

FORECASTING TRADE BEHAVIOUR OF MAJOR FOOD CROPS IN FOUR LEADING SAARC COUNTRIES

MUHAMMAD IQBAL, ZAKIR HUSSAIN and TAHIR MAHMOOD*

Abstract. Poverty alleviation is going to become the hot stack in the world. Many of the researchers and policy makers are engaged to overcome this problem. South Asian Association for Regional Cooperation (SAARC) consists of a rich topographic, climatic endowments and variations. The region is blessed with cereals, fruits, ornamental, medicinal and staple foods of diverse varieties. SAARC countries have a capacity to produce a quantum of foreign exchange by its agriculture export programmes. This sector has the potential to uplift income, alleviate hunger, poverty and thus to cut down socio-economic constraints of the region. The study under consideration is an outcome of decomposition method to check the future state of economic and trade affairs in four major countries (Bangladesh, India, Pakistan and Sri Lanka) of SAARC for different commodities (Cotton lint, Rice milled and Sugar refined). Data used in this study is taken from Food and Agriculture Organization (FAO) during 1970 to 2010, while for Bangladesh the period has been considered from 1972 to 2010. The results reveal that India will enjoy optimum level in the export of cotton, sugar and rice while Pakistan will achieve second level and future export of Bangladesh and Sri Lanka will remain at low level in all the commodities.

Keywords: SAARC, Agriculture, Cotton lint, Rice milled, Sugar refined, Forecasting

JEL classification: C53, E17, F17

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I. INTRODUCTION

South Asian Association for Regional Cooperation (SAARC), comprising of Nepal, India, Bangladesh, Pakistan, Sri Lanka, Maldives, Afghanistan and Bhutan, was established in 1985 having its secretariat in Kathmandu, Nepal. South Asia is one of the most densely populated regions in the world and livelihood of millions of people of this area depends mainly on agriculture (Noorka *et al.*, 2013a). SAARC area consists of diverse climatic, rich topographic and variant range of agricultural crops from cereals to vegetables. During recent past there has been a handsome increase in the export earnings from agricultural sectors among SAARC countries. This sector has high potential to uplift farm income and to alleviate poverty, hunger as well as to cut down the socio-economic issues prevailing in the region. Due to burgeoning population in South Asia and to address the food issue and to maintain demand and supply position of food and feed the Governments have to take strict action and top priority agenda so that nobody should go to bed hungry. The Green Revolution has set a clear milestone and brought a significant change in farm productivity to ensure food security in SAARC as well as rest of the world (Noorka *et al.*, 2013b).

The area covered by South Asian region is 4482388 square kilometres which is holding population of 1,596,000,000. The regional organization, SAARC, comprises of 4,637,469 square kilometres. The population of SAARC countries is 1,626,000,000. South Asia is the poorest region in the world after Sub-Saharan Africa. The nominal GDP of Pakistan was \$ 230.525 billion and GDP per capita was \$ 1,182. Pakistan has the fifth highest GDP per capita in the region. But at the same time, it has the low human development index which is 0.51 in 2012 (The World Bank, 2012).

However, India has comparative advantage due to its largest cultivated area and largest economy in the region (US \$ 1.97 trillion) and makes up almost 82 percent of the South Asian economy. The nominal GDP of India was \$ 1.947 trillion and GDP per capita was \$ 1,592 in 2011. India has the medium human development index which is 0.554 in 2012 (The World Bank, 2012). According to the World Bank (2012), Sri Lanka has the highest GDP per capita in the region. The nominal GDP of Sri Lanka was \$ 64.914 billion and GDP per capita was \$ 3,139 in 2011. Sri Lanka has the highest human development index of 0.715 as in 2012 in the region. Bangladesh has the second highest GDP per capita in the region. The nominal GDP of Bangladesh was \$ 122.72 billion which made the per capita GDP as \$ 817.95 in 2011. Bangladesh has the low human development index which is 0.515 in 2012 in the region (The World Bank, 2012).

It is true that the agricultural trade is not favourable in the SAARC countries due to heavily subsidized OECD, America and European countries as well as both tariff and non-tariff barriers. Hence, it is imperative to study the relative comparative advantage of agriculture trade among these SAARC countries. Earlier studies had depicted that the future state of important food crops is very encouraging within SAARC countries. Earlier researchers conducted different studies like Azhar *et al.* (1973) who suggested three suitable models for forecasting about wheat while Masood and Javed (2004) developed the models for sugarcane area of Pakistan and concluded one yield model was developed to measure fertilizers consumption and total water availability. Sahu (2010) studied the major SAARC countries (Bangladesh, India, Nepal and Pakistan) to examine the behaviour of the production, productivity, actual availability and waste of food crops in cereals and vegetables. The study used Box-Jenkins method to conclude that higher values of vegetables yield were shown by India and Nepal. Similarly Mehmood (2012) tried to forecast the exports of Pakistan to SAARC countries during the years 1975 to 2010. By using different model selection criteria like RMSE, MAPE, MSE, MAE, AIC, BIC, the ARIMA (1, 1, 4) model was found most appropriate for forecasting. In Bangladesh, Rahman *et al.* (2013) examined differential variable in grass pea and mung bean pulse to measure the coefficient of variation (CV) and percentage deviations from three years moving average values and forecasts were computed by using the deterministic and ARIMA models. Tahir and Habib (2013) conducted the trend analysis for area and production of maize in Pakistan and used four models (Linear trend model, Quadratic trend model, Exponential trend model and S-Curve model) to find the forecasts by the interaction of time series data from 1990-2011. The results revealed positive increasing trend in future maize production in the country.

CONTRIBUTION OF THE STUDY

This study is one of very few works which have investigated the future thoughts about the exports of Cotton lint, Rice milled and Sugar refined in four major countries (Bangladesh, India, Pakistan and Sri Lanka) of SAARC.

