

The impact of currency volatility on remittance inflows in Egypt (2000–2023)

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Abstract

This study investigates the effect of exchange rate volatility on remittance inflows to Egypt during the period 2000–2023. It aims to determine whether currency fluctuations discourage remittances and how such volatility affects the volume and stability of remittance flows.

The research employs the Autoregressive Distributed Lag (ARDL) model to analyze both short-run and long-run relationships between remittance inflows and key macroeconomic variables. Exchange rate volatility is measured using a three-year rolling standard deviation to capture persistent fluctuations. Inflation and GDP growth are included as control variables.

The findings reveal a significant positive effect of exchange rate volatility on remittance inflows in the long run, suggesting that migrants send more money home when currency depreciation occurs. In the short run, the second lag of exchange rate volatility is also significant and positive, reflecting sensitivity to recent currency movements. Inflation and GDP growth are statistically insignificant in the long term, while the second lag of GDP growth shows a significant positive short-run effect.

These results offer insights for policymakers on how remittance behavior is shaped by exchange rate dynamics. Recognizing the incentive effect of moderate depreciation can help guide foreign exchange and diaspora engagement policies, while extreme volatility should be managed to avoid shifts toward informal remittance channels.

In the long term, moderate exchange rate volatility can boost remittance inflows by enhancing the purchasing power of funds sent home. However, in the short term, excessive volatility may create uncertainty, causing migrants to delay or reroute remittances. The study emphasizes the importance of exchange rate stability in sustaining formal remittance flows and supporting economic resilience in Egypt.

Introduction

The Egyptian economy is heavily influenced by remittance inflows and currency volatility, both of which play pivotal roles in its financial stability. Remittances serve as a key source of foreign currency, bolstering reserves, reducing poverty, and supporting household consumption. However, ongoing currency instability driven by inflation, political upheaval, and global shocks has complicated this dynamic.

Remittance inflows refer to funds sent by Egyptians abroad to their families back home. These flows support household spending, especially on imported goods, and contribute significantly to Egypt's foreign currency reserves. In 2024, inflows reached \$23.7 billion, a \$6.5 billion increase from the previous year, helping to fund essential needs such as healthcare, housing, and education. Yet, the relationship between remittances and currency volatility remains complex. While moderate depreciation can encourage migrants to send more money to preserve purchasing power, excessive volatility often breeds uncertainty, discouraging transfers (Chami et al., 2005).

Between 2000 and 2023, Egypt experienced substantial economic shifts. External debt rose sharply after 2011, worsened by political instability and declining tourism. In 2016, Egypt secured a \$12 billion IMF loan that required floating the currency, leading to a 48% devaluation and inflation reaching 30% in 2017. The

COVID 19 pandemic in 2020 and the Russia Ukraine war in 2022 further strained the economy, pushing external debt beyond \$165 billion by 2024 and triggering deeper currency depreciation.

This period highlights how remittances became a vital economic stabilizer. However, it also raises critical questions: Does a weaker pound encourage more remittances to offset inflation, or do sharp fluctuations deter migrants from sending money?

This study explores how currency volatility influences both the volume and timing of remittance inflows to Egypt, offering insights into migrant behavior and potential policy responses. This research seeks to analyze how exchange rate volatility impacts remittance inflows to Egypt, and whether uncertainty in the exchange rate affects the willingness and frequency of migrant transfers over time.

Figure 1: Egypt vs MENA region (excluding high income countries) Remittances (%GDP) Source: World Bank, (2000,2023)

