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Impacts of Trade Liberalization on Balance of Trade of Bangladesh: An Econometric Exercise

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Abstract: *The broad objective of the study is to empirically analyze the impacts of trade liberalization on trade balance of Bangladesh and to find out causal relationship between trade liberalization and export, import, balance of trade. Trade Balance is a systematic record of export and import between a country and the rest of the world in a given period of time, usually one year. Trade deficit is conventionally defined as the difference between export earnings and import payments. For estimation purpose the term 'Trade Balance' is used instead of 'Trade Deficit' and the absolute values of the trade deficits over the study period are considered. The growth trend of trade balance, stability test, stationarity test of the variables, cointegration test, model estimation by OLS, Granger Causality test, estimation of VCEM and VAR model, long run and short run elasticities of trade balance in respect of each independent variable, long run relationship between export and import are presented here. Bangladesh has been experiencing persistent trade deficit since independence. The policy makers should pay due attention to address this issue through formulation a comprehensive trade policy for the country.*

Introduction:

Trade liberalization has become the centre point of both economic researches and policy debates in many countries for economic growth and development. A number of empirical studies show positive impact of trade liberalization on trade performance and economic growth while some studies show very little or inconclusive impact of trade liberalization. Trade liberalization has been one of the major policy reforms in Bangladesh since 1980s. Bangladesh, as one of the founding member countries of WTO, started a wide range of trade liberalization programs in the mid-1980s which gained momentum in early 1990s. The major objective of trade liberalization is to shift the economy from anti-export bias to export oriented economy. The liberalization programs include various measures such as removal of major tariff and non-tariff

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barriers, reduction of import quota, reduction of tariff rates, rationalization of tariff structure, tariff escalation, incentives for exports, duty drawback system, simplification of custom procedures, export diversification programs, regional and bi-lateral trade negotiations etc. This study is intended and designed to examine the impacts of trade liberalization on exports, imports, balance of trade of Bangladesh by using both conventional statistical tools as well as modern time series econometric modeling. The broad objective of the study is to empirically analyze the impacts of trade liberalization on trade balance of Bangladesh and to find out causal relationship between trade liberalization and export, import, balance of trade.

2.0 Trade Balance of Bangladesh

The trade deficit of Bangladesh, growth rate of trade balance and trade deficit as percentage of GDP from 1972-1973 to 2008-2009 are presented in Table 1. The trade deficit was ranged from Taka 4280 million in 1973-1974 to Taka 74760 million in 1989-1990 during the pre-liberalization regime. The phenomenal trade deficits were Taka 7150 million in 1974-1975 with 67.06 per cent growth rate, Taka 14290 million in 1975-1976 with 99.86 per cent growth rate, Taka 14090 million in 1977-1978 with 136.81per cent growth rate, Taka 23980 million in 1979-1980 with 49.13 per cent growth rate and Taka 37660 million in 1981-1982 with 28.44 per cent growth rate. The trade deficits have been widen without few exceptions over the years. During the post-liberalization regime it ranged from Taka 59300 million in 1991-1992 to Taka 382400 million in 2006-2007. The trade deficits were Taka 71340 million in 1992-1993 with 20.30 per cent growth rate, Taka 103250 million in 1994-1995 with 48.20 per cent growth rate, Taka 144470 million in 1995-1996 with 39.92 per cent growth rate, Taka 176290 million in 1998-1999 with 27.84 per cent growth rate, Taka 226760 million in 2002-2003 with 25.18 per cent growth rate and Taka 382400 million in 2006-2007 with 97.52 per cent growth rate.

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Table 1: Trade Balance Bangladesh

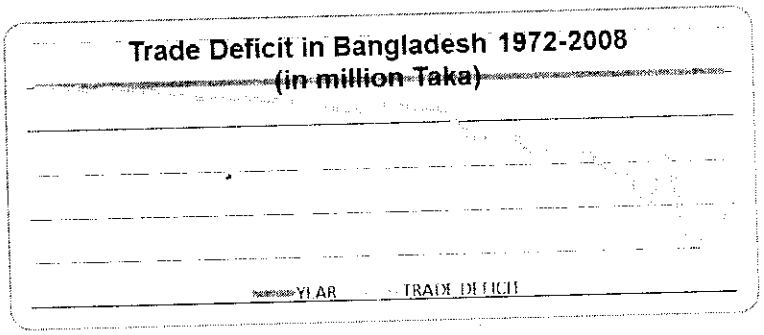
(Value in million Taka)

Regime	Fiscal Year	Trade Deficit (Export-Import) (in million Taka)	Growth Rate (%) of trade deficit	TD as % of GDP
Pre-liberalization	1972-1973	(-) 4820		-7.11
	1973-1974	(-) 4280	-11.20	-4.15
	1974-1975	(-) 7150	67.06	-4.23
	1975-1976	(-) 14290	99.86	-9.52
	1976-1977	(-) 5950	-58.36	-3.77
	1977-1978	(-) 14090	136.81	-7.13
	1978-1979	(-) 16060	13.98	-6.78
	1979-1980	(-) 23950	49.13	-8.53
	1980-1981	(-) 29320	22.42	-9.10
	1981-1982	(-) 37660	28.44	-10.41
	1982-1983	(-) 36520	-3.03	-8.94
	1983-1984	(-) 38180	4.55	-7.80
	1984-1985	(-) 43530	14.01	-7.75
	1985-1986	(-) 43480	-0.11	-6.87
	1986-1987	(-) 49620	14.12	-6.82
	1987-1988	(-) 56240	13.34	-7.03
	1988-1989	(-) 66290	17.87	-7.44
	1989-1990	(-) 74760	12.78	-7.45
Post-liberalization	1990-1991	(-) 63960	-14.45	-5.79
	1991-1992	(-) 59300	-7.29	-4.96
	1992-1993	(-) 71340	20.30	-5.69
	1993-1994	(-) 69670	-2.34	-5.15
	1994-1995	(-) 103250	48.20	-6.77
	1995-1996	(-) 144470	39.92	-8.69
	1996-1997	(-) 139760	-3.26	-7.73
	1997-1998	(-) 137900	-1.33	-6.89
	1998-1999	(-) 176290	27.84	-8.02
	1999-2000	(-) 172080	-2.39	-7.26
	2000-2001	(-) 179520	4.32	-7.08
	2001-2002	(-) 181150	0.91	-6.63
	2002-2003	(-) 226760	25.18	-7.54
	2003-2004	(-) 236760	4.41	-7.11
	2004-2005	(-) 300600	26.96	-8.11
	2005-2006	(-) 193600	-35.60	-4.66
	2006-2007	(-) 382400	97.52	-8.09
	2007-2008	(-) 380000	-0.63	-6.96
	2008-2009	(-) 323900	-14.76	-4.69

Source: BBS, Foreign Statistics of Bangladesh, various issues, GOB, Bangladesh Economic Review, various issues.

