Impact of Devaluation on Industrial Exports in Saudi Arabia: J-Curve Hypothesis

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Abstract

Most of studies in past literature on J-curve has been dealt with aggregated data of trade and very few deals with phenomena of non-linear ARDL. This study does an analysis of J-curve by using annual data of 1970-2015 for industrial dis-aggregated exports of Saudi Arabia, to remove aggregation biasness, by using non-linear ARDL technique introduced by Shin et al. (2014). The strong evidence of cointegration of real exchange rate and industrial exports has been found for all of our models. World income has been reflected the positive contribution in industrial exports. An appreciation of Saudi Riyal has been found responsible for depressing the industrial exports except of food stuff and metal and articles in the long run. A devaluation has been helpful in raising industrial exports except the food stuff, plastic products and other exports' group category. Asymmetrical effects of devaluation and appreciation have been found in industrial exports. J-curve hypothesis has been validated for only electrical products. This study recommends for devaluation of Saudi Riyal to promote industrial exports.

Key Words: J-Curve, industrial exports, no-linear ARDL, real exchange rate

1. Introduction

Expansion and liberalization of financial markets along with emerging market economies plausibly increased capital flows, as we observed throughout 1990s. These big swings in capital flows are attributed to effect the exchange rate. Traditionally view regarding influence of exchange rate on economy is considered expansionary, but from the last two decades, this view

has been questioned and has been part of the debate. The present study emphases on observing the impact of real exchange rate on Saudi Arabia's some major industrial exports whether positive and negative changes (i.e. appreciation and depreciation of a currency) in real exchange rate bring what type of changes in industrial exports.

Saudi Arabia's economy has been broadly dependent on oil export but recent slowdown of world oil price compelled Saudi Arab to move towards non-oil production and exports according to vision 2030. Oil export revenue nourishes Saudi Arabia's external and fiscal balances and support economic growth as well. But lower oil prices are likely to affect oil-exports revenue and economic growth negatively. Therefore, in this crises period, the other non-oil exports and particularly industrial exports can be helpful in increasing overall exports' revenue, balance of trade and economic growth. Saudi Arabia with population of 32 million enjoying 20813 USD GDP per capita in 2015, and economic growth of 3.4 percent in 2015 as compared to 10 percent of 2011. A downturn movement in growth is again majorly attributed by oil price crises. Further, due to oil price crises, Saudi Arabia's foreign exchange reserves are depleting and budget deficit is going to touch double digits in 2016. Saudi Arabia's exports are gradually decreasing and imports are increasing. Therefore the cabinet decided to introduce National Transformation Plan to combat the situation with major ingredient of vision 2030. Saudi Arabia is keeping fixed exchange rate, officially pegged to the IMF, under special drawing rights, since 1986. Such fixing can be dangerous for the economy if exports is not taken care of. Further, devaluation is considered as a good policy measure to boost the exports and resultantly beneficial for exports' revenue if elasticity of exports are found elastic. Thus, it is mandatory to observe and forecast that what else could have been occurred in depreciation or appreciation of a currency, what will be the elasticity of exports' demand with response to change in exchange rate resultantly and overall possible response of exports. Manufacturing industries in Saudi Arabia progressed steadily over the past few years. From the year 1975 to 2015, share in manufacturing GDP (at constant price) of manufacturing industry (other than oil refining industry) increased from 57 percent to 87 percent. While the contribution of manufacturing industries in total GDP has improved from 4.1 percent to 13.5 percent and manufacturing exports of total merchandize exports has been increased from 0.57% to 11.25%. On the other hand, oil-exports are still more than 80% of total exports (Ministry of Economic & Planning, Saudi Arabia).

