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Does Exchange Rate Volatility Affect Foreign Trade? The Empirical Evidence from Some Selected MENA Countries

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Abstract
The study examines empirically the effect of the exchange rate volatility on foreign trade of eight (08) selected MENA countries from 1988-2022. For the reliability of the findings, the study applied the Panel ARDL/PMG technique, as well as the Robust Least-Squares and Fixed-Effect approaches. In addition, the Heterogeneous Panel Granger Causality test by Dumitrescu and Hurlin (2012) is utilized to determine causal relationships between the variables. The results indicate that exchange rate volatility has a significant and positive effect on the export demand, and while negative and significant effect on the import demand of MENA Countries. Overall, the study findings imply that policies focused on obtaining and preserving a stable competitive real exchange rate might further improve these nations' exporting activities.
***Keywords*:** Exchange Rate Volatility, Foreign Trade

1. Introduction

Under the Bretton Woods system of fixed exchange rates collapsed currency rates all across the world fluctuated dramatically. Since then, there has been much discussion regarding how exchange rate volatility affects foreign trade. The encouragement of trade is a well-known justification for a steady exchange rate. Exchange rate volatility is a term used to describe the degree of risk or uncertainty related to the magnitude of changes in a currency's value. A currency's value might be stretched out over a broader range of values if its volatility is significant. As a result, the currency's price can swing drastically in either way within a short period. According to Asseery and Peel (1991), trade is a choice whose worth rises when exchange rate uncertainty rises, boosting the quantity of exports. According to Tavlas and Swamy (1997), higher levels of exchange rate uncertainty will cause exporters to gain greater expertise in dealing with fluctuations in currency rates. According to Oyle (2001), the beneficial impacts of currency rate uncertainty refer to the international nature of enterprises engaged in international trade. As a result, having a multinational firm gives some natural protection against currency rate fluctuations by allowing production or exports to be moved between subsidiaries in other countries. Caballero and Corbo (1989) originate that exchange rate uncertainty had a considerable adverse influence on exports, based on data from six developing nations. Furthermore, they discovered that the long-run effect of unpredictability is significantly greater than the short-run effect. From a theoretical standpoint, American economist Mundell's (1961) theory of optimal currency regions says that a fixed exchange rate system can boost trade and economic growth by devaluing the currency. Exchange rate and risk premium, while promoting investment by reducing monetary value with interest rates. Flood and Rose (1995) and Juhn, & Mauro (2002) contend that the optimal exchange rate regime does not influence economic growth. According to Husain *et al*. (2005), a floating exchange rate system is steadier and has a greater link with economic growth.

The current study has a strong emphasis on MENA countries which are Iran, Algeria, Bahrain, Italy, Libya, Kuwait, Oman, and Qatar are some of the most active economic areas on the planet, and it is vital to the global economy. The study demonstrates that foreign trade in MENA countries is consistently significantly greater than the global average. Furthermore, the present study is being used to provide further empirical information on MENA countries of foreign trade and exchange rate volatility. Most studies employed de jure data sets on exchange rate regimes, and exchange rate volatility of MENA countries such as Husain *et al.* (2005), Domaç *et al.* (2004), and Eichengreen and Leblang (2003).

The study's main research question is: Does the exchange rate volatility influence the flow of foreign trade from eight (08) MENA countries? The idea behind the question is if the exchange rate volatility truly brings any change in the flow of foreign trade in MENA countries[5]. The objective of this study is to:

- To estimate the short- and long-run effect of exchange rate volatility on the flow of foreign trade of eight (08) MENA countries.

The rest of the study is structured as follows: Section 2 includes a review of several key previous research to provide empirical evidence for the topic's multidimensional support. The specifics of our empirical model and data sources are covered in Section 3, which is followed by a discussion of econometric methods. In the meantime, the empirical

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findings for the eight (08) nations may be found in section 4. The concluding remarks are discussed in Section 5. The study's last part closes with policy recommendations based on the study's empirical results.

2. Empirical Studies on Exchange Rate Variability and Foreign Trade

Cushman (1983) recognized a negative link between volatility and exports and found conflicting impacts of volatility on exports which incorporated the absolute variance between spot, forward, and current rates as an alternative measure of volatility. VAR models are used by Koray and Lastrapes (1989) to see if exchange rate volatility influences trade volume. Only a small portion of imports and exports is explained by exchange rate volatility.