However the deficit became slightly improved in 2008-2009 when it reached Taka 323900 million with a growth rate of (-) 14.76 per cent. The trend of the trade deficits is shown in Figure 1.

Figure-1: Trade Deficit in Bangladesh



2.1 Growth Trend of Trade Balance

There are some improvements in the current account of the balance of payment but deficits in the trade balances remain permanent[1]. The Trend Growth Rate(TGR) and Compound Annual Growth Rate(CAGR) of trade balance are estimated separately for the pre-liberalization and post-liberalization regimes covering the period from 1972-1973 to 2009-2010 (Table-2). It is observed that the TGR of trade balance in the pre-liberalization regime i.e. from 1972-1973 to 1989-1990 is 17.82 per cent while the same is 10.41 per cent in the post-liberalization period i.e. from 1990-1991 to 2009-2010. The TGR for the whole study period i.e. from 1972-1973 to 2009-2010 is estimated as 11.74 per cent. It is observed that the CAGR of trade balance in the pre-liberalization regime i.e. from 1972-1973 to 1989-1990 is 8.54 per cent while the same is 11.88 per cent in the post-liberalization period i.e. from 1990-1991 to 2009-2010. The CAGR for the whole study period i.e. from 1972-1973 to 2009-2010 is estimated as 10.63 per cent. It indicates that the growth rates of trade deficit are lower in the post-liberalization period as compared the pre-liberalization regime. Therefore, it can be concluded here that the trade liberalization has positive impact on trade balance.

[1] Md. Abdur Razzaque, Balance of Payments of Bangladesh: Trends and Challenges, unpublished Ph.D. Dissertation, (Rajshahi: Institute of Bangladesh Studies, University of Rajshahi, 2008), p. 1.

Table 2: TGR and CAGR of Trade Balance

Period	Estimated Trend Regression Log(TD) = C + bT + u	TGR[1] (%)	CAGR[2](%)
Pre-liberalized 1972-1973 to 1989-1990	Log(TD) = 8.46 + 0.164T*	17.82	8.54
Post-liberalized 1990-1991 to 2009-2010	Log(TD) = 9.20 + 0.099T*	10.41	11.88
Overall 1972-73 to 2009-2010	Log(TD) = 8.92 + 0.111T*	11.74	10.63

1. TGR = [Anti-log of estimated b - 1] X 100, log means natural logarithm

2. CAGR = [Ending Value/Beginning Value]1/N - 1

3. * represents that the estimated trend coefficients are highly significant since p-values are 0.000.

Source: Estimated from Table-1.

2.2 Test of Hypothesis

Using t-test the following hypothesis is tested whether trade liberalization has positive impact on trade balance in Bangladesh.

H_0 : There is no change in trade balance between pre and post trade liberalization regime.

H_1 : There is significant positive change in trade balance between pre and post trade liberalization regime.

The t-test is performed on the basis of trend regression of the pre-liberalization and post-liberalization periods.

$$t\ 37df = (b_1 - b_2)/\sqrt{(seb_1)^2 + (seb_2)^2}$$

Here, b_1 = slope coefficient of time variable in the pre-liberalization period, b_2 = slope coefficient of time variable in the post-liberalization period, se = standard error of slope coefficient. Now the putting the values in the formula t-statistic is computed as:

$$t\ 37df = (0.037 - 0.049)/\sqrt{(0.002)^2 + (0.002)^2}$$

$$= -4.26$$

Decision: The table value of t-statistic at 37 degree of freedom is 1.65 and the absolute value of calculated t-statistic is 4.26. Since the calculated value is higher than the critical t-value so the null hypothesis H0 is rejected and the alternative hypothesis H_1 is accepted at 5 per cent significance level implying that the trade deficit is significantly decreased in the post-liberalization regime.

2.3 Improvement of Balance of Trade

A country facing with chronic trade deficit takes resort to devaluation of its own currency to boost up exports and reduce import dependency. This situation can be explained by the Marshall-Lerner(M-L) condition. The M-L condition[2] states that devaluation improves trade balance of a country and appreciation worsen it if the sum of elasticities of export demand and import demand is greater than one. Four cases[3] can be explained from the M-L condition such as :

Case One: When the elasticity of export demand is zero (EDx = 0) and elasticity of import demand is greater than one (EDm > 1) then devaluation will improve trade balance.

Case Two: When the elasticity of import demand is zero (EDm = 0) and elasticity of export demand is greater than one (EDx > 1) then devaluation will improve trade balance.

Case Three: When the elasticity of both export demand and import demand is less than one but their sum is greater than one (EDx < 1, EDm<1 but EDx + EDm > 1) then devaluation will improve trade balance.

Case Four: When the elasticity of export demand is greater than one (EDx >1) and elasticity of import demand is greater than one (EDm > 1) then devaluation will improve trade balance.

Therefore, before taking any decision on devaluation the policy makers should consider the above four cases of elasticity of export demand and the elasticity of import demand. In this study we have found that M-L condition is satisfied since the sum of elasticities of export demand and import demand is greater than one. It indicates that devaluation will improve trade balance of Bangladesh because it will increase export earning and reduce import payment at the same time.

2.4 Chow Breakpoint Test

Chow Test is conducted to find out the structural change in trade balance of Bangladesh due to the liberalization of trade.

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2 Charles P. Kindleberger. International Economics. 8th ed. (Illinois: Richard D. Irwin Inc. 1991).

3 Abdul Bayes. International Economics. (Dhaka: The Registrar, Jahangirnagar University. 1980). pp.125-128.

Table 3 : Chow Breakpoint Test: 1989

F-statistic	14.02954	Prob. F(2,33)	0.000039
Log likelihood ratio	22.76737	Prob. Chi-Square(2)	0.000011

Chow Breakpoint test is conducted based on 1989-90 and it is found (Table-3) that F-statistic is greater than F critical value at 2, 33 degree of freedom and the p-value 0,000 meaning that the null hypothesis H_0 of structural stability is rejected. Therefore, it can be concluded that there is a structural change in the trade balance of Bangladesh.

2.5 Test of Stationarity of the Variables of Trade Balance Model

The stationarity of the variables, expect the liberalization dummy, of the trade balance model is conducted by Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests both at levels and at the first difference. The test results are presented in summarized form in Table 4 and Table 5.

