange rate is given below.

$$\ln Y_t = \beta_0 + \beta_1 \ln(RGE_t) + \beta_2 \ln(RPCR_t) + \beta_3 \ln(TT_t) + \beta_4 \ln(RER_t)$$

The estimated output as a function of real exchange rate and other variables is given below.

$$\ln Y_t = 9.04 + 0.21 \ln(RGE_t) + 0.28 \ln(RPCR_t) - 0.33 \ln(TT_t) + 0.32 \ln(RER_t) \quad (7.2)$$

(22.95) (2.37) (2.82) (-4.97) (4.59)

$$R^2 = 0.9920$$

$$D-W = 0.9515$$

The estimates of equation (7.2) show that output is positively related to the real government expenditure, real private credit, and real exchange rate but negatively related to terms of trade. The coefficient of government expenditure is also positive. Statistically, the estimated coefficient is found to be significant as indicated by the t-value, which is 2.37. The coefficient of private credit, terms of trade and real exchange rate, were found to be small but all these variables were found to be statistically significant.

The coefficient of real exchange rate was found to be positive and the reason is similar as the real exchange rate also increased over time though it was lower than the nominal exchange rate.

The D-W statistics is 0.95, which means that there is problem of autocorrelation in this estimate. So, this is corrected and revised estimates are presented below.

7.6.2 Estimated Autocorrelation Corrected Output as a function of Real Exchange Rate and other Variables

It can be seen that our previous estimate given above suffered from the problem of autocorrelation. Hence, this was corrected using appropriate methods and the results are given below in Table 7.20.

Table 7.20
Estimated Autocorrelation Corrected Output as a function of Real Exchange Rate and other Variables

Dependent Variable: Y

Method: Least Squares

Date: 03/10/14 Time: 16:31

Sample (adjusted): 1982 2012

Included observations: 31 after adjustments

Convergence achieved after 11 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RGE	-0.033606	0.064769	-0.518855	0.6084
RPCR	0.252515	0.058907	4.286630	0.0002
TOT	-0.114282	0.067547	-1.691881	0.1031
RER	0.533642	0.046302	11.52533	0.0000
C	8.188326	0.383238	21.36614	0.0000
AR(1)	0.664766	0.061182	10.86530	0.0000
R-squared	0.998445	Mean dependent var	10.62968	
Adjusted R-squared	0.998134	S.D. dependent var	0.442542	
S.E. of regression	0.019116	Akaike info criterion	-4.904564	
Sum squared resid	0.009136	Schwarz criterion	-4.627018	
Log likelihood	82.02074	F-statistic	3210.521	
Durbin-Watson stat	1.442637	Prob(F-statistic)	0.000000	

The estimated output as a function of real exchange rate and other variables is given below.

$$\ln Y_t = 8.19 - 0.03 \ln(RGE_t) + 0.25 \ln(RPCR_t) - 0.11 \ln(TT_t) + 0.53 \ln(RER_t)$$

(21.366) (-0.52) (4.29) (-1.69) (11.52)

$$R^2 = 0.9984$$

$$D-W = 1.4426$$

The estimated real exchange rate function corrected for autocorrelation shows that output is positively related to real private credit, real exchange rate, and negatively related to real government expenditure and terms of trade.

It is observed from equation (7.3) that there are some differences between estimated nominal exchange rate and estimated real exchange rate equation. The

coefficient of real exchange rate was found to be 0.53 against 0.43 for the nominal exchange rate. The coefficient of government expenditure has now changed to negative, which is a little surprising, but it is statistically not significant. The coefficient of terms of trade is negative like that of the nominal exchange rate, but it is statistically not significant. The significance of other variables is similar.

The value of R-squared was found to be 0.998, which is quite high. The D-W value is 1.44, which falls in the zone of indecision and here is not a matter of worry.