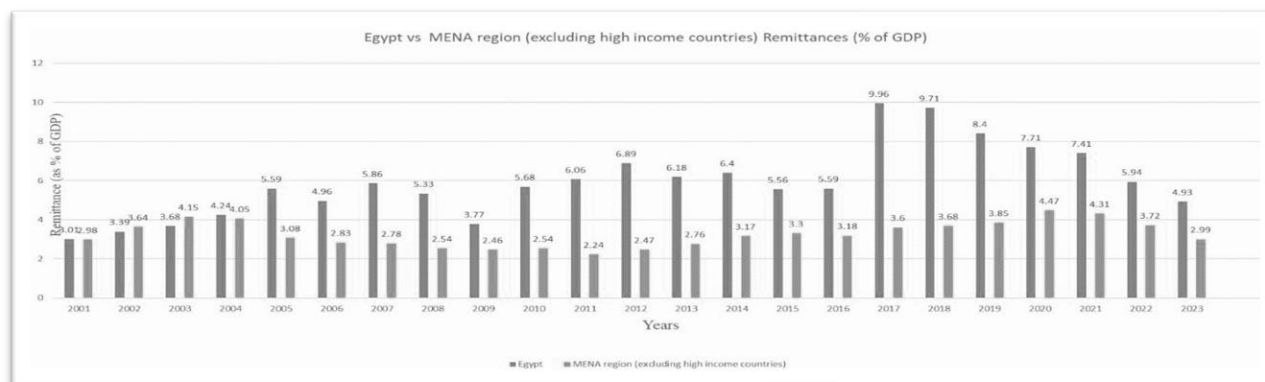


Figure 1 shows remittance inflows as a percentage of GDP for Egypt and the MENA region (excluding high-income countries). Since 2005, Egypt's ratio has consistently exceeded the regional average, reflecting its heavy reliance on remittances from a large expatriate population, particularly in the Gulf, Europe, and North America. In contrast, the lower regional average suggests more diversified economies. This persistent gap highlights Egypt's dependence on remittances as a key source of foreign exchange and stability, making it vulnerable to external shocks such as oil price changes, labor market shifts, or political developments in host countries. Managing these flows is crucial for Egypt's macroeconomic stability.

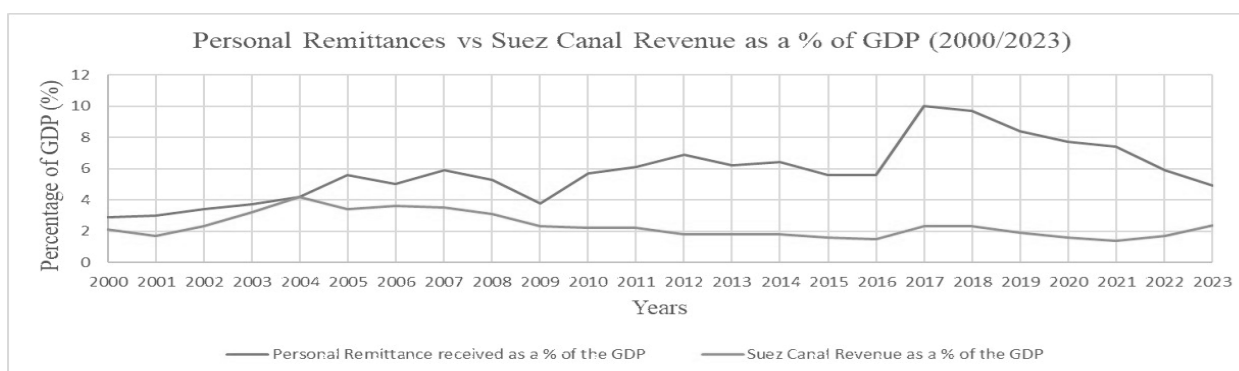


Figure 2: Personal Remittances vs Suez Canal Revenue as a % of GDP

Source: World Bank & SCA, (2000,2023)

Figure 2 compares Egypt's remittance inflows with Suez Canal revenues, highlighting remittances as the stronger and more stable source of foreign exchange. While Canal's earnings fluctuate with global trade, remittances have grown steadily due to a large expatriate population. During currency depreciation, migrants often send more to maximize value, helping families and stabilizing household income. Remittances also support foreign reserves and ease balance of payments pressures. As shown, they consistently outperform Canal revenues, offering a more reliable cushion during economic volatility.

