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The effects of exchange rate changes on the bilateral trade balances between the MENA country group and France: empirical evidences based on non-linear ARDL approach

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Abstract. *The aim of this study is to reveal the asymmetric effect of exchange rate changes on the bilateral trade balance between Middle East and North Africa (MENA) country group and France. There are used the variables of the import/export values of MENA and France, and the real value of domestic currency in Euro, and is employed nonlinear estimation method using data spanning the 1999QI-2021QIII. Findings reveal that the exchange rates carry a significantly positive coefficient in Bahrain, Tunisia, and Egypt, and a negative coefficient in Kuwait and Morocco, implying that real depreciation of the domestic currency against the euro will improve the MENA-France trade balance.*

Keywords: foreign trade, international trade, exchange rate, MENA country group, non-linear ARDL approach.

JEL Classification: B17, F14, F31.

1. Introduction

Foresight for economic growth in the MENA stands at between a modest 1.5 and 3.5 percent for the period 2019-2021 (World Bank, 2019). This growth is also likely to be mixed, with some slow-moving countries and a few emerging growth countries. Growth is traditionally connected to trade: countries more integrated into the international production process tend to grow more. In the case of MENA countries, some of them are oil producers and export mainly raw materials, especially for Morocco and Tunisia have a stronger manufacturing industry. The EU countries are the most important trading partner for MENA countries. Gross exports to the Eurozone in 2016 were around 26 percent of GDP for Tunisia, and 16 percent for Morocco. Considering the aggregate MENA region, the main trade partners are China, the US, Germany, France, South Korea, Japan and Italy. France is the only important link in overall intermediate trade with the region. However, in terms of manufacturing only, France is much more central and has many export links that include Algeria, Tunisia, and Morocco. Among the MENA countries, there are no outward hubs of intermediate manufacturing products. The only countries with a positive trade balance outside the region are Kuwait, Bahrain, and Morocco. Considering intermediate manufacturing products, Morocco and Tunisia are a supplier of intermediate products for further processing stand out for France (also geographically close) (Marvasi, 2019). In 2019, the exports of MENA countries to France are 23 billion dollars, while the total imports of France are 649 billion dollars (3.5 per cent). The import of MENA countries from France is 30 billion dollars and the total export of France is 597 billion dollars (5 per cent). In 2020, the import of MENA countries from France is 25 billion dollars and the total export of France is 502 billion dollars (5 per cent). Exports of MENA countries to France are 16 billion dollars, and the total imports of France are 570 billion dollars (3 per cent).

In almost all countries in the world economy, floating exchange rate system have eliminated the process of changing the value of the domestic currency as a policy change by the authority. However, even in floating exchange rate system, economies carry out some monetary policies based on the appreciation or depreciation of their domestic currency. International trade theory emphasizes that the devaluation of the domestic currency (depreciation) first deteriorates the trade balance, and then improves. Krueger (1983) states that the change in the exchange rate is due to the fact that transit and contracted goods are already purchased, and the completion of these transactions dominates the short-run change in the trade balance. Therefore, the trade balance deteriorates at first, but starts to improve after time passes (there is a chance of increased elasticity). On the other hand, there is also the fact that the rapid increase in domestic activity compared to foreign activity may pressure any positive effects of devaluation (Magee, 1973).

A country's trade balance may deteriorate due to currency devaluation or depreciation. However, due to adjustment delays, the effects of devaluation are not instantaneous and are decisive in the long run. Indeed, the trade balance continues to deteriorate and improve only after a while. Therefore, the phenomenon of the J-curve expresses exactly this case (Oskooee and Fariditavana, 2016). In the world's foreign trade, there are at least five lags in the process between the exchange rate changes of countries and their ultimate effects on real trade: 1. recognition of the changed situation; 2. the decision to change real variables;

