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Revisiting the Existence of J-Curve Effect Between Bangladesh and USA

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Abstract

This study attempts to revisit the existence of the J-curve effect between Bangladesh and the USA, one of its major trading partners of her, by using annual data from 1986-to 2020. The J-curve phenomenon states that currency depreciation initially decreases before increasing the trade balance. In this study, the Co-integration test shows a long-run association between trade balance, exchange rate, domestic income, and foreign income. OLS is applied to estimate the impact of the exchange rate on the trade balance. The calculated result shows that domestic currency depreciation negatively affects the trade balance, which means that depreciation does not improve the trade balance in the long run.

On the other hand, negative domestic and foreign income affect the trade balance. An increase in domestic income worsens the trade balance, and an increase in foreign income improves it. This study finds no J-curve effect in Bangladesh.

Keywords *J-curve · Exchange rate · Trade balance · Depreciation · Co-integration · OLS*

1. Introduction

Bangladesh economy has been undergoing a trade balance deficit because of a large number of imports since 1976. The trade deficit is the leading cause of her current account deficit. In January 2020, the trade balance deficit was recorded at USD18.8 billion. Trade balance refers to the value of exported goods minus imported goods. The trade balance is a surplus when the export is more than the import, and the trade balance is a deficit when the import is greater than the export. The Trade regime was changed many times. After1971 independence, the import was not easy due to the lack of import financing. Initially, it gave importance to

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importing substitutes and restricting imports. Government policy was changed in the laissez-fair economy. The coming of foreign aid increased, and imports from Bangladesh also increased. In the 1990s, Bangladesh liberalised the trade policy, removed the restriction and significantly decreased import tariffs. Since that, the trade balance of Bangladesh has been passing through deficits (Mostofa and Rashid 2015).

One of the factors related to trade balance is the exchange rate. The exchange rate refers to the amount of one currency per unit of another currency. Bangladesh has followed an exchange rate policy since 1971, which was changed several times from 1972 to 2002. Bangladesh has followed the floating exchange rate since 2003. However, at present, demand and supply determine the exchange rate. In Bangladesh, the exchange rate is used to improve her trade balance deficit (Chowdhury and Younus 2015).

J-Curve phenomenon suggests that depreciation of currency primarily worsens the trade balance, but after passing of time trade balance will be improved, which resembles the shape J. Depreciation of currency will successfully improve the trade balance if it holds Marshall-learner condition. This condition implies that depreciation will improve the trade balance if the sum of export and import price elasticity is greater than 1. It works in two way-First, currency depreciation will cheaper the export than before. The exporters will get more money when converting foreign currency into domestic currency, and the exporter will encourage exporting more. Second, currency depreciation will be more expensive for the import than before. The Import of foreign goods will require more money than before, and the importers will discourage and import less. After the depreciation, the export will increase, and imports will decrease. As a result, the trade balance will be developed in the long run (Piskin 2014).

In the short-run, currency depreciation will increase the import price, while the export price will stay constant, and the trade balance will worsen. The quantity of export and import will adjust with price and improve the trade balance in the long run. The price effect will exacerbate the trade balance, and the volume effect will increase the trade balance creating the “J- curve” effect.

2. Review of Literature

Author	Data	Sample	Methodology	Country	Variables	Findings
(Halicioglu 2008)	Quarterly	1980-2005	ARDL	Turkey	Trade balance, Real effective exchange rate, Industrial production of the industrial country, industrial production of turkey	The long-run relationship between trade balance and exchange rate, the short-run bi-directional relationship between two variables.
(Piskin 2014)	Quarterly	1987:1-2013:3	ARDL, ECM of ARDL	Turkey	Trade balance, Real effective exchange rate, Foreign income, Domestic income	The long-run relationship among all the variables, In Short-run, no j-curve effect.
(Baek, Mulik et al. 2006)	Quarterly	1989:1-2004:4	ARDL	USA	US trade balance, Bilateral real exchange rate, US real income, the Real income of the trading partner	j-curve does not exist for US agricultural trade with the trading partner, but the J-curve effect exists for US non-agricultural trading with Canada and Japan, not for Mexico
(Petrović and Gligorić 2010)	Monthly	2002:1-2007:9	ARDL, ECM	Serbia	Trade balance, Real effective exchange rate, GDP	J-curve effect exists in the short-run, and trade balance improves in long-run
(Hsing 2008)	Quarterly	1994:2-2007:3,	Cointegration, ECM	Argentina,	Trade balance, Real exchange rate, the Real income of the home country, Real income of US	J-curve exists for Chili, Ecuador, and Uruguay but not for Argentina, Brazil, Peru, Colombia
		1995:3-2007:3		Brazil		
		1980:4-2007:3		Chili		
		1995:3-2007:3,		Colombia		
		1991:4-2007:3,		Ecuador		
		1992:3-2007:3,		Peru		
		1993:1-2007:3		Uruguay		

