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An Analysis of Symmetric and Asymmetric Information in the Volatility Structure of Real Exchange Rates: A Study of Selected Arab Countries

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Table of Contents

Introduction 5

Literature Review 6

Methodology 8

- ***Data and Variables Measurement*** 8
- **Method of Analysis** 8
- ***Diagnostic Tests*** 9

Findings and Discussions 10

- ***Graphical Preliminary Tests Results*** 10
- ***Descriptive Statistics Results*** 11
- ***Unit Root and ARCH Test Results*** 12
- ***Symmetric Information Analysis Results*** 14
- ***Asymmetric Information Analysis Results*** 14

Conclusion and Recommendations 17

References 18

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Abstract

An understanding of the volatility structure of foreign exchange rates is fundamental to assessing investment risks in the forex market. This study, therefore, analyzes the symmetric and asymmetric information in the volatility structure of selected Arab exchange rate markets. The study applied the EGARCH model for analyzing the volatility structure of selected currencies using the daily data of rate of return of real exchange rates over the period from January 3, 2017, to June 2, 2022. These currencies are the Saudi Riyal, Kuwait Dinar, Bahrain Dinar, Egyptian Pound, Algerian Dinar, Tunisian Dinar, and Moroccan Dirham. As a result of the symmetric analysis, the findings indicate that volatility structures of all the real exchange rate markets' return under study are symmetrically informative, and the memory of volatility structures is influenced more by past information, so they should hold over time, except in the case of the Kuwait exchange rate market that shows better stability. On the other hand, the asymmetric analysis results indicate that real exchange rate markets' returns in Saudi Arabia, Egypt and Algeria are asymmetrically informative, and that the markets' returns are significantly influenced by positive news more than negative news. However, positive, or negative information or news had no statistically significant effect on the returns of the real exchange rate markets of Kuwait, Bahrain, Tunisia, and Morocco. Basically, the exchange rate markets of Kuwait, Bahrain, Tunisia, and Morocco are not subject to asymmetric effects. As a result, the findings of this study will serve as an insightful input for policymakers, investors, and market participants in the Arab region's forex markets to make better-informed decisions.

Key Words: Symmetric & Asymmetric information, Volatility Structure, Real Exchange Rate, Arab World

Introduction

Developing a stable exchange rate policy is crucial for monetary authorities and governments. It is because the exchange rate is affected by many macroeconomic fundamentals, such as inflation, interest rates, current account deficits, public debt, and terms of trade, which have direct effects on the economic growth of a country. The efficient market hypothesis states that "news" or "market information" is an indication of macroeconomic fundamentals that affect asset prices (Taylor, 1995). It has been argued by Dornbusch (1980) and Frenkel (1981) that exchange rates behave in unanticipated ways when fundamentals change (unobservable shocks or surprises in monetary policy). Historically, the regime of exchange rates changed across countries after the failure of the Bretton Woods system in 1970. The use of floating exchange rates has increased since the early 1980s, but most countries have shifted to a more flexible medium-term regime, which includes conventional pegs (Morina *et al*., 2020). A number of countries also prevent their nominal exchange rates from fluctuating freely for fear of floating (Levy-Yeyati et al., 2005). As a fixed exchange rate applies to every country, the central bank must preserve the rate through currency purchases and sales. By doing so, a stable currency market is maintained. Maintaining a fixed exchange rate regime is difficult, but a stable exchange rate in conjunction with macroeconomic stability can boost growth through international trade and investment (Morina *et al*., 2020).

During the rapid developments in the global monetary system, the tendency toward enhanced exchange rate flexibility in developing countries remains a topic of major interest. Flexible exchange rates are determined by market forces, whereas the floating rate is called self-correcting, meaning that any differences in supply and demand are automatically corrected by the market. Due to a lack of information, foreign exchange markets are susceptible to a wide range of internal and external events (including political, economic, social, and economic) especially in developing countries where the informal sector is widely spread. Further, information is necessary for governments to make financial decisions that protect the economy and establish exchange rate stability, as well as individuals and market participants are in need for the relevant information for making their right investment decisions and making expectations about upcoming economic events so as to minimize their risk or maximize their profit.

