

Empirical estimation of the Marshall-Lerner condition in India in the pre- reform (1962-1990) and the post reform period (1991-2013) with special reference to the Sugar industry (2009-2014)

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Abstract- The purpose of this study is to empirically examine the validity of the Marshall-Lerner Condition in India in the Pre reform (1962-1990) and Post reform interlude (1991-2013) considering the total exports & imports of India. Also, this paper critically analyzes chief industry (Sugar Industry) of the Manufacturing sector of India for the five year period of 2009-2014. Manufacturing sector is the backbone of Indian economy as it fuels growth, productivity and employment and strengthens other sectors of the economy. Consequently, Government launched its ambitious programme of “Make in India” on 25th September 2014 which is expected to establish India as a major manufacturing hub and push India on a high and sustainable growth trajectory in the coming times. Manufacturing exports constitute the lion’s share of merchandise exports of countries globally. Similarly, in the case of India too it contributes the largest share to the country’s merchandise exports. In particular, the sector’s share increased from 50 percent in 1985 to over 65 percent by the year 2013. India enjoys the position of 2nd largest exporter of Sugar with 17% (2014-2015) share in the world. Moreover, 45 million of population is dependent on this industry which constitutes 7.5 per cent of the rural population. Therefore, an attempt is made to scrutinize the indispensable industry of this sector. An in depth literature review was conducted & it was observed that no study was undertaken specifically in the Sugar industry. In this study, an export-import model is created by the annual data of five variables namely; Exports, Imports, GNI, Exchange Rate and the World Income taken from World Bank database (for total exports and imports) & Ministry of Commerce and Industry (for Sugar Exports and Imports). This is done using the best possible econometric technique where all these variables are tested for Stationarity and then for Cointegration via SAS and finally OLS technique has been implied in order to find the import and export elasticity.

The study concludes that the Marshall- Lerner condition is satisfied in the Pre-reform and the Post-reform period in India, but there has been decline in the numerical terms. Further, the findings show that the theory is not justified for the Sugar industry. All these findings are supported with the theoretical prospectus. This paper serves as a stepping stone towards future research on which the policies can be adopted by India & this will be helpful for the growth and development of Indian Sugar Industry and therefore, this study will be useful for the country’s

growth as India is in the top exporters of sugar and its components.

Index Terms- Balance of Payment, Depreciation, Export elasticity, Import Elasticity, Marshall-Lerner condition

I. INTRODUCTION

In today’s world the problem of depression and recession is faced by not only the developing countries but also by the developed countries. As a result of which there occurs deficit in the Balance of Payment. Marshall- Learner has given the most useful insight on how can the Balance of Payment be improved in such situation. Therefore, this paper aims to study and analyze his following condition will in the pre reform and post reform interlude for a developing country like India:

$$E^x d + E^m d > 1$$

This condition says that if the sum of price elasticity of demand ($E^x d$) for export and price elasticity of demand for import ($E^m d$) is greater than 1, only then the Balance of Trade will improve. This condition tells us whether the foreign exchange market is stable or unstable. If this equation is satisfied then the foreign exchange is stable and if this sum is less than 1 then the market is unstable and if it is equal to 1, then the change in exchange rate will leave the Balance of Payments unchanged.

However, the overall effect of the devaluation or the depreciation has an effect on the BOP of a country in three ways:

- i. The imports become costlier and so their volume reduces
- ii. The exports are encouraged as they become cheaper for the rest of the world
- iii. Lesser foreign currency is earned by a given quantity of exports

Therefore, the ultimate effect depends upon how the imports and exports of a country respond to the depreciation which in turn depends upon the import and export demand elasticity. So, any combination of export and import elasticities that satisfies the Marshall-Lerner condition will cause the first two effects

described above to outweigh the third, leading to an improved trade balance.

The liaison of exchange rate and trade balance is an imperative basis for the foreign policy of any country. According to Classic economic theory, the affiliation of exchange rate and trade balance can to a great extent be explained by Marshall-Lerner condition and J-curve. Majority of the studies assessing the impact of currency depreciation on the external account of a country have focused on the well known Marshall-Lerner condition, which is a long run effect and the J-curve which is the short-run effect.

