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Impact of Exchange Rate Volatility on The Performance of Egyptian Agricultural Exports Using A Vector Error Correction Model

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ABSTRACT

Motivated by the ongoing debate among Egyptian economists and policymakers regarding the likely impacts of the recent depreciations of the Egyptian Pound on the country's economic sectors, this study aimed at contributing to this debate by providing empirical evidence of the impact of exchange tare volatility on the Egyptian agricultural exports. Specifically, a vector error correction model (VECM) was applied to quarterly data covering the period 1999:q1 – 2014:q4 to examine short-run and long-run impact of exchange rate volatility on Egypt's agricultural exports to the world. The econometric results indicate the existence of a statistically significant long-run relationship between exchange rate and Egyptian agricultural exports. The econometric results of the VECM model *(with respect to exchange rate)* reveal the existence of a long-run relationship between exchange rate and the value of Egypt's agricultural exports to the world. With an estimated negative and statistically significant error-correction term, the results showed a slow speed of adjustment toward long-run equilibrium and that only 2% of deviations from long-run equilibrium in the volume of Egyptian agricultural exports to the world are corrected for in the current period. In contrast, the short-run estimates of the VECM illustrated that exchange rate has a statistically insignificant effect on Egyptian agricultural exports. This finding was further confirmed by the results of the Wald Test. Based on these results, the study drew a number of policy recommendations including: *i)* Egyptian macroeconomic and foreign trade policymakers should be primarily preoccupied with the long-term movements of the exchange rate to design and implement monetary policies that ensure the stability of the exchange rate of the Egyptian Pound and enable Egyptian agricultural exporters to hedge against long-term exchange rate risk, *ii)* Egyptian agricultural trade policies should not only be focused "agricultural" related aspects but they should also take into account the impacts of "macroeconomic" variables on Egypt's agricultural exports which also matter for export, and *iii)* in order to benefit from the recent and expected depreciations in the Egyptian Pound, it is critical that agricultural exporters and export-supporting organizations in Egypt focus their effort on minimizing the production and post-production costs as well as on improving the quality of the agricultural commodities to enhance their ability to compete with other suppliers on the global market for agricultural commodities.

INTRODUCTION

Exchange rate represents a major variable that influences agricultural trade flows and countries' competitiveness on the international market for agrifood commodities (Mousavi and Leelavathi 2013). Moreover, while most of agrifood commodities are perishable in nature, and thus a considerable proportion of their production is globally traded, a decline in export demand for these commodities (e.g. due to exchange rate volatility) would lead to an oversupply in the producing countries and thus lower farm prices and diminish profits (Acharya and Patterson 2005). Specifically, from an "export" point of view, a depreciation in an exporting country's currency (the Egyptian Pound, EGP, in our case) against the currencies of trading partners is expected to lower the prices of the exported commodities on the importing countries, and thus stimulate agricultural exports and raise their competitiveness relative to other competitors (Abu Hatab *et al.*, 2010). In contrast, an appreciation in an exporting country's national currency would make agricultural exports more expensive and thus negatively affects their flows and competitiveness in the importing markets.

Given this role that exchange rate plays in agricultural trade flows among the countries, voluminous studies have investigated its impact on (agricultural) exports and prices including, among others; Bradshaw and Orden (1990), Cho, Kim *et al.* (2004); Cho, Kim *et al.* (2005), Orden (2002), Xu and Orden (2002), Baek and Koo (2008), Huang (2004), Godwin (2009), Chebbi and Olarreaga (2011), Nazlioglu and Erdem (2011), and Simakova (2015). With regards to Egypt, a review of the literature on international agrifood trade indicates that a relatively few number of studies, in comparison to studies that have focused on other determinants of agrifood exports, have examined the relationship between exchange rate volatility and the performance of the country's agricultural exports (Shabsigh and Domaç, 1999; Achy and Sekkat, 2003; Rey, 2006, Abu Hatab *et al.*, 2010).

A look at the findings of these studies shows that they have provided conflicting evidence on the effect of exchange rate volatility on both total and agricultural trade flows. A group of these studies supports the hypothesis that exchange rate and its volatility have a negative impact on agricultural trade volumes; whereas the other group found either positive or absence of any impact of exchange rate on agricultural exports. Therefore, the present study contributes to this debate by providing empirical evidence on the influence of exchange rate volatility on Egypt's agricultural exports.