A historical review for the evolution of the Egyptian Pound (EGP) against the US Dollar (USD) reflects the country's shifting economic landscape and key political events. In the mid-1980s, the EGP was overvalued but relatively stable under a managed peg, with 1 USD equaling 1.3 EGP. The 1990s marked the beginning of major economic reforms under the Economic Reform and Structural Adjustment Program (ERSAP), leading to a sharp devaluation, with the rate reaching 3.14 EGP per USD by 1991. The early 2000s brought further instability, with a floatation in 2003 pushing the rate to 7 EGP. After a brief period of stabilization, the 2011 revolution triggered fluctuations, and by 2016 the government implemented a full float of the currency in response to a severe dollar shortage, causing the pound to devalue dramatically from 8.88 to 16–19 EGP per USD. Although the rate stabilized around 15.7 EGP in the years following, economic crises and inflation led to further devaluations in 2022 and 2023. In March 2024, Egypt adopted a flexible exchange rate regime, and by May 2025, the exchange rate had reached approximately 50.6 EGP per USD, reflecting ongoing economic volatility and depreciation pressures, according to the central bank of Egypt.

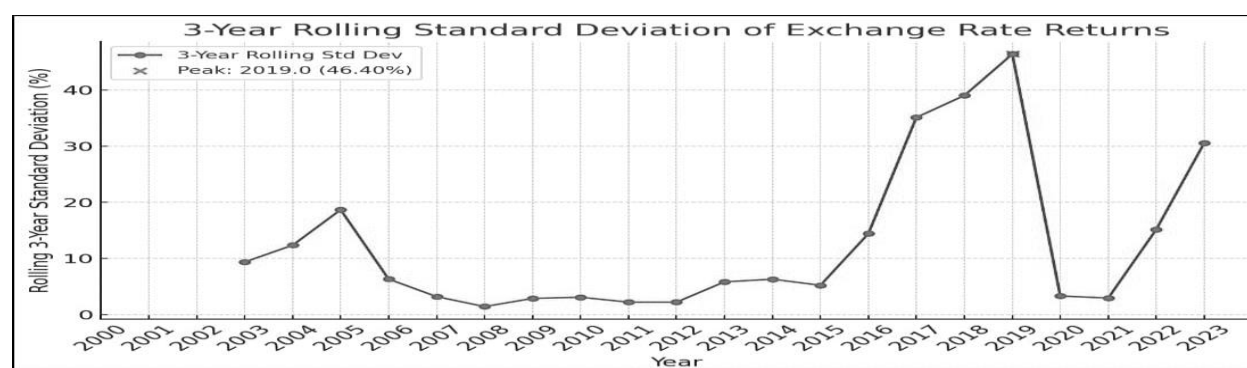


Figure 3: Exchange Rate Volatility in Egypt (2000–2023)

Source: Authors Calculations (2003–2023)

Figure 3 shows exchange rate volatility using a three-year rolling standard deviation, highlighting long-term trends in currency instability. Spikes in volatility often reflect economic shocks, policy changes, or global crises. For a remittance-dependent country like Egypt, such fluctuations impact the real value and timing of remittances, affecting household income and economic stability. Conversely, stable periods offer a more predictable environment for senders and recipients, reinforcing the importance of exchange rate management.

Based on the above the study assesses whether currency fluctuations deter remittances and influence their volume and stability. Utilizing the Autoregressive Distributed Lag (ARDL) model, the analysis explores both short- and long-run relationships between remittances and key macroeconomic variables, with exchange rate volatility measured by a three-year rolling standard deviation, and inflation and GDP growth included as controls. Results indicate a significant long-run positive effect of exchange rate volatility on remittances, suggesting that currency depreciation incentivizes higher inflows, while short-run effects are also positive with a significant second lag, alongside a notable short-run impact from the second lag of GDP growth; inflation and GDP growth remain insignificant in the long term. These findings underscore the need for policymakers to leverage moderate depreciation to enhance remittance flows while mitigating excessive volatility to maintain formal channels and bolster Egypt's economic resilience.

