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Impact of Exchange Rate Depreciation on Export of Bangladesh: An ARDL (Autoregressive Distributed Lag) Model

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Abstract: *This paper is to examine the impact of depreciation of exchange rate on export of Bangladesh. An Autoregressive Distributed Lag Model (having lags of both dependent and independent variables) has been used to test this. From the analysis it has been found that depreciation at some lags has positive impact on export. But current-period depreciation has negative impact on export (this result goes with the findings of Fang, Lai, Miller, 2005 & Fang, Miller, 2004 where they showed that too much fluctuation in exchange rate might have offset the growth in export generated by depreciation). However, both the relations are statistically significant. These findings somehow go with the celebrated J-curve effect which points out deterioration before an improvement in a country's trade balance resulting from a depreciation or devaluation. So in Bangladesh depreciation might not be a correct choice if we want to increase export within a short span of time. This analysis also shows that the income of the consumers of our exportable does not have significant effect on our export i.e. our export is income inelastic.*

Key Words: *Export, Exchange Rate Depreciation, ARDL, Foreigners' Income.*

Introduction and Justification of the study:

One of the merits, the advocates of depreciation commonly put forward is its contribution to increase export. In fact in the era of devaluation the authority in Bangladesh used to place export as one of the foremost reasons of devaluing taka against US$. Intuitively depreciation is expected to be more free and frequent under free-floating exchange rate regime than under managed floating regime. Thus export has become an effective tool for the advocates of free floating as they find such regime

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help more export via more depreciation. According to theory depreciation lowers the foreign price of our exportable. Given that the demand of our exportable to the foreigners is price elastic, depreciation may be able to increase total volume of export. However empirical findings are clearly divided in results: some have found positive impact of depreciation on export (**Thapa,** 2002) while the others have found negative or no impact of depreciation on export (**Fang & Miller,** 2004). Literature based on Bangladesh context has also shown two types of results (**Hossain,** 2000). The results vary due to economy and time period being concerned, methodology applied etc. Bangladesh has recently introduced free-floating exchange rate system[1] .Bangladesh's export pattern has also been changed from traditional items to non-traditional items like RMG, frozen foods etc. All these require a fresh insight look into the depreciation-export relation of Bangladesh. Here we shall see the impact of depreciation at two consecutive financial years on the export of their next calendar year i.e. we shall see the impact of depreciation at (suppose) FY 95/96 & 96/97 on the export of calendar year 1997. This is mainly because of the pattern of available data and this relation is not less logical.

Literature Review

Fang.W; Lai.Y & Miller.S.M (2005) analyzed the relation between exchange Rate depreciation and export in 8 Asian countries namely Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand. He found that depreciation encourages export in most of the countries though its contribution to export growth is weak. He further pointed out that export growth due to depreciation might be offset by exchange rate fluctuation.

Fang.W. & Miller.S.M. (2004) showed that in Singapore depreciation doesn't significantly improve export but exchange rate risk (generated by fluctuation) significantly impedes export. They suggested that Singaporean policy makers could better promote export growth by stabilizing the exchange rate rather than generating its depreciation.

Thapa.B.N (2005) analyzing the data of Nepal found that depreciation of real exchange rate enhance international competitiveness of domestic good and boosts net export.

[1] From 31st May, 2003

Hossain, A.(2000) analyzing the data of Bangladesh between the period 1976-1996 showed that our exports have high- price elasticities and devaluation may be effective in raising export earnings.

Export Performance of Bangladesh.

Overall export performance since independence is shown in table- 1.

Table- 1

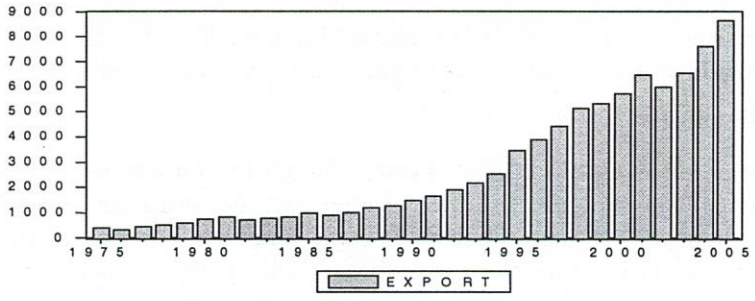
Periods	Average annual growth rate of export	Percentage share of Export in GDP
73/74-79/80	11.93%	0.80%
80/81-84/85	5.19%	1.7%
85/86-89/90	12.22%	3.1%
90/91-94/95	18.34%	6.4%
95/96-99/2000	10.72%	12%
2000/01-04/05	10.20%	17%

Notes: Calculation based on various issues of Economic Trends, Published by Bangladesh Bank.