Table 4: Results of ADF Unit Root Test

Null Hypothesis: H_0 : The concerned variable has a unit root

Variables	Level / First Difference	Intercept	Intercept and Trend	Conclusion
LTD	Level	-4.247 (0.002)	-2.479 (0.335)	I(1) and I(0) Inconclusive
	First Difference	-6.428 (0.000)	-8.34 (0.000)	I(0) and I(0) Stationary
LREER	Level	-2.685 (0.086)	-2.162 (0.494)	I(1) and I(1) Non Stationary
	First Difference	-5.426 (0.000)	-5.413 (0.000)	I(0) and I(0) Stationary
LRGDP	Level	-0.652 (0.845)	-2.079 (0.539)	I(1) and I(1) Non-stationary
	First Difference	-6.555 (0.000)	-6.471 (0.000)	I(0) and I(0) Stationary
LTOT	Level	-2.345 (0.164)	-3.634 (0.044)	I(1) and I(0) Inconclusive
	First Difference	-5.480 (0.000)	5.442 (0.000)	I(0) and I(0) Stationary

Note: 1. ADF test Critical Values for model with intercept: -3.62 for 1% level of significance, -2.94 for 5% level of significance and -2.61 for 10% level of significance.

2. ADF test Critical Values for model with intercept and trend: -4.23 for 1% level of significance, -3.54 for 5% level of significance and -3.20 for 10% level of significance.

3. The optimum lag is selected by using SIC. Unit Root Tests are performed by Econometric Software E-Views 5.1.

Source: Estimated from Appendix-1

It is observed from the ADF test (Table 4) that most of the variables are non-stationary i.e. I(1) at the level for model with intercept and intercept and trend. But it is interesting to note that all the variables are I(0) i.e. stationary at the first differences for both models. The similar test result is found in case of Phillips-Perron test (Table 5).

Table 5 : Results of Phillips-Perron Unit Root Test
Null Hypothesis: H_0 ; The concerned variable has a unit root

Variables	Level / First Difference	Intercept	Intercept and Trend	Conclusion
LTD	Level	-2.685 (0.086)	-2.155 (0.498)	I(1) and I(1) Non Stationary
	First Difference	-10.125 (0.000)	-14.682 (0.000)	I(0) and I(0) Stationary
LREER	Level	-1.178 (0.673)	-2.188 (0.481)	I(1) and I(1) Non Stationary
	First Difference	-5.426 (0.000)	-5.410 (0.000)	I(0) and I(0) Stationary
LRGDP	Level	-0.64 (0.848)	-2.11 (0.520	I(1) and I(1) Non-stationary
	First Difference	-6.54 (0.000)	-6.46 (0.000)	I(0) Stationary
LTOT	Level	-2.968 (0.047)	-2.88 (0.178)	I(0) and I(1) Inconclusive
	First Difference	-7.198 (0.000)	-8.090 (0.000)	I(0) and I(0) Stationary

Note:
1. PP test Critical Values for model with intercept: -3.62 for 1% level of significance, -2.94 for 5% level of significance and -2.61 for 10% level of significance.
2. PP test Critical Values for model with intercept and trend: -4.23 for 1% level of significance, -3.54 for 5% level of significance and -3.20 for 10% level of significance.
3. The optimum lag is selected by using SIC. Unit Root Tests are performed by E-Views 5.1.
Source: Estimated from Appendix 1.

PP unit root test (Table 7.5) shows that most of the variables are non-stationary at the level for model with intercept and intercept and trend. But all the variables are I(0) i.e. stationary at the first differences both for model with intercept and intercept and trend.

2.6 Co-integration Test

Co-integration test is conducted to examine the existence of long run relationship among the variables of the trade balance model. Johansen and Juselius co-integration test is applied here. Two tests namely the trace test and the maximal eigenvalue test are used to determine the number of cointegrating vectors. The cointegration test results are shown in Table 6 and Table 7.

Table 6: Johansen Co-integration Test Based on Maximum Eigenvalue

Trend assumption: Linear deterministic trend

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesis		Eigenvalue	Max-Eigen Statistics	0.05% Critical Value	p-value**
Null	Alternative				
r* = 0	r = 1	0.894	78.59	33.87	0.000
r ≤ 1	r = 2	0.424	19.31	27.58	0.391
r ≤ 2	r = 3	0.313	13.15	21.13	0.438
r ≤ 3	r = 4	0.215	8.49	14.26	0.330

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Estimated from Appendix 1.

It is observed from Table 6 that only one null hypothesis of 'no co-integrating vector' is rejected at 5 per cent level of significance(maximum eigenvalue statistics is 78.59). Therefore, it can be concluded that there are long run co-integrating relationship among the variables of the model. The same result is found by trace test (Table 7).

Table 7: Johansen Co-integration Test Based on Trace Test

Trend Assumption: Linear Deterministic Trend

Unrestricted Cointegration Rank Test (Trace)

Hypothesis		Eigenvalue	Trace Statistics	0.05% Critical Value	p-value**
Null	Alternative				
r* = 0	r = 1	0.894	122.82	69.81	0.000
r ≤ 1	r = 2	0.424	44.22	47.85	0.105
r ≤ 2	r = 3	0.313	24.91	29.79	0.164
r ≤ 3	r = 4	0.215	11.76	15.49	0.168

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

It is observed from Table 7 that only one null hypothesis of 'no co-integrating vector' is rejected at 5 per cent level of significance (trace statistics is 122.82). Therefore, it can be concluded that there are long run co-integrating relationship among the variables of the model.

2.7 Long Run Cointegrated Relationship

Based on the co-integration test the long run estimates of the co-integrating vectors are presented in the Table 8.

Table 8: Long Run Co-integration Estimates of Variables

LOG(TD)	LOG(TOT)	LOG(RGDP)	LOG(REER)	LIBD
1.00	4.55	3.71	-1.59	-7.94
Standard Errors	0.649	0.506	0.585	0.588
T-statistics	7.01	5.71	2.71	13.50
Significance Level	Significant at 1%	Significant at 1%	Significant at 1%	Significant at 1%

Note: Log Likelihood 101.2528

From Table 8 it is evident that trade deficit (TD) is positively correlated with terms of trade (TOT) and real GDP (RGDP) while it is negatively correlated with real effective exchange rate (REER) and liberalization dummy (LIBD). All the estimated coefficients are found significant at 1 per cent level. The co-integrating relationship is shown in Figure 2. The curve is fluctuating but it shows the trend of long run convergence.