Table 1: Summary of Empirical Literature Review on Exchange Rate Volatility and Flow of Foreign Trade

S. NO	Study	Country & time	Methodology	Regressed	Regressors	Outcomes
1	Cushman (1988)	US (1974-1983	VAR model	US Export & Import	Real Exchange Rate	(-)
2	Koray, & Lastrapes (1989)	US (1961-1985)	VAR Model	US Bilateral Trade	Real Exchange Rate Volatility	(-)
3	Chowdhury (1993)	G-7 Countries (1973-1990)	VAR Model	Trade Flow	Exchange Rate Volatility	(-)
4	Poon, Choong, & Habibullah (2005)	East Asian Countries (1973-2002)	Vector Autoregressive (VAR)& Vector Error Correction Model (ECM)	Export	Exchange Rate Volatility	(+)
5	Doroodian (1999)	Three Developing Countries (1973-1996)	ARMA-GARCH Model	International Trade	Exchange rate Volatility	(-)
6	Arize, Osang, & Slottje (2000)	13 Less Developing Countries (19973-1996)	Error Correction Model (ECM)	Foreign Trade	Exchange rate Volatility	(-)
7	Arize, Osangand, & Slottje (2008)	Eight Latin American Countries (1973-2004)	Error Correction Techniques (ECM)	Foreign Trade	Exchange rate Volatility	(-)
8	Arize (1995)	US (1970-1990	Johnsen Co-integration Techniques	Real Exports	Exchange rate Volatility	(-)
9	Tavlas, Swamy (1997)	11 OCED countries (1975-1985)	VAR model	Export Growth	Exchange rate Volatility	(-)
10	Choudhry (2008)	United Kingdom, Canada, Japan, & New Zealand (1980-2003)	GARCH Model	Trade Flow	Exchange rate Volatility	(-)
11	Caballero, & Corbo (1989)	Six Developing Countries (1975-1989)	Ordinary Least Square (OLS)	Export	Exchange Rate Uncertainty	(-)
12	Edwards (1987)	30 Developing Countries (1976-1995)	ARCH Model	Trade Flow	Exchange Rate Uncertainty	(-)
13	Onafowora, & Owoye (2008)	Nigeria (1980-2001)	Co-integration & Error Correction Model (ECM)	Export Growth	Exchange rate Volatility	(-)

Source: Authors' compilation. Exchange Rate Variability

Chowdhury (1993) studied the influence of exchange rate volatility on trade flows for the G-7 nations using an Error Correction Model. His research revealed a substantial negative effect of the real exchange rate as a measure of exchange rate volatility on trade. Another research, by Arize et al. (2000), looked at the association between a measure of exchange rate uncertainty and export volume in 13 developing nations, including Malaysia. The estimation of that vector for each nation shows that exchange rate uncertainty does have a considerable negative effect on export volume for all 13 nations, including Malaysia. Poon et al. (2005) looked at aggregate export data from five Asian nations and found that exchange rate volatility has a positive long-term influence on Indonesian and Thai exports, as well as a positive short-term impact on Singapore exports. Choudhry (2008) claims that exchange rate volatility has a substantial beneficial impact on actual exports from Canada, Japan, and New Zealand to the United Kingdom. Doroodian (1999) looked at the influence of exchange rate volatility on exports in three emerging nations: India, South Korea, and Malaysia. The GARCH method was applied to calculate the measure of exchange rate volatility because the data were collected quarterly from 1973 to 1996. The empirical findings backed the theory that the GARCH-based measure of exchange rate volatility had a considerable negative influence on all three nations' exports. Exchange rate fluctuation has a considerable negative impact on exports in eight Latin American Nations, according to Arize et al. (2008), both in the short and long run. Edwards (1987) looked at the effect of exchange rate uncertainty on trade flow. He has demonstrated that the exchange rate system should be neutral in terms of exchange rate fluctuation. According to Onafowora and Owoye (2008), uncertainty has a bigger impact in certain nations than the relative pricing of tradable and non-tradable commodities. The findings demonstrate that exchange rate uncertainty has a detrimental impact on exports not just in low-income nations but also in middle-income countries. They also stress the significance of examining the impact of particularly high levels of uncertainty in countries that have converted from a fixed to a flexible exchange rate system, given the typically higher volatility linked with a flexible exchange rate regime. Caballero and Corbo (1989) initiate that exchange rate uncertainty had a considerable negative influence on exports, based on data from six developing nations. Furthermore, they discovered that the long-run effect of indecision is significantly larger than the short-run effect, and they used risk aversion to explain this.

The current study is being used to provide further empirical information on MENA countries' foreign trade, and exchange rate volatility. To discuss this issue, the study contributes to the discussion in this paper by investigating the effect of exchange rate volatility on foreign trade using the unique data set of Reinhart and Rogoff (2004).

The above table shows that some countries such as the United States, G-7 Countries, East Asian Countries, Latin American Countries, OCED countries, Developing countries, the United Kingdom, Canada, Japan, New Zealand, and Nigeria have shown that exchange rate volatility is a negative influence on the flow of export and import using VAR model, ARCH model, ECM techniques and Ordinary Least Square. The available empirical studies have offered a narrative analysis of the link between exchange rate volatility, and the flow of foreign trade in MENA countries. Our study uses a meta-analytical methodology and a sample of eight (08) MENA countries such as Iran, Algeria, Bahrain, Italy, Libya, Kuwait, Oman, and Qatar to provide data on the nature of the link between exchange rate volatility and the flow of foreign trade. The researchers assume that exchange rate volatility has a significant positive and negative effect on the flow of foreign trade.

