CHAPTER-7

DETERMINANTS OF EXPORTS OF THE SELECTED COMMODITIES

7.1 Introduction

Export is generally considered to play an important role in the economic development of a country. In this respect, measuring the income and price elasticities of foreign trade, especially in developing countries, has received a great deal of attention because of its substantial implications on trade policy and balance of payments issues. Post-liberalization, India witnessed a visible appreciation in its volume of exports in most of the sectors including agriculture. Certain factors such as domestic demand, domestic prices, export prices, foreign prices and the exchange rate etc, are likely to have played key roles in this appreciation. While individual factors can help explain movements in India’s exports in the short run, a comprehensive study is required, of the demand and supply factors to help explain India’s exports in the long run.

Given the diversified nature of agricultural commodities and diversified policies towards them, efforts are made to examine the factors influencing demand & supply of exports of selected agricultural commodities traded by India. The present chapter focuses on four of the selected commodities viz., Coffee, Tobacco, Rice and Cotton. A model is developed using OLS regression to identify the significant determinants of export of these commodities. The chapter also provides an extensive literature review on similar kind of studies and using the similar approach. Model is developed for each commodity separately and then final conclusion is made on the price and income elasticities of these commodities. The model can be used for further forecasting purposes and policy making with respect to individual commodities

7.2 Literature Review

Many empirical studies have been undertaken on determination of India’s exports, few of them are as follows:-
Riedel (1984) empirically analyzed the determinants of India’s exports performance at aggregate level for the period 1968-78. He used ordinary Least Square (OLS) method for this purpose. The empirical findings show the strong influence of Domestic demand, along with relative prices on India’s exports.

Ratho & Sahoo (1990) empirically analyzed the impact of both demand and supply side factors on Indian Capital goods industry by using Simultaneous model (3SLS) for the period 1970-1988. The empirical analysis found that world demand and relative profitability were significant.

Virmani (1991) examined the impact of both demand and supply side determinants of Indian exports at aggregate level over the period 1970-1986. He found that price and world demand were significant while domestic demand was found to be insignificant.

Sharma (2000) empirically examined the determinants of India’s exports performance at aggregate level for the period 1970-1998. He used ordinary Least Square (OLS) method for this purpose. The empirical results found that Export was elastic to exchange rate movement and domestic demand had a negative impact on India’s exports.

Kareem (2000) examined the impact of both demand and supply side factors on Indian Machine tool exports by using single equation model (OLS) over the period 1970-1987 and found that World demand was significant for most of the industries while the significant of domestic demand and import substitution varied across the products.

Sinha Roy (2004) make an extensive study of determinants of India’s exports at aggregate level using time series data running from 1960-1999 and concluded that exports was largely driven by demand side factors during the period under study.

Sinha Roy (2009) analyzed the determinants of India’s exports performance at disaggregate level for the period 1960-2000 by using 2SLS method of estimation. The study concluded that even if the supply and demand sides are significant in understanding India’s disaggregate export performance during the period under study,
responsiveness of exports to specific supply factors like supply capability and export price is found to vary across products.

In 1991, Virmani conducted an empirical study on the demand and supply factors affecting India’s trade in which he stresses the importance of carefully specifying the demand and supply functions in order to achieve “reliable estimates of the causative factors in export performance”, especially if they are to be a guide to policy formation. An aggregate demand and supply function is estimated for India’s exports. On the demand side, the quantum of exports demanded is measured as a function of the rupee price of Indian exports converted into dollars by multiplying it by the nominal exchange rate, the dollar prices of exports in the rest of the world, the dollar prices of world home goods and world income. The price of Indian exports is measured using the unit value index, while world GDP is used as a proxy for world income. The price of world exports is estimated using the unit value index (UVI) of world exports. Virmani looks at the quantum of exports supplied as a function of the price of exports including export subsidies, the domestic prices at home, domestic income and supply factors such as capacity utilization or rainfall. WPI is used as a substitute for domestic prices while domestic GDP is used as a proxy for domestic income. The broad conclusions of his research are that the demand for Indian manufactured exports is extremely price elastic with 10% depreciation likely to lead to a 15-19% increase in the dollar value of Indian manufactured exports. Demand for primary goods however does not change significantly. World demand is also found to play a positive role in affecting demand for manufactures and primary exports, while domestic demand negatively affects the prices of India’s manufactured export prices. Rainfall is found to have a negative coefficient on prices, indicating an increase in rainfall over the previous year leads to a decrease in export prices. Measures of export capability such as capacity utilization did not have a significant effect on India’s export prices.

In 2002 and later 2009, Saikat S. Roy did a seminal piece of work on Indian trade by using a simultaneous equation model along the lines of Muscatelli et al’s model (1992) to examine the determinants of India’s exports. Roy argues that the findings of his paper go beyond their empirical results. His research provides a theoretical background for explaining India’s rising exports across various sectors despite
changes in trade and exchange rate regimes. Roy’s model consists of a simultaneous equation model along the lines of an “imperfect-substitutes model” with export volume and export prices as the joint dependent variables with all the other variables pre-determined. The export demand function consists of real exports demanded as a function of export prices in domestic currency, foreign prices in dollars multiplied by the rupee-dollar nominal exchange rate and world demand. World demand is calculated as the weighted sum of imports of individual destination countries with the weights being the destination’s share in India’s total exports in 1985. The export unit value is used as a proxy for price of exports, while the wholesale price index of India in domestic currency is used as a proxy for domestic prices. Additionally, Roy’s results show export prices on the supply side to be relatively insignificant implying that even if price incentives were to offered, it would not necessarily convince domestic producers to export. The lack of a significant coefficient on supply variables does not necessarily negate the possibility that a long-run relationship still exists between export supply capability and exports in India.

Sharma (2003) also created a simultaneous export demand-supply model to test his regressions with the export demand a function of the real effective exchange rate, world income (which he proxies by world GDP) and lagged export demand. Export supply is a function of the relative price of export prices, measured as the unit price of Indian exports, to domestic prices, measured by the wholesale price index of India. Sharma finds the coefficient on the REER to be significant with demand for Indian exports increasing when the currency undergoes a real depreciation. He also finds export supply to be positively related to the relative price of exports and negatively related to domestic demand suggesting increases in domestic demand reduces supply of exports.

The annual export unit value index (UVI) or the wholesale price index (WPI) can be used as a proxy for the price of exports.

Mookergee [1997] have analyzed the relationship between exchange rate, volume of India’s export, gross domestic product (GDP) in countries of Organization of Economic Cooperation (OEC) and also world GDP by time series data and using co-integration approach in India. Results showed that volume of India exports is sensitive to real exchange rate and world GDP growth rate.
Narayanan and Reddy [1992] studied behavior of net export supply function for dominant agricultural commodities in India. They used time series data during 1960-1986 published by FAO. The results showed that India do import substitution policies instead of export encourage and also states that domestic factors such as production and domestic price have an important effect on export changes.

Nwachukwu, et al (2010) had tried to examine competitiveness of Nigeria’s cocoa exports with the help of export performance and determinants of cocoa export. Time series data was used for different variables like production of cocoa, export of cocoa, world export of cocoa and exchange rate ranging from 1990-2005. Export performance ratio was estimated for Nigeria’s comparative advantage which is called revealed comparative advantage (RCA). Regression was done using Ordinary Least Square (OLS). In findings Nigeria was highly competitive in export of cocoa. To find out determinants of cocoa exports four functional forms were used out of which exponential function was best fit. Cocoa output and world export volume were positively significant while exchange rate was significant and had negative impact. Export price was negative but insignificant.

Kumar, et al (2008), tried to find out empirically the performance, competitiveness and determinants of exports. Time series data was used. Comparative advantage was examined through export performance ratio. Log linear model was used for determinants of exports. Exports depend upon total international trade in specific commodity, export price, exchange rate and world market size. Indian exports of gherkin and cucumber depend positively on their international trade volume, Exchange rate, export prices but export price was insignificant. In findings India was highly competitive in exports of both these commodities and exchange rate was significant determinant than prices.

Haleem, et al (2005) had tried to estimate an export supply function for citrus fruit in Pakistan. Annual time series data from 1975-2004 was used for the analysis. Quantity of citrus exported depends upon export unit value index, domestic production, and domestic price index, GDP of Pakistan, and exchange rate. Tabulation method was used to determine export performance. Co-integration was used to estimate elasticity of price for citrus. Dickey Fuller test was used to check unit root. All series were stationary at first difference except domestic production which was stationary at level.
Johansen co-integration method was used. Each variable had correct sign except citrus production. Domestic price index was negatively significant. Export price, exchange rate and GDP were positively affecting citrus exports. All variables were significant.

Gbetnkom and Khan (2002) had tried to find out determinants of agricultural exports of Cameroon for three commodities cocoa, coffee and banana from 1971/72-1995/96. Simple OLS method was used. For stationarity Unit root and Co-integration tests were applied. Exports supply(tons) depends on ratio of producer price to domestic price index positively, ratio of export price to producer price positively significant for banana only, agricultural export credit positively significant, average annual rainfall(mm) positively but insignificant for banana, classified road network positively but insignificant for banana and lag exports positively significant for only banana. Dummy variables for coffee and cocoa were deregulation positively significant, abandonment insignificant and ICA quotas (coffee) negatively insignificant, ICCA buffer stocks (cocoa) positively significant while for banana restructuring of banana sector positively significant and quota imposed negatively insignificant.

Lukonga (1994) had tried to review the performance of non-oil exports of Nigeria during the period 1970-90. Nigeria’s exports supply was taken with respect to three commodities cocoa, rubber and palm kernel and depends upon ratio of exports price to domestic price index, productive capacity and domestic demand. Ordinary least square method was used for estimations of export supply equations for these three commodities. Exports supply depends positively on price elasticity for cocoa and rubber while negatively for palm kernel which was insignificant. Productive capacity index was negative for cocoa & rubber while positive for palm kernel but only significant for cocoa. Domestic demand was negative for all three commodities. Dummy was positively significant for cocoa and rubber denoting a change in intercept and slope.

Yousuf and Yousuf (2007) had tried to explore determinants of three major agricultural commodities of Nigeria including cocoa, rubber and palm kernel. Time series data from 1970-2002 had been used for analysis. Error Correction Mechanism was used. Unit root test was also applied and all series were stationary at first difference. Quantity Exported was used as dependent while price ratio of export to domestic unit value index, net exports value, real GDP, domestic production,
exchange rate, premium are independent. In findings GDP, exchange rate and net exports had positive impact on exports while price ratio and premium had negative impact.

Therefore, the literature review on determining the factors on Indian exports is rich and diverse with authors coming up with various solutions to help explain India’s export behavior.

The above studies clearly shows that supply or demand factors on their own can only determine export behavior only for short periods but cannot explain a long-run phenomenon. It is the combination of supply and demand effects that cause long–run export performance.

7.3 Data and Methodology

Annual data is collected for the period 1980 to 2010 from various sources including the Reserve Bank of India’s (RBI) “Handbook of Statistics on Indian Economy, the International Financial Statistics (IFS) database and World Economic Outlook database from the IMF, data by USDA and World Bank, Agricultural Statistics at a glance by Ministry of Agriculture, government of India and Indian Meteorological department (IMD).

To identify the factors that determine India’s exports of selected Agricultural & Allied commodities, an Ordinary Least Square (OLS) model is used. Time series usually shows signs of autocorrelation and non-stationary and that is why Ordinary Least Square Method (OLS) cannot be applied to it without some transformation achieved sometimes by logging and/or by differencing. The data is transformed into natural log form to rule out the differences because of different units. This model was selected because it met most of the criteria (statistical and econometric) for selection. The linear model showed the presence of auto-correlation error as confirmed by the DW estimates. DW estimates ranges from 0 – 4 but values closer to 0 and 4 indicate the presence of auto-correlation error. Estimates within the 1.5 - 2.5 range show absence of auto-correlation error.

Exports value of the selected commodities is used as the dependent variable and the independent variables are selected from both the demand and supply side factors. The
model is tested for all the underlying assumptions before application and due care is taken in the interpretation of results.