Research Problem

For a country like Egypt, the effect of exchange rate volatility should be taken into account when analyzing international trade and designing trade policies given that exports, on average, calculated for around 20% of the country's GDP during the past two decades (World Bank 2016). Moreover, the country has been facing a "dollar crisis" since 2011 while Egypt's foreign reserves declined to about USD 16.5 billion, less than half of what the country had before the 2011 uprising when they were around USD 36 billion. An important factor that has exaggerates Egypt's

exchange rate crisis is the role that the "black market" plays in the weakening the EGP against the US dollar. Specially, the EGP has lost about 20% of its value against the US dollar in the official market since 2015. The influence of the black market is evident by the wide gap between its USD/EGP exchange rate and the official rate set by the central bank of Egypt. For instance, on July 31, the EGP weakened by a shocking rate of 13% against the US dollar on the black market which was around 40% weaker than the official rate of Central Bank of about 8.80. To respond to these burgeoning exchange rate crisis, the government has introduced tougher measures to the exchange rate system which are expected to have significant impacts on different economic sectors including the foreign trade sector. Therefore, these ongoing changes in the Egyptian exchange rate regime gives the present paper more importance since the assessment of the impact of exchange rate on the performance of agricultural exports should be given a special attention due to the socio-economic importance of the agricultural sector and the agricultural exports to the Egyptian economy.

Research Objective

Against this background, the main objective of this study is to investigate the impact of exchange rate volatility on the export performance of Egyptian agricultural exports to the world during the period 1999-2014 and to suggest policy proposals which may be useful for policymakers in agrifood export promotion. The rest of the paper is organized as follows: the next sections provides an overview on Egypt's exchange rate regime over the past three decades. Section three brief reviews the performance of Egyptian agricultural exports to the world during the period understudy. In section 4, the data and underlying methodology are discussed in more detail. The estimation results and their discussion are presented in section 5. Finally, in section 6, a summary of the study and the concluding remarks are provided.

Model Specification And Data Sources

Based on a review of previous related empirical studies on the impact of exchange rate volatility on foreign trade flows (e.g. Baharumshah, 2001; Onafowora, 2003; Mousavi and Leelavathi, 2013; Ramphul, 2013), the long-run export demand equation for Egyptian agricultural commodities can be written as follows:

$$EXPV_t = \beta_0 + \beta_1 REER_t + \beta_2 GDPW_t + \beta_3 PRICE_t + u_t \quad \ldots\ldots(1)$$

Where $EXPV_t$ is the value of Egyptian agricultural exports to the world at time *t* (quarterly estimates). $REER_t$ is the real effective exchange rate between the EGP and the USD. It is defined as $(CPI_{WLD}.ER_{EGP/USD})/CPI_{EGP}$, while CPI_{WLD} is the world consumer price index, $ER_{EGP/USD}$ is the exchange rate between EGP and the USD, and CPI_{EGP} is the Egyptian consumer price index. $GDPW_t$ is the real world gross domestic product, $PRICE_t$ measures the relative prices defined as the ration of Egypt's agricultural export prices to the world prices, and u_t is an error term.

With respect to expected signs of the coefficients in equation (1), the coefficient of our variable of interest β_1 (exchange rate) could be positive if a real depreciation of the EGP improves the performance of Egyptian agricultural exports to the world, and vice versa. The Economic theory suggests that an increases in the trading partner's GDP (β_2) would increase the demand for imports and thus this will positively influence the volume of Egyptian agricultural exports. Finally, a decline in Egyptian export prices of agricultural commodities relative to the world prices (β_3) would increase the competitiveness of Egyptian agricultural commodities in the importing markets and thus increase the demand on exports.

For the econometric estimation of equation (1), the study used a quarterly data covering the period from 1999:1 to 2014:4. Data on Egyptian agricultural exports were obtained from the *UN-Comtrade Commodity Trade Statistics Database*, the *electronic yearbook of* the Central Agency for Public Mobility and Statistics (CAPMAS), and the *Quarterly Economic Reviews* of the CBE. The calculations of the $REER$ relied on data from the *Monthly Statistical Bulletins and the annual reports* of the CBE, *electronic yearbooks* of CAPMAS and the *World Economic Outlook database* of the International Monetary Fund (IMF). Real GDP data were collected from the *World Development Indicators* database of the World Bank and IMF *World Economic Outlook database*. With regards to the "relative prices" variable, an index was constructed based on the Egypt's export prices of agricultural commodities relative to the average world prices. Moreover, the monetary values related to these variables were converted into US dollar terms and expressed in real prices of 2000. Finally, the variables in Equation 1 were then transformed into logarithmic forms in order to interpret the estimation results as elasticities. Table 1 in the appendix summarizes the descriptive statistics of the variables used in the econometric estimations.

