Trends in the Growth Rate of RMG Exports of Bangladesh

An Analysis of the Trends with Special Emphasis on the RMG Exports of Bangladesh to the US Market

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Abstract

The readymade garments (RMG) sector of Bangladesh has been maintaining its impressive growth rate for quite a long time. But although there have been many studies on this sector, significant analysis of the trends in the growth rate of the garments sector is yet to be done. Moreover, a formal statistical measurement of how the recent financial crisis would affect the garments exports has not been done yet, which is surely very important for policy making, given the current economic situation of the world. Using non-parametric approaches and time series econometrics, this paper provides a first look at the trend growth rates of RMG exports, and provides a special focus on RMG exports of Bangladesh in the US market, since USA is the largest buyer of RMG products (if individual countries are taken into account). The main conclusion is that the trend growth rates of both the total RMG exports to all countries and the RMG exports to USA are showing signs of decline. However, application of ARIMA estimation and co-integration techniques show that in the US market, the RMG exports would show some increase in the coming year, even after accounting for the recent financial downturn. This means that the future of the RMG export earnings from USA might not be as disastrous as speculated by many. Since economic fluctuations in USA tend to affect the rest of the world significantly, this indicates that there is a probability that RMG export earnings from other countries would not decrease as well. But precise country studies like the one presented in this paper are needed to reach such a conclusion about the other countries of the world.

1.0   Introduction

The Ready-made Garments (RMG) industry of Bangladesh has expanded dramatically over the last three decades, and has been contributing greatly to

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the export earnings of Bangladesh. Traditionally, the jute industry dominated the industrial sector of the country until the 1970s. Since the early 1980s, the RMG industry has emerged as an important player in the economy of the country and has gradually replaced the jute industry. It is the only multi-billion-dollar manufacturing and export industry in Bangladesh. Whereas the industry contributed only 0.001 per cent to the country's total export earnings in 1976, its share increased to about 76 per cent of those earnings in the fiscal year 2007-08.

There have been many studies done by the experts of Bangladesh on the RMG sector of Bangladesh, most of which are concerned with the competitiveness of the RMG exports of Bangladesh in international markets. Rahman and Anwar (2006) examines the revealed comparative advantage of Bangladesh, price competition, wage rates and productivity, China's export policy etc. to examine the competitiveness of RMG exports of Bangladesh vis-à-vis China. They suggest that following the MFA (Multi Fibre Agreement) phase-out Bangladesh has started to experience considerable competitive pressure from China in a number of items of major export interest to Bangladesh. Therefore, Bangladesh should design a medium term strategy towards Bangladesh's continued market presence in the US as a major supplier of apparels, which would require targeted actions in several areas, such as productivity enhancement, reducing the lead time, etc.

Ahmed and Hussain (2006) concludes that Bangladesh still remains competitive in the RMG exports in the post MFA period, due to steps taken by the industry such as successful diversification of products and markets, increased backward integration, high level of investment and supportive policy regime. Haider (2007) concludes that the surface-level competitive performance of the Bangladesh RMG industry is rather good, as indicated by quantitative expansions of its exports to major international markets over the time period. However, the most urgent and important tasks for the Bangladesh RMG industry include shortening the lead time, expanding the backward linkage industry for RMG, improving the working environment in factories and address other social issues related to the garment industry, product and market diversification and development of the sea ports of Bangladesh.

Bhattacharya, Rahman and Raihan (2002) conducted a survey of selected RMG units and made a detailed analysis of the statements of accounts of 15 RMG units, both woven and knit to find out the contribution of the RMG sector to the economy of Bangladesh. They concluded that not only have the RMG sector contributed towards the growth of export earnings of Bangladesh, it has also provided for ample opportunities for employment of

women, leading to women empowerment, increased savings of the workers and population control. Khosla (2009) suggests that women have greater economic independence, respect, social standing and "voice" than before due to their increased participation in the RMG industry, but harassment and exploitation persists.

