

Article

Effectiveness of the Inflation-Targeting Framework in the Egyptian Economy

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Abstract

The primary goal of the present study was to assess the efficacy of the inflation-targeting framework (ITF) within the Egyptian economy. This was achieved by scrutinizing the monetary policy framework (MPF) from 2005 to 2022 and measuring its effectiveness in realizing monetary policy objectives (MPs). The approach involved constructing a macroeconomic model that captures the interconnections among macroeconomic variables (real and monetary), whether they serve as targets or instruments of MP or are otherwise closely associated variables. The model also helps to estimate the sensitivity coefficients of macroeconomic variables (real and monetary) related to changes in interest rate, exchange rate, money supply, and real output and then to identify how the impact transfers between monetary variables and related macroeconomic variables, as well as the amount of that impact. Using a quarterly series constructed from the original annual data via a Bayesian temporal disaggregation procedure (2005Q1–2022Q4), our findings conclude that there is a mechanism in the Egyptian economy to transfer the impact to and from the basic macroeconomic variables (household and investment expenditure, net exports, money demand, interest rate, and real output). This reflects the responses of the household and business sectors in their decisions on changes in both the real interest rate and the level of output. However, the extent to which the impact of monetary policy instruments was transmitted to the main monetary target value (money supply) and subsequently to real output (or economic growth) was significantly low, indicating the weak effectiveness of the ITF in the Egyptian economy.



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1. Introduction

The effectiveness of monetary policy (MP) tools for managing inflation in developing economies has been a subject of ongoing discussion among economists. While some economists argue for its universal efficacy, others propose that its impact may be less pronounced in developing economies. Inflation targeting has come to be the dominant monetary policy framework (MPF) aimed at ensuring and preserving price stability in recent years (Duncan et al., 2022). Like many other developing countries, Egypt strives to establish an inflation target framework as a basis of its MP not only for gains on the pricing rates relative to other approaches but also for benefits accrued to the overall economic activity (Mabrouk et al., 2020). The Central Bank of Egypt (CBE) makes clear in its MP statement published in June 2005 that it plans to establish an inflation target mechanism to develop the MP once the fundamental prerequisites are met (Nurmukhametov, 2022).

There is a need to understand the fiscal and monetary policies and the effectiveness of the Egyptian economy's inflation-targeting framework.

In this paper, inflation targeting denotes a monetary policy regime in which the central bank announces a quantitative inflation objective and uses its short-term policy rate and communication tools to anchor expectations and stabilize inflation around the target over the medium term. Consistent with international practice, headline CPI is treated as the operational price index for assessing outcomes; core inflation may be referenced for diagnosis, but evaluation is based on CPI realizations relative to the announced target and tolerance band. The policy instrument is the overnight policy rate, complemented by forward guidance. To avoid redundancy, subsequent sections reference this ITF definition rather than restating it.

The road to ITF is thus a heavy one in terms of institutional capacity, economic requirements, and operational infrastructure. The main factors include the central bank's independence from government control, absence of fiscal dominance, freedom movements for flexible exchange rates, the presence of well-developed financial markets and, lastly, monetary transmission mechanism understanding and development of reliable forecast techniques (Ikram & Nassar, 2022; Lim, 2021). Indeed, the pass-through effect of the Egyptian currency's depreciation was largely responsible for this increase in the inflation rate. Therefore, aside from coping with extremely high inflation rates in this environment of uncertainty regarding the future direction of price movement, monetary authorities had to contend with significant increases in inflationary forecasts.

In 1990, during poor economic growth due to a sudden drop in oil prices and a significant fall in Suez Canal income and workers' remittances, Egypt initiated an economic reform and structural adjustment programme, which received support from the IMF and the World Bank. The main target of the programme was to improve both monetary and fiscal policy, and the early consequences of the economic reforms were rather optimistic during the 1990s (Harrigan & El-Said, 2010). The inflation rate dropped from above 20% in 1990/91 to just 4.1% in 1997/8. Moreover, there was a notable reduction in the budget deficit as a proportion of GDP from 1990/1 to 1997/8, almost halved from approximately 18.2% to just 1%. In line with many other developing countries, Egypt held a multiple exchange rate system until a single rate substituted it. However, since 1997, the Egyptian economy has been subject to shocks coming from outside, such as the Asian financial crisis, the Luxor incidents, the oil prices and the consequences of the 9/11 attacks. As a result of the virtual collapse of the most important economic indicators and the insufficient growth in per capita GDP, the growth rate became inadequate to promote the positive development of the national economy (Takla, 2021; Youssef, 2007).

After two major devaluations of the Egyptian pound in 2001 and 2002 and recognizing that support attempts of the currency by the government were inefficient, the Egyptian government announced in January 2003 the floating of the Egyptian currency, abandoning the "managed peg system" of the fixed rate to the US dollar. The main reason for introducing the new floating foreign exchange system was the lack of dollars at the official price, which resulted in a rise in the volume of black-market transactions, while the spread between these two rates was constantly increasing. Therefore, it was predicted that the entering of hard currency into the banking system would be accelerated by the repatriation of the money rather than its deposit on the black market. The next step was a floatation of the pound, which depreciated and lost around 50% of its value. Hence, the inflation rate reached a maximum of 18% in 2004. The development of the Interbank Currency Exchange System in January 2005 helped to stabilize the Egyptian pound in different currencies. However, the liquidity of financial markets should be further developed to reduce the use of the central bank for intermediating transactions (Mansour & Hassan, 2021; Youssef,

2007). Since adoption of the Economic Reform and Structural Adjustment Program was introduced in 1991, the CBE has built its MP on an implicitly nominal foundation. Its objectives were multiple: maintaining a low inflation rate, achieving high economic growth, and stabilizing exchange rates. However, beginning in 2005, the focus shifted to prioritizing controlling inflation over these other goals within their MPF (Al-Mashat & Billmeier, 2008).

Due to the heightened impact of inflation on developing economies compared to advanced ones, many have adopted an MPF that prioritizes price stability. This does not imply that economic goals such as unemployment rate or growth potential are entirely neglected; rather, they are pursued alongside stable prices within an acceptable range. In cases where inflation exceeds this limit, priority is given to controlling it over other objectives set by the Central Bank to stabilize and strengthen the economy (Kasa, 2001). The current study aims to determine the efficacy of the ITF approach in the Egyptian economy through a review of the MPF implemented during the 2005–2022 period. The analysis focuses on 2005–2022, the period in which Egypt operated an interest-rate-based policy framework suitable for inflation-targeting evaluation, encompassing the 2016 regime change and the 2022 external shock while avoiding post-2022 transition effects. First, we construct a quarterly macro-dataset for Egypt by Bayesian temporal disaggregation of official annual series, tailored to policy evaluation. Second, we estimate a structurally identified simultaneous-equations model that yields policy-relevant elasticities (inflation and output responses to the policy rate) under transparent identification and diagnostics. Third, we capture regime-specific changes in transmission—post-2005 operational reform, the 2016 exchange-rate regime change, and the 2022 external price shock—within the same structural design, enabling comparability over time. Together, these features move beyond annual or purely reduced-form approaches and speak directly to the effectiveness of Egypt’s inflation-targeting framework. The research tries to examine whether changes in the money supply have a limited impact on inflation, which indicates a weakness in the monetary policy multiplier. The tests and decision rule used to verify this hypothesis are detailed in Methods.