It appears that the real exchange rate has generated results, which are not always quite satisfactory. It also appears that the estimates of the equation which used the nominal exchange rate is more in line with the expected notion. It is also found that our results are similar to the ones obtained the earlier study by Khondoker, Bidisha, and Razzaque (2012) who only used the real exchange rate. Only future studies can shed further definitive light on this matter.

7.7 Chapter Summary

1. The external value of money of Bangladesh steadily declined since Bangladesh emerged as an independent nation in 1971. In this chapter, the impact of this is examined.
2. At first, the stationarity properties of the relevant variables were examined.
3. Having assured of stationarity, co-integration of the relevant pairs of variables were examined and found to exist.
4. Then the estimated equation using nominal exchange rate was stated. The explanatory variables were all found to be significant.

5. The estimated equation using real exchange rate was showed some differences from those obtained in the nominal exchange rate estimate.
6. There was some evidence of autocorrelation problem. When corrected, this lead to some changes in the estimated function. In one or two cases, even the sign of the coefficient changed though those were found to be statistically insignificant.
7. In a nutshell, considerable insights could be obtained from these estimates on the impact of exchange rate changes on economic growth.

Chapter 8

Summary and Conclusion

This chapter contains an overall summary and conclusion of the thesis. It has four sections. In Section 1, the summary is given, while Section 2 contains the conclusions. Section 3 provides some policy recommendations and the last section, that is Section 4, contains a short comment on scope for further extension.

8.1 Summary

The summary is given below chapter by chapter. In the main body of the thesis, each chapter contains a summary. These are now collected to provide an overall summary.

Chapter 1

This is the introductory chapter and it contains the main outline of the thesis. It includes the statement of the problem, objectives, hypotheses, research questions, rationale, and research gap.

It also provides chapter outline of the thesis, which is given below. This follows below.

1. In Chapter 1, the main objectives of the thesis were stated and detailed objective were described.
2. Chapter 2 contains a background of the study. It focused on export, import, output (GDP), and exchange rate changes.
3. Chapter 3 contains a comprehensive literature survey related to the issues covered in the thesis. The first part of the survey contained a general review while the second part covered the works on Bangladesh.

4. This study uses several models and function such the export demand function, the import demand function, the model causality analysis, the model of long term convergence of export and import. The impact of exchange rate changes on economic growth were also examined using appropriate function applying both the nominal and real rate data. These are described and explained in Chapter 4.
5. The data for empirical estimation are all described and discussed in Chapter 5. Where possible and pertinent, graphical representations have been given.
6. The empirical results on export, import, and economic growth were presented in Chapter 6.
7. The relationship between exchange rate changes and economic growth was assessed in Chapter 7 and the estimates and their analysis are presented here.
8. The last chapter contains summary, conclusion, policy suggestions, and scope for further research.

Chapter 2

1. The export of Bangladesh has steadily grown, rising from 1303.13 million US dollar in 1981 to 23264.61 million U.S dollar in 2012.
2. The imports of Bangladesh have also grown always outstripping exports. The exports of Bangladesh are import-dependent and, hence, it is difficult to reduce trade deficit.
3. The balance of trade of Bangladesh continued to be negative given the situation as mentioned above in (2).
4. Balance of payments of Bangladesh, however, attained a surplus in recent years due mainly to foreign remittance, which continued to grow and reached 15 billion by 2014.

5. The nominal exchange rate continued to rise, and the external value of taka continued to fall, due mainly to the persistent trade deficit.
6. The discussion of trade policy showed that Bangladesh was consciously and successfully handling the challenges of international economic exchanges.
7. Bangladesh has entered into several trade agreements to advance the cause of its external trade.

Chapter 3

1. This chapter contains a survey of works on export, import, exchange rate, and economic growth.
2. These surveys included mostly empirical works, which is the main thrust of this thesis.
3. There are a very large number of publications on this topic. So, in order to save the space, only works done since 1983 have been included.
4. The first section of this chapter contains a survey of contributions in general, while the second section reviews works on Bangladesh.