Econometric Estimation Procedures

According to Abu Hatab and Nsabimana (2016), a long-run association among variables in a system exists when these variables are integrated in the same order. To test for integration order of the variables, Levin, Lin et al. (2002) and Wang and Tomek (2007) point out that several approaches can be used, including: the Dickey-Fuller test, Kwiatkowski-Phillips-Schmidt-Shin test, Ng-Perron modified unit root test, unit root test with structural breaks, Augmented Dickey-Fuller test and the Phillips-Perron (PP) unit root test. In this analysis, the ADF and PP tests which have been widely used in the literature to test for stationarity (Narayan and Popp 2010) have been employed. Table 2 in the appendix shows that the ADF and PP statistics for all series levels are lower, in absolute terms, than the corresponding critical values, implying the non-stationarity of series levels, i.e. they are not integrated

of order or *I*(1). According to the literature, when series levels are non-stationary, then estimated regressions involving the levels cannot be trusted and could lead to spurious regressions (Giles 2007, Chu and Kozhan 2010).

To deal with this issue, the study investigated the co-integration relationship among the variables using the Johansen technique (Johansen 1988, Johansen and Juselius 1990). Table 3 in the appendix reports the results of the Johansen co-integration test based on the trace statistic values as well as the max-eigenvalues. The results suggests that we cannot reject the null hypothesis (there is no co-integration among our five variables). This implies that that there is at least one co-integrating vector among the variables included in the model, and thus a long-run association among the variables exists. The rejection of the null hypothesis implies that a vector error correction model (VECM) combining levels and differences, can be estimated (Ahking 2002, Sun 2007). Accordingly, the log-form of Equation (1) represents the long-run equilibrium relationship based on the assumption that "unobserved" exports equal "actual" exports in the long-run. Given that the results of the Johansen test for co-integration confirmed the existence of cointegration among the variables, the following vector error correction model (VECM) was estimated to capture the short-run dynamics between agricultural exports and exchange rate:

$$\Delta \ln EXPV = \beta_0 + \beta_1 ECT + \sum \beta_2 \Delta \ln EXPV_{t-i} + \sum \beta_3 \Delta REER_{t-i} + \sum \beta_4 \Delta \ln PRICE_{t-i} + u_t \quad (2)$$

While ECT is the error correction term or the residual from Equation (1), and other variables are defined above.

Table 1: Descriptive statistics of the dependent and the explanatory variables

Statistics	$EXPV_t$	$REER_t$	$GDPW_t$	$PRICE_t$
Mean	653.9747	5.442944	14970.76	0.610839
Median	332.2274	5.706900	15329.28	0.351342
Maximum	1351.390	7.145567	18232.47	5.048558
Minimum	146.9172	3.390000	11730.31	-0.510686
Std. Dev.	490.3552	1.059781	1974.181	1.086029
Jarque-Bera	9.200876	4.861232	4.270954	328.6646
Probability	0.010047	0.087983	0.118188	0.000000
Sum Sq. Dev.	15148237	70.75751	2.46E+08	74.30591
Observations	64	64	64	64

Source: Author calculations

Table 2: Results of ADF and PP unit root tests

Variables	ADF		PP		Decision
	Statistic	Critical Value	Statistic	Critical Value	
$EXPV_t$	-0.769122	-2.913549	-0.475165	-2.908420	Unit Root
$D(EXPV_t)$	-2.760089*	-2.913549	-2.296571	-2.809206*	Unit Root
$REER_t$	-1.510502	-2.909206	-1.191943	-2.908420	Unit Root
$D(REER_t)$	-4.667157*	-2.909206	-4.537906*	-2.909206	Stationary
$GDPW_t$	-0.346939	-2.913549	-0.212469	-2.908420	Unit Root
$D(GDPW_t)$	-3.741973*	-2.913549	-3.058174*	-2.909206	Stationary
$PRICE_t$	-2.683627*	-2.910019	-2.438170	-2.908420	Unit Root
$D(PRICE_t)$	-6.121957*	-2.910019	-2.816564*	-2.909206	~ Stationary

(*)Significant at 5% level. Critical values for the ADF and PP tests are based on MacKinnon (1996) one-sided p-values. Source: Author's own results

Table 3: Results of Johansen test for co-integration

	Unrestricted Cointegration Rank Test (Trace)			
Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.412692	53.52814	47.85613	0.0134
At most 1	0.221488	21.06364	29.79707	0.3537
At most 2	0.086922	5.790974	15.49471	0.7201
At most 3	0.003992	0.244005	3.841466	0.6213
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
None *	0.412692	32.46451	27.58434	0.0109
At most 1	0.221488	15.27266	21.13162	0.2702
At most 2	0.086922	5.546969	14.26460	0.6718
At most 3	0.003992	0.244005	3.841466	0.6213

** denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values. Source: Author's own results*

Overview Of Egypt's Exchange Rate Regime

Historically, the Central Bank of Egypt (CBE) has placed a high premium on the stability of the values of the EGP with respect to the US dollar (Khan and Miller 2015). Over the past three decades, the EGP exchange rate has experienced significant changes (Figure 1). As part of a comprehensive economic reform policy and a structural adjustment program during the 1990s, the Central Bank of Egypt (CBE) displaced its semi-fixed "adjustable peg" exchange rate system with a managed floating regime which devaluated the exchange rate of the EGP against the USD from 1.5 to

3.5 per USD between 1990 and 2000 (Moursi and El Mossallamy 2010; Ahmed 2012; Mabrouk and Hassan 2012). In 2001, the CBE adopted a crawling peg exchange rate system through which the USD exchange rate was set at 3.85 EGP but was allowed to fluctuate within a band of rates. During the following two years, the value of the EGP was frequently revisited and adjusted due to market factors including inflation and following a number of shocks which hit the world economy and caused adverse effects on Egyptian economic sectors (Elatraby and Saad, 2016). In 2003, the CBE adopted a "free floating exchange rate regime" which according to many observers was not strictly followed leading the International Monetary Fund to revise its classification of the country's exchange rate regime several times between 2003 and 2010 (Massoud and Willett, 2014). During the years 2003-2009, higher rates of economic growth together with foreign-exchange generating activities including the boom of the tourism sector and the influx of the foreign direct investments have produced comfortable levels of net international reserves and supported the CBE's policy of maintaining the EGP/USD exchange rate within relatively stable ranges.

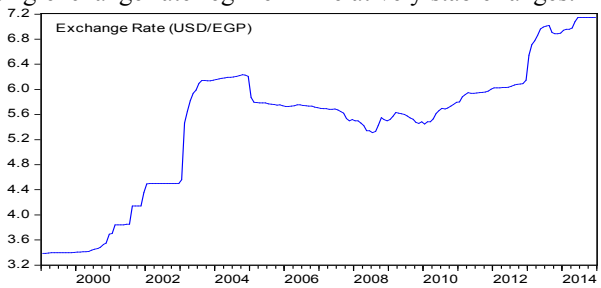

Figure 1: Yearly nominal average exchange rate EGP/USD, 1999-2015

Source: Plotted by the author based on data from the CBE, 2016

Following the political turmoil of 2011, several major crucial sources of foreign currency, including, tourism and foreign direct investments, have been negatively affected. In addition, receipts from the Suez Canal have declined as a result of global trade slowdown (Abu Hatab, 2016). Together these circumstances have curtailed the inflow of foreign exchange and put pressures on the existing foreign currency reserves causing a foreign currency crisis. The cost of stabilizing the EGP have further resulted in a large loss of international reserves of which declined by approximately 55% from USD 36 billion in 2010 to around USD 16.3 billion in 2015 (CBE, 2016). To respond to these burgeoning challenges and boost foreign investment and revive tourism, the CBE has allowed several minor and gradual devaluations of the EGP to maintain inflation within reasonable levels. Accordingly, the exchange rate depreciated from a rate of 5.6 EGP/USD in 2011 to around 8.8 EGP/USD in July 2016. These recent developments in Egypt's monetary policy and the resulting depreciations in the value of the EGP have generated divided views among economists and financial policymakers in the country with regards to their potential effects on the foreign trade sector. This paper therefore contributes to this ongoing debate by providing empirical evidence on the impact of exchange rate volatility on the volume of Egyptian agricultural exports to the world.

Performance Of Egypt's Agricultural Exports

During the past three decades, the contribution of agriculture to the GDP of Egypt continued to decline retreating from around 20% in the 1980s to roughly 13% in 2014 (World Bank, 2016). Despite the share of industry and service sectors are rising constantly, agriculture is still retaining a significant role in the national economy while the sector creates jobs to around 30% of the labor force and provides livelihood to about 55% of the populations (Abu Hatab, 2011).

Furthermore, agricultural exports account for around 15% of the country's total exports earnings (Abu Hatab and Hess, 2013). The development of the agricultural sector in general and the promotion of agricultural exports in particular have always received a special attention from Egypt's successive governments. Particularly, Egypt has since the 1990s began actively advocating development strategies based on trade liberalization and export promotion within the framework of a series of trade policy reforms which were based on three main pillars, namely: *i)* lowering and promoting an efficient use of tariffs as a policy instruments, *ii)* reducing the level of non-tariff barriers, and *iii)* reforming the exchange rate regime (Abu Hatab 2011).

With the turn of the millennium, the scope of these trade policy reforms has expanded and the country took further steps towards agricultural trade liberalization with the aim to promote a stronger integration with the world economy.