The studies mentioned so far concentrate mainly on the qualitative analysis of the competitiveness of RMG exports and the effects of these earnings on the economy of Bangladesh, but these studies are very general in nature. Moreover, the studies mainly point out facts and figures, with no attempt at using formal statistical procedures to find the trend growth rate of the RMG export earnings or developing a model which can be used for predicting the future sustainability of the growth rate of the RMG sector. There also have been no formal statistical studies on the analysis of probable impact of the recent global recession on the countrywise garments exports or the total RMG exports of Bangladesh. But since year-to-year growth rates do not give the precise picture of the trends in the growth rates (i.e. they do not show the average growth rate of a ten year or twenty year period), it is very important that the proper information about the 'trend growth rate' of RMG exports is conveyed to the policymakers, so that they can take the correct measures. That is because some years may show high growth rates, but the overall trend of ten years or so may be quite low. Hence, policies based on year-to-year growth rates may be misleading. Moreover, there should at least be some attempt to scientifically predict the future RMG export earnings and study the impact the recession could have on it. Otherwise, only speculations about the future do not necessarily help in policy formulation. This paper tries to fill in this gap of the existing literature. More precisely, this paper tries to present a first attempt at finding out the yearly trend growth rate of the total RMG export earnings using popular non-parametric approaches. This paper is also a first attempt at finding out the probable impact of the global recession on the RMG exports using standard statistical methods. As the global recession has had slightly varying impacts on the various destination countries of Bangladeshi RMG exports, analysis of the impact requires separate studies on each of the countries. This paper provides a special look at the probable impact of the recession in the USA on the RMG exports to that country. Special emphasis has been given on the US market because firstly, USA is the largest buyer of RMG products from Bangladesh (if individual countries are considered); secondly, the recent global recession basically started in USA, and lastly, any economic fluctuation in the US economy has a big effect on most European countries, and many European countries are among the main buyers of RMG products from Bangladesh. Hence, this paper finds out the general yearly trends in the total RMG exports of Bangladesh, and also highlights how

the trend of RMG exports would behave in the US market given the recent global recession. Section 2 highlights the recent trends in the export earnings of RMG; Section 3 discusses the general trends of the total RMG exports, while section 4 focuses on the Bangladeshi RMG exports to the US market. Section 5 points out the major findings of the analysis and the final section concludes.

2.0   RMG Exports of Bangladesh: An Overview

The ready-made garments (RMG) industry of Bangladesh emerged from economic opportunities perceived by the private sector in the late 1970s. Many entrepreneurs from other Asian countries were frustrated due to the quota restrictions imposed by importing nations such as the USA, and so they set up their Ready Made Garments (RMG) factories in Bangladesh. This provided the entrepreneurs with an opportunity to bypass the quota restrictions and they also benefited from the low labor cost of Bangladesh. Some 85 percent of these RMG products were sold to North American customers, with Bangladesh becoming the sixth largest supplier to the North American market. Seeing the vast profitability of RMG production, Bangladeshi capitalists started organizing companies in Dhaka, Chittagong, and smaller towns, where basic garments--men's and boys' cotton shirts, women's and girls' blouses, shorts, and baby clothes--were cut and assembled, packed, and shipped to customers overseas (mostly in the United States). With virtually no government regulation, the number of firms proliferated; no definitive count is available, but there were probably more than 400 firms by 1985, when the boom was peaking. The trend in the RMG export earnings (in real US $) has been graphically shown in figure 1:

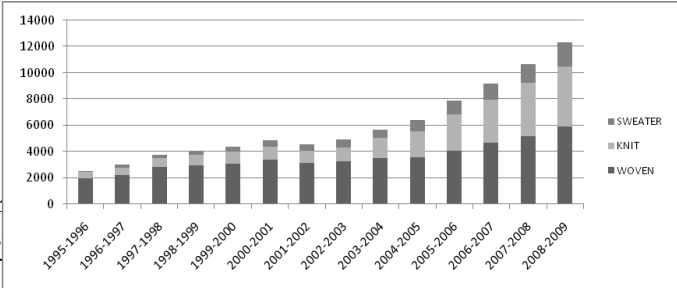**Figure 1: RMG Export Earnings (In Billion Real US $)**
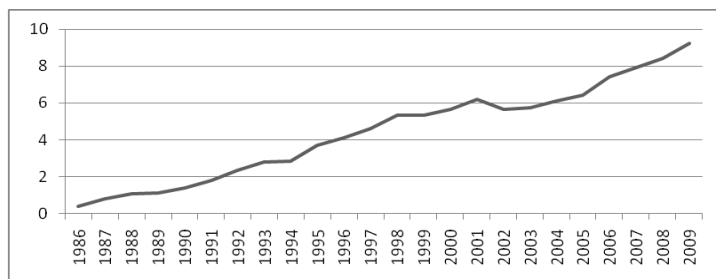
The figure shows an increasing trend in the RMG export earnings. There are, however, some periods in which the growth was negative, such as from the fiscal year 2001 to 2002, but in all the other years, the growth was positive, as

shown by the positive slope of the curve. This indicates the possibility of an increasing and monotonic trend of the RMG export earnings.

Ready-made garments manufactured in Bangladesh are divided mainly into two broad categories: woven and knit products. Shirts, T-shirts and trousers are the main woven products and undergarments, socks, stockings, T-shirts, sweaters and other casual and soft garments are the main knit products. Woven garment products still dominate the garment export earnings of the country. The recent composition of total apparel exports of Bangladesh is graphically shown in figure 2:

Figure 2: Value and Quantity of Total Apparel Export (In Million Current US)

The figure shows that woven garments dominate the apparel exports of Bangladesh. The recent composition of total apparel garments consist of woven garments in recent times. But the share of knit garments exports in total apparel exports is increasing every year. The trends in the main apparel items exported from Bangladesh have been shown in Table 1. The table shows that the value of shirts and t-shirts exported from Bangladesh have almost always been more than the other items exported in recent times. This is a reflection of the types of buyers of the RMG products of Bangladesh, since most of the buyers of the RMG products of Bangladesh in USA and the European countries are from the younger population who work in slightly low-paid jobs. However, the value of exports of trousers has increased in the recent times, and has reached its peak in the fiscal year 2008-09.