For instance, when a currency is in low demand, its value will depreciate, which will increase the cost of imported goods. Thus, domestic demand for local goods and services will be stimulated, resulting in economic growth and improved demand for the local currency. Afterwards, the market will automatically correct itself as the exchange rate will always fluctuate. Market pressures can affect exchange rate volatility under a flexible regime. In such instances, the central bank may intervene as soon as necessary to promote stability, support the self-correction mechanism, and avoid excessive inflation. A key attribute of price efficiency is its replication of market efficiency, meaning that information spread across the market is obtainable and accessible to all market participants. Despite the dynamic nature of the forex market, some countries are more likely to have some limits on the information that is supposed to be available in a fair manner by market participants. Alternatively, when the market is perfectly competitive, buyers and sellers compete to satisfy their needs on the forex market. As a consequence, central banks function as a regulator, providing essential information to ensure that exchange rates remain within a narrow range. The opposite may occur in a scenario where the exchange rate witnesses sharp fluctuations over time, which allows speculators to make up a normal return by exploiting market distortions. As a result, there is a likelihood of confrontation between the central bank and speculators.

As a recap, for all policy makers and both foreign and domestic investors, exchange rate volatility plays an important role in decision-making. This is because exchange rates have an impact on a wide variety of economic factors, including global capital flows, business activity, and instruments used to support government policy. In addition, financial theory and decision-making procedures today rely on volatility as an indicator of risk. When exchange rates fluctuate drastically, national assets can be subject to doubt and mistrust. The increased volatility of exchange rates poses additional threats to the capital markets. This in turn impacts investment behaviours. Exchange rate volatility is therefore subject to changes in financial market information or news, whether it's positive news or negative news. Accordingly, the purpose of this study is to examine the effects of both symmetric and asymmetric information on the volatility structure of foreign real exchange rate markets in the Arab world.

Literature Review

Exchange rate volatility or the symmetric and asymmetric information effects of exchange rate volatility has been examined by a wide range of researchers, economists, and industry players and analyzed from various perspectives. Researchers have attempted to determine how money demand is affected by asymmetric exchange rate effects, for example Ho & Saadaoui (2019); Leong, Puah, and Tang (2021); Hannan & Ishaq (2021); and Oskooee & Baek (2017). Furthermore, numerous empirical studies have investigated the effects of asymmetric information about exchange rates on international trade, including Ozturk (2006), Oskooee & Saha (2016), Oskooee & Baekb (2016), Iqbal, J., Aziz, S., & Nosheen, M. (2022), and Bahmani-Oskooee, M., & Arize, A. C. (2022).

On the other hand, there have been few studies examining the volatility structure of real foreign exchange rates, such as Maganini, Rasheed, and Sheng (2021) discovered that free-floating currencies were more price-efficient than those following managed-floating regimes. A further finding is that currencies undergoing Managed Float regimes are significantly less price efficient than currencies undergoing Free Float regimes. Czech & Waszkowski (2012) assessed the efficiency of the USD/EUR exchange rate market in their study. Based on the study's findings, it is difficult to say that the USD/EUR foreign exchange market is inefficient, meaning the market may be asymmetrically informative to such a degree.

In their study, Cespa, Gargano, Riddiough, & Sarno(2021) point out that there is debate among economists over revealing asymmetric information in the foreign exchange market. The authors find that there is an information asymmetry across foreign exchange market participants, and that this asymmetry is independent of the average liquidity and volatility levels of currencies. Kim, Lewis, and Vigfusson (2019) find that foreign currency appreciations pass through faster than foreign currency depreciation into product-level U.S. import prices, despite the commonly held belief that exchange rate pass-through would be symmetric to appreciations and depreciations. Several studies have found that volatility tends to be symmetrical for appreciations and depreciations. Despite this, Oskooee and Baek (2017) found out that in the short run, the magnitude of the effect is different for appreciations than depreciations.

Models are built from daily exchange rate data collected from January 1, 2000, to November 19, 2011, in Abdalla's (2012) study. A combination of exchange rate information, including cluster fluctuations and the impact of leverage, was applied to symmetric and asymmetric models representing the most prevalent patterns. As a result of GARCH (1,1), volatility is demonstrated as an explosive process for ten out of nineteen currencies, and as a continuous process for seven currencies. Thus, volatility is explosive for ten out of nineteen currencies where the estimated fixed transactions exceed one. Additionally, the asymmetric EGARCH results show that negative shocks after a period of positive shocks indicate increased volatility in the majority of currencies studied. Ultimately, the study concludes that GARCH models were appropriate for capturing exchange rate volatility.

