Oil Price-Exchange Rate Dynamics in Egypt: An ARDL Bounds Testing Approach to Understanding Macroeconomic Relationships in Emerging Markets (1990-2023)

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Abstract:

This study examines the dynamic relationship between oil prices and exchange rates in Egypt from January 1990 to December 2023, addressing a significant gap in literature concerning oil-importing developing economies. Using monthly time series data spanning 408 observations, we employ the Autoregressive Distributed Lag (ARDL) bounds testing approach to investigate both short-run and long-run relationships between international oil prices and the Egyptian pound-US dollar exchange rate. The research incorporates comprehensive control

variables including inflation rates, interest rates, public debt levels, and trade openness to provide a robust analytical framework. Our findings reveal a statistically significant positive relationship between oil prices and exchange rates in both short-run and long-run contexts, with a long-run elasticity of 0.058, indicating that a one-dollar increase in oil prices leads to a 0.058 unit depreciation of the Egyptian pound. The study establishes unidirectional Granger causality running from oil prices to exchange rates, with no evidence of reverse causality. The error correction mechanism indicates a relatively slow adjustment process, with approximately 3.5% of disequilibrium corrected monthly. These findings have important implications for monetary policy, fiscal planning, and economic risk management in Egypt and similar oil-importing emerging economies.

Keywords: Oil prices, Exchange rates, ARDL bounds testing, Egypt, Emerging markets, Cointegration, Monetary policy

المُلخص

تبحث هذه الدراسة في العلاقة الديناميكية بين أسعار النفط وأسعار الصرف في مصر من يناير ١٩٩٠ إلى ديسمبر ٢٠٢٣، معالجة بذلك فجوة مهمة في الأدبيات المتعلقة بالاقتصادات النامية المستوردة للنفط. باستخدام بيانات السلاسل الزمنية الشهرية التي تمتد على ٤٠٨ مشاهدة، نستخدم منهج اختبار الحدود للنموذج الانحداري الموزع ذي الفجوات الزمنية (ARDL) لاستقصاء العلاقات قصيرة المدى وطويلة المدى بين أسعار النفط الدولية وسعر صرف الجنيه المصري مقابل الدولار الأمريكي. يتضمن البحث متغيرات تحكم شاملة تشمل معدلات التضخم ومعدلات الفوائد ومستويات الدين العام والانفتاح التجاري لتوفير إطار تحليلي قوي. تكشف نتائجنا عن علاقة إيجابية ذات دلالة إحصائية بين أسعار النفط وأسعار الصرف في السياقين قصير المدى وطويل المدى، مع مرونة طويلة المدى تبلغ ٠.٠٥٨، مما يشير إلى أن زيادة دولار واحد في أسعار النفط تؤدي إلى انخفاض قدره ٠.٠٥٨ وحدة في قيمة الجنيه المصري. تؤسس الدراسة سببية جرانجر أحادية الاتجاه تسير من أسعار النفط إلى أسعار الصرف، دون وجود دليل على السببية العكسية. تشير آلية تصحيح الخطأ إلى عملية تعديل بطيئة نسبياً، حيث يتم تصحيح ما يقرب من ٣.٥% من عدم التوازن شهرياً. لهذه النتائج تداعيات مهمة على السياسة النقدية والتخطيط المالي وإدارة المخاطر الاقتصادية في مصر والاقتصادات الناشئة المماثلة المستوردة للنفط.

الكلمات المفتاحية :أسعار النفط، أسعار الصرف، اختبار ARDL، مصر، الأسواق الناشئة، التكامل المشترك، السياسة النقدية

1. Introduction

The intricate relationship between oil prices and exchange rates has emerged as one of the most critical areas of investigation in international macroeconomics, particularly in light of increasing global economic integration and the persistent volatility of commodity markets (Hamilton, 2020; Kilian & Zhou, 2021). This relationship carries profound implications for economic stability, monetary policy effectiveness, and overall macroeconomic performance, especially for emerging market economies that are heavily dependent on oil imports to meet their energy needs (Basher & Sadorsky, 2020; Liu & Liao, 2021).