7.4 Factors Determining Exports

The export of a commodity is determined by various factors. These factors can be classified as the demand side and the supply side factors. Some of the studies on income and price elasticities of exports and imports include Brar Jaswinder Singh, Da Costa G C, Kantawala B S, and Wadhva Charan D.

Most of the studies estimate tea-exports as single-equation model with explanatory variables like relative prices and world income (Kumar, Badal, Singh and Singh, 2008; Kutty, 1999, Dutta, 1965) or club together both supply and demand side factors (Kumar and Mittal, 1995; Kumar and Kumar, 1994; Misra, 1994; Dass, 1990). Yet others like Islam and Subramaniyan (1989), Bond (1987) and Goldstein and Khan (1978) specify both export supply and demand relationships separately for agricultural exports, primary commodity exports and industrial exports respectively. However, the export supply specifications in Islam and Subramaniyan (1989) and Bond (1987) are a bit simplistic in that the effect of the domestic factors on the supply of exports is captured using trend as a long run impact variable and supply and demand shocks as the short run impact variables.

Abdshahi and Torkamani discussed citrus exports in Iran. The aim of his research was investigating effective factors on citrus exports and determining presence or absence instability in export incomes. They used time series data during 1981-1997 and results showed that variables of domestic product and wholesale price index have had respectively positive and negative effect on fresh lemon exports. Variables of export price, domestic product, exchange rate and GNP have a positive and significant effect on orange exports. Here, there is instability in export earnings resulted of fresh lemon, orange and total citrus. Instability of fresh lemon exports is due to export supply and for orange and total citrus export is due to export demand.
To examine the factors responsible for the changes in the export performance of selected agricultural & allied commodities, the export function is defined choosing some of the important variables effecting demand & supply of exports in the selected commodities. The demand side variables determine the demand for exports and the supply side factors determine the supply of exports for the individual commodity.

### 7.4.1 Demand for Exports

The responsiveness of demand for exports to the change in real world income, relative price, world consumption etc refers to the demand for exports. It can also be specified as elasticity of demand for exports with respect to the particular variable. The magnitude of the elasticity of export demand has long been debated and continues to be in need of a firmer empirical foundation (Magee, 1975; Gardiner and Dixit, 1987; Carter and Gardiner, 1988; Miller and Paarlberg, 2001). Senhadji and Montenegro (1999) emphasized the importance of export demand elasticities as follows; demand elasticity is a measure of sensitivity of demand against the changes in price and income. The higher the income elasticity of export demand, the more powerful exports will be as an engine of growth.

The study by Da Costa (1996) specifies export demand as a function of export prices, real income or industrial activity of trading nations and price of the competitors. By applying a multiple linear regression model, the author estimated the elasticity of demand for India’s export for the period of 1953-62. The study estimated the elasticity at three different levels. That is at aggregate level (for overall exports), the export demand for different individual commodities’ exports and the export demand for country wise exports. Following Goldstein and Khan, Export demand for the product is related to various factors such as export price of the product, world price of exports (the average prices of goods in world markets), world consumption and world income.

Though there are ample literature on export demand function estimating price and income elasticity of demand for the developing countries, not much have been done in the context of India, particularly for the period covering large part of trade liberalization era. Some of the studies that were done in the context of India covered only few years of trade liberalization period (Srinivasan, 1998; Sharma, 2000).
In the present study, world consumption, real world income and export prices are taken as the demand side variables.

7.4.2 Supply of exports

Standard models of export supply include explanatory variables such as export prices (relative contribution of improved export profitability), variable home and foreign costs, and productive capacity. In recent empirical literature, however, some researchers have contributed to the empirical modeling and the issue of developing country export supply significantly. On the supply side, aside from a diversification in India’s export basket, an exporter’s decision to export is influenced by both demand at home as well as the prices he receives at home relative to the prices he gets for his exports. The present study uses various supply side factors such as domestic production, domestic prices (WPI used as a proxy), rainfall, production and domestic real income. MSP and procurement are also used wherever available.

Before applying the OLS model, the basic assumptions underlying the model are verified using various tests.

7.5 Normality

The regression model has a basic assumption that the data is normally distributed. Various graphical as well as statistical tools are available to check this. The present study makes use of the Jarque-Bera values to check the normal distribution of the data. The significance of J-Bera values is used to accept or reject the null hypothesis of normal distribution.

Besides, the skewness and Kurtosis values are also analyzed to see if the data is normally distributed or not. As a rule of thumb, a variable is reasonably close to normal if its skewness and kurtosis have values between –1.0 and +1.0.

7.6 Stationarity: Unit Root Test (Augmented Dickey Fuller)

In this study, time-series data of macroeconomic nature are used for the estimation of the model and thus the data generating processes exhibit trends and volatility which could result in a non-stationary issue. Stationarity in time-series data refers to a
stochastic time series that has three characteristics, as described. First, a variable over
time has a constant mean. Thus the expected value of Y at different time periods is
fixed and has an average value. Hence the data generating process Y is not a trend.
Second, the variance of a variable over time is constant. Hence the data generating
process is not stable. Third, the covariance between any two time periods is
correlated. Further, the correlation value is constant and depends on the difference
between the time periods. If one or more of these criteria is violated, then the data
generating process of the time-series data is a non-stationary series (Gujarati 1995).

When we deal with a time series the first and foremost step is to check whether the
underlying time series is stationary or not. If we want to apply the appropriate
technique on the underlying time series then we must be aware of the order of
integration of underlying time series. Stationarity is also important in the context that
if we apply OLS to a non-stationary time series it may result in spurious regression. A
time series will be stationary if it fulfills following three characteristics:

Let Yt is a time series. For stationarity it must fulfill the following three
characteristics

i. E(Yt) = μ (i.e. Mean is constant)

ii. Var(Yt) = E(Yt - μ)2 = σ2 (i.e. Variance is constant)

iii. Yk = E[(Yt – μ) (Yt-k – μ)2] (i.e. Covariance is constant)

In short, for a stationary time series its mean, variance and covariance remain the
same and do not vary with time. If a time series does not fulfill all these
characteristics then it is called as non-stationary time series.

To check the unit root in the data Augmented Dickey-Fuller (ADF) Test is used. ADF
is an extended form of Dickey-Fuller test. In DF test we assume that error terms are
uncorrelated or white noise but if error terms are correlated then ADF is best because
it also allows for Serial Correlation to be checked. ADF test has the following
regression equation

\[ \Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i}^{m} \epsilon_i \Delta Y_{t-1} + \epsilon_t \]
Where $\epsilon_t$ is white noise error, $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$ where $\Delta$ represents first difference, $q$ represents number of lagged difference, These lags are included to make error term white noise in above equation. $\beta_1$ is intercept and $t$ represents time trend.

ADF has a null hypothesis same as DF

**7.7 Multicolinearity**

Another assumption of OLS is that there are no exact linear relationships among the sample values of the explanatory variables (the Xs). So, when the explanatory variables are very highly correlated with each other (correlation coefficients either very close to 1 or to -1) then the problem of multicolinearity occurs. The easiest way to measure the extent of multicolinearity is simply to look at the matrix of correlations between the individual variables. If the value of the correlation coefficient is closer to -1 or 1, collinearity exists. However, some economists argue that, this can be ignored if rest of the model is ok as collinearity is obvious to occur between one group of variables or the other.

**7.8 Heteroscedasticity**

One of the statistical assumptions underneath ordinary least squares is that the error terms for all observations have a common variance; that they are *homoskedastic*. Varying variance errors are said, in contrast, to be *heteroskedastic*. If heteroscedasticity is present, OLS leads to inefficient estimates of the coefficients and biased standard errors, which invalidates hypothesis testing, requiring an alternative estimation procedure. White test is used in the present study to test heteroscedasticity. And White’s correction is used to correct heteroscedasticity, if any, in the model. This correction method only treats the problem of biased standard errors, keeping the inefficient least squares estimates of the coefficients. The advantage of this option is that it does not require that you identify the precise form of heteroscedasticity that exists in the model.

**7.9 COFFEE**

Dass studied coffee exports in India and the aims of this study are including determination of effective factors on coffee exports, measuring growth rate of coffee exports and effective factors on it. The results of this study showed that domestic
product has a positive and significant effect on product export but the actual increase in exports and pure national income per capita leads to decreasing volume of coffee exports during (1972-1986) in India.

7.9.1 Demand for India’s Coffee exports

The demand for India’s Coffee exports is determined by certain demand side factors which are discussed below:

World consumption: The world consumption of coffee refers to the total quantity of coffee consumed in the world during a particular year. It is assumed that the world consumption creates the world demand for coffee. More demand also leads to more exports of the commodity all over the world. Thus a direct kind of relationship is assumed between the world consumption of Coffee and India’s Coffee exports.

World income: The world income is the per capita NI. As already discussed, more income means more demand and ten more exports. Thus a positive sin is expected for this variable. The world NI per capita (at constant prices, PPP) is used as a proxy for world income. As the study is at individual commodity level, NI per capita seems to be a better indicator. It represents the purchasing power as well as the standard of living of the people.

7.9.2 Supply side factors

However the supply of Coffee exports in India is determined by the following supply side factors:

Unit Value Index (UVI): It is the Unit Value Index of Coffee exports which represents the export price of Coffee. As a general economic rule, more is supplied at a higher price and vice versa. Most of the previous literatures show that this is an important determinant of exports. Various similar previous studies has used this variable and found it to be significant.

Domestic prices (WPI): The wholesale price index of primary commodities is used as a proxy for domestic prices. High domestic prices induce exporters to sell more in the domestic market and export less. But it may differ in case of different
commodities, as it is a composite index and not the exact value of domestic prices of coffee.

**Rainfall:** The all India actual rainfall is used as a proxy for India’s supply capacity. Indian crops are based on climate and a good and sufficient rainfall increases the productivity as well as the supply capacity. Thus rainfall has a direct impact on the supply. However it doesn’t have direct impact on exports. Roy (2009) uses data on sectoral value added from the National Accounts Statistics, Government of India; Sharma (2003) uses infrastructure as a proxy and Virmani uses rainfall and capacity utilization.

Domestic production of Coffee and Domestic income (IGNI) are important determinants but are dropped because of the problem of multicolinearity. There is a high degree of multicolinearity among domestic income, world income world consumption and domestic production due to which the regression model may not yield better results.

### 7.9.3 MODEL SPECIFICATION

Demand for coffee exports can be determined as:

\[ EX_t = f( WGNI_t, WCNSP_t, UVI_t) \]  \hspace{1cm} (1)

and supply of exports is determined as:

\[ EX_t = f(WPI_t, RAINFALL_t) \]  \hspace{1cm} (2)

Thus the model can be represented as a single equation containing both the demand and supply side factors determining India’s tobacco exports.

It can be written as

\[ Exp = f(wrld cnsp, wrld income, export prices, domestic prices, rainfall) \]

Thus the determinants of India’s coffee exports can be identified with the following equation having both the demand & supply side factors.

\[ EX_t = f(WGNI_t, WCNSP_t, UVI_t, WPI_t, RAINFALL_t) \]  \hspace{1cm} (3)

where;
\[ EX_t = \text{Value of India’s coffee exports} \]

\[ WGNI = \text{World GNI per capita (PPP)} \]

\[ WCNSP = \text{World consumption of coffee (Qty)} \]

\[ UVI = \text{Unit Value Index of Coffee} \]

\[ WPI = \text{Wholesale Price Index of Primary commodities in India} \]

\[ RAINFALL = \text{All India Actual annual rainfall} \]

\[ t = \text{Time} \]

i.e; \[ Exp = WCNSP + WGNI + UVI + WPI + \text{rainfall} + \mu t \] (4)

By taking the natural logs (ln) on both sides of the equation, in order to rule-out the differences in the units of measurements for our variables, it leads us to;

\[ Lnexp = lncnsp + lnwgni + lnUVI + lnwpi + \text{lnprod} + \text{lnini} + \mu t \] (4i)

Where; Ln is the natural logarithm of the variables.