II. TIME SERIES ANALYSIS

The present study was designed to estimate the prime changes prevailing among agricultural exports for cotton, rice and sugar in natural environment in a time series of 1970-2010 among SAARC countries.

Time series analysis is used to discover past pattern of growth and change by which future prediction pattern can be made and national and

multinational firms used these parameters to depict their operations and progress. However Time series analysis does not provide the answer to what the future holds, but it is valuable in the forecasting process. In economic and business activity, casual conditions rarely remain constant and multitude of casual factors tends to be constantly shifting. In a recent study Ali *et al.* (2013) computed the time series analysis of cotton's area and production to find the forecasting of cotton production by using linear regression technique while Mehmood and Ahmad (2013) examined the forecasts about the area of mangoes in Pakistan by the use of univariate ARIMA model and depicted that ARIMA (0, 1, 0) is the appropriate model to forecast. Forecasting is considered as a reliable procedure to analyze the time series data and to cope up the uncertainty of the future by the interaction of the existing data and analysis of trends (Makridakis, 1978). Similarly Ghafoor and Hanif (2005) computed the forecasting model to measure the future state of Pakistani trade (exports and imports). By using the time series data since 1971 to 2003 concluding that imports and exports of Pakistan will increase in next few years. In another study Mustafa and Ahmad (2006) examined the forecasting trend of exports of Pakistani Kinnow fruit from the years 1990-91 to 2001-02 by using the Log linear model and ARIMA (2, 2, 2) model to find the forecasts. Rahman (2010) evaluated the growth pattern of boro rice production in Bangladesh during the years 2008-09 to 2012-2013 by using the box Jenkins technique three models (ARIMA (0, 1, 0), ARIMA (0, 1, 3) and ARIMA (0, 1, 2)) for forecasts. The results showed that the short term forecasts are more efficient for ARIMA models.

III. FUTURE IS MORE VALUABLE

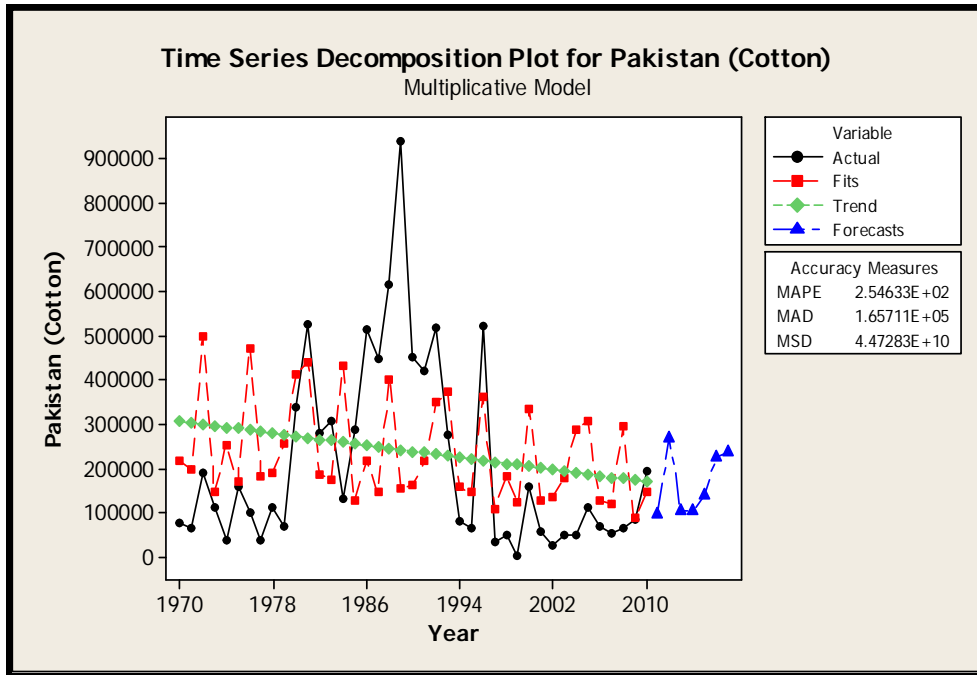
There is significant volatility in the trend of competitiveness and comparative advantage in the production and export of agricultural products because all the economies operate in an atmosphere of risk and uncertainty. South Asia is not an exception. Educated guess about the future is more valuable for country managers rather than visualizing the trade trends in static state. It is law of land for a good manager to make a wise decision by using quantitative forecasting techniques to estimate the future planning either by explicitly or implicitly to meet the divers and adverse conditions. Forecasts are used in the financial sectors, marketing, personal or government production areas, profit making organizations, small social clubs (NGO's etc.) and in national political parties.

Export of cotton in Pakistan revealed fluctuated behaviour throughout the study years from 1970 to 2010, where trend was slight, moderate and strong but remained optimum during 1990. The slightly downward trend was

revealed while forecasted export values show a rise in 2012 than it predicts to be coming down for the year 2017 (Figure 1).

FIGURE 1

Time Series Forecasting of Cotton Lint in Pakistan



The trend of the exports of cotton lint was affected due to up and down position in economic growth (low as 1.9 percent in 1996-97, besides the same on average 6.5 percent in 1980 and 4.6 percent in 1990s) (Pakistan Bureau of Statistics, 2001; Chaudhry, 1995). Figure 1 shows that cotton exports of Pakistan have slightly negative trend and fluctuations during 1981, 1989 and 1995. The reason may be the introduction of interest free banking system and re-joining of Pakistan into the commonwealth. Similarly the biggest energy sector like WAPDA revenue increase up to 14.5 percent in electricity rates reflecting small change in the economic, political and diplomatic systems.