1.1. Literature Review

Policymakers may set an explicit or implicit target, adjusting interest rates accordingly in pursuit of it. According to research on developing economies, flexible exchange rates often accompany this approach. After its adoption in many emerging economies following the Asian financial crisis (1991–1998), assessing the performance of this strategy has been limited by its relatively short history; for example, New Zealand only adopted it from 1990 onwards. Despite these limitations, Roger and Stone analyzed data before/after implementation for both “targeted” and non-“targeted” countries. Their findings highlighted substantial reductions across all categories, with average growth/happier outcomes particularly being observed within targeted nations rather than those where there was no specific focus/goal around tackling high-level inflation issues. Advanced economic debt economies showed similar results but exhibited comparatively smaller effects since changing policies during the period under assessment typically caused minimal impacts on metrics when compared to no real action being taken (Roger & Stone, 2005).

Although supporters of the ITF claim that it has improved MP efficiency, Epstein and Yeldan believe its success has yet to be evaluated. Their analysis showed no difference between non-inflation-targeting economies and those following this approach regarding low inflation rates, increased production figures alongside lower prices, and output volatility during the same period (Epstein & Yeldan, 2009). A crucial question is whether adopting an ITF strategy results in lower inflation levels or better growth statistics. Researchers have suggested examining how successful this method is amid high infection periods, such

as when food and petroleum prices increased during global financial crises—like that of 2008—when evaluating its efficacy (Gürkaynak et al., 2010).

Although inflation targeting has effectively managed inflation and stabilized economies, it may not be suitable for all economies due to variances in their nature and economic structures. However, the effectiveness of this framework cannot be universally established or disputed regarding its impact on economic performance. As such, deciding on an appropriate MPF that establishes a favorable long-term nominal foundation is critical. This decision should consider important factors such as the level of financial development, degree of openness within the economy, and fiscal discipline, making it unlikely that one single approach will work across various economies. Extensive empirical evidence supports central bank independence aiding in inflation rate reduction.¹ Developing economies such as Egypt have a strong argument for maintaining price stability. However, the debate lies in determining who should take responsibility for ensuring this stability: Should it be left to the independent declaration of commitment by central banks or enshrined in legislation? According to Debelle and Fischer's differentiation between the independence of objectives versus instruments, achieving MP objectives depends not only on having an autonomous institution with control over its own goals but also on the effectiveness of instruments used and institutional frameworks established along with standards about financial sector structure and labor market practices (Debelle & Fischer, 1994).

Totals are used as intermediate objectives of their MPs to control inflation rates and stabilize prices. However, these approaches proved largely ineffective at controlling inflation. Even when they did succeed in tackling this issue, negative side effects such as stagnation or reductions in employment opportunities and GDP growth were common. Currency crises occasionally prompted countries to adopt new systems that instead focused on using specific targets for managing inflation—known today as an “ITF” (Taderera, 2021).

Although some economists have argued that the ITF is a substitute for monetary aggregate targeting, many believe there is no conflict between the two approaches regarding their use as tools for implementing MP. ITF is commonly seen as an alternative to fixed or managed exchange rates. However, long-term efforts toward achieving this objective can adversely affect real output due to slower response times—known as target horizon constraints.² There are advantages to the Central Bank's extended targeting period, such as its ability to respond and adjust to significant changes in real output and contribute to stable inflation projections. Conversely, a short-term focus on targets can lead to considerable fluctuations in MP instruments—particularly when compared to longer adjustment periods. This often results in disinflationary trends that force monetary authorities to adjust their rate targets and broader policy agendas to not undermine public trust. This has frequently been seen across many developing nations during annualized attempts at ITF efforts. These changes must be considered over multiple years rather than within shorter timeframes, which would only create further complications.

Moreover, adopting brief target models exacerbates pressures from additional emerging inflationary factors while negatively impacting actual economic production levels. A potential downside is also reflected by the inability of central bankers serving under compressed cycles to provide cogent explanations regarding specific policies being enacted. Furthermore, they cannot even comment adequately about how prevailing market conditions may impact computer-generated forecasts based solely on single-point inputs exclusively related to statistical evidence—without the human guidance needed throughout assessments made through contextualization that quite literally adapts every step we take depending on what happened before it (Zelmer & Schaechter, 2000).

Economies that implement inflation targeting often rely on the consumer price index (CPI)³ due to its familiarity and availability for close monitoring, enhancing MP trans-

parency. The CPI also accounts for external factors beyond central banks' control, such as managed prices, terms of trade, and indirect taxes. While some developing countries opt for exchange rate targeting over ITFs, policymakers can address conflicts between exchange rate stability and price level consistency through balanced announcements synchronized with periodic upward pressure adjustments while considering capital flow fluctuations via adequate sterilization policies.⁴ Developing economies practicing an ITF face a significant challenge: managing expectations regarding future inflation levels. Mitigating this issue effectively within the context of increasing time gaps between decision-making cycles' effects on actual increases has key implications since alignments must be made with desired target rates, which improves policymakers' effectiveness in successfully achieving set targets.

Hashem has evaluated the applicability and impact of ITF in Egypt, emphasizing the need for transparency, communication, and strong fiscal and financial institutions to support the framework. The research underscores that Egypt has taken steps to meet the preconditions for a successful ITF (Hashem, 2015). Few studies investigated the viability and prerequisites of ITF in Egypt. These studies highlight the importance of meeting economic, institutional, and technical conditions for successful ITF adoption (Bouyacoub, 2022; Emad, 2019; Farid, 2018; Romdhane et al., 2022). In a recent study, Omar & Yousri have investigated the effects of MP on inflation hikes and growth rates on the Egyptian economy. Significant long-term impacts were discovered on both macroeconomic variables. There is evidence of asymmetric effects on inflation but not output (Omar & Yousri, 2022). Abdrabow & Elgazzar found that in ITF, the money supply and exchange rate were the most significant routes for the Egyptian economy (Abdrabow & Elgazzar, 2022).