The table shows export's share in GDP has impressively increased over the years. Export's contribution to GDP has been increased to 20% in 2004/05 from less than 1% in 1972/73.

The average annual growth rate of export stuck at around 10% for last 10 years after a boom during early nineties especially in FY1994/95.

The chart below shows the increase in export in million US$ over the years.



It is seen from the graph that during early nineties the increment in export is at increasing rate but later it increases at a decreasing rate which is also supported from Table-1.

Since independence Bangladesh export has also gone through changes in its structure and composition. Right from beginning manufactures have dominated over primary goods and this dominance has increased over times. While in 1972-75 62% of export was comprised of manufactures, by 1992-93 the share of manufactures had risen to 79%. (Nath,1995). In FY2005/06 the share of manufactures in total export reaches 93%. (Manufactures 9753.46 mill $ and primary goods 772.70 million $).

An important aspect of the transformation of the pattern of exports that has taken place in recent years is the vastly increased contribution made to export earnings by non-traditional items especially by RMG (readymade garments). In 1972-75, 95% of exports were of traditional items. Their share declined sharply in the eighties and by 1992-93 traditional items accounted for no more than 26% of total exports.(Nath,1995). At present RMG alone accounts for 74.16% of total export while frozen foods, jute goods, leather and raw jute contribute 4.86%, 3.55%, 2.55% and 1.11% respectively[2].

Since late seventies EEC & North America (USA & Canada) have been major destinations of our exports. In 1991-92, 76% of exports went to these two key markets (Nath,1995). Bangladesh at present is exporting to 173 countries of the global market of which EU region alone accounts for 53.40% and American region accounts for 32.29%[3].

Methodology:

(A) **Data :**Data on considered variables are collected from secondary sources and for one variable(Foreigners' Income) data are calculated or generated from secondary sources and all are given in appendix

(B) **Diagnostic Tests:**

1. Unit Root & co integration Test: Unit root test is carried out on all the series using Augmented Dicky-Fuller. All the series are tested first with intercept, then with intercept & trend, and then with none. Lag has been chosen as per rule $3\sqrt{n}$(cubic root n), which here is approximately

[2] Source- Export Promotion Bureau(EPB),Bangladesh

[3] Source- Export Promotion Bureau(EPB),Bangladesh

3. All the series have been found non-stationary at level (App-2). Running non-stationary series using OLS may produce spurious regression. However if the series are cointegrated i.e. if they have long run equilibrium relationship then the OLS method can be used. Johansen cointegration test has been performed, once with the assumption that the series have (unrestricted) deterministic trend and then with the assumption that the series have no (unrestricted) deterministic trend, to examine whether the series have cointegration. Both trace and maximum-eigen value confirmed one cointegrated relation among the variables at both 1% & 5% level of significance. (Appendix-3)

2. Heteroskedasticity Test: White's Heteroskedasticity Test has been performed and has been satisfied in favor of having no Heteroskedasticity problem. (Appendix-4)

3. Serial Correlation Test: Breusch-Godfrey Serial Correlation LM Test has been performed and found no problem of serial correlation. (Appendix-5)

(C) Model Specification

Like demand for anything, demand for export also depends on income and relative price of exportable. Symbolically,

$$exp = f(Y^F, P/P^C) \qquad (1)$$

Where

exp = Export.

Y^F = Foreigners' Income.

P = Price index of our exportable.

P^C = Price index of exportable of compositing countries.

However, due to data constraints we shall use nominal exchange rate as a proxy of relative prices (P/P^C).Depreciation shall mean decrease in foreign price of our exportable.

$$exp = f(Y^F, e) \qquad (2)$$

Where,

e = Nominal Exchange Rate of Taka per US$

Here Foreigners' Income is defined as weighted average of output (GDP) of the countries(USA, UK, Germany, Belgium, Canada, Italy, Netherlands, Japan) in which Bangladesh mainly exports.

Weight has been given as the respective country's share in the total export to these countries.

Theory says export is positively related to both Y^F and e.