Egypt presents a compelling case study for examining oil price-exchange rate dynamics due to its unique economic characteristics and evolving position in global energy markets. As documented by Hassan and Kandil (2021) and Mohieldin and Rostom (2019), Egypt has experienced substantial economic transformations over the past three decades, including periods as both a net oil exporter and importer, major exchange rate regime changes, and comprehensive economic reform programs. These characteristics make Egypt an ideal laboratory for understanding how oil price fluctuations affect exchange rate dynamics in emerging market contexts, as emphasized by El-Ramly and Abdel-Haleim (2018).

The theoretical foundations for examining oil price-exchange rate relationships are well-established in economic literature, drawing from multiple theoretical frameworks including terms of trade theory (Kilian & Zhou, 2021), portfolio balance models (Akram & Mumtaz, 2020), and purchasing power parity approaches (Sadorsky & Vo, 2020). For oil-importing countries like Egypt during most of the study period, higher oil prices typically worsen the current account balance by increasing import costs, leading to increased demand for foreign currency and subsequent domestic currency depreciation, as demonstrated by Aissaoui (2020) and Basher and Sadorsky (2020).

However, the empirical evidence on the magnitude, persistence, and channels of this relationship remains limited, particularly for Middle Eastern and North African emerging economies. As noted by Beckmann et al. (2020) and Filis and Chatziantoniou (2021), most existing research has focused on developed economies or major oil exporters, leaving a significant gap in understanding how these dynamics operate in oil-importing developing countries.

This study addresses several important research gaps identified in the existing literature. First, while extensive research has examined oil price-exchange rate relationships in developed economies and major oil exporters (Kang & Ratti, 2020; Park & Ratti, 2020), relatively limited attention has been paid to oil-

importing developing economies, particularly those in the MENA region. Second, most existing studies have employed relatively short time horizons or have focused on specific crisis periods, limiting their ability to capture long-term structural relationships and adjustment mechanisms, as highlighted by Mohammadi and Su (2021). Third, the methodological approaches used in previous research have often failed to adequately account for the potential presence of different integration orders among variables or the possibility of both short-run and long-run relationships (Narayan & Narayan, 2020).

2. Literature Review and Theoretical Framework

2.1 Theoretical Foundations

The theoretical relationship between oil prices and exchange rates is grounded in several well-established economic frameworks that collectively explain the transmission mechanisms through which commodity price fluctuations influence currency valuations. Understanding these theoretical foundations is essential for developing appropriate empirical models and interpreting empirical findings within broader economic contexts.

The terms of trade theory provides the most direct theoretical link between oil prices and exchange rates for oil-importing countries (Kilian & Zhou, 2021). According to this framework,

changes in oil prices directly affect a country's terms of trade, which represents the ratio of export prices to import prices. For oil-importing countries like Egypt, increases in international oil prices worsen the terms of trade by raising the cost of essential imports while leaving export prices relatively unchanged (Aissaoui, 2020). This deterioration in terms of trade creates downward pressure on the domestic currency as the country requires more foreign exchange to finance its import bill, leading to currency depreciation (Basher & Sadorsky, 2020).

The portfolio balance approach offers an alternative theoretical perspective by emphasizing the role of international capital flows in exchange rate determination (Akram & Mumtaz, 2020). Under this framework, oil price fluctuations affect exchange rates through their impact on international asset portfolios and capital flows. When oil prices rise, oil-importing countries experience capital outflows as domestic investors seek to hedge against higher energy costs, while foreign investors may reduce their exposure to economies vulnerable to oil price shocks (Sadorsky & Vo, 2020). These portfolio adjustments create additional downward pressure on the exchange rates of oil-importing countries beyond the direct trade balance effects.

The purchasing power parity (PPP) theory provides another theoretical channel through which oil prices affect exchange rates, operating through domestic price level adjustments

(Hamilton, 2020). Higher oil prices typically lead to increased domestic inflation in oil-importing countries through both direct energy cost increases and indirect effects on production and transportation costs throughout the economy. According to PPP theory, these inflation differentials between countries should be reflected in exchange rate adjustments to maintain purchasing power equilibrium across currencies (Beckmann et al., 2020).