3. The Trade Model

3.1. The Import and Export Demand Models

This study investigates the influence of exchange rate volatility on the foreign trade of MENA countries from 1988 to 2022. By Hondroyiannis et al. (2008), Bahmani-Oskooee and Hegerty (2007), Bailey et al. (1987), Tenreyno (2007), and Onafowora and Owoye (2008), the empirical model used in this study is based on the traditional determinants of international trade theory, according to which international trade is a function of national income, goods' prices, exchange rates' level, and exchange rate volatility. The model may be expressed as

$$\mathrm{EX}_{\mathrm{it}}^{\mathrm{MENA}} = \mathrm{f}(\mathrm{FI}_{\mathrm{it}}, \mathrm{PEX}_{\mathrm{it}}, \mathrm{MIS}_{\mathrm{it}}, \mathrm{VOL}_{\mathrm{it}}) \quad (1)$$

$$\mathrm{EX}_{\mathrm{it}}^{\mathrm{MENA}} = \alpha_0 + \alpha_1 \mathrm{FI}_{\mathrm{it}} + \alpha_2 \mathrm{PEX}_{\mathrm{it}} + \alpha_3 \mathrm{MIS}_{\mathrm{it}} + \alpha_4 \mathrm{VOL}_{\mathrm{it}} + \varepsilon_{\mathrm{it}} \quad (2)$$

$$\mathrm{IM}_{\mathrm{it}}^{\mathrm{MENA}} = \mathrm{f}(\mathrm{DI}_{\mathrm{it}}, \mathrm{PIM}_{\mathrm{it}}, \mathrm{MIS}_{\mathrm{it}}, \mathrm{VOL}_{\mathrm{it}}) \quad (3)$$

$$\mathrm{IM}_{\mathrm{it}}^{\mathrm{MENA}} = \beta_0 + \beta_1 \mathrm{DI}_{\mathrm{it}} + \beta_2 \mathrm{PIM}_{\mathrm{it}} + \beta_3 \mathrm{MIS}_{\mathrm{it}} + \beta_4 \mathrm{VOL}_{\mathrm{it}} + \varepsilon_{\mathrm{it}} \quad (4)$$

Where,

EX_{it} represents actual exports of goods and services (i.e., total exports in domestic currency deflated by the GDP deflator). IM_{it} represents real imports of goods and services (i.e., total imports in domestic currency deflated by the GDP deflator). $FI_{it}, and\ DI_{it}$ are real foreign income and real domestic income. PEX_{it} is the export price (the difference between the domestic export price and the international export price), and PIM_{it} is the import price (the difference between the domestic import price and the international import price). $MIS_{it}\ is\ the$ real exchange rate misalignment. VOL_{it} is the exchange rate Volatility. ε_{it} is the random error.

The study used yearly data spanning the years 1988 to 2022. The data originates from the IMF's International Financial Data (IFS), International Monetary Fund (IMF) Directions of Trade Statistics (DOT), and World Development Indicator.

Using the trade theory, the study anticipates that the export demand is predicted to be inversely correlated with export price and positively correlated with foreign income. It is anticipated that the import demand is anticipated to have a positive relationship with import price and domestic income. According to Asseery and Peel (1991), there is ambiguity around the effect of exchange rate volatility on exports. It is unclear if nations with flexible monetary policies would see increased trade values. The elasticity of net export and import for the commodities significantly impacts how trade is affected by volatility.

To address the effect of exchange rate volatility on foreign trade for selected eight (08) MENA countries. The study used the Panel ARDL/PMG technique, as well as the Robust Least-Squares and Fixed-Effect approaches. In addition, the Heterogeneous Panel Granger Causality test by Dumitrescu and Hurlin (2012) is utilized to determine the causal relationships between the variables.

3.2. Estimation Technique

3.2.1. Pesarans (2004) CD Test

Pesaran (2004) most recently introduced a new Cross-Section Dependence test, the CD test, which allows a more flexible model framework incorporating extremely general heterogeneous dynamic models and non-stationary models. The test statistic is described in several of the following ways:

$$CD = \sqrt{\frac{2T}{N(N-1)}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\dot{\rho_{ij}}\right)} \qquad (5)$$

3.2.2. Panel Unit Root Tests (PURTs)

To find the unit root of variables, the study used Pesaran's Cross-Sectional Augmented Lin, Levin, and Chu (LLC) (2002), I'm, Pesaran, and Shin (IPS) (2003), and Fisher ADF panel unit root test (Maddala and Wun 1999).

$$\Delta EX_{it} = \alpha_i + \alpha_i t + \alpha_i EX_{i,t-1} + \alpha_i \overline{EX_{t-1}} + \sum_{r=0}^{p} \alpha_{ir} \overline{\Delta EX_{t-r}} + \sum_{r=1}^{p} \alpha_{ir}\, \Delta EX_{i,t-r} + \varepsilon_{it,} \qquad (6)$$

$$\Delta IM_{it} = \alpha_i + \alpha_i t + \alpha_i IM_{i,t-1} + \alpha_i \overline{IM_{t-1}} + \sum_{r=0}^{p} \alpha_{ir} \overline{\Delta IM_{t-r}} + \sum_{r=1}^{p} \alpha_{ir}\, \Delta IM_{i,t-r} + \varepsilon_{it,} \qquad (7)$$

CIPS's test statistic is as follows:

$$CIPS = (N)^{-1} \sum_{i=1}^{N} CADF_i \qquad (8)$$

3.2.3. The Robust Least Squares (RLS), Fixed-Effect, and Dumitrescu and Hurlin

Robust least squares estimators are employed since data outliers can considerably affect the outcomes of a regression. The furthermost common technique, such as the conventional Least Squares Method (OLS), often ignores the problem of outliers, according to Barnett and Lewis (1984) and Belsley et al. (1980). Alternative strategies, such as robust regression, yield solid results (Huber, 1973).