Particularly, the government has since 2004 sought to accelerate agricultural export development while an economic goal founded on the export-led growth hypothesis, which suggests that exports contribute to economic growth, and therefore, can be an effective mechanism to expand output, employment, income, and foreign exchange earnings (Abu Hatab *et al.*, 2010). The outcomes of these reforms were reflected in a steady growth of Egyptian agricultural exports which increased from USD 0.6 billion in 1994 to around a billion USD in 2003 (Figure 2). Despite some moderate fluctuations, Egyptian agricultural exports grew at their fastest-ever rate of approximately 31% annually between 2004 and 2010, increasing from USD 1.3 billion to around USD 5.1 billion, respectively. During the post-2011 years, the growth rate of Egyptian agricultural exported has sharply plummet registering a year-on year growth rate of almost zero.

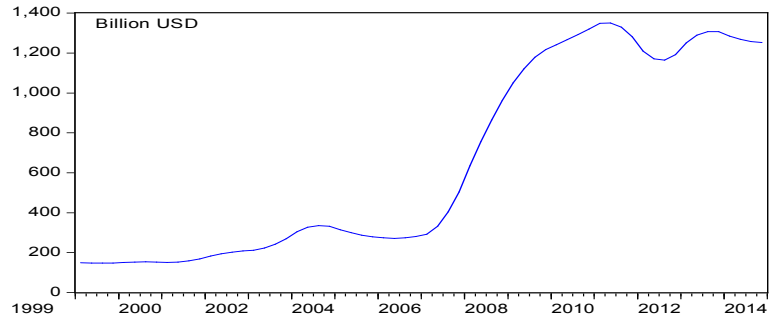

Figure 2: Egyptian agricultural exports to the world, 1994-2014, billion USD

Source: World Bank (2016)

RESULTS & DISCUSSION

Table 4 summarizes the long run econometric results of the vector error correction model of Egyptian agricultural exports during the period 1999-2014. To check the goodness of fit of the estimated model, a number of diagnostic tests including stability tests (CUSUM and CUSUM of squares), serial correlation test, and the heteroscedasticity in the residual series were performed.

Table 4: Vector Error Correction Model Estimates, long-run coefficients

Variables	$REER_t$	$GDPW_t$	$PRICE_t$
Coefficients	0.0421016	-5.907325	-0.549560
Standard errors	(0.0141975)	(0.92279)	(0.10446)
t-statistics	[2.965423]	[-6.40162]	[-5.26082]
Prob.	0.0043	0.0000	0.0004
Observations: 61			
R-squared	0.929483	Mean dependent var	0.035137
Adjusted R-squared	0.917039	S.D. dependent var	0.063279
S.E. of regression	0.018226	Akaike info criterion	-5.023099
Sum squared resid	0.016942	Schwarz criterion	-4.677054
Log likelihood	163.2045	Hannan-Quinn criter.	-4.887480
F-statistic	74.69217	Prob(F-statistic)	0.000000

Standard errors in ( ) & t-statistics in [ ]
Source: Author's own results

The results of these tests are reported in Figures 3 and 4, and Tables 5 and 6 in the appendix. Both the CUSUM and CUSUM of squares tests suggest the constancy over time of the coefficients of the estimated model. Moreover, the p-value in the heteroscedasticity test was found to be greater than 0.05 indicating that the null hypothesis cannot be rejected and that the model is homoscedastic. Furthermore, the results of the Breusch-Godfrey Serial Correlation LM Test (Table 6 in the appendix) show that p-value is 0.9721 implying that there is no serial correlation. Finally, the adjusted squared R of 0.917 further suggests the goodness-of-fit of the estimated model. Theoretically, a long-run equilibrium relationships exists when the coefficient of the error correction term $\eta(\varepsilon_{t-1})$ is negative and statistically significant (Nieh and Lee, 2002; Onafowora, 2003; Humpe and Macmillan, 2009). According to the reported results in Table 7, the error-correction term has a negative and a statistically significant coefficient of (-0.021) implying that there is a long-run causality between the value of Egyptian agricultural exports and the independent variables in the estimated model. This indicates also a slow speed of adjustment toward long-run equilibrium and that only 2% of deviations from long-run equilibrium in volume of Egyptian agricultural exports to the world are corrected for in the current period.

