DETERMINANTS OF THE DEMAND FOR IMPORT OF BANGLADESH: A COINTEGRATION AND VECTOR ERROR CORRECTION ANALYSIS

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ABSTRACT

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This paper examines the determinants of import demand of Bangladesh by using the time series data for the period 1990-91 to 2015-16. The study found that both export and import of the country has increased significantly after the liberalization of its economy in early 1990s. But its import has always been higher than export resulting in widening of its trade deficit. Its export destinations are located in distant countries; USA, Germany and UK while its imports sources are neighbouring countries like China and India. Johansen's cointegration method and vector error correction model was applied to estimate the determinants of its import demand. The results showed that there was a long-run relationship between real import, real GDP and Foreign exchange reserves. In the long-run, import was found to be more elastic to real GDP and inelastic with respect to foreign exchange reserves. The VEC model indicated that any deviation in import in the short-run would get corrected within a period of less than one year. The import was more elastic to real income in the short-run than in the long-run. The evidences showed that the volume of import would increase faster with increase in real GDP and would deteriorate the country's trade balance unless accompanied by high export growth. Hence, there is a need to invest in establishing import substitute industries to control imports and promote exports to reduce trade deficit.

KEYWORDS: *Import, trade policy, real GDP, foreign exchange reserve, cointegration*

INTRODUCTION

In the era of globalization, international trade has come be recognized as an important economic activity to promote economic development in developing countries. The trade has gained so much importance that it is considered as an engine of growth. Trade can help to enhance economic growth of an economy through promoting investment, innovation and enhancing productivity. This is particularly true for small economy with narrow domestic market. One of the main constraints to economic development of less developed countries is the small size of domestic market which is mainly because of low income. Small size of domestic market and low demand leads to low inducement to invest and low economic growth. The trade widens the size of market and provides an opportunity to such countries to substitute large international market for narrow domestic market. In fact, trade can help less developed countries to specialize in the production those products in which they have natural advantage and earn foreign exchanges. The trade effectively expands production possibility frontiers of each participating country (Ray, 2014). It is an alternative production activity where quantities of some commodities (exports) are transformed into quantities of other commodities (imports). The more trade encourages a country to produce surplus output and export their products in the international markets. This can greatly help them to promote investment and economic growth, generate employment and alleviate poverty.

Many studies have argued the growth benefit of trade. Krugman (1979) argued that the total output increases as a country liberalizes its trade. Trade can contribute to economic growth of a country as it introduces forces of competition and encourages economy to specialize in production of those commodities in which it has better factor endowments. This increases productivity in that sector and output goes up. The export from that sector also increases which lead to boost growth. Rivera-Batiz and Romer (1991) stated that trade openness increases competition that drives innovation, greater resource allocation, efficiency and technological advancement. Wang and Xie (2014) argued that trade can affect economic growth by reallocating resources among different sectors and transmission of knowledge.

The importance of trade in economic development gained momentum among the developing countries during the 1970s. In the middle of 1970s there has been considerable progress in trade reforms in most developing countries. Many Asian countries like Taiwan, Korea, Singapore and Hong Kong which opened up their economies for trade and adopted export promotion strategy during 1960s and 70s achieved great success in promoting economic development. The success of these countries encouraged other Asian and South Asian countries to open their economies for trade achieved high growth by promoting exports. For instance, China opened up its economy in the early 1980s and within few years it could accelerate its economic growth.

India, Pakistan, Bangladesh and other developing countries also started to open up their economies for trade during late 1980s and early 1990s. However, in these countries opening up of their economy led to more imports than the exports which resulted in growing trade deficit. Bangladesh, since the liberalization of its economic has been witnessing trade deficit due to higher imports than its exports. Its trade deficit has, in fact, widened in the recent years. Hence, there is need to examine the factors determining imports. Many studies have been carried out to analyse determinants of import demand of the developing countries. For example, Sarmad (1989) examined the factors influencing the demand for Pakistan's import during the period 1959-60 to 1985-86 by applying the log-linear functional form. The study found that the estimated price and income elasticities were distinctly different from those of the developed and middle-income countries. Dutta and Ahmad (2006) examined the India's import demand function by incorporating dummy variable to capture the effect of trade liberalization on imports along with income and relative price of imports. They found that income of the country had positive but relative price of imports had negative influence on import demand while liberalization was found to be insignificant. Moran (1989) found that foreign exchange receipts, international reserves, relative price of import and income of the country had significant impact on import of developing countries. Arize et al. (2004) also found a long-run relationship between real import, relative price of imports, income and foreign exchange reserves. Ariz and Osang (2007) in the study of Latin American countries found the income elasticity of demand for import to be greater than one, price elasticity to be close to one and small elasticity to foreign exchange reserves. Aljebrin and Ibrahim (2012) in the study of import demand of GCC countries confirmed that there are positive and significant relationships between the demand for import and real income, private consumption, international reserves and gross capital formation. Sultan (2013) investigated aggregate import demand function for India using Johansen's cointegration method. The the study found a long-run equilibrium relationship between real imports, real income, relative price of imports and real foreign exchange reserves. In the long run import was found to be elastic to income and inelastic with respect to relative price and foreign reserves.