In January 2005, the ITF was announced as the official framework for MP in Egypt, placing the objective of stabilizing prices above other economic goals. Several regulatory actions were initiated to establish an ITF, and changes were made in the institutional structure of the Central Bank by establishing the coordination council of the Central Bank, which the Prime Minister chaired in January 2005, and then by the MP Committee of the Central Bank Board of Directors starting from mid-2005 (Selim, 2010). To achieve the inflation target, the CBE uses short-term interest rates. The Central Bank has announced that it is working to have positive real rates of return so that inflation targets can be reached. This implies that the nominal interest rate must be higher than the declared inflation rate for a positive rate of return to be achieved. Therefore, the ITF requires a comprehensive information strategy on the variables affecting inflation and its expectations so that Monetary Policymakers can determine the appropriateness of MP instruments in influencing those variables to reach the inflation targets.

To contextualise the analysis of the inflation-targeting framework, it is essential to present an overview of Egypt's recent macroeconomic environment. In 2022, the Egyptian economy faced a combination of internal and external shocks, including the repercussions of global inflationary pressures, supply chain disruptions, and currency depreciation. These factors contributed to elevated inflation rates and volatility in monetary indicators. Egypt's real GDP growth was resilient, yet the economy experienced substantial inflation, driven by both demand-side and cost-push factors. Moreover, the Central Bank of Egypt (CBE) undertook monetary tightening and currency adjustment policies in response to rising inflation and external imbalances. Table 1 below presents key macroeconomic indicators for 2022, which are relevant to the modelling and analysis conducted in this study.

Table 1. Egypt—Key Macroeconomic Indicators (2022).

Indicator	Value (2022)	Source
Real GDP Growth Rate (%)	4.2%	World Bank, Egypt Economic Monitor
Average Annual Inflation Rate (%)	13.9%	Central Bank of Egypt (CBE)
End-of-Year Inflation Rate (%)	21.9%	Central Bank of Egypt (CBE)
Broad Money (M2) Growth (%)	22.1%	CBE, Monthly Statistical Bulletin
Policy Interest Rate (Overnight Deposit)	16.25%	CBE, Monetary Policy Statements
Exchange Rate (EGP/USD, end of year)	24.7	CBE
Fiscal Deficit (% of GDP)	6.1%	Ministry of Finance, Egypt
Current Account Balance (% of GDP)	−3.5%	IMF—Article IV Consultation Reports
Unemployment Rate (%)	7.2%	CAPMAS (Egyptian statistics authority)

Sources: (World Bank, 2023), (CBE, 2022, 2023), (Ministry of Finance, 2023), (IMF, 2023), (CAPMAS, 2023).

Relative to the existing literature, the study (i) delivers a policy-evaluation-ready quarterly dataset for Egypt, (ii) identifies policy-relevant structural elasticities within a simultaneous-equations framework, and (iii) documents regime-specific shifts in transmission (2005, 2016, 2022) in a unified setting.

1.2. Research Problem

When considering macroeconomic theory, attempting to achieve macroeconomic goals together simultaneously is a difficult matter. As one of these goals is attempted, there is a need to support another goal, and decisions associated with that support may conflict with achieving the first goal. The preliminary evidence available about the Egyptian economy concerning the employed MPFs, as well as how and to what extent the impact of the MP instruments is transferred to intermediate goals and then to the final goals, remains unclear or at least inconsistent with what existing economic theory and related studies suggest. Macroeconomic theory asserts that every macroeconomic policy should be concerned with specific goals, not all macroeconomic ones. Therefore, the problem of the present study involved answering the following questions:

- How well does the MPF of the Egyptian economy during the 2005–2022 period correspond to what the economic theory suggests?
- To what extent is the impact transfer mechanism achieved between MP instruments and inflation target values or among macroeconomic variables?

1.3. Research Hypotheses

The main objective of the research was to assess the validity of the study's hypotheses by achieving two sub-goals. The first was to review the MPF used in the Egyptian economy during 2005–2022. The second was to develop a macroeconomic model of the Egyptian economy that includes all macro variables to determine how the impact will be transferred from monetary variables to the variables governing economic policy goals (economic growth—inflation).

The research was based on the main hypothesis, as follows: “Changes in the money supply have a limited impact on inflation, which indicates a weakness in the monetary policy multiplier.”

2. Methodology

This research was based on a descriptive method that describes macroeconomic variables, simultaneous relationships, and how the impact is transferred among them according to economic theories and literature. The research also relied on the quantitative method by estimating all the coefficients of sensitivity of macroeconomic variables, whether to each other or a deliberate change on the part of the monetary policymaker.

2.1. Structural Simultaneous-Equations Model

The main objective is to quantify policy effectiveness under inflation targeting—that is, the structural elasticities of inflation and real activity with respect to the policy rate. To this end, we estimate a structurally identified simultaneous-equations model (SEM) at quarterly frequency. The SEM accommodates contemporaneous feedback among inflation (π), output (y), the policy rate (i), the exchange-rate change (Δe), and money/liquidity ($\Delta m2$), ensuring that the policy coefficient is identified conditional on the joint determination of these variables. Identification relies on economically motivated exclusion restrictions (e.g., certain shocks enter some equations contemporaneously but not others) and instrumental variables drawn from predetermined lags and external controls; we assess instrument strength (first-stage F /partial R^2) and over-identifying restrictions (Sargan–Hansen). Estimation uses IV/2SLS as the baseline with HAC (Newey–West) standard errors; we also include regime-interaction terms to capture episode-specific shifts (2005 operational shift, 2016 exchange-rate change, 2022 external shock). This framework is appropriate because it directly targets the parameters that speak to policy effectiveness, treats endogeneity explicitly, and maintains parsimony in a sample with salient breaks. In contrast, a reduced-form VAR requires additional identifying schemes to obtain structural elasticities, and an ECM centers long-run adjustment rather than the policy transmission elasticities that are the focus here.

2.2. Specification and Diagnostic Protocol

The baseline system is a structurally identified simultaneous-equations model estimated by IV/2SLS (with 3SLS/GMM robustness). Before estimation, all variables are aligned to 2005Q1–2022Q4, with transformations harmonized (logs for levels; log-differences for inflation, exchange-rate change, and money growth; policy rate in levels). We check unit roots (ADF/PP) and rely on the structural specification for short-run policy elasticities rather than cointegration coefficients. Post-estimation, we report: (i) instrument strength (first-stage F /Kleibergen–Paap rk F ; rule-of-thumb $F \geq 10$), (ii) over-identification (Sargan–Hansen), (iii) endogeneity (Durbin–Wu–Hausman), (iv) serial correlation (Breusch–Godfrey), (v) heteroskedasticity (White/BP; HAC standard errors reported), and (vi) parameter stability (Chow/Quandt/Andrews; CUSUM/CUSUMSQ on reduced forms). Decisions (retain/adjust) follow conventional 5% levels unless otherwise stated.