In light of different exchange rate volatility forecasting models used by advanced and non-developed economies (emerging markets), Carvalho (2014) used ARCH models to estimate and forecast the conditional variance of exchange rates in Brazil, Mexico, and Singapore, representing emerging nations, and the Eurozone, the United Kingdom, and Japan, representing advanced nations. Based on Carvalho's (2014) study, emerging markets are more sensitive to negative shocks than positive shocks. Advance markets do not exhibit the same pattern. According to the study, there are no correlations across countries. Emerging and developing nations both have symmetrical or asymmetrical models to offer. In both symmetric and asymmetric GARCH models, conditional variance predictability is unrelated to the state's membership in either of the studied classes. Balaban (2004) compared the forecast performance of symmetric and asymmetric conditional volatility exchange rate models across the period January 2, 1974 - December 30, 1997, for US dollar and German mark closing prices at the Frankfurt Stock Exchange. In the study, the researchers found that the quality of the out-of-sample relative forecast differed for conditional volatility models with symmetric and asymmetric evaluation criteria. It is evident that all symmetric and asymmetric conditional volatility models are biased and consistently overestimate volatility when predicting currency volatility.

Despite the fact that numerous studies have investigated the volatility structure of foreign exchange rates in developed and emerging markets and viewed it from different perspectives. It is hard, however, to find scientific literature on this subject in the Arab world. In this paper, we will fill in the gap by investigating whether foreign exchange markets in the region are efficient. In other words, investigate whether exchange rate markets in the Arab region are symmetric or asymmetric informative.

Methodology

Data and Variables Measurement

In this study, daily time series data of the real exchange rate were used to examine the effects of symmetric and asymmetric information on the volatility structure of the exchange rate over the period from January 3, 2017, to June 2, 2022. The real exchange rate data was collected from the data stream database for seven different currencies, namely the Saudi Riyal, Kuwait Dinar, Bahrain Dinar, Egyptian Pound, Algerian Dinar, Tunisian Dinar, and Moroccan Dirham. Further, the Real exchange rate (R) is calculated by dividing the foreign exchange rate by the domestic exchange rate, where the foreign exchange rate (U.S Dollar) is converted into domestic currency units via the nominal exchange rate. Mathematically, the real exchange rate can be formulated as $R = (E.P^*)/P$. Whereas the P^* represents the foreign price level and the P represents the domestic price level while the E represents the nominal exchange rate. Additionally, the volatility structure of real exchange rates was estimated using daily returns (r_t) and the daily returns were derived by taking the logarithm of the first difference between the closing prices of the real exchange every day. Mathematically, this is presented as follows:

$$r_t = \log \left(\frac{p_t}{p_{t-1}}\right)$$

Where r_t is returns (volatility) and P_t is the daily real exchange price at time *t, while* p_{t-1} is the real exchange price at previous day.

Method of Analysis

In 1982, Engle introduced the Auto-Regressive Conditional Heteroscedasticity (ARCH) model for measuring the volatility structure of financial assets using lags. However, this method is limited in that a large ARCH is needed to capture volatility's dynamic behavior. Because of this, Bollerslev (1986) developed the Generalized Auto-Regressive Conditional Heteroscedasticity (GARCH) model, which is more flexible in terms of lag structure. However, the conditional variances of both ARCH and GARCH fail to capture the asymmetrical volatility of returns on financial assets. Nelson (1991) introduced the Exponential Generalized Auto-Regressive Conditional Heteroscedasticity (EGARCH) model as a method to capture asymmetric volatility effects. Therefore, EGARCH was applied to estimate the impact of symmetric and Asymmetric information on the real exchange rates for the selected countries. The ARCH, GARCH and EGARCH models are mathematically presented using the following Equations:

<u>ARCH Model</u>

$$\varepsilon_t = \eta_t \times h_t^{1/2}$$

$$h_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-i}^2$$

<u>GARCH Model</u>

$$\varepsilon_t = \eta_t \times h_t^{1/2} \quad , \quad \eta_t \sim N(0,1)$$
$$h_t = var(\varepsilon_t | I_{t-1}) = \alpha_0 + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{q} \beta_j h_{t-j}^2$$

$$\alpha_0 > 0 , \alpha_i \geq 0 , \beta_j \geq 0 , i = 1, \ldots, p , j = 1, \ldots, q$$

Where h_t denotes for the natural logarithmic return of the conditional variance, (p) refers for the order of GARCH, and (q) is the order of ARCH process, while (ε_t) is the error term that expected to be normally distributed. The (α) is referring for ARCH term, while (β) indicates for GARCH term. In particular, the lag of the squared residual from the mean equation can be used to measure volatility from the previous period. The estimate of (β) also demonstrates the persistence of volatility following a shock or, alternatively, the influence of old news on volatility. The volatility of the previous period can be calculated as a squared residual from the mean equation (α). Further, the estimate of (β) illustrates how volatility persists or, alternatively, how old news influences volatility.