In the period of oil price crises, there is a dire need of industrial exports' growth to support the balance of trade and the whole economy as well. One of increasing industrial exports strategy can be of devaluation policy to increase the demand for Saudi industrial goods in the international market and particularly in the Gulf market. But this policy requires the factual estimates of devaluation on the industrial exports' revenue. Therefore, this study explores the repercussions of devaluation of Saudi Riyal on industrial exports of Saudi Arabia. This study aims to explore the possible linkages between exchange rate and industrial exports by applying Non-Linear Autoregressive Distributive Lag Approach (NARDL) introduced by Shin et al. (2014). Both, devaluation and appreciation may have same or opposite effects on industrial exports. Further, the effect of positive and negative movements of exchange rate may have effect of equal magnitude or its effect might have different magnitude as well. In large, devaluation may encourages exports, discourages imports and may improve balance of trade. This is expansionary dimension of an economy through devaluation of a currency if demand for exports is price elastic. Globally, so far studies have found mixed evidence for the influence of exchange

rate on exports. Empirically, literature is less fragmented and stood inconclusive regarding impact of exchange rate on exports in general. Theoretically and empirically it is generally found that a devaluation may lead to increase in exports if demand elasticity of exports are found elastic. Further, price elasticity of exports' demand is also different in the short and long run. Therefore, short and long run analysis of devaluation/appreciation is also a focus of this study.

Rest of this study is structured as follows: second section follows literature review, third describes data and methodology, section four discusses results and descriptions and fifth section concludes the study with appropriate suggestions.

2. Literature Review

Empirically literature confirms that a planned real exchange rate may be helpful for export diversification and thereby economic growth. Exchange rate effects pass on whole economy through demand sided effect mostly. The channel of this effect is that devaluation of a currency decreases the price of local goods of a country in the international market and also increases international competitiveness. A favorable outcome from currency devaluation is not an easy task. Trade balance can only be corrected if elasticity of export demand of domestic goods and elasticity of import demand of foreign goods are elastic. On the other hand, aggregate supply effects of currency devaluation increase input cost and imported raw material cost. Literature provides us mixed results from the impact of exchange rate subjected with different methodologies and different sets and sample of nations. With their respective objectives, some studies have explored "the Dutch disease effect" on oil exporting economies. Dutch disease explains that with exploration of oil, a lot capital inflow enter in country that in turn appreciate the exchange rate and it has negative effect on the exports of products other than oil as an appreciation will increase the price of exports in the international market and these product are facing less price competitiveness in the international market (Beine et al., 2009).

Arize (1995) is criticizing previous literature for not considering unit root therefore his study utilizes a cointegration approach to estimate the influence of exchange rate on exports of Netherland, Switzerland, Denmark and Sweden with trading partners. His study finds one cointegrating vector in the export demand model. Further it reveals negative impact of exchange rate of these four countries on export performance and concludes that a devaluation is helping in raising exports. Further, Arize (1998), when applied the cointegration for 8-European countries' imports, finds a positive relation between exchange rate and imports. It means that a devaluation is helping in reducing imports in these countries. Some studies explored the relationship via Marshall-Lerner condition and checked its application in different countries. Bahmani-Oskooee and Cheema (2009) utilizes the ARDL cointegration to investigate the J-curve hypothesis with Pakistan at aggregate level and with disaggregation of trade with her 13 major trading partners. They find no evidence of any effect of devaluation on the trade balance at aggregate level. However, they find that devaluation helps in improving trade balance Pakistan with her half of major trading partners by fulfilling the Marshal-Lerner condition. Paleologos and Georgantelis (1997) utilizes the cointegration analysis on the relationship of exchange rate and trade balance for Greek and finds the expected result of devaluation on trade balances. Further, Ratha (2010) finds that devaluation has been improved the overall Indian trade balance.

Bahmani-Oskooee and Margeret (1992) also check J-curve for selected developing countries by using quarterly data. The lags of real effective exchange rate were taken to trace J-curve and J-curve hypothesis could not be proved for most of countries. Interesting fact is that most of the past studies investigated aggregated trade data, thereby contradictory findings were obtained. The reason is that aggregated data erroneously, unnecessarily and implicitly assumes that estimates of elasticities exchange rate are equal across sectors. This is implausible thinking, so it is better to assume different elasticities across sectors regarding impact of exchange rate. Baldwin and Krugman (1989) believe that sunk cost for entering into export market may have effects on bilateral exports of exchange rate movements. They argue that only heavy shocks to exchange rate can affect trade volume. Despite paying sunk cost in advance to enter into export markets, firms even need a large depreciation of exporter's currency to earn profit. Further appreciation of a exporter's currency may have dilute effect. Once paying sunk cost firms wish to remain intact with the market even suffering a loss in the short run. Thereby, they advocate that positive and persistent effects may obtained of exchange rate shocks on trade volume.