By Log-linearising equation (2) we form following ARDL model.

$$logexp_t = \theta_1 loge_t + \theta_2 loge_{t-1} + \theta_3 logY^F_t + \theta_4 logY^F_{t-1} + \theta_5 logexp_{t-1} + \varepsilon_t \quad (3)$$

Where ε_t is an error term which is assumed to be normally distributed and of mean zero.

Results & Interpretation:

We shall estimate Equation (–3) by OLS method using annual data between the period 1976-2005. Data on GDP of the countries and export have been retrieved from www.imfstatistics.org and data on NER have been taken from Bangladesh Economic Review (Bangladesh Orthonoitik Shomikkha). The results are summarized in the following table[4].

Dependent Variable: log (Export).

Variables	coefficient
$loge_t$	-1.464117 (-3.805631)*
$loge_{t-1}$	1.654485 (3.277307)*
$logY^F_t$	-0.984224 (-0.632691)
$logY^F_{t-1}$	0.756925 (0.629584)
LOG(EXPORT(-1))	0.952430 (6.513538)*
C	0.887018
R-squared	0.994112
Durbin-Watson stat	2.650299
F-statistic	776.6033

(1) Figures within bracket show t-ratios.
(2) * indicates significant at 1% level.

Export is negatively related to exchange rate at current period but positively related to the exchange rate at one-period lag. Both the relation is significant at 1% level. The reason, why improvement in export following depreciation takes some time, is that export contract are usually made much before and it is the then exchange rate and not the current exchange rate that plays role. This also somehow goes with

the celebrated J-curve effect that says the improvement of trade balance (generated from increase in export and decrease in import) kicks off not immediately but after some period of depreciation.

However, foreign income is not a significant determinant of our export though it positively affects our export. This is also well understandable as the importers of our exportable spend very little of their total income on our goods and thus our exportable are income inelastic.

Conclusion:

As already mentioned, one of the reasons of allowing depreciation is to enhance export. But according to this analysis the result should be expected after certain period. According to this model for 1% depreciation of taka in previous period is able to increase 1.65% export in current period but a 1% depreciation of taka in current period decreases export by 1.46% in current period. However it is not export but overall trade balance that should be concerned with more importance. And for the overall improvement of trade balance, import should also be curbed (which is also expected as a result of depreciation) along with increase in export.

References

Fang, W. and Miller, S. M. (2004), Exchange Rate Depreciation and Exports: The Case of Singapore Revisited. http//www.unlv.edu/faculty/similar/Singapore revisited

Fang, W. and Miller, S. M. & Lai. Y (2005), Export Promotion through Exchange Rate Policy: Exchange Rate Depreciation or Stabilization?
http//www.unlv.edu/faculty/smiller.

Thapa, N.B (2002), An Econometric Analysis of the impact of Real Effective Exchange Rate on Economic Activities in Nepal.
http//www.nrb.org.np/red/publication/EconomicReview

Hossain,A.(2000), Exchange Rates, Capital Flows and International Trade.(The Case of Bangladesh). The University Press Limited

Mia, A. H. and Ullah, M. S (2005), Balance of Payments of Bangladesh: An Analysis of Trade Balance and Current Account Balance with Respect to Currency Devaluation.
http//www.icmab.org.bd

Nath. M. C. (1995), The Export Performance of Bangladesh. Grieve. R. H & Huq. M (ed.) Bangladesh Strategies for Development. University Press Limited, Dhaka.

Appendix

Appendix -1 (E-views Result Sheet)

Dependent Variable: LOG(EXPORT)

Method: Least Squares

Date: 08/01/07 Time: 22:50

Sample(adjusted): 1977 2005

Included observations: 29 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(NER)	-1.464117	0.384724	-3.805631	0.0009
LOG(NER(-1))	1.654485	0.504831	3.277307	0.0033
LOG(YF)	-0.984224	1.555616	-0.632691	0.5332
LOG(YF(-1))	0.756925	1.202262	0.629584	0.5352
LOG(EXPORT(-1))	0.952430	0.146223	6.513538	0.0000
C	0.887018	2.305549	0.384732	0.7040

R-squared	0.994112	Mean dependent var	7.622472
Adjusted R-squared	0.992832	S.D. dependent var	0.938488
S.E. of regression	0.079459	Akaike info criterion	-2.045172
Sum squared resid	0.145214	Schwarz criterion	-1.762283
Log likelihood	35.65499	F-statistic	776.6033
Durbin-Watson stat	2.650299	Prob(F-statistic)	0.000000

Appendix -2 (Unit Root Test)

Method of analysis: A greater ADF test statistic than critical value(s) will indicate the presence of unit root.