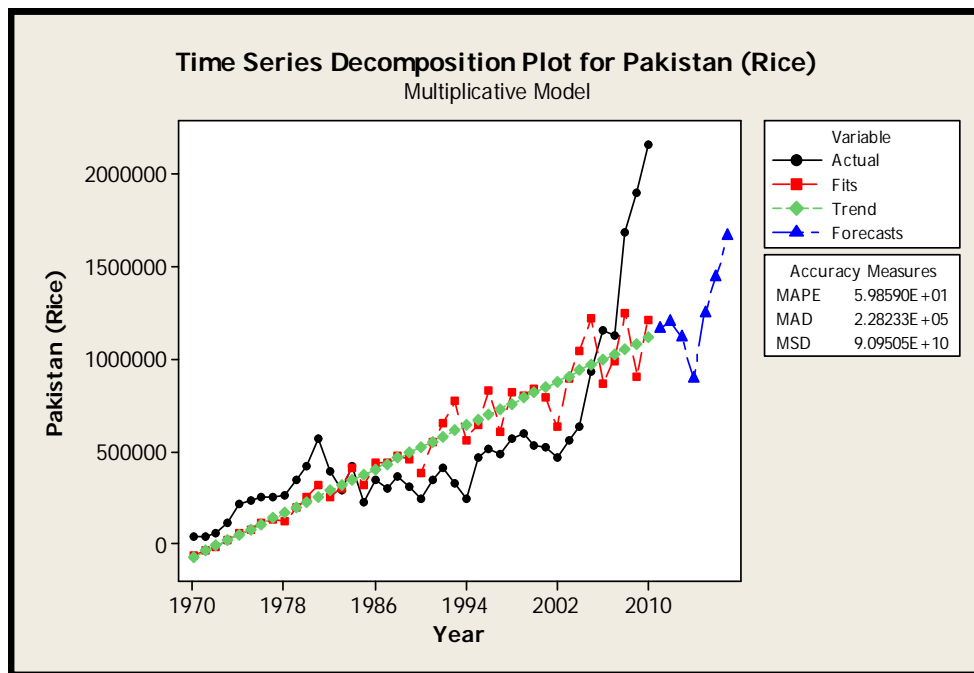
IV. EXPORT OF RICE IN PAKISTAN

Rice production in Pakistan holds an extremely important position in agriculture and the national economy. Pakistan is the world's fourth largest producer of rice. Each year, it produces an average of 6 million tonnes and together with the rest of the South Asia, the country is responsible for

supplying 30 percent of the world's paddy rice output. In 2002, onward exporters said that an unexpected strong demand for basmati 385 from a Gulf country had improved exports. However, Pakistani exporters continue to face high cost for all varieties of rice as they are unable to compete with Indian, Chinese and Vietnamese exporters who are flooding the world market with cheap rice. A relatively distorted market structure in Pakistan has been going against the reasonable growth of external sector of the economy.

FIGURE 2

Time Series Forecasting of Rice in Pakistan



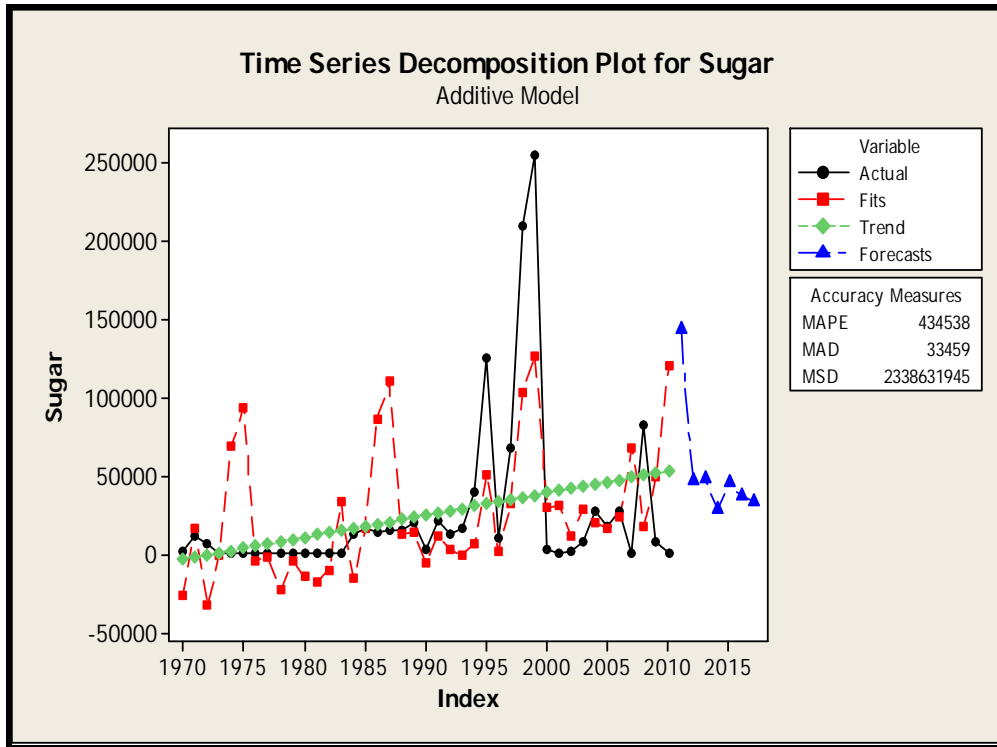
During 1970-2010 the export of rice milled in Pakistan was haphazard due to the 1970 civil war, from zero to negligible. However during the year 2010 an export of two million dollars was recorded. The strong upward positive trend was found, however forecasted values seem to be faintly dipped up to 2017.

V. EXPORT OF REFINED SUGAR IN PAKISTAN

Export of sugar refined in Pakistan as shown in Figure 3 reveals that there is a varied behaviour between the years 1970-94 with a slightly increase in export of sugar refined in Pakistan. It was also noticed that in 1998-1999 optimum level of exports was achieved with minimum tilt in 2000.

FIGURE 3

Time Series Forecasting of Sugar Refined in Pakistan



The stability period sugar export in Pakistan was 1970 to 1993. Within this era the export of sugar rose up due to the construction of Tarbela Dam on the Indus River and destruction of periodic floods. Further, in 1999, export of sugar refined in Pakistan boosted up due to regime change.

