Forman Journal of Economic Studies
Vol. 11, 2015 (January–December) pp. 1-14

Testing for Marshall-Lerner Condition: Bilateral Trade between Pakistan and its Major Trading Partners

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Abstract

Marshall Lerner condition is an important phenomenon that determines the correlation between the exchange rate and the balance of trade. In this study, we test the Marshall Lerner condition for Pakistan against her ten major trade partners - the US, UK, Saudi Arabia, China, Canada, France, Japan, Germany, UAE and Kuwait. The study covers a period from 1980-2013 while for estimation purpose; we apply Johansen Juselius Co-integration technique. We find evidence of the long run cointegration relationship between the variables of the exchange rate and the balance of trade for Pakistan against her all ten trade partners. However, empirical findings confirm Marshall Lerner condition only for six countries, i.e. the US, UK, Saudi Arabia, China, Canada and France, while there is no evidence of Marshall Lerner condition, in case of the remaining countries Japan, Germany, UAE and Kuwait.

Keywords: J-curve, Marshal Lerner, Devaluation, Depreciation

JEL classification: F31, C22, C32

1. Introduction

Trade deficit is one of the prime focuses of the policy making in international economics. The countries in particular, face chronic balance of payment crisis due to deficit in current account. The authorities can counter this by export promotion policies or import restriction policies. But in most developing countries we also come across the policy of devaluation which helps to make domestic goods cheaper and help improve competitiveness of domestic exports. On the other hand, the devaluation of currency is also assumed to result in increasing the prices of imports hence, in this way, the devaluation policy can affect the trade balance. There is an important underpinning in this regard as well that both currency depreciation (in case of flexible exchange rate) and currency devaluation (in case of fixed exchange rate) may affect the trade balance

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positively only if we have sum of import and export elasticities greater than one the condition known as Marshal-Lerner condition. In other words, this is the precondition for trade balance to be improved through devaluation (Oskooee and Niroomand, 1998). Pakistan has a history of trade deficit and balance of payment crisis. Our exchange rate has seen several devaluations as well as depreciations that have affected macroeconomic variables like inflation, economic growth and also trade balance. The first devaluation experienced by Pakistani rupee was in 1952. After that there are frequent instances where the Pakistani rupee has faced a decline in its value like in 1972 and 1996. The decrease in value was expected to promote exports, but the capital account deficit could not be reduced. The recent depreciation of currency against dollar since 2006 has also been unable to improve BOP situation (Various issues of Economic Survey of Pakistan).

This study, therefore, is an attempt to investigate whether devaluation or depreciation has any relationship with trade balance over time in case of Pakistan. The economic theory predicts a J-curve type relationship which means that due to currency depreciation or devaluation, the trade balance deteriorates and as time passes the trade balance improves (Magee, 1973). The previous studies that investigated for the J-curve phenomena in case of Pakistan, have found no evidence of J-curve (Awan et al., 2012). However, the present study is different compared to previous studies as the study makes a contribution by analyzing the impact of currency fluctuation on Pakistan's trade balance against her ten major trade partners.[2]

The study is organized as follows: Literature review is presented in section 2 while the theoretical frame work is given in section 3; section 4 is related to empirical results while section 5 presents conclusions of the study

2. Literature Review

Many of the studies considered J-curve hypothesis and the Marshal-Lerner condition. In the short run, the J-curve phenomenon shows the negative impact of depreciation of currency on balance of trade and the improvement of the trade balance in the long run. This difference is due to the short run and long run difference in imports and exports demand elasticities. The Marshal-Lerner condition implies that the sum of import and export elasticities is greater than one

[2] In fact the study was aimed at investigating the J-cure relationship of Pakistan with her major ten trade partners but because of unavailability of historical data for other four countries the study was restricted to major six trade partners of Pakistan.

is thus an underlying explanation for the J-curve (Bahmani-Oskooee and Niroomand, 1998). However, this study was based on aggregate level exports and imports. In order to come up with a more detail analysis on Marshal-Lerner, These two authors used data for US and her six trade partners. The study confirms the existence of Marshal-Lerner condition for we trade with Japan, U.K., France, and Italy, while there was no evidence of existence of Marshal-Lerner condition for the US trade with Canada and Germany (Oskooee and Niroomand, 1999).