In the above equation, Value of coffee exports for India is the dependent variable which is the left hand side variable and the right hand side variables are the independent variables including both the demand and supply side variables. Natural logarithmic equation is used in the study to see the effects of changes in explanatory variables on India’s coffee exports.

Therefore, the logarithmic transformation of estimated model is:-

\[ \ln Ext = b0 + b1 \ln WCNSPt + b2 \ln WGNI_t + b3 \ln UVI + b4 \ln WPI_t + b5 \ln RAINFALL_t + U_t \]

Equation (4)

where;

\( \ln \) = natural logarithm

\( b0, b1, b2---b5 = \text{coefficients} \)

\( U_t = \text{error term} \)
7.9.4 Empirical Results

Normality test

The regression analysis has certain assumptions one of which is the normal distribution of the data. Since a time series data is being used which is collected from different sources, there are possibilities of some trend etc. Thus it becomes necessary to check it before applying the final regression model.

Table 20: Descriptive Statistics (Coffee)

Sample: 1981 2009

<table>
<thead>
<tr>
<th></th>
<th>LnEXPORTS</th>
<th>LnUVI</th>
<th>LnWCNSP</th>
<th>LnWGNI</th>
<th>LnWPI</th>
<th>LnRAINFALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>6.469326</td>
<td>5.254834</td>
<td>10.40659</td>
<td>8.895134</td>
<td>4.977260</td>
<td>7.063354</td>
</tr>
<tr>
<td>Median</td>
<td>6.946928</td>
<td>5.257495</td>
<td>10.03131</td>
<td>8.861057</td>
<td>4.962845</td>
<td>7.055485</td>
</tr>
<tr>
<td>Maximum</td>
<td>7.670429</td>
<td>5.938855</td>
<td>11.74536</td>
<td>9.180916</td>
<td>5.473321</td>
<td>7.214431</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.934647</td>
<td>0.453405</td>
<td>0.709369</td>
<td>0.158914</td>
<td>0.216395</td>
<td>0.063138</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.298075</td>
<td>0.118591</td>
<td>1.224113</td>
<td>0.321392</td>
<td>0.416014</td>
<td>0.110305</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>1.588759</td>
<td>1.597184</td>
<td>2.613940</td>
<td>2.021448</td>
<td>2.444322</td>
<td>3.380677</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>2.835952</td>
<td>2.445846</td>
<td>7.422617</td>
<td>1.656303</td>
<td>1.209599</td>
<td>0.233914</td>
</tr>
<tr>
<td>Probability</td>
<td>0.242204</td>
<td>0.294369</td>
<td>0.024446</td>
<td>0.436856</td>
<td>0.546184</td>
<td>0.889623</td>
</tr>
<tr>
<td>Sum</td>
<td>187.6105</td>
<td>152.3902</td>
<td>301.7912</td>
<td>257.9589</td>
<td>144.3406</td>
<td>204.8373</td>
</tr>
</tbody>
</table>
The normal distribution of variables for India’s coffee exports is tested using the Jarque-Bera statistics. From the above table, it can be observed that the J-Bera value for all the variables is less than the critical value of Chi-square at 5 percent level of significance, which is 11.20, thus all the variables are normally distributed. Besides the probability values are also insignificant, which shows that the null hypothesis of normality cannot be rejected.

Another method for testing the normality is the Skewness and Kurtosis values. If the skewness values are near to 0 and kurtosis values are near to 3, the variables are said to be normally distributed. The variables in this model are also normally distributed as the skewness and kurtosis values are within the desired limits.

### 7.9.4.a Test for Stationarity (Unit Root)

The usage of ordinary least squares (OLS) methodology on time series data usually requires that the data be stationary to avoid the problem of spurious regression. A variable is said to be stationary if it’s mean, variance and auto covariance remains constant no matter at what point we measure them. A series is therefore stationary if it is the outcome of a stationary process. The most common example of a stationary series is the white noise which has a mean of zero, a constant variance and a zero covariance between successive terms.

A non-stationary time series may become stationary after differencing a number of times. A series may be difference or trend stationary. A series integrated of order I (n) becomes stationary after differencing n times. To establish the order of integration of a series, Augmented Dickey fuller unit root test is performed with an intercept and the results are depicted in **table 21**.

### Table 21 ADF test values, Coffee

<table>
<thead>
<tr>
<th>Variable</th>
<th>Difference</th>
<th>Order of Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variables</td>
<td>Stationarity</td>
<td>Intercept</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>lnEX</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnWGNI</td>
<td>Second difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnRAINFALL</td>
<td>level</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnUVI</td>
<td>Second difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnWPI</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnWCNSP</td>
<td>Second difference</td>
<td>Intercept</td>
</tr>
</tbody>
</table>

* Calculated by Author

* Significant at 1% level of significance

Exports, and WPI are stationary at first difference, WGNI; UVI and WCNSP which are stationary at second difference and rainfall is stationary at level.

**Table 21** sows the values of the Augmented Dickey fuller test, which was done to check the level of stationarity of the dependent and independent variables. The values were tested both at level and at first difference. All the variables (except rainfall) were non-stationary at the level but became stationary at the first or second difference. All the variables were tested with an intercept. WGNI, UVI and WCNSP are stationary at second difference and rest of the variable are stationary at first difference.

### 7.9.4.b Autocorrelation Test

Autocorrelation refers to the existence of a relationship between error terms across observations of a time series. Error covariance are therefore different from zero. This constitutes a violation to one of the assumptions of the classical linear model. Autocorrelation is manifested by OLS estimators which are not BLU (Best linear unbiased).

Auto correlation is tested using the Breusch-Godfrey serial correlation LM test. The null hypothesis is that there is no serial correlation. The decision rule is to accept the null hypothesis if the probabilities of the F-statistic and the observed R2 of the intermediary equation are greater than 0.05, which depict the absence of autocorrelation. On the other hand, null hypothesis is not rejected if the probabilities of the F-statistic and the observed R2 of the intermediary equation are lesser than 0.05.

**Table 22: Serial Correlation LM Test (Coffee)**
Breusch-Godfrey Serial Correlation LM Test:

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Probability</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>1.809372</td>
<td></td>
<td>0.1884</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>4.262751</td>
<td></td>
<td>0.1187</td>
</tr>
</tbody>
</table>

Calculated by the author

The above table shows that the values of F statistic and Observed R square both are insignificant at 5% level of significance, i.e the probability values are less than .005, thus as per the decision rule, the null hypothesis of “no autocorrelation”, is not rejected. In other words there is no problem of autocorrelation among the variables.

7.9.4.c Heteroscedasticity

In order to ensure that the residuals are randomly dispersed throughout the range of the dependent variable, we are going to use the heteroscedasticity test. The variance of the error should therefore be constant for all values of the dependent variable. In the presence of heteroscedasticity, the distributions of the OLS parameters are no longer normal. Heteroscedasticity is tested in this study using the White test. The test is conducted with two lags and the results are shown in the table below.

Table 23: Heteroskedasticity Test: White (Coffee)

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Probability</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>2.512688</td>
<td></td>
<td>0.0590</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>10.24479</td>
<td></td>
<td>0.0686</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>15.47111</td>
<td></td>
<td>0.0085</td>
</tr>
</tbody>
</table>

Calculated by the author

The results clearly show the absence of heteroscedasticity in the variables. The observed value of the white test (10.244) is less than the critical values of Chi-square at 5 percent level of significance which is 11.20. Hence the null hypothesis of no heteroscedasticity is not rejected. The probability value is also insignificant confirming that the null hypothesis is not rejected. Thus the data is homoscedastic.
7.9.4.d Multicollinearity

The variables should not be cross correlated so that the regression results are good and can be analysed properly to obtain concrete results. However, sometimes correlation between two variables is very much obvious and being important variables none of them can be dropped, then due care must be taken during the analysis of regression results. In some studies, the author has talked of multicollinearity but has not taken any measure to address it. Multicollinearity can be checked using the correlation coefficients of the correlation matrix or the VIF values. A correlation coefficient of rater than 0.8 and a VIF greater than 10 sows multicollinearity. Both values are shown below:

**Table 24: VIF values (Coffee)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnWgni</td>
<td>13.03</td>
</tr>
<tr>
<td>LnRAINFALL</td>
<td>1.35</td>
</tr>
<tr>
<td>LnUVI</td>
<td>4.18</td>
</tr>
<tr>
<td>LnWPI</td>
<td>1.66</td>
</tr>
<tr>
<td>LnWCNSP</td>
<td>6.95</td>
</tr>
</tbody>
</table>

*Calculated by the author*

The VIF values for all the variables except Wgni are less than 10. This shows that there is a problem of multicollinearity with the world income. This can be further tested with the collinearity diagnostics.

**Table 25: Collinearity diagnostics**

<table>
<thead>
<tr>
<th></th>
<th>lnRAINFALL</th>
<th>lnUVI</th>
<th>lnWCNSP</th>
<th>lnWPI</th>
<th>lnWgni</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnRAINFALL</td>
<td>1.000000</td>
<td>-0.016924</td>
<td>-0.274451</td>
<td>0.149694</td>
<td>-0.288226</td>
</tr>
<tr>
<td>lnUVI</td>
<td>-0.016924</td>
<td>1.000000</td>
<td>0.471605</td>
<td>-0.269877</td>
<td>0.717253</td>
</tr>
<tr>
<td>lnWCNSP</td>
<td>-0.274451</td>
<td>0.471605</td>
<td>1.000000</td>
<td>-0.189984</td>
<td>0.867327</td>
</tr>
<tr>
<td>lnWPI</td>
<td>0.149694</td>
<td>-0.269877</td>
<td>-0.189984</td>
<td>1.000000</td>
<td>-0.061357</td>
</tr>
</tbody>
</table>
The collinearity shows a high degree of correlation between world consumption (WCNSP) and world income (WNI), with a correlation coefficient of 0.867. However this is very obvious because the world consumption increases with an increase in the world income. Thus this would be taken care of while interpreting the regression results and will not create any serious problem in the regression model.

**7.9.4.e Regression Results**

OLS regression results are shown below with value of India’s Coffee exports as dependent variable and demand and supply side factors as independent variables.

**Table 26: Regression Results (Coffee)**

Dependent Variable: EXPORTS

Method: Least Squares

Sample: 1981 2009

Included observations: 29

White Heteroskedasticity-Consistent Standard Errors & Covariance

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnUVI</td>
<td>1.159725</td>
<td>0.132954</td>
<td>8.722725</td>
<td>0.0000</td>
</tr>
<tr>
<td>LnWCNSP</td>
<td>-0.274483</td>
<td>0.073239</td>
<td>-3.747784</td>
<td>0.0011</td>
</tr>
<tr>
<td>LnWGI</td>
<td>3.880363</td>
<td>0.590329</td>
<td>6.573219</td>
<td>0.0000</td>
</tr>
<tr>
<td>LnWPI</td>
<td>0.295517</td>
<td>0.148417</td>
<td>1.991121</td>
<td>0.0585</td>
</tr>
<tr>
<td>LnRAINFALL</td>
<td>-0.590728</td>
<td>0.465222</td>
<td>-1.269776</td>
<td>0.2169</td>
</tr>
<tr>
<td>C</td>
<td>-28.58310</td>
<td>4.018760</td>
<td>-7.112419</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
The OLS results show that the model is able to explain 97 percent of variation in the dependent variable (India’s Coffee exports). The F-statistic is significant at 1 percent level of significance, showing the goodness of fit for the model. The Durbin Watson statistic is also less than 2 confirming that there is no problem of serial correlation.