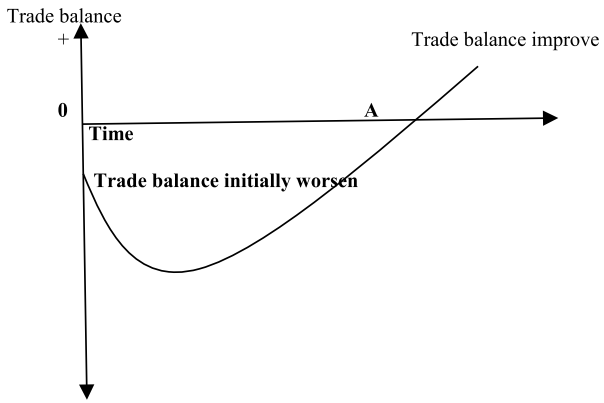
Author	Data	Sample	Methodology	Country	Variables	Findings
(Thom 2017)	Quarterly	2001:1-2015:4	VAR	Vietnam	Trade balance, Real effective exchange rate	J-curve does not exist in long-run
(Bahmani-Oskooee, Economidou et al. 2006)	Quarterly	1973:1-2001:3	ARDL, ECM	UK	UK trade balance, Real GDP of UK, Real GDP OF trading partner, Bilateral exchange rate	J-curve not exist for most countries except for two country
Bahmani-Oskooee, Iqbal et al. (2017)	Annual	1980-2013	ARDL, ECM	Pakistan, EU	Trade balance for industries, Real GDP of Pakistan, Real GDP of EU, Real bilateral exchange rate	Of 77 industries, J-curve does not exist in most industries
(Khalid 2017)	Annual	1975-2013	ARDL, ECM	Pakistan	Trade balance, Real GDP of Pakistan, Real GDP of the trading partner, Real bilateral exchange rate	No evidence of J-curve
(Masih, Liu et al., 2018)	Monthly	2005:8-2016:7	Causality test, VAR	China	Trade balance, Real effective exchange rate	J-curve does not exist
(Bahmani-Oskooee, Rahman et al. 2017)	Quarterly	1985:1-2015:4	ECM, ARDL	Bangladesh	Bangladesh's trade balance, Real GDP of Bangladesh, Real GDP of trading partners, Bilateral exchange rate	From 11 partners, the effect of the J-curve exists only with 3 trading partner

3. Theoretical Framework

After depreciation, the trade balance will initially worsen and improve over the years. In the short-run, import prices will increase more rapidly than export prices, but initially, export volume remains unchanged after devaluation. Despite imports being more expensive, import volume will not decrease much. In the long- run, currency depreciation will improve the trade balance, and the export volume will increase, but import volume will decrease. The domestic consumer will shift from expensive foreign goods to domestic goods, assuming equivalent goods exist in

the country. On the other hand, the foreign consumer will shift from expensive domestic goods to cheaper exported goods. After the depreciation of a country's currency initially deteriorate and then improves the trade balance over time, Economist called this the J-curve effect (Dominick 2012).

Figure 1: J-curve effect after depreciation



The figure shows that after depreciation, a country's trade balance initially decreases from 0, and after time A, the trade balance improves.

4. Data and Methodology

Time Series data for the 1986-2020 period has been used in this study. The data that have been used are from Bangladesh bank, WDI (World Development Indicators) database, United States Census Bureau. In this study, the trade balance is the dependent variable and exchange rate, foreign income, and domestic income are the independent variables. Here, trade balance refers to export minus imports and data on trade balance has been taken from the United States census bureau. The exchange rate means the amount of taka per unit of the dollar. This study tested the following hypothesises.

H_0: J-curve effect exists in Bangladesh.
H_1: J-curve effect does not exist in Bangladesh.

5. Empirical Model

By following Bahmani-Oskooee, Iqbal et al. (2017), Narayan and Narayan (2004), and Halicioglu (2008) model, the following model has been estimated to check the effect of exchange rate on the trade balance and also domestic income and foreign income effect on the trade balance.

$$\text{Ln}\,(TB_t) = B_1 + B_2\text{Ln}\,(EXC_t) + B_3\text{Ln}\,(Y_{BDt}) + B_4\text{Ln}\,(Y_{USt}) + e_t$$

Here,
Ln (TB_t) = natural Log of trade balance
Ln (EXC_t) =nature Log of exchange rate
Ln (y_{BDt}) =nature Log of Bangladesh income
Ln (Y_{USt}) =nature Log of US income
All variables are transformed into the natural logarithm.

e_t" is an error term and the subscript "t" indicates time series data. It is anticipated that B_2 will be positive, which means currency depreciation will improve the trade balance. B_3 will be negative, which means imports will increase if Bangladesh's income increases. B_4 will be positive, meaning exports will increase if US income increases.