The elasticities were observed to be less than one in case of Saudi Arabia and greater than one in case of Venezuela and Iran; thus deteriorating the trade balance in Saudi Arabia and improving in the case of the other two countries (Yousefi and Wirjanto, 2003). Another study by Mahmud et al. (2004) was conducted by using non-parametric kernel estimation method. For six developed countries, Import and export price elasticities were estimated and then Marshal-Lerner condition was checked. This condition satisfied in sub sample period and under the fixed exchange rate regime. The Generalized Marshal-Lerner condition was used to test that the appreciation effect on the future balance of trade and found that in appreciation, scale of the J-curve is much higher than the depreciation period in the Korean economy (Han and Suh, 1996). The J–curve phenomenon was investigated by Hsing Yu (2009) for the bilateral trade between US and DR-CAFTA countries using co-integrating equations and concluded that in the long run, balance of trade improved because of real depreciation and Marshal-Lerner condition has met.

Oskooee and Hajilee (2009) used error correction model and a disaggregated data of 87 industries, involved in trade between the Sweden and US, and considered the long run and the short run effect of real depreciation of Kronor on balance of trade at industry level. The results showed that the J – curve phenomenon existed in most of the industries in the short run, while only 23 industries had the long run effect. The latest study by Kyophilavong et al. (2013) employed ARDL bounds testing approach and concluded that in the Laos economy, there observed a J-curve effect. In the short run there had a negative effect of devaluation of currency on balance of trade while there was a positive but insignificant effect of devaluation on balance of trade. The domestic income was determinant of trade balance in the long run in Laos's economy.

The J-curve was observed to be non-existent in the case of Chinese trade with its eighteen major trading partners and with G-7 countries (Ahmad and Yang, 2004). Bilateral J-curve dynamics for Turkey and its 13 trading partners was tested by Halicioglu (2008) using time series data on a quarterly basis.

Bounds testing and error correction were used which revealed there was no short run J-curve effect in Turkey. However, a positive impact of devaluation was observed of the Turkish Lira on balance of trade with UK and US. Short run J-curve effect of devaluation was not observed for 9 African nations; however in the long-run, the real depreciation effect was favorable only in the cases of South Africa, Nigeria, and Egypt (Bahmani-Oskooee and Gelan, 2012).

In the case of Pakistan, J-curve phenomenon was not detected. Awan et al. (2012) use quarterly data from 1980-2006 noticed negative elasticities which implied negative effect of depreciation on the balance of trade. There exists a long run relationship between the balance of trade and real exchange rate and deterioration of the balance of trade was the result of the devaluation of currency. This study thus called for other policies like import substitution and quality control of exports to solve trade deficit issues as devaluation will worsen of the situation due to heavy reliance on imports in Pakistan

Kyophilavong et al. (2013) employed ARDL bounds testing approach and concluded that there was an evidence of a J-curve effect in the Laos economy. The study reports the negative effect of currency devaluation on the balance of trade in the short run while this effect becomes positive though it is insignificant in the long run.

3. Imports and Exports Demand Models

In general, we need to include the relative price term as well as a scale variable to estimate aggregate import and export demand models. However, the aim of present study is to estimate the elasticities of trade on the bilateral basis, we therefore, require using bilateral import prices as well as exporting prices. However, because of unavailability of such indices on a bilateral basis, this study relies on using the real bilateral exchange rate that is a measure of relative prices. Using real bilateral exchange rate is supposed to estimate the import and export demand sensitivity to the real bilateral exchange rate movements.

We use annual time series data from 1998 to 2013 for the purpose of the present study. Data on bilateral exports, imports and bilateral exchange rate come from International Financial Statistic. Real GDP data come from World Development Indicators (WDI). We use real exchange rate following Bahmani-Oskooee and Niroomand (1998), in order to estimate import demand function by assuming that Pakistan's import demand from trading partners have been given in the following way:

$$\text{Ln } M_t^{Pak} = \alpha + \beta \text{ Ln } Y_t^{Pak} + \gamma \text{ Ln } REX_i + \varepsilon_t \qquad (1)$$