Campa and Goldberg (2001) investigate the impact of exchange rate by using two decades data of annual series of SIC level of two digit for US economy. The study found positive and significant impact of exchange rate on wages when interacted with export oriented industry in US and negative significant impact when interacted with imports or imported inputs are uses in each US industry. Chinn (2006) investigate three different measure of real effective exchange on the exports of goods and service. This study revealed that appreciation of a domestic currency against all major currencies effect negatively along with the elasticity of minus 2, on exports volume.

In conclusion of the literature review, the disaggregated studies could capture right impacts of exchange rate on trade. Further, the use of appropriate econometrics has also a strong impact in finding the true results. Therefore, this present study is taking care of both these issues.

3. Data and Methodology

This study considers annual data series of exports of some major products of Saudi Arabia e.g. chemical products, electrical products, food stuff, metal & articles, mineral products, plastic product and others exports of small industries for the period of 1970-2015. Though, industrial classification can be further enhanced but due to data constraint study limited its focus towards some major export groups of products. The exports values are converted in real terms by dividing the exports of each industry by GDP deflator of Saudi Arabia. Our variable of interest and time availability of data induced to take the period form 1970-2015. Data on industrial exports and real exchange rates is collected from Saudi Arabian Monetary Agency (SAMA). The world real GDP (income of the rest of the nations) as an indicator for world demand for Saudi exports is collected from World Development Indicators (WDI). All variables are then converted into logarithm to capture the log-linear relationships.

3.1 Methodology

The objective of this research is twofold in nature. At first, the study aims to explore the impact of devaluation in Saudi currency, a typical fixed exchange rate country (later converted into real exchange rate), have positive effects on industrial exports or not. Secondly, the negative movements in exchange rate, devaluation, and the positive movements in exchange rate, an appreciation, do not necessarily to have same impacts. There can be asymmetrical impacts of these two different movements on the industrial exports of Saudi Arabia instead of same or symmetrical effects. At first we may assume a symmetrical model by including a variable of exchange rate as a determinant of industrial exports. This can be expressed as:

$$INDEXP_t = \alpha + \beta YW_t + \gamma XR_t + \varepsilon_t \quad (1)$$

Model (1) assumes all variables in logarithm. $INDEXP_t$ is expressing the industrial exports. Here we have not differentiated this variable by any other subscript for different industries as we are dealing each industry in a separate model. YW_t is used for representing world income/GDP to capture the demand for Saudi exports in the rest of world and it is assumed to have a positive effect on industrial exports as increasing income can be accompanied by increasing demand for exports. XR_t is denoting real exchange rate defined as one Saudi Riyal equals to the numbers of US dollars. Further, it is converted into real by multiplying the ratio of CPI of Saudi Arabia to CPI of United States and a downwards movement of this variable is showing a devaluation of Saudi Riyal. The coefficient of XR_t is expected to carry a negative sign if Saudi industrial exports are rising with a devaluation of Saudi Riyal.

The equation (1) can be termed as a symmetrical model as the variable real exchange rate does not carry both positive and negative movements. Shin et al. (2014) proposed the methodology to differentiate one variable into two variables by the following way:

$$PXR_t = \sum_{j=1}^{t} \Delta XR_j^+ = \sum_{j=1}^{t} \max\left(\Delta XR_j, 0\right) \quad (2)$$

and

$$NXR_t = \sum_{j=1}^{t} \Delta XR_j^- = \sum_{j=1}^{t} \min\left(\Delta XR_j, 0\right) \quad (3)$$

Equation (2) is calculating the partial sum of positive movements in real exchange rate and equation (3) is calculating a partial sum of negative movements. If we replace the variables calculated from equations (2) and (3) into equation (1) and expressed the resultant equation in the Auto-Regressive Distributive Lag (ARDL) model then we can have an asymmetrical or non-linear ARDL equation as introduced by Shin et al. (2014). This non-linear ARDL model is an extension of a linear ARDL model of Pesaran et al. (2001) and it may articulate in the following way:

$$\begin{aligned}\Delta INDEXP_t = {} & \alpha + \varphi INDEXP_{t-1} + \beta YW_{t-1} + \gamma^+ PXR_{t-1} + \gamma^- NXR_{t-1} + \sum_{i=1}^{p} \delta_i \Delta INDEXP_{t-i} \\ & + \sum_{i=0}^{q} \nu_i \Delta YW_{t-1} + \sum_{i=0}^{r} \left(\theta_i^+ \Delta PXR_{t-i} + \theta_i^- \Delta NXR_{t-i}\right) + \zeta_t\end{aligned} \quad (4)$$