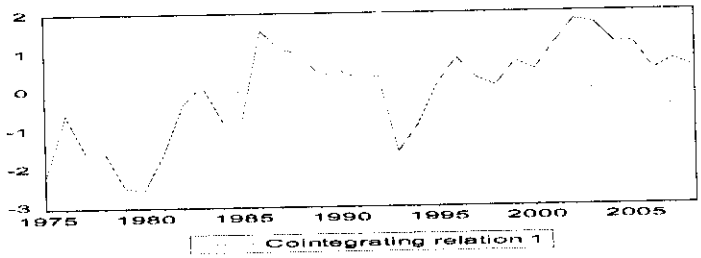


Figure 2: Co-integrating Relationship of Trade Balance Model

2.8 Causality between Variables of Trade Balance Model

The results of Granger causality test is shown in Table 9 and the direction of causality on the basis of test statistic is shown in Table 10.

Table 9: Granger Causality Test of the Trade Balance Model

Sl.	Null Hypothesis	F-Statistics	Probability
1	LOG(TOT) does not Granger Cause LOG(TD)	0.060	0.941
2	LOG(TD) does not Granger Cause LOG(TOT)	5.758	0.007
3	LOG(RGDP) does not Granger Cause LOG(TD)	0.681	0.513
4	LOG(TD) does not Granger Cause LOG(RGDP)	0.756	0.477
5	LOG(REER) does not Granger Cause LOG(TD)	0.434	0.651
6	LOG(TD) does not Granger Cause LOG(REER)	1.431	0.254
7	LIBD does not Granger Cause LOG(TD)	1.120	0.339
8	LOG(TD) does not Granger Cause LIBD	1.510	0.237
9	LOG(RGDP) does not Granger Cause LOG(TOT)	1.501	0.239
10	LOG(TOT) does not Granger Cause LOG(RGDP)	1.706	0.198
11	LOG(REER) does not Granger Cause LOG(TOT)	1.987	0.154
12	LOG(TOT) does not Granger Cause LOG(REER)	0.808	0.454
13	LIBD does not Granger Cause LOG(TOT)	1.124	0.338
14	LOG(TOT) does not Granger Cause LIBD	0.808	0.454
15	LOG(REER) does not Granger Cause LOG(RGDP)	1.810	0.181
16	LOG(RGDP) does not Granger Cause LOG(REER)	3.630	0.038
17	LIBD does not Granger Cause LOG(RGDP)	21.52	0.000
18	LOG(RGDP) does not Granger Cause LIBD	0.491	0.616
19	LIBD does not Granger Cause LOG(REER)	9.410	0.000
20	LOG(REER) does not Granger Cause LIBD	0.188	0.829

Note: Lag=2, Observation=35

Source: Estimated from Appendix-1.

It is evident from the Table 7.9 that the terms of trade has no Granger cause to trade deficit but trade deficit has granger cause to terms of trade. There are no Granger causality between real GDP and trade deficit, real effective exchange rate and trade deficit, liberalization and trade deficit, real effective exchange rate and terms of trade, liberalization and terms of trade. However, liberalization has Granger cause to Real Effective Exchange Rate and liberalization has Granger cause to GDP. Details are shown in Table 10.

Table 10: Direction of Causality Based on Granger Test

Null Hypothesis	Results	Conclusion
H_0: 1	Accepted	TOT has no Granger cause to Trade Deficit.
H_0: 2	Rejected	Trade Deficit has Granger cause to TOT.
Direction of Causality		Uni-directional, TD → TOT
H_0: 3	Accepted	GDP has no granger cause to Trade Deficit.
H_0: 4	Accepted	Trade Deficit has no Granger cause to GDP.
Direction of Causality		No casual relationship
H_0: 5	Accepted	Real Effective Exchange Rate has no Granger cause to Trade Deficit.
H_0: 6	Accepted	Trade Deficit has Granger no cause to Real Effective Exchange Rate.
Direction of Causality		No casual relationship
H_0: 7	Accepted	Liberalization has no Granger cause to Trade Deficit.
H_0: 8	Accepted	Trade Deficit has no Granger cause to Liberalization.
Direction of Causality		No casual relationship
H_0: 9	Accepted	GDP has no Granger cause to TOT.
H_0: 10	Accepted	TOT has Granger cause to GDP.
Direction of Causality		No casual relationship
H_0: 11	Accepted	Real Effective Exchange Rate has no Granger cause to TOT.
H_0: 12	Accepted	TOT has no Granger cause to Real Effective Exchange Rate.
Direction of Causality		No casual relationship
H_0: 13	Accepted	Liberalization has no Granger cause to TOT.
H_0: 14	Accepted	TOT has no Granger cause to Liberalization.
Direction of Causality		No casual relationship
H_0: 15	Accepted	Real Effective Exchange Rate has no Granger cause to GDP.
H_0: 16	Rejected	GDP has Granger cause to Real Effective Exchange Rate.
Direction of Causality		Uni-directional, GDP → REER
H_0: 17	Rejected	Liberalization has Granger cause to GDP.
H_0: 18	Accepted	GDP has no Granger cause to Liberalization.
Direction of Causality		Uni-directional, Liberalization → GDP
H_0: 19	Rejected	Liberalization has Granger cause to Real Effective Exchange Rate.
H_0: 20	Accepted	Real Effective Exchange Rate has no Granger cause to Liberalization.
Direction of Causality		Uni-directional, Liberalization → REER

Source: Table -9

3.0 Econometric Estimation of Trade Balance Model

The OLS estimation of the trade balance model is:

LRTD = -0.01 - 1.41 LTOT + 0.84LRGDP + 0.73LREER + 0.06LIBD

Table 11: OLS Estimation of Coefficients of Trade Balance Model Dependent Variable: LRTD

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.01	4.983	-0.002	0.998
LTOT	-1.41	0.342	-4.107	0.000
LRGDP	0.84	0.233	3.587	0.001
LREER	0.73	0.302	2.407	0.022
LIBD	0.06	0.278	0.224	0.824
Test Statistics				
R-squared	0.911	Mean dependent var		6.318
Adjusted R-squared	0.900	S.D. dependent var		1.133
S.E. of regression	0.357	Akaike info criterion		0.905
Sum squared resid	4.090	Schwarz criterion		1.123
Log likelihood	-11.759	F-statistic		82.502
Durbin-Watson stat	1.902	Prob(F-statistic)		0.000

Source: Estimated from Appendix-1

All estimated coefficients are in expected sign but all are not statistically significant. The R-squared (R2) of the model is very high i.e. 0.911 and adjusted-R2 is 0.900. It signifies that about 91 per cent variation in the dependent variable i.e. real trade deficit (RTD) is explained by the independent variables i.e. Terms of Trade (TOT), real GDP (RGDP) and real gross capital formation (REER). The DW statistic is 1.40. The F-statistics of the model is computed as 82.52 (Table 11). The mean of the dependent variable in logarithm is found as 6.18 and the standard deviation is 1.33. The DW statistics is 1.90, closer to 2, means that there are no presence of multicolinerality in the model.