Instead of the Fixed-Effect (FE) estimator, the present study employed the Random-Effect (RE) estimator suggested by the Hausman (1978) test (see Tables 8 and 9). A method for addressing endogeneity bias is the Random-Effect (RE) analytical technique, which involves panel data or multi-level data (Allison, 2009). The Random-Effect (RE) technique gives a somewhat flexible option to have accuracy for endogeneity arising from missing bias factors. The primary objective of the Random-Effect (RE) approach is to eliminate any bias resulting from the existence of variables that are not time-invariant variables (Wooldridge, 2015; Stone and Rose, 2011). To determine the way of causality between the variables, Dumitrescu and Hurlin's (2012) heterogeneous tests were often used. Granger (1969) developed this non-causality test in models using heterogeneous panel data.

$$EX_{i,t} = \alpha_i + \sum_{k=1}^{K} \gamma_{ik} EX_{i,t-k} + \sum_{k=1}^{K} \beta_{ik} x_{i,t-k} + \varepsilon_{i,t} \qquad with\ i = 1, \dots., N\ and\ t = 1, \dots, T \qquad (9)$$

$$IM_{i,t} = \alpha_i + \sum_{k=1}^{K} \gamma_{ik} IM_{i,t-k} + \sum_{k=1}^{K} \beta_{ik} x_{i,t-k} + \varepsilon_{i,t} \qquad with\ i = 1, \dots., N\ and\ t = 1, \dots, T \qquad (10)$$

4. Results and Discussion

4.1. Results of Descriptive Statistics and Correlation

Table 2: Descriptive Statistics and Correlation of Exchange Rate Volatility with Export of MENA Countries

Statistics/ Variables	*EX*	*PEX*	*FI*	*MIS*	*VOL*
Mean	3.681196	5.298208	4.139616	1.420948	4.126470
Median	3.651301	5.3681182	0.932912	1.679295	4.432454
Maximum	4.652100	6.0371716	25.88325	4.108851	5.691407
Minimum	2.838527	4.455362	-9.623365	-3.621576	2.370772
Std. Deviation	0.443440	0.460705	8.823381	1.377903	1.377903
Skewness	0.237445	-0.362954	1.882159	-0.851704	-1.071152
Kurtosis	2.134020	2.094967	4.905804	3.678777	2.817560
Jarque-Bera	5.690077	7.851823	103.8460	19.61364	26.96604
P-value	0.90976	0.60170	0.151653	0.519855	0.325101
EX	1.000000				
PEX	-0.1184359	1.000000			
FI	-0.1510225	0.01088709	1.0000000		
MIS	-0.0971659	0.23870934	0.10097649	1.0000000	
VOL	0.04228046	-0.1143832	-0.4138790	-0.252856	1.0000000

Source: Author's Estimation

Table 3: Descriptive Statistics and Correlation of Exchange Rate Variability with Import of MENA Countries

Statistics/ Variables	*IM*	*PIM*	*DI*	*MIS*	*VOL*
Mean	3.568392	1.42094	4.890474	21.29091	4.126470
Median	3.176989	1.67929	4.933680	24.94083	4.432454
Maximum	4.341749	4.108851	5.257520	27.11831	5.691407
Minimum	3.621576	2.370772	4.486287	-5.512016	2.370772
Std. Deviation	1.589223	0.755468	0.190145	9.521910	1.377903
Skewness	-0.847468	-0.851704	-0.332325	-2.016341	-1.071152
Kurtosis	2.999601	3.678777	2.108715	5.186146	2.817560
Jarque-Bera	16.75803	19.61364	7.210871	122.7436	26.96604
P-value	0.230500	0.344521	0.601752	0.156734	0.321055
IM	1.000000				
PIM	0.05447643	1.000000			
DI	0.34034385	0.14326062	1.000000		
MIS	0.07466808	0.30591362	-0.1205681	1.000000	
VOL	-0.1437142	-0.0425303	0.42944568	-0.2572856	1.000000