The mean and conditional variance equations for the EGARCH can be presented as the following:

Mean Equation: $r_t = \mu + \varepsilon_t$. Where: r_t is the return of the real exchange rate at time t, μ is the average return and ε_t is the random innovations with zero mean and constant variance.

Variance Equation: $\log h_t = \omega + \sum_{j=1}^{p} \beta_j \log h_{t-j} + \sum_{i=1}^{q} \alpha_i \left(\left| \frac{\varepsilon_{t-i}}{\sqrt{h_{t-i}}} \right| - E\left[\left| \frac{\varepsilon_{t-i}}{\sqrt{h_{t-i}}} \right| \right] \right) + \sum_{k=1}^{r} \gamma_k \frac{\varepsilon_{t-k}}{\sqrt{h_{t-k}}}$

$\log(h_t)$ denotes for the natural logarithmic return of the conditional variance. ω refers to a constant, while γ_k is referring to the measurement of the asymmetric effect due to leverage. α_i is referring to the measurement of the ARCH effect and β_j is indicating for the measurement of the GARCH effect and finally ε_t refers to the error term. We can test the existence of leverage effects by hypothesizing that $\gamma_k < 0$. If $\gamma_k \neq 0$, again asymmetric behaviour exists.

Diagnostic Tests

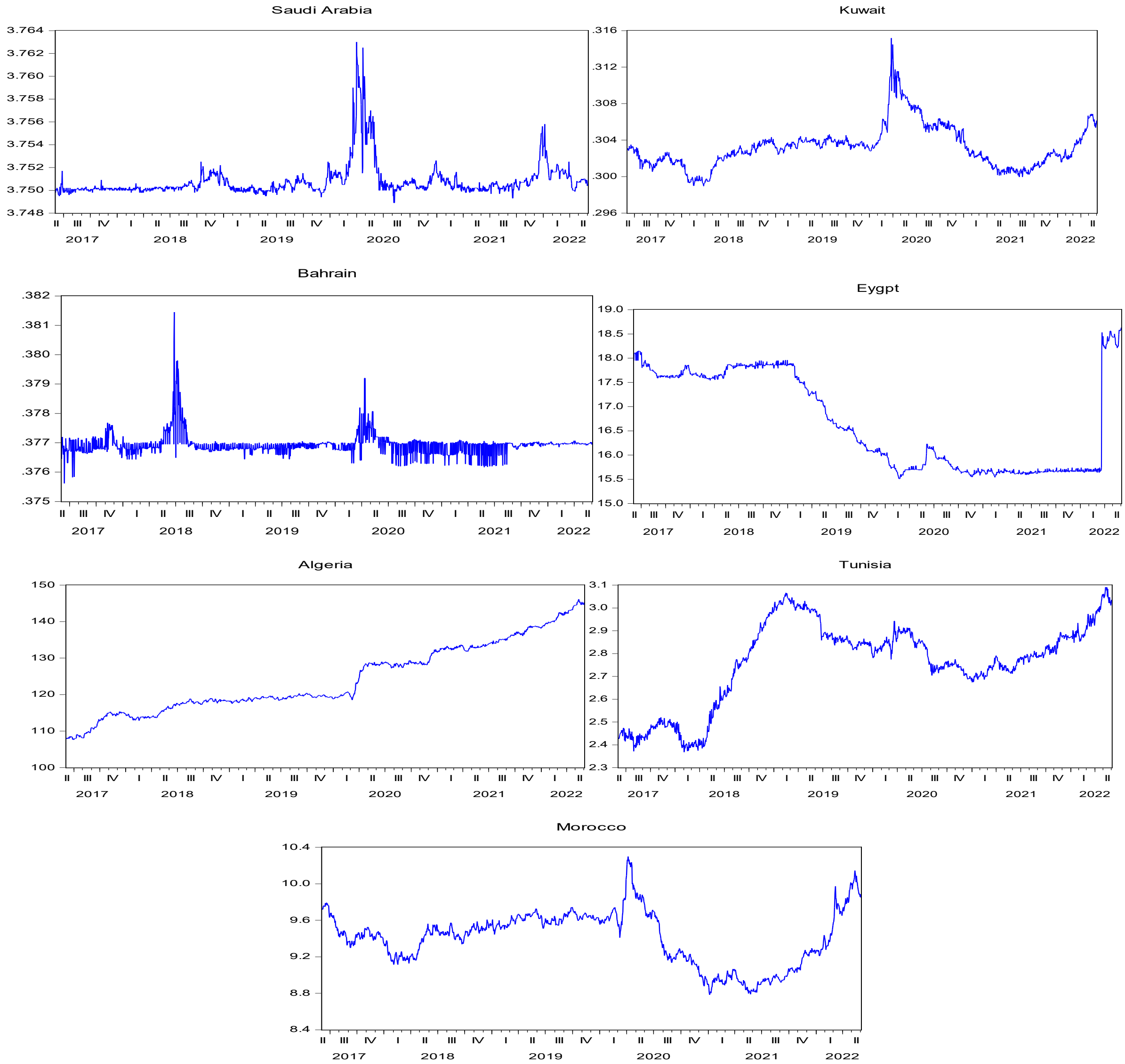
Lastly, the EGARCH (1,1) model specification must be validated by looking at the residuals of the real exchange rate return series for evidence of heteroscedasticity. This was achieved by assessing the ARCH effect through the ARCH-Lagrange multiplier (LM) test. The null hypothesis of ARCH-LM is that the residuals are homoscedastic (Engle (1982)). In the end, the study also specified the accuracy of the model using the Log likelihood ratio and Akaike information criterion.