The first step in the above equation is to find the cointegration at first. The null hypothesis for a no long run relationship or no cointegration can be expressed as ($\varphi = \beta = \gamma^+ = \gamma^- = 0$). A bound test can be performed to test the null hypothesis. If calculated F-values from Bound / Wald test is

found larger than that of upper critical values generated by Pesaran et al. (2001) then we can reject the null hypothesis and may claim a cointegration in equation 4. After validating the cointegration, we can proceed for long run effects of our explanatory variables on industrial exports by calculating the normalized coefficients of YW_{t-1}, PXR_{t-1} and NXR_{t-1} normalized by coefficient of $INDEXP_{t-1}$. The effect of world income is expected to be positive. The normalized coefficients of both PXR_{t-1} and NXR_{t-1} are expected to carry the negative signs. Because, a negative movement in NXR, a devaluation, is probably expanded industrial exports and a positive movement in PXR, an appreciation, is expected to reduce industrial exports.

After finding the long run parameters, we can find short run parameters for our explanatory variables by defining the Error Correction Model (ECM). The ECM model can be defined by including the lag of error term generated from the equation 4. The ECM may have following equation:

$$\Delta INDEXP_t = \sum_{i=1}^{p} \delta_i \Delta INDEXP_{t-i} + \sum_{i=0}^{q} \nu_i \Delta YW_{t-1} + \sum_{i=0}^{r} \left(\theta_i^{+} \Delta PXR_{t-i} + \theta_i^{-} \Delta NXR_{t-i}\right) + \tau ECT_{t-1} + \psi_t \quad (5)$$

In equation (5), a negative parameter of Error Correction Term (ECT) is an evidence for a short run relationship in the model. It is also an alternative evidence for a cointegration in the model as claimed by Pesaran et al. (2001). Further, the short run effects can be measured through rest of parameters of equation 5 by choosing appropriate lag lengths. The optimum lag lengths are captured by the Schwarz Information Criterion (SIC).

4. Data Analyses

The most of macroeconomic series have the issue of unit root and should be tested for diagnosing the stationary level. As the ARDL methodology is even efficient in case of a mix order of integration i.e. integration at order one or zero. But, the integration of order two is not permissible in the ARDL methodology. We have confirmed that all of our tested series are stationary at their levels or at their first differences and none of series is needed to test at their second difference. Therefore, we can forward our analyses without presenting the unit root tests. In table 1, we are performing and reporting the bound tests on the models of industrial exports and run some necessary diagnostic tests to ensure the validity of results from estimated models.

Table 1: Bound Tests and Diagnostics

Industries	**Chemical Products**	**Electrical Products**	**Food Stuff**	**Metal & Articles**	**Mineral Products**	**Plastic Products**	**Others**
F-value (Bound Test)	11.7423	6.7330	2.9000	7.6460	4.1379	4.6297	4.9001
Serial Correlation Tests	0.3409 (0.5656)	0.0429 (0.9581)	2.0887 (0.1029)	0.3642 (0.6985)	0.6519 (0.4274)	0.3598 (0.7010)	0.8554 (0.4352)
Heteroscedasticity Test	1.3448 (0.2520)	1.4400 (0.2330)	1.6446 (0.2161)	1.2726 (0.2876)	0.7235 (0.7398)	1.6735 (0.1285)	0.4933 (0.8421)
Normality Test	0.0751 (0.9632)	0.8526 (0.5984)	0.3312 (0.8474)	0.5370 (0.7645)	4.0555 (0.1316)	1.3586 (0.5069)	0.2843 (0.8675)

Ramsey RESET Test	0.5120 (0.4821)	0.9034 (0.3723)	0.3960 (0.6956)	1.4986 (0.1465)	0.8807 (0.3872)	0.7486 (0.4602)	1.4193 (0.1658)
CUSUM	S	S	S	S	S	S	S
CUSUMsq	S	S	S	S	S	S	S

Note: Upper bond critical values are 3.2, 4.08 and 4.66 at 10%, 5% and 1% respectively. Brackets keep p-values of respective tests. S is showing stability of estimated parameters through CUSUM and CUSUM square tests.