The TOT is negatively associated to the trade imbalance (-1.41) as expected and the relationship is highly statistically significant meaning that TOT is an important determinant of Trade Imbalance. The coefficient of real GDP is positive(0.84) meaning that the trade imbalance is positively related with real GDP and the relationship is statistically significant. The coefficient of real effective exchange rate is positive meaning that the trade imbalance is positively related (0.73) with real exchange rate and the relationship is statistically significant. The coefficient of liberalization dummy is positive meaning that the trade imbalance is increased in post-liberalization regime but the relationship is not statistically significant. Since all the variables except dummy variable are taken in natural logarithm form, the estimated coefficients represent the respective elasticity of trade balance of Bangladesh. The TOT elasticity of trade imbalance is estimated at 1.41, the GDP elasticity of trade imbalance is estimated at 0.84 and the real exchange rate elasticity of trade imbalance is estimated at 0.73. The estimated coefficient of

liberalization dummy is very low (0.062) and it is not statistically significant meaning that liberalization of trade has not significant impact on the trade balance of Bangladesh.

3.1 VECM Analysis for Trade Balance Model

The estimated coefficients of VECM for trade balance model is shown in Table 12. The short run elasticity of trade balance is -0.84 with respect to its own value at one lag and it is statistically significant at 1 per cent. The short run elasticity of trade balance is -0.31 with respect to terms of trade at one lag and it is statistically significant at 1 per cent level. The short run elasticity of trade balance is -0.24 with respect to real GDP at one lag but it is not statistically significant. The short run elasticity of trade balance is 0.09 with respect to real effective exchange rate and it is statistically significant at 5 per cent level of significance. The coefficient of liberalization is -0.015 and it is not statistically significant.

Table 12: Long Run Cointegrating Estimates of Variables

Repressors	Coefficients	T-statistics	Test Statistics	
C (Intercept)	0.25	4.36	R-squared	0.696
Δ Log(TD)(1)	-0.84	-5.57	Adj. R-squared	0.583
Δ Log(TD)(-2)	-0.52	-3.49	Sum sq. resids	1.096
Δ Log(TOT)(1)	-0.31	-0.97	S.E. equation	0.213
Δ Log(TOT)(2)	-0.005	-0.016	F-statistic	6.134
Δ Log(RGDP)(1)	-0.24	-0.92	Log likelihood	10.14
Δ Log(RGDP)(2)	0.02	0.07	Akaike AIC	-0.008
Δ Log(REER)(1)	0.09	0.31	Schwarz SC	0.440
Δ Log(REER)(2)	-0.37	-1.21	Mean dependent	0.092
Δ LIBD(1)	-0.02	-0.16	S.D. dependent	0.331
Δ LIBD(2)	-0.05	-0.54	S.E. equation	0.213
EC(-1)	-0.18	-4.73	D.W	1.96

Source: Estimated from Appendix1.

The error correction term, EC at lag one, is negative (-0.18) means that any short run disequilibrium of the variables will be converged in the long run.

3.2 VAR Analysis for Trade Balance Model

The estimated coefficients of VAR for trade balance model is shown in Table 13. The elasticity coefficient of trade balance is 0.17 with respect to its own value at one lag and it is statistically significant at 5 per cent level. The elasticity coefficient of trade balance is 0.09 with respect to terms of trade at one lag and it is statistically significant at 5 per cent. The elasticity of trade balance is -0.04 with respect to real GDP at one lag but it is not statistically significant. The elasticity of trade balance is 0.62 with respect to real effective exchange rate and it is statistically

significant at 5 per cent level of significance. The coefficient of liberalization is -0.02 and it is not statistically significant.

Table 13: Results of VAR Estimates

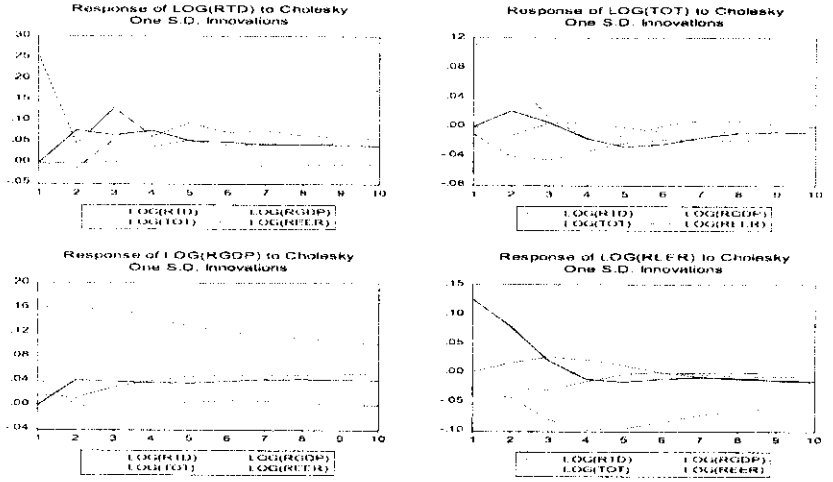
Dependent Variable: Log(TB)

Repressors	Coefficients	T-statistics	Test Statistics	
LOG(RTD(-1))	0.17	0.97	R-squared	0.948
LOG(RTD(-2))	0.42	2.64	Adj. R-squared	0.932
LOG(TOT(-1))	0.09	0.22	Sum sq. resids	1.705
LOG(TOT(-2))	-0.06	-0.16	S.E. equation	0.256
LOG(RGDP(-1))	0.04	0.15	F-statistic	59.72
LOG(RGDP(-2))	0.48	1.44	Log likelihood	3.215
LOG(REER(-1))	0.61	1.63	Akaike AIC	0.330
LOG(REER(-2))	-0.004	-0.01	Schwarz SC	0.730
C	-6.19	-1.51	Mean dependent	6.461

3.3 Impulse Responses of the variables of Trade Balance Model

The impulse responses of trade balance model in VAR are shown in Figure 3. The impulse responses imply that the variables cannot move 'too far away' from each other independently but move together. The independent variables are well responded with real trade deficit and long run convergence is established. The response of TOT to other variables is correlated and strongly convergent. In case of real GDP other variables move together and long run convergent is seen. In response of real effective exchange rate the variables move together and convergent in the long run.

Figure 3: Impulse Responses of Trade Balance Model in VAR.