Series-Export (with intercept)

ADF Test Statistic	2.069443	1% Critical Value*	-3.7076
		5% Critical Value	-2.9798
		10% Critical Value	-2.6290

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXPORT)

Method: Least Squares

Date: 08/01/07 Time: 23:37

Sample(adjusted): 1980 2005

Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXPORT(-1)	0.097014	0.046879	2.069443	0.0510
D(EXPORT(-1))	0.012948	0.249558	0.051883	0.9591
D(EXPORT(-2))	-0.142529	0.253100	-0.563135	0.5793
D(EXPORT(-3))	0.086550	0.266528	0.324729	0.7486
C	49.86779	114.3712	0.436017	0.6673

R-squared	0.335029	Mean dependent var	328.1012
Adjusted R-squared	0.208368	S.D. dependent var	389.1350
S.E. of regression	346.2277	Akaike info criterion	14.70311
Sum squared resid	2517346.	Schwarz criterion	14.94505
Log likelihood	-186.1405	F-statistic	2.645086
Durbin-Watson stat	1.920149	Prob(F-statistic)	0.062281

Series-Export (with intercept & trend)

ADF Test Statistic	-0.159257	1% Critical Value*	-4.3552
		5% Critical Value	-3.5943
		10% Critical Value	-3.2321

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXPORT)

Method: Least Squares

Date: 08/01/07 Time: 23:39

Sample(adjusted): 1980 2005

Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXPORT(-1)	-0.014727	0.092471	-0.159257	0.8751
D(EXPORT(-1))	0.001350	0.244314	0.005526	0.9956
D(EXPORT(-2))	-0.179737	0.249076	-0.721613	0.4789
D(EXPORT(-3))	-0.004190	0.268804	-0.015586	0.9877
C	-229.6959	229.9518	-0.998887	0.3298
@TREND(1976)	39.27360	28.22096	1.391646	0.1793

R-squared	0.393736	Mean dependent var	328.1012
Adjusted R-squared	0.242170	S.D. dependent var	389.1350
S.E. of regression	338.7552	Akaike info criterion	14.68761
Sum squared resid	2295102.	Schwarz criterion	14.97794
Log likelihood	-184.9389	F-statistic	2.597790
Durbin-Watson stat	1.952409	Prob(F-statistic)	0.057489

Series-Export (with none)

ADF Test Statistic	2.363012	1% Critical Value*	-2.6560
		5% Critical Value	-1.9546
		10% Critical Value	-1.6226

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXPORT)

Method: Least Squares

Date: 08/01/07 Time: 23:40

Sample(adjusted): 1980 2005

Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXPORT(-1)	0.103355	0.043738	2.363012	0.0274
D(EXPORT(-1))	0.024417	0.243557	0.100252	0.9211
D(EXPORT(-2))	-0.126065	0.245617	-0.513258	0.6129
D(EXPORT(-3))	0.112640	0.254899	0.441901	0.6629

R-squared	0.329010	Mean dependent var	328.1012
Adjusted R-squared	0.237511	S.D. dependent var	389.1350
S.E. of regression	339.7951	Akaike info criterion	14.63520
Sum squared resid	2540135.	Schwarz criterion	14.82875
Log likelihood	-186.2576	Durbin-Watson stat	1.918880

Series-NER (with intercept)

ADF Test Statistic	0.190889	1% Critical Value*	-3.7076
		5% Critical Value	-2.9798
		10% Critical Value	-2.6290

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(NER)

Method: Least Squares

Date: 08/01/07 Time: 23:42

Sample(adjusted): 1980 2005

Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NER(-1)	0.004163	0.021810	0.190889	0.8504
D(NER(-1))	0.421813	0.216042	1.952459	0.0643
D(NER(-2))	-0.388019	0.218064	-1.779381	0.0897
D(NER(-3))	0.162530	0.224761	0.723125	0.4776
C	1.282825	0.739652	1.734363	0.0975