Table 1: Main Apparel Items Exported (In million US $(current)

YEAR	SHIRTS	TROUSERS	JACKETS	T-SHIRT	SWEATERS
1997-1998	961.13	333.28	467.19	388.50	296.29
1998-1999	1043.11	394.85	393.44	471.88	271.70
1999-2000	1021.17	484.06	439.77	563.58	325.07
2000-2001	1073.59	656.33	573.74	597.42	476.87
2001-2002	871.21	636.61	412.34	546.28	517.83
2002-2003	1019.87	643.66	464.51	642.62	578.37
2003-2004	1116.57	1334.85	364.77	1062.10	616.31

2004-2005	1053.34	1667.72	430.28	1349.71	893.12
2005-2006	1056.69	2165.25	389.52	1781.51	1044.01
2006-2007	943.44	2201.32	1005.06	2208.9	1248.09
2007-2008	915.6	2512.74	1181.52	2765.56	1474.09
2008-2009	1000.16	3007.29	1299.74	3065.86	1858.62

Source: BGMEA

3.0   Analysis of the General Trends:

The tables and figures only represent some numerical facts and figures, but the exact average annual growth rate or the trend growth rate can be found through employing some popular non parametric methods. The methodological issues involved in this analysis have been discussed in the following section.

3.1 Methodology:

As a first step of finding out the trend growth rate, let us suppose that the value of total exports of RMG in year t is Qt which grows at rate ρ, and is subject to stochastic shocks, ut. That is,

$$Q_t = (1+\rho)Q_{t-1}u_t \ \ldots\ldots\ldots\ldots\ldots.(i)$$

It is assumed that a multiplicative error, representing proportional shocks, is a more appropriate representation than an additive error, representing similar magnitudes of shock at all levels of output (Banerjee, et al.). In the RMG sector, these shocks include random economic fluctuations in Bangladesh as well as in the destination countries of RMG exports, changes in economic policies, etc.

From (i), it follows that
$$Q_{t-1} = (1+\rho)Q_{t-2}u_{t-1},$$
and substituting the value of   we get:
$$Q_{t-1} = (1+\rho)Q_{t-2}u_{t-1},$$
recursive substitution yields:
$$Q_t = (1+\rho)t Q_0 u_t u_{t-1}\ldots\ldots u_0$$

Taking logarithms and setting $\mu = \ln(Q_o)$, $\beta = \ln(1+\varrho)$, and $\varepsilon_t = \sum_t \ln(u_t)$ gives

$$\ln Q_t = \mu + \beta t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots(i)$$

When the dataset is large enough, such that it can be assumed that the errors are normally distributed, β can be estimated with OLS (Gujarati, 2003). Here, β shows the average or trend growth rate of the RMG export earnings. In this paper, non-parametric methods have been used to estimate the trend growth rate (β of equation (ii)). The advantages of using non-parametric approaches are:

-        Non-parametric approaches are applicable for small sample sizes. Since the garments exports have not started to grow rapidly before the late 1970s, annual data on the garments sector before that year is difficult to obtain. On the other hand, compilation of quarterly or monthly RMG exports data is hard to come across. Hence, the sample size used in this paper is n = 24 years, which is not large, and so the non-parametric approaches are applicable here.

-        Nonparametric methods require no or very limited assumptions to be made about the format of the data.

-        Nonparametric methods can be useful for dealing with unexpected, outlying observations that might be problematic with a parametric approach.

-        The growth rate could have been calculated using common methods such as taking the arithmetic mean of the year-to-year growth rates or using continuous compounding methods such as those used to calculate population growth. But the non-parametric approaches would allow the inclusion of an error term, and the error term would be able to capture random shocks to the trends, such as random economic fluctuations in the home country and the destination countries of the RMG exports. Moreover, the common methods have many problems, such as simple averages of year-to-year growth rates are generally affected to a large extent by extreme values (i.e. very large or small values) while compounding methods pose problems when some values are zero or close to zero.