3. delivery time; 4. replenishment of stocks and materials, and 5. delays in production (Junz and Rhomberg, 1973). While many studies in the literature confirm the validity of the J curve of developed countries, different results emerge in terms of trade balances of developing countries. Bahmani-Oskooee (1985) confirmed the validity of the J curve for Greece, India and Korea, except Thailand. In these economies, where the J curve is valid, the duration of the worsening in the trade balance in the first stage and the period of recovery in the next stage differ due to the different dynamics of the countries. Miles (1979) emphasizes that the decrease in the value of the domestic currency does not improve the trade balances of the countries; Himarios (1985) emphasized the drawbacks of determining the ratio of trade balance to income as a dependent variable. Himarios (1985) revealed that the depreciation of the domestic currency has a positive effect on the trade balance. However, there is an important determination by Bahmani-Oskooee and Alse (1994) regarding the different results of these studies. According to this determination, while Miles (1979) used the first difference of the variables in his analysis; Himarios (1985) used it at a level. Since it is known that many macroeconomic variables used at the level are not stationary and have unit roots, the estimation results obtained by Himarios (1985) don't have reliability of significance and the coefficients.

The depreciation of the domestic currency primarily reflects the deterioration in the trade balance, but then the long-run improvement. Standard methods, such as the ARDL approach of Pesaran et al. (2001), were mostly preferred in testing this J-curve relationship. This cointegration and error correction method assumes that the adjustment of variables follows a linear path. However, recent studies have shown that the adaptation process is not linear. Shin et al. (2013) provide further evidence of the J-curve supporting the nonlinear adjustment of variables and the asymmetric effects of exchange rate changes on the trade balance, using bilateral trade balance models between countries with the application of the nonlinear ARDL approach. Previous studies have emphasized the symmetrical relationship by analyzing the effect of exchange rate changes on the trade balance based on the cointegration and error correction model. Bahmani-Oskooee and Fariditavana (2015), (2016) is the first studies that applies the non-linear ARDL approach to test the short-run and long-run effects of currency depreciation on the trade balance and emphasizes the asymmetric relationship. The nonlinear ARDL model provides the opportunity to demonstrate that the exchange rate change, the appreciation and depreciation of the domestic currency, does not affect the trade balance between countries at the same rate or at the level of significance. Bahmani-Oskooee and Fariditavana (2015, 2016) and Bahmani-Oskooee et al. (2016) have report that while it is possible for the exchange rate to be insignificant in the linear model, a variable representing depreciation or appreciation could be significant in the nonlinear model.

This study examines whether data from MENA and France are subject to such assessments. Shin et al. (2014) following, we employ asymmetric or nonlinear ARDL approach to cointegration, using quarterly data over the period 1999QI-2021QIII. Unlike the previous studies, in doing so we confide in nonlinear models so that we can assess the asymmetric effects of exchange rate changes. This study investigates the hypothesis that the domestic currency depreciation and appreciation towards Euro have different effects on the trade balance within the scope of MENA and France trade data. We find that while real appreciation of the domestic currency of Bahrain, Kuwait, Egypt and Morocco have significant effects on the bilateral trade balance of those country with France, real depreciation of the domestic currencies against the euro and have significantly effects on Bahrain's, Morocco's, Kuwait's, Egypt's and Tunisia's trade balance with France. Non-Linear ARDL model reveal the domestic currency depreciation and appreciation have different significance and coefficients in the short and long run. Morocco and Kuwait domestic currency appreciation have favorable effect, but the domestic currencies depreciation have deteriorating effect on the Morocco-France and Kuwait-France bilateral trade balance (i.e. Morocco's imports to France/Morocco's exports to France). Tunisia domestic currency depreciation has favorable effect on the Tunisia-France trade balance, the appreciation is insignificant. Findings imply that the long-run effects of exchange rate changes are asymmetric on Morocco's, Kuwait's and Tunisia's trade balance with France. To show these findings, we present the models, methods, definitions of variables and empirical results in Section 2. Finally, Section 3 provides a conclusion.

2. Methodology, data and empirical results

2.1. Econometric methodology

The study employs the Non-linear ARDL model to establish a relationship between real exchange rate change and trade balance. Non Linear ARDL model represents the bilateral trade model pioneered by Shin et al. (2014). The bilateral trade model adopted in this study follows Bahmani-Oskooee and Fariditavana (2015), (2016). This is represented below

$$TB_{ij} = \beta_0 + \beta_1 \, REX_i + u_{ij} \quad (1)$$

where TB_{ij} is the trade between country *i* and *j*. *i* is the country under investigation (MENA countries), while *j* is the trading partner country (i.e., France). TB is measured as the value of import of country *i* from country *j* divided by the value of export of country *i* to country *j*. REX_i represents the real exchange rate in country *i,* proxied by Euro per domestic currency. Taking natural log of both sides;