Recently, Prime Minister Narendra Modi launched the Make in India program on 25 September 2014. The main objective of this program is to develop the manufacturing industries, as they are the main source of exports and all other industries are inter-related to the manufacturing Industries. Sugar Industry is the chief industry in the manufacturing sector. Indian sugar industry enjoys to be 2nd largest sugar exporter in the world. However, there has been a declining trend noticed with regards to the quality. Moreover, the domestic prices of sugar are higher as compared to the international market and therefore, the exports are reducing. So, there arises a need to scrutinize this phase and investigate which factors are leading to this situation. As by doing so, we will be able to know the drawbacks and the policies can be made to revive this industry again.

According to the Wall Street Journal, this is due to the fact that Indian sugar isn't competitive in world markets, which are dominated by low-cost producers Brazil and Thailand. Therefore, the Government of India is considering giving financial incentives to sugar mills to encourage the export of 1.4 million tons of raw sugar as the cash-starved industry looks to cut huge stockpiles and make payments to cane farmers. It won't be the first time the government has used this tactic. During the season ended in September 2014, India's government paid a subsidy of 3,371 rupees (about \$56) per ton to produce and export raw sugar.

1. The industry has been calling for such an incentive to help with the export of its massive surplus stock. India, the world's second largest sugar producer after Brazil, produced 13.48 million tons of the sweetener between October and last month, according to the Indian Sugar Mills Association, compared with 11.7 million tons during the comparable period last season.

India's sugar production for this season, which runs from this past October 2013 to the September 2014, is expected to come in at 25 million tons, while domestic consumption is estimated to be 24.8 million tons, according to government figures. However, it is worth noting that India has Capacity to produce over 30 million tons of sugar. The stockpiles have led to a decline in local prices, making it difficult to for the industry to pay farmers.

In order to analyze the state of Indian Sugar industry, in this paper, the five year data is analyzed from 2009 to 2014.

OBJECTIVES:

- a. **To examine the validity of the Marshall-Lerner Condition in the pre reform and post reform**

interlude for India and judge against the analysis.

- i. To test the authenticity of the Marshall-Lerner Condition in India in the Pre-reform period (1962-1990)
 - ii. To test the legitimacy of the Marshall-Lerner Condition in India in the Post -reform period (1991-2013)
 - iii. Critical analysis and comparison of India in the Pre-reform and the post-reform interlude
- b. **To test the legitimacy of the Marshall-Lerner Condition and scrutinize the Sugar Industry of India (2011-2014)**
 - i. To review the export and import trends of the Sugar industry
 - ii. To understand the factors leading to the turn down of Sugar Industry
 - iii. To analyze the data with respect to the Marshall-Lerner Condition

II. LITERATURE REVIEW

The empirical assessment of these conditions encompasses a wealthy heritage and numerous studies have attempted to find the nature of the relationship between exchange rate volatility and trade. The studies conducted in the 18th and 19th century mainly used the least square methods to guesstimate price elasticities in import and export equations and many of them bent mixed results (Khan 1974, Goldstein and Khan 1985, Wilson and Takacs 1979, Warner and Kreinin 1983, Bahmani-Oskooee 1986, Krugman and Baldwin 1987). But, these theories are mainly criticized because they did not check the stationarities of the data and hence the result seemed to be biased. As a result, recently modern econometric techniques implying non-stationarities and reduced-form equation in the data has been used and many studies resulted to support the ML condition (Bahmani-Oskooee 1998, Bahmani-Oskooee and Niroomand 1998, Caporale and Chui 1999, Boyd, Caporale and Smith, 2001).

This paper aims to determine the Marshall- Lerner Condition for India and China for the period 1991-2013. The main reason that this topic is essential to explore because while reviewing the past it is discovered that very little exertion has been done in this field and specifically in this region. The chief rationale which makes this study stands out is that no significant work has been done to analyse the conditions in India except a few. Moreover, there is no study which have thrown light on the comparison between India and China particularly. As this paper will use the modern econometric and research methods, so it will provide an in-depth analysis. This paper will also briefly focus on the points which have lead to justification of the Marshall-Lerner condition in both the countires.