All the independent variables except rainfall are significant at 5% level of significance. This implies that both the demand side as well as supply side variables play significant role in the determination of India’s coffee exports. The coefficient of WCNSP is significant with a negative value of 0.27. This implies that if the world consumption of coffee increase by 1%, India’s coffee exports decrease by 2.6 percent. It is to be noted that world consumption and exports generally have a direct relationship, but the model is showing a negative sin, which is due to the problem of multicolinearity between world consumption and world income. The increase in world income causes a rise in the world consumption of almost all the commodities. Thus assuming this direct relationship and the problem of multicolinearity, the negative sin is ignored. Te world income represented by World GNI per capita is also significant with a coefficient value of 3.88 implying a 38 percent increase in India’s coffee exports with a 1 percent increase in world per capita, showing that world income is a significant determinant of India’s coffee exports. The export prices (UVI) and domestic prices (WPI) are also positive and significant. The coefficient of UVI is 1.15, implying that a 1 percent increase in the export prices will increase India’s Coffee exports by around 11 percent. Similarly a 1 percent increase in India’s
domestic prices (WPI) will increase the coffee exports of India by 2.9 percent. The coefficient of rainfall, which is used as an indicator of India’s supply capacity is negative, however it is insignificant. The Durbin-Watson (D.W) statistics is 1.27 which is within the critical limits of less than 2, showing that there is no presence of serial correlation in the model, which has already been proved through the serial LM test. Value of F-test is also found to be statistically significant at 5% level of significance.

Thus it can be concluded that both the demand side as well as supply side factors are important determinants of India’s coffee exports. World consumption of coffee, world income export prices are the important demand side variables and WPI is a significant supply side factor. It can thus be concluded that India’s coffee exports are highly price elastic (as shown by WPI and UVI coefficients) as well as income elastic (as shown by WGNI coefficient).

7.10 TOBACCO

The recent trend towards the increased liberalization of trade in most goods and services has significantly reduced high-tariff and non-tariff barriers to trade in tobacco and tobacco products and contributed to the sharp increase in tobacco use in many low-income and middle-income countries. Over the past two decades, the various bilateral, regional, and multilateral trade agreements that many nations have adopted have led to significantly greater competition in domestic tobacco markets. This increased competition has almost certainly been accompanied by reduced prices for tobacco products and dramatic increases in the advertising and promotion of these products.

7.10.1 Export Demand Function

The study by Da Costa (1996) specifies export demand as a function of export prices, real income or industrial activity of trading nations and price of the competitors. By applying a multiple linear regression model, the author estimated the elasticity of demand for India’s export for the period of 1953-62. The study estimated the elasticity at three different levels. That is at aggregate level (for overall exports), the export demand for different individual commodities’ exports and the export demand for country wise exports. Both with respect to price and income the demand for Indian
exports appear to be inelastic. Inelastic demand with respect to income shows that demand for products of developing countries is lagging behind the growth of incomes or industrial activities in developed countries. Thus the author concludes that the current rate of economic growth in the advanced countries is not sufficient to guarantee a high rate of expansion of the export of developing countries. The study limited in taking only two variables as the explanatory variable in the model. There can be some other variables like import quotas. Author mentioned the presence of multicollinearity in the model. This can be corrected by correct specification of the model. Even though they estimated the elasticity of substitution, they did not incorporate it with the overall estimates.

As it is a time series data the model should be tested for autocorrelation. But the article does not mention about the problem.

Wadhva (1974) estimated the export demand function by using a single equation regression technique with the variables of price and world GDP for the period of 1954 to 1970. During the study period the Indian rupee was devalued in the year 1966. To see if this change in the macro variable affected the export pattern, the author introduced a dummy variable and performed the regression again. Out of these equations the single linear regression found to be having more explanatory power represented by R2 (goodness of fit).

The study by Jaswinder Singh Brar (1995) is one of the studies which used the log-linear functional form. The author used relative price instead of absolute price and world GDP as explanatory variables. All of these studies conclude with same results.

A later study by Kantawala (1996) shows export demand is a function of relative prices in terms of unit value index of export of a country and unit value index of world export and world real income. In the long run, trend also has an influence on exports. All of these studies conclude with same results. This study also used a log linear model of specification and estimated the export demand function for the period of 1969-70 to 1989-90.

The study by Sinha (2001) addressed the problem of stationarity of the data. By using a log linear regression model the estimated the elasticity of exports for the period of 1950 to 1996. The author used Augmented Dickey-Fuller (ADF) test (Dickey and
Fuller 1979) of stationarity. For the export demand functions, all variables were found to be non-stationary in their levels but stationary in their first differences. So the cointegration test was applied to do the further analysis. The Phillips-Hanson fully modified Ordinary Least Squares (OLS) method has been used for regression and Johansen cointegration test is used for stationarity. The cointegration coefficients are estimated by using Vector Error Correction Method (VECM).

According to Garg and Ramesh (2007) export demand is a function of real exchange rate and world GDP. They estimated the export elasticity for the period of 1970-71 to 2002-2003 by employing log linear regression model.

Export demand for the product is related to various factors such as export price of the product, world price of exports (the average prices of goods in world markets) and income of importing countries. (Goldstein M. and Khan M.S.1978). Also in demand pattern, production quantity of other countries has been considered as exogenous variable (Farris P.L.,1971).

7.10.2 Data and model specification

The data is taken for the period 1981-2011 and is converted into centered average to rule out the problem of trend. Further the data is converted into natural log to remove the differences because of different units.

7.10.2.i Demand side Factors

It is identified that demand for India’s Tobacco exports is determined by world consumption, world income and international prices.

World Income

The demand of a products export is influenced by the conditions prevailing in the world market. Theory assumes that world income could have positive or negative impact on the export of domestic economy but generally we assume it to be positive. That is, higher the level of foreign real income, larger would be the foreign demand for a nations export, ceteris paribus. The measurement of world income variable has often been varied across studies. In this present study, the GNI per capita (PPP) is used as a proxy for world income. It is a better indicator as compared to GDP because
it is also an indicator of standard of living and is also comparable because it’s on the basis of PPP. An increase in world income will increase the real export demand of India.

**World Consumption**

The world consumption refers to the total consumption of Tobacco in the world during a particular year. An increase in world consumption generally leads to an increase in the total demand of the product and hence an increase in its exports. Thus it is considered as an indicator of world demand for tobacco.

**Export Prices**

The annual export unit value index (UVI) or the wholesale price index (WPI) can be used as a proxy for the price of exports. Virmani (1991) argues that the export unit value index (UVI) is a better estimate of India’s export prices than the wholesale price index of India despite the flaws of the UVI. The UVI is limited by the fact that even if the prices of all of India’s exports do not change, the value of the index still changes. Further, as the UVI does not have fixed weights, if the price of an export increases causing export volumes to decrease, the weight of that particular good in the index decreases resulting in a biased estimate of our coefficient towards zero. Nonetheless, it is still a better measure of India’s export prices because the WPI index is even more limited by its use of domestic weights rather than trade weights in its calculation. Further, it is often based on listed prices rather than the prices at which trades actually take place and it also includes the prices of non-tradable. Virmani argues that this is particularly relevant for India as there are a large number of commodities whose imports are restricted or banned and need to be treated as non-tradable goods. I choose to use the export UVI as a proxy for export prices.

*Note: REER could not be used because of different base rates since 1980. Thus it has become incomparable after 1993.*

A dummy variable for liberalization was considered but discarded because of insignificant results.

7.10.2 ii Supply side factors
There is a great deal of controversy in modeling export supply function. Not surprisingly, most of the previous studies have generally not considered the supply variables explicitly and assumed supply elasticity to be infinite. On the supply side, we can identify the following factors as the major determinants of India's export performance:

**Domestic Price**

The domestic price is measured by the WPI, for primary articles which includes both the food and non food articles. It is generally noticed that an increase in domestic prices reduces the volume of exports as it acts as an incentive to producers to sell in the domestic market. Virmani (1991) also argues in favor of usage of WPI because its calculation includes the widespread prevalence of import controls making it an extremely reliable proxy for domestic prices. India’s consumer price index is far more recent and generally unreliable to calculate domestic prices in India.

**Domestic Income**

Domestic income is measured in terms of GNI per capita (PPP) for the country. The domestic income is an important determinant of demand for a product, which affects its value of exports. High domestic income indicates high demand and thus it as a negative relationship with the exports.

**Domestic Production**

Domestic Production has been used as an important determinant of supply of exports in various studies. It shows the supply capabilities of the exporters and thus is expected to have a positive relationship with the value of exports. High production of a commodity increases the export capacity, keeping other factors as constant and vice-versa.

**7.10.3 Model Building**

**Therefore**

Demand for tobacco exports can be determined as :

\[ EX_t = f( GNI_t, WCNSP_t, UVI_t) \]  

(1)
and supply of exports is determined as:

\[ EX_t = f( WPI_t, INI_t, PROD_t) \]  \hspace{1cm} (2)

Thus the model can be represented as a single equation containing both the demand and supply side factors determining India’s tobacco exports.

It can be written as

\[ \text{Exp} = f(\text{wrld cnsp, wrld income, export prices, prod, domestic income, domestic prices}) \]

Thus the determinants of India’s tobacco exports can be identified with the following equation having both the demand & supply side factors.

\[ EX_t = f(\text{GNI}_t, \text{WCNSP}_t, \text{UVI}_t, \text{WPI}_t, \text{IGNI}_t, \text{PROD}_t) \]  \hspace{1cm} (3)

where;

\[ EX_t \] = Value of India’s tobacco exports

\[ \text{GNI} = \text{World GNI per capita (PPP)} \]

\[ \text{WCNSP} = \text{World consumption of tobacco (Qty)} \]

\[ \text{UVI} = \text{Unit Value Index of Tobacco} \]

\[ \text{WPI} = \text{Wholesale Price Index o Primary commodities in India} \]

\[ \text{IGNI} = \text{India’s GNI per capita} \]

\[ \text{PROD} = \text{Total production of tobacco in India} \]

\[ t = \text{Time} \]

More precisely, the variable to the left-hand side of the equality symbol represents the dependent variable, while those to the right-hand side are referred to technically as explanatory variables. While modeling trade behavior the choice of appropriate functional forms is often controversial in trade literature. Generally, a log linear model is preferred due to their generally superior fit and ease of interpretation. In the present study, instead of using linear regression equations we have used Natural
logarithmic equations hence the study is concerned with isolating the effects of changes in explanatory variables on India’s tobacco exports.

Therefore, the logarithmic transformation of estimated model is:

\[
\ln \text{Ext}=b_0+b_1 \ln \text{WCNSP}_t + b_2 \ln \text{GNI}_t + b_3 \ln \text{UVI}_t + b_4 \ln \text{IGNI}_t + b_5 \ln \text{PROD}_t + b_6 \ln \text{WPI}_t + U_t
\]

Equation (4)

where:

\[\ln\] = natural logarithm

\[b_0- b_6\] = coefficients

\[U_t\] = error term

7.10.4 Empirical Results

7.10.4.a Normality

Table-27 Descriptive Statistics (Tobacco)

<table>
<thead>
<tr>
<th></th>
<th>LnEXP</th>
<th>LnGNI</th>
<th>LnIGNI</th>
<th>LnPROD</th>
<th>LnUVI</th>
<th>LnWPI</th>
<th>LnWCNSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>6.205203</td>
<td>8.895134</td>
<td>7.249706</td>
<td>-0.644756</td>
<td>5.353845</td>
<td>4.977260</td>
<td>13.47490</td>
</tr>
<tr>
<td>Median</td>
<td>6.147613</td>
<td>8.861057</td>
<td>7.188677</td>
<td>-0.653926</td>
<td>5.411646</td>
<td>4.962845</td>
<td>13.46217</td>
</tr>
<tr>
<td>Maximum</td>
<td>8.269373</td>
<td>9.180916</td>
<td>7.884513</td>
<td>-0.371064</td>
<td>6.348264</td>
<td>5.473321</td>
<td>14.13034</td>
</tr>
<tr>
<td>Minimum</td>
<td>4.871373</td>
<td>8.662148</td>
<td>6.783076</td>
<td>-0.867501</td>
<td>3.732657</td>
<td>4.629375</td>
<td>13.10590</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.996204</td>
<td>0.158914</td>
<td>0.330827</td>
<td>0.122764</td>
<td>0.814784</td>
<td>0.216395</td>
<td>0.258919</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.194240</td>
<td>0.321392</td>
<td>0.377573</td>
<td>-0.000789</td>
<td>-0.714446</td>
<td>0.416014</td>
<td>1.011395</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>1.922053</td>
<td>2.021448</td>
<td>2.019375</td>
<td>2.538255</td>
<td>2.472293</td>
<td>2.443222</td>
<td>3.718634</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>1.586405</td>
<td>1.656303</td>
<td>1.851010</td>
<td>0.257630</td>
<td>2.803584</td>
<td>1.209599</td>
<td>5.568137</td>
</tr>
<tr>
<td>Probability</td>
<td>0.452394</td>
<td>0.436856</td>
<td>0.396331</td>
<td>0.879137</td>
<td>0.246155</td>
<td>0.546184</td>
<td>0.061787</td>
</tr>
<tr>
<td>Sum</td>
<td>179.9509</td>
<td>257.9589</td>
<td>210.2415</td>
<td>-18.69791</td>
<td>155.2615</td>
<td>144.3406</td>
<td>390.7721</td>
</tr>
</tbody>
</table>
Before applying the OLS regression, it is to be checked that the data is normally distributed. There are various tests for normality but in the present study the Jarque-Bera values are analysed. If the J-Bera values for the variable are less than the critical value of Chi-Square at the desired level of significance, the variable is said to be normally distributed. From the above table, it can be observed that the J-Bera value for all the variables is less than the critical value of Chi-square at 5 percent level of significance, which is 11.20, thus all the variables are normally distributed. Besides the probability values are also insignificant, which shows that the null hypothesis of normality cannot be rejected.