This paper uses Sen's method to estimate β, while the Mann-Kendall method has been used for finding out the presence of a statistically significant and monotonous trend. The two methods are discussed as follows:

3.1.1   Mann-Kendall Test:

The Mann-Kendall test is applicable in cases when the data values of a time series can be assumed to obey the model:

$$x_i = f(t_i) + \varepsilon_i, \ldots\ldots\ldots\ldots(1)$$

where f(t) is a continuous monotonic increasing or decreasing function of time ti. This test is actually a test of the null hypothesis of no trend, Ho: the observations xi are randomly ordered in time, against the alternative hypothesis, H1: there is an increasing or decreasing monotonic trend. The Mann-Kendall test statistic S is calculated using the following formula:

$$S = \sum_{k=1}^{n-1} \sum_{j=k+1}^{n} \text{sgn}\left(x_j - x_k\right)$$

where xj and xk are the annual values in years j and k, and j > k. In this paper, this test is applied on the following model:

$$Q_t = f(t) + \varepsilon_t, \ldots\ldots\ldots\ldots(2)$$

where, Qt = RMG export earnings in year t, measured in real US $ (in millions)

The result of this test would indicate whether there is any presence of a monotonic trend in the time series of RMG export earnings of Bangladesh. Generally, when the sample size n is 9 or less, the absolute value of S is compared directly to the theoretical distribution of S derived by Mann and Kendall (Gilbert, 1987). If n is at least 10 the normal approximation test is used.

3.1.2   Sen's Method of Estimating Slope:

The Mann-Kendall test shows the presence of a monotonic trend in a time series, but does not show the trend growth rate of that series. The most popular non-parametric approach for estimating the slope of a linear trend is the slope estimator proposed by P. K. Sen (1968). This estimator has been used in many studies, such as Simpson and Olsen (1990), Sisterson (1990) etc. Its applicability in analyzing trends has been advocated by Gilbert (1987), Pregorsch (2002), Calzarossa and Tucci (2002), Pham (2003), Batalla and Garcia (2005), Brimblecombe et. al. (2007), among others. This method is widely applied in psychology, environment studies, natural sciences etc. especially when the data points are not large enough to assume normality.

The Sen's method can be used in cases where the trend can be assumed to be linear. This means that this test is applied when f(t) in equation (1) is equal to f(t) = Qt + B, and this method calculates the value of Q. By applying this method on equation (ii), (since lrmg is a linear function of t), the value of β can be obtained, where β refers to the average or trend growth rate of the RMG export earnings. The minimum number of datapoints needed for using Sen's method is 10.

3.2   Dataset:

The dataset consists of annual data of RMG exports of 24 years, starting from the fiscal year 1986 to the fiscal year 2009. The data is measured in million US $ (real). The dataset has been collected from the BGMEA (Bangladesh Garments Manufacturers and Exporters Association) database. The data in the BGMEA database was in current US dollars, but for the statistical purposes of this paper it has been converted into real US dollars using the year 2005 as base year.

3.3 Results:

The results of the Mann-Kendall Test, along with the Sen's slope estimates are shown in table 2:

Table 2: Results of the Non-Parametric Tests

Period	Mann-Kendall Z Statistic	Sen's Estimate of β	99% Confidence Interval of β
1984 – 2009	6.62*	0.104	0.075 – 0.139
1990 – 1999	3.94*	0.151	0.110 – 0.186
2000 – 2009	3.22*	0.065	0.019 – 0.087

*Significant at the 1% level of significance

The table above shows that, the Z-statistics for the Mann-Kendall Test are all significant at the 1% level. This result provides statistical evidence of the presence of a monotonous trend in the RMG exports of Bangladesh in the period 1984 – 2009, and also in the periods 1990 – 1999 and 2000 – 2009. From Sen's estimates of the slope parameter (β) of equation (ii), it is clear that the trend growth rate of RMG exports during 1986 – 2009 was 10.4%. If we consider the recent two decades, the trend growth rate was 15.1% in the period 1990 – 1999, while it was 6.5% in the period of 2000 – 2009. This shows that in the recent decade, the trend growth rate of RMG exports of Bangladesh has

fallen behind the overall trend growth rate of 24 years (from 1986 – 2009), and it is also lower than the trend growth rate of the previous decade (1990 – 1999). This finding is contrary to the existing literature outlining the impressive growth of the RMG exports, since none of them point out the declining trend growth rate. The reason behind this is that this decline in the trend growth is not completely evident from the calculation of year to year growth rates, and so there has not been much concern about this among the economists or the entrepreneurs of Bangladesh.

The analysis outlined till now shows a decline in the decade wise trend growth rate, which is not a good sign for the future of RMG export earnings. Moreover, there is speculation that the growth rate of the RMG exports would decline further due to the recent global recession. The recent trends in the exports of woven garments and knitwear have been shown in table 3:

Table 3: Recent Trends in RMG Exports (in million current US $)

Month	Total (Woven+Knit)		Growth Rate
	Fiscal Year		
	2008/09	2009/10	
July	1187.8	1173.63	**-1.19**
August	1055.54	1042.55	**-1.23**
September	1113.02	814.39	**-26.83**
October	649.26	748.22	**15.24**
November	1036.34	927.06	**-10.54**
Total:	5041.96	4705.85	**-6.67**

Source: Export Promotion Bureau

The table clearly shows that compared to the fiscal year 2008-09, the exports of knitwear and woven garments have decreased sharply, especially in the months of September and October. This may become the regular picture in the coming months. However, numerical facts and figures such as the data of Export Promotion Bureau shown in Table 6 do not provide a clear indication of what might be the precise effect of recession. For that, detailed country studies on the destination countries are needed. The following section analyses the RMG export trends in the US market, and tries to find out how the recent recession might affect these export earnings in that country.