$$\ln TB_{ij} = \ln\beta_0 + \beta_1 \ln REX_i + u_{ij} \quad (2)$$

We begin the specification of the long-run relationship between real exchange rate-trade balance in the following way (3)

$$\ln TB_t - \ln\beta_0 - \beta_1 \ln REX_t = \varepsilon_t \quad (3)$$

where TB_t represents the natural log of the value of MENA's import divided by the value of its export to France; REX_t measures real exchange rate and it is described in a way that its decrease would mean domestic currency depreciation. ε_t represents the disturbing variable. The logarithmic form allows their slope coefficients to represent the elasticity of the dependent variable in line with the independent variable. Now that we have defined the variables in Eq. (3), we apply the linear ARDL cointegration approach of Pesaran et al. (2001) considering both the short and long-run effects of the variables in the same equation. Therefore, we transform the model in Eq. (3) to the model in Eq. (4) to examine the short and long-run effects of exchange rate changes in domestic currency on the trade balance.(1)

$$\Delta lnTB_t = a' + \sum_{k=1}^{n} b'_k \, \Delta lnTB_{t-k} + \sum_{k=0}^{n} c'_k \, \Delta lnREX_{t-k} + \propto_1 lnTB_{t-k} +$$

$$+ \propto_2 lnREX_{t-1} + \varepsilon_t \quad (4)$$

In Eq. (4), while the coefficients of the first difference variables in the equation provide information about the short run; long-term information is obtained by normalizing $\propto_2$ values over $\propto_1$ value (Bahmani-Oskooee and Fariditavana (2015). However, co-integration test can also be preferred to test whether there is a long-term relationship. In cases where the variables are not stationary at the same level; It is possible to apply the ARDL method if the dependent variable is I(1) stationary at the first difference and the dependent variables are stationary at level I(0) or I(1) at the first difference levels. Oskooee and Halicioglu (2017) emphasized that the new critical values take into account the integrative properties of the variables and do not require preliminary unit root testing. They also noted that almost all macroeconomic variables can be a combination of I(0) and I(1). The Linear ARDL model presented in Equation (4) takes into account the symmetrical effects of exchange rate changes on the trade balance. However, while the depreciation of domestic currency has not had a significant effect on the trade balance due to the differentiation of expectations regarding the exchange rate; the appreciation of domestic currency can have significant effects on the trade balance. In this context, there is an asymmetric effect of exchange rate changes on the trade balance.

Preferring Bahmani-Oskooee and Fariditavana's approach, we decompose changes in the real exchange rate LnREX into positive changes, denoted by $\Delta lnREX^+$, and negative changes, denoted by $\Delta lnREX^-$, and given as:

$$POS_t = \sum_{i=1}^{t} \Delta lnREX_i^+ = \sum_{i=1}^{t} \max(\Delta lnREX_i, 0)$$

$$NEG_t = \sum_{i=1}^{t} \Delta lnREX_i^- = \sum_{i=1}^{t} \min(\Delta lnREX_i, 0) \quad (5)$$

Following Shin et al. (2014), Non-Linear ARDL model with the addition of the variables $\Delta lnREX^+$ and $\Delta lnREX^-$ to Eq. (4) as in:

$$\Delta lnTB_t = a' + \sum_{k=1}^{n1} b'_k \, \Delta lnTB_{t-k} + \sum_{k=0}^{n2} c'_k \, \Delta lnREX_{t-k}^+ + \sum_{k=0}^{n3} d'_k \, \Delta lnREX_{t-k}^- + \delta_0 lnTB_{t-k} + \delta_1 lnREX_{t-1}^+ + \delta_2 lnREX_{t-1}^- + \varepsilon_t \quad (6)$$

The new variables in Eq. (6) let us to test whether exchange rate changes have asymmetric or symmetric effects on the bilateral trade balance between France and MENA country. In Eq. (4). while the short-run asymmetric effect is revealed by the comparison of the estimates of c and d; the long-run asymmetric effect is tested according to whether the δ_1 and δ_2 estimations are equal.