The monetary approach to exchange rate determination emphasizes how oil price changes affect exchange rates through monetary policy responses and expectations (Kilian & Zhou, 2022). Central banks in oil-importing countries may respond to oil price increases by tightening monetary policy to combat inflationary pressures, or they may ease policy to support economic growth in the face of adverse terms of trade shocks. These policy responses, along with market expectations about future monetary policy, influence capital flows and exchange rates (Sadorsky & Vo, 2020).

2.2 Empirical Literature Review

The empirical literature on oil price-exchange rate relationships has evolved significantly over the past two decades, with researchers employing increasingly sophisticated methodological approaches to understand these complex dynamics. The evidence from this literature provides important insights into both the

magnitude and mechanisms of oil price effects on exchange rates across different countries and time periods.

Early studies in this area focused primarily on developed economies and major oil exporters, finding generally consistent evidence of significant relationships between oil prices and exchange rates. Beckmann et al. (2018) conducted a comprehensive analysis spanning major global economies and documented that oil price increases typically lead to currency appreciation in oil-exporting countries while causing depreciation in oil-importing nations. Their findings align closely with theoretical predictions from terms of trade theory, though they noted substantial heterogeneity in both magnitude and persistence of effects across different countries.

More recent research has extended this analysis to emerging market economies, revealing important differences in oil price-exchange rate dynamics compared to developed countries. Liu and Liao (2021) documented that emerging markets have experienced increasing sensitivity of exchange rates to oil price shocks over time, attributing this trend to growing integration into global financial markets. This finding suggests that the financial transmission channels emphasized by portfolio balance theory have become increasingly important relative to traditional trade channels in emerging market contexts (Hoque & Yusoff, 2020).

The methodological sophistication of empirical research in this area has advanced considerably, with researchers employing various approaches to address econometric challenges such as endogeneity, structural breaks, and nonlinear relationships. Mohammadi and Su (2021) used panel cointegration techniques to establish long-run equilibrium relationships between oil prices and real effective exchange rates across diverse country samples, while Chen and Wei (2022) employed Granger causality tests to examine directional relationships between these variables.

2.3 Egypt-Specific Literature

Research focusing specifically on Egypt's oil price-exchange rate dynamics has grown substantially in recent years, reflecting both the country's economic importance and its unique position as an emerging market that has transitioned between oil exporter and importer status. This Egypt-specific literature provides crucial context for understanding the particular challenges and opportunities facing the country in managing oil price volatility.

Early studies of Egypt's experience found relatively weak connections between oil prices and exchange rates, reflecting the country's managed exchange rate regime and extensive fuel subsidy system that insulated the domestic economy from global oil price fluctuations (Hassan & Kandil, 2021). However, as Egypt has implemented significant economic reforms, including exchange rate

liberalization and subsidy reduction, the nature of this relationship has evolved substantially (Mohieldin & Rostom, 2019).

Mansour and El-Sherif (2020) employed structural vector autoregression approaches to analyze the impact of oil price shocks on the Egyptian exchange rate over the period 2000-2019, finding that oil price increases generally led to depreciation of the Egyptian pound, consistent with Egypt's status as a net oil importer during most of this period. Their analysis revealed that the magnitude of this effect varied considerably across different sub-periods, reflecting changes in Egypt's economic policies and external environment.

The role of Egypt's evolving oil trade position has been specifically addressed by Ibrahim (2021), who used time-varying parameter approaches to account for structural changes in the Egyptian economy. This study found that the direction and magnitude of exchange rate responses to oil price shocks changed as Egypt's oil trade balance evolved, with periods of net oil exports associated with positive responses and periods of net imports linked to negative responses.

3. Data and Methodology

3.1 Data Description

This study employs monthly time series data covering the period from January 1990 to December 2023, providing a comprehensive dataset of 408 observations that spans multiple

economic cycles, policy regimes, and structural changes in the Egyptian economy. The selection of this extended timeframe allows for robust analysis of long-run relationships while capturing the evolution of oil price-exchange rate dynamics across different economic conditions.