A vast review of literature has been done to understand the work done in this vital field. A broad-spectrum acuity is that a nominal devaluation can trim down trade imbalances only if it translates into a real one and if trade flows respond to relative prices in a momentous and conventional manner (Reinhart, 1995). A devaluation of the domestic currency will be lucrative and beneficial for the economy by escalating the global

competitiveness of domestic industries (Kandil and Mirazaie, 2005). Dornbusch (1988) shows that the efficacy of depreciation in improving the balance of payments depends on redirecting demand in the right direction and by the correct amount and also on the capacity of the domestic economy to meet the additional demand through increased supply. Bird (2001) argues that if inflation is on acceleration, then there is no course of action to keep the real exchange rate in equilibrium. Therefore, in his outlook, several developing countries have selected flexible exchange rates because of this reason but this is not an idyllic elucidation since demand and supply elasticities may be fairly low: even when they satisfy the Marshall-Lerner conditions, their response to exchange rate changes may not be as big as in developed economies.

The research so far done on the developing countries are included in this paper and discussed here. By reviewing these studies no definite conclusion can be drawn for developing countries. Eita, Joel Hinaunye (2013) finds evidence in favour of Marshall-Lerner condition for Namibia using a cointegration model and also estimates income elasticities of trade for the country. When the SAARC countries are taken into consideration namely India and China, 2 studies were conducted which concluded that Marshall-Lerner is fulfilled they are Ritesh Pandey(2012) for India and Yun Zheng(2012) for China. Judith Olivia Canipe (2012) conducted a study in Ghana to test the ML condition prior to 1983 using OLS and panel regressions and the theory was not agreed upon. Başak Gümüştekin(2012) attempted to enquire the existence of the effect of devaluation on the trade balance both for the long run as well as the short run for a period of 22 years which included 20 industries using the co integration and error correction modeling The result does not strongly favor the ML condition. The main loophole noticed here is that only specific industries have been studied by them which does not bring out a clear and broad picture.

2.1 Theoretical model and concept

Adnan Ali Shahzad (2013) tried to estimate the relationship between the real exchange rate and the balance of trade for the selected South Asian countries. The study used panel unit root test and Pedroni cointegration test. The study found no evidence for the satisfaction of the condition. In order to test the ML condition in Nigeria Unit root tests (ADF and PP), Johansen and Juselius approach to estimation of multivariate cointegration system and ordinary least square (OLS) were used. The results show the evidence to support the theory.

ML condition was tested for the Kenyan economy for the period 1996 to 2011 by using the quarterly data on the log of real exchange rates. In particular, fractional integration and cointegration methods were used by Robert Mudida (2012). The study concluded of a well defined relationship and agreed with the ML condition for the long run.

A study was conducted in Pakistan with time series quarterly data for 12 major trading partners Aftab and Khan (2008). It used unit root test and ARDL model. It stated no evidence in support of the theory. W.S.Ho* (2004) estimated the import demand function for Macau by both aggregate and disaggregate models. Here, Johansen – Juselius co integration was used and it was concluded that disaggregate model is more appropriate to explain the import demand.

Bahmani-Oskooee (1985) used quarterly data and Almon lag structure for 7 years to estimate the ML condition in 4 developing countries. The result satisfied the J-curve and ML condition but it is criticized on the point that it did not check the data for the stationarity and therefore the result may be biased. However, this shortcoming has been later covered and Lal and Lowinger (2002) conducted a study for the selected South Asian countries where the data was tested for stationarity and used Johansen Multivariate Cointegration and Error Correction Model (ECM) approach. This study supported the ML condition. But, the greatest shortcoming is that this study has used individual analysis on a region instead of regional analysis.

2.2 Sugar industry profile

2.2a Historical perspective

The Indian sugar industry has a history of nearly 100 years. The origins of the industry can be traced back to the early period of the 20th century. The first plant was setup at Saran in Bihar in the year 1904. (See <http://coopsugar.org/history.php>).