4.0   Bangladeshi RMG Exports in the US Market:

In terms of export destinations, export underwent important changes over the decades. The USA and the EU became the most important export destinations of Bangladeshi products in the global market. However, if individual countries are considered, USA is the single largest importer of apparel from Bangladesh. While in 1981-82, USA accounted for only 9 per cent of the total Bangladeshi exports, the share rose to 28 per cent in the decade of 2000 – 2009. The annual apparel exports to USA have been shown in figure 3:

Figure 3: Annual Bangladeshi RMG Exports to the US Market (in billion real US $)
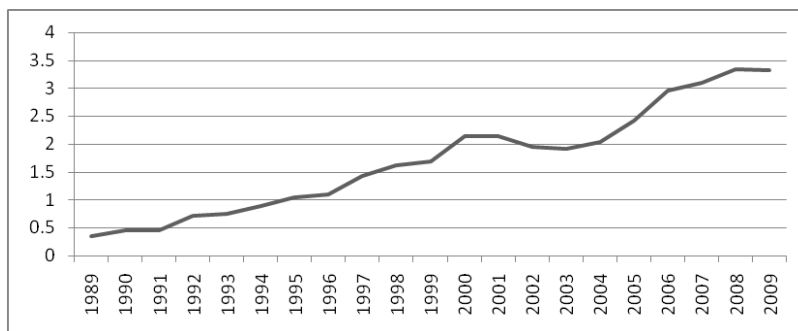
The figure above shows a more or less increasing trend, except during the period 2001 – 2003 and after 2008, the RMG exports seem to be starting to decease. The Mann-Kendall test results, along with the trend growth rates, have been shown in the following table:

Table 4: Results of the Non-Parametric Tests

Period	Mann-Kendall Z Statistic	Sen's Estimate of β	99% Confidence Interval of β
1989 – 2009	4.20*	0.105	0.082 – 0.131
1990 – 1999	3.94*	0.154	0.111 – 0.188
2000 – 2009	2.50*	0.062	-0.005 – 0.120

*Significant at the 1% level of significance

The Mann-Kendall test statistics show that there is a statistically significant trend in the yearly RMG exports of Bangladesh to USA in all the three periods considered. From the Sen's estimates of the slope coefficient, it is evident that the trend growth rate of real RMG exports during the period of 1989 to 2009 was 10.5%. It was 15.4% during 1990 – 1999, but it was only 6.2% during 2000 – 2009. Hence, the trend growth rate has seen a drastic decrease during the decade of the 2000s.

Many might indicate that the recent financial downturn in the USA, which slowly spread throughout the world as a big economic recession, is the main reason behind this drastic fall in the trend growth rate of RMG exports to the USA. Many also say that there are worse times for the RMG exports in future. But further statistical analysis is needed before jumping into such conclusions. This section tries to find out exactly what could happen to the

RMG exports in USA in the future, and the methodology of this analysis is described in the following section.

4.1   Methodology:

Prediction of the future RMG export earnings can be done in two ways. One popular approach is the ARIMA (Autoregressive Integrated Moving Average) modeling using the Box-Jenkins methodology. However, modeling structural breaks becomes difficult in this method. But authors such as Greene (2001) have found that ARIMA modeling is more useful than long simultaneous equations modeling for prediction purposes.

Another approach which can be applied in this case is testing for cointegration between the RMG exports to USA and the main variables which determine the demand for RMG imports from Bangladesh by USA. This would certainly be helpful in quantifying the effect of the recent economic recession in USA, since, according to the definition of recession by NBER2, any recession is "normally visible in real GDP." A large body of empirical literature has tried to find out the determinants of import demand, and much of it has focused on the US imports. Many recent studies include studies by Rose and Yellen (1989), Meade (1992), Johnston and Chinn (1996), Hooper et al. (1998), Boyd et al. (2001), Chinn (2005b) etc. Since there is no sound or uniform theory which explains the determinants of imports of a country, these empirical studies and the NBER definition serve as the basis for the inclusion of real GDP and CPI as independent variables, where CPI would represent the variation in the domestic price level of USA, and variations in real GDP would show the variations in the business cycle (i.e. economics recessions and booms) of USA.