Chapter 4

1. The import demand function which is used in this study is described first. It has two versions. The first one shows that the import demand is a function of domestic real income, domestic price, and price of import. The second includes the variable, lagged import, which stands for habit persistence or past habit of imports.
2. The export demand function is stated after this, which showed that demand for export is a function of income of the trading partners and relative price, that is, unit price of exports of the country divided by the domestic price index of the

leading countries (in this study, the price index of U.S.A., which is the largest importer of goods from Bangladesh is used as a proxy of external price).

3. The causality analysis framework is stated in terms of pairs of relationship between export and output, and import and output.
4. To study possible convergence between export and import, the co-integration methodology is described.
5. Lastly, two forms of a function which can study the impact of changes in output and nominal and real exchange rate were presented.

Chapter 5

1. Data on export, import, and GDP were presented in Table 5.1. All these data were in real terms.
2. Unite prices of export and import was reported in Table 5.2.
3. Table 5.3 shows average GDP of three leading countries (U.S.A., Germany and U.K.). Relative price of Bangladesh and U.S.A. were also given in this Table.
4. The nominal exchange rate was reported in Table 5.4.
5. Table 5.5 showed the real exchange rate constructed by the author of the thesis.
6. The real government expenditure, credit to the private sector and terms of trade of Bangladesh for the whole study period was reported in Table 5.7.

Chapter 6

1. The estimated import demand function showed that import price was an important determinant of import and it was negatively related to import.
2. Domestic income was also found to be an important determinant of import, the two variables being positively related.

3. Lagged import was also a significant variable implying that past import and habit were important. This variable was included by us and also by others to capture past habit and linkage.
4. Estimates of export demand function showed that foreign income was the most important determinant of export. The real data confirmed this by showing that Bangladesh exported mostly to the richer countries such as U.S.A., Germany and U.K.
5. Causality test showed that output Granger caused import, implying that import growth was output-led.
6. Another result confirmed many earlier results that Bangladesh had export-led output growth.
7. Test of co-integration showed that trade deficit was likely to be erased as export and import are likely to converge in future.

Chapter 7

1. The external value of money of Bangladesh steadily declined since Bangladesh emerged as an independent nation in 1971. In this chapter, the impact of falling external value of Bangladesh currency on output growth was examined.
2. At first, the stationarity properties of the relevant variables were examined.
3. Having assured of stationarity, co-integration of the relevant pairs of variables were examined and found to exist.
4. Then the estimated equation using nominal exchange rate was stated. The explanatory variables were all found to be significant.
5. The estimated equation using real exchange rate showed some differences from those obtained in the nominal exchange rate estimate.

6. There was some evidence of autocorrelation problem. When corrected, this lead to some changes in the estimated function. In one or two cases, even the sign of the coefficient changed though those were found to be statistically insignificant.
7. In a nutshell, considerable insights could be obtained from these estimates on the impact of exchange rate changes on economic growth.

Chapter 8

Chapter 8, which is this chapter, contains a summary, which is given above and conclusion, policy suggestions and scope for further research, which are given below.

8.2 Conclusion

This study covers an important period of the economy of Bangladesh. Bangladesh started rather precariously having been termed a bottomless basket. But the turnaround started in the early 1980s and the period of 1981 to 2012, which this thesis covers, is the period which is marked by continued growth of the economy of Bangladesh. In this study, export, import, output growth, and the impact of exchange rate changes on growth were examined. This being an empirical study, the results were all based on real data. So, the conclusion of the thesis should be viewed in that light.

The analysis in this thesis contains estimation of the export demand function by which is meant demand for our export abroad and the determinants of that export. It was found that the main determinant of our export was income of the importing countries. This meant that the richer countries were our main importers. This was corroborated by the fact that the main importers of Bangladeshi commodities were

U.S.A., Germany, and U.K. This was described in Chapters 2 and 6. This has important policy implications, which will be discussed below in the policy section.