Findings and Discussions

Graphical Preliminary Tests Results

From January 3, 2017, to June 2, 2022, figure (1) illustrates the price volatility behaviour of the real exchange rates for the selected countries' currencies against the United States Dollar. A majority of the foreign exchange rates have experienced an upward trend, particularly during the Covid-19 pandemic crisis, with the exception of Saudi Arabia and Bahrain which have shown greater stability following Covid-19. Most of the currencies under consideration experienced a deterioration in their purchasing power during 2022 against the U.S. dollar, with the exception of the mentioned two countries.

Figure (1): Primary analysis of Real Exchange Rates for Currencies under study



Descriptive Statistics Results

Table (1) shows the statistical characteristics of the countries real exchange rate under study, including mean, maximum, minimum, standard deviation, and normality distribution tests (Skewness, Kurtosis and Jarque-Bera). In the period of the study, the average Saudi Riyal exchange rate was 3.751, the minimum and maximum being 3.749 and, 3.763 respectively. Standard deviation was 0.002, which indicates the relative stability of the exchange rate during that period. For the Kuwait Dinar and Bahrain Dinar, the exchange rate volatility was extremely low with a mean of 0.303 and 0.377, respectively, with low standard deviation values of 0.002 and 0.00 respectively. On the other hand, Egypt's bound, Algeria's dinar, Tunisian dinar, and Morocco's dirham rates fluctuated with mean values of 16.670, 124.207, 2.762, and 9.407, respectively. The standard deviations for these rates were high with values of 0.995, 9.544, 0.184, and 0.300 respectively, indicating that their real foreign exchange rate was unstable.

Additionally, Table (1) reports the results of the Skewness, Kurtosis, and Jarque-Bera tests. Positive skewness values may indicate that local currencies in the related countries will appreciate, while negative skewness values indicate that local currencies in the specified countries will continue to depreciate in the near future, such as Tunisia and Morocco. In addition, the kurtosis statistical values in Table (1), which exceeded the threshold of 3.0 established by Stock and Watson (2006), indicate that the exchange rate series does not follow a normal distribution. Time series models are further analysed using the Jarque-Bera test for normality distribution. Based on the Jarque-Bera test values in Table (1), all variables have probability values of (0.000); this means that the exchange rate data did not conform to a normal distribution because its statistical value is highly significant at a 1% significance level. P-values below significance levels reject the null hypothesis that residuals are normally distributed (Jarque and Bera, 1980). Overall, the non-normal distribution results suggest that foreign exchange trading can be speculative in these countries.

Table (1): Descriptive Statistics for Countries' Exchange Rates under Study

	Saudi Riyal	Kuwait Dinar	Bahrain Dinar	Egyptian Pound	Algerian Dinar	Tunisian Dinar	Moroccan Dirham
Mean	3.751	0.303	0.377	16.680	124.207	2.762	9.407
Max	3.763	0.315	0.381	18.630	146.103	3.090	10.299
Min	3.749	0.299	0.376	15.510	107.667	2.368	8.784
Std. Dev.	0.002	0.002	0.000	0.995	9.544	0.184	0.300
Skewness	3.945	1.216	3.842	0.239	0.411	-0.605	-0.087
Kurtosis	21.956	5.518	32.441	1.341	2.089	2.447	2.578
Jarque-Bera	32077.810	932.478	70440.690	226.949	81.821	96.109	11.309
Prob	0.000	0.000	0.000	0.000	0.000	0.000	0.004
Obs	1826	1826	1826	1826	1304	1304	1304