In addition, this study tested the following hypothesises:

1. H_0: Bangladesh's income does not affect the trade balance
   H_1: Bangladesh's income affects the trade balance
2. $H_{0:}$ US income does not affect the trade balance
   H_1: US income affects the trade balance

6. Empirical Results

6.1 Unit Root Test

In the case of time series analysis, it is essential to check the stationary of data to avoid spurious regression. Over the period, if the mean and variance of time series variables are constant, then the time series variables are considered stationary. Augmented Dickey-Fuller (ADF) unit root test is used to test the stationary of data.

Here,
H_0: variable is not stationary.
H_1: variable is stationary.

If the P-value of the ADF test>0.05, then the null hypothesis will not be rejected. If P-value <0.05, then the null hypothesis will be rejected.

Table 1: ADF test result for unit root on level and first difference

Variables	ADF test	P-value	5% critical value	Decision
Ln (TB_t)	-2.03	0.56	-3.56	Non-stationary
Δ Ln (TB_t)	-8.06	0.000	-2.96	Stationary
LN (EXC_t)	-2.83	0.20	-3.64	Non-stationary
Δ (EXC_t)	-2.94	0.067	-3.11	Stationary
Ln (Y_{BDt})	-1.02	0.92	-3.56	Non-stationary
Δ Ln (Y_{BDt})	-4.47	0.006	-3.56	Stationary
Ln (Y_{USt})	-1.64	0.75	-3.56	Non- stationary
Ln (Y_{USt})	-3.40	0.018	-2.96	Stationary

Note: Δ indicate the first difference

6.2 Co-integration Test

Co-integration test is used to check the long-run association among the variables in a regression model. Co-integration test is used to determine whether the variables used in the model are co-integrated. Johansen co-integration test has been used to check whether there is a long-run association between trade balance, exchange rate, Bangladesh's income and US income.

Here,
H_0: no co-integration among variables.
H_1: co-integration among variables.
The null hypothesis will be rejected if the P-value is less than 5%.

Table 2: Result of co-integration test

Hypothesized		Trace	0.05	
No. of CE (s)	Eigenvalue	Statistic	Critical Value	Prob.**
None*	0.726399	61.89942	47.85613	0.0014
At most 1	0.430482	26.90518	29.79707	0.1040
At most 2	0.326284	11.70513	15.49471	0.1716
At most 3	0.037842	1.041576	3.841466	0.3075

Here, the null hypothesis is rejected because P-value is less than 0.05. Eigenvalue and trace statistic test indicate that P-value is less than 0.05, suggesting a long-run relationship between variables. This test demonstrates that the OLS result of this study is not spurious.

6.3 Autocorrelation Test

The null and alternative hypothesises are-
H_0: No autocorrelation in residual
H_1: Autocorrelation in residual
Here, the Breusch-Godfry Lm test has been used to check whether there is a serial correlation or not.

Table 3: Autocorrelation test result Serial_1

F-statistic	0.470622	Prob. F (1,26)	0.4988
Obs*R-squared	0.551150	Prob. Chi-Square (1)	0.4578

Table 4: Autocorrelation test result Serial_2

F-statistic	0.318878	Prob. F (2,25)	0.7299
Obs*R-squared	0.771146	Prob. Chi-Square (2)	0.6801

Table 5: Autocorrelation test result serial_3

F-statistic	1.893168	Prob. F (3,24)	0.1577
Obs*R-squared	5.932194	Prob. Chi-Square (3)	0.1150

If the P-value> 0.05, the null hypothesis cannot be rejected. It implies that there is no autocorrelation in the residual. Here, P-value is more than 0.05 in the 1st, 2nd, and 3rd order serial correlation. So, it is said that there is no autocorrelation. The model has no 1st order, 2nd order and 3rd order serial correlation.

6.4 Normality Test

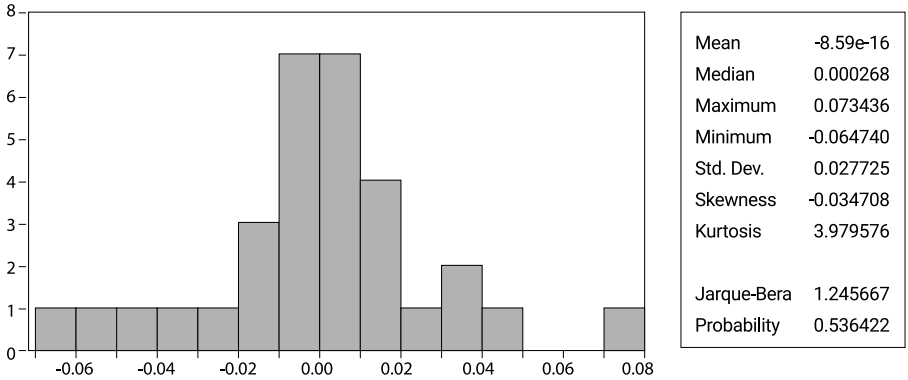
A normality test is used to check whether a group of data or a data set is well-modelled or data set is normally distributed or not. If the data set is not normally distributed, the acquired t-ratios are below the required standard, and illations will not be valid.