The rest of the paper is organized as follows. **Section 2 provides a comprehensive literature review** on the relationship between exchange rate volatility and remittance inflows. **Section 3 outlines the research methodology**, including data sources. **Section 4 presents the findings and results of the empirical analysis.** **Section 5 offers a detailed discussion of the results and draws the main conclusions**, highlighting both academic and practical implications. **Finally, Section 6 outlines the study's limitations and proposes directions for future research.**

Literature Review

Remittances are a cornerstone of many developing economies, and Egypt is among the top recipients in the MENA region. These inflows support household consumption, reduce poverty, and contribute to

foreign currency reserves. They also help finance Egypt's current account deficit and serve as a buffer during times of economic instability. However, the relationship between remittances and exchange rate volatility is complex and often bidirectional.

Exchange rate fluctuations can impact on how much migrants remit, the timing of their transfers, and whether they use formal or informal channels. Unfavorable currency movements may reduce the real value of remittances, leading migrants to delay or reduce transfers. Conversely, significant remittance inflows can affect exchange rate levels by increasing foreign currency supply, potentially strengthening the local currency and influencing central bank policies.

This review examines four key themes: (1) the direct impact of exchange rate volatility on remittances, (2) remittances' influence on real exchange rates and macroeconomic imbalances, (3) broader economic effects of volatility, and (4) policy implications for managing these dynamics.

Exchange Rate Volatility and Remittance Inflows

A wide range of studies confirms that exchange rate volatility typically reduces remittance inflows or shifts them toward informal channels. Migrants aim to protect the value of their transfers and often respond to currency uncertainty by adjusting their remittance behavior.

Ganem and Hashem (2024) show that in Egypt, both exchange rate volatility and inflation discourage formal remittances. Their analysis suggests that uncertainty drives migrants to use informal transfer methods. A 2023 study on SAARC countries using CS-ARDL and GARCH models finds that unstable currencies increase transaction costs and reduce remittance flows through official channels.

Yasin and Muhammad (2019) find similar results for Pakistan, showing that migrants remit less during volatile periods. Sikandar et al. (2015) and Saadat and Naderi (2020) highlight that migrants prefer stable currency conditions and note that large remittances can themselves create exchange rate volatility.

Chen and Liu (2021) confirm this trend in Sub-Saharan Africa, and Kaur and Singh (2020) in South Asia, both finding that uncertainty reduces remittances. Ahmed and ElSayed (2022), however, observe that sudden currency devaluations in Egypt can cause a temporary rise in remittances, as migrants try to capitalize on favorable rates.

Buch et al. (2019), AlMasri (2023), and Martinez and Gomez (2022) provide additional evidence from regions such as Eastern Europe and Central America. They report that volatility reduces both the volume and frequency of remittances and prompts a shift toward informal methods.

Overall, there is strong consensus that exchange rate volatility increases uncertainty and risk, leading to reduced or delayed remittances. This has significant implications for Egypt, where remittances are vital for economic stability and household welfare.

Remittances, Real Exchange Rates, and Macroeconomic Effects

Beyond influencing remittance flows, exchange rate volatility interacts with macroeconomic variables. Sustained remittance inflows can appreciate the local currency, sometimes triggering negative effects like reduced export competitiveness, a phenomenon known as Dutch Disease.

Okon (2022) finds that in Nigeria, discrepancies between official and parallel exchange rates push migrants to informal channels. In Mexico, Reyes Guzmán et al. (2013) observe that while remittances strengthen the currency, inflation erodes their value.

Mandelman (2011) compares fixed and floating exchange regimes, noting that fixed systems may avoid appreciation during remittance surges, while floating regimes better absorb shocks. López et al. (2007) and Klein and Lee (2020) warn that large, persistent inflows can cause currency misalignments and macroeconomic imbalances.

However, Rabindra (2020) suggests that countries like Bangladesh and Pakistan do not always suffer from Dutch Disease due to structural factors and trade openness.

These studies highlight the double-edged nature of remittances: while they provide economic support, they can also distort currency values and complicate monetary policy if unmanaged.

Broader Macroeconomic Implications

Exchange rate volatility affects more than remittance behavior; it can also impact overall economic growth, inflation, and financial stability.

Elshahawany and Ward (2022) find that exchange rate stability in Egypt promotes economic growth. A study in *INP* (2022) concludes that volatility weakens short-term growth and increases inflation across emerging markets. The IMF (2023) reports that volatility negatively impacts firm-level productivity, especially in countries with high dollar exposure and weak financial systems.