Unit Root and ARCH Test Results

As shown in table (2), unit root tests, such as ADF and PP, demonstrate stationary conditions in the return series of the selected real exchange rates, since their P-values are statistically significant at the 1 percent level. Figure (2) shows a graphic representation of the study's estimation of the volatility of the returns of the analysed real exchange rates. A pattern of volatility clustering has been observed in the selected exchange rates during the study period. This pattern is characterized by high volatility periods followed by periods of highly volatile conditions for an extended period. In contrast, low volatility periods followed by low volatility periods. In other words, the return series for the selected real exchange rates are not constant with time, but they vary over time. To confirm the persistence of volatility clustering in exchange rate markets for the selected countries, the ARCH-LM test was applied to the residuals of the return series. As shown in table (2), the ARCH effect is confirmed for each residual model based on the ARCH-LM test results. Due to the ARCH-LM test statistical value being highly significant, we reject the null hypothesis that ARCH does not exist at the 1 and 5 percent level of significance. Having confirmed the existence of the ARCH effect throughout the preliminary tests, the study applied the EGARCH model to estimate the impact of symmetric and asymmetric information in the context of the volatility structure of the real exchange rate for slected currencies, which is presented in the following section.

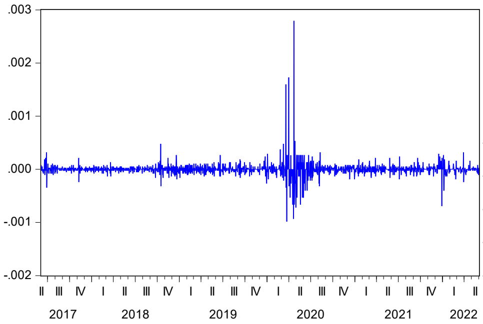
Table (2): Unit Root and ARCH Test Results

Variables	**ADF-test**	**PP-test**	**ARCH -LM test**
Saudi Riyal	-14.61190^{***}	-60.54183^{***}	Prob. F (1,1822) = [0.0155]
Kuwait Dinar	-62.75435^{***}	-62.75435^{***}	Prob. F (2,1822) = [0.0000]
Bahrain Dinar	-15.16300^{***}	-106.0923^{***}	Prob. F (2,1822) = [0.0000]
Egyptian Pound	-31.42246^{***}	-40.2485^{***}	Prob. F (1,1823) = [0.0104]
Algerian Dinar	-40.68774^{***}	-40.6743^{***}	Prob. F (2,1300) = [0.0001]
Tunisian Dinar	-33.24846^{***}	-54.83045^{***}	Prob. F (2,1300) = [0.0000]
Moroccan Dirham	-34.19777^{***}	-34.24821^{***}	Prob. F (1,1300) = [0.0000]

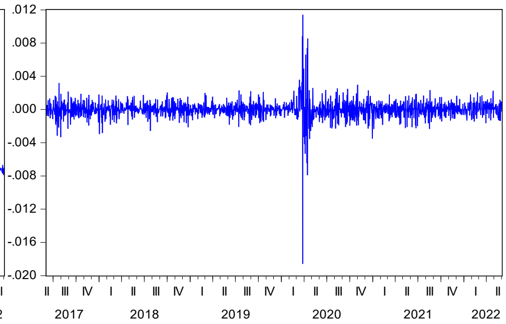
Note: *** and ** denote significant levels at 1% and 5% significance, respectively