VI. EXPORT TREND IN OTHER SAARC COUNTRIES

Export of cotton lint in India has been portrayed in Figure 3. The data exports were approximately stable between the era 1970-2004 while slightly upward trend was noted during 1990 and 1996. An increase in export was recorded from 2004 to 2007 however an optimum level was perceived during 2010. The rapid rise was recorded from 1973 to 2007 due to the agreement between Pakistan and India about reducing the risk of accidental nuclear war. Then onward, the export of cotton lint in India was decreased in 2008 due to terrorist attack. Once again peak was observed in 2010.

The exports of cotton forecast of exports that was indicated with slightly an increasing behaviour.

FIGURE 4

Time Series Forecasting of Cotton Lint in India

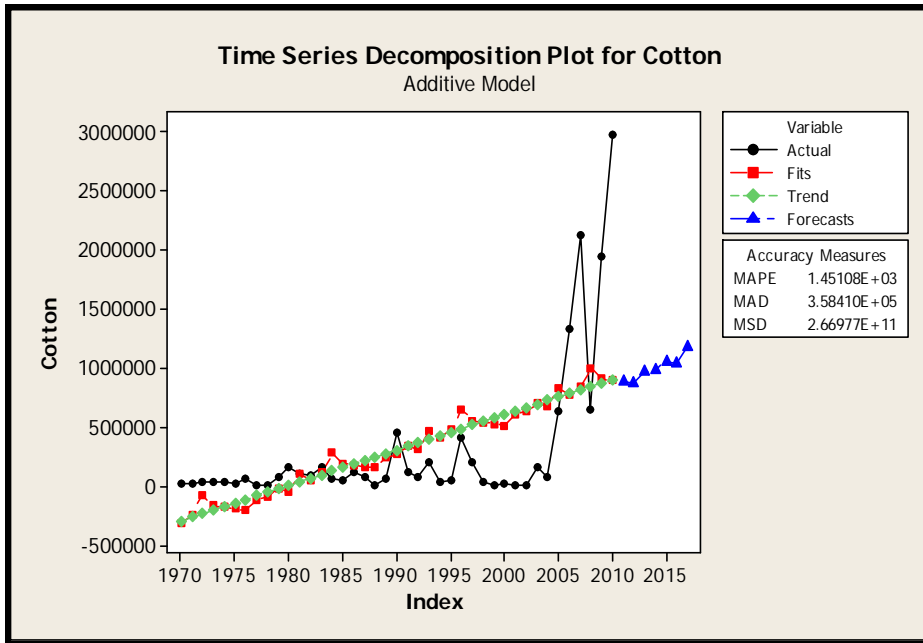
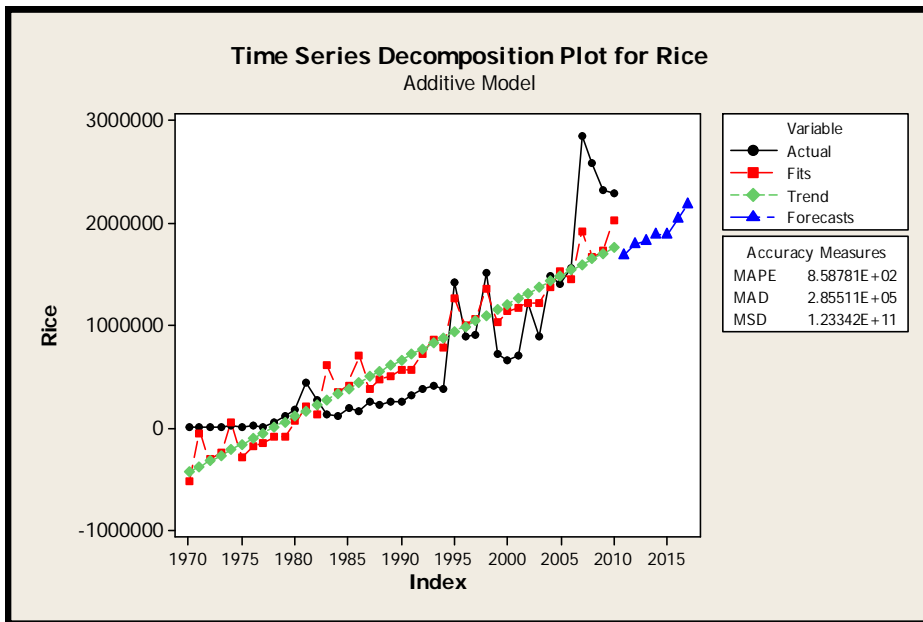