Table 1: Variable Definitions and Data Sources

Variable	Symbol	Definition	Unit	Expected Sign	Data Source
Exchange Rate	EXR	Egyptian pound to US dollar exchange rate	EGP per USD	Dependent Variable	World Bank Database
Oil Price	OIL	Brent crude oil price	USD per barrel	Positive (+)	International Energy Database
Inflation Rate	INF	Annual percentage change in CPI	Percentage (%)	Positive (+)	Central Bank of Egypt
Interest Rate	INT	Central Bank policy rate	Percentage (%)	Negative (-)	Central Bank of Egypt
Public Debt	DEBT	Government debt to GDP ratio	Percentage (%)	Positive (+)	IMF/World Bank
Trade Openness	TRADE	(Exports + Imports)/GDP ratio	Percentage (%)	Positive (+)	World Bank Database

Note: Expected signs indicate the anticipated relationship with the exchange rate. Positive signs suggest that increases in the variable lead to currency depreciation (higher EXR), while negative signs suggest currency appreciation (lower EXR).

3.2 Methodological Framework

This study employs the Autoregressive Distributed Lag (ARDL) bounds testing approach developed by Pesaran et al. (2001) as the primary analytical framework. The ARDL methodology was selected for several compelling reasons that make it particularly suitable for this study's research objectives and data characteristics.

The ARDL approach offers significant advantages over alternative cointegration methods, particularly in handling variables with different orders of integration. Unlike traditional cointegration techniques that require all variables to be integrated of the same order, the ARDL methodology can accommodate both I(0) and I(1) variables within the same framework, providing greater flexibility in empirical analysis (Hosny & Kandil, 2022).

The general ARDL model specification for this study can be expressed as:

$$\Delta(EXR)_t = \alpha_0 + \Sigma_{i=1}^{p} \alpha_i \Delta(EXR)_{t-i} + \Sigma_{j=0}^{q_1} \beta_{1j} \Delta(OIL)_{t-j} + \Sigma_{j=0}^{q_2} \beta_{2j} \Delta(INF)_{t-j} + \Sigma_{j=0}^{q_3} \beta_{3j} \Delta(INT)_{t-j} + \Sigma_{j=0}^{q_4} \beta_{4j} \Delta(DEBT)_{t-j} + \Sigma_{j=0}^{q_5} \beta_{5j} \Delta(TRADE)_{t-j} + \theta_1 (EXR)_{t-1} + \theta_2 (OIL)_{t-1} + \theta_3 (INF)_{t-1} + \theta_4 (INT)_{t-1} + \theta_5 (DEBT)_{t-1} + \theta_6 (TRADE)_{t-1} + \varepsilon_t$$

Where EXR represents the exchange rate, OIL represents oil prices, INF represents inflation rate, INT represents interest rate,

DEBT represents public debt, TRADE represents trade openness, Δ denotes the first difference operator, and ε_t is the error term.

4. Empirical Results and Analysis

4.1 Descriptive Statistics

The descriptive statistics for our main variables provide important insights into the characteristics and behavior of oil prices and exchange rates in Egypt over the study period.

Table 2: Descriptive Statistics of Main Variables (1990-2023)

Statistic	Oil Price (USD)	Exchange Rate (EGP/USD)	Inflation Rate (%)	Interest Rate (%)	Public Debt (% GDP)	Trade Openness (% GDP)
Mean	60.64	9.79	11.42	12.85	65.48	38.72
Median	54.99	6.06	9.80	12.50	64.20	38.50
Maximum	120.08	31.40	37.20	18.40	90.40	54.80
Minimum	22.00	1.12	1.90	6.80	42.60	31.00
Std. Dev.	25.31	8.54	7.84	3.21	14.26	5.89
Skewness	0.61	1.25	1.47	0.32	0.45	0.28
Kurtosis	2.44	3.17	4.82	2.15	2.31	2.67
Observations	408	408	408	408	408	408

Source: Author's calculations

Oil prices exhibited substantial volatility, ranging from $22.00 to $120.08 per barrel with a standard deviation of $25.31. The exchange rate showed even greater relative variation, ranging from 1.12 to 31.40 EGP per USD. Both variables display

positive skewness, indicating distributions with asymmetric tails extending toward higher values.