2.2. Empirical results

In this section of the study, we present the empirical results of the nonlinear ARDL model between the MENA and France. Quarterly data over the period 1999Q1-2021Q3 are used to carry out the estimation. We estimate each model by applying a maximum of eight lags on each first- differenced variable and using Akaike's Information Criterion (AIC) to select the optimal lags. We then report the results for each optimal model in Tables 1–8. Accordingly, panel A of the table presents that the short run estimates. Panel C of the table depicts whether or not there is a cointegration relationship among variables result in the empirical model. The empirical results indicate that nonlinear approaches support the long-run relationships between the MENA-France since F-statistics for those countries are higher than the upper bound values. As is seen, the null hypothesis of no cointegration can be rejected, indicating that there is a cointegration relationship in the empirical model. Thus, long-run coefficients of the independent variable can be estimated through the NARDL method. These long-run coefficients are exhibited in panel B of the table.

To be able to conduct the results from eight tables, we first focus attention on Table 1 and interpret the results for the Egypt-France bilateral trade balance model. This will pave the way to summarize the results for the remaining seven country group. In Panel A for Table 1, at least one of all variables is statistically significant. This significance implies that the real exchange rate has significant short-run effects on the trade balance between Egypt and France. However, do these short- run meaningful effects last in the long- run? The long-run estimates in panel B suggest that the answer is yes, as both normalized long- run coefficients are significant. The fact that at least one of the coefficients was significant required us to establish a cointegration relationship with the F test. Since the F statistic reported in Panel C is greater than the upper bound critical value (4.35) of our calculated statistic (8.73), it can be stated that the variables are cointegrated. How fast do the variables adapt to the long-run equilibrium values? The answer to the question is determined by the coefficient of the error term, known as the error correction term, represented by the ECM. A significant negative coefficient value obtained for ECM_{t-1} will indicate adjustment process to long- run from the short- run, and the size of the estimated coefficient in absolute value measures the adjustment speed. Our calculated ECM_{t-1} appears that 38% of the adjustment takes place within one quarter

We test the different effects of real exchange rate changes (appreciation or depreciation) on the bilateral trade balance between Egypt and France with the help of a nonlinear ARDL model. From the long-run coefficient estimates in panel B of Table 1, we gather that at least at the 1% significance level the $lnREX^{+}$ and $lnREX^{-}$ variable carry significant coefficient but the size of these coefficients is different. (2) This implies that the long-run effects of exchange rate changes are asymmetric. More precisely, while real depreciation of the domestic currency has long-run favorable effects on the Egypt-France trade balance, real appreciation of the domestic currency has long-run deteriorating effects. Domestic currency depreciation is more effective than its appreciation on the Egypt-France trade balance. However, Shin et al. (2014) suggested testing for short-run and long-run “impact asymmetry” by applying the Wald test. If the Wald statistic is significant, there is evidence of short-run or long-run impact asymmetry. This statistic is represented by $Wald_{Short}$ and $Wald_{long}$, showed in Panel C of Table 1, which have an insignificant value of 0.62 for short run asymmetry and -0.03 for long run asymmetry, supporting short run and long run symmetry. The short-run effects of domestic currency depreciation and appreciation last into the long run. The $lnREX^{+}$ and $lnREX^{-}$ variables carry significant coefficients. But, there is not evidence the exchange rate changes have asymmetric effects in the long run and short run. Our reported Wald test statistic with $Wald_{short}$ and W_{Long}, in Table 1 is insignificant, not supporting both short-run and long-run asymmetry.

Several additional statistics are reported in Panel C. Since the dependent variable has lagged values in the NARDL model, the serial correlation between the residuals should be tested. The best way to do this is to use the Lagrange Multiplier (LM) statistic. Our reported LM statistic is insignificant, supporting auto-correlation free residuals. Another statistic is the Ramsey's RESET statistic, which is used to test misspecification of the optimal model. Our reported statistic is insignificant, implying that the optimal model is correctly specified. For the stability of the short- run and long- run coefficient estimates, Pesaran et al. (2001) suggest the well-known CUSUM (stated by CUSM) and CUSUMSQ (stated by $CUSM^2$) and show stable coefficients with "S" and unstable ones with "UNS". Although all estimated coefficients seem to return to stable equilibrium ($CUSM^2$), all coefficient estimates are in stable equilibrium for CUSM test. Lastly, adjusted R^2 is also evaluate the strength of fit and our reported is 0.73, implying that strength of fit for Egypt-France NARDL model is satisfactory.