The legislative framework for the industry was put in place through the Indian Sugar Industries (Protection) Act 1932, which facilitated rapid development of the industry. A number of factories were established in Bihar and U.P. During 1931-32, there were 32 sugar factories in India which increased to 136 by 1935-36 with a production capacity of 9.47 lakh tonnes per annum.(Thorat, 2009, p.14-15) Subsequently, there was no appreciable development in sugar industry for a considerable period.

The next phase of development of the industry was ushered in by the initiation of the planning process in the post-independence period. Under provisions of the Industries (Development and Regulation) Act, 1951 it became incumbent on each entrepreneur to take a license from Government of India both for establishing new factories and expansion of the existing sugar factories. In the initial years, the growth of the industry was restricted to the sub-tropical regions in the country comprising the States of UP, Bihar, Punjab and Haryana. However, under the five year plans, after 1950-51, large number of factories were set up in the tropical regions also which comprise the States of Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu. (Thorat, 2009, p.15).

Sugar became an essential commodity under the Essential Commodities Act, 1955. The Government has since then been following a policy of partial control and dual pricing for sugar. Under this policy, a certain percentage of sugar produced by sugar factories is requisitioned by the Government as compulsory levy at a price fixed by the Government in every sugar season for distribution in the Public Distribution System (PDS). Therefore, sugar industry is having the dual pricing system.

2.2b Sugar Industry Trends

In this paper, emphasis has been led on the sugar industry as it is one of the top exporting and the importing industry in the world. The sugar industry in India is of significant economic and political importance. It is the major agro-processing industry in the country and hence the evolution of the industry has had important implications for rural industrialization and associated livelihoods. The importance of sugarcane in the Indian economy is manifold. This industry is an important source of foreign

exchange earnings and plays a crucial role in the global market for sugar.

To be specific, India was the 2nd largest producer of sugar in the world after Brazil in 2014-15. India's share in the world production of sugar was 17 percent in 2014-15 as per the report of the Department of Agriculture & Cooperation. However, in

spite of being the second largest producer of Sugar, India was the sixth largest exporter of sugar having a share of 2.76% in total global exports in 2014- 2015. However, India's share has been less in imports than exports since 2009-2010. It is shown as follows:

Figure 1: Trade Flow of India during 2009-10 and 2014 -15 (Unit: Lakh Tonnes)

Year	Export	Import
2009-10	0.42	25.51
2010-11	17.11	11.98
2011-12	27.38	0.99
2012-13	27.91	11.21
2013-14	24.60	8.81
2014-15	19.54	15.38
2015-16 (April-June)	7.38	1.19

Source: Department of Commerce.

An analysis of the trends of sugar supply and utilization in India between the period 2000 and 2011, reveals that the highest production was in the year 2011 that is 20934 (thousand metric tonnes), the highest net export was in the year 2001 that is 1200 (thousand metric tonnes) (Koo and Taylor, 2002, p. 28). Since then the net export of sugar has dwindled.

The point to note here is that the domestic prices were higher than the international prices for the last one year due to accumulated stocks. One possible reason for the same is that the top 3 sugar producing countries produced record quantity of sugar. The same is shown as below:

Figure 2: Sugar Price comparison of Domestic Sugar Price and International Spot Prices



Source: Agmarknet (for Domestic price), London International Financial Futures Exchange (LIFFE) (for international price)

In India, sugarcane is grown in the widely irrigated areas or the areas with high potential irrigation facilities in the states like Uttar Pradesh, Madhya Pradesh, Maharashtra, and Karnataka. India is majorly an agricultural country and sugarcane is a labor-intensive crop. Sugar is the largest agro-processing rural industry in India with 2.76% weight in annual industrial production. 50 million farmers and their families are involved in sugar cane cultivation and harvesting (Thorat, 2009, p.17) Over 5 lakh workmen are directly employed. Employment is also generated

through various ancillary activities relating to transport, trade, machinery servicing and agricultural input supply. The industry, thus, caters to over 7% of India's rural population (Thorat, 2009, p.17).