The data on export and import of Bangladesh shows that it has been facing growing trade balance. Its trade deficit in notably high with India compared to rest of the world. India is a major source country for imports rather than destination for exports of Bangladesh. India is the second largest source of Bangladesh's overall imports and accounted for 15.1 per cent of total import of the country (Basher,

2013). In this background the study seeks to examine the determinants of Import demand of Bangladesh. The finding study is expected to help the policy makers to design appropriate strategy to improve its trade balance.

OBJECTIVES

The objectives of the study are as follows:
1. To analyse the trend, growth and composition of export and import of Bangladesh.
2. To examine the determinants of import demand of Bangladesh.

Bangladesh's Trade Policy and Growth in its Export and Import

Bangladesh, after its independence in 1971 followed a highly restricted trade policy strategy until mid 1980s. Its trade policy regime registered a major shift in mid 1980s when a policy of moderate liberalization was initiated. However, the large scale liberalization of trade was implemented in the early 1990s (Raihan, 2008). The tariff regime has been increasingly liberalized and tariff rates were drastically reduced, quotas were removed, imports were liberalized and import licensing system was abolished. The reforms also provided exporters with unrestricted and duty free access to imported inputs and easy access to credit and credit subsidies and fiscal incentives such as rebates on income taxes and concessionary duties on imported capita machinery. These measures were aimed at strengthening the institutional framework for export promotion (Rahman, 2001). The liberalization helped its economy to grow at commendable rate and reduce the incidence of poverty. Bangladesh demonstrated higher average growth during 1990s due to success of trade liberalization (Ahmed and Sattar, 2004). Raihan (2008) found that trade liberalization in Bangladesh has generated employment in major export-oriented industries.

Trend and Growth in Export and Import of Bangladesh

The trend in export and import of Bangladesh shows that after the liberalization of its economy both export and import have increased significantly. This is clearly depicted in figure 1. In 1990 both the export and import were very low. But after that both export and import have increased significantly.   For example, its export increased from just 57.89 billion Taka in 1990 to 269.15 billion Taka in 2001. It further rose to 2634.98 billion Taka in 2015. During the period 1990 to 2015, the compound annual growth rate (CAGR) of its export was 16.53 %. Its import was 124.88 billion Taka in 1990 to 465.61 billion Taka in 2001 and rose further to 3869.35 Taka in 2015. During this period its imports grew at CAGR of 15.62 % (Figure 2). The growth of export and import shows that both export and import grew at more or less similar rate during the period under review. However, its import has always been more than export during the period under review. This implies that it has always been experiencing trade deficit during this period. Moreover, its trade deficit has been widening over the years. In 1990 its trade deficit was 67 billion Taka which rose to 196.46 billion Taka in 2001. It further rose to 1050.96 billion Taka in 2011. After that its trade deficit fell to 876.27 billion Taka in 2012. It was mainly due to significant increase in exports. Its trade deficit further fell to 630.31 billion Taka in 2013 which was due to sharp fall in its import. After that its trade deficit showed increasing tendency and reached a level of 1234.37 billion Taka in 2015. The increase in trade deficit was due to much higher growth in

its import. The high growth in import value is due to import of expensive capital goods which are required for promoting its economic development. The increase in exports which mainly consists of textiles and garments and primary products could not compensate the increase in imports. As a result, its trade deficit has been widening over the years. Hence, there is need to focus on promoting exports and check imports to reduce its trade deficit and maintain external balance. In this regard, diversification of its exports and exploring of new market destination for exports may help it to increase export earnings. At the same time, imports need to be streamlined.