FIGURE 5

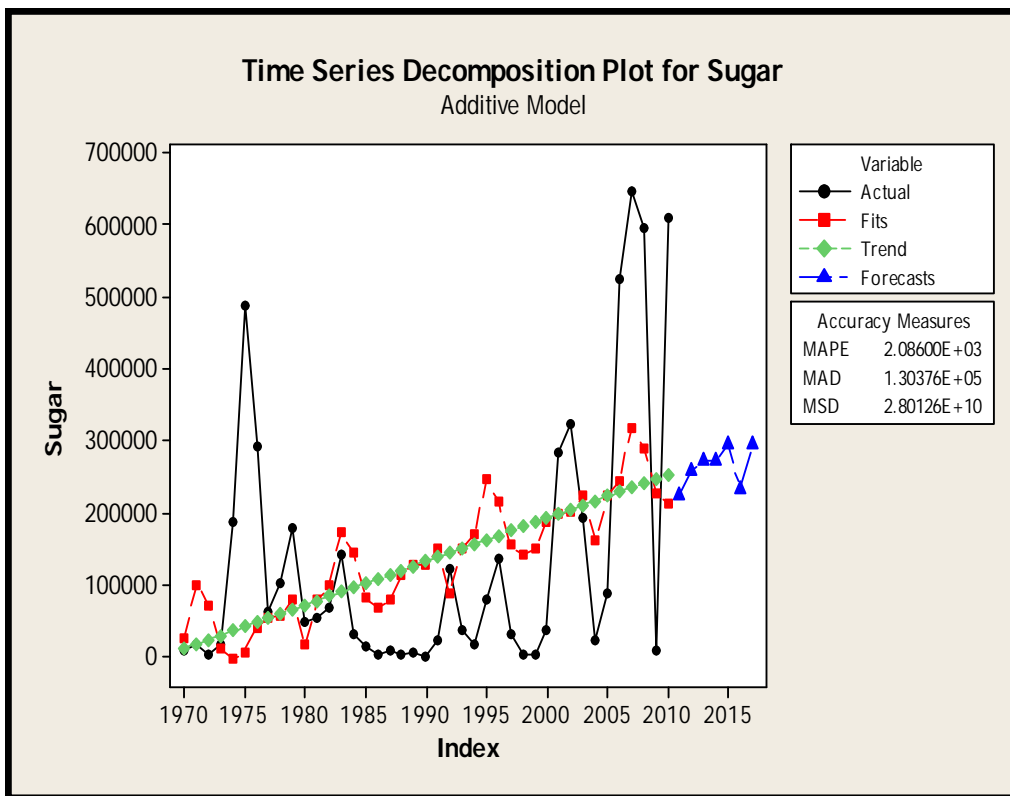
Time Series Forecasting of Rice in India



A forecast profile of export of rice milled in India is shown in Figure 5 which depicts sustained values during 1970-94 except there was slight jump in 1981. Trend revealed rise in exports of rice milled in India while the trend of forecast values seems to be slightly increasing behaviour up to 2017. It was also evident that in 1995, India joined the World Trade Organization (WTO) due to which exporters trend increased toward India. Furthermore, a lot of fluctuations occurred in the export of rice. The trend was found rising in 2007.

FIGURE 6

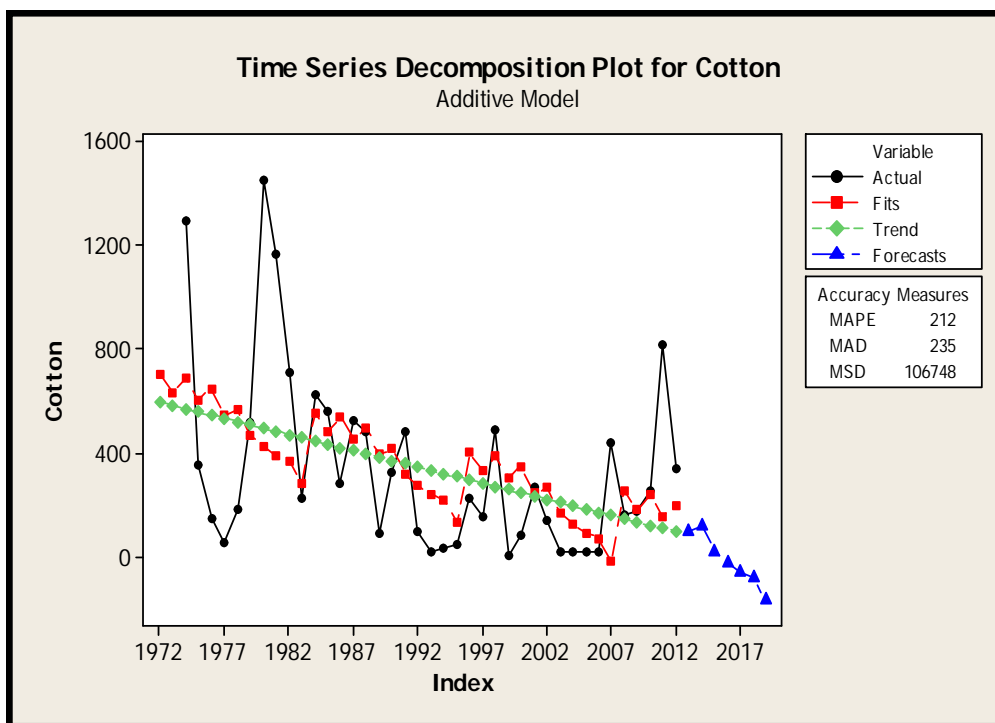
Time Series Forecasting of Sugar Refined in India



The export of sugar refined in India started from zero and then reflected extremely fluctuated behaviour in the form of upward trend throughout the period under study. Further, exports showed optimum trend in 1974, 2007 and 2010, while in 2009 the export was badly dipped downward. The forecasted values of exports increase up to 2015 and then a slight decrease is noted in 2016.