Besides, its annual contribution to the Central and State exchequers by way of taxes is around Rs. 5750 crores. Cyclically it has the potential to earn the foreign exchange through exports in two years out of six years. The turnover of the sugar industry is presently estimated at over Rs. 80,000 cores. Sugar industry

has been recognized as an important one for its contribution to employment and livelihoods contribution to exchequer through taxes and earnings (Thorat, 2009, p.18).

III. RESEARCH METHODOLOGY

Yearly data is collected for all the variables and the following equation is used to analyze the data after conduction Unit root test for stationary testing and Augmented dickey-fuller test for testing the co-integration.

$$\log X = B1 + B2\log WI + B3\log ER + a1 \text{-----to calculate Export Elasticity-----}(1)$$

$$\log Y = B1 + B2\log DI + B3\log ER + a2 \text{-----to calculate Import Elasticity-----}(2)$$

Where,

X= Exports (as percentage of GDP)

Y= Imports (as percentage of GDP)

WI= World Income (In terms of US dollar)

DI= Domestic Income (In terms of US dollar)

$$\log X = B1 + B2 \log WI + B3\log ER + a1$$

$$X= -0.552 + 0.258 WI - 0.174 ER$$

$$\text{Export elasticity} = 1/0.174 = 5.74$$

$$\text{World income elasticity} = 1/0.258 = 3.875$$

ER= Real Exchange rate (In terms of US dollar)

All the data to analyze the condition in India in the pre-reform and the post –reform period is collected from the data bank of World Bank. The data of exports and imports is collected from the databank of the Ministry of Commerce and Industry.

The data is tested for stationarity using Unit root test by making use of SAS and it is found that there is stationarity.

The data is tested for cointegration using Augmented Dickey- Fuller test and it is found that no cointegration exist between the series.⁴

Finally OLS is done at 95% level of significance to find the estimates which can be shown in the next section.

IV. DATA ANALYSIS

TABLE 1: Export Equation of Pre-reform Period India (1962-1990)

SUMMARY OUTPUT	
<i>Regression Statistics</i>	
Multiple R	0.886024545
R Square	0.785039495

Adjusted R Square		0.768504071	
Standard Error		0.049134577	
Observations		29	
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept	-0.552440472	0.14736581	-3.74877
Log ER	-0.17413016	0.12788179	-1.36165
Log world Income	0.25848676	0.04386675	5.892544

DISCUSSION OF TABLE 1:

1. As multiple regressions is 0.88. So, it indicates that there is a very high level of correlation between the dependent (Export) and independent variables (World Income and Exchange rate).
 2. R² is 0.78 which is very good fit as it means that 78% of the variation in Exports is explained by the World Income and the Exchange rate.
 3. The standard error is coming to be too low at 0.04.
 4. The ER coefficient is 0.17, it means that for each unit increase in ER (appreciation), the exports decreases by 0.17 unit. Also the standard error is coming to be too low at 0.12.
 5. The world income coefficient is 0.25 which means that for each unit increase in WI, the exports increases by 0.25 units. Also, the standard error is coming to be too low at 0.04.
- So we can write the following equations from Table 1:

1. A1% depreciation in the Real Exchange rate causes the exports to increase by 5.74%.
2. A 1% increase in the World income causes 3.875 increases in the exports.

TABLE 2: Import Equation of Pre-reform Period India (1962-1990)

SUMMARY OUTPUT			
<i>Regression Statistics</i>			
Multiple R		0.827653	
R Square		0.685009	
Adjusted R Square		0.660779	
Standard Error		0.064789	
Observations		29	
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept	-0.32356	0.149428	-2.16536

Log GNI	0.703448	0.117077	6.008444
Log ER	-0.52228	0.169978	-3.07263

1980-1982: Recession period

Also as this is a long term data, therefore the accuracy of the data is questionable.