Where M = Pakistan's imports from a trading partner, alternatively, it is trading partner's exports to Pakistan; Y = Pakistan's GDP; Y = Pakistan's GDP; REX = Pakistan's real bilateral exchange rate with her trading partners; and is ε an error term. An increase in the real bilateral exchange rate indicates appreciation while a decrease indicates depreciation of the currency. Hence currency depreciation is supposed to result in decreasing imports, we expect $\gamma > 0$[3]. Likewise, an increasing GDP means increasing purchasing power of domestic economy. Thus the increase in domestic GDP is expected to increase domestic imports. Thus we have $\beta > 0$

Pakistan's export demand function which in other words, is country i's import demand from Pakistan; is to be estimated in the following form:

$$\text{Ln } X_t^{Pak} = \alpha'' + \beta'' \text{ Ln } Y_t + \gamma'' \text{ Ln REX}_t + \varepsilon_t \qquad (2)$$

Where *X* = trading partner's imports from Pakistan or alternatively it denotes Pakistan's exports to the trading partner; Y=Pakistan's GDP; REX = Pakistan's real bilateral exchange rate with her trading partners; and ε is an error term. An increase in the real bilateral exchange rate indicates appreciation while a decrease indicates depreciation of the currency. Hence currency depreciation is supposed to result in increasing exports, hence γ'' is expected to be <0. The Coefficient β'' Shows the responsiveness of trading partner's imports to her GDP, which is expected to have positive impact on trading partners' imports. Thus we have $\beta'' > 0$. Since this study intended to include tem major trading partners of Pakistan for our empirical analysis, however, time series data were not available for some of the countries beyond 1995 we therefore had to discard the remaining four countries. The present study, therefore intends to include major six trade partners of Pakistan, i.e. United States, UK, Saudi Arabia, China Canada and France. The empirical analysis is given below:

4. Empirical Results

As far the Marshall-Lerner condition is concerned, it is a long run phenomenon, while the appropriate methodology for estimation is the

[3] *R E Xi* = Real bilateral exchange rate between Pakistan and each trading partner. It is defined as (*PPak E/Pi*) where *PPak* is Pakistan's GDP deflator; *E* is the nominal bilateral exchange rate defined as number of *i*'s currency per dollar ; and *Pi* is country *i*' s GDP deflator.

cointegration analysis. In the literature, we have different approaches for estimating long run cointegrating relationships such as Engle-Granger approach, Johansen technique and auto-regressive distributed lag (ARDL) model as well. Before we move ahead with Johansen cointegration approach, we have to check for the order of integration. The possibility of time dependence in time series data can result in the spurious regression which is not the actual relationship, therefore, the first step in cointegration analysis would be to test the variables for stationary.

There are different tests in literature for this purpose and the most common is the unit root test. The most common in practice is ADF due to its property of relaxing the assumption of serial correlation among errors. The order of integration is crucial in deciding whether to go with Johansen cointegration or ARDL approach. The unit root tests based on ADF test are given in Table 1 below:

Table1: Augmented Dickey Fuller Test results

Variable	Level	Lags	First difference	Lags
Pakistan				
Ln Y	-1.8085	1	-3.0903**	0
United States				
REX	-1.8085	1	-3.0903***	0
LnY	-1.3497	0	-7.4284***	0
LnM	-1.7146	1	-4.1273***	0
LnX	-2.0252	0	-7.4023***	0
United Kingdom				
REX	-1.4161	0	-6.1692***	0
LnY	-0.8979	2	-3.7579***	1
LnM	-1.9534	0	-5.0994***	7
LnX	-1.4529	0	-5.8714***	0
Saudi Arabia				
REX	0.5158	4	-3.3815**	3
LnY	-0.1568	0	-2.8432*	3
LnM	-0.5294	0	-4.7263***	0
LnX	-2.1706	0	-5.4016***	2
China				