The bound tests, in table 1, show the evidence of the long run relationships in our estimated models as F-values are greater than a critical F-value (4.08) at the level of significance of 5% except food stuff export's model. The table (2) shows that coefficient of ECT of negative and significant in case of food stuff model. Therefore, we can claim that we have found the long run relationships in all of exports' models. Further, F-values of diagnostic tests are presented in the table (1) and the p-values are greater than 0.1. Therefore, our estimated models are free of econometric problems of serial correlation, heteroscedasticity and non-normality in estimated error terms' series. The Ramsey RESET test is also ensuring the normality of the functional forms of exports' models. Most importantly, the estimated ARDL parameters are stable in the testing of CUSUM and CUSUM square tests. Therefore, we can proceed for long and short effects of estimated models.

Table 2: Non-Linear ARDL Results

Variables	**Chemical Products**	**Electrical Products**	**Food Stuff**	**Metal & Articles**	**Mineral Products**	**Plastic Products**	**Others**
Long Run Results							
YW_t	3.4176 (0.0000)	5.2002 (0.0173)	3.5995 (0.0066)	3.4223 (0.0000)	3.8224 (0.0000)	7.2046 (0.0145)	7.6539 (0.0000)
PXR_t	-0.5361 (0.0801)	-10.1618 (0.0015)	-0.2210 (0.8379)	-0.1158 (0.7938)	-1.7394 (0.0209)	-8.4107 (0.0572)	-7.0558 (0.0008)
NXR_t	-2.4920 (0.0000)	-3.6419 (0.0041)	-2.5197 (0.1469)	-2.2487 (0.0003)	-5.6626 (0.0604)	-2.1731 (0.1667)	0.5382 (0.4917)
Intercept	-43.0866 (0.0000)	-68.8155 (0.0175)	-46.4980 (0.0070)	-43.9676 (0.0000)	-52.9202 (0.000)	-94.7297 (0.0154)	-99.7605 (0.0000)
Short Run Results							
$\Delta INDEXP_{t-1}$	0.6265 (0.0001)	0.1854 (0.0675)		0.4647 (0.0013)	0.4378 (0.0156)		0.4574 (0.0037)
$\Delta INDEXP_{t-2}$	0.5669 (0.005)			0.5371 (0.0002)			0.2539 (0.0699)
$\Delta INDEXP_{t-3}$	0.2393 (0.0337)			0.2082 (0.0477)			
ΔYW_t	-1.9980 (0.1315)	4.1334 (0.0136)	2.2755 (0.1860)	5.0548 (0.0010)	-4.7251 (0.0166)	4.8281 (0.0615)	-2.5962 (0.2272)
ΔYW_{t-1}	-5.8598 (0.0000)		3.1542 (0.0586)	1.8465 (0.2305)	-9.9955 (0.2546)	4.5556 (0.0742)	-7.6434 (0.0008)
ΔYW_{t-2}	-4.4040 (0.0044)		-3.5599 (0.0356)	-7.0182 (0.0001)		-5.5764 (0.0000)	
ΔPXR_t	-6.1259		-8.2602	-7.0854	-4.9955	5.4960	-5.6806

	(0.0026)		(0.0023)	(0.0001)	(0.2546)	(0.1350)	(0.0503)
ΔPXR_{t-1}	-1.4196 (0.529)	-6.1884 (0.0245)	-2.3767 (0.4195)		2.9967 (0.0292)		
ΔPXR_{t-2}	0.0922 (0.9685)		4.8322 (0.1310)		-3.3997 (0.0169)		
ΔPXR_{t-3}	3.5405 (0.0346)		4.9948 (2.4841)		2.2715 (0.0220)		
ΔNXR_t	-3.7437 (0.0008)	-0.8454 (0.3977)	-3.5169 (0.0143)	-4.3084 (0.0016)	-4.7302 (0.0002)	-5.2509 (0.0027)	1.0334 (0.4240)
ΔNXR_{t-1}	3.4312 (0.0018)		1.8199 (0.1966)	4.3339 (0.0030)	-6.3316 (0.1288)	-3.4082 (0.0379)	
ΔNXR_{t-2}	4.8771 (0.0002)		2.5246 (0.0706)	3.9263 (0.0017)	7.06433 (0.0620)	-2.9363 (0.0240)	
ΔNXR_{t-3}			-3.2857 (0.0073)		-2.0184 (0.0000)		
ECT_{t-1}	-1.6147 (0.0000)	-0.4932 (0.0002)	-0.5498 (0.0004)	-1.1442 (0.0000)	-0.4590 (0.0000)	-0.5279 (0.0000)	-0.8 912 (0.0000)