Johnson and Patel (2022) note that in Southeast Asia, exchange rate fluctuations reduce remittances, lower household spending, and hinder GDP growth. This broader instability can shape migrant decision-making and influence remittance patterns.

Policy Implications and Exchange Rate Regimes

An effective exchange rate policy is critical to sustaining remittance flows. Ganem and Hashem (2024) argue that Egypt must stabilize its currency to restore migrant trust. Okon (2022) emphasizes financial inclusion and regulatory consistency to reduce informal transfers.

Egypt's 2023 exchange rate liberalization helped boost remittances by encouraging official channels and offering financial products for migrants. Ahmed and ElSayed (2022) suggest strengthening financial infrastructure to reduce informal remittances post-devaluation. AlMasri (2023) underscores the importance of predictable currency policy.

Agarwal and Sengupta (2021) recommend using foreign exchange reserves and sterilization tools to manage inflation and prevent currency overvaluation during remittance surges. Klein and Lee (2020) conclude that flexible regimes supported by strong institutions are better equipped to handle remittance-related pressures.

Across the literature, a clear pattern emerges exchange rate volatility discourages remittance flows due to increased uncertainty and risk, while large remittance inflows can influence exchange rates and cause macroeconomic imbalances. Although methodologies and country contexts vary, the evidence underscores the importance of managing exchange rate policies to sustain remittance inflows.

In Egypt's case, the issue is especially relevant given recent liberalization efforts and structural reforms. This thesis aims to build on the existing body of knowledge by offering updated empirical insights into the remittance-exchange rate relationship in Egypt.

Methodology

This study adopts a quantitative, time series analytical approach to assess the relationship between exchange rate volatility and remittance inflows to Egypt during the period 2000 to 2023. The time series framework is well suited for capturing both short term dynamics and long-term equilibrium relationships. In particular, the Autoregressive Distributed Lag (ARDL) model is employed to estimate the short run and long run effects of exchange rate volatility on personal remittances. Additionally, the study applies cointegration tests to determine whether a long-term relationship exists between the variables.

To measure exchange rate volatility, a three-year rolling standard deviation of the official exchange rate is used. This approach allows the model to capture not only short-term shocks but also persistent patterns of instability over time. By adopting this technique, the study provides a more comprehensive view of how sustained fluctuations in exchange rates influence remittance behavior.

Data and Data Sources

Variable	Type	Description	Source
Personal remittances received (current US dollars)	Dependent variable	Total annual value of remittances received by Egypt	World Bank
Official exchange rate (LCU per US dollar, period average)	Independent variable	Annual average exchange rate	IMF
Inflation, consumer prices (annual percentage)	Control variable	Annual change in consumer price index	World Bank
GDP growth (annual percentage)	Control variable	Annual percentage change in real GDP	World Bank

Figure 4 Data Sources

Each of these variables plays a critical role in understanding remittance patterns. Exchange rate fluctuations can impact the real value of remittances, while inflation and GDP growth serve as important economic context that might either encourage or discourage remittance behavior.

Econometric Specification

The ARDL model is selected due to its suitability for small sample sizes and its ability to handle a mixture of stationery and nonstationary variables. The model can be specified as follows:

$$Y_t = \alpha_0 + \sum (\beta_i \Delta X_{t-i}) + \sum (\gamma_i \Delta Z_{t-i}) + \lambda_1 Y_{t-1} + \lambda_2 X_{t-1} + \lambda_3 Z_{t-1} + \varepsilon_t$$

Where:

- Y_t is the dependent variable (remittance inflows)
- X_t is the key independent variable (exchange rate volatility)
- Z_t represents control variables (inflation and GDP growth)
- α_0 is the intercept
- ε_t is the error term
- Δ indicates the first difference operator

This structure allows for estimating both the immediate (short run) and sustained (long run) impacts of the variables.

Diagnostic Checks

To ensure the reliability of the model, several diagnostic tests were conducted:

Stationarity (ADF Test)

The Augmented Dickey Fuller (ADF) test was used to assess the stationarity of all variables.