While the main objective of this study is to investigate the impact of exchange rate volatility on Egypt's agricultural exports, the discussion of the results will chiefly focus on the estimates related to the exchange rate variable whereas estimates related to other variables will be referred to when necessary. With respect to the long-run estimates, Table 4 show that the coefficient of the exchange rate variable is statistically significant at 5% level of confidence and has a positive effect on the Egyptian agricultural exports to the world. This means that a depreciation of 1% of the Egyptian Pound against the USD would, in the long-run, lead to an increase of 4.21% in the value of Egyptian agricultural exports to the world. The results show also that the relative prices' variable ($PRICE_t$) has the expected positive sign and is highly significant. Contrary to the theoretical expectations, the coefficient of the variable GDP, which was introduced to capture the income effect of the importing markets, has a strongly statistically negative sign. This finding could be partially attributed to the fact that high foreign income would expectedly lead to higher per-capita incomes in the importing countries. Thus, foreign consumers, in the long run, would turn to higher quality and value-added agricultural commodities which might negatively influence the Egyptian agricultural exports that are generally less competitive in terms of quality and are commonly supplied to the international market in bulk raw commodities (for more details, see for instance: Abu Hatab *et al.*, 2010; Torayeh, 2013; Abu Hatab and Surry, 2016).

The short-run estimations of the vector error correction model are summarized in Table 7. In line

with previous studies (e.g.Clarida, Sarno *et al.*, 2003; Sarno and Valente, 2005; Rusjdi and Islam, 2007), the estimated coefficients of the short-run model have smaller magnitude in comparison to the long-run model. Despite the estimated coefficients have the expected signs, they are without exception statistically insignificant at 5% level of confidence. This suggests that exchange rate volatility does not have a significant effect on Egyptian agricultural exports in the short run.

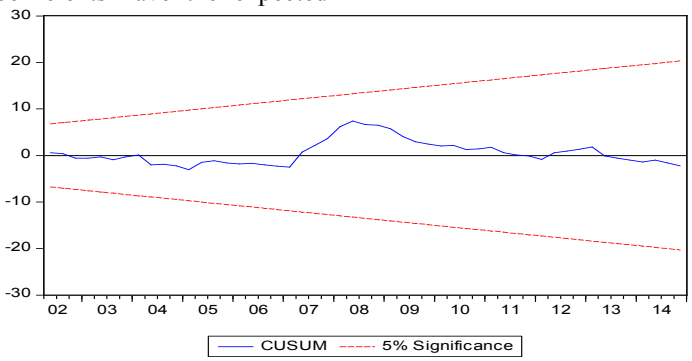

Figure 3: The Cumulative Sum Control Chart (CUSUM)

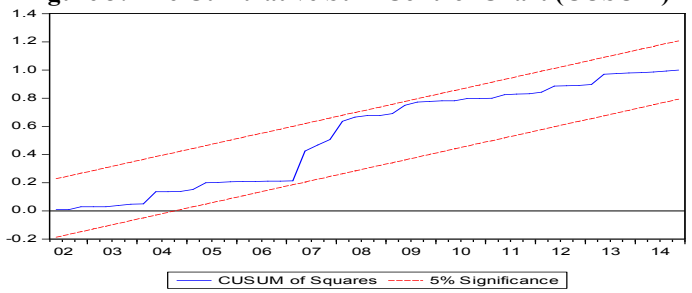

Figure 4: CUSUM of Squares

Table 5: Heteroscedasticity Test

F-statistic	0.481801	Prob. F(2,56)		0.6202
Obs*R-squared	0.998049	Prob. Chi-Square(2)		0.6071
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000338	0.000114	2.975378	0.0043
RESID^2(-1)	-0.090069	0.132931	-0.677562	0.5008
RESID^2(-2)	-0.101461	0.132930	-0.763271	0.4485
R-squared	0.016916	Mean dependent var		0.000284
Adjusted R-squared	-0.018194	S.D. dependent var		0.000755
S.E. of regression	0.000762	Akaike info criterion		-11.47214
Sum squared resid	3.25E-05	Schwarz criterion		-11.36651
Log likelihood	341.4283	Hannan-Quinn criter.		-11.43091
F-statistic	0.481801	Durbin-Watson stat		2.012302
Prob(F-statistic)	0.620207			

Table 6: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.022734	Prob. F(2,49)		0.9775
Obs*R-squared	0.056549	Prob. Chi-Square(2)		0.9721
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.000661	0.010150	0.065143	0.9483
C(2)	0.026148	0.202968	0.128830	0.8980
C(3)	-0.025207	0.193176	-0.130486	0.8967
C(4)	0.000621	0.017491	0.035528	0.9718
C(5)	-0.001219	0.017523	-0.069545	0.9448
C(6)	0.002764	1.073623	0.002575	0.9980
C(7)	-0.012445	1.022435	-0.012172	0.9903
C(8)	0.000528	0.006431	0.082086	0.9349
C(9)	0.000460	0.006272	0.073328	0.9418
C(10)	7.81E-05	0.006071	0.012857	0.9898
RESID(-1)	-0.049066	0.266143	-0.184360	0.8545
RESID(-2)	-0.002063	0.202572	-0.010183	0.9919
R-squared	0.000927	Mean dependent var		-1.63E-15
Adjusted R-squared	-0.223355	S.D. dependent var		0.016804
S.E. of regression	0.018586	Akaike info criterion		-4.958452
Sum squared resid	0.016926	Schwarz criterion		-4.543199
Log likelihood	163.2328	Hannan-Quinn criter.		-4.795711
F-statistic	0.004133	Durbin-Watson stat		1.986086
Prob(F-statistic)	1.000000			