Source: Author's Estimation

Table 4: CD Cross-Section Dependence Tests of MENA Countries

Tests	*EX*	*IM*	*PEX*	*PIM*	*FI*	*DI*	*MIS*	*VOL*
Breusch-Pagan LM	82.08530 (0.0000)	65.24927 (0.0000)	401.4360 (0.0000)	372.4503 (0.0000)	26.34559 (0.0000)	299.0192 (0.0000)	54.12182 (0.0001)	41.63514 (0.0000)
Pesaran scaled LM	9.425666 (0.0000)	6.827810 (0.0000)	58.70255 (0.00000)	54.22996 (0.0000)	0.824842 (0.0495)	42.89930 (0.0000)	5.110808 (0.0000)	3.184071 (0.0000)
Bias-corrected scaled LM	9.241456 (0.0000)	6.643600 (0.0000)	58.51834 (0.00000)	54.04575 (0.0000)	0.640632 (0.0000)	42.71509 (0.0000)	4.926597 (0.0000)	2.999860 (0.0002)
Pesaran CD	-1.524098 (0.0004)	-0.591752 (0.0000)	20.03225 (0.00000)	19.23488 (0.0000)	-1.588903 (0.0000)	17.06500 (0.0000)	2.976333 (0.0000)	1.855111 (0.0000)

Note: Null hypothesis: No cross-section dependence. All tests show that all included variables are significant at the 5% level of significance.

Table 5: Panel Unit Root Test of MENA Countries

Test	Variables	Level			1st difference		
		Constant	Constant & trend	Decision	Constant	Constant & trend	Decision
Levin Lin & Chu (LLC)	*EX*	-0.73781 (0.2303)	0.07397 (0.5295)	Nonstationary	-5.21009 (0.0000)	-5.99825 (0.00000)	Stationary
	IM	-3.65197 (0.0001)	-3.77622 (0.00001)	Stationary	-7.02974 (0.0000)	-6.73258 (0.0000)	Stationary
	PEX	2.87137 (0.9980)	-0.31405 (0.3767)	Nonstationary	-5.79576 (0.0000)	-4.88045 (0.0000)	Stationary
	PIM	-0.79567 (0.2131)	3.89718 (1.0000)	Nonstationary	-4.23576 (0.0000)	-3.96495 (0.0000)	Stationary
	FI	-1.38914 (0.0224)	-3.00706 (0.0013)	Stationary	-4.58207 (0.0000)	-11.2167 (0.0000)	Stationary
	DI	-0.59878 (0.2747)	0.68696 (1.0000)	Nonstationary	-5.24114 (0.0000)	-4.53851 (0.0000)	Stationary
	MIS	-3.00706 (0.0013)	-1.38914 (0.0824)	Stationary	-11.2167 (0.0000)	-8.09449 (0.0000)	Stationary
	VOL	-1.98040 (0.0238)	-1.98040 (0.0238)	Stationary	-8.80545 (0.0000)	-9.72965 (0.0000)	Stationary
Im, peseran & shin W-stat (IPS)	*EX*	19.5624 (0.1446)	7.09228 (0.9311)-	Nonstationary	50.0198 (0.0000)	58.7490 (0.0000)	Stationary
	IM	43.2114 (0.0001)	43.0097 (0.0001)	Stationary	72.4607 (0.0000)	65.1630 (0.0000)	Stationary
	PEX	1.81417 (1.0000)	11.2699 (0.6647)	Nonstationary	56.4918 (0.0000)	45.2788 (0.0000)	Stationary
	PIM	15.1846 (0.3657)	0.99328 (1.0000)	Non Stationary	41.5873 (0.0000)	38.3733 (0.0005)	Stationary
	FI	36.4936 (0.0009)	35.5695 (0.0000)	Stationary	49.3564 (0.0000)	85.5602 (0.0000)	Stationary
	DI	13.3531 (0.4989)	4. 65459 (1.00000)	Non Stationary	50.9507 (0.0000)	49.6733 (0.0000)	Stationary
	MIS	35.5695 (0.0012)	36.4934 (0.0009)	Stationary	84.3057 (0.0000)	80.9174 (0.0000)	Stationary
	VOL	26.7368 (0.0208)	26.7368 (0.0208)	Stationary	98.7464 (0.0000)	49.3564 (0.0000)	Stationary
ADF-Fisher Chi-square	*EX*	12.9826 (0.5279)	12.1578 (0.5936)	Nonstationary	52.8190 (0.0000)	61.1249 (0.0000)	Stationary
	IM	20.9183 (0.1037)	24.3273 (0.0418)	Non Stationary	123.122 (0.0000)	94.8282 (0.0000)	Stationary
	PEX	2.03294 (0.9999)	11.5032 (0.6461)	Nonstationary	56.0328 (0.0000)	57.6649 (0.0000)	Stationary
	PIM	10.0888 (0.7557)	1.10359 (1.0000)	Nonstationary	41.2029 (0.0002)	50.8626 (0.0000)	Stationary
	FI	47.5662 (0.0000)	45.9303 (0.0000)	Stationary	56.8150 (0.0000)	84.3057 (0.0000)	Stationary
	DI	12.6054 (0.5578)	0.61571 (1.0000)	Non-stationary	55.2339 (0.0000)	70.9946 (0.0000)	Stationary
	MIS	45.9303 (0.0000)	47.5662 (0.0000)	Stationary	84.3551 (0.0000)	80.9174 (0.0000)	Stationary
	VOL	32.6424 (0.0032)	32.6424 (0.0032)	Stationary	128.057 (0.0000)	108.552 (0.0000)	Stationary