The analysis of trading partner of Bangladesh shows that in December 2015 in terms of exports the USA is its largest trading partner with share of 12.05 of its total exports followed by Germany (10.86 %) and United Kingdom (6.07 %). Its top ten trading partners in exports are given in the table 1. This shows that its exports destinations are located far away from its territory which may involve high transaction costs.

However, in case of imports in December 2015 its largest trading partner is China with share of 26.32 % of its total imports followed by India (11.54 %) and Singapore (10.93 %). Its top ten trading partners in imports are given in the table 2. This shows that Bangladesh depends on its neighbouring countries for its imports requirements.

Composition of Export and Import of Bangladesh

The analysis of composition of exports and import of Bangladesh showed that its exports mainly consist of readymade garments, textiles, footwear special woven fabrics etc. (Table 3). In December 2015, the ready garments accounted for 83.79 % of its total exports followed by textiles articles (2.58 %) and footwear special woven fabrics (2.32 %). In December 2016 also readymade garments accounted for 83.37 % of its total exports. The composition of exports indicates that it exports mainly consists of garments, textiles and primary products. On the other hand, the composition of its imports shows that it consists of mainly capital goods, equipment and petroleum products (Table 4).

The table 4 shows that in December 2015, the machinery and parts accounted for 9.61 % of its total imports followed by petroleum product and oil (11.37 %), electric machinery (4.39 %) and iron and steel (4.30 %). In December 2016, while the share of machinery and parts increased to 10.57 per cent of its total imports, the share of petroleum products and iron and steel increased to 11.96 per cent and 5.21 per cent respectively.

DATA AND METHODOLOGY

The study is based on time series data for the period 1990-91 to 2014-15. The required data were collected from the websites of the Bangladesh Bureau of Statistics and International Monetary Fund (IMF). The real GDP and real import were calculated by taking the base year 2005. In order to examine the growth of export and import both simple growth and compound growth rates were calculated. The review of literature showed that the important determinants of import demand are; real GDP and relative price of import. Some studies have also considered foreign exchange reserves as an important determinant of import demand along with real GDP

and relative price of import. The composition of export and import of Bangladesh revealed significant difference. It's exports mainly consist of garments, textiles and primary products while it's import consist of manufactured and capital goods. Hence, it may not be appropriate to consider relative price of as a determinant of import.

Hence, import demand model for Bangladesh has been specified as;

$$M_t = f\,(GDP_t,\ FE_t) \qquad\qquad \text{...............} \ (1)$$

Where,

M_t is real import

GDP_t is real income of the country

FE_t is foreign exchange reserves

There are different functional forms which can be use to estimate the demand function. The choice between linear and log linear model is considered important because the functional form affects the explanatory power of the variables (Sultan, 2013). The log linear model is preferred over the linear model because of certain advantages. It allows researchers to interpret coefficients of independent variables directly as elasticity with respect to the dependent variable. It is also useful in accommodating heteroscedasticity problem and also takes care of multicollinearity (Goldstein and Khan, 1976; Gafar, 1998). Hence, in this study log linear model was applied to estimate the import demand function.

The Specification of model

The long-run import demand model can be expressed as follows:

$$Ln\ M_t = \beta_0 + \beta_1\ Ln\ GDP_t + \beta_2\ Ln\ FE_t + u_t \quad \text{.............} \ (2)$$

Where u_t is the white noise error term and is normally distributed. Ln indicates the natural logarithm of the respective variables. β's is the elasticity of demand for import to respective variables.

The relationship between import demand, real GDP and foreign exchange reserves is expected to be positive. This is because theoretically demand is positively related to income and negatively related to price. Foreign exchange reserves increase the country's capacity to import. So it can exert positive impact on import demand.