Table 7: Vector Error Correction Model Estimates, short-run coefficients

Variables	Coefficient	Std. Error	t-Statistic	Prob.
$\eta(\varepsilon_{t-1})$	-0.021579	0.009216	-2.341396	0.0232
$\Delta(REER_t)$	0.009255	0.016242	0.569822	0.5713
$\Delta(GDPW_t)$	1.389861	1.001014	1.388453	0.1710
$\Delta(PRICE_t)$	0.001089	0.005231	0.208199	0.8359
Constant	0.004014	0.005885	0.682084	0.4983

Source: Author's own results

Table 8: Results of the Wald Test (exchange rate and value of agricultural exports):

Test Statistic	Value	df	Probability
F-statistic	0.417041	(2, 51)	0.6612
Chi-square	0.834082	2	0.6590

Note: Restrictions are linear in coefficients.
Source: Author's own results

To further confirm this finding, the study performed Wald Test to examine the short run causality between the exchange rate and the agricultural exports (Table 8). The results show that the null hypothesis cannot be reject (the probability is greater than 5%) implying that there is no short-run causality between the exchange rate and the value of Egyptian agricultural exports. The insignificance impact of the exchange rate variable in the short-run is no surprise while several previous studies have shown that a depreciation in a country's currency does not necessarily exhibit a significant effect on its exports.

In this respect, Nazlioglu and Erdem (2010), Nyahokwe and Ncwadi (2013), and Irandoust *et al.*(2006) point out to two potential explanations. First, demand side factors may lead to inelastic foreign demand curve and thus eliminate the effect of change rate movements on export performance. The second explanation has to do with supply side factors which push exporters to adopt "pricing-to-market-behavior" in situations when exchange rate movements could negatively influence their competitiveness.

Summary and Concluding Remarks

Motivated by the ongoing debate among researcher and monetary policymakers in Egypt with respect to the recent depreciations of the Egyptian Pound and their likely impacts on the country's foreign trade sector, the present was carried out to provide empirical evidence on the influence of exchange rate volatility on Egypt's agricultural exports to the world. To this end, the study used quarterly data covering the period 1999:q1 – 2014:q4 in an error correction model (VECM) framework to examine the long- and short-run impacts of exchange rate volatility on Egyptian agricultural exports.

In summary, the econometric results of the VECM model (with respect to exchange rate) indicate the existence of a long-run relationship between EGP exchange rate and the value of the country's agricultural exports. With a negative and a statistically significant coefficient of the estimated error-correction term, the study concluded also that there is a slow speed of adjustment toward long-run equilibrium and that only 2% of deviations from long-run equilibrium in the volume of Egyptian agricultural exports to the world are corrected for in the current period. Moreover, the study found that a 1% change in the exchange rate of the Egyptian Pound against the USD would in the long-run lead to an increase of around 4% in the value of Egyptian agricultural exports to the world. With regards to the short-run estimates, the results revealed that there is a positive bust statistically insignificant relationship between the exchange rate volatility and Egyptian agricultural exports. This finding was further confirmed by the results of the Wald Test which suggested that the null hypothesis cannot be reject implying that there is no short-run causality between the exchange rate and the value of Egyptian agricultural exports.

Based on the findings of this study, the following policy implications could be concluded: *first*, given that the impact of exchange rate on agricultural exports in the short run is insignificant, Egyptian macroeconomic and foreign trade policymakers should be primarily preoccupied with the long-term movements of the exchange rate and their effects on Egypt's export sectors. This highlights the necessity of monitoring and evaluating exchange rate dynamics to design and implement fiscal and monetary policies that ensure the stability of the exchange rate and enable Egyptian agricultural exporters to hedge against long-term exchange rate risk. *Second*, as the results clearly demonstrate that macroeconomic factors (e.g. exchange rate policy) matter for agricultural export, the study emphasizes that Egyptian agricultural trade policies should not only be focused on "agricultural" related aspects (such as production, postharvest services and marketing strategies, etc.), but it is equally important that these policies consider and take into account the impacts of "macroeconomic" variables on the performance of Egypt's agricultural exports. *Third*, while the secondary results of this study (results related the income and price effects) suggest that foreign importers would, in the long run, turn to higher quality and value-added agricultural commodities with increases in their incomes and/or increases in the Egyptian export prices of agricultural exports. Therefore, should Egyptian exporters want to benefit from the ongoing and expected depreciation trends in EGP, it is critical that agricultural exporters and export-supporting organizations in Egypt focus their effort on enhancing the quality of the exported agricultural commodities and on lowering the production and post-

production costs so as to improve the ability of Egyptian agricultural commodities to compete with other suppliers on the global market for agricultural commodities.