Normality can also be tested with the Skewness & Kurtosis values. If the values are between zero three, variable is said to be normally distributed. This can be observed in the above table and hence there is no problem with the distribution of variables.

### 7.10.4.b Collinearity

Table 28: Collinearity diagnostics

<table>
<thead>
<tr>
<th></th>
<th>LnGNI</th>
<th>LnIGNI</th>
<th>LnPROD</th>
<th>LnUVI</th>
<th>LnWPI</th>
<th>LnWCNSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnGNI</td>
<td>1.000000</td>
<td>0.995281</td>
<td>0.064994</td>
<td>-0.107599</td>
<td>-0.061357</td>
<td>0.343982</td>
</tr>
<tr>
<td>LnIGNI</td>
<td>0.995281</td>
<td>1.000000</td>
<td>0.083359</td>
<td>-0.109730</td>
<td>-0.086790</td>
<td>0.358801</td>
</tr>
<tr>
<td>LnPROD</td>
<td>0.064994</td>
<td>0.083359</td>
<td>1.000000</td>
<td>0.351247</td>
<td>0.078622</td>
<td>0.354333</td>
</tr>
<tr>
<td>LnUVI</td>
<td>-0.107599</td>
<td>-0.109730</td>
<td>0.351247</td>
<td>1.000000</td>
<td>0.499788</td>
<td>0.089742</td>
</tr>
<tr>
<td>LnWPI</td>
<td>-0.061357</td>
<td>-0.086790</td>
<td>0.078622</td>
<td>0.499788</td>
<td>1.000000</td>
<td>0.324745</td>
</tr>
<tr>
<td>LnWCNSP</td>
<td>0.343982</td>
<td>0.358801</td>
<td>0.354333</td>
<td>0.089742</td>
<td>0.324745</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

*Calculated by the author*

If the variables are correlated the regression results are spurious. Thus there should not be any cross correlation between the independent variables. It is assumed that if the correlation coefficient is greater than 0.8, the variables are highly correlated and a
correction model must be used to obtain better results. The correlation coefficients for most of the variables in the present study are within the assumed limits, hence there is no cross correlation among them. However, GNI and IGNI are correlated which is very much obvious, because if the world real income increases, country’s real income also increase, i.e. there is a positive and direct relationship between the two. Care would be taken for this while making the final interpretations.

### 7.10.4.c Heteroscedasticity

White test is used to test the heteroscedasticity of the variables. The decision rule is to reject the null hypothesis if the probability of the F-statistic and observed $R^2$ are less than 0.05, meaning heteroscedasticity is present. On the other hand, if the probability of the F-statistic and observed $R^2$ are greater than 0.05, we do not reject the null hypothesis, implying that there is no heteroscedasticity. As such, errors are homoscedastic.

The probability of Observed R squared values and F statistic are both insignificant, thus null hypothesis is not rejected and there is no problem of heteroscedasticity.

**Table 29: Heteroskedasticity Test: White (Tobacco)**

<table>
<thead>
<tr>
<th></th>
<th>F-statistic</th>
<th>Prob. F(25,3)</th>
<th>0.1816</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obs*R-squared</td>
<td>27.96190</td>
<td>Prob. Chi-Square(25)</td>
<td>0.3096</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>22.44693</td>
<td>Prob. Chi-Square(25)</td>
<td>0.6098</td>
</tr>
</tbody>
</table>

*Calculated By the author*

### 7.10.4.d Stationarity

The usage of ordinary least squares (OLS) methodology on time series data usually requires that the data be stationary to avoid the problem of spurious regression. Thus it is appropriate that all the series be tested for stationarity or the same statistical property – means the series have to be differenced or de-trended by the same number of times to render them stationary. The traditional approach of first differencing disregards potentially important equilibrium relationships among the levels of the series to which the hypotheses of economic theory usually apply (Engle and Granger,
The use of non-stationary variables in the time series analysis leads to misleading inferences (Libanio, 2005).

The Augmented Dickey fuller test is used to test the stationarity of the variables. The variables are tested with intercept both at levels and at first difference. The results of the test are given below:

**Table 30 ADF Test Values (Tobacco)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Difference</th>
<th>order</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnEX</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnGNI</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnIGNI</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnPROD</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnUVI</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnWPI</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnWCNSP</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
</tbody>
</table>

*Calculated by the author*

The above table shows that all the variables are non stationary at level but becomes stationary at first difference. It may also be noted that a constant (intercept) is included in the test.

### 7.10.4.e Autocorrelation

Autocorrelation refers to the existence of a relationship between error terms across observations of a time series. Presence of Autocorrelation results in biased estimators of OLS results. Thus the variables must be checked for autocorrelation. In this study, autocorrelation is tested using the Breusch-Godfrey serial correlation LM test. The decision rule is to accept H0 if the probabilities of the F-statistic and the observed R2 of the intermediary equation are greater than 0.05, which depict the absence of autocorrelation. On the other hand, H1 is not rejected if the probabilities of the F-statistic and the observed R2 of the intermediary equation are lesser than 0.05.

**Table 31: Breusch-Godfrey Serial Correlation LM Test (Tobacco)**

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The above table shows that the values of F statistic and Observed R square both are insignificant at 5% level of significance, thus the null hypothesis of “no autocorrelation”, is not rejected. In other words there is no problem of autocorrelation among the variables.

### 7.10.4.f Regression Results

The OLS regression is applied to estimate the value of coefficients in the equation 4 of the model. In the equation, value of India’s tobacco exports is the dependent variable and other demand & supply side factors (discussed above in the model) are the independent variables. The White Heteroscedasticity-Consistent Standard Errors are used in the calculation to get better results. The following results were obtained.

#### Table 32: Regression Results (Tobacco)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnWgni</td>
<td>-9.602985</td>
<td>1.863459</td>
<td>-5.153311</td>
<td>0.0000</td>
</tr>
<tr>
<td>LnIGNI</td>
<td>7.369309</td>
<td>0.870998</td>
<td>8.460764</td>
<td>0.0000</td>
</tr>
<tr>
<td>LnPROD</td>
<td>0.777123</td>
<td>0.201485</td>
<td>3.856973</td>
<td>0.0009</td>
</tr>
<tr>
<td>LnUVI</td>
<td>0.005407</td>
<td>0.050102</td>
<td>0.107910</td>
<td>0.9150</td>
</tr>
<tr>
<td>LnWPI</td>
<td>0.090847</td>
<td>0.242039</td>
<td>0.375341</td>
<td>0.7110</td>
</tr>
<tr>
<td>LnWCNSP</td>
<td>0.354009</td>
<td>0.168768</td>
<td>2.097602</td>
<td>0.0476</td>
</tr>
<tr>
<td>C</td>
<td>33.44942</td>
<td>11.36369</td>
<td>2.943536</td>
<td>0.0075</td>
</tr>
</tbody>
</table>

R-squared 0.983265  Mean dependent var 6.205203
The empirical results show that the model is able to explain 98 percent of variation in the dependent variable. World consumption (WCNSP) and World Income (GNI) is found to be significant at 5% level of significance. The coefficient of WCNSP is positive with a value of 0.35. This implies that world consumption plays an important role in determining export demand for Indian tobacco and with an increase of 1% in the World consumption, India’s tobacco exports increase by 3.5%. The income elasticity of tobacco exports is found to be significant but negative which implies that India’s tobacco exports fall with an increase in the world per capita. This also implies that with the improvement in the standard of living, people spend less on tobacco and tobacco products. However, the world income and domestic income are The Durbin-Watson (D.W) statistics showed that it fall under non-collusive region and therefore there is no presence of serial correlation in the model. F-test is also found to be statistically significant at 5% level of significance. An examination of the coefficient on the Demand-side reveals that only the coefficient correlated, hence the coefficient is negative. Dropping one of the two variables may yield different results. The export prices (UVI) are positive but insignificant, implying that they affect India’s tobacco exports but doesn’t play a significant role in its determination.

On the supply side, domestic production and domestic income both are significant. Domestic production of tobacco has a positive coefficient value of 0.77. This implies that a 1 percent increase in the production of tobacco in India increases its exports by around 8 percent. Similarly, IGNI also have a positive coefficient value of 7.36, implying a 73 percent increase in tobacco exports with a 1 percent increase in India’s per capita. The domestic prices represented by WPI are positive but insignificant.
Thus it can be concluded that world consumption on the demand side and domestic production on the supply side are the important determinants of India’s tobacco exports. In other words India’s tobacco exports are not highly price elastic and income elastic.

7.11 RICE

Rice is the first most important staple food of the country (Singh Ajmer: 2008). Therefore, rice is the important crop of the country (India). Rice contributes 14.35 per cent in the export of agriculture and allied commodities and 0.628 per cent in total export of India (ESI: 2010). India’s share in total World rice export in 2007 was 2.7 per cent (ESI: 2009). West Bengal, Andhra Pradesh and Utter Pradesh have the leading States of India in rice production.

7.11.1 Model Specification

Abolagba, et al (2010) tried to determine the factors that can influence the agricultural exports of Nigeria with reference to cocoa and rubber. Time series data from 1970-2005 had been used for this purpose. OLS method was applied. Export of specific commodity was taken as dependent whereas domestic output, domestic consumption, exchange rate, average producer price, average world market price, interest rate and average total rainfall were independent. In findings output, domestic consumption, average producer price and exchange rate play key role in exports.

The objective here is to find out the important determinants of Demand and supply of India’s rice exports. Thus both the demand side and the supply side variables are considered to develop a model and find out the significant determinants.

7.11.1.i Demand for rice exports

Demand for India’s rice exports is determined by the following factors:

**World Consumption:** The total consumption of rice is the world is considered as world consumption in the model. Increase in the world consumption causes an increase in the world demand and thus the demand for exports of a commodity also
rises. Hence a positive relationship is expected between the demand for India’s rice exports and world consumption.

**World Income**

The world gross national income, per capita (PPP) at constant prices in international dollars represents the world income, i.e it is used as a proxy for world income. It also indicates the standard of living and the purchasing power of the individuals. As the world income increases, the world demand increases, not in the same proportion, but generally in the same direction. And a high demand means increased demand for exports. This implies a positive relationship between the demand for rice exports and world income.

**Export Prices**

Export prices are an important determinant of the demand for exports. The Unit Value Index is used as a proxy for export price. Whenever export prices increase export becomes costly to the importers. As a result importers may decrease their imports. Increase in export prices may also result in a decrease in the nation’s competitiveness with respect to other exporting nations. So a negative impact of export prices is expected on rice exports. In empirical literature Abolagba et al (2010), Narayan & Narayan (2004) and Nwachukwu et al (2010), Yousuf & Edom (2007) have proved this relationship. Haleem et al (2005), Kumar et al (2008) have used this variable and their results show a positive impact.