Since the data used in the study are times series data, it is essential to check whether the series are stationary or non-stationary. This is because the regression of non-stationary series can produce spurious regression coefficients. If the variables are stationary, the OLS method can be used to estimate the relationship among the variables. But if the variables are non-stationary at level, data can be made stationary by taking the first difference of the data and then estimate the equation. However, this method removes the long run behavior of the data and captures only short run relationship among the variables (Sultan, 2013). In such a case, co-integration and error correction model (ECM) model is considered to be better method. The variables are said to be co-integrated if a linear combination of these variables are stationary. When the variables are co-integrated then there exists a long run stable relationship among the variables. So, vector error correction model (VEC) can be applied to capture both the short run and long-run relationship among the variables. The error correction model is presented as follows:

$$\Delta M_t = \alpha_0 + \beta ECT_{t-1} + \sum_{i=1}^{n}(b_{1i}\,\Delta M - i) + \sum_{i=1}^{n}(b_{2i}\,\Delta GDP - i) + \sum_{i=1}^{n}(b_{3i}\,\Delta FE - i) + \varepsilon_i \text{...................} \ (3)$$

The coefficient (β) of the error correction term with one period lag (ECT_{t-1}) measures the speed of adjustment to long-run

equilibrium condition. The coefficients of the first difference lagged regressors (b_{2i}, b_{3i}) give the short-run effects of the variables on the dependent variables.

The Granger causality/Wald test was conducted to examine whether the explanatory variables have a causal relation with the import.

RESULTS AND DISCUSSION

The study applied cointegration approach to examine the determinants of import demand of Bangladesh. The application of cointegration requires that all the variables should be integrated of the same order. The unit root properties of the variables were examined by applying the ADF test. The result showed that all the variables were non-stationary at level. However, the variables were stationary at first difference. The result is shown in the table 5. This implies that all the variables are integrated of order one i.e. I(1). Hence, Johansen's cointegration approach was applied to examine the presence of long-run relationship of the import with real income of the country and foreign exchange reserve.

The lag length of the variables can significantly affect the results of the cointegration and vector error correction model. Hence, it is important to select the appropriate lag length. The result of the lag order selection criteria is presented in the table 6. The result shows that majority of the criteria (sequential modified LR criteria and Akaike Information criteria) have recommended for lag order 3. Therefore, the lag length of 3 was used to obtain the results.

The study has selected intercept and trend model to examine the long-run relationship among the variables. The cointegration results are given in the table 7a and 7b. The results showed that for none both trace statistic and maximum eigen value are greater than the critical values at 5 per cent significance level. Hence, the null hypothesis that there is no cointegration relationship between the variables could not be accepted. This implies that there is a cointegrating vector among the variables included in the model. The estimates of long-run relationship are presented in the table 8.

The long-run relationship can be expressed as follows:

$$LM_t = -15.044 + 2.514LGDP + 0.085LFE$$

The results show that import has a long-run relationship with all these variables. The import was positively related to real GDP and Foreign exchange reserve (FE). The results support the theoretical prediction that income and foreign exchange reserves of the country have positive impact on its import. Among the various explanatory variables import was highly elastic to real GDP with elasticity of 2.514. This is also expected as most of the import of the country consisted of intermediate and capital goods which are needed to facilitate economic growth. The import was found to be inelastic to FOREX with coefficient of 0.085 This implies that the foreign exchange reserve does not have a significant impact on the import demand.

The short-run dynamics of among the variables was estimated by the vector error correction model. The results of the VEC model is given in the table 9. The model was found to be good with high AR-square value of 0.77. The diagnostic test (LM test) showed that there is no problem of autocorrelation. The result showed that the coefficient of the error term with one lag period was negative and significant at 1 per cent level which implied that the above long-run relationship is stable and any disequilibrium created in the short-run will be temporary and get corrected within a short period. The magnitude of the coefficient of the error term indicated that if there is any deviation in the short-run, it would take less that one year for import to return to its long-run equilibrium level. Further, in the short-run, one period lag of GDP had positive and significant impact on import. The two period lag of GDP had negative impact on import but it was not significant. The lags of FOREX had negative impact. The import was found to be more income elastic in the short-run than in the long-run. Further, the Granger Causality/Wald test (table 10) showed that all the variables Granger cause the import.

SUGGESTIONS

The above findings and discussion lead to the following policy suggestions:

1. Import of the country was found to be more elastic to real GDP. This implied that the volume of its import would continue to grow with increase in income. Therefore, it should focus on promoting exports to reduce trade balance.

2. The import was found to be inelastic to foreign exchange reserve. Hence, there is need to invest in import substitute industries to control imports and increase foreign exchange reserve.

3. Its export destinations are located in distant countries. It should explore neighbouring countries like, India and China as its new export destinations for its exports where there are large markets.