Table 1. *Egypt-France model*

NARDL	A. Short Run Estimates NARDL (8 2 5)								
	Lags								
	0	1	2	3	4	5	6	7	8
ΔlnTB		-0.31	-0.06	0.07	0.22	-0.04	0.08	-0.31	
		(-3.15)*	(-0.63)	-0.71	(2.27)**	(-0.50)	-0.93	(-3.46)*	
$\Delta lnREX^+$	2.95	2.46							
	(2.43)**	(2.02)**							
$\Delta lnREX^-$	0.36	0.12	-2.11	-0.29	-2.94				
	-0.58	-0.18	(-3.06)*	(-0.41)	(-4.22)*				
B. Long Run Estimates									
$lnREX^+$	2.31								
	(4.10)*								
$lnREX^-$	2.58								
	(3.68)*								
C. Diagnostic Test									
F	ECM_{t-1}	LM	RESET	CUSM	$CUSM^2$	Adj.R^2	$Wald_{short}$	$Wald_{long}$	
8.73*	-0.38*	1.77	0.44	S	UNS	0.73	0.62	-0.03	

Note: Parentheses represent t values; *, ** and *** indicate 1%, 5% and 10% significance levels, respectively. $Wald_{short}$ and $Wald_{long}$, refer to the Wald test for the null of long run and short run symmetry.

Table 2. *Algeria-France model*

NARDL	A. Short Run Estimates NARDL (7 0 0)							
	Lags							
	0	1	2	3	4	5	6	7
ΔlnTB		0.22	0.39	0.09	0.22	0.08	0.34	
		(1.68)***	(3.10)*	-0.79	(1.90)***	-0.73	(3.05)*	
$\Delta lnREX^+$								
$\Delta lnREX^-$								
B. Long Run Estimates								
$lnREX^+$	-0.07							
	(-0.14)							
$lnREX^-$	-0.33							
	(-0.72)							
C. Diagnostic Test								
F	ECM_{t-1}	LM	RESET	CUSM	$CUSM^2$	Adj.R^2	$Wald_{short}$	$Wald_{long}$
4.44**	-0.52*	2.62	1.04	S	Non-S	0.64		-1.93**

Note: Parentheses represent t values; *, ** and *** indicate 1%, 5% and 10% significance levels, respectively. $Wald_{short}$ and $Wald_{long}$, refer to the Wald test for the null of long run and short run symmetry.

Table 3. *Bahrain-France model*

NARDL	A. Short Run Estimates NARDL (6 0 7)							
	Lags							
	0	1	2	3	4	5	6	7
ΔlnTB		0.06	0.34	0.11	0.06	-0.01		
		-0.67	(3.44)*	-1.1	-0.67	(-0.22)		
$\Delta lnREX^+$								
$\Delta lnREX^-$	1.82	-4.24	-3.47	-0.06	-3.42	-1.78	-2.47	
	-1.25	(-3.13)*	(-2.54)**	(-0.04)	(-2.56)**	(-1.25)	(-1.59)	
B. Long Run Estimates								
$lnREX^+$	3.42							
	(5.45)*							
$lnREX^-$	3.43							
	(5.52)*							
C. Diagnostic Test								
F	ECM_{t-1}	LM	RESET	CUSM	$CUSM^2$	Adj.R^2	$Wald_{short}$	$Wald_{long}$
6.14*	-0.41*	3.50**	0.31	S	S	0.55	-3.44*	-0.72

Note: Parentheses represent t values; *, ** and *** indicate 1%, 5% and 10% significance levels, respectively. $Wald_{short}$ and $Wald_{long}$, refer to the Wald test for the null of long run and short run symmetry.

Table 4. *Jordan-France model*

NARDL	A. Short Run Estimates NARDL (1 6 0)							
	Lags							
	0	1	2	3	4	5	6	7
ΔlnTB								
$\Delta lnREX^+$	1.01	3.04	-3.45	6.67	0.38	5.32		
	-0.42	-1.13	(-1.31)	(2.53)*	-0.14	(2.22)**		
$\Delta lnREX^-$								
B. Long Run Estimates								
$lnREX^+$	-0.76							
	(-1.65)							
$lnREX^-$	-0.99							
	(-1.63)							
C. Diagnostic Test								
F	ECM_{t-1}	LM	RESET	CUSM	$CUSM^2$	Adj.R^2	$Wald_{short}$	$Wald_{long}$
14.39*	-0.84	1.1	2.23**	S	UNS	0.1		0.91

Note: Parentheses represent t values; *, ** and *** indicate 1%, 5% and 10% significance levels, respectively. $Wald_{short}$ and $Wald_{long}$, refer to the Wald test for the null of long run and short run symmetry.