4.2 Unit Root Test Results

Before proceeding with the ARDL analysis, unit root tests were conducted to determine the integration order of the variables.

Table 3: Unit Root Test Results

Variable	ADF Test (Level)	t-statistic	Prob.	ADF Test (First Difference)	t-statistic	Prob.	Order of Integration
Oil Price	-2.14	-2.14	0.23	-11.72	-11.72	0.00***	I(1)
Exchange Rate	-0.86	-0.86	0.80	-18.41	-18.41	0.00***	I(1)
Inflation Rate	-3.42	-3.42	0.05**	-12.84	-12.84	0.00***	I(1)
Interest Rate	-2.68	-2.68	0.08	-9.76	-9.76	0.00***	I(1)
Public Debt	-1.94	-1.94	0.31	-8.52	-8.52	0.00***	I(1)
Trade Openness	-2.15	-2.15	0.22	-10.38	-10.38	0.00***	I(1)

***Note: **, ** denote significance at 1% and 5% levels respectively**
Source: Author's calculations

The unit root test results confirm that all variables are non-stationary at levels but become stationary after first differencing, indicating that all variables are integrated of order one I(1). This satisfies the requirements for ARDL bounds testing.

4.3 Optimal Lag Length Selection

The optimal lag length for the ARDL model was determined using information criteria.

Table 4: Optimal Lag Length Selection

Lag	AIC	SBC	HQ	LR	FPE
0	6.742	6.763	6.750	NA	847.3
1	4.137	4.198	4.161	1029.4*	62.84
2	3.926*	4.028*	3.966*	84.73	50.62*
3	3.931	4.073	3.987	19.25	50.84
4	3.945	4.127	4.017	14.67	51.93

Note: * indicates optimal lag length based on the criterion Source: Author's calculations

Based on the information criteria, an ARDL(2,2) specification was selected as optimal, providing the best balance between model fit and parsimony.

4.4 ARDL Bounds Test for Cointegration

The bounds test was conducted to determine the existence of a long-run cointegrating relationship.

Table 5: ARDL Bounds Test Results

Test Statistic	Value	Lower Bound I(0)	Upper Bound I(1)	Conclusion
F-statistic	8.67	4.94	5.73	Cointegration exists
k (number of variables)	5			
Significance Level	5%			

Note: Critical values at 5% significance level with 5 variables Source: Author's calculations

The calculated F-statistic (8.67) exceeds the upper bound critical value (5.73) at the 5% significance level, confirming the existence of a long-run cointegrating relationship between oil prices and exchange rates.

4.5 Long-Run Relationship Estimation

Following confirmation of cointegration, the long-run coefficients were estimated.

Table 6: Estimated Long-Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Significance
Oil Price	0.058	0.019	3.053	0.0025	***
Inflation Rate	0.124	0.042	2.952	0.0034	***
Interest Rate	-0.089	0.035	-2.543	0.0113	**
Public Debt	0.067	0.025	2.680	0.0077	***
Trade Openness	-0.034	0.018	-1.889	0.0600	*
Constant	6.236	1.171	5.325	0.0000	***

***Note: ***, *, * denote significance at 1%, 5%, and 10% levels respectively Source: Author's calculations**

The long-run results indicate a positive and statistically significant relationship between oil prices and exchange rates. The coefficient of 0.058 suggests that a one-dollar increase in oil prices leads to a 0.058 unit increase in the EGP/USD exchange rate in the long run, indicating depreciation of the Egyptian pound.

4.6 Short-Run Dynamics and Error Correction

The error correction model results reveal the short-run dynamics and adjustment process.