In this paper, both these approaches have been applied. Using monthly data of US apparel imports from Bangladesh from the year 1989 to 2010 (August), firstly an ARIMA model (following the Box-Jenkins methodology) has been estimated to predict the future RMG exports to the USA. For the second approach, the Johansen cointegration test has been run to find out the presence of cointegration between three variables: Real Export Earnings from RMG exports to the US Market, Real GDP and Consumer Price Index, where consumer price index is included to account for price movements. After the Johansen test, if any evidence of the existence of cointegration is found, then the RMG export earnings is regressed on Real

GDP and CPI, which would enable the analysis of the effect of variation in Real GDP and CPI on RMG export earnings from USA.

4.2   Data:

The dataset consists of monthly data on US apparel imports from Bangladesh, Real GDP and CPI of USA for the period 1989 (January) – 2010 (August). All the data values are measured in real US dollars, and the base year is 2007. The data has been collected from various sources: data on apparel imports have been collected from the database of Office of Textiles and Apparel, United States Department of Commerce; data on CPI has been calculated from US Bureau of Labor Statistics; and finally, data on Real GDP has been collected from the database of NBER (National Bureau of Economic Research), USA. The data on US apparel imports was originally in current US dollars, which has been converted to real US dollars using import price indices calculated by the Bureau of Labor Statistics, USA and using the year 2007 as base year.

4.3   Estimation Procedure and Results:

The estimation procedure of the ARIMA model basically follows from seminal work of Box and Jenkins (1970). On the other hand, the testing of cointegration which has been done in this paper follows from the works of Johansen (1991). The estimation procedure, along with the results is described in the following subsections.

2 The National Bureau of Economic Research (NBER) is an American private nonprofit research organization dedicated to studying the science and empirics of economics, especially the American economy. The NBER is the largest economics research organization in the United States. Sixteen of the thirty-one American winners of the Nobel Prize in Economics have been NBER associates.

4.3.1   Time Series Modelling of the Trends

The prerequisite of estimating a time series model is making the data stationary. For this, different transformations of the RMG export data have been made, and the best transformation has been identified using standard tests like the Augmented Dickey-Fuller (ADF) test. The standard method of estimating a

time series, the Box-Jenkins method, has been followed while estimating the time series models in this paper. The steps of this method are model identification, estimation, diagnostic checking and forecasting. The first step consists of the identification of the series, i.e. whether it is a pure autoregressive (AR) process, moving average (MA) process, an autoregressive moving average process (ARMA), an autoregressive integrated moving average (ARIMA) process, or do we need to include a variable showing time trend as well. The second step consists of the estimation of the parameters of the time trend, autoregressive and moving average terms included in the model, which has been done using the standard and most popular statistical software STATA. After the determination and estimation of the model parameters, the diagnostics of the model has been checked by examining the autocorrelation functions of the residuals, and the Wald test. Running ARIMA regression models, first only on a trend variable 't', and then including one-year and two-year lagged values of the logs of Real RMG Exports to USA yielded the following results:

Table 5: Results of ARIMA regression

Dependent Variable		*Constant*	*t*	L_1	L_2	R-squared	AIC	BIC
lrmg	(i)	17.44545** (0.0373024)	0.0087787** (0.0002135)	-	-	0.8471	81.7144	92.3964
	(ii)	17.43568** (0.0628481)	0.008432** (0.0003654)	0.7364667** (0.0577151)	-0.204637** (0.0557528)	0.9524	-45.2846	-27.4812

*Figures in the parentheses indicate standard errors
**Significant at the 1% level of significance

The time series model (ii) is a better fit of data, according to the AIC and the BIC criteria, and also according to the value of R-squared. This model has been estimated by using data till the month of August of 2010. Now, according to NBER, the recession has ended in 2009. Business Cycle theories, such as the Keynesian Business Cycle Theory, state that after a recession, countries gradually move towards economic booms, and real GDP along with all other macroeconomic variables show gradual improvement. This means that theoretical explanations and empirical research of NBER indicate that the probability of structural breaks (such as big economic downturns) in the future is very low. Hence, predictions based on this model would give an idea of how the monthly exports of RMG to the US market would behave in the coming months, since statisticians have found that these types of models have more

predictive power than simultaneous equation models (Greene, 2001). The predictions for 2011 are shown in table 6:

Table 6: Predicted RMG Export Earnings

Months	RMG Export Earnings (in million real US $) (Predicted values for 2011)	RMG Export Earnings (in million real US $) (Actual values of 2010)
January	388.561	309.101
February	391.744	293.921
March	395.511	318.311
April	399.299	359.930
May	402.985	334.725
June	406.612	303.011

The predicted values show that the monthly real RMG exports to the US market are likely to increase, compared to 2010. These predictions are subject to the assumption that there are no structural breaks in the future, but, as mentioned earlier, there is a low possibility of structural breaks, since USA has already started to revive from the recession. However, some cointegration analysis needs to be done to be able to see how changes in real GDP and price movements affect the monthly RMG exports to that country. Since, according to NBER, recessions are largely prominent through negative Real GDP growth as well as deflation (decreases in CPI), the cointegration analysis would help in determining the effect of recession on Real RMG exports to USA.