Last but equally important, it is important to mention two major limitations of this study. First, the econometric analyses in this study were based on high aggregated level of data (total agricultural exports) and markets (the world). It is however expected that individual or sub-categories of agricultural commodities may vary in their response to exchange rate volatility. Second, the focus of this study was limited to the effect of real bilateral exchange rate between the Egyptian Pound and the US dollar. Accordingly, more research based on more disaggregated level of trade data and with focus on certain importing markets is still needed to support or challenge the findings of this paper.

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أثر تقلبات سعر الصرف على أداء الصادرات الزراعية المصرية باستخدام نموذج متجه تصحيح الخطأ

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مساهمةً في النقاش الدائر حالياً في أوساط الاقتصاديين وصانعي السياسات في مصر حول انعكاسات تخفيض سعر صرف الجنيه المصري مقابل الدولار الامريكي وتأثيراتها المحتملة على قطاع التجارة الخارجية، قامت هذه الدراسة بتقدير "نموذج متجه تصحيح الخطأ" (VECM) باستخدام بيانات ربع سنوية تغطي الفترة ١٩٩٩ – ٢٠١٤ لتقييم الأثار قصيرة وطويلة الأجل لتقلبات سعر الصرف على صادرات مصر الزراعية إلى العالم. وأوضحت النتائج التجريبية للدراسة وجود علاقة إيجابية ومعنوية احصائياً بين سعر الصرف وقيمة الصادرات الزراعية المصرية في الأجل الطويل. كذلك، فقد أشارت نتائج الدراسة إلى الإشارة السالبة لـ"معامل تصحيح الخطأ" وكذلك لمعنويته احصائياً عند مستوي ثقة ٥%، مما يدلل على وجود علاقة سببية بين سعر الصرف وقيمة الصادرات المصرية في المدى الطويل، وأن حوالي ٢٪ فقط من الانحرافات عن التوازن على المدى الطويل في حجم الصادرات المصرية إلى العالم يتم تصحيحها في الفترة الحالية. وفيما يتعلق بالنتائج التجريبية الخاصة بالمدى القصير، فقد كشفت النتائج عدم معنوية تأثير سعر الصرف على الصادرات الزراعية المصرية وقد تم التثبت من صحة هذه النتيجة من خلال نتائج "اختبار والد". وفي ضوء هذه النتائج ومناقشتها، أمكن استخلاص التوصيات التالية من هذه الدراسة: أولاً، ينبغي على صانعي سياسات الاقتصاد الكلي والسياسات المتعلقة بقطاع التجارة الخارجية في مصر التركيز في المقام الأول على الأثار طويلة المدى لتقلبات سعر الصرف على قطاع الصادرات المصري، وذلك لرصد وتقييم ديناميكية هذه التقلبات و تصميم السياسات النقدية التي تضمن استقرار سعر صرف الجنيه المصري وتمكن مصدري السلع الزراعية المصرية من تلاشي مخاطر تقلباته على المدى الطويل. ثانياً، ينبغي للسياسات الزراعية المصرية ألا تركز فقط على "العوامل الفنية" المرتبطة بإنتاج وتسويق المنتجات الزراعية، بل يجب أن تأخذ أيضاً بعين الاعتبار أثر متغيرات "الاقتصاد الكلي " - كسعر الصرف- على أداء الصادرات الزراعية المصرية، نظراً لأهميتها في تحديد حجم الصادرات الزراعية المصرية كما أوضحت نتائج الدراسة الحالية. ثالثاً، حتى يستطيع المصدرون المصريون جنى ثمار إنخفاض سعر الصرف الذي تم في الأونة الاخيرة والتخفيضات المستقبلية، فمن الأهمية بمكان أن تركز جهود مصدري السلع الزراعية والمنظمات الداعمة للتصدير في مصر على تقليل تكاليف الإنتاج وتكاليف ما بعد الحصاد ، وكذلك على تحسين جودة السلع الزراعية المصدرة لتعزيز قدرتها على المنافسة في السوق العالمي للسلع الزراعية.