DISCUSSION OF TABLE 2:

- As multiple regressions is 0.82. So, it indicates that there is a very high level of correlation between the dependent (Import) and independent variables (Domestic Income and Exchange rate).
- R² is 0.68 which is very good fit as it means that 68% of the variation in Exports is explained by the Domestic Income and the Exchange rate.
- The standard error is coming to be too low at 0.06.
- The ER coefficient is 0.52, it means that for each unit increase in ER (appreciation), the imports decreases by 0.52 unit. Also the standard error is coming to be too low at 0.16.
- The domestic income coefficient is 0.70 which means that for each unit increase in GNI, the imports increases by 0.70units. Also, the standard error is coming to be too low at 0.11.

TABLE 3: Export Equation of Post-reform Period India (1991-2013)

<i>Regression Statistics</i>			
Multiple R	0.565912		
R Square	0.320256		
Adjusted R Square	0.252282		
Standard Error	0.410783		
Observations	23		
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept	-3.49821	4.371009	-0.80032
Log ER	2.595639	1.259534	2.060794
Log world Income	0.090476	0.890035	0.101655

DISCUSSION OF TABLE 3:

- As multiple regression is 0.56. So, it indicates that there is a satisfactory level of correlation between the dependent (Export) and independent variables (World Income and Exchange rate).
- R² is 0.32 which represents goodness of fit as it means that 32 % of the variation in Exports is explained by the World Income and the Exchange rate.
- The standard error is coming to be too low at 0.41.
- The ER coefficient is 2.59, it means that for each unit increase in ER (appreciation), the exports(as a percentage of GDP) decreases by 2.59 unit. Also the standard error is coming to be too low at 1.25 .
- The world income coefficient is 0.09 which means that for each unit increase in WI, the exports increases by 0.09 units. Also, the standard error is coming to be too low at 0.89.

So we can write the following equations from Table 2:

- A 1% depreciation in the Real Exchange rate causes the imports to increase by 1.915%.
- A 1% increase in the domestic income causes 1.42 % increase in the imports.

ALL-LERNER CONDITION IN THE PRE-REFORM PERIOD

EXPORT ELASTICITY + IMPORT ELASTICITY = 5.74 + 1.915 = 7.655

The high elasticity because it gets effected by the extreme observations:

- Export Range: 0.84-0.511=0.329
- World Income=6.03-4.73=1.3
- Exchange rate=1.243-0.677=0.566
- Import Range: 0.958-0.561=0.397

Moreover, these 29 years witnessed following dramatic years so there are various extraneous factors which had an effect

$\log X = B_1 + B_2 \log WI + B_3 \log ER + a_1$ on the variables.

X = -3.49 + 0.09 WI + 2.59 ER

Export elasticity = 1/2.59 = 0.38

World income elasticity = 1/0.09 = 1.11

- 1962 to 1990
- North Indian Ocean Cyclone
- 1971: Indo-Pak war
- 1973-1975: Recession period

So we can write the following equations from Table 3:

- A 1% appreciation in the Real Exchange rate causes the exports (as a percentage of GDP) to increase by 0.38%.
- A 1% increase in the World Income causes 1.11% increase in the exports.

TABLE 4: Import Equation of Post-reform Period India (1991-2013)

<i>Regression Statistics</i>			
Multiple R	0.977101		
R Square	0.954727		
Adjusted R Square	0.9502		
Standard Error	0.041759		
Observations	23		
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept	-1.20489	0.143667	-8.38673
Log GNI	0.668333	0.054474	12.26878
Log ER	0.344675	0.12765	2.700164

DISCUSSION OF TABLE 4:

1. As multiple regressions is 0.97. So, it indicates that there is a very high level of correlation between the dependent (Import) and independent variables (Domestic Income and Exchange rate).
2. R^2 is 0.95 which is very good fit as it means that 95% of the variation in Exports is explained by the Domestic Income and the Exchange rate.
3. The standard error is coming to be too low at 0.04.
4. The ER coefficient is 0.34, it means that for each unit increase in ER (appreciation), the imports increase by 0.34 unit. Also the standard error is coming to be too low at 0.12.
5. The domestic income coefficient is 0.66 which means that for each unit increase in GNII, the imports increases by 0.66 units. Also, the standard error is coming to be too low at 0.05.