Source: Appendix-I

4.0 Long Run Relationship between Export and Import

The main objective of pursuing a liberal trade policy instead of import substitution strategy since late 1980s is to achieve a competitive trade balance. The foreign exchange gap (Export minus Import) is also another concern of Bangladesh economy for development efforts. The import capacity also depends on export receipts. Though Bangladesh has been experiencing negative foreign exchange gap since independence but the gap has been fluctuating over the years. Therefore it is important to examine the long run relationship between export and import for designing appropriate policy option in the external sector.[4] Husted (2001) explored the long run relationship between exports and imports of the USA using Engle-Granger methodology[5]. Bahmani-Oskooee(1994) studied the long run relationship between export and import of Australia[6]. Dipendra Singha(1999) explored the long run relationship between export and import of Pakistan[7] with the annual data by applying Cointegration methodology. Naqvi and Morimune (2005) studied the long run convergence[8] of export and import for Pakistan using Johanson method of Cointegration. C.C. Keong et al. (2004) investigated the long run relationship between export and import of Malaysia[9] by applying multivariate cointegration technique. The main findings of most these studies reveal that trade gap is a short run phenomenon and it is convergent in the long run. In case of Bangladesh ADF and PP unit root tests and Johanson method of Cointegration are applied to examine the long run relationship between export and import using annual time series data (Figure 4).

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4 Md. Ezazul Islam and Mst. Nurnaher Begum, "The Long Run Relationship between Export and Import of Bangladesh: A Cointegration Approach", Journal of the Institute of Bankers, Bangladesh, Vol. 52(2) (Dhaka: Institutes of Bankers, 2005), p. 61.

5 S. Husted, "The Emerging US Current Deficit in the 1980s: A Cointegration Analysis", Review of Economics and Statistics, Vol. 74 (1995), pp. 159-66.

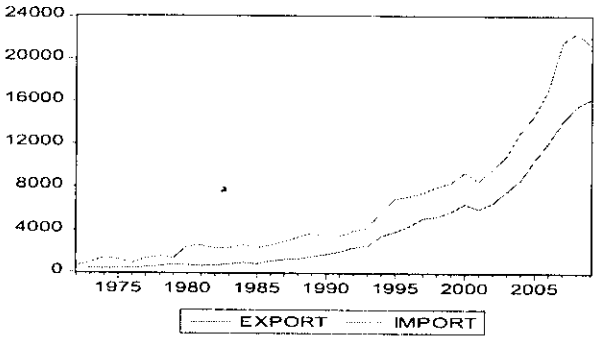
6 M. Bahmani-Oskooee, "Are Import and Export of Australia Cointegrated?", Journal of Economic Integration, Vol. 9(1994), pp. 525-33.

7 Dipendra Sinha, "The Long Run Relationship between Export and Import of Pakistan", The Indian Economic Journal, Vol. 46(3) (1999), pp. 104-09.

8 K.H. Naqvi and Kimio Morimune, "An Empirical Analysis of Sustainability of Trade Deficits", Discussion Paper No. 72, Interfaces for Advanced Economic Analysis, Kyoto University (2005).

9 C.C. Keong et al., "Are Malaysian Exports and Imports Cointegrated?", Sunway College Journal, Vol. 1(2004), pp. 29-38.

Figure 4 : Export and Import



Following the literature of export-import relationship we can specify the model as shown below:

Model 1: $M_t = \alpha + \beta X_t + u_t$; $LM_t = \alpha + vLX_t + u_t$

Model 2: $X_t = \alpha + \beta M_t + u_t$; $LX_t = \alpha + \beta LM_t + u_t$

where Mt represents import at time t, Xt stands for export at time t, ? stands for intercept, ? for slope coefficient and ut is the error term at time t. LMt represents import in log form at time t, Xt stands for export in log at time t, The co-integration method implies that if two or more series are linked to form equilibrium relationship over long run even though they are non-stationary and the first difference of the series is stationary. The first step is to test the order of integration of the variables.

4.1 Test of Stationarity of the Variables of Export-Import Model

Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests have been conducted both at levels and at the first difference of each variable of the model. The test results are presented in Table 14 and Table 15.

Table 14: Augmented Dickey-Fuller Unit Root Test

Null Hypothesis: H_0; The concerned variable has a unit root

Variables	Level / First Difference	Intercept	Intercept and Trend	Conclusion
LM	Level	-0.81 (0.803)	-4.06 (0.015)	I(1) and I(0) Inconclusive
	First Difference	-6.87 (0.000)	-6.76 (0.000)	I(0) Stationary
LX	Level	-0.49 (0.984)	-0.25 (0.292)	I(1) Non-stationary
	First Difference	-5.60 (0.000)	-5.59 (0.000)	I(0) Stationary

Note:

1. ADF test Critical Values for model with intercept: -3.62 for 1% level of significance, -2.94 for 5% level of significance and -2.61 for 10% level of significance.
2. ADF test Critical Values for model with intercept and trend: -4.23 for 1% level of significance, -3.54 for 5% level of significance and -3.20 for 10% level of significance.
3. Unit Root Tests are performed by E-Views 5.1

It is observed from the Table 14 that most of the variables are non-stationary at the level for model with intercept and intercept and trend. But all the variables are I(0) i.e. stationary at the first difference for model with intercept and intercept and trend. The similar test result is found in case of Phillips-Perron test (Table 15).

Table 15: Phillips-Perron Unit Root Test

Null Hypothesis: H_0 ; The concerned variable has a unit root

Variables	Level / First Difference	Intercept	Intercept and Trend	Conclusion
LM	Level	-0.81 (0.803)	-4.06 (0.015)	I(1) and I(0) Inconclusive
	First Difference	-6.87 (0.000)	-6.76 (0.000)	I(0) Stationary
LX	Level	-0.49 (0.984)	-0.25 (0.292)	I(1) Non-stationary
	First Difference	-5.60 (0.000)	-5.59 (0.000)	I(0) Stationary

Note:

1. PP test Critical Values for model with intercept: -3.62 for 1% level of significance, -2.94 for 5% level of significance and -2.61 for 10% level of significance.
2. PP test Critical Values for model with intercept and trend: -4.23 for 1% level of significance, -3.54 for 5% level of significance and -3.20 for 10% level of significance.
3. Unit Root Tests are performed by E-Views 5.1

It is observed from the Table 15 that most of the variables are non-stationary at the level for model with intercept and intercept and trend but all the variables are I(0) i.e. stationary at the first difference.

4.2 Co-integration Test

The co-integration test based on maximum eigenvalue and trace tests are shown in Tables 16 and 17.

Table 16 : Johansen Co-integration Test Based on Maximum Eigenvalue Test

Trend assumption: Linear deterministic trend

Hypothesis		Max-Eigen Statistics	0.05% Critical Value	p-value**
Null	Alternative			
r* = 0	r = 1	16.77	15.49	0.031
r ≤ 1	r = 2	0.138	3.84	0.709

Note: Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

*(**) denotes rejection of the hypothesis at the 5%(1%) level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Researcher's Own Calculation.