Table 5. *Kuwait-France model*

NARDL	A. Short Run Estimates NARDL (1 0 0)							
	Lags							
	0	1	2	3	4	5	6	7
ΔlnTB								
ΔlnREX$^+$								
ΔlnREX$^-$								
B. Long Run Estimates								
lnREX$^+$	-0.77							
	(-1.04)							
lnREX$^-$	-0.37							
	(-0.41)							
C. Diagnostic Test								
F	ECM_{t-1}	LM	RESET	CUSM	$CUSM^2$	Adj.R^2	$Wald_{short}$	$Wald_{long}$
5.09*	-0.28*	4.53**	1.44	S	UNS	0.64		-2.11**

Note: Parentheses represent t values; *, ** and *** indicate 1%, 5% and 10% significance levels, respectively. $Wald_{short}$ and $Wald_{long}$, refer to the Wald test for the null of long run and short run symmetry.

Table 6. *Morocco-France model*

NARDL	A. Short Run Estimates NARDL (4 8 0)							
	Lags							
	0	1	2	3	4	5	6	7
ΔlnTB		-0.13	-0.06	-0.25				
		(-1.23)	(-0.62)	(-2.53)*				
ΔlnREX$^+$	3.24	1.63	3.49	3.12	5.07	1.04	3.81	2.98
	(2.17)**	-0.87	(2.16)**	(1.90)**	(3.25)*	-0.66	(2.51)*	(1.95)**
ΔlnREX$^-$								
B. Long Run Estimates								
lnREX$^+$	-7.83							
	(-5.37)*							
lnREX$^-$	-8.01							
	(-5.29)*							
C. Diagnostic Test								
F	ECM_{t-1}	LM	RESET	CUSM	$CUSM^2$	Adj.R^2	$Wald_{short}$	$Wald_{long}$
4.87**	-0.40*	0.5	0.11	S	S	0.73		2.16**

Note: Parentheses represent t values; *, ** and *** indicate 1%, 5% and 10% significance levels, respectively. $Wald_{short}$ and $Wald_{long}$, refer to the Wald test for the null of long run and short run symmetry.

Table 7. *Saudi Arabia-France model*

NARDL	A. Short Run Estimates NARDL (6 2 0)							
	Lags							
	0	1	2	3	4	5	6	7
ΔlnTB		0.01	0.17	0.39	0.17	0.23		
		-0.13	-1.54	(3.25)*	-0.12	(0.12)***		
$\Delta lnREX^+$		1.29	2.4					
		-1.17	(1.12)**					
$\Delta lnREX^-$								
B. Long Run Estimates								
$lnREX^+$	0.55							
	-1.58							
$lnREX^-$	0.2							
	-0.48							
C. Diagnostic Test								
F	ECM_{t-1}	LM	RESET	CUSM	$CUSM^2$	Adj.R^2	$Wald_{short}$	$Wald_{long}$
5.66*	0.49*	1.38	1.14	S	Non-S	0.62		1.62