Figure (2): Volatility Clustering Analysis Results for the Real Exchange Rates

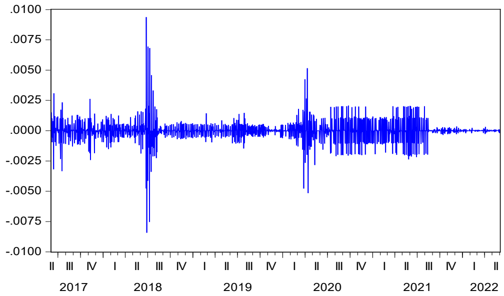
Saudi Riyal



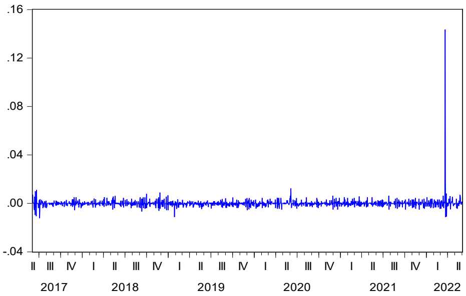
Kuwait Dinar



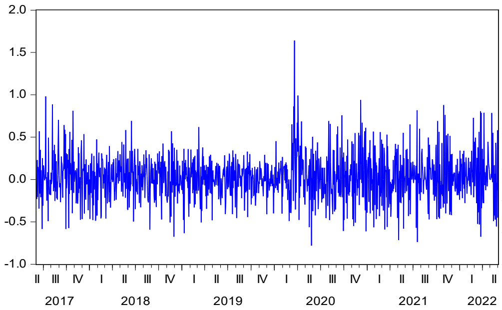
Bahrain Dinar



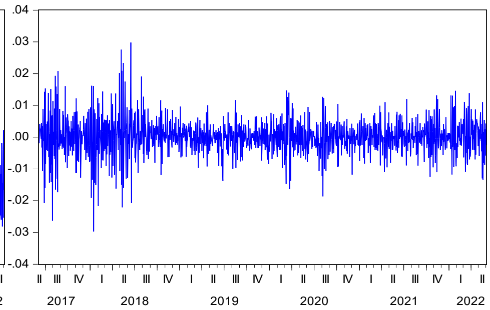
Egyptian Pound



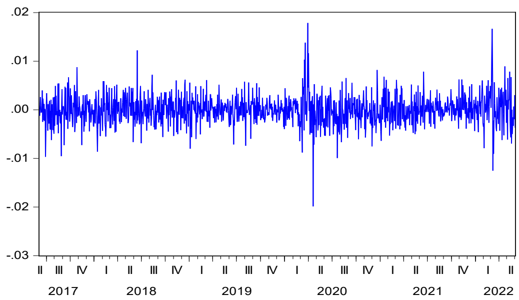
Algerian Dinar



Tunisian Dinar



Moroccan Dirham



Symmetric Information Analysis Results

Table (3) shows the results of analysis using the EGARCH (1,1) model both for symmetric (α) and asymmetric (Leverage effect (β)) information. In EGARCH (1,1) models' mean equation, the constant (constant) values are demonstrably statistically significant at a 1 per cent level in Saudi Arabia, Kuwait, Egypt, and Algeria exchange rate markets, and to be statistically significant at a 5 per cent level in the Tunisian exchange rate market, indicating abnormal returns in exchange rate markets in these countries. While the Bahraini and Moroccan exchange rate markets had no statistical significance. Furthermore, Table (3) shows that the estimates for the coefficients for in the conditional variance equation for ARCH (α) and GARCH (β) parameters of the EGARCH (1,1) model for selected real exchange rates are statistically significant at 1 percent. The results confirm the persistent volatility in exchange rates' market returns in all selected countries. Table (3) demonstrates that the estimated coefficients of (β) parameters in the exchange rate markets of Saudi Arabia, Algeria, Tunisia, and Morocco are greater than the estimated coefficients of (α) parameters. It indicates that real exchange rates in these countries have a memory longer than one period and that volatility is very sensitive to its previous values (lags) than to new shocks in market values. On the other hand, the estimated coefficient of (β) parameters for Kuwait, Bahrain, and Egypt exchange rates is lower than the estimated coefficient of (α) parameters. These results suggest that exchange rate markets in these countries retain a memory longer than one period, and that volatility in these markets is more sensitive to new shocks. Furthermore, the summation of the coefficients of these two parameters (α + β) was greater than one in all selected countries except Kuwait, which was less than one. The values above unity indicate that the volatility in exchange rate markets will persist for many periods to come, while the values below unity, as in the case of Kuwait, imply that the market shock will not persist, and the volatility may shortly disappear. In general, all selected countries are affected symmetrically by symmetric information.

Asymmetric Information Analysis Results

This study examined asymmetric information effects using the quasi-maximum likelihood (QML) estimators with asymmetric variance specification, which is the EGARCH (1, 1) specification. Table (3) demonstrates that there is evidence that the coefficient of the (γ) parameter, which refers to asymmetry, is positive and statistically significant in Saudi Arabia, Egypt, and Algeria real exchange rate markets. This indicates that exchange rate markets in these countries are more sensitive to positive news than to negative news. In Table (3), on the other hand, the results of the estimated coefficient (γ) parameters show that the markets exchange rates in Kuwait, Bahrain, Tunisia, and Morocco are not affected statistically significantly by positive or negative news, which indicates that the absence of the leverage effect or, to put it differently, the asymmetry informative is not existent in these countries' exchange rate markets. According to this line of reasoning, real exchange rates market prices are unpredictable in these countries, and investors cannot benefit from past market information to create above average trading advantages.