It is observed from Table 16 that only one null hypothesis of 'no co-integrating vector' is rejected at 5 per cent level of significance (maximum eigenvalue statistics is 15.49). Therefore, it can be concluded that there are long run co-integrating relationship among the variables of the model.

Table 17: Johansen Co-integration Test Based on Trace Test

Trend assumption: Linear deterministic trend

Hypothesis		Trace Statistics	0.05% Critical Value	p-value**
Null	Alternative			
r* = 0	r = 1	16.79	15.49	0.031
r ≤ 1	r = 2	0.138	3.84	0.709

Note: Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

*(**) denotes rejection of the hypothesis at the 5%(1%) level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Researcher's Own Calculation.

It is observed from Table 17 that only one null hypothesis of 'no co-integrating vector' is rejected at 5 per cent level of significance (trace statistics is 16.79). Therefore, it can be concluded that there are long run co-integrating relationship among the variables of the model. The normalized co-integrating coefficients are shown in Table 18.

Table 18 : Normalized Cointegrating Coefficients

LM	LX
1.000	-0.76 (0.029)

Source: Researcher's Own Calculation.

4.3 Pair wise Granger Causality Test

It is evident from the Table 19 that export Granger cause to import because the null hypothesis ' export does not Granger cause import' is rejected at 1 per cent level. On the other hand import does not Grange cause export is not rejected at any level of significance. It indicates that import of a country is influenced by the export.

Table 19 : Pair wise Granger Causality Test based on Model-1

Null Hypothesis: H_0	F-Statistic	Probability	Conclusion
LOG(EXPORT) does not Granger Cause LOG(IMPORT)	9.62*	0.000	H_0 is rejected meaning Export granger cause to import
LOG(IMPORT) does not Granger Cause LOG(EXPORT)	1.49	0.241	H_0 is not rejected meaning import has no granger cause to export

Source: Researcher's Own Calculation.

It is evident from the Table 20 that import does not Granger cause to export because the null hypothesis 'import does not Granger cause export' is not rejected at any level but 'export does not Grange cause import' is rejected at 1 per cent level of significance. It indicates that import of a country is influenced by the export.

Table 20: Pair wise Granger Causality Test based on Model-2

Null Hypothesis: H_0	F-Statistic	Probability	Conclusion
LOG(IMPORT) does not Granger Cause LOG(EXPORT)	1.48996	0.241	H_0 is not rejected meaning import has no granger cause to export
LOG(EXPORT) does not Granger Cause LOG(IMPORT)	10.1616	0.000	H_0 is rejected meaning export has no granger cause to import

*Significant at 1% level

Source: Table: 19.

4.4 Estimation of Export-Import Model by OLS

The OLS estimation of the Export-Import Model-1 is:

LM= 2.42 + 0.77 LX

Table 21: Regression Results of Export-Import Model-1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.42	0.191	12.64	0.000
LOG(EXPORT)	0.77	0.025	31.36	0.000
Test Statistics				
S.E. of regression	0.184	Akaike info criterion		-0.494
Sum squared resid	1.222	Schwarz criterion		-0.407
R-squared	0.964	F-statistic		983.66
Adjusted R-squared	0.963	Prob(F-statistic)		0.000
Log likelihood	11.379	Durbin-Watson stat		1.65

Source: Researcher's Own Calculation.

The R-squared (R2) of the model is very high i.e. 0.96 and adjusted-R2 is also 0.96. It signifies that about 96 per cent variation in the dependent variable i.e. import is explained by the independent variable i.e. export. The F-statistics of the model is computed as 983.66. The DW statistics is 1.65, closer to 2, means that there are no presence of multicollinearity in the model (Table 21).

The estimated coefficient of independent variable export is 0.77 and the t-statistic is 31.36. The elasticity of import with respect to export is 0.77. That means that the dependent variable import is positively associated to the independent variable and the relationship is highly statistically significant.

The OLS estimation of the Export-Import Model-2 is:

LX= -2.79 + 1.25 LM

Table 22: Estimated Export-Import Model-2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.79	0.333	-8.37	0.0000
LOG(IMPORT)	1.25	0.039	31.47	0.0000
Test Statistics				
S.E. of regression	0.232	Akaike info criterion		-0.028
Sum squared resid	1.946	Schwarz criterion		0.057
R-squared	0.964	F-statistic		990.67
Adjusted R-squared	0.963	Prob(F-statistic)		0.000
Log likelihood	2.543	Durbin-Watson stat		1.70

Source: Researcher's Own Calculation.

The R-squared (R2) of the model is very high i.e. 0.96 and adjusted-R2 is also 0.96. It signifies that about 96 per cent variation in the dependent variable i.e. import is explained by the independent variable i.e. export. The F-statistics of the model is computed as 990.67. The DW statistics is 1.70, closer to 2, means that there are no presence of multicollinearity in the model. The estimated coefficient of independent variable import is 1.25 and the t-statistic is 31.47. The elasticity of export with respect to import is 1.25. That means that the dependent variable export is positively associated with the independent variable and the relationship is highly statistically significant (Table 22).

4.5 Vector Error Correction Estimates for Export-Import Model

The estimated coefficients of VECM for export-import model is shown in Table 23. The short run elasticity of import is -1.49 with respect to its own value at one lag and it is not statistically significant. The short run

elasticity of import is -0.21with respect to export at one lag and it is statistically significant at 1 per cent level.

Table 23: Vector Error Correction Model (VECM) Estimation

Dependent Variable: ΔLM

Independent Variables	Coefficient	Std. Error	t-statistics
Δ LM(1)	-0.149	0.171	-0.869
Δ LM(2)	-0.291	0.147	-1.97**
Δ LX(1)	-0.002	0.286	-0.006
Δ LX(2)	0.252	0.272	0.928
Constant	0.097	0.048	2.04*
EC_{t-1}	-0.42	0.201	-2.07*
Test Statistic			
R-squared	0.439	Log likelihood	23.33
Adj. R-squared	0.342	Akaike AIC	-0.990
Sum sq. resids	0.540	Schwarz SC	-0.723
S.E. equation	0.136	Mean dependent	0.081
F-statistic	4.543	S.D. dependent	0.168

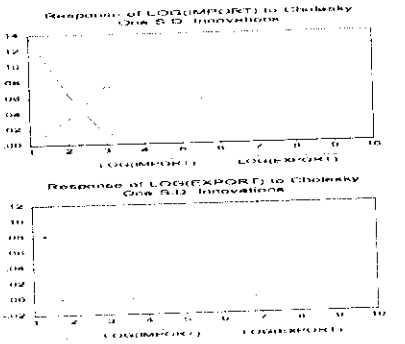
Source: Researcher's Own Calculation.