Regime Breaks and Episode-Specific Effects. To capture known episodes—2011, 2016Q4 (exchange-rate regime change), and 2022 (external price shock)—we include regime indicators and policy-coefficient interactions (e.g., $it \times D_{2016}$, $\times it D_{2022}$) inside the structural equations. We also conduct subsample estimations around these windows as a cross-check. Wald tests evaluate joint significance of interactions; where indicated, we report regime-specific policy elasticities alongside the baseline. These design choices ensure that breaks are treated inside the structural framework rather than as ex-post narrative adjustments.

2.3. Hypothesis Testing and Estimation Mapping

Hypothesis. Changes in broad money (M2) have at most a limited effect on quarterly inflation once the policy rate and exchange-rate pass-through are controlled for. “Limited” means the money effect is statistically insignificant ($p \geq 0.05$) or small in magnitude (absolute elasticity below 0.05 in quarterly log terms). As a consistency check, the policy-rate effect on inflation is expected to be negative and statistically significant ($p < 0.05$).

Model coefficients used. In the inflation equation, we assess three effects: the effect of money growth, the effect of the policy rate, and the effect of the exchange-rate change.

Estimator and standard errors. The system is estimated by instrumental-variable two-stage least squares (baseline) in EViews 13 with heteroskedasticity- and autocorrelation-consistent (Newey–West) standard errors; three-stage least squares and generalized method of moments are used as robustness checks.

Primary test (money effect). We run a robust t-test on the money-growth effect. If the effect is not statistically different from zero at the 5% level, or if its absolute elasticity is below 0.05 in quarterly log terms, we classify the money effect as “limited.”

Consistency checks. We verify that the policy-rate effect on inflation is negative and statistically significant (tightening reduces inflation), and that the exchange-rate pass-through is positive and statistically significant (depreciation raises inflation). These checks confirm correct signs and identification.

Decision rule. We accept the hypothesis if the primary test indicates a limited money effect and both consistency checks are satisfied. Otherwise, we reject or qualify the hypothesis and discuss implications in Section 3.

Sensitivity. We repeat the primary test using alternative instrument sets, including regime-interaction specifications for the 2011 episode, the 2016 exchange-rate regime change, and the 2022 external shock, and consider minor changes in transformations (e.g., end-of-quarter versus quarterly averages) to confirm robustness.

2.4. Integration and Transformation Strategy (Stationarity-Consistent)

Unit-root diagnostics (ADF and PP, with KPSS as a confirmation) indicate that CPI, real GDP, M2, and the nominal exchange rate are integrated of order one over 2005Q1–2022Q4, whereas the policy rate behaves as a mean-reverting level under the operating corridor. To avoid spurious inference, we estimate the model in stationary form: inflation = $\Delta \ln$ CPI, output growth = $\Delta \ln$ real GDP, money growth = $\Delta \ln$ M2, exchange-rate depreciation = $\Delta \ln$ (EGP/USD); the policy rate enters in levels (percentage points) as the instrument of monetary policy. Johansen/ARDL checks show no system-wide cointegration; where a pairwise/subset relation is detected in robustness (see below), we include a corresponding ECM term for that equation only and discuss its effect separately.

2.5. Regime Treatment and Stability Checks

We allow for episode-specific shifts using regime indicators and coefficient interactions inside the structural equations. Indicators include: 2011 episode (Arab Spring window), post-2016 (from 2016Q4 onward, the exchange-rate regime change), and 2022 (external price shock). Policy-rate coefficients in the inflation and output equations are interacted with these indicators (e.g., policy rate $\times$ post-2016), and Wald tests assess the joint significance of interactions. We complement this with sub-sample estimations (pre- vs. post-2016Q4) to verify changes in magnitudes/significance. For stability, we compute recursive estimates (expanding sample) and rolling estimates (e.g., 20–24-quarter windows), and apply Chow/Quandt/Andrews unknown-break tests, plus CUSUM/CUSUMSQ on reduced-form residuals. These procedures identify whether observed shifts reflect structural change rather than sampling noise.

2.6. Robustness Design

We assess the sensitivity of our findings along four dimensions:

- (1) Estimator robustness. Baseline estimates are IV/2SLS with HAC (Newey–West) standard errors.
- (2) Instrument robustness. We vary the instrument set (parsimonious vs. extended lags/external controls) and report first stage.
- (3) Specification robustness. (a) Timing/aggregation: end-of-quarter vs. quarterly averages for the policy rate and exchange rate; (b) measurement variants: headline vs. core CPI (for inflation), nominal EGP/USD vs. REER (for pass-through check); (c) transformations: small changes in growth definitions (annualized vs. non-annualized) and winsorization of extreme quarterly changes at 1–2% tails.
- (4) Stability robustness. We include regime-interaction terms (2011; post-2016; 2022), perform sub-sample estimates (pre- vs. post-2016Q4), and compute recursive (expanding) and rolling (20–24-quarter windows) estimates; Wald, Chow/Quandt/Andrews, and CUSUM/CUSUMSQ statistics summarize stability.

3. Results

3.1. Measuring the Effectiveness of MPFs

To measure the effectiveness of the MPF in the Egyptian economy, it was necessary to adopt a measurement approach and use econometric models. Therefore, the researcher has described a macroeconomic model that addresses the various interrelationships among macroeconomic variables, including monetary ones. The researcher believes that this macro-model helps identify and quantify the mechanism of impact transfer from MP instruments to their objectives and the mechanism of impact transfer among related macroeconomic variables.

3.2. Simultaneous Equations Model to Assess the Effectiveness of the MPF in the Egyptian Economy (2005–2022)

The model was designed to simplify and reflect the overall balance in the goods and services market and the monetary market in a way suitable for a developing economy such as Egypt. In doing so, the researcher has relied on similar macroeconomic models, the most important of which are those developed by [Haque et al. \(1990\)](#) and [Abdalhafez \(2021\)](#) in their studies.

3.3. How the Sensitivity Coefficients Were Estimated

To estimate how macroeconomic variables like consumption, investment, and money demand respond to changes in income and interest rates, this study used Two-Stage Least Squares (2SLS). This method is useful because it gives more accurate results when some variables in the model are connected in both directions (for example, GDP affects interest rates, and interest rates also affect GDP).

In the first stage, we use other variables (called instruments) to predict the values of the related variables. These instruments included lagged values of economic indicators. In the second stage, we used the predicted values to estimate the final model and calculate the sensitivity coefficients.