REX	-1.6524	0	-4.0994***	3
LnY	-0.3724	2	-7.2297***	1
LnM	0.4485	0	-5.4188***	0
LnX	0.6158	5	-3.4815**	4
Canada				
REX	-1.4434	0	-5.0994***	4
LnY	-0.5123	0	-5.8346***	0
LnM	-0.1524	1	-9.3633***	0
LnX	-2.5752	0	-4.6783***	0
France				
REX	-1.9534	0	-5. 8432***	2
LnY	-1.5976	0	-7.0397***	0
LnM	-1.6202	3	-5.9615***	1
LnX	-1.5161	0	-6.1892***	0
Germany				
REX	0.5752	2	-4.6624***	2
LnY	-1.8813	2	-6.8100***	2
LnM	-1.3770	1	-5.3932***	0
LnX	-2.3062	0	-5.7100***	0
Japan				
REX	-1.8188	2	-5.6172***	2
LnY	-1.3726	0	-5.4809***	0
LnM	-1.4793	0	-4.2176***	0
LnX	0.7303	0	-4.4193***	0
UAE				
REX	-1.2796	2	-5.3838***	2
LnY	-2.1818	0	-4.1212***	2
LnM	-1.4793	3	-6.3211***	3
LnX	-1.6623	0	-3.2267***	0
Kuwait				
REX	-0.2245	2	-4.9245***	2
LnY	-1.0800	0	-5.1234***	2
LnM	-0.8821	0	-6.2133***	0

LnX	1.4455	0	-5.1100***	0
*10%, **5%, ***1% level of significance.				

Table 1 indicates that at level all the variables are non-stationary. At first difference all the variables become stationary for 1% significance level while Pakistan's GDP, China's exports as well as Saudi Arabia's real exchange rate become stationary at 5%. On the other hand, Saudi Arabia's real GDP becomes stationary at 1 % level of significance. It shows that all the variables are integrated of order 1. For VAR specification, as a precondition we have to decide about variables lag length. There are different criterions, but we rely on Akike information criterion (AIC) and Schwarz information criterion (SC). The results indicate that they are fairly consistent across lag order choices.

According to the information reported in Table-1 all the variables are I (1), hence the appropriate method is Johansen Juselius co-integration. Johansen Juselius use two statistics the maximum Eigen value and the Trace test in order to determine the number of cointegrating vectors. Table 2 reports these two statistics for all six cases.

Table 2: Cointegration Results for Import and Export Demand

Country		**Import demand**		**Export demand**	
		Trace statistic	Maximum Eigen value statistic	Trace statistic	Maximum Eigen value statistic
United States	$r_{0=0}*$	45.676	23.984	51.677	29.469
	$r_{0\leq 1}$	21.691	14.773	22.208	15.554
	$r_{0\leq 2}$	6.918	6.918	6.653	6.654
United Kingdom	$r_{0=0}*$	46.667	24.601	39.481	24.765
	$r_{0\leq 1}$	22.066	18.463	14.716	10.859
	$r_{0\leq 2}$	3.603	3.603	3.856	3.856
Saudi	$r_{0=0}*$	42.11	29.651	40.133	26.766

Arabia	$r_{0 \leq 1}$	12.458	12.437	13.367	9.097
	$r_{0 \leq 2}$	0.021	0.021	4.271	4.271
China	$r_{0 = 0*}$	53.811	42.978	35.093	23.337
	$r_{0 \leq 1}$	10.834	10.833	11.757	11.735
	$r_{0 \leq 2}$	0.001	0.001	0.021	0.021
Canada	$r_{0 = 0*}$	58.793	40.729	32.548	23.811
	$r_{0 \leq 1}$	18.064	11.383	8.737	7.39
	$r_{0 \leq 2}$	6.681	6.681	1.347	1.347
France	$r_{0 = 0*}$	31.261	21.216	45.081	21.723
	$r_{0 \leq 1}$	10.045	5.954	23.358	15.219
	$r_{0 \leq 2}$	4.091	4.091	8.138	8.138
Germany	$r_{0 = 0*}$	40.01	27.551	38.033	24.666
	$r_{0 \leq 1}$	10.358	10.337	11.267	6.997
	$r_{0 \leq 2}$	2.121	2.121	6.371	6.371
Japan	$r_{0 = 0*}$	55.911	45.078	37.193	25.437
	$r_{0 \leq 1}$	14.034	14.033	14.957	14.935
	$r_{0 \leq 2}$	3.201	3.201	3.221	3.221
UAE	$r_{0 = 0*}$	53.793	35.729	27.548	18.811
	$r_{0 \leq 1}$	19.364	12.683	10.037	8.69
	$r_{0 \leq 2}$	7.981	7.981	2.647	2.647