Note: Brackets ( ) keep p-values based on t-test

Table (2) also shows long and short run parameters. In the long run estimates, world income is positively and significantly impacting the all industrial exports of Saudi Arabia. PXR has negative effects on all of industrial exports except of food stuff and metal & articles in the long run. It means that an appreciation in real exchange rate is adversely affecting the industrial exports as expected for most of industrial exports. Likewise, negative movements of exchange rate have also negative and significant impacts on all industrial exports except the food stuff, plastic products and other exports' group category in long run. The negative movements of exchange rate has also expected sign in the above mentioned categories of industrial exports and therefore devaluation creates favorable impacts on industrial exports at large. Further, the evidences of presence of J-curve effect has been observed in case of exports of electrical product as the short run effect is at least found insignificant if not positive and significant and long run negative effect is found significant. It means that a devaluation could not achieve its objectives in short run but it remain effective in long run by improving the electrical products' exports' performance. In short run analyses, parameters of ECT_{t-1} are negative and significant and therefore the all models carry short run relations and this is also an alternative proof for cointegration as well. Further, devaluation helps in improving the exports performance in short run in case of all industrial exports except electrical products and others and appreciation has been found responsible for depressing industrial exports in all cases except plastic products. In overall analysis, the devaluation and appreciation have expected impacts on the most of industrial exports in long or short runs and only one evidence, for electrical exports' model, is found for J-curve hypothesis. Further in the analyses of asymmetry, all model are showing the asymmetrical effects in long and short runs as positive and negative variables of exchange rates are showing different magnitude / signs of their coefficients.

5. Conclusion and Policy Recommendations

This study is aiming at finding the effects of devaluation on industry-specific exports in Saudi Arabia by using annual data of 1970-2015 for each industry. It utilize the latest non-linear ARDL

introduced by Shin et al. (2014) for this purpose. We find the cointegration in all of industrial exports' models and short relationships as well. Further, concluding present study, it is clear evident from the above discussion in the result section that world income is helping in raising industrial exports and theoretically proven fact vindicates the present empirical evidence of world income, that is improving the industrial exports of the Saudi Arabia. A appreciation of exchange rate has negative effects on all of industrial exports except of food stuff and metal & metal articles. Therefore, appreciation has adverse impact on industrial exports in most of cases. Likewise, devaluation has negative impacts on all industrial exports except the food stuff, plastic products and other exports' group. Therefore, devaluation is remained helpful in enhancing the industrial exports while an evidence of J-curve has been found for electrical products. In the short run analysis, appreciation has been found responsible for lowering exports in all industrial exports' categories except plastic products. And devaluation helps in improving the exports performance in short run in case of all exports except electrical products and others. Though no short effect is found in the exports of electrical products but long run negative and significant results clearly indicates the occurrences of J-curve. In the light of above findings of short and long runs, devaluation of Saudi Riyal is advisable as it has desirable effects on the most of industrial exports.

References

Arize, A. (1995). Trade Flow and Real Exchange Rate Volatility: An Application of Cointegration and Error-Correction Modeling. North American Journal of Economics and Finance, 6(1), 37–51

Arize, A.C. (1998). The long-run relationship between import flows and real exchange-rate volatility: the experience of eight European economies. International Review of Economics and Finance, 7, 417–35.

Beine, M., Bos, C. S., and Coulombe, S. (2009). Does the Canadian Economy Suffer from Dutch Disease? Tinbergen Institute, Discussion Paper No. 09–096/4.

Chinn, M. (2006). A primer on real effective exchange rates: Determinants, overvaluation, trade flows and competitive devaluation. Open Economies Review, 17 (1), 115–143.

Paleologos, J.M., and Georgantelis S.E. (1997). Exchange Rate Movements and the Trade Balance Deficit: A Multivariate Analysis. Economia Internazionale, 3, 459–474.