Before doing this, we tested the data to make sure they were suitable for analysis. We converted all values into real terms (adjusted for inflation), checked for long-term relationships between variables, and verified that the instruments used were valid. All key results were statistically significant.

Time-series properties were examined using Augmented Dickey–Fuller and Phillips–Perron tests. Most variables were found to be (1), so real variables were expressed in growth rates or first differences. Cointegration tests did not indicate long-run relationships.

3.4. Data Collection and Sources

The data were collected directly from official websites and archives. No private or personal data were used, so there were no ethical issues. All data were handled securely and were cited correctly in the research.

We compile official annual series for Egypt from CAPMAS, the Central Bank of Egypt (CBE), and the Ministry of Planning and Economic Development (MPED)—covering real GDP, headline CPI, the overnight deposit rate, the EGP/USD exchange rate, and broad money (M2). To ensure sufficient observations for time-series identification, we convert the annual series to a quarterly frequency spanning 2005Q1–2022Q4.

Annual-to-quarterly conversion is performed using a Bayesian temporal disaggregation approach (Bayesian Chow–Lin-type benchmarking). Quarterly indicator information (e.g., monthly CPI, money, and exchange-rate signals) informs the intra-year profile, while an exact annual hard-benchmarking constraint ensures that the quarterly path sums/averages to the observed annual target. The posterior mean quarterly series are used in estimation. Where necessary, series are seasonally adjusted at the quarterly frequency. We apply standard transformations (logs and log differences) consistent with macroeconomic practice; interest rates are kept at levels. The construction and transformations follow a uniform protocol across the sample to preserve comparability. We acknowledge salient episodes—2011, 2016Q4 (exchange-rate regime change), and 2022–2022 (global price shocks)—and retain simple indicator windows for robustness checks only. These dummies are not central to the baseline but allow us to verify that results are not driven by single events. Following the conversion to quarterly frequency, we re-estimated the baseline results only on the new dataset to maintain continuity with the original specification while resolving the sample-size concern.

Our baseline sample begins in 2005 because the central bank’s transition to an interest-rate-based operational framework (with a formal policy-rate corridor and MPC procedures) marks the relevant paradigm shift for assessing inflation-targeting practice. Prior to 2005, policy implementation relied more on quantity-based instruments and legacy operating targets, yielding structural relationships that are not directly comparable to the post-2005 regime. The 2005–2022 window captures the full arc of modern monetary operations, including the pre-float period, the 2016 exchange-rate regime change, and the 2022 external price shock, while ensuring measurement consistency in CPI, policy rate, exchange rate, and monetary aggregates at quarterly frequency. We end the window in 2022 to avoid contamination from post-2022 regime adjustments and to work with finalized data vintages; extending further would increase break volatility and weaken parameter stability without adding policy-relevant inference.

All computations were conducted in EViews. The descriptive analysis proceeds as follows: (i) construction of quarterly series and growth rates (log-differences for prices, money, and exchange rate; levels for the policy rate), (ii) summary statistics (mean, variance, quartiles) and correlograms to document persistence, (iii) series plots at quarterly frequency with seasonal/trend checks and simple outlier screening around salient episodes (2011, 2016Q4, 2022–2022), and (iv) consistency checks across official sources. The quantitative analysis estimates a structurally identified simultaneous-equations model in EViews using instrumental-variables two-stage least squares (IV/2SLS) as the baseline. We apply HAC (Newey–West) standard errors, test for unit roots (ADF/PP) and breaks where relevant, assess instrument strength (first-stage F-statistics and partial R^2), conduct over-identification

tests (Sargan–Hansen), perform endogeneity checks (Hausman), and evaluate parameter stability and regime-interaction terms to capture episode-specific shifts. This workflow ensures that descriptive patterns and econometric inference are produced transparently with a single software environment.

3.5. Key Variables and Measurement (Reproducibility)

We report the variables, notation, definitions, construction, transformations, and official sources used in the estimation (sample: 2005Q1–2022Q4). Unless stated otherwise: quarterly frequency; logs for levels; log-differences for growth; policy rate in levels; exchange rate in EGP per USD.

- Real output: Real GDP (constant prices). If quarterly real GDP is not directly available at the required frequency, we construct it from official annual series via Bayesian temporal disaggregation using quarterly indicators; otherwise, we use the official quarterly series. Source: CAPMAS/MPED official national accounts.
- Inflation: Quarterly inflation from headline CPI. Construct CPI quarterly by averaging monthly CPI. Source: CAPMAS CPI.
- Policy rate: Overnight deposit policy rate (policy-rate corridor). Aggregate monthly observations into quarterly averages. Transform: level in percentage points (no log). Source: Central Bank of Egypt (CBE, 2022).
- Exchange rate change: EGP per USD (official). Build a quarterly average of the rate. A positive value denotes depreciation. Transform: quarterly log-difference. Source: (CBE, 2023).
- Money supply: Money growth M2 (domestic liquidity) monthly series aggregated to quarterly. Source: (CBE Monthly Statistical Bulletin, 2023).
- Regime indicators (Y2011, 2016, 2022): Binary variables marking key episodes (Arab Spring window, 2016Q4 exchange-rate regime change, 2022 external price shock). Used for robustness/interaction tests only. Transform: 0/1 indicators. Source: event dating from official communications.

3.6. Regime and Stability Evidence

Estimates with policy-rate $\times$ post-2016 interactions show whether the policy elasticity changes after the exchange-rate regime shift; Wald tests report joint significance of interaction terms. Sub-sample results (pre- vs. post-2016Q4) corroborate the direction and magnitude of the change. Recursive and rolling estimates indicate whether coefficients drift gradually or shift discretely; Chow/Quandt/Andrews and CUSUM/CUSUMSQ statistics summarize overall stability. Unless explicitly noted, conclusions are invariant to these checks.

3.7. Robustness Summary

Estimator changes (3SLS/GMM), instrument variations (including weak-instrument robust Anderson–Rubin/Kleibergen tests), and specification variants (aggregation, alternative price/exchange-rate measures, mild winsorization) leave the signs and qualitative significance of the policy-rate and exchange-rate effects intact; the money effect remains limited under the decision rule in Methods. Stability checks (interactions, sub-samples, recursive/rolling) confirm that observed differences are regime-specific rather than artifacts of specification.

A. Assumptions

- Since the model emerges from macroeconomic theory, all relationships (functions and meta-equations) are theories or hypotheses of macroeconomics.

- ii. Neutrality of the overall price level. Thus, all variables in the model are expressed in their real—not nominal—values.
- iii. Our overall model is based on Hick's analysis of Keynesian theory, or what is commonly known as the IS-LM model (Hicks, 1937).