CONCLUSION

After the liberalization of economy both export and import of Bangladesh have increased significantly. The period has also witnessed comfortable growth of its GDP and foreign exchange reserve. However, its import has always been higher than its exports. In recent years the gap between import and export has widen indicating growing trade deficit. But the growth rate of export and import was almost same during 1990-2015. Against this backdrop, the study examined the determinants of merchandise import of Bangladesh by applying the Johansen's cointegration method. The demand function was estimated by taking real GDP and FOREX as explanatory variables. The cointegration results showed that there is a long-run relationship among the variables. The coefficients of the variables indicated that real GDP was the most important determinant of its import in the long-run. It was found that in the long-run import was highly elastic to real GDP of the country. The VEC model showed that if there is any deviation in import in the short-run, it would reach its long-run equilibrium within a period of less than one year. The import was more elastic to income in the short-run than in the long-run. This implies that the volume of import will grow at faster rate with increase real income and would deteriorate the country's trade balance unless accompanied by high export growth. Hence, there is a need to invest in establishing import substitute industries to control imports and promote exports to reduce trade deficit.

FIGURES AND TABLES
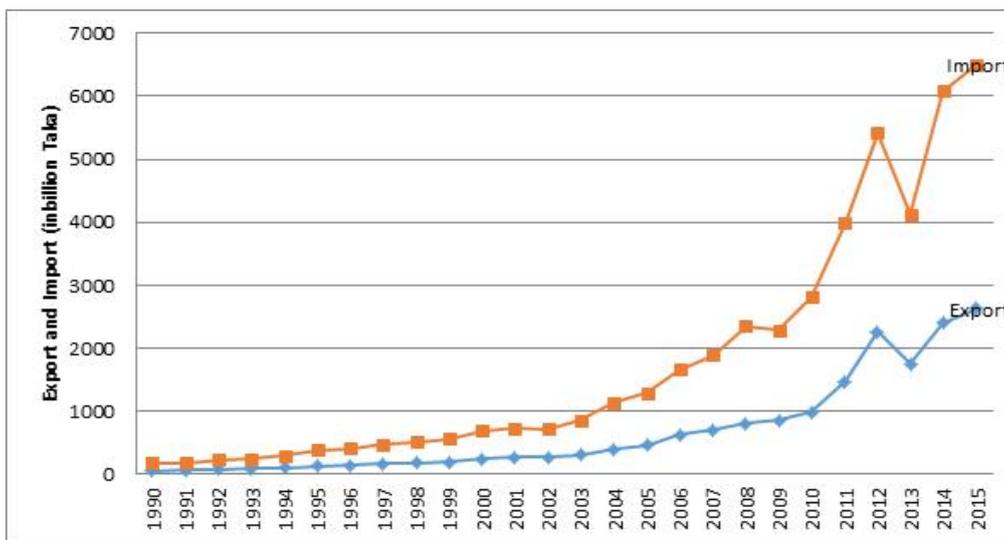
Figure 1: Trend in Export and Import of Bangladesh

Figure 2: CAGR of Export, Import, Foreign Reserves and GDP of Bangladesh during 1990 to 2015

Table 1: Top Trading Partners of Bangladesh in Export (Goods) in December 2015

Country	Percent of Total Export	Rank
USA	12.05	1
Germany	10.86	2
United Kingdom	6.07	3
France	3.74	4
Spain	3.5	*5*
Italy	3.08	6
Canada	2.12	7
Netherlands	2.07	8
Japan	1.86	9
Belgium	1.78	10

Source: Bangladesh Bureau of Statistics

Table 2: Top Trading Partners of Bangladesh in Import (Goods) in December 2015

Country	Percent of Total Import	Rank
China	26.32	1
India	11.54	2
Singapore	10.93	3
Hong Kong	5.16	4
Indonesia	3.86	5
Japan	3.06	6
Malaysia	2.81	7
Korea REP.	2.71	8
Brazil	2.65	9
Argentina	2.5	10

Source: Bangladesh Bureau of Statistics

Table 3: Composition of Bangladesh's Export

Items	Percentage share	
	Dec.2015	Dec.2016
1. Readymade Garments	83.79	83.37
2. Shrimps and prawn	1.41	1.22
3. Vegetable textiles fibre/yarn	1.72	2.21
4. Made-up textiles articles	2.58	2.97
5. Raw hides, skins & leathers	0.70	0.66
6. Raw jute	0.05	0.00
7. Footwear Special woven fabrics	2.32	2.22
8. Fertilizer	0.00	0.00
9. Hats and other head gear	0.48	0.53
10. Special woven fabrics	0.18	0.14
11. Others	6.78	6.68
1. Export (Commodities)	100.00	100.00