Ratha, A. (2010). Does Devaluation Work for India? Economics Bulletin, 30, 247–264.

Baldwin, R. and Krugman, P. (1989). Persistent trade effects of large exchange rate shocks. Quarterly Journal of Economics, 19, 635–654.

Campa, J.M., Goldberg, L. (2001). Employment versus wage adjustment and the US dollar. The Review of Economics and Statistics, 83 (3), 477–489.

Bahmani-Oskooee, M. and Margeret, M. (1992). More evidence on the J-curve from LDCs. Journal of Policy Modeling, 14(5), 641-653.

Bahmani-Oskooee, M. and Cheema, J. (2009). Short-run and long-run effects of currency devaluation on the bilateral trade balance Pakistan and her major trading partners. Applied Economics, 34(1), 19-41.

Pesaran, M.H., Shin, Y. and Smith, R. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. Journal of Applied Econometrics, 16(3), 289-326.

Shin, Y., Yu, B. and Greenwood-Nimmo, M. (2014). Modelling asymmetric cointegration and dynamic multiplier in an ARDL framework. In: Horrace, W.C. and Sickles, R.C. (Eds) Festschrift in honor of Peter Schmidt. Springer Science and Business Media, New York.

Ahmad, K. & Mahmood, H. (2013). Macroeconomic Determinants of National Savings Revisited: A Small Open Economy of Pakistan. World Applied Sciences Journal, 21(1), 49-57.

Ahmad, K., & Mahmood, H., (2013). Openness-Inflation Puzzle: Evidence from Pakistan. The Bangladesh Development Studies, 69-78.

Ahmad, N., Iqbal, A. and Mahmood, H. (2013). CO2 Emission, Population and Industrial Growth linkages in Selected South Asian Countries: A Co-integration Analysis. World Applied Sciences Journal, 21(4), 615-622.

Alkhateeb, T.T.Y, Mahmood, H. & Sultan, Z.A. (2016). The Relationship between Exports and Economic Growth in Saudi Arabia. Asian Social Science. 12(4), 117-124.

Alkhateeb, T.T.Y., Alkahtani, NS, Mahmood, H., (2017). Assessing the Role of Foreign Labour on Saudi Labour Unemployment in Saudi Arabia. International Journal of Applied Business and Economic Research 15, 22.

Alkhateeb, T.T.Y., Mahmood, H., Sultan, ZA & Ahmad, N. (2017). Trade Openness and Employment Nexus in Saudi Arabia. International Journal of Economic Research, 14 (14), 56-66.

Alkhateeb, T.T.Y., Mahmood, H., Sultan, ZA, & Ahmad, N. (2017). Financial market development and employment nexus in Saudi Arabia. International Journal of Applied Business and Economic Research 15 (21), 165-174.

Alkhateeb, TT, Ajina, AS, George, S, & Mahmood, H., (2017). Egyptian intra agriculture trade with GAFTA members: Reilly's law of retail gravitation and marketing effects. International Journal of Economic Research 14 (9), 137-147.

Habib, A., Rehman, V, Zafar, T., Mahmood, H., (2016). Does sustainability hypothesis hold in developed countries? A panel co-integration analysis. Quality & Quantity, 50 (1), 1-25.

Hassan, M.U., Mahmood, H. & Hassan, M.S. (2013). Consequences of Worker's Remittances on Human Capital: An In-Depth Investigation for a Case of Pakistan. Middle-East Journal of Scientific Research, 14 (3), 443-452.

Hassan, MU, Hassan, MS, & Mahmood, H., (2013). An empirical inquisition of the impact of exchange rate and economic growth on export performance of Pakistan. Middle-East Journal of Scientific Research 14 (2), 288-299.

Liaquat, S., & Mahmood, H., (2017). Electricity consumption and economic growth in Pakistan: Menace of circular debt. International Journal of Economics and Business Research, 13 (3), 227-245.

Mahmood, H. & Alkhateeb, T.T.Y. (2017). Trade and Environment Nexus in Saudi Arabia: An Environmental Kuznets Curve Hypothesis. International Journal of Energy Economics and Policy, 7(5), 291-295.

Mahmood, H. and Chaudhary, A.R. (2012). A Contribution of Foreign Direct Investment in Poverty Reduction in Pakistan. Middle-East Journal of Scientific Research, 12 (2), 243-248.