Kuwait	$r_{0 = 0}*$	32.561	22.516	46.381	23.023
	$r_{0 \leq 1}$	11.345	7.254	24.658	16.519
	$r_{0 \leq 2}$	5.391	5.391	9.438	9.438

The Eigen values and trace show that there is at most one co-integration relationship between the variables as can be seen, the null hypothesis of no cointegration, i.e., *r=0* is rejected at the 95 percent significance level for Pakistan's import as well as export demands for all ten countries. "Thus, there is at least one cointegrating vector in each case".

Table-3 presents long run elasticities for Pakistan's trade with its major six trade partners. It shows that income elasticities of exports as well as imports are higher supporting previous studies that report larger elasticities such as (Bahmani-Oskooee and Brooks, 1999).

Import which depends on domestic income is supported by our income elasticities of imports. As far, Pakistan's exports to her ten major trade partners is concerned, it shows that with the exception of Saudi Arab, China and UAE Pakistan's exports to her other trade partners tend to decrease with increasing GDP of these countries. However, these findings are not surprising as with increasing GDP, these countries tend to develop domestic substitutes instead of imports.

As far the impact of exchange rate on export demand is concerned, the results are as per expectations, i.e., depreciation causes Pakistan's exports to increase against her trading partners, however in case of Japan, Kuwait and Canada Pakistan's exports to these countries tend to decrease with increasing depreciation of Pakistani currency. On the other hand, exchange rate impact on Pakistan's imports indicate that with increasing currency depreciation of Pakistani currency, imports tend to decrease with the exception of the US, France and Japan .

And finally to conclude about Marshall-Lerner condition, we come up with the findings that the sum of exchange rate elasticities of exports and imports is greater than one in case of six countries, i.e. the US, UK, Saud Arabia, Canada, France and China, while there is no evidence of the Marshall-Lerner condition in case of four countries, Germany, Japan, UAE and Kuwait.

Table 3: Estimates of the Cointegrating Vectors

Countries	Dependent variable: Exports LX^i		Dependent variable: Imports LM^i	
	LY^i	REX	LY^{PK}	REX
United States	-5.198 (6.209)	-4.019 (4.421)	3.381 (0.411)	-1.232 (0.269)
United Kingdom	-8.623 (3.023)	-4.368 (-1.054)	1.834 (0.375)	0.575 (0.235)
Saudi Arabia	1.753 (0.257)	-0.334 (0.103)	0.178 (1.822)	2.965 (1.264)
China	3.320 (0.681)	-2.644 (-0.881)	6.184 (1.224)	1.151 (0.753)
Canada	-3.373 (5.636)	8.975 (1.202)	4.538 (2.210)	0.020 (1.476)
France	-3.768 (6.943)	-4.590 (-2.139)	3.556 (1.589)	-3.081 (1.016)
Germany	-0.693 (-0.301)	-0.472 (-0.112)	0.109 (2.277)	0.258 (3.622)
Japan	-001 (-0.343)	0.329 (6.217)	0.228 (5.875)	-0.024 (-0374)
UAE	1.459 (16.244)	-0.243 (-2.452)	0.328 (3.688)	0.797 (3.780)
Kuwait	-0.042 (-1.074)	0.810 (5.443)	0.264 (3.717)	0.062 (0.362)

5. Conclusion

Devaluation/depreciation is supposed to have a positive impact on trade balance in the long run. It is because of the fact that in the long run, the Marshal-Lerner condition tends to hold if the import and export elasticities of exchange rates are greater than one. This study intends to determine Marshall Lerner

condition for Pakistan's with its major ten trade partners such as US, UK, Saudi Arabia, China, Canada, France, Japan, Germany, UAE and Kuwait. The empirical estimates show that there is a long run cointegrating relationship between the trade balance variables and the exchange rate, in case of all ten trading partners of Pakistan. However, our empirical results confirm the existence of Marshall Lerner condition in case of six countries, i.e. the US, UK, Saud Arabia, Canada, France and China. On the other hand, there is no evidence of the Marshall Lerner condition in case of four countries, Germany, Japan, UAE and Kuwait.

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