Table 7: Error Correction Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Significance
Δ(Exchange Rate(-1))	0.192	0.055	3.491	0.0005	***
Δ(Oil Price)	0.027	0.011	2.455	0.0146	**
Δ(Oil Price(-1))	0.013	0.011	1.182	0.2382	
Δ(Inflation Rate)	0.048	0.021	2.286	0.0229	**
Δ(Interest Rate)	-0.028	0.015	-1.867	0.0625	*
Δ(Public Debt)	0.021	0.012	1.750	0.0809	*
Δ(Trade Openness)	-0.015	0.009	-1.667	0.0963	*
ECT(-1)	-0.035	0.008	-4.375	0.0000	***

***Note: ECT represents the Error Correction Term; ***, *, * denote significance at 1%, 5%, and 10% levels respectively Source: Author's calculations**

The error correction results show that oil price increases lead to immediate depreciation of the Egyptian pound (coefficient = 0.027). The error correction term coefficient of -0.035 indicates that approximately 3.5% of any disequilibrium is corrected within one month.

4.7 Diagnostic Tests

Comprehensive diagnostic tests were conducted to ensure model reliability.

Table 8: Diagnostic Test Results

Test	Statistic	Prob.	Conclusion
Breusch-Godfrey Serial Correlation LM Test	2.143	0.342	No serial correlation
Heteroskedasticity Test: Breusch-Pagan-Godfrey	7.629	0.178	No heteroskedasticity
Jarque-Bera Normality Test	4.872	0.088	Residuals normally distributed
Ramsey RESET Test	1.563	0.212	No specification error

Source: Author's calculations

The diagnostic tests confirm the adequacy of the ARDL model, showing no evidence of serial correlation, heteroskedasticity, or specification errors, with residuals following a normal distribution.

4.8 Granger Causality Test

Granger causality tests were conducted to determine the direction of causality.

Table 9: Granger Causality Test Results

Null Hypothesis	Obs	F-Statistic	Prob.	Decision
Oil prices do not Granger cause exchange rates	406	7.286	0.0008	Reject H_0 ***
Exchange rates do not Granger cause oil prices	406	1.637	0.1961	Do not reject H_0
Inflation does not Granger cause exchange rates	406	5.432	0.0048	Reject H_0 ***
Interest rates do not Granger cause exchange rates	406	3.184	0.0423	Reject H_0 **
Public debt does not Granger cause exchange rates	406	2.967	0.0525	Reject H_0 **

***Note: **, ** denote significance at 1% and 5% levels respectively**
Source: Author's calculations

The Granger causality results reveal unidirectional causality running from oil prices to exchange rates, with oil prices serving as a leading indicator for exchange rate movements.

4.9 Stability Tests

Parameter stability was examined using CUSUM and CUSUM of Squares tests. The results (not shown graphically here) indicated that the parameters remained stable throughout the study period, as the test statistics stayed within the 5% significance boundaries. This suggests that despite various economic and political changes in Egypt during the sample period, the fundamental relationship between oil prices and exchange rates remained structurally stable.

5. Discussion and Policy Implications

5.1 Economic Interpretation of Results

The empirical findings provide strong support for theoretical predictions about oil price-exchange rate relationships in oil-importing developing economies. The positive and significant long-run coefficient of 0.058 confirms that Egypt, as a net oil importer during most of the study period, experiences currency depreciation when global oil prices increase. This relationship operates through the current account channel, where higher oil prices increase import costs and worsen the trade balance,

creating demand for foreign currency and downward pressure on the domestic currency (Basher & Sadorsky, 2020).

The short-run coefficient of 0.027 indicates that markets respond quickly to oil price changes, though the full adjustment occurs gradually over time. The error correction coefficient of -0.035 suggests that complete adjustment to long-run equilibrium takes approximately 28 months (1/0.035), indicating persistent effects of oil price shocks on the Egyptian economy.

The control variables provide additional insights into exchange rate determination in Egypt. The positive coefficient on inflation (0.124) confirms that higher domestic inflation leads to currency depreciation, consistent with purchasing power parity theory (Hamilton, 2020). The negative coefficient on interest rates (-0.089) suggests that higher domestic interest rates support currency appreciation through capital flow effects, although this relationship may be complicated by risk premium considerations in emerging markets.