Source: Author's Estimation

Table 2 and 3 summarizes descriptive statistics from a balanced panel data collection comprising eight (08) countries from 1988 to 2022. According to Jarque-Bera's statistics, all of the variables are normally distributed; The Jarque-

Berra- Berra test demonstrates the acceptance of H_0 of a normal distribution with each variable. Table 2 and 3 also includes the findings of the pair-wise correlation between the series. Exchange rate volatility is positively associated with export, but export price and export are adversely correlated, as are foreign income and real exchange rate misalignment. In Table 4 exchange rate volatility is adversely associated with import, but import price, domestic income, and real exchange rate misalignment and import are positively correlated with each other. There's no sign of multicollinearity between the series in both tables, according to the correlation analysis. This study uses Pesaran's (2004) tests to analyze the cross-sectional dependency in panel data before assessing stationary features of chosen variables such as export, import, export price, import price, foreign income, domestic income, real exchange rate misalignment, and exchange rate volatility. To circumvent the problem of cross-sectional dependency, partial findings may be obtained. Table 4 shows the results of the Cross-Sectional Dependency Test.

4.2. Results of CD Cross-Section Dependence Test

The study uses Pesaran's (2004) tests to inspect the Cross-Sectional Dependency in panel data before assessing stationary features of chosen variables such as export, import, export price, import price, domestic income, foreign income, real exchange rate misalignment, and exchange rate volatility. To circumvent the issue of Cross-Sectional Dependency, partial findings may be obtained. The findings of the Cross-Sectional Dependency Test are displayed in Table 4.

4.3. Results of Panel Unit Root Test

Table 5 provides an overview of the PURT's results. The panel unit root results show that the export, export price, import, import price, domestic income, and exchange rate volatility are non-stationary whereas, foreign income and real exchange rate misalignment are stationary at the level. After the first difference, all the variables become stationary with individual constants and trends. According to PURT's findings, all of the variables in the research are mixed in order of integration, i.e., integrated at I (0) and I (I) in each panel. As a result, for an empirical estimate, the study uses the ARDL/P.M.G. techniques. This study also used Robust Least Squares and Fixed-Effect T techniques for robustness.

4.4. Results of the Pooled Mean Group

Table 6: Pooled Mean Group Estimation for Exchange Rate Variability with Export of MENA Countries

Variable	Coefficient (std. Error)	P-value
	Long Run Equation	
PEX	-0.037355 (0.017700)	0.0375
FI	0.022593 (0.004783)	0.0000
MIS	0.018323 (0.016907)	0.0413
VOL	0.280643(0.094593)	0.0038
	Short run equation	
$ECM_{t\text{-}1\ export}$	2.939183 (0.411290)	0.0000
Δ (EX (-1))	-0.205403 (0.079244)	0.0111
PEX	-0.028825 (0.020233)	0.0176
Δ (PEX (-1))	0.016713 (0.040723)	0.6821
FI	0.020441(0.026364)	0.4401
Δ (FI (-1))	0.016348 (0.011073)	0.1422
MIS	5.193699 (3.819512)	0.0720
Δ (MIS (-1))	0.025757 (0.014496)	0.0779
VOL	0.02032 (0.007216)	0.7788
Δ (VOL (-1))	0.183628 (0.061285)	0.0033

Source: Author's Estimation

According to the results of PURT, this study uses the Pooled Mean Group method to estimate the long-run equilibrium connection between variables. The PMG technique was used to estimate both the long-run and short-run parameters that related to export, import, export price, import price, real exchange rate misalignment, foreign income, domestic income, and exchange rate volatility. The above table shows that all empirically examined explanatory factors have a significant effect on export and import in the eight (08) MENA countries in the short run. The P.M.G. findings show that each of the regressors is statistically significant, confirming and indicating that the considered model is theoretically and statistically acceptable. The probable coefficient signs are present in all of the regressors.

The study produced an objectively strong empirical indication of the long-run detrimental impact of exchange rate volatility on the export and import of eight (08) MENA countries.

The export price has an estimated coefficient of -0.03755 in the long run, which is statistically significant at the 5% level. According to empirical findings, a 1% increase in export price leads to a reduction in exports by 0.03755 percent

(%). As a result, the MENA economy's exports declined, and imports rose, which lowered net exports' value. The finding of the present study is supported by Arize, Osangand, and Slottje (2008). While, the import price has an estimated coefficient of 0.463679 in the long run, which is statistically significant at the 5% level. According to empirical findings, a 1% increase in import price leads to an increase in imports by 0.463679 percent (%). The finding of the study is similar to Poon, and Hooy (2013).