FIGURE 7

Time Series Forecasting of Cotton Lint in Bangladesh



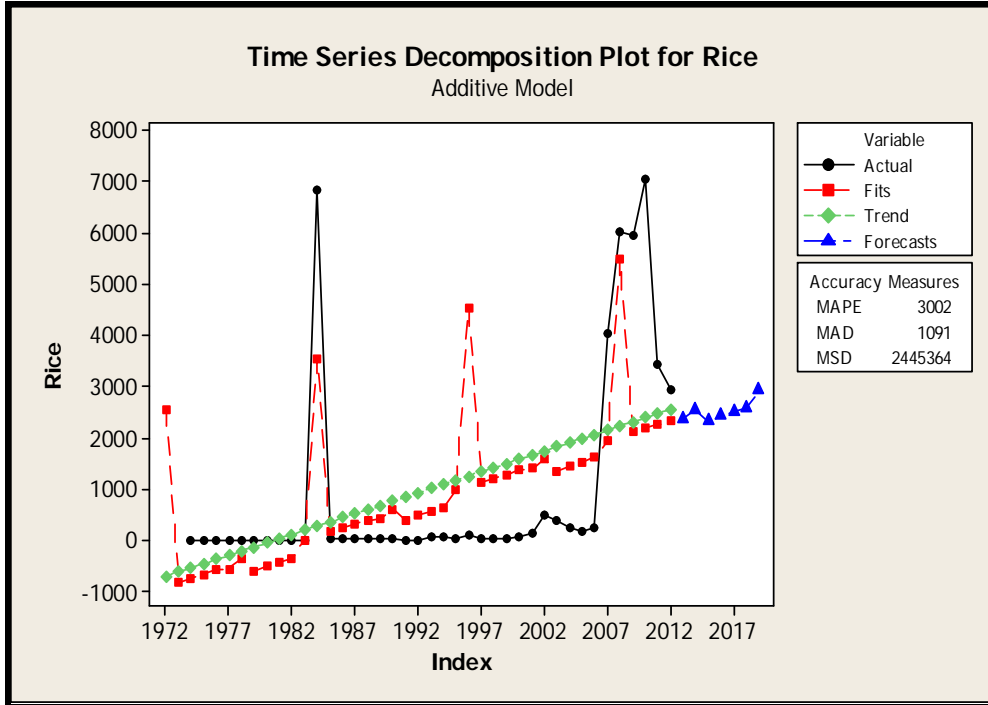
VII. EXPORT BEHAVIOUR IN BANGLADESH

The export of cotton lint in Bangladesh is illustrated in above picture. During 1973, the export of cotton lint crossed annual 1300 thousand dollars and then a fall was recorded up to the year 1975. In 1976, a boom was observed that reached to the optimum level in 1977. While, there was continuous fluctuated behaviour observed and the trend remained stable throughout the study years (1972-2010). Forecast of exports had no stable behaviour in coming three years and then fall in exports has been predicted in 2015.

In Bangladesh, the decreasing trend of export of cotton lint was observed from 1972 to 1975 due to the military coup and hydro power projects in Bangladesh. Due to the Farakka barrage commission in 1975, supply of water was not adequate in the dry season. Further, the cotton lint export peaked during 1978 when military ruler won presidential election and secured his position for a five year term. Due to another upheaval, the trade of cotton lint fell from 1973 to 1981, with some fluctuations occurred between 1982-2010.

FIGURE 8

Time Series Forecasting of Rice in Bangladesh

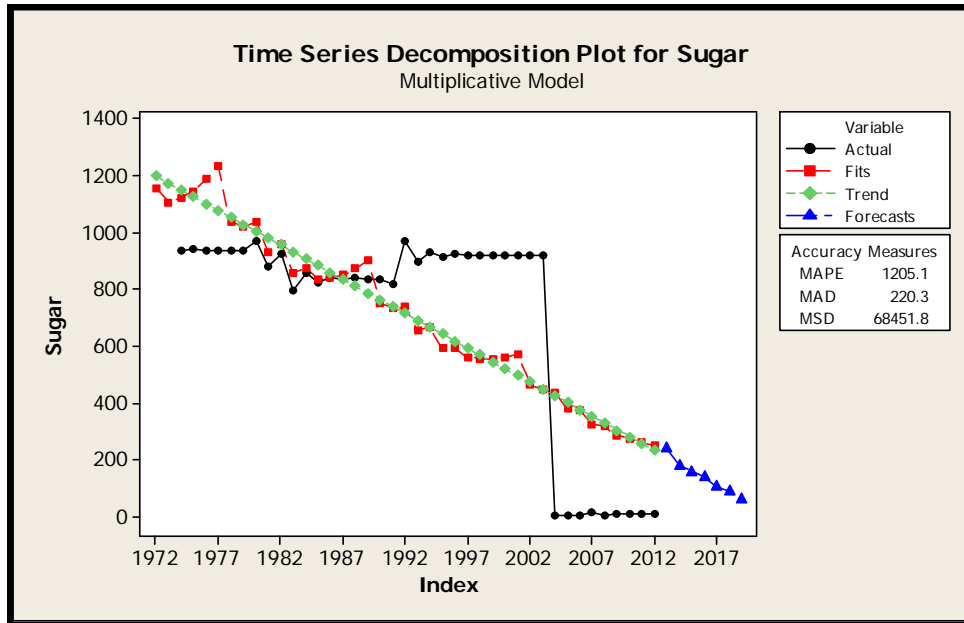


In case of export of rice milled in Bangladesh, stable export values were observed up to year 2004 except a rapid increase in 1982, since 2005, an upward increase in export of rice milled was seen with an optimum level in 2008. The trend in the forecasted values of export was observed slightly upward. Low export rate of rice was recorded in Bangladesh. Rice export in Bangladesh stabilized between 1972-1981. At the start of 1982, new active government was established due to which the export of rice reached at its peak in 1982 but later on export rate fell in 1983. Then again it became levelled in 1973-2004. Export of rice in Bangladesh rose from 1973 to 2009 and in 2010 exports of rice fell due to corruption charges on the outgoing regime.

The sugar refined of Bangladesh (Figure 9) revealed that export remained same from 1972-77 and slight decrease was recorded from 1978-93. In 2002, a plunged trend was recorded to the level of zero that continued up to 2010. The trend remained constant, while the forecasted export remained falling between 600 thousand dollars and 1000 thousand dollars.

FIGURE 9

Time Series Forecasting of Sugar Refined in Bangladesh



The export of sugar refined in Bangladesh remained constant from 1972-1977, then slight decrease occurred in the subsequent period. Again it was noted in the stability period that during 1993-2001 and in 2002, exports of sugar refined remained plummet in Bangladesh.