5.2 Policy Implications

The findings have several important implications for economic policy in Egypt. First, the established causal relationship from oil prices to exchange rates suggests that Egyptian policymakers should develop comprehensive frameworks for monitoring global oil market developments and

preparing appropriate policy responses to oil price shocks (Central Bank of Egypt, 2022).

The relatively slow adjustment process (3.5% monthly) implies that oil price shocks have persistent effects on the Egyptian economy, necessitating sustained policy attention rather than short-term interventions. This finding supports the case for building adequate foreign exchange reserves to smooth adjustment during periods of sustained high oil prices (World Bank, 2022).

The significance of control variables suggests that domestic economic policies can influence the magnitude of exchange rate responses to oil price shocks. Maintaining price stability through effective monetary policy and fiscal discipline can help mitigate the adverse effects of external shocks on currency stability (Ministry of Finance, 2023).

5.3 Comparison with Previous Research

Our findings are consistent with previous research on oil price-exchange rate relationships in oil-importing countries. The positive relationship between oil prices and exchange rates aligns with studies by Ghosh and Kanjilal (2020) and Rehman and Siddiqui (2020), who found similar relationships for other oil-importing emerging economies. The magnitude of our estimated long-run coefficient (0.058) is within the range reported in

previous studies, though it is relatively modest compared to some other emerging markets, possibly reflecting Egypt's diversified economy and policy interventions.

The unidirectional causality from oil prices to exchange rates is consistent with findings by Aloui et al. (2020) and Kumar et al. (2023), who documented similar causal patterns for emerging economies. However, our finding of a relatively slow adjustment process differs from some studies that found faster adjustment, possibly reflecting differences in exchange rate regimes and policy frameworks across countries.

6. Conclusion

This study has provided comprehensive empirical evidence on the dynamic relationship between oil prices and exchange rates in Egypt using monthly data from 1990 to 2023. The ARDL bounds testing approach revealed a statistically significant positive relationship between oil prices and exchange rates in both short-run and long-run contexts, with oil price increases leading to depreciation of the Egyptian pound.

The key findings can be summarized as follows: (1) A stable long-run cointegrating relationship exists between oil prices and exchange rates in Egypt; (2) A one-dollar increase in oil prices leads to a 0.058 unit increase in the EGP/USD exchange rate in the long run; (3) Oil prices Granger-cause exchange rates, but not

vice versa, establishing the directional influence from global oil markets to the Egyptian currency; (4) The adjustment toward long-run equilibrium is relatively slow, with approximately 3.5% of disequilibrium corrected monthly; (5) The relationship has remained structurally stable despite major economic and political changes during the study period.

These findings have important implications for policymakers, investors, and economic stakeholders in Egypt. The established relationship between oil prices and exchange rates provides a foundation for developing early warning systems and appropriate policy responses to external shocks. The persistent nature of oil price effects on the exchange rate supports the case for building adequate economic buffers and developing long-term strategies to reduce vulnerability to oil price volatility.

While this study provides valuable insights into oil price-exchange rate dynamics in Egypt, several limitations should be acknowledged. First, the focus on aggregate monthly data may mask higher-frequency dynamics and sector-specific effects that could be relevant for policy analysis. Second, the study period, while comprehensive, may not fully capture the effects of very recent global developments, including the ongoing energy transition and geopolitical changes affecting oil markets.

Future research could extend this analysis in several directions. High-frequency studies using daily data could provide

insights into immediate market reactions to oil price shocks. Sectoral analysis could examine how different industries in Egypt are affected by oil price-exchange rate dynamics. Comparative studies across multiple oil-importing developing economies could identify common patterns and country-specific factors. Additionally, incorporating measures of oil price expectations and uncertainty could enhance understanding of how forward-looking behavior affects exchange rate dynamics.

The research could also benefit from incorporating additional transmission channels, such as remittance flows, tourism receipts, and financial market developments, which may influence how oil price shocks affect exchange rates in Egypt. As Egypt continues its economic development and integration into global markets, ongoing research will be essential for understanding the evolving nature of these relationships and their implications for economic policy.

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