Mahmood, H., & Alkhateeb, T.T.Y. (2017). An Estimation of Service Quality in King Khalid Hospital, Saudi Arabia. International Journal of Applied Business and Economic Research, 15 (16), 459-467.

Mahmood, H., & Asif, M., (2016). An empirical investigation of stability of money demand for GCC countries. International Journal of Economics and Business Research, 11 (3), 274-286.

Mahmood, H., & Chaudhary, A.R. (2009). Application of endogenous growth model to the economy of Pakistan: A cointegration approach. Pakistan Journal of Commerce and Social Sciences, 2, 16-24.

Mahmood, H., (2016). Determinants of Bilateral Foreign Direct Investment Inflows in Pakistan from major investing countries: A dynamic panel approach. Journal of Applied Economic Sciences, 11 (7), 1471 – 1476.

Mahmood, H., (2016). Revisited Money Demand function for GCC countries and testing its stability. Journal of Economics and Economic Education Research, 17 (2), 137 – 148.

Mahmood, H., & Chaudhary, A.R. (2012). Impact OF FDI on Human Capital in Pakistan. Asian Journal of Empirical Research, 2(3), 84-91.

Mahmood, H., & Chaudhary, A.R. (2012). Impact of Sector-Specific FDI on Sector-Specific Labour Productivity in Pakistan. World Applied Sciences Journal, 19 (4), 566-574.

Mahmood, H., & Chaudhary, A.R. (2012). Foreign Direct Investment-Domestic Investment Nexus in Pakistan. Middle-East Journal of Scientific Research, 11 (11), 1500-1507.

Mahmood, H., & Chaudhary, A.R. (2012). A Contribution of Foreign Direct Investment in Poverty Reduction in Pakistan. Middle-East Journal of Scientific Research, 12 (2), 243-248.

Mahmood, H., & Chaudhary, A.R. (2012). FDI, Financial Market Development, Trade Openness and Economic Growth. World Applied Sciences Journal, 19 (8), 1125-1132.

Mahmood, H., & Chaudhary, A.R. (2012). FDI, Population Density and Carbon Dioxide Emissions: A Case Study of Pakistan. Iranica Journal of Energy & Environment, 3(4), 254-260.

Mahmood, H., & Chaudhary, A.R. (2012). Impact of Sector-Specific FDI on Sector-Specific Employment in Pakistan. Middle-East Journal of Scientific Research, 11 (11), 1514-1523.

Hassan, MS., Ahmad, I., & Mahmood, H., (2012). Does Growth Led Inflation Hypothesis & Locus Critique Exist in Pakistan? A Time Series Study. World Applied Sciences Journal, 20(7), 917-926.

Mahmood, H., (2016). Testing fiscal sustainability under inter-temporal budget constraint in Saudi Arabia. Actual Problems of Economics 185 (11), 356-362.

Mahmood, H., A Ali, MI Chani (2013). Determinant of Aggregate Imports Demand Function: A Case of Tunisia. International Journal of Economics and Empirical Research, 1 (6), 74 – 82.

Mahmood, H., Al Khateeb, V, & Ahmad, N (2017). Impact Of Devaluation On Industrial Exports In Saudi Arabia: J-Curve Analysis. Actual Problems in Economics 189 (3), 331-41.

Mahmood, H., Alkhateeb, T.T.Y., & Ahmad, N (2017). Impact of devaluation on service sector exports in Saudi Arabia: non-linear ARDL approach. Economic annals-XXI, 36-40.

Mahmood, H., Alkhateeb, T.T.Y., & Ahmad, N. (2017). Impact of Devaluation on Foreign Trade in Saudi Arabia. International Journal of Applied Business and Economic Research, 15 (17), 13.

Mahmood, H., Alkhateeb, T.T.Y., Ahmad, N. (2017). Impact of Devaluation on Saudi Oil Exports: The J-Curve Analysis. International Journal of Economic Research, 14 (9), 375-383.

Mahmood, H., Alkhateeb, T.T.Y., N Maalel (2016). Egyptian intra agriculture trade with Common Market for Eastern and Southern Africa trading partners: A gravity model. International Journal of Economics and Financial Issues 6 (6S), 177-182.