The P.M.G. results show that the predicted coefficient for foreign income and domestic income is 0.022593 percent (%) and 0.220420 percent (%), which both are statistically significant in the long term. According to empirical estimations, a 1% increase in foreign income and domestic income boosts the export rate by 0.022593 percent (%) and the import rate by 0.220420 percent (%). The positive link between foreign income, domestic income, imports, and exports demonstrates that foreign income and domestic income have a significant and useful influence on export and import demand. This outcome is not unexpected considering that MENA countries have maintained a large import percentage of capital and intermediate goods, which accounts for more than 22 percent (%) of their total imports to support their export-led economic growth. The finding of the study is similar to Malaysia (2010).

Table 7: Pooled Mean Group Estimation for Exchange Rate Variability with Import of MENA Countries

Variable	Co-efficient (St. Error)	P- value
	Long run equation	
PIM	0.463679 (0.234663)	0.0511
DI	0.220420 (0.091199)	0.0176
MIS	1.858067 (0.563326)	0.0014
VOL	-0.118323 (0.016907)	0.0213
	Short run equation	
$ECM_{t\text{-}1\ import}$	-0.515916 (0.151353)	0.0010
Δ (IM (-1))	30.04993 (20.02122)	0.1358
PIM	1.778473 (0.072124)	0.0015
Δ (PIM (-1))	0.045556 (0.031443)	0.1498
DI	0.615553 (0.240962)	0.0122
Δ (DI (-1))	0.117284 (0.850436)	0.8905
MIS	0.048767 (0.049763)	0.3296
Δ (MIS (-1))	0.162851 (0.051272)	0.0377
VOL	-0.048767(0.049763)	0.3296
Δ (VOL (-1))	0.421482 (0.094909)	0.0409

Source: Author's Estimation

4.5 Results of the Robust Least Square and Fixed Effect Model

Table 8: Robust Least Square and Fixed Effect Estimations of Export of MENA Countries

	Robust Least Squares		Fixed Effect	
Variables	Coefficient (Std. Error)	P-value	Co-efficient (Std. Error)	P-value
Constant	4.576866 (0.556400)	0.0000	2.828508 (0.377756)	0.0000
PEX	-1.126677 (0.087509)	0.0277	-0.104133 (0.042298)	0.0223
FI	0.109025 (0.004976)	0.0597	3.2700 (0.004563)	0.0364
MIS	0.141313 (0.0161119)	0.0401	0.208697 (0.065028)	0.0017
VOL	0.027311 (0.004570)	0.5502	0.024951 (0.014664)	0.0913
R^2	0.042862		0.807930	
RW^2	0.052062			
Adj. R^2	0. 014503		0.793041	
Adj. RW^2	0.052062			
Correlated Random Effect: Hausman Test			10.8765	0.0345

Method: M-estimation M settings: weight=Bisquare, tuning = 4.685, scale = MAD (median centered).
Huber Type I Standard Errors & Covariance.
Note: 5% level of significance respectively.

The real exchange rate misalignment is a positive link with export and import demand as well as statistically significant at 5%. In the long term, the predicted coefficients for export and import levels are 0.018323 and 1.858067. Choudhry

(2008) looked at the export's considerable positive influence on early real exchange rate. This may be due to the efficacy of MENA trade reform policies from the 1980s, which placed a strong emphasis on Import-Substitution (IS) and Export-Oriented Strategy (EO). The results of the study are similar to Kroner and Lastrapes (1993), and Malaysia (2010).

Tables 6 and 7 show that at a 5% level, the effect of exchange rate volatility on exports is considered positive. In the long term, the predicted coefficient is 0.280643, indicating that a 1% upsurge in exchange rate volatility leads to a 0.280643 percent (%) increase in export demand demonstrating that selected MENA nations with flexible monetary policies and high trade openness perform better exports when the exchange rate is fluctuating than the remaining MENA nations with fixed monetary policies and less trade openness. The coefficient of exchange rate volatility on Imports is -0.118323 which is considered negative indicating that a 1% increase in exchange rate volatility leads to a 0.118323 percent (%) decrease in imports. This result is related to Poon and Hooy (2013).

Table 9: Robust Least Squares, and Fixed Effect Estimation of Import of MENA Countries

	Robust Least Squares		Fixed Effect	
Variables	Coefficient (std. Error)	P-value	Co-efficient (std. Error)	P-value
Constant	47.24609 (10. 02213)	0.0000	2.85977 (0.373746)	0.0000
PIM	0.196180 (0.052253)	0.0557	0.125110 (0.041287)	0.0484
DI	1.199180 (0.052253)	0.0357	0.125110 (0.041287)	0.0241
MIS	9.241784 (1.916600)	0.0000	0.198792 (0.06278	0.0019
VOL	-0.305520 (0.146201)	0.0425	-0.027142(0.014554)	0.0645
R^2	0.312611		0.812095	
RW^2	0.292244			
$Adj.R^2$	0.372642		0.797528	
$Adj.RW^2$	0.372642			
Correlated Random Effect: Hausman Test			12.1732	0.0233

Method: M-estimation M settings: weight=Bisquare, tuning = 4.685, scale = MAD (median centered).
Huber Type I Standard Errors & Covariance.
Note: 5% level of significance respectively.