4.3.2 Cointegration Analysis:

As mentioned in the methodology section, the Johansen Cointegration test has been applied on three variables: the log values of Real RMG exports to USA, log of real GDP and Consumer Price Index (CPI). The results of the test are shown in the following table:

Table 7: Results of Johansen Cointegration Test

Maximum rank	Parameters	Log-likelihood	Trace statistic	5% critical value
0	12	757.62784	90.9413	29.68
1	17	797.66319	10.8706	15.41
2	20	802.40899	1.3790	3.76

The results show that, if the 5% critical value is considered, the null hypothesis that there is at least one co integrating rank cannot be rejected, while the null hypothesis that there is no co integrating rank can be rejected. This certainly shows the presence of co integration among the variables.

Regressing the log of RMG (*lrmg*) on the log of real GDP (*lrgdp*) and cpi yielded the following results:

Table 8: Regression Results

Dependent Variable		*Constant*	*lrgdp*	*cpi*	R-squared	AIC	BIC
lrmg	(i)	-15.03839* (0.857875)	3.632164* (0.0920361)	-	0.8530	68.58	79.23
	(ii)	-7.300935 (3.144992)	2.678027* (0.381765)	0.064157* (0. 0023354)	0.8560	65.22	79.43

* Significant at the 1% level of significance &
- Figures in the parenthesis denote the semi-robust standard errors

The results show that the variations in the log of real GDP alone can explain 84% of the total variation in the log of RMG exports to USA, but including CPI as another regressor increases the value of R-squared a little bit, and the Akaike Information Criterion suggests that the second model is better. From the second model, we find that the elasticity of RMG exports with respect to real GDP is 3.681, which means that if real GDP of USA grows by 1%, RMG exports to USA would grow by 2.68%. On the other hand, if the value of CPI rises by 1%, RMG exports rise by 6%. Both the variables (lgdp and cpi) are statistically significant at the 1% level of significance.

The intuitive reasoning behind these conclusions is simple. When real GDP of USA rises, the income of the consumers of RMG products in USA rises, as a result of which the demand for RMG products in the USA rises. Hence, USA imports more apparel from Bangladesh. On the other hand, CPI measures the level of inflation in USA. When the level of inflation in USA rises, Bangladeshi goods become cheaper compared to US goods, and so the Bangladeshi RMG exports to USA rises.

From the NBER definition of an economic recession, it is evident that any recession would cause the real GDP to fall. Indeed, as a result of the recent global recession, real GDP of USA decreased at an annual rate of approximately 6 percent in the fourth quarter of 2008 and first quarter of 2009, compared to the previous years. Moreover, some have pointed out that there has been considerable deflation in the USA due to the recession, which means that there have been decreases in the values of CPI. Therefore, as both real GDP and CPI of USA have a positive relationship with the RMG exports to USA, if the USA does not recover from the recession quickly, both real GDP and CPI would be at low levels, as a result of which the RMG exports to that country would show a low growth rate. The predicted RMG export earnings for different real GDP growth rates using some alternative scenarios is shown in the following table:

Table 9: Some Alternative Scenarios

Scenario	Real GDP	Consumer Price Index	RMG Exports
1	Decreases by 2%	Unchanged	392960155.0 real US $
2	Decreases by 1%	Unchanged	396969952.5 real US $
3	Increases by 1%	Unchanged	404989547.5 real US $
4	Increases by 2%	Unchanged	422472264.6 real US $

The table above shows the impact of different growth rates of real GDP of USA on monthly real RMG export earnings from the US market. It considers the consumer price index to be unchanged, since for the previous eight months (January to August, 2010), the CPI has remained more or less at the same level. On the other hand, the trend real GDP growth rate in USA for the previous ten months was 2%. But there were months where the real GDP growth was negative in the decade of 2000s. The highest negative growth rate was almost - 1%. Therefore, the table shows that the monthly RMG export earnings in the months of 2011 would most probably be around 400 million real US dollars, even if there is a decrease in real GDP by 1%. This is almost the same as the predictions of the ARIMA model derived earlier, since those predictions also show that in the first six months of 2011 the RMG export earnings would be around 400 million real US $ per month. In fact, data of the Department of Commerce of USA reveals that the RMG export earnings of Bangladesh from USA for August, 2010 was 400979752 real US $.