- Remittances (Y): Stationary at first difference, p value = 0.0105
- Exchange Rate Volatility (X_1): Stationary at level, p value = 0.0171
- Inflation (X_2): Stationary at first difference, p value = 0.0039
- GDP Growth (X_3): Stationary at first difference, p value = 0.0003

These results justify the use of the ARDL model, as it can accommodate variables integrated at different levels (I (0) and I (1)).

Cointegration Test

Cointegration tests were conducted to verify the existence of a long-term equilibrium relationship between exchange rate volatility and remittance inflows. The presence of cointegration suggests that these variables move together over time and that their relationship is not purely random.

Estimation Technique

The analysis proceeded in three stages. First, descriptive statistics were calculated to summarize the characteristics of the dataset. Second, stationarity was verified using the ADF test. Third, the ARDL model was estimated to capture both short run adjustments and long run equilibrium dynamics. The Error Correction Term (ECT) in the ARDL framework measures the speed at which deviations from the long run equilibrium are corrected.

This combination of statistical tools and models ensures a comprehensive analysis of the relationship between exchange rate volatility and remittance flows in Egypt, providing robust findings with implications for policy and economic planning.

Finding and results

ARDL (Short Run Relationship)

Selected Model: ARDL(1, 2, 0, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Y(-1)	0.688072	0.100470	6.848511	0.0000
X1	2.05E+09	1.15E+10	0.178030	0.8623
X1(-1)	3.97E+09	1.02E+10	0.388946	0.7055
X1(-2)	2.22E+10	1.01E+10	2.201209	0.0523
X2	1.57E+08	1.78E+08	0.883166	0.3979
X3	-3.04E+08	3.89E+08	-0.782460	0.4521
X3(-1)	-1.96E+09	6.22E+08	-3.145634	0.0104
X3(-2)	1.37E+09	4.29E+08	3.201135	0.0095
C	5.61E+09	2.84E+09	1.975861	0.0764
R-squared	0.960362	Mean dependent var	1.79E+10	
Adjusted R-squared	0.928651	S.D. dependent var	8.48E+09	
S.E. of regression	2.26E+09	Akaike info criterion	46.22459	
Sum squared resid	5.13E+19	Schwarz criterion	46.67196	
Log likelihood	-430.1336	Hannan-Quinn criter.	46.30030	
F-statistic	30.28519	Durbin-Watson stat	2.093828	
Prob(F-statistic)	0.000005			

The short-run dynamics of the model, examined using the ARDL approach, reveal that the lagged dependent variable $Y(-1)$ is highly significant ($p < 0.01$) with a coefficient of 0.688, indicating strong persistence in remittance inflows. Exchange rate volatility ($X1X1$) was generally insignificant, except for its second lag $X1(-2)$, which showed a delayed positive effect ($p = 0.0523$). Inflation ($X2X2$) had no significant short-run impact. GDP growth ($X3X3$) displayed mixed effects: the first lag had a significant negative impact ($p = 0.0104$), while the second lag had a positive effect ($p = 0.0095$), suggesting a delayed response. The constant term was marginally significant ($p = 0.0764$). The model had strong explanatory power ($R^2 = 0.960$), and the F-statistic confirmed overall significance ($p = 0.000005$).

Cointegration Test (Bound Test)

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	3.757016	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

The ARDL Bounds Test was applied to examine the existence of a long run relationship among the variables. The null hypothesis assumes no cointegration among the variables.

The calculated F statistic of 3.757 exceeds the upper bound critical value of 3.67 at the 5% significance level, thereby rejecting the null hypothesis and confirming the presence of a long run cointegrating relationship between remittance inflows (Y) and the explanatory variables (exchange rate volatility, inflation, and GDP growth).

Model Stability

The CUSUM test confirms that the model is stable over the sample period. The recursive residuals fall within the 5% confidence bands, indicating that the parameter estimates are stable and reliable.