So we can write the following equations from Table 4:

$$\log Y = B1 + B2 \log GNI + B3 \log ER + a1$$

$$Y = -1.20 + 0.66 \text{ GNI} + 0.344 \text{ ER}$$

$$\text{Import elasticity} = 1/0.344 = 2.90$$

$$\text{Domestic income elasticity} = 1/0.66 = 1.5151$$

MARSHALL-LERNER CONDITION IN THE POST-REFORM PERIOD (1991-2013)

$$\text{EXPORT ELASTICITY} + \text{IMPORT ELASTICITY} = 0.38 + 2.90 = 3.28$$

The high elasticity because it gets affected by the extreme observations:

1. Export Range = $3.303 - 0.921 = 2.382$ (High)
2. World Income = $6.49 - 6.06 = 0.43$
3. Exchange rate = $1.767 - 1.356 = 0.411$
4. Import Range = $1.487 - 0.921 = 0.566$
5. Domestic Income = $3.195 - 2.518 = 0.677$

Moreover, these 23 years witnessed following dramatic years so there are various extraneous factors which had an effect on the variables.

1991-2013

1991: Indian economic reform began

2004: Indian Ocean earthquake and tsunami

2008: Recession period

2012: After effects of the recession in 2008

2013: Depression period

2013: North India floods

Also as this is a long term data, therefore the accuracy of the data is questionable.

TABLE 5 : Exports Equation of Sugar Industry (2009 -2014)

SUMMARY OUTPUT			
<i>Regression Statistics</i>			
Multiple R	0.649472706		
R Square	0.421814796		
Adjusted R Square	-0.156370409		
Standard Error	0.571297387		
Observations	5		
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept	-33.02418426	76.10474	-0.43393
Log Exchange rate	9.3193612	8.866394	1.051088
Log World Income	3.133304588	10.09287	0.310447

1. A 1% appreciation in the Real Exchange rate causes the imports to increase by 2.90%.
2. A 1% increase in the domestic income causes 1.51% increase in the imports.

DISCUSSION OF TABLE 5:

1. As multiple regressions is 0.64. So, it indicates that there is a high level of correlation between the dependent (Export of Sugar) and independent variables (World Income and Exchange rate).

- R^2 is 0.42 which is satisfactory fit as it means that 42% of the variation in Exports of Sugar is explained by the World Income and the Exchange rate.
- The standard error is coming to be as 0.57.
- The ER coefficient is 9.31; it means that for each unit increase in ER (appreciation), the exports increase by 9.31 units.
- The world income coefficient is 3.13 which means that for each unit increase in WI, the exports increases by 3.13
- Also, the standard error is coming to be too low at 0.04.

$$\log Y = B_1 + B_2 \log \text{GNI} + B_3 \log \text{ER} + a_1$$

$$Y = 0.18 + 3.79\text{GNI} - 5.57\text{ER}$$

$$\text{Import elasticity} = 1/5.57 = 0.179$$

$$\text{Domestic elasticity} = 1/3.79 = 0.263$$

$$\log X = B_1 + B_2 \log \text{WI} + B_3 \log \text{ER} + a_1$$

$$X = -33.02 + 3.13 \text{WI} + 9.31 \text{ER}$$

$$\text{Export elasticity} = 1/9.31 = 0.107$$

$$\text{World income elasticity} = 1/3.13 = 0.319$$

So we can write the following equations from Table 5:

TABLE 6: Import Equation of Sugar Industry (2009-2014)

SUMMARY OUTPUT			
<i>Regression Statistics</i>			
Multiple R	0.442106		
R Square	0.195458		
Adjusted R Square	-0.60908		
Standard Error	0.537992		
Observations	5		
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept	0.186983	15.45932	0.012095
Log Domestic Income	3.79262	6.716224	0.564695
Log Exchange rate	-5.57812	8.155074	-0.68401

DISCUSSION OF TABLE 6:

- As multiple regressions is 0.44. So, it indicates that there is a satisfactory level of correlation between the dependent (Import) and independent variables (Domestic Income and Exchange rate).