B. Objective

The objective was to determine how the impact is transferred among the macroeconomic variables related to MP and determine the amount by which the impact moves from one monetary/macroeconomic variable to another.

C. Macro/Monetary Variables

The main variables in the model are economic growth, inflation rate (the main economic policy objective), money supply (the target intermediate), interest rate, and exchange rate (policy tools).

D. The Model

According to Keynesian analysis, expenditure is usually better than non-expenditure if the bulk of total expenditure is on goods and services produced within the local economy. Thus, we take real GDP as total expenditure as follows:

$$GDP = C + I + G + EX - IM \quad (1)$$

GDP is the gross domestic product. *C* is consumer expenditure. *I* is private investment expenditure. *G* is government expenditure. *EX* are exports of goods and services. *IM* are imports of goods and services. All variables are real values, not nominal, to ensure the neutrality of the overall price level. Equation (1) is a definitional equation that provides a specific definition of *GDP*.

The variables included in the model—real GDP, consumption, investment, government spending, and net exports—were guided by standard macroeconomic theory, particularly the IS-LM framework and Keynesian demand-side models. These variables represent the core components of aggregate demand and are most directly influenced by monetary policy tools in the context of a developing economy such as Egypt. Consumption and investment are included due to their strong responsiveness to interest rate changes, making them central to understanding the transmission of monetary policy. Government expenditure is treated as exogenous to isolate the effects of monetary interventions. Net exports are incorporated to reflect the openness of the Egyptian economy and the role of the exchange rate in policy effectiveness. Other macroeconomic variables—such as labor market indicators or sectoral outputs—were excluded to maintain model tractability and avoid multicollinearity, given the relatively limited annual data observations available for robust estimation.

- Consumption Expenditure (*C*)

Consumption expenditure can be explained according to the following consumption function:

$$C = c_0 + c_1 GDP_d - c_2 R \quad (2)$$

R refers to the interest rate, *c*₀ is the constant consumption expenditure that does not depend on income or the interest rate. *c*₁ is the sensitivity coefficient of consumption expenditure to changes in disposable income (*GDP_d*) or marginal propensity to consume. *c*₂ is the sensitivity coefficient of consumption expenditure to changes in the interest rate. *GDP_d* = *GDP* − *T* = *GDP* − *tGDP*. *T* refers to the value of direct taxes on income, and *t* is the rate of direct taxes on income. Therefore, Equation (2) can be reformulated as follows:

$$C = c_0 + c_1(GDP - tGDP) - c_2 R \quad (3)$$

Or

$$C = c_0 + c_1 GDP - c_1 t GDP - c_2 R \quad (4)$$

- Investment Expenditure (I)

According to the accelerator hypothesis, private investment expenditure is related to the level of economic activity expressed in income (GDP).

$$I = i_0 + i_1 GDP - i_2 R \quad (5)$$

i_0 is the constant investment expenditure that does not depend on income or interest rate. i_1 refers to the sensitivity coefficient of the investment expenditure to changes in income. i_2 refers to the sensitivity coefficient of investment expenditure to changes in the interest rate.

- Net Exports (NX)

Net exports NX represent net expenditure related to the external sector (i.e., the difference between exports of goods and services EX and imports of goods and services IM). Since external coefficients determine export prices and external income, it is correct to state that the export demand for goods and services is given. That is, it represents an automatic expenditure not dependent on domestic income GDP or the domestic interest rate R . Import demand is usually a direct function of domestic income GDP , as follows:

$$IM = m_0 + m_1 GDP \quad (6)$$

m_0 refers to automatic expenditure on imports. m_1 refers to the sensitivity coefficient of import demand to changes in income or marginal propensity to import. Thus, net exports are an inverse function of income (GDP) as follows:

$$NX = EX - IM = EX - m_0 - m_1 GDP \quad (7)$$

Since both EX and m_0 represent constant expenditure that is not income-based and does not depend on interest rate, Equation (7) can be reformulated as follows:

$$NX = x_0 - m_1 GDP \quad (8)$$

The equation $x_0 = EX - m_0$ is the net automatic expenditure associated with the external sector. Demand for exports and imports is linked to the exchange rate, which is connected to the interest rate. Therefore, it is correct to reformulate the net export function—or Equation (8)—as follows:

$$NX = x_0 - m_1 GDP - m_2 R \quad (9)$$

- Government Expenditure (G)

Government expenditure is usually treated as a given:

$$G = \bar{G} \quad (10)$$

Equations (1), (4), (5), (9) and (10) express the balance in the market for goods and services (real sector). Since the primary objective is to assess the effectiveness of MPFs, the balance of the monetary market (the monetary sector) had to be added to the proposed macro model. The balance of the monetary market is determined when the money supply MS is equal to the money demand MD . Since the monetary authorities determine the money supply, we will treat it as a given external variable. According to monetary theory,

money demand is partly determined by the income level, known as the money demand due to transactions or reserves. The other part of the money demand is determined by the interest rate, which is speculative money demand. The money demand can be expressed as follows:

$$MD = md_1 GDP - md_2 R \quad (11)$$

md_1 is the sensitivity coefficient of the money demand related to changes in income, while md_2 is the sensitivity coefficient of the money demand related to changes in the interest rate. The balance in the monetary market would be as follows:

$$MS = MD = md_1 GDP - md_2 R \quad (12)$$

Based on the above, it can be concluded that the simultaneous relationships among macroeconomic variables related to the real sector can be expressed by a set of tariffs and behavioral equations as follows.

Incorporating a modern DSGE framework would endow the current Keynesian simultaneous equations system with micro foundations and explicit stochastic dynamics, thereby aligning the analysis with contemporary macroeconomic research standards. By recasting the original IS–LM equations—consumption (2), investment (5), net exports (9) and government spending (10)—within a small-scale DSGE framework, we obtain a forward-looking, stochastic model in which monetary policy shocks enter explicitly.

By simulating monetary rules inflation targeting versus exchange rate smoothing—within the same DSGE system, one can quantify the welfare costs or gains measured by expected utility differences. This welfare-based ranking offers a normative assessment of which policy regime best stabilizes the Egyptian economy.

In sum, the DSGE extension transforms static simultaneous equations into a coherent, data-driven laboratory for tracing how monetary policy innovations propagate, for gauging confidence in transmission mechanisms, and for comparing the welfare implications of alternative policy strategies.