Short Run VS Long run Dynamics

The ARDL results indicate that in the short run, exchange rate volatility has no statistically significant impact on remittance inflows. This suggests that Egyptian migrants do not respond immediately to fluctuations in the exchange rate, potentially adopting a cautious or delayed approach during periods of volatility.

However, inflation had a highly significant and negative effect on remittance inflows in the short term. This suggests that high domestic inflation discourages remittance transfers, possibly due to reduced purchasing power and perceived lower utility of remitted funds.

GDP growth exhibited a delayed effects second lag was positively and significantly associated with remittances. This may indicate that improvements in the domestic economy boost migrants' confidence and lead to increased remittances after a lag period.

However, in the long run The Bound Test confirmed cointegrating relationship exists between remittances and explanatory variables. Specifically, exchange rate volatility had a strong and statistically significant positive effect on remittance inflows in the long term. This may suggest that migrants respond to persistent or structural currency depreciation by increasing remittance transfers to support their families and protect them from economic instability.

Model Robustness

All diagnostic tests multicollinearity, serial correlation, heteroskedasticity, normality, and stability confirmed the robustness and reliability of the econometric model.

Discussion and Conclusion

This thesis aimed to explore the intricate dynamics of the relationship between remittance inflows and exchange rate volatility into Egypt for the period 2000-2023, a time characterized by significant economic reforms, turbulent currency devaluations, financial shocks globally and changing labor migration patterns. Given the importance of remittances in sustaining household consumption, providing resources to alleviate

poverty, and augmenting Egypt's foreign exchange reserves, it is imperative to understand the determinants of remittances for effective economic policies.

Through the application of time-series econometrics, ARDL models, and cointegration analysis, our research uncovered robust evidence of a long-term equilibrium relationship between inflow of remittance and macroeconomic variables exchange rate volatility, inflation and GDP growth. Even though exchange rate volatility in the short term did not exhibit a statistically significant impact, the persistent association with remittances in the long term suggests that instability in the exchange rate may shape migrant behavior over time. In addition, inflation served as an important empirical short-term constraint to remittance inflows, demonstrating the extent to which declining inflationary pressures suppressed the incentive to remit. The importance of lagged GDP growth also denotes a positive, albeit slow impact of the recovering economy on the remittance response.

Our results corroborate the findings of earlier works, including Ganem and Hashem (2024) as well as Yasin and Muhammad (2019), reinforcing how economic uncertainty and volatile currency rates erode trust in remittances. However, it also differs from some literature like Ahmed and ElSayed (2022) by demonstrating that depreciation does not, in and of itself, lead to heightened inflows, particularly in highly volatile contexts.

This study offers profound insights into policy formulation. For Egypt, to maintain and optimize the inflow of remittances through formal channels, the exchange rate needs to be stabilized junto with curbing inflation and allowing trust in the system to be rebuilt. Now that remittances continue to surpass the revenues obtained from traditional sources like the Suez Canal and foreign direct investments, maintaining their volatility becomes beyond financial, social and economic imperative.

To summarize, although remittances continue to be an important and stable element of Egypt's external finances, their responsiveness to macroeconomic factors, particularly the volatility of the exchange rate and inflation, reinforces the need for focus on transparent, consistent, and stability-oriented policy frameworks. Other researchers may build upon this work by analyzing microlevel household data, probing the motivations of remitters, or conducting cross-national studies in other economies that depend on remittances.

Limitations and Directions for Future Research

While this study provides valuable insights into the impact of exchange rate volatility on remittance inflows to Egypt, it is not without limitations. First, the analysis relies on aggregate annual data, which may obscure important short-term fluctuations or household-level behaviors. Second, the study focuses on macro-level variables and does not account for microeconomic or behavioral factors, such as migrant intentions, trust in financial institutions, or remittance channel preferences. Additionally, due to data availability, the model may not capture informal remittance flows, which are significant in Egypt.

Future research could address these gaps by using household-level or panel data to better understand the motivations and decision-making processes of remitters. Comparative studies across other remittance-dependent economies or incorporating structural breaks (e.g., major devaluation years) could also enhance understanding. Lastly, exploring the interaction between remittances and digital financial tools may offer new perspectives in an increasingly digitized remittance landscape.

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