VIII. THE EXPORT BEHAVIOUR IN SRILANKA

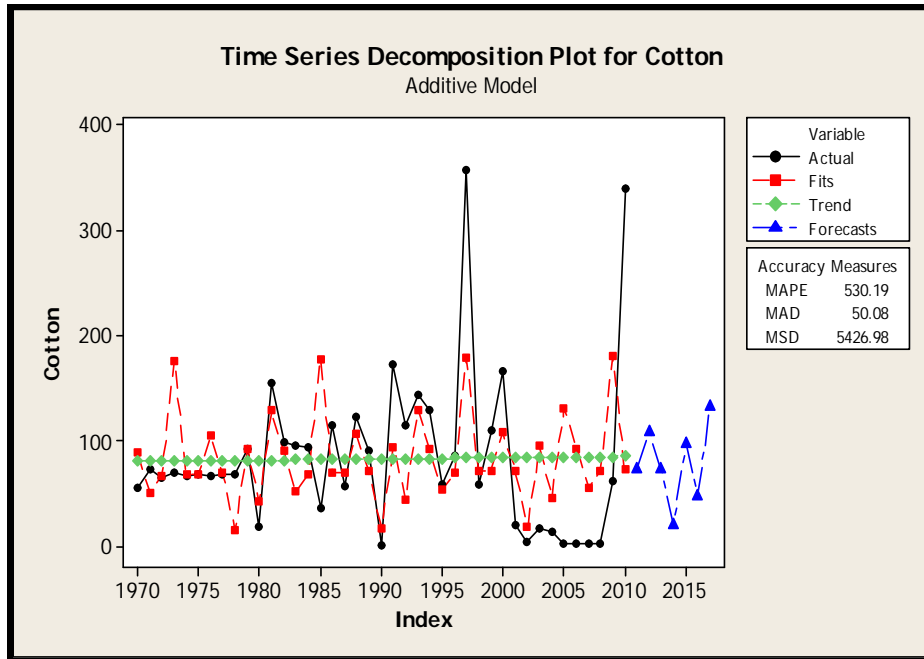
The export of cotton stayed almost stable during 1970-79, then a minute decrease in 1981 was noted. The export of cotton lint fluctuated during 1981-2000 in Sri Lanka while peak was observed at optimum level in 1997 and 2010. A dramatic fall was reported in the subsequent year and then during 2001-08. In 2009 and 2010, sharp rise occurred and levelled trend was revealed throughout the years under study. Forecasted values of cotton revealed fluctuated behaviour between zero to 100 thousand dollars from the year 2010 to onward.

There was stability noted in 1970-79 in this graph. In 1980, government friendly policies increased agricultural manufacturers and industrialised the economy. For this export of cotton lint was fluctuating in Sri Lanka from 1980-1995. The export of cotton lint rose up due to the economy rebounded in 1997-98 but slowed in 1999. For the next round of reforms, the central bank of Sri Lanka recommended that Colombo should expand market

mechanisms. In 2002, the export of cotton lint decreased due to war rages across north and east from 1995-2001. Further, in April 2010, export of cotton lint in Sri Lanka rose up due to the victory of ruling alliance in parliamentary elections and Parliament approved a constitutional change allowing the regime to seek unlimited number of terms.

FIGURE 10

Time Series Forecasting of Cotton Lint in Sri Lanka



Exports of rice in Sri Lanka revealed significant positive trend, slight stability was noted during 1970-2004 while optimum point was observed in 1995. Forecasted values slightly increased and then least possible exponential decay occurred after 2014.

In 1995, agreements in agriculture sector reduced the export subsidies by at least 21 percent (by volume) or around 36 percent (by value) over the six years in developed countries. In developing countries, cut was imposed at the proportion of 14 percent (by volume) or around 24 percent (by value) over 10 years (WTO, 1995). Due to these subsidies, export of rice in Sri Lanka increased rapidly but did not sustain and again fell in 1996, because Liberation Tigers of Tamil Eelam (LTTE) attacked on military base at Mullaitivu, in which 12,000 soldiers were killed and base was badly destroyed. Further, exports of rice in Sri Lanka revealed slight upward trend with the passage of time and reported maximum export in the year 2010.

FIGURE 11
Time Series Forecasting of Rice in Sri Lanka

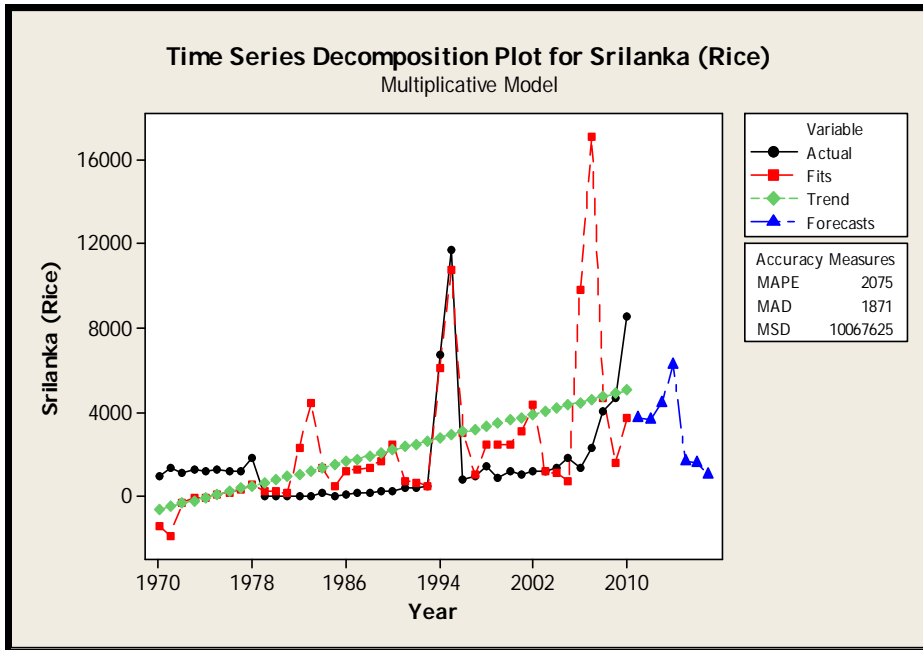
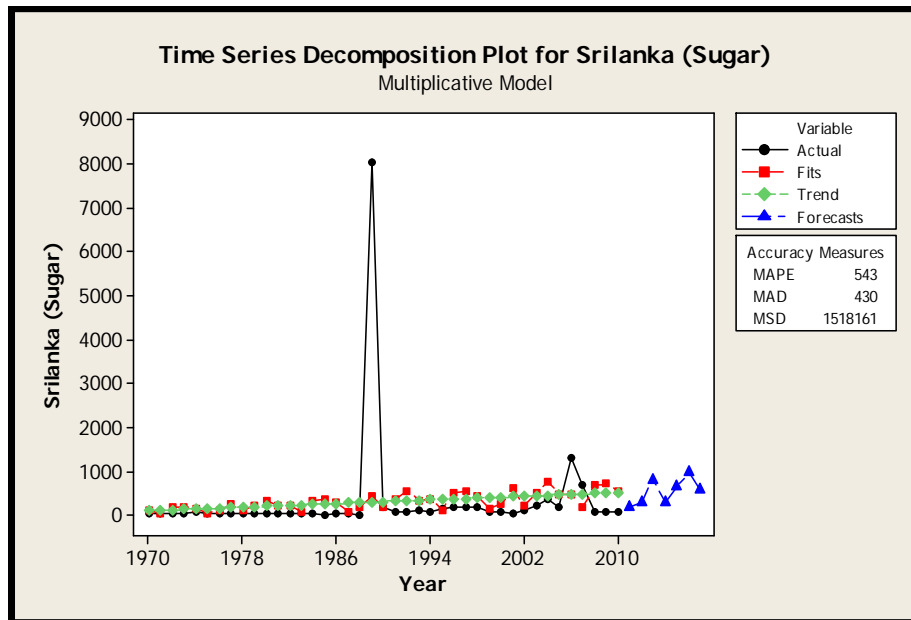