R-squared	0.198913	Mean dependent var	1.776538
Adjusted R-squared	0.046325	S.D. dependent var	1.243347
S.E. of regression	1.214206	Akaike info criterion	3.397099
Sum squared resid	30.96023	Schwarz criterion	3.639041
Log likelihood	-39.16229	F-statistic	1.303598
Durbin-Watson stat	1.937777	Prob(F-statistic)	0.300881

Series-NER (with intercept & trend)

ADF Test Statistic	-2.820425	1% Critical Value*	-4.3552
		5% Critical Value	-3.5943
		10% Critical Value	-3.2321

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(NER)

Method: Least Squares

Date: 08/01/07 Time: 23:43

Sample(adjusted): 1980 2005

Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NER(-1)	-0.513920	0.182214	-2.820425	0.0106
D(NER(-1))	0.657912	0.203995	3.225131	0.0042
D(NER(-2))	-0.162116	0.204186	-0.793963	0.4365
D(NER(-3))	0.486248	0.224681	2.164168	0.0427
C	4.834504	1.396973	3.460700	0.0025
@TREND(1976)	0.850309	0.297459	2.858578	0.0097

R-squared	0.431278	Mean dependent var	1.776538
Adjusted R-squared	0.289097	S.D. dependent var	1.243347
S.E. of regression	1.048328	Akaike info criterion	3.131445
Sum squared resid	21.97985	Schwarz criterion	3.421775
Log likelihood	-34.70879	F-statistic	3.033313

Series-NER (with none)

ADF Test Statistic	1.910585	1% Critical Value*	-2.6560
		5% Critical Value	-1.9546
		10% Critical Value	-1.6226

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(NER)

Method: Least Squares

Date: 08/01/07 Time: 23:43

Sample(adjusted): 1980 2005

Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NER(-1)	0.030849	0.016147	1.910585	0.0692
D(NER(-1))	0.512276	0.219010	2.339056	0.0288
D(NER(-2))	-0.388693	0.227798	-1.706306	0.1020
D(NER(-3))	0.178595	0.234595	0.761294	0.4546

R-squared	0.084167	Mean dependent var	1.776538
Adjusted R-squared	-0.040720	S.D. dependent var	1.243347
S.E. of regression	1.268409	Akaike info criterion	3.454041
Sum squared resid	35.39493	Schwarz criterion	3.647595
Log likelihood	-40.90254	Durbin-Watson stat	1.905377

Series-YF (with intercept)

ADF Test Statistic	1.773964	1% Critical Value*	-3.7076
		5% Critical Value	-2.9798
		10% Critical Value	-2.6290

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(YF)

Method: Least Squares

Date: 08/01/07 Time: 23:44

Sample(adjusted): 1980 2005

Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
YF(-1)	0.029112	0.016411	1.773964	0.0906
D(YF(-1))	0.220114	0.220016	1.000445	0.3285
D(YF(-2))	-0.090650	0.222514	-0.407391	0.6878
D(YF(-3))	-0.252645	0.221585	-1.140173	0.2671
C	-0.027462	1.068860	-0.025693	0.9797

R-squared	0.254770	Mean dependent var	2.039231
Adjusted R-squared	0.112822	S.D. dependent var	1.158464
S.E. of regression	1.091159	Akaike info criterion	3.183399
Sum squared resid	25.00318	Schwarz criterion	3.425341
Log likelihood	-36.38419	F-statistic	1.794810
Durbin-Watson stat	1.944410	Prob(F-statistic)	0.167615

Series-YF (with intercept & trend)

ADF Test Statistic	-2.650311	1% Critical Value*	-4.3552
		5% Critical Value	-3.5943
		10% Critical Value	-3.2321

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(YF)

Method: Least Squares

Date: 08/01/07 Time: 23:46

Sample(adjusted): 1980 2005

Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
YF(-1)	-0.264783	0.099906	-2.650311	0.0154
D(YF(-1))	0.217789	0.187788	1.159763	0.2598
D(YF(-2))	0.007257	0.192756	0.037651	0.9703
D(YF(-3))	-0.143982	0.192629	-0.747457	0.4635
C	12.41456	4.285967	2.896561	0.0089
@TREND(1976)	0.629111	0.211747	2.971052	0.0076
R-squared	0.482967	Mean dependent var		2.039231

Series-YF(with none)

ADF Test Statistic	3.300965	1% Critical Value*	-2.6560
		5% Critical Value	-1.9546
		10% Critical Value	-1.6226