The import demand function showed that our income was the main determinant of our import. The continued rise in our aggregate import is largely explained by this. It appears that the import of Bangladesh, given the rising income, is likely to continue. Also, it has been explained above that although Bangladesh is a developing economy, its exports contain 95% manufacturing commodities whose ingredients are mostly imported. Hence, import is likely to increase and remain ahead of exports in the foreseeable future. But what will happen in distant future or in the long- run? The answer to this question has been obtained in this study through the use of the concept of co-integration and was discussed in detail in Chapter 6.

The estimates of causality study have also revealed interesting results. It was found that Bangladesh had export-led growth. This meant that the driving force behind steady growth of real output, which is now hovering around 6.0 percent, was the export growth. The policy implication of this development will be briefly discussed below.

The causality result between import and output growth has provided an outcome which requires some explanation. Bangladesh was found to have output-led import. The result could be the outcome of the fact that both Bangladesh's export and agricultural production have now both become import dependent. As a result, as Bangladesh strives for higher growth of output, growth of import is needed for that. So, the driving force behind import growth is the growth of output.

An important thing that was analysed in this thesis was the possibility of convergence of export and import in the long run. This possibility eludes Bangladesh.

It was formally analysed using the co-integration analysis. The results showed that exports and imports were likely to converge in the long- run. Although this was good news, other supportive efforts, such as austerity measures in consumption and luxury imports, should be made in order for this to materialize.

The next thing this study examined was the relationship between exchange rate changes and output growth. The results suggested that the fall in the external value of our currency did affect output. This was examined by using both nominal and real exchange rate.

Both the empirical results showed that there was a positive relationship between exchange rate increase and output growth, which meant that the fall in the external value of our currency adversely affected growth. This did not mean that our output did not grow but it implied that the growth was adversely affected and that it grew at a slower rate. Therefore, there was need for controlling the continued fall in the external value of our currency.

Our estimating equations showed that exchange rate affected output not alone but in conjunction with other variables such as monetary policy, fiscal policy, and terms of trade. Hence, an exchange rate policy should combine all these factors and it should not be applied in isolation.

8.3 Some Policy Suggestions

Some of the policy suggestions that emerge from the empirical results of this study are mentioned now. The policy suggestions or recommendations are based on the empirical results of this study.

The export equation clearly showed that our exports were dependent on income of the importing countries. An important policy implication is that Bangladesh should try to expand exports to the richer countries such as U.S.A., Germany, and

U.K., which are our leading importers. Trade with other countries including the SAARC countries constitute only about 4percent of all trade.

Another result that was obtained in this study was that Bangladesh had export-led growth. This suggested that Bangladesh should pursue a forceful policy of export growth. True, imports of Bangladesh are greater than exports and this is likely to remain so in the foreseeable future, but exports are the driving force behind output and, hence, should be pushed forward as far as possible.

Our results on convergence of export and import suggested that these two were likely to converge in the long-run. However, it would seem that supporting policy of austerity in the import of consumer goods and luxury items should be taken up, which will help and hasten convergence between export and import.

One important consequence of trade deficit is the continued fall in the external value of our currency, and hence, an increase in the exchange rate. Therefore, policies to raise the external value of our currency should be put in place. It follows from the results of this study that such a policy should be a combined one including monetary policy and fiscal policy.

8.4 Scope for Further Extension

Ours is an aggregative study and it hence deals with export and import in a highly aggregative manner. A disaggregative study for different components of export and import could be quite interesting and may be a topic for future research.

Also, disaggregation in terms of destination, that is, from where our imports come and where our exports go can be done. This may shed light on country-wise determinants of exports and imports.

It was mentioned in our chapter on exchange rate changes and growth that exchange rate worked in conjunction with monetary and fiscal policy. Future research can shed light on the specific nature of such policies and how those could affect growth.

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