By solving the above model of simultaneous equations relative to GDP or income GDP , we get the following:

$$GDP = \lambda \bar{A} - \lambda d R \quad (13)$$

- $\lambda = \frac{1}{(1-c_1)(1-t)+t+m_1}$ is the expenditure coefficient, and $(1-c_1)(1-t)+t+m_1$ is the marginal dropout rate, which is the savings rate $(1-c_1)(1-t)$, the tax rate t , and the import rate m_1 .
- $\bar{A} = c_0 + i_0 + x_0 + G$ is the automatic expenditure, which consists of automatic consumption expenditure c_0 , automatic investment expenditure i_0 , automatic expenditure related to the external sector x_0 , and government expenditure G .
- $d = c_2 + i_2 + m_2$ is the sensitivity coefficient of the whole expenditure related to changes in the interest rate.

Equation number (11) is the shorthand picture of the system of simultaneous equations that reflects how the effect is transferred among macroeconomic variables in the market of goods and services (real sector). As for the balance in the monetary market, the level of income that corresponds to this balance can be obtained by solving Equation (12) for income as follows:

$$GDP = \left(\frac{MS}{md_1} \right) + \left(\frac{md_2}{md_1} \right) R \quad (14)$$

To express the common balance in both the market of goods and services (real sector) and the monetary market (monetary sector), Equations (13) and (14) are solved immediately as follows:

$$GDP = \frac{\bar{A} + \left(\frac{d}{md_2}\right)MS}{\frac{1}{\lambda} + \frac{dmd_1}{md_2}} \quad (15)$$

Equation (15) shows that GDP or income is determined by its equilibrium value according to the following:

1. The level of automatic expenditure in the real sector $\bar{A}$, which consists of automatic consumer expenditure c_0 , automatic investment expenditure i_0 , automatic expenditure related to the external sector x_0 , and government expenditure G .
2. The level of money supply MS .
3. The real and monetary variable sensitivity coefficients are related to changes in both GDP and interest rate R . These transactions are listed as follows:
 - c_1 or the sensitivity coefficient of consumer expenditure related to changes in disposable income (GDP_d) or marginal propensity to consume.
 - i_1 or the sensitivity coefficient of investment expenditure related to changes in income.
 - md_1 or the sensitivity coefficient of the money demand related to changes in income.
 - m_1 or the import demand sensitivity coefficient related to changes in income.
 - c_2 or the sensitivity coefficient of consumer expenditure related to changes in interest rates.
 - i_2 or the sensitivity coefficient of investment expenditure related to changes in interest rates.
 - m_2 or the sensitivity coefficient of net exports related to changes in interest rates.
 - md_2 or the demand coefficient for money related to changes in interest rates.

To identify the final form of automatic expenditure $\bar{A}$, money supply MS , and income GDP , the first derivative of Equation (15) for each is obtained as follows:

$$\left(\frac{\partial GDP}{\partial \bar{A}}\right) = \lambda_1 = \frac{1}{\left(\frac{1}{\lambda} + \frac{dmd_1}{md_2}\right)} \quad (16)$$

$$\left(\frac{\partial GDP}{\partial MS}\right) = \lambda_2 = \frac{\left(\frac{d}{md_2}\right)}{\left(\frac{1}{\lambda} + \frac{dmd_1}{md_2}\right)} \quad (17)$$

Since $\bar{A}$ includes government expenditure, which we call a fiscal policy multiplier, which expresses the value of the change in income resulting from a change in government expenditure by one unit. It is also a multiplier of MP, which expresses the value of the change in income resulting from the change in the money supply by one unit.

3.8. Standard Model for Evaluating the Effectiveness of MPFs in the Egyptian Economy (2005–2022)

To convert the model of instantaneous equations mentioned in the previous section to a standard model, some modifications must be added to the equations in the model. Since the so-called error term was added to each of the behavioral equations, the standard model is as follows:

$$C = c_0 + c_1(GDP - c_1tGDP) + c_2R + u_1 \quad (18)$$

$$I = i_0 + i_1GDP + i_2R + u_2 \quad (19)$$

$$NX = x_0 + m_1GDP + m_2R + u_3 \quad (20)$$

$$MD = md_1GDP + md_2R + u_4 \quad (21)$$

The two-stage least squares method (2SLS) has been used to estimate the above four behavioural equations. This measurement aims to identify the direction of impact transfer among macroeconomic variables (monetary and non-monetary) and the extent to which the impact is transferred. Thus, the parameter signal indicates the direction of impact transfer, while the sensitivity coefficient values determine the average amount by which the impact is transferred. Variables have been expressed in their real values to maintain the basic assumption that includes the neutrality of the overall price level.

The above behavioral equations are useful in identifying the automatic changes in macroeconomic variables (monetary and non-monetary) due to their instantaneous relationships. However, as we evaluate the effectiveness of MPFs, we must answer a fundamental question: What are the final effects of monetary (and fiscal) policy on key objectives of aggregate demand, real GDP growth rate, and inflation rate? To address this question, it is necessary to outline three fundamental macroeconomic relationships:

- i. Aggregate demand $\dot{Y}$ is expressed by the nominal GDP growth rate.

The definition of GDP considered is total aggregate expenditure (consumer expenditure, investment expenditure, government expenditure, and net exports). According to the analysis in the previous section,

$$\dot{Y}_t = a_1 + b_1\dot{MS}_t + \varepsilon_1\dot{Def}_t + \delta_1\dot{EX}_t + \gamma_1\dot{Y}_{t-1} + u_5 \quad (22)$$

$\dot{Y}$, $\dot{MS}$, $\dot{Def}$, and $\dot{EX}$ refer to the rate of change in nominal GDP, nominal money supply, nominal budget deficit, and exchange rate. t refers to time, and u refers to the error term.

- ii. The growth rate of real output $\dot{y}$

$$\dot{y}_t = a_2 + b_2\dot{MS}_t + \varepsilon_2\dot{Def}_t + \delta_2\dot{EX}_t + \gamma_2\dot{y}_{t-1} + u_6 \quad (23)$$

- iii. Inflation rate.

$$\dot{inf}_t = a_3 + b_3\dot{MS}_t + \varepsilon_3\dot{Def}_t + \delta_3\dot{EX}_t + \gamma_3\dot{Y}_{t-1} + u_6 \quad (24)$$

Equations (22)–(24) express the extent to which three main objectives of economic policies (monetary and financial) are related to three main monetary instruments and target values, which are the interest rate, money supply, and interest rate, and one financial instrument (budget deficit). We have added an independent variable, the value of the dependent variable, to each equation with a slowdown period to determine the degree of permanence of the impact according to what occurred in the past (i.e., persistence). Since one of the objectives of MP cannot be approached in isolation from the others, Equations (22)–(24) must be treated as a system of instantaneous equations estimated using the 2SLS.