Now, if the average monthly RMG export earnings of the months of September through December of 2010 is around 400 million real US dollars (which is quite probable, given the current analysis), then the total RMG export earnings of 2010 would be equal to around 4.1 billion US dollars. This means that since the total real RMG export earnings from USA for the year 2009 was 3.32 billion real US $, the total RMG export earnings is supposed to grow by almost around 20% from 2009 to 2010. If, on average, the RMG export earnings are around 400 million US dollars per month in the year 2011, then it can be easily estimated that the total yearly earnings from RMG exports in the US market would be around 4.8 billion real US dollars. This would mean a growth rate of 16% in the RMG export earnings from 2010 to 2011. Now, general business cycle theories, such as the Keynesian Business Cycle Theory would suggest that after a recession, economies generally start moving gradually towards an economic boom. Hence, it suggests that the growth of real GDP of USA would be better in 2011 than that of 2010. Since the regression analysis shows that the real RMG export earnings in the US market and US real GDP have a positive relationship (i.e. when real GDP rises, RMG export earnings also rises), a better real GDP growth in USA in 2011 would mean more RMG export earnings from USA in 2011. All of these facts indicate

that from 2010 to 2011, the RMG export earnings from the US market would at least rise by 16%.

5.0 Major Findings:

As a summary, the major findings of the study presented in this paper are given below:

- The total yearly RMG exports earnings are growing each year, but the growth rate is showing decreasing trends. The trend growth rate (as measured by Sen's method, a non-parametric approach) in the period 2000-2009 was 6.4% lower than that of the previous decade.

- The trend growth rate of the yearly RMG exports to USA is showing signs of decline. The trend growth rate for the period of 2000-2009 was 9.4% lower than that of the previous decade. This trend growth rate of 2000 – 2009 was lower than the overall growth rate of 1986 – 2009 as well.

- From the special focus on USA, the application of cointegration techniques reveals that the monthly RMG exports to USA depends very much on the real GDP and CPI (Consumer Price Index) of that country.

- ARIMA estimation of monthly data suggests that in the coming months, the monthly RMG export earnings from the largest market of RMG exports, USA, can reach almost 400 million real US $ (388 million to be exact) in the month of January 2011 . The cointegration analysis (the Johansen cointegration test and the multivariate time series regression) also reveals the same conclusion, assuming that the real GDP would grow at least 2% by January (since the trend growth rate of real GDP of January – June of 2010 was 2%).

- The analysis also suggests that the real RMG export earnings from the US market would approximately rise by 20% from 2009 to 2010, and would at least rise by 16% from 2010 to 2011. This does not show a very bad future of RMG exports to USA, but there are signs of declining growth rates.

6.0 Conclusion:

The analysis of this paper basically shows that the period of 2000 – 2009 was a period of low growth in the total RMG export earnings. But, contrary to the popular speculations, the RMG export earnings from the US market are not predicted to face negative growth at all. In fact, from 2010 to 2011, it is

supposed to rise by at least 16%, even if the effects of the recession are considered. These predictions are, of course, subject to the assumption that all other things, such as the political situation, productive capacity of Bangladesh, bilateral relations of Bangladesh and USA etc. remain unchanged. As for the RMG export earnings from other countries, similar studies can be done in order to find out the probable impact of global recession on the RMG exports to those countries. However, since USA controls a substantial portion of international trade, and since the recent economic recession showed that economic fluctuations in USA tend to be positively correlated with many other countries of the world, there is indeed a strong possibility that if real GDP in USA rises sufficiently, other countries would face positive economic growth. Since empirical studies indicate a positive relationship between import demand and real GDP, as the real GDP of countries other than USA starts rising (as a result of increases in US real GDP), RMG export earnings of Bangladesh in other countries are supposed to rise as well. However, further studies on the countries are needed to speculate on a theoretical and empirical basis.

Reference

Ahmed and Hussain (2006): Future Prospects of Bangladesh's Ready-Made Garments Industry and the Supportive Policy Regime, Policy Note 0702, Policy Analysis Unit, Bangladesh Bank.

Bhattacharya, Rahman and Raihan(2002): Contribution of the RMG Sector to the Bangladesh Economy, Working Paper No. 50, Centre for Policy Dialogue (CPD).

Box, G.E.P. and G.M. Jenkins. 1976. Time Series Analysis: Forecasting and Control,2nd Edition. Holden-Day, San Francisco.

Gilbert, R.O. 1987. Statistical Methods for Environmental Pollution Monitoring. van Nostrand Rienhold Company, Inc., New York.

Hollander, M. and D.A. Wolfe. 1973. Nonparametric Statistical Methods. John Wiley & Sons, New York.

Nidhi Khosla (2009): The ready-made garments industry in Bangladesh: A means to reducing gender-based social exclusion of women? Journal of International Women's Studies, Vol. 11 (1).

Rahman and Anwar (2006): Bangladesh Apparels Export to the US Market: An Examination of Her Competitiveness vis-à-vis China, Working Paper No. 62, Centre for Policy Dialogue (CPD).

Sen, P.K. 1968. Estimates of the regression coefficient based on Kendall's tau. Journal of the American Statistical Association. 63:1379-1389

Ziaul Haider (1998): Competitiveness of the Bangladesh Ready-made Garment Industry in Major International Markets, Asia-Pacific Trade and Investment Review, Vol. 3(2), pp. 3 - 27.