**7.11.1.ii Supply side factors**

Not only the demand side but also the supply side variables play an important role in the determination of a commodities export. The important supply side factors effecting supply of India’s rice exports are discussed below:

**Domestic Prices**

WPI for primary commodities is used as a proxy for the domestic prices. Whenever the domestic prices increase, the suppliers try to sell more in the domestic market to
earn more profits. Due to increased sale in the domestic nation, less is left for exports. Thus higher domestic prices reduce the exports of the commodity and thus a native relationship is expected in the model.

**Rainfall**

Rainfall doesn’t affect the exports directly; however it largely affects the supply of the commodity. In the case of rice, its productivity highly depends upon the amount of rainfall. A good rainfall means increased production and increased availability of the commodity. If more is produced, more can be supplied as exports. Therefore, rainfall represents the supply capacity of the country and has a positive relationship with exports.

**Procurement**

It refers to that quantity of total production of a commodity which is procured by the government. It directly affects the supply of the commodity. More procurement means less is left for exporting and vice-versa. It depends on the government policies and the market conditions of the country. It is expected to have a negative relationship with supply of India’s rice exports.

**7.11.2 Model**

Now the demand for India’s rice exports can be expressed as,

\[ \text{Exp} = f(\text{world consumption, world income, export prices}) \]

and, Supply of India’s rice exports can be expressed as,

\[ \text{Exp} = f(\text{rainfall, domestic prices, procurement}) \]

The above two equations can be combined together to form a single equation which can be written as:

\[ \text{Exp} = f(\text{world consumption, world income, export prices, rainfall, domestic prices, procurement}) \]

\[ \text{Or, } \text{EX}_t = f(\text{WGNI}_t, \text{WCNSP}_t, \text{UVI}_t, \text{WPI}_t, \text{RAINFALL}_t, \text{PROCUR}_t) \]

where,
WGNI = world gross national income per capita (PPP) in international $

WCNSP = World consumption of rice (Qty)

UVI = Unit value index for rice exports in India

WPI = Wholesale price index of primary commodities

Rainfall = All India annual rainfall (actual, mm)

Procur = Procurement of Rice by the government (Qty.)

t = Time

Therefore the final equation for determining the important determinants of India’s rice exports would be;

\[ \text{Exp} = b_0 + b_1 \text{WCNSP} + b_2 \text{WGNI} + b_3 \text{UVI} + b_4 \text{WPI} + b_5 \text{RAINFALL} + b_6 \text{PROCUR} + \text{dummy} + U_t \]

After taking natural logarithms on both the sides, the logarithmic transformation of the equation can be written as:

\[ \ln \text{Exp} = b_0 + b_1 \ln \text{WCNSP} + b_2 \ln \text{WGNI} + b_3 \ln \text{UVI} + b_4 \ln \text{WPI} + b_5 \ln \text{RAINFALL} + b_6 \ln \text{PROCUR} + \text{dummy} + U_t \]  (4)

Where

\( \ln \) = natural logarithm

\( b_0, b_1 \ldots b_6 = \) coefficients

\( U_t = \) Error term

Dummy = variable for differentiating pre and post reform period

A dummy variable is introduced in the model to study the impact of liberalization. The value for dummy is 0 representing the pre reform period, i.e. till 1990, and 1 for post reform period i.e. 1991 onwards.

7.11.3 EMPIRICAL RESULTS
Before applying the final regression model, it is necessary to test the basic assumptions of normality, heteroscedasticity and stationarity.

### 7.11.3.a Normality

**Table 33: Descriptive Statistics (Rice)**


<table>
<thead>
<tr>
<th></th>
<th>LnEXPORTS</th>
<th>LnWGNI</th>
<th>LnWCNSP</th>
<th>LnUVI</th>
<th>LnRAINFALL</th>
<th>LnWPI</th>
<th>LnPROCUR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean</strong></td>
<td>7.271067</td>
<td>8.913235</td>
<td>12.77156</td>
<td>5.769792</td>
<td>7.063354</td>
<td>4.977260</td>
<td>2.601697</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>7.967973</td>
<td>8.885146</td>
<td>12.79814</td>
<td>5.936216</td>
<td>7.055485</td>
<td>4.962845</td>
<td>2.568022</td>
</tr>
<tr>
<td><strong>Minimum</strong></td>
<td>5.063512</td>
<td>8.662148</td>
<td>12.48032</td>
<td>4.691348</td>
<td>6.929517</td>
<td>4.629375</td>
<td>1.821318</td>
</tr>
<tr>
<td><strong>Std. Dev.</strong></td>
<td>1.462832</td>
<td>0.162543</td>
<td>0.146717</td>
<td>0.481479</td>
<td>0.063138</td>
<td>0.216395</td>
<td>0.473006</td>
</tr>
<tr>
<td><strong>Skewness</strong></td>
<td>-0.187678</td>
<td>0.286450</td>
<td>-0.449368</td>
<td>-0.569385</td>
<td>0.110309</td>
<td>0.416015</td>
<td>0.276562</td>
</tr>
<tr>
<td><strong>Kurtosis</strong></td>
<td>1.498392</td>
<td>1.954846</td>
<td>1.959506</td>
<td>2.299281</td>
<td>3.380675</td>
<td>2.444324</td>
<td>1.976523</td>
</tr>
<tr>
<td><strong>Jarque-Bera</strong></td>
<td><strong>2.894826</strong></td>
<td><strong>1.716510</strong></td>
<td><strong>2.284181</strong></td>
<td><strong>2.160266</strong></td>
<td><strong>0.233916</strong></td>
<td><strong>1.209601</strong></td>
<td><strong>1.635418</strong></td>
</tr>
<tr>
<td><strong>Probability</strong></td>
<td><strong>0.235178</strong></td>
<td><strong>0.423901</strong></td>
<td><strong>0.319151</strong></td>
<td><strong>0.339550</strong></td>
<td><strong>0.889622</strong></td>
<td><strong>0.546183</strong></td>
<td><strong>0.441442</strong></td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td>210.8610</td>
<td>258.4838</td>
<td>370.3752</td>
<td>167.3240</td>
<td>204.8373</td>
<td>144.3405</td>
<td>75.44920</td>
</tr>
<tr>
<td><strong>Sum Sq. Dev.</strong></td>
<td>59.91659</td>
<td>0.739672</td>
<td>0.602723</td>
<td>6.491024</td>
<td>0.111620</td>
<td>1.311150</td>
<td>6.264577</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>

*Calculated by the author*

The J-Bera values and the values of Skewness and Kurtosis are used to test the normal distribution of the variables. As per the decision rule, if the J-Bera values for the variable are less than the critical value of Chi-Square at the desired level of significance, the variable is said to be normally distributed. The null hypothesis is that the data is normally distributed. From the above table, it can be observed that the J-Bera value for all the variables is less than the critical value of Chi-square at 5
percent level of significance, which is 11.20, thus all the variables are normally distributed. Besides the probability values are also insignificant, which shows that the null hypothesis of normality cannot be rejected.

Normality can also be tested with the Skewness & Kurtosis values. If the values for Skewness and Kurtosis are nearing zero and three respectively, variable is said to be normally distributed. This can be observed in the above table and hence there is no problem with the distribution of the selected variables.

7.11.3.b Serial Correlation

In this study, auto correlation is tested using the Breusch-Godfrey serial correlation LM test. The decision rule is to accept H0 if the probabilities of the F-statistic and the observed R2 of the intermediary equation are greater than 0.05, which depict the absence of auto correlation. On the other hand, H1 is not rejected if the probabilities of the F-statistic and the observed R2 of the intermediary equation are lesser than 0.05.

<table>
<thead>
<tr>
<th>Table 34 Breusch-Godfrey Serial Correlation LM Test: (Rice)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
</tr>
<tr>
<td>Obs*R-squared</td>
</tr>
</tbody>
</table>

The above table shows that the values of F statistic and Observed R square both are insignificant at 5% level of significance, thus the null hypothesis of “no autocorrelation”, is not rejected. In other words there is no problem of autocorrelation among the variables. The test value of 3.158 is also less than the value of chi square at 5 percent level of significance (value is 11.20), thus there is no serial correlation in the data.

7.11.3.c Stationarity
Augmented Dickey Fuller test is used to find out the order of integration of the variables and the results are shown below in the table.

**Table 35: ADF Test Values (Rice)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Difference</th>
<th>order</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnEX</td>
<td>Second difference</td>
<td>I(2)</td>
</tr>
<tr>
<td>lnWGNI</td>
<td>First difference</td>
<td>I(1)</td>
</tr>
<tr>
<td>lnRAINFALL</td>
<td>level</td>
<td>I(1)</td>
</tr>
<tr>
<td>lnUVI</td>
<td>Second difference</td>
<td>I(2)</td>
</tr>
<tr>
<td>lnWPI</td>
<td>First difference</td>
<td>I(1)</td>
</tr>
<tr>
<td>lnWCNSP</td>
<td>First difference</td>
<td>I(1)</td>
</tr>
<tr>
<td>lnPROCUR</td>
<td>First difference</td>
<td>I(1)</td>
</tr>
</tbody>
</table>

*Calculated by the author*

All the variables except rainfall are non-stationary at level. World Income (WGNI), WPI, World Consumption (WCNSP) and Procurement are integrated of the order one i.e I(1) or stationary at first difference, whereas UVI, and Rice Exports are integrated of order 2, I(2), i.e stationary at second difference.

**7.11.3.d Heteroscedasticity**

Results of the white test for heteroscedasticity are shown below:

**Table 36: Heteroskedasticity Test: White (Rice)**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>3.484371</td>
<td>Prob. F(7,21)</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>15.58312</td>
<td>Prob. Chi-Square(7)</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>10.22696</td>
<td>Prob. Chi-Square(7)</td>
</tr>
</tbody>
</table>

*Calculated by the author*

The observed test values and the F-statistic both are significant at 5 percent level of significance. Also the observed value of white test is greater than the Chi-square value.
at the same level of significance (chi sq value = 11.20). Thus there is a problem of heteroscedasticity. The null hypothesis of no heteroscedasticity is rejected.

This problem would be addressed in the regression model by using the White Heteroscedasticity-Consistent Standard Errors & Covariance to correct the error because of heteroscedasticity.

**7.11.3.e Multicollinearity**

**Table 37: Collinearity Diagnostics (Rice)**

<table>
<thead>
<tr>
<th></th>
<th>LnWGNI</th>
<th>LnWRCNSP</th>
<th>LnWPI</th>
<th>LnUVI</th>
<th>LnRAINFAL</th>
<th>LnPROCUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnWGNI</td>
<td>1.000000</td>
<td>0.950722</td>
<td>-0.077175</td>
<td>0.773616</td>
<td>-0.293021</td>
<td>0.964076</td>
</tr>
<tr>
<td>LnWRCNSP</td>
<td>0.950722</td>
<td>1.000000</td>
<td>0.094408</td>
<td>0.874058</td>
<td>-0.229852</td>
<td>0.930563</td>
</tr>
<tr>
<td>LnWPI</td>
<td>-0.077175</td>
<td>0.094408</td>
<td>1.000000</td>
<td>0.180047</td>
<td>0.149695</td>
<td>-0.008060</td>
</tr>
<tr>
<td>LnUVI</td>
<td>0.773616</td>
<td>0.874058</td>
<td>0.180047</td>
<td>1.000000</td>
<td>-0.012365</td>
<td>0.753671</td>
</tr>
<tr>
<td>LnRAINFAL</td>
<td>-0.293021</td>
<td>-0.229852</td>
<td>0.149695</td>
<td>-0.012365</td>
<td>1.000000</td>
<td>-0.339204</td>
</tr>
<tr>
<td>LnPROCUR</td>
<td>0.964076</td>
<td>0.930563</td>
<td>-0.008060</td>
<td>0.753671</td>
<td>-0.339204</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

*Calculated by the author*

The above table shows the correlation coefficients among the independent variables. It can be seen that there is a problem of multicollinearity among various variables such as WNI and WCNSP, WCNSP and PROCUR, but these correlations are very obvious and thus doesn’t create much difference in the regression results. Still, while interpretation and analysis of the regression results, this problem of multicollinearity is taken care of.