- R^2 is 0.19 which is very poor goodness of fit as it means that 19% of the variation in Imports is explained by the Domestic Income and the Exchange rate.
- The standard error is coming to be at 0.53.
- The ER coefficient is 5.57, it means that for each unit increase in ER (appreciation), the imports decreases by 5.57 unit. Also the standard error is coming to be too low at 6.71.
- The domestic income coefficient is 3.79, which means that for each unit increase in GNI, the imports increases by 3.79 units. Also, the standard error is coming to be too low at 8.15.
- A 1% depreciation in the Real Exchange rate causes the imports to increase by 0.17%.
- A 1% increase in the domestic income causes 0.26 % increase in the imports.

So we can write the following equations from Table 6:

- A 1% depreciation in the Real Exchange rate causes the exports to decrease by 0.107%.
- A 1% increase in the world income causes 0.319% increase in the exports.

MARSHALL-LERNER CONDITION IN THE SUGAR INDUSTRY (2009-2014)

$$\text{EXPORT ELASTICITY} + \text{IMPORT ELASTICITY} = 0.107 + 0.179 = 0.286$$

However, the low elasticity may be due to extreme observations:

- Export Range : 3.30-2.01 = 1.29 (High)
- World Income : 6.45-6.35 = 0.1
- Exchange Rate : 1.76-1.66 = 0.1
- Import Range : 3.11-2.16 = 0.95 (High)
- Domestic Income : 3.19-3.06 = 0.13

Moreover, the data is short-term data.

V. CONCLUSION AND DISCUSSION

From the analysis of the data it is clear that the ML condition in India in the Post reform period have been reduced as compared to the Pre reform period by 4.37. The major point to notice is that in spite of export elasticity being so high especially in the pre reform period that is 5.74, so the depreciation should actually increase the exports by a large amount but there are various constraints which a country (India) faces while increasing the exports. This area is yet to be reviewed.

Further, the findings show that the Marshall-Lerner Condition is not satisfied in the Sugar Industry for the five year data. However, there are various practical economic situations which might have influenced this result. The first and foremost is that the data is of five years (2009-2014). Therefore, J-Curve Theory might be applicable to this result that in the short term the depreciation of the currency actually has negative effect on the Balance of Payment of the country as the short run variables are fixed, but in the long run, the depreciation is useful to improve the Balance of Payment. This theory is yet to be tested taking the long term data.

Another factor influencing the result is that India is following the Dual Price System. The reason for this is that Government has recognized Sugar as the Essential under the Essential Commodities Act, 1955. Therefore, a policy of partial control is followed in the country. Under this policy, a certain percentage of sugar produced by sugar factories is requisitioned by the Government as compulsory levy at a price fixed by the Government in every sugar season for distribution in the Public Distribution System (PDS). Therefore, sugar industry is having the dual pricing system.

The next important factor contributing to this result is that the international prices of sugar were lower than domestic prices for the last one year owing to accumulated stocks. One reason for the same may be that the major sugar producing countries like Brazil, Thailand and India produced record quantity of sugar in the marketing year 2014-15.

Apart from the above main factors effecting the Sugar industry, there are other export-import policies also, which have been key role to influence the international trade of Sugar. This area is yet to be analyzed.

VI. FUTURE SCOPE

The Indian Sugar industry is striving to achieve its best. Manufacturing sector is the backbone of Indian economy as it fuels growth, productivity and employment and strengthens other sectors of the economy. Consequently, Government launched its ambitious programme of "Make in India" on 25th September 2014 which is expected to establish India as a major manufacturing hub and push India on a high and sustainable growth trajectory in the coming times. Manufacturing exports constitute the lion's share of merchandise exports of countries globally. Similarly, in the case of India too it contributes the largest share to the country's merchandise exports. In particular, the sector's share increased from 50 percent in 1985 to over 65 percent by the year 2013. These developments in the manufacturing sector over the last few decades have been quite phenomenal and have resulted in economic growth impelled by import substitution, export promotion, and acquisition of modern technological capabilities. Therefore, efforts should be made to study this sector and its major industries in depth in order to identify the strengths and the drawbacks so that these industries can achieve the high growth. The development of the major industries in the manufacturing sector will help India to soon find its place in the Sun.

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