Jarque-Bera test formula is

$$JB = \frac{N}{6}\left[S^2 + \frac{(k-3)^2}{4}\right]$$

Here, S = Skewness, K =Kurtosis, N = Sample size
In the normal distribution,
Skewness will have 0.
Kurtosis value will have 3.
Here, The Null and Alternative hypothesises are-
H_0: Residuals are normally distributed.
H_1: Residuals are not normally distributed.

Figure 2: Jacque- Bera test for normality of data



The above figure shows that Skewness is -0.034704, Kurtosis is 3.979576, and the JB value is 1.245667. According to the JB test, the Null hypothesis cannot be rejected. So, it is said that data are normally distributed, and illations are correct. We can also infer from the p-value. Since the p-value is greater than 0.10, the null hypothesis of normality could not be rejected, suggesting the normality of the residuals.

6.5 Ramsey Test

Table 6: Ramsey test result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LRATE	-0.274933	0.159620	-1.722420	0.0969
LBS	-6.243650	3.601687	-1.733535	0.0948
LYS	1.447929	0.823184	1.758937	0.0904
C	68.08761	36.94851	1.842770	0.0768
FITTED^2	-0.424222	0.277694	-1.527660	0.1387

The statistic and associated P-value show that the coefficient of the fitted square is insignificant. Therefore, the model is not miss-specified.

6.6 Ordinary Least Square Method (OLS)

To estimate the equation, OLS has been used in this study. This study has used the auto-correlation and Ramsey tests to check the reliability of OLS estimation. This study found that residuals were not auto-correlated after using the auto-correlation test, and the Ramsey test has implied that the model was not miss-specified.

If P-value is less than 0.05 or equal to 0.05, then the independent variable significantly affects the dependent variables. If P-value is more than 0.05, it is said that the independent variable does not significantly affect the dependent variable or is insignificant.

Table 7: OLS result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LATE	-0.033681	0.023783	-1.416190	0.1682
LBS	-0.741868	0.042780	-17.34165	0.0000
LYS	0.198789	0.097334	2.042346	0.0510
C	11.65526	0.793531	14.68784	0.0000
R-squared	0.983910	Mean dependent var		8.959519
Adjusted R-squared	0.982122	S.D. dependent var		0.218573
SE of regression	0.029225	Akaike info criterion		-4.107693
Sum squared resid	0.023060	Schwarz criterion		-3.922663
Log-likelihood	67.66925	Hannan-Quinn criter.		-4.047378
F-statistic	550.3612	Durbin-Watson stat		2.111931
Prob (F-statistic)	0.000000			

Table 7 shows that the exchange rate coefficient is insignificant, implying that the trade balance does not improve with the exchange rate rise. We could not find J-curve in Bangladesh during our study period. The coefficient of LBS is negative and significant. It implies that if Bangladesh citizens' income increases, the import and trade balance worsens because the export and import gap increases. Again, the coefficient of LYS is positive and significant. This suggests that if US citizens' income increases, Bangladesh's exports increase and the trade balance improve because the export and import gap decrease.

7. Conclusion and Recommendations

This study revisits the J-curve effect between Bangladesh and the USA. The results of this study found that there is a long-run association between the trade balance, exchange rate, and foreign and domestic income. On the other hand, the OLS result found that currency depreciation did not improve the trade balance in the long run. The depreciation of currency negatively affected the trade balance instead of positively affecting the trade balance. In the long run, trade would worsen instead of improving. This study could not find the j-curve effect for Bangladesh from 1986-to 2020. OLS also found that Bangladesh's income negatively affected the trade balance of Bangladesh. If Bangladesh citizens' income increases, imports

would increase, and the trade balance would worsen. On the other hand, US income positively affected the trade balance of Bangladesh. If US citizens' income increased, export would increase, and the trade balance would improve.

Bangladesh mainly imports essential goods, machinery, and raw materials. So, because of depreciation, the import will not decrease more. These imported goods and machinery will be used to produce exported goods and the country's industrialisation. So, in the case of Bangladesh's policy making, exchange rate change will not play a role in improving Bangladesh's trade balance. In the case of Bangladesh, the trade deficit is favourable. It mainly imports Raw materials and machinery and converts them into exportable goods. The export will increase, and export earnings will also increase, which is favourable for Bangladesh.

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