**7.11.3.f Regression Results**

The OLS regression was applied, using value of India’s rice exports as dependent variable and other demand & supply side factors as independent variables. Dummy variable is also used as an independent variable to find out the impact of liberalization on India’s rice exports.
Table 38: Regression Results (Rice)
Dependent Variable: EXPORTS
Method: Least Squares
Sample: 1981 2009
Included observations: 29
White Heteroskedasticity-Consistent Standard Errors & Covariance

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnWGNI</td>
<td>6.072809</td>
<td>2.695009</td>
<td>2.253354</td>
<td>0.0351</td>
</tr>
<tr>
<td>LnWRLDCNSP</td>
<td>3.956505</td>
<td>3.396556</td>
<td>1.164858</td>
<td>0.2571</td>
</tr>
<tr>
<td>LnDUMMY</td>
<td>1.267760</td>
<td>0.463267</td>
<td>2.736564</td>
<td>0.0124</td>
</tr>
<tr>
<td>LnUVI</td>
<td>-0.464429</td>
<td>0.258340</td>
<td>-1.797742</td>
<td>0.0866</td>
</tr>
<tr>
<td>LnRAINFALL</td>
<td>1.022289</td>
<td>0.935350</td>
<td>1.092948</td>
<td>0.2868</td>
</tr>
<tr>
<td>LnWPI</td>
<td>-0.645311</td>
<td>0.437554</td>
<td>-1.474816</td>
<td>0.1551</td>
</tr>
<tr>
<td>LnPROCUR</td>
<td>-0.990345</td>
<td>0.453572</td>
<td>-2.183434</td>
<td>0.0405</td>
</tr>
<tr>
<td>C</td>
<td>-96.97132</td>
<td>25.68976</td>
<td>-3.774708</td>
<td>0.0011</td>
</tr>
</tbody>
</table>

R-squared 0.965688 Mean dependent var 7.271067
Adjusted R-squared 0.954250 S.D. dependent var 1.462832
S.E. of regression 0.312888 Akaike info criterion 0.743006
Sum squared resid 2.055874 Schwarz criterion 1.120191
Log likelihood -2.773593 Hannan-Quinn criter. 0.861136
F-statistic 84.43230 Durbin-Watson stat 1.456531
Prob(F-statistic) 0.000000

*Calculated by the author*
The above results show that the model could explain 96 percent of variance in the dependent variable; i.e the value of India’s rice exports is determined by the selected demand and supply side variables. The F statistic is significant at 1 percent level of significance and the Durbin Watson Statistic is less than 2. Thus the model is good and there is no serial correlation.

On the demand side, world income is significant at 5 percent level of significance and export price (UVI) is significant at 10 percent level of significance. The value of coefficient for world income is 5.18 which is positive. This shows that with a 1 percent increase in world income, India’s rice exports increase by 5.18 percent. The coefficient of UVI is also significantly negative with a value of 0.46 implying that India’s rice exports decrease by 0.46 percent with a 1 percent increase in export prices. The relationship with export prices is as per the expectations; however it is significant at 10 percent. The world consumption is also an important determinant but there is multicollinearity between world income and world consumption, thus the results may vary. So it can be concluded that the demand side variable play an important role in the determination of India’s rice exports.

On the supply side, procurement is significantly negative at 5 percent level of significance. This shows that a 1 percent increase in rice procurement, causes a decrease in India’s rice exports by about 1 (0.99) percent, i.e almost an equal change. As already discussed, more procurement means less availability of the commodity for exports, thus a negative relationship was expected. The other supply side variables, WPI and rainfall are insignificant.

Hence it can be concluded that the demand side variables are more significant in India’s rice export determination.

The dummy variable is significant with a positive sign, showing that liberalization as appositive and significant impact on India’s rice exports. This fact can also be verified from the growth trends in the post liberalization period, as discussed in the earlier chapters.

7.12 COTTON

Cotton exports were restricted by the Indian government for many years. Despite the economic liberalization since 1991, the government did not considered changing the
policy for quite long and as a result, India is far from being a major exporter in the world cotton market. Considering one fourth of the world's cotton-cultivated land acreage is in India and one eighth of the world's cotton is produced in the country, the market share is quite small.

India's cotton exports are handled by their Ministry of Textiles. Every year, the Textile Commissioner recommends an export quota to the Minister of Textiles, based on crop estimates made by the Cotton Advisory Board.

As far as cotton trading is concerned, the role of the Ministry of Agriculture is limited to suggesting the minimum support price that cotton farmers are guaranteed to receive. The Commission for Agriculture Costs and Prices records the prices of basic cotton varieties every year. If the market price of cotton is below the minimum support price, the Cotton Corporation of India (CCI) must enter the cotton market to purchase cotton in the domestic cotton market.

7.12 Model Specification

With an objective to find out the important determinants of India’s cotton exports a model is developed with various demand and supply side factors.

7.12.1 Demand for Cotton Exports

The demand for India’s cotton exports is broadly determined by the following factors:

**World Consumption**

The total consumption of cotton in the world refers to the world consumption. Cotton is used for various purposes, thus its total consumption is an important demand side determinant. High level of world consumption means more demand, which is fulfilled by imports. Therefore India’s exports must increase with an increase in world consumption of cotton and thus a positive and significant relationship is expected.

**World Income**

As a general economic rule, demand for a commodity is directly related to income, i.e., more income means more demand. Here the world per capita is used as a proxy for world income which also indicates the standard of living and purchasing power of the
consumers. Consumers buy more with increased purchasing power and improved standard of living thus exports also increase. A positive relationship is expected between the two variables.

Export Prices

The Unit Value Index is used as a proxy for export price. Whenever export prices increase export becomes costly to the importers. As a result importers may decrease their imports. So a negative impact of export prices is expected on cotton exports.

7.12.1.ii Supply side factors

Besides the demand side factors, there are certain factors which affect the supply of cotton exports in India. These are the supply side factors, some of which are discussed below:

Rainfall

Rainfall affects the productivity of the crop. A suitable rainfall yields sufficient quantity of the product and as a result more is exported from the surplus output. Rainfall does not affect the exports directly but it is a measure of the supply capacity. A positive relationship is expected between India’s cotton exports and actual rainfall in the country.

Domestic Prices

WPI of primary commodities is used as a proxy for domestic prices. It is used to find out the price elasticity of India’s cotton exports. Increased prices yield more profit to the producers and they are willing to sell more in the domestic markets, thus, keeping other factors constant, exports decrease with a rise in domestic prices and vice-versa. There are a number of factors that make exporting spinnable cotton very attractive for traders. The most obvious incentive is the difference in price between the Indian market and the world market. In the past few years, the difference between nominal domestic cotton prices and export prices has been around 15 per cent (Pursell and Gupta, 1996).

So, a negative relationship is expected which also depends on other factors such as world consumption, and world prices etc.
**MSP**

The Minimum Support Price is the price guaranteed by the government to the cotton growers in India. It is proposed by the Ministry of Agriculture every year. If the market price of cotton is below the minimum support price, the Cotton Corporation of India (CCI) enters the cotton market to purchase cotton in the domestic cotton market. A high MSP for cotton makes the growers feel secure for the sale of their output and thus they become competitive in the international market and export more by taking even high risks. Thus a positive relationship is expected.

**7.12.2 Model Building**

Now the demand for India’s cotton exports can be expressed as,

\[ \text{Exp} = f(\text{world consumption}, \text{world income}, \text{export prices}) \]

and, Supply of India’s cotton exports can be expressed as ,

\[ \text{Exp} = f(\text{rainfall}, \text{domestic prices}, \text{MSP}) \]

The above two equations can be combined together to form a single equation which can be written as:

\[ \text{Exp} = f(\text{world consumption}, \text{world income}, \text{export prices}, \text{rainfall}, \text{domestic prices}, \text{MSP}) \]

Or, \( \text{EX}_t = f(\text{WGNI}_t, \text{WCNSP}_t, \text{UVI}_t, \text{WPI}_t, \text{RAINFALL}_t, \text{MSP}_t) \)

Where,

\( \text{WGNI} = \) world gross national income per capita (PPP) in international $  
\( \text{WCNSP} = \) World consumption of cotton (Qty)  
\( \text{UVI} = \) Unit value index for cotton exports in India  
\( \text{WPI} = \) Wholesale price index of primary commodities  
\( \text{Rainfall} = \) All India annual rainfall (actual, mm)
MSP = Minimum Support Price of cotton

t = Time

A dummy variable is introduced in the model to study the impact of liberalization. The value for dummy is 0 representing the pre reform period, i.e., till 1990, and 1 for post reform period, i.e., 1991 onwards.

Therefore, the final equation for determining the important determinants of India’s rice exports would be:

\[ E_{xp} = b_0 + b_1 WCNSP + b_2 WGNI + b_3 UVI + b_4 WPI + b_5 RAINFALL + b_6 PROCUR + \text{dummy} + \text{dummy} + Ut \]

After taking natural logarithms on both the sides, the logarithmic transformation of the equation can be written as:

\[ \ln E_{xp} = b_0 + b_1 \ln WCNSP + b_2 \ln WGNI + b_3 \ln UVI + b_4 \ln WPI + b_5 \ln RAINFALL + b_6 \ln PROCUR + \text{dummy} + Ut \]  \hspace{1cm} (4)

Where

\[ \ln = \text{natural logarithm} \]

\[ b_0, b_1 \ldots b_6 = \text{coefficients} \]

\[ Ut = \text{Error term} \]

\[ \text{Dummy} = \text{variable for differentiating pre and post reform period} \]

7.12.3 EMPIRICAL RESULTS

7.12.3.a Normality

Table 39: Descriptive Statistics (Cotton)

<table>
<thead>
<tr>
<th></th>
<th>LnEXPRTSLnMSP</th>
<th>LnRAINFAL</th>
<th>LnUVI</th>
<th>LnWCNSP</th>
<th>LnWGNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>5.852571</td>
<td>7.104742</td>
<td>7.063354</td>
<td>5.306360</td>
<td>11.38780</td>
</tr>
<tr>
<td>Median</td>
<td>5.494501</td>
<td>7.250835</td>
<td>7.055485</td>
<td>5.368310</td>
<td>11.36693</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
<td>Minimum</td>
<td>Std. Dev.</td>
<td>Skewness</td>
<td>Kurtosis</td>
</tr>
<tr>
<td>-------</td>
<td>---------------</td>
<td>---------------</td>
<td>-----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td>8.920870</td>
<td>3.839452</td>
<td>1.489374</td>
<td>0.702940</td>
<td>2.480997</td>
</tr>
<tr>
<td></td>
<td>8.006368</td>
<td>6.274762</td>
<td>0.546615</td>
<td>-0.298854</td>
<td>1.725763</td>
</tr>
<tr>
<td></td>
<td>7.214431</td>
<td>6.929517</td>
<td>0.063138</td>
<td>-0.298854</td>
<td>3.380675</td>
</tr>
<tr>
<td></td>
<td>6.201523</td>
<td>4.094345</td>
<td>0.600742</td>
<td>-0.244336</td>
<td>1.964811</td>
</tr>
<tr>
<td></td>
<td>11.70706</td>
<td>11.07082</td>
<td>0.166943</td>
<td>0.244336</td>
<td>2.688766</td>
</tr>
<tr>
<td></td>
<td>9.197760</td>
<td>8.662148</td>
<td>0.162543</td>
<td>0.102448</td>
<td>1.954846</td>
</tr>
<tr>
<td></td>
<td>62.11061</td>
<td>169.7246</td>
<td>204.8373</td>
<td>204.8373</td>
<td>153.8844</td>
</tr>
<tr>
<td></td>
<td>7.469686</td>
<td>184.7233</td>
<td>304.2461</td>
<td>304.2461</td>
<td>258.4838</td>
</tr>
<tr>
<td></td>
<td>0.111620</td>
<td>7.25763</td>
<td>0.111620</td>
<td>0.111620</td>
<td>0.739762</td>
</tr>
</tbody>
</table>

The null hypothesis for the data is that it is normally distributed. The Jarque Bera value for all the variables is less than the chi-square value (11.20) at 5 percent level of significance with insignificant probability values (all greater than .005). This shows that the null hypothesis is not rejected and the data is normally distributed.