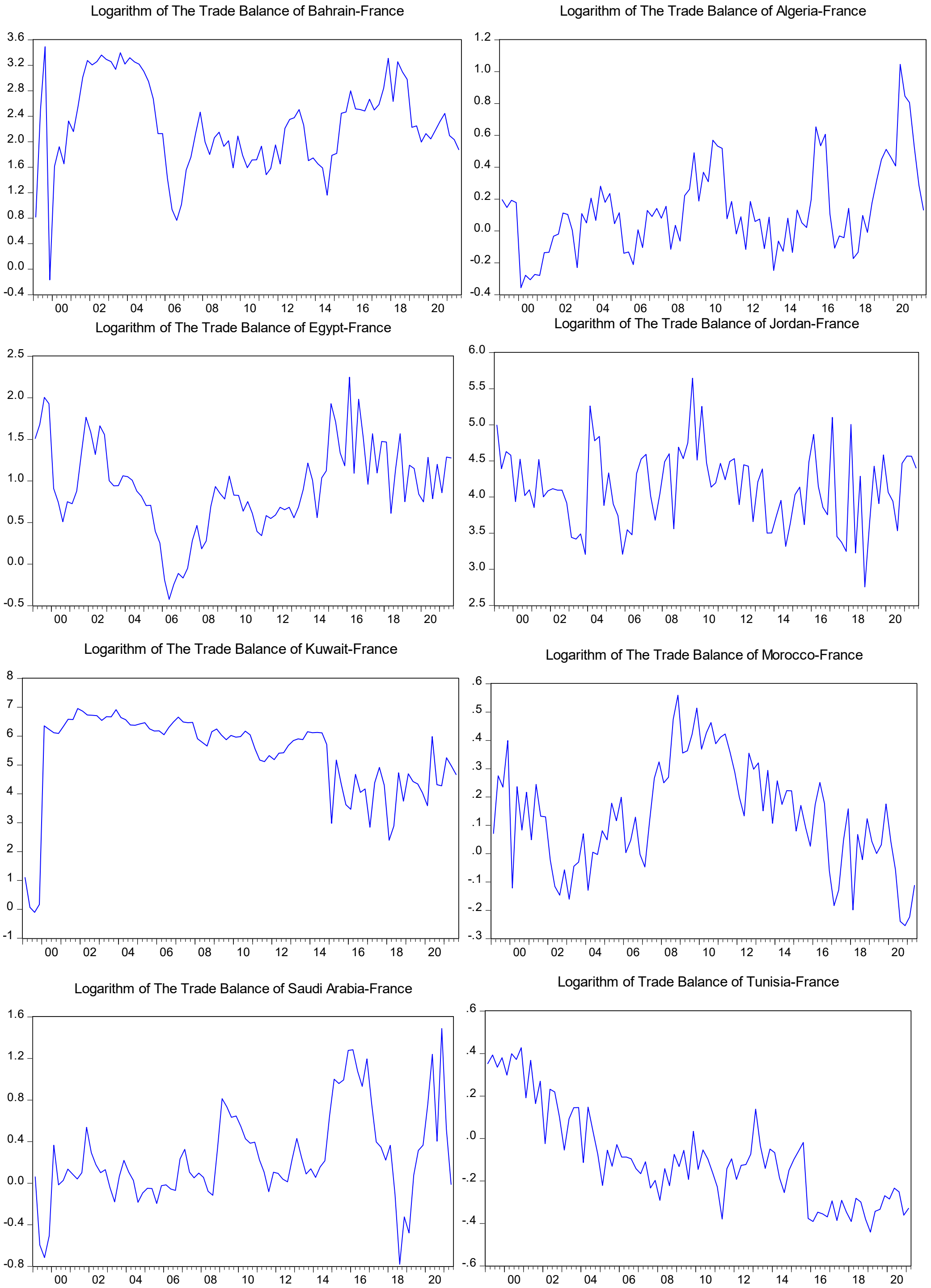
Note: Parentheses represent t values; *, ** and *** indicate 1%, 5% and 10% significance levels, respectively. $Wald_{short}$ and $Wald_{long}$, refer to the Wald test for the null of long run and short run symmetry.

Table 8. *Tunisia-France model*

NARDL	A. Short Run Estimates NARDL (5 3 0)							
	Lags							
	0	1	2	3	4	5	6	7
ΔlnTB		-0.39	-0.19	-0.16	0.18			
		(-3.63)*	(-1.61)	(-1.34)	(1.74)***			
$\Delta lnREX^+$		1.52	1.55	1.48				
		-1.64	-1.52	-1.56				
$\Delta lnREX^-$								
B. Long Run Estimates								
$lnREX^+$	0.28							
	-0.3							
$lnREX^-$	0.86							
	(1.78)***							
C. Diagnostic Test								
F	ECM_{t-1}	LM	RESET	CUSM	$CUSM^2$	Adj.R^2	$Wald_{short}$	$Wald_{long}$
4.38**	-0.33	0.33	2.78*	S	S	0.77		-1.75**

Note: Parentheses represent t values; *, ** and *** indicate 1%, 5% and 10% significance levels, respectively. $Wald_{short}$ and $Wald_{long}$, refer to the Wald test for the null of long run and short run symmetry.