In addition, the Log likelihood ratio and Akaike information criterion were used to select the best fitted model as a final point. Selection is determined by the maximum value of the Log likelihood ratio and the minimum value of the Akaike information criterion score. Therefore, the most accurate model used for all real exchange rate markets, including Saudi Arabia, Kuwait, Bahrain, Egypt, Algeria, Tunisia, and Morocco, were the EGARCH (1,1) models with a high log likelihood value of 14804.12, 10496.680,11531.33, 8727.070, 6218.585, 5043.019 and 5802.706, as well as the low Akaike information criterion values of -16.2182, -11.4966, -12.6305, -9.5584, -9.5374, -7.7314, and -8.8990, respectively. Finally, the study applied a diagnostic ARCH-LM test to determine whether any additional ARCH effects were evident in the residuals of the specified EGARCH (1,1) model. Based on the study results in Table (3), the residual from the EGARCH (1,1) models are free from ARCH effects in all cases, and the null hypothesis that "there are no ARCH effects" is accepted at a significance level of 5%, indicating well-defined and accurately estimated variance equations.

Table (3): Symmetric and Asymmetric Information Analysis Results

	Saudi Riyal	Kuwait Dinar	Bahrain Dinar	Egyptian Pound	Algerian Dinar	Tunisian Dinar	Moroccan Dirham
Variable	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Mean Equation							
μ (constant)	5.66E-06***	1.47E-05***	-1.27E-06	1.91E-04***	2.14E-04***	2.47E-04**	2.22E-05
Variance Equation							
ω (constant)	-0.1990***	0.7377***	-0.4026***	-10.3775***	-0.5685***	-1.0500***	-0.4150***
α (ARCH-effect)	0.1779***	0.0821***	4.2226***	1.0753***	0.1129***	0.3317***	0.1475***
γ (Leverage effect)	**0.0905***	**0.0468**	**-0.4046**	**0.6378***	**0.0308**	**0.0599**	**0.0121**
β(GARCH-effect)	0.9950***	0.0529***	0.9869***	0.2116***	0.9610***	0.9236***	0.9742***
α+ β	1.1729	0.1350	5.2095	1.2869	1.0740	1.2553	1.1217
Log likelihood	14804.120	10496.680	11531.330	8727.070	6218.585	5043.019	5802.706
Akaike info criterion	-16.2182	-11.4966	-12.6305	-9.5584	-9.5374	-7.7314	-8.8990
ARCH -LM test	Prob. F (1,1822) [0.1369]	Prob. F (1,1822) [0.2956]	Prob. F (1,1822) [0.5064]	Prob. F (1,1822) [0.7698]	Prob. F (1,1300) [0.9389]	Prob. F (1,1300) [0.2660]	Prob. F (1,1300) [0.5401]

Note: *** and ** denote significant levels at 1% and 5% significance, respectively

Conclusion and Recommendations

Investing in forex markets requires a deep understanding of foreign exchange rates' volatility structure. In this study, symmetric and asymmetric information were examined in relation to volatility structure of real exchange rate markets in the Arab region using the EGARCH model. Over the period January 3, 2017, to June 2, 2022, the study utilized the Daily frequency return of the real exchange rates of seven currencies, including the Saudi Riyal, Kuwait Dinar, Bahrain Dinar, Egyptian Pound, Algerian Dinar, Tunisian Dinar, and Moroccan Dirham. Based on ARCH (α) and GARCH (β) coefficient parameters, all volatility structures of selected exchange rate markets are symmetrically informative. This was confirmed by the statistical values of ARCH (α) and GARCH (β) parameters at a 1% significance level for all currencies exchange rates under study. The sum of the ARCH (α) and GARCH (β) parameters suggests unity and indicates that the volatility structure of all currencies under study will persist for lengthy periods except for the Kuwait Dinar, which shows better stability. According to the asymmetric analysis results, the effect of (γ) parameters were found statistically meaningful at 1, 1, and 5 percent significance levels for the case of Saudi Arabia, Egypt, and Algeria exchange rate markets respectively. It implies that there is persistent asymmetry information or in other words, it indicates that positive news or information have more effect on the real exchange rates' return in these countries. In contrast, Kuwait, Bahrain, Tunisia, and Morocco did not show significant leverage effect parameters (γ). Therefore, neither bad news nor good news has a significant effect on the volatility structure or exchange rate market returns in these countries. As a result of using the study's findings, policymakers, investors, and forex market participants from the Arab world will be able to make better investment choices and efficient decisions.

One limitation of this study is that it focuses exclusively on the flexible exchange rate regime in the Arab region. A comparison of selected currencies' exchange rates with the volatility of other currencies in different region will, however, provide a more comprehensive framework for analyzing flexible exchange rates' dynamic structure and improving exchange rate regime stability.

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