### 7.12.3.b Serial Correlation

The Breusch-Godfrey Serial Correlation LM Test is used to test the presence of serial correlation in the data. As a decision rule, the F-statistic and observed test value must be insignificant at the desired level of significance (5 percent in the present study), to accept the null hypothesis of no serial correlation. Besides the test value should also be less than the value of chi square at the same level of significance.

**Table 40 Breusch-Godfrey Serial Correlation LM Test: (Cotton)**

<table>
<thead>
<tr>
<th></th>
<th>F-statistic</th>
<th>Prob. F(2,16)</th>
<th>Obs*R-squared</th>
<th>Prob. Chi-Square(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.846897</td>
<td>0.4471</td>
<td>2.488931</td>
<td>0.2881</td>
</tr>
</tbody>
</table>

*Calculated by the author*
It can be seen in the table above table that both the F statistic and the test value are insignificant as the probability values are greater than 0.005. Thus the null hypothesis of no serial correlation is not rejected. The test value of 2.4889 is also less than the value of Chi square (11.20) at 5 percent level of significance. So there is no problem of serial correlation in the data.

7.12.3.c Heteroscedasticity

Another important assumption of regression is that there should be no heteroscedasticity in the data. To test this, White test is used and the decision rules are same. The null hypothesis is that there is homoscedasticity. The null hypothesis is rejected if the values are significant.

Table 41: Heteroskedasticity Test: White (Cotton)

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Probability Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>0.540154</td>
<td>0.7931</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>4.513457</td>
<td>0.7191</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>1.860411</td>
<td>0.9672</td>
</tr>
</tbody>
</table>

*Calculated by the author*

Both the F statistic and the test values are insignificant, thus the null hypothesis is not rejected and the data is homoscedastic. The observed R squared value, which is the value of white test, is 4.51 and the chi square value at 5 percent significance is 11.20. So the test value is less than the chi square value, which again implies that the null hypothesis cannot be rejected and there is no problem of heteroscedasticity in the data.

7.12.3.d Stationarity

Augmented Dickey fuller test is used to test the stationarity of the data and find out the order of integration of the variables. All the variables are tested with an intercept, at level, first difference and second difference, till they become stationary. The results of the test are given below:
Table 42 ADF test results (Cotton)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Difference</th>
<th>order</th>
</tr>
</thead>
<tbody>
<tr>
<td>lnEX</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnWGINI</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnRAINFALL</td>
<td>level</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnUVI</td>
<td>Second difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnWPI</td>
<td>First difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnWCNSP</td>
<td>Second difference</td>
<td>Intercept</td>
</tr>
<tr>
<td>lnMSP</td>
<td>Second difference</td>
<td>Intercept</td>
</tr>
</tbody>
</table>

Calculated by the author

All the variables except rainfall are non stationary at level. Rainfall is stationary at level and is integrated of the order I (0). Exports, World Income (WGNI) and WPI are integrated of the order one i.e I(1) or stationary at first difference, whereas UVI, WCNSP and MSP are integrated of order 2, I(2), i.e stationary at second difference.

7.12.3.e Multicolinearity

Table 43 Collinearity Diagnostics (Cotton)

<table>
<thead>
<tr>
<th></th>
<th>LnMSP</th>
<th>LnRAINFAL</th>
<th>LnUVI</th>
<th>LnWCNSP</th>
<th>LnWGNI</th>
<th>LnWPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnMSP</td>
<td>1.000000</td>
<td>-0.266543</td>
<td>0.562143</td>
<td>0.799022</td>
<td>0.732789</td>
<td>-0.133881</td>
</tr>
<tr>
<td>LnRAINFAL</td>
<td>-0.266543</td>
<td>1.000000</td>
<td>0.183511</td>
<td>-0.262361</td>
<td>-0.307069</td>
<td>0.189854</td>
</tr>
<tr>
<td>LnUVI</td>
<td>0.562143</td>
<td>0.183511</td>
<td>1.000000</td>
<td>0.092875</td>
<td>0.289340</td>
<td>0.196167</td>
</tr>
<tr>
<td>LnWCNSP</td>
<td>0.799022</td>
<td>-0.262361</td>
<td>0.092875</td>
<td>1.000000</td>
<td>0.944776</td>
<td>-0.165100</td>
</tr>
<tr>
<td>LnWGNI</td>
<td>0.732789</td>
<td>-0.307069</td>
<td>0.289340</td>
<td>0.944776</td>
<td>1.000000</td>
<td>-0.235993</td>
</tr>
<tr>
<td>LnWPI</td>
<td>-0.133881</td>
<td>0.189854</td>
<td>0.196167</td>
<td>-0.165100</td>
<td>-0.235993</td>
<td>1.000000</td>
</tr>
</tbody>
</table>
The above table shows the correlation coefficients between the determinants. A coefficient value greater than 0.8 refers to a problem of multicollinearity. Results show that multicollinearity exists between WCNSP and WGNI which is very obvious and is considered in the interpretation of regression results. The other variables are non-collinear.

### 7.12.3. f Regression Results

An OLS regression model is applied with value of India’s cotton exports as dependent variable and demand & supply side variables as independent variables, which are discussed above. The results are shown below in the table and analysis is made thereon.

#### Table 44 Regression Results (Cotton)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LnMSP</td>
<td>5.633253</td>
<td>2.105535</td>
<td>2.675449</td>
<td>0.0154</td>
</tr>
<tr>
<td>LnRAINFAL</td>
<td>8.094567</td>
<td>3.720826</td>
<td>2.175476</td>
<td>0.0432</td>
</tr>
<tr>
<td>LnUVI</td>
<td>-1.635446</td>
<td>0.577895</td>
<td>-2.830004</td>
<td>0.0111</td>
</tr>
<tr>
<td>LnWCNSP</td>
<td>14.92234</td>
<td>5.337739</td>
<td>2.795628</td>
<td>0.0119</td>
</tr>
<tr>
<td>LnWGNI</td>
<td>-22.70264</td>
<td>9.749400</td>
<td>-2.328619</td>
<td>0.0317</td>
</tr>
<tr>
<td>LnWPI</td>
<td>-1.679738</td>
<td>1.060687</td>
<td>-1.583633</td>
<td>0.1307</td>
</tr>
<tr>
<td>DUMMY</td>
<td>-0.111175</td>
<td>0.784162</td>
<td>-0.141776</td>
<td>0.8888</td>
</tr>
<tr>
<td>C</td>
<td>-41.35027</td>
<td>44.08874</td>
<td>-0.937887</td>
<td>0.3607</td>
</tr>
</tbody>
</table>
The above results show that the model could explain 77 percent of variance in the dependent variable; i.e the value of India’s cotton exports is determined by the selected demand and supply side variables. The Durbin Watson statistic is 1.43 which is within the desired limit of less than 2, indicating that there is no problem of serial correlation in the model. This has also been verified with the serial correlation LM test, the results of which are already discussed above. The F statistic is also significant at 1 percent level of significance, showing the goodness of fit for the model.

All the variables except domestic prices are significant at 5 percent level of significance. On the demand side, world income, world consumption and export prices, all are significant. This implies that demand side factors are quite important in the determination of India’s cotton exports. WCNSP (world consumption is significant wit a positive sin which was expected, indicating a positive and direct relationship with India’s Cotton exports. The value of its coefficient is 14.92, implying that a 1 percent increase in world consumption of cotton, causes around 15 percent increase in India’s cotton exports. This also means that India’s cotton exports are largely affected by the world demand of cotton. UVI (export prices) is significant with a negative sin, which is as per the expectations. As a high export price makes exports costly for the importers, they import less and as a result exports reduce. The coefficient is -1.63 implying that a 1 percent increase in export prices decreases the cotton exports of India by around 2 percent. However there are other external & internal factors as well which affects the export prices directly or indirectly. WNI
(world income) is negatively significant at with a coefficient value of -22.7, which indicates a 23 percent decline in India’s cotton exports with a 1 percent increase in world income. However the negative sign is not expected, but it is because of multicollinearity between world income and world consumption. Thus ignoring the sign, the significance of the factor should be considered.

On the supply side, MSP is significant with a positive sign and a coefficient value of 5.63. This shows that a 1 percent increase in MSP of Cotton, causes a 5.63 percent increase in India’s cotton exports as the exporters feel much secured with a high MSP and export more. Rainfall, which expresses the supply capacity of exporters, is also significant with a positive coefficient value of 8.09. Thus a 1 percent increase in rainfall will cause about 9 percent increase in India’s cotton exports by increasing the exporters’ capacity because of surplus output. WPI i.e the domestic prices are insignificant but show a negative relationship, which is obvious and expected. High domestic prices induce the suppliers to sell in the domestic market and thus they export less.

Hence it can be concluded that both the demand side and supply side variables are significant in India’s cotton export determination.

The dummy variable is insignificant showing that liberalization does not have a significant impact on India’s cotton exports. Cotton exports were restricted in India for a long period of time even after liberalization. Cotton is a traditional and important item of India’s export basket. The government should take measures to boost this sector.

7.13 CONCLUSION

The above findings show that the export behaviour of the selected commodities is determined by both the demand and supply side factors. However, factors differ from in case of each commodity. It can be observed that the exports are price elastic as well as income elastic. The demand side factors or the demand for exports is showing significant results as compared to that of the supply side factors. The world consumption, world income and export prices are significant in the case of most of the commodities. On the supply side the variables differ for each commodity.
In case of Coffee, the demand side variables are more significant as compared to that of the supply side. All the demand side variables i.e world demand, world real income and export prices are significant, with the expected relationships. This shows that the coffee exports are price elastic as well as income elastic. On the demand side, coffee exports are being determined by the domestic prices as well. The literature already discussed in the previous chapters also confirms the fact that India’s coffee exports are highly price elastic and response to the domestic as well as international price fluctuations.

India’s Tobacco exports are not price elastic rather income elastic. It is being determined by the domestic income as well as world income. Domestic production and world consumption are also significant in the case of Tobacco. Tobacco is a commercial crop which responses to the changes in the standard of living of the people. Thus income plays an important role in its determination.

Rice is an important item in India’s export basket which is influenced by various internal s well as external factors including government policies related to procurement and MSP. The results of the present study reveals that Rice exports are price elastic and they are also affected by government’s procurement policies. World income is also a significant determinant of India’s rice exports. The government must focus on its MSP and procurement policies to increase the country’s rice exports as it can contribute highly to the export revenue.

India’s Cotton exports are driven by the demand side factors. World income, world consumption and export prices are the significant demand side contributors. However the supply side variables, MSP and rainfall also affect cotton exports by controlling its supply. Cotton exports were restricted in India for quite a longer period of time even after liberalization. In the present times also, cotton exports are controlled by the government policies and the Minimum Support Prices. It is India’s traditional and important item of exports. Thus the government must take measures to increase its share in India’s total exports.

The impact of liberalization can also be seen on the exports of the selected commodities, with the help of the dummy variable which is significant in the case of Rice and Coffee i.e export of these commodities has increased in the post liberalization period. However it’s not the case of Cotton and Tobacco. Price of
exports is found to be significant on the supply side indicating that the supply of Indian exports is price elastic. Therefore, the government should consider providing price incentives to Indian exporters to get them to supply more goods. Further, given the negative relation between domestic prices and export volumes, it is imperative that the government keeps a lid on domestic prices and inflation. High prices at home dissuade manufacturers from seeking markets abroad for their goods hurting India’s export growth.

Further, there are several variables from technological changes, to infrastructure improvements and hedging that could potentially affect a manufacturer’s decision to export goods, but are not considered in the research.