Figure 1. *Plot of MENA's trade balance with France*



3. Conclusions

The use of VAR models in testing the effects of exchange rate changes on trade between countries has been criticized by Rose and Yellen (1989). Rose and Yellen (1989) stated those studies on the ground that they suffer from aggregation bias and they did not test for integrating or cointegrating properties of the variables in the trade balance model. They used bilateral trade flows data between the U.S. and her six major trading partners as well as Engle and Granger (1987) cointegraion and error-correction modeling. But, they found no evidence of the J-curve in any model. Oskooee and Fariditavana (2016) preferred Shin et al. (2013)'s Nonlinear ARDL approach. They provided proof of the J-curve phenomenon. When testing the effect of the real exchange rate on the bilateral trade of countries, they stated that when the non-linear ARDL approach is used, the effects of exchange rate changes are mostly asymmetrical and provide more evidence of the J curve. Starting from this point new empirical approach, the non-linear ARDL approach reveals that in most cases exchange rate changes have asymmetric effects on the trade balance.

Findings from the MENA-France Non-Linear ARDL model reveal the domestic currency depreciation and appreciation have different significance and coefficients in the short and long run. While real depreciation of the domestic currency has long-run favorable effects on the Egypt-France trade balance, real appreciation of the domestic currency has long-run deteriorating effects, supporting long-run and short run symmetry. The domestic currency appreciation has favorable effect, but the domestic currency depreciation has deteriorating effect on the bilateral trade balance (Morocco's or Kuwait's import to France/Morocco's or Kuwait's export to France) of the Morocco-France and Kuwait-France. Real exchange rate coefficients are negative and significant but the size of these coefficients are different. Tunisia domestic currency depreciation has favorable effect on the Tunisia-France trade balance, the appreciation is insignificant. Findings imply that the long-run effects of exchange rate changes are asymmetric on the Morocco's, Kuwait's and Tunisia's trade balance with France. Besides, the coefficients of Bahrain's domestic currency depreciation and appreciation carries positive and significant at least at the 1% significance level on the Bahrain's trade balance with France. Those coefficients are almost the same for log run estimation, supporting long-run symmetry. However, the short-run effects of exchange rate changes are asymmetric in the results between Bahrain and France. Finally, the exchange rates carry significantly positive coefficient in Bahrain, Tunisia and Egypt cases except Kuwait and Morocco, implying that real depreciation of the domestic currency against euro will improve the MENA countries with France.

In conclusion, nonlinear ARDL approach reveals that depreciations in domestic currencies of the Bahrain, Tunisia and Egypt against Euro improve the trade balances with France, thereby making an important contribution to this MENA countries economy. Hence, it is recommended that policy makers take into account the real exchange rate changes in MENA's bilateral trade balances with France. Furthermore, Policy makers should take into account the fact that a devaluation policy will not improve the trade balance for every trading partner country. In this case, if policy makers consider models that allow non-linear exchange rate adjustment, they will be able to predict the effect of exchange rate changes on the trade balance with some countries. Future research should analyze nonlinearity into the adjustment process for the effect of reel exchange rates on trade balances of MENA with other Europe countries

Notes

(1) Quarterly data over the period 1999QI-2021QIII are used to estimate all models, to estimate the econometric models. Export, import, nominal exchange rate (NEX) and Consumer Price Index (CPI) data come from the Direction of Trade Statistics by the IMF and International Financials Statistics by the IMF.
TB (Trade Balance) = MENA trade balance with France defined as MENA imports from France over exports to MENA. Data come from the Direction of Trade Statistics by the IMF.
REX (Real Exchange Rate) = The bilateral exchange rate of MENA against the Euro. It is defined as REX = (PMENA × NEX / PFrance) where NEX is the nominal exchange rate defined as the number of units of Euro per MENA domestic currency, PMENA is the price level in MENA (measured by CPI) and PFrance is the price level in France (also measured by CPI). Thus, a decline in REX reflects a real depreciation of MENA's domestic currency. All nominal exchange rates and consumer price index data come from International Financials Statistics by the IMF.

(2) A decrease in the real exchange rate means that the domestic currencies of MENA depreciate against the Euro.

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