The results show that in export function, the export price has a negative influence, as well as foreign income, real exchange rate misalignment, and exchange rate volatility all have a positive impact on the export demand of eight (08) selected MENA countries, based on the results of Robust Least Squares and Fixed-Effect Estimators. Whereas, exchange rate volatility has a negative while import price, domestic income, and real exchange rate misalignment are positively correlated with import demand of eight (08) MENA countries, based on the results of Robust Least Squares and Fixed-Effect Estimators. The empirical results of the P.M.G. method are firmly supported by all calculated coefficients, which are statistically significant. When comparing the empirical conclusions of this study to those of others, such as Arize, Osang, and Slottje (2000) and Cushman, (1988) have concluded that exchange rate volatility has influenced the export and import demand of selected Eight (08) MENA countries.

4.5. Results of Dumitrescu Hurlin panel Causality

Table 10: Dumitrescu Hurlin panel causality tests with Export of MENA Countries

Variable/Statistics	*EX*	*PEX*	*FI*	*MIS*	*VOL*
EX	-	4.13218	0.50149	4.66346	5.39564
		(0.0281)	(0.6069)	(0.0169)	(0.0280)
PEX	6.22250	-	4.13218	2.64701	3.40975
	(0.0281)		(0.03763)	(0.0014)	(0.0292)
FI	2.97616	2.41803	-	4.01185	3.23720
	(0.0547)	(0.0462)		(0.0282)	(0.0592)
MIS	2.78938	3.95977	3.03255	-	3.46200
	(0.0564)	(0.0459)	(0.0141)		(0.0345)
VOL	3.47679	2.23720	4.40975	3.94883	-
	(0.0326)	(0.0147)	(0.0247)	(0.0301)	

Source: Author's Estimation

Table 11: Results of Dumitrescu Hurlin panel causality tests with Import of MENA Countries

Variable/Statistics	*IM*	*PIM*	*DI*	*MIS*	*VOL*
IM	-	5.27934	3.65485	6.17890	3.47679
		(0.0568)	(0.0214)	(0.0028)	(0.0325)
PIM	2.16633	-	5.65485	5.78938	4.96051
	(0.0470)		(0.0214)	(0.0564)	(0.0356)
DI	2.17949	2.07949	-	6.30913	1.30913
	(0.0359)	(0.0359)		(0.0239)	(0.2749)
MIS	3.20374	3.66346	3.84428	-	3.46200
	(0.0441)	(0.0169)	(0.0324)		(0.0345)
VOL	3.90417	5.50527	2.84428	3.94883	-
	(0.0076)	(0.0114)	(0.0324)	(0.0301)	

Source: Author's Estimation

Furthermore, the widely used Heterogeneity test developed by Dumitrescu and Hurlin (2012) is utilized to investigate causal relationships between the variables. The findings of the Dumitrescu and Hurlin test, which accounts for Heterogeneity via cross-sections, are shown in Tables 10 and 11. The findings indicate that real exchange rate misalignment and exchange rate volatility with export and import have a statistically significant and bidirectional causal relationship. Tables 10 and 11 show that the majority of the data demonstrate causality between statistically significant variables.

5. Concluding Remarks

Some empirical research on the link between exchange rate volatility, and the flow of export and import are available, however, the results are still unclear. Exchange rate volatility is undeniably important for all countries. As a result, the goal of this study is to evaluate experimentally the influence of exchange rate volatility, as well as certain other control factors, on the flow of foreign trade for a group of eight (08) MENA nations from 1988 to 2022. The P.M.G. findings show that exchange rate volatility, foreign income, and real exchange rate misalignment have a statistically positive significance while the export price harms export demand which offers evidence of a threshold effect. The result also reveals that domestic income, import price, and real exchange rate misalignment have positive and exchange rate volatility has a negative correlation with import demand. The findings of the Dumitrescu and Hurlin test indicate that real exchange rate misalignment and exchange rate volatility with export and import demand have a statistically significant and bidirectional causal relationship which shows that the majority of the data demonstrate causality between variables that is statistically significant.

5.1. Policy Implication

Many policy implications stem from our findings. The amount of trade between MENA nations is most likely to rise as a result of economic measures that, first and foremost, aim to stabilize the exchange rate. To attain and maintain real exchange rate stability, it is necessary to have a transparent exchange rate system, and achieving the targeted exchange rate should be a key component of the overall trade and Economic Growth plan.

Our findings help policymakers in two different ways. They first suggest that in the long run, stabilizing the real exchange rate may be better achieved with a flexible exchange rate strategy, like the crawling peg. Exchange rate flexibility will be the best course of action if actual exchange rate stability is thought to be an anticipated government goal. Second, we have identified several factors that policymakers took into account while deciding on the Exchange Rate Regime.

Here, a potential direction for our study is apparent. As was said in the introduction, the choice of exchange rate misalignment is a dichotomous variable because of the structure of the model. It would be helpful to extend the model such that the decision might take one of multiple values. Moreover, broadening the sample to include information from developed nations may help clarify if the two sets of countries' distinct exchange rate regimes have different effects on actual exchange rate volatility.

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