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(YF)

Method: Least Squares

Date: 08/01/07 Time: 23:46

Sample(adjusted): 1980 2005

Included observations: 26 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
YF(-1)	0.028758	0.008712	3.300965	0.0033
D(YF(-1))	0.220651	0.213990	1.031127	0.3137
D(YF(-2))	-0.090732	0.217379	-0.417392	0.6804
D(YF(-3))	-0.252293	0.216079	-1.167593	0.2555

R-squared	0.254747	Mean dependent var	2.039231
Adjusted R-squared	0.153122	S.D. dependent var	1.158464
S.E. of regression	1.066088	Akaike info criterion	3.106507
Sum squared resid	25.00397	Schwarz criterion	3.300061
Log likelihood	-36.38460	Durbin-Watson stat	1.944639

Appendix -3 (Co integration Test)

With Linear Deterministic Trend

Date: 08/01/07 Time: 23:49

Sample(adjusted): 1980 2005

Included observations: 26 after adjusting endpoints

Trend assumption: Linear deterministic trend

Series: EXPORT NER YF

Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.653451	41.59810	29.68	35.65
At most 1	0.416164	14.04506	15.41	20.04
At most 2	0.002057	0.053531	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 1 cointegrating equation(s) at both 5% and 1% levels

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.653451	27.55304	20.97	25.52
At most 1	0.416164	13.99153	14.07	18.63
At most 2	0.002057	0.053531	3.76	6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 1 cointegrating equation(s) at both 5% and 1% levels

With No Determinestic Trend

Date: 08/01/07 Time: 23:54

Sample(adjusted): 1980 2005

Included observations: 26 after adjusting endpoints

Trend assumption: No deterministic trend

Series: EXPORT NER YF

Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.625939	40.50960	24.31	29.75
At most 1 *	0.301082	14.94286	12.53	16,31
At most 2 *	0.194671	5.629104	3.84	6.51

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Trace test indicates 3 cointegrating equation(s) at the 5% level
Trace test indicates 1 cointegrating equation(s) at the 1% level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None **	0.625939	25.56674	17.89	22.99
At most 1	0.301082	9.313755	11.44	15.69
At most 2 *	0.194671	5.629104	3.84	6.51

*(**) denotes rejection of the hypothesis at the 5%(1%) level
Max-eigenvalue test indicates 1 cointegrating equation(s) at both 5% and 1% levels

Appendix -4: Heteroskedasticity test

Method of Analysis: An insignificant Obs*R-squared value will reject the presence of heteroskedasticity problem.

White Heteroskedasticity Test:

F-statistic	0.815965	Probability	0.618146
Obs*R-squared	9.045604	Probability	0.527781

Appendix -4: Serial correlation test

Method of Analysis: An insignificant Obs*R-squared value will reject the presence of serial correlation.

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.994125	Probability	0.147316
Obs*R-squared	6.677175	Probability	0.082931

Data (Annual:1976-2005)

Export is in million Dollar. (source:www.imfstatistics.org)

NER = Tk. Per US$ (source: Bangladesh Orthonoitik Shomikkha.)

YF= Weighted average of GDP of the selected countries; Index number(2000=100) (source:www.imfstatistics.org)

EXPORT	NER	YF
399.2900	15.05000	51.60000
476.4400	15.43000	53.31000
549.2600	15.12000	55.60000
655.5900	15.22000	57.28000
793.2300	15.49000	57.40000
790.4700	16.26000	57.84000
768.4400	20.07000	57.58000
723.9400	23.80000	59.41000
931.7400	24.94000	62.09000
999.4600	25.96000	64.28000
880.0000	29.88000	66.35000
1076.880	30.63000	68.55000
1291.020	31.24000	71.53000
1304.770	32.14000	73.80000
1672.400	32.92000	75.44000
1688.660	35.68000	76.69000
2097.870	38.15000	75.86000
2544.670	39.13000	79.45000
2934.410	40.00000	82.40000
3733.290	40.20000	84.97000
4009.290	40.84000	87.20000
4839.910	42.70000	90.21000
5141.450	45.46000	93.07000
5458.280	48.06000	96.41000
6399.170	50.31000	100.0000
6084.730	53.96000	101.3800
6102.360	57.43000	102.8300
7050.130	57.90000	104.7200
8150.680	58.94000	107.9400
9186.220	61.41000	110.3000