The error correction term, ECt-1, is negative(-0.42) and it is statistically significant at 5 per cent level that indicates the medium speed adjustment of short run disequilibrium to long run equilibrium.

4.6 Impulse Responses of VECM

The impulse responses of export-import model in VECM are shown in Figure 5. The impulse responses imply that the variables cannot move 'too far away' from each other independently but move together. Response of import to export shows that they move together but not closely. On the other hand response of export to import shows they move together but in a very divergent way.

Figure 5| Impulse Responses of VECM for Export-Import Model



4.7 Vector Error Correction Estimates for Export-Import Model

The estimated coefficients of VAR for export-import model is shown in Table 24. The elasticity coefficient of import is 0.36 with respect to its own value at one lag and it is statistically significant at 5 per cent level. The elasticity coefficient of import is 0.45 with respect to export at one lag and it is statistically significant at 5 per cent.

Table 24 : Vector Autoregression Estimates

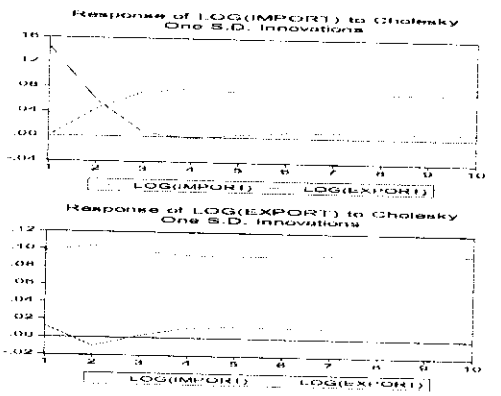
Variables	LOG(IMPORT)	Std. Error	t-statistics
C	1.884816	0.47860)	3.93
LOG(IMPORT(-1))	0.363297	(0.17972)	2.02
LOG(IMPORT(-2))	-0.076416	0.14866)	-0.51
LOG(EXPORT(-1))	0.453832	0.25479)	1.78
LOG(EXPORT(-2))	0.091484	0.28785	0.31
	Test Statistic		
R-squared	0.977273	Log likelihood	21.23964
Adj. R-squared	0.974341	Akaike AIC	-0.902202
Sum sq. resids	0.647693	Schwarz SC	-0.682269
S.E. equation	0.144545	Mean dependent	8.441917
F-statistic	333.2611	S.D. dependent	0.902369

Source: Researcher's Own Calculation.

4.8 Impulse Responses of VAR for Export-Import Model

The impulse responses of export-import model in VAR are shown in Figure 6. The impulse responses imply that the variables cannot move 'too far away' from each other independently but move together. Response of import to export shows that they move together but not closely. On the other hand response of export to import shows they move together but in a very divergent way.

Figure 6: Impulse Responses of VAR for Export-Import Model



5.0 Conclusion

This paper analyses the impacts of trade liberalization on trade balance in Bangladesh. There are some improvements in the current account of the balance of payment but deficits in the trade balances remain permanent. The growth rates of trade deficit are lower in the post-liberalization period as compared the pre-liberalization regime. Chow Test result shows there is a structural change in the trade balance of Bangladesh due to trade liberalization. The short run elasticity of trade balance is -0.24 with respect to real GDP at one lag but it is not statistically significant. The short run elasticity of trade balance is 0.09 with respect to real effective exchange rate and it is statistically significant at 5 per cent level of significance. The coefficient of liberalization is -0.015 and it is not statistically significant. The error correction term, EC at lag one, is negative (-0.18) means that any short run disequilibrium of the variables will be converged in the long run. The policy makers should pay due attention to address this issue through formulation a comprehensive trade policy for the country.

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Appendix-1

Trade Balance, Terms of Trade, Real Effective Exchange, CPI of Bangladesh.

Year	TD (Million Taka)	TOT (1995 -96 = 100)	RGDP (million Taka)	REER 1995 -96 = 100)	CPI 1995 -96 = 100)	RTD (million Taka)
1972 -73	4820	261.83	19081	90.00	96.20	50.10
1973 -74	4280	232.64	28993	100.00	103.45	41.37
1974 -75	7150	183.17	27808	114.00	104.60	68.36
1975 -76	14290	167.19	29382	90.00	117.60	121.51
1976 -77	5950	154.29	30167	101.00	120.30	49.46
1977 -78	14090	155.21	32301	138.00	92.45	152.41
1978 -79	16060	173.67	33852	156.00	103.24	155.56
1979 -80	23950	207.41	3413 0	137.00	115.42	207.50
1980 -81	29320	161.74	35288	146.00	116.54	251.59
1981 -82	37660	124.72	35722	155.00	98.90	380.79
1982 -83	36520	101.40	37470	170.00	95.35	383.01
1983 -84	38180	119.04	39503	178.00	98.70	386.83
1984 -85	43530	127.74	40693	172.00	87.65	496.63
1985 -86	43480	82.49	42459	145.00	79.64	545.96
1986 -87	49620	81.23	44234	170.00	88.96	557.78
1987 -88	56240	88.52	45513	155.00	96.43	583.22
1988 -89	66290	100.06	46661	163.00	100.45	659.93
1989 -90	74760	98.26	49753	162.00	95.90	779.56
1990 -91	63960	102.38	51444	151.00	97.45	656.34
1991 -92	59300	86.41	53619	179.00	93.87	631.72
1992 -93	71340	106.16	145568	140.00	84.09	848.38
1993 -94	69670	97.64	151514	120.00	86.85	802.19
1994 -95	103250	99.72	158976	88.00	94.55	1092.01
1995 -96	144470	100.00	166 324	75.00	100.00	1444.70
1996 -97	139760	94.66	175285	90.00	103.39	1351.77
1997 -98	137900	96.51	184448	88.00	110.61	1246.72
1998 -99	176290	93.63	193429	76.00	120.94	1457.66
1999 -00	172080	92.77	204928	78.00	124.31	1384.28
2000 -01	179520	88.35	215735	65.00	126.72	1416.67
2001 -02	181150	84.11	225261	55.00	130.26	1390.68
2002 -03	226760	80.01	237101	62.00	135.97	1667.72
2003 -04	236760	82.36	251968	67.00	143.90	1645.31
2004 -05	300600	81.14	266975	70.00	153.23	1961.76
2005 -06	193600	80.60	284673	72.00	164.21	1178.98
2006 -07	382400	81.53	302971	76.00	176.06	2171.99
2007 -08	380000	71.26	321726	90.00	193.54	1963.42
2008 -09	323900	68.20	340197	85.00	206.64	1567.46

Source: IMF, International Financial Statistics (various issues).GOB, Bangladesh Economic R eview (various issue). Bangladesh Bank, Economic Trends (various issues).