Source: Bangladesh Bureau of Statistics

Table 4: Composition of Bangladesh's Import

Items	Percentage share	
	Dec.2015	Dec.2016
1. Machinery & parts	9.61	10.57
2. Petroleum product and oil	11.37	11.96
3. Electric Machinery	4.39	4.90
4. Soya bean and Palm oil	4.01	5.16
5. Raw cotton	3.81	3.93
6. Textile fabrics	0.28	0.24
7. Iron and steel	4.30	5.21
8. Plastics and articles	3.65	3.51
9. Wheat	1.85	1.78
10. Fertilizer	2.52	1.35
11. Others	54.19	51.39
2. Import (Commodities)	100.00	100.00

Source: Bangladesh Bureau of Statistics

Table 5: Results of the Unit Root Test (Augmented Dickey-Fuller test)

| Variables | Test Statistic | | Order of Integration |
	At level	At First difference	
LMt	-2.689	-5.049	I(1)
LGDP	-2.095	-4.096	I(1)
LFE	-1.164	-4.466	I(1)
Critical values			
1%	-4.380	-4.467895	
5%	-3.600	-3.644963	
10%	-3.240	-3.261452	

*indicates significant at 5% level.
Lag lengths for the ADF test is chosen on the basis of the Schwarz Criteria (SIC)

Table 6: Lag Order Selection Criteria.

Lag	Log L	LR	AIC	HOIC	SBIC
0	0.385954	NA	0.307814	0.342862	0.456593
1	117.111	234.99	-9.55557	-9.41538	-8.96046*
2	129.239	24.255	-9.83987	-9.59453*	-8.79842
3	138.159	17.841*	-9.88496*	-9.48217	-8.34487
4	147.735	19.151	-9.83265	-9.42934	-7.95084

*indicates lag order selected by the criterion.

Table 7a: Results of Johansen's Cointegration Test

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE (s)	Eigen value	trace statistic	5% critical value
None*	NA	57.2344*	34.55
At most 1	0.82884	16.6357	18.17
At most 2	0.47781	1.692	3.74
At most 3	0.07093		

*denotes rejection of the hypothesis at the 0.05 level.
Trace test indicates 1 co-integrating equation (s) at the 0.05 level.

Table 7b: Unrestricted Co-integration Rank Test (Maximum Eigen Value)

Hypothesized No. of CE (s)	Eigen value	Max-Eigen Statistic	5% critical value
None*	NA	40.5987*	23.78
At most 1	0.82884	14.9437	16.87
At most 2	0.47781	1.692	3.74
At most 3	0.07093		

*denotes rejection of the hypothesis at the 0.05 level.
Max-Eigen test indicates 1 co-integrating equation (s) at the 0.05 level.

Table 8: Estimates of Long Run Co-integrating Vectors

Normalised Coefficients

variables	Coefficient	Std. Err	z	p>z
LMt	1.000			
LGDP	-2.514	0.0695726	-36.15	0.001
LFE	-0.085	0.0230281	-3.73	0.002
C	15.044			

Table 9: Result of Error Correction Model

Variables	Coefficient	Std. Err.	z	P>z
Ect-1	-1.625728	0.4813474	-3.38	0.001
ΔLMt-1	0.1889946	0.322582	0.59	0.558
ΔLMt-2	0.2693186	0.2124673	1.27	0.205
ΔLGDPt-1	10.77793	5.535743	1.95	0.052
ΔLGDPt-2	-11.79554	5.103846	-2.31	0.021
ΔLFEt-1	-0.2945543	0.1127803	-2.61	0.009
ΔLFEt-2	-0.0308865	0.1108919	-0.28	0.781
Constant	0.0116474	0.1634396	0.07	0.943

Table 10: Granger Causality/Wald Test

Equation	Excluded	F	df	Prob.>F
ΔMt	ΔGDP	8.5607	3	0.0021
ΔMt	ΔFE	4.5179	3	0.0222
ΔMt	ΔALL	6.142	3	0.0031

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