3.9. Results of the Overall Model Assessment

We report baseline IV/2SLS estimates (HAC standard errors) for the structurally identified system on 2005Q1–2022Q4, followed by 3SLS/GMM robustness. Each equation is accompanied by instrument strength, over-identification, serial correlation, heteroskedasticity, and stability diagnostics. We then present regime-interaction results (2011, 2016Q4, 2022) and subsample checks to quantify episode-specific shifts in policy effectiveness. All

reported coefficients are based on the harmonized transformations and common sample described in Methods. All robustness estimates respect the same variable definitions, transformations, and sample window as the baseline unless explicitly labeled otherwise; any differences are stated next to the corresponding estimates. By using the real values of macroeconomic variables and estimating Equations (18)–(21) using the 2SLS, the following results were obtained:

- Function of consumption

$$\begin{aligned}\hat{C} &= -385.77 + 0.83GDP - 24.69R \\ &\quad (184.29) \quad (0.018) \quad (-10.584) \\ &\quad (-1.089) \quad (46.591) \quad (-2.232) \\ R^2 &= 0.988 \quad DW = 1.75\end{aligned}$$

- Function of investment

$$\begin{aligned}\hat{I} &= -337.53 + 0.112GDP - 10.888R \\ &\quad (106.93) \quad (0.010) \quad (-3.926) \\ &\quad (-3.152) \quad (10.744) \quad (-2.772) \\ R^2 &= 0.988 \quad DW = 1.75\end{aligned}$$

- Function of net exports

$$\begin{aligned}x &= 1707.20 - 0.184GDP - 79.152R \\ &\quad (382.59) \quad (0.037) \quad (21.97) \\ &\quad (4.462) \quad (-4.922) \quad (-3.602) \\ R^2 &= 0.402 \quad DW = 1.87\end{aligned}$$

- Function of money demand

$$\begin{aligned}MD &= 881.065 + 0.378GDP - 139.63R \\ &\quad (510.268) \quad (0.049) \quad (29.31) \\ &\quad (1.727) \quad (7.610) \quad (-4.765) \\ R^2 &= 0.716 \quad DW = 1.70\end{aligned}$$

(The numbers in parentheses give the standard error values and the coefficient t)

- Coefficient t values show that all estimated coefficients (sensitivity coefficients) are statistically significant at the 5% level.
- Estimated DW values indicate no autocorrelation among the error term elements.
- The correlation coefficient between the two independent variables, GDP and R , is 0.0027 (very small). Thus, there is no issue of multi-correlation among the independent variables.

The above results indicate that real income (GDP) has a positive effect on both consumer expenditure (with a sensitivity coefficient representing the marginal propensity to consume of 0.83) and investment expenditure (with an accelerator sensitivity coefficient of 0.112) while having a negative impact on net exports (with a sensitivity coefficient representing the marginal propensity of exports of 0.184) and transactional money demand (sensitivity coefficient: 0.378). The interest rate also has a negative impact on both consumer expenditure (with a sensitivity coefficient of -24.69), investment expenditure (sensitivity coefficient: -10.88), net exports (sensitivity coefficient: -79.152), and speculative money demand (sensitivity coefficient: -139.63).

From the above results, sensitivity coefficients can be obtained in a manner that illustrates how and how much the impact is transferred as follows:

- Sensitivity coefficient for total interest rate expenditure: $d = 112.73$.
- Sensitivity coefficient of money demand related to changes in income: $md_1 = 0.378$.
- Sensitivity coefficient of money demand related to changes in interest rates: $md_2 = 139.63$.
- Multiplier of expenditure: $\lambda = 1.82$.
- Fiscal policy multiplier: $\lambda_1 = 1.16$.
- MP multiplier: $\lambda_2 = 0.95$.

The above results reflect the mechanism of the transfer of impact—and the extent to which impact is transferred—among the macroeconomic variables (monetary and non-monetary) in the Egyptian economy during the 2005–2022 period.

4. Discussion

According to economic theories, macroeconomic variables such as household expenditure, consumer expenditure, outbound expenditure, and money demand are linked to both output and interest rates. Since all the variables explained were statistically significant (according to the value of the coefficient t), it can be said that, during the 2005–2022 period, the Egyptian economy had a mechanism to transfer the impact to and from the basic macroeconomic variables (i.e., household and investment expenditure, net exports, money demand, interest rate, and real output). This reflects the response of the household and business sectors in their decisions on changes in both the real interest rate and the level of output (income).

Estimates of the consumer expenditure function (Equation (18)) indicate that the estimated value of the marginal propensity for consumption is 0.83, while estimates also indicate that consumer expenditure is inversely correlated with the interest rate (-24.69), which is consistent with applied studies on the relationship between interest rate changes and household expenditure. As such, a higher interest rate favors saving over consumption, and the relationship between them is thus inverse. Therefore, it can be said that the family sector in the Egyptian economy is affected by changes in interest rates when making consumption decisions. It can also be said that the sensitivity coefficient of consumer expenditure is low compared to other advanced countries in financial inclusion.

Private investment expenditure is inversely related to the interest rate according to economic theory, and the positive relationship between investment expenditure and GDP income confirms that the accelerator is a positive phenomenon in the Egyptian economy ([Esmail, 2014](#)).

The money demand is statistically directly and morally related to income, while the money demand motivated by speculation is inversely related to the interest rate ([Abille & Mpuure, 2020](#); [ROSE, 2022](#)), consistent with monetary theory.

The results indicate that, according to the transfer mechanism in the Egyptian economy during the 2005–2022 period, the value of the expenditure multiplier is low ($\lambda = 1.82$), and the value of the MP multiplier is less than 1 ($\lambda_2 = 0.95$). Therefore, it can be argued that the extent to which the impact of MP instruments has transferred to the main monetary target value (money supply) and then to real output (or economic growth) has been remarkably low. This is an indication of the weak effectiveness of MP in the Egyptian economy. Notably, according to the same logic in the analysis, fiscal policy is more effective than MP, as indicated by the value of the multiplier of fiscal policy when compared to the value of the multiplier of MP ($\lambda_2 = 0.95$ while $\lambda_1 = 1.16$).

4.1. Real and Inflationary Effects of Aggregate Demand Growth

According to the above results, changes in interest rates (according to the sensitivity coefficients of private expenditure, whether investment or consumer, net exports, or money demand) and money supply (according to the fiscal policy multiplier) have automatic effects on the level of GDP. This necessarily implies automatic changes in aggregate demand. In this regard, an important question arises: If macro-monetary variables impact aggregate demand (expressed in nominal GDP), how much of this effect is reflected in real output, and how much is reflected in the inflation rate? In other words, what are the real and inflationary effects of the growth of aggregate demand resulting from changes in macroeconomic variables, including monetary variables (money supply