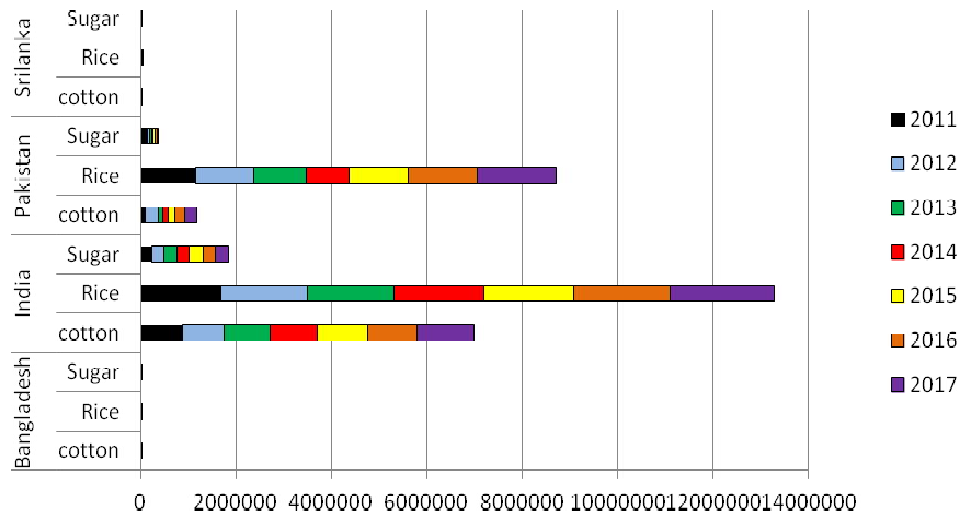
FIGURE 12
Time Series Forecasting of Sugar Refined in Sri Lanka



The refined sugar exports in Sri Lanka depicted near to zero and stayed almost stable, although exports were highest in 1987 while during 2006-07, a small rise in values were observed.

FIGURE 13

Bar Chart for Forecasted Values of All Commodities and Countries



The forecasted results are presented in Figure 13. The forecasted values reveal that India will enjoy optimum level in the export of cotton, sugar and rice, while Pakistan will achieve second level and future export of Bangladesh and Sri Lanka will remain at low level in all the commodities. The forecasted results of the present study are compatible with the forecasted results by United States Department of Agriculture (2013) and International Trade Centre UNCTAD/WTO (2013) (*see* Table 1), which reflect the credibility and accuracy of the study. Similar results were revealed by Kiran and Subashini (2014). They investigated Indian trade in relation with SAARC countries and suggested that SAARC countries should have to change the trade policy to promote the trade in the international trade while Kaloo *et al.* (2014) examined the factors influencing rice production in India. The results revealed that both the time and area significantly affected the production of rice in India at 95% level of significance. Abid *et al.* (2014) studied the forecasting behaviour of maize crop in Khyber Pakhtunkhwa province of Pakistan and used five different models which are Moving average model, Exponential growth model, Quadratic trend model, Linear trend model and Double exponential model and concluded the quadratic model as most appropriate model to find the future maize production.

TABLE 1
Ranking with Respect to Export of Commodities

Countries	Ranking		
	Rice Milled	Cotton Lint	Sugar Refined*
India	1 st	2 nd	10 th
Pakistan	5 th	14 th	32 nd
Sri Lanka	31 st	72 nd	94 th
Bangladesh	88 th	90 th	114 th

Source: United States Department of Agriculture 2013, * International Trade Centre UNCTAD/WTO (2013)

IX. CONCLUSION AND POLICY SUGGESTIONS

International trade is an important tool which played a catalyst role in economic growth of any country. The innovative study emerged from this empirical evaluation will add new passion for the trade and to address the exports barriers among the very close competing nations of South Asia. The political leadership also promised lot of time to be a part of viable policies to ensure sustainable food production in SAARC countries. It is further added that shaken law and order situation in any country will not only affect its own resources but also competitive and neighbouring countries economies. So the time has come that scientists, economic analysts, politicians, provincial and federal governments, policy makers, investors, researchers and coming generation should join their hand to reap full advantage of global markets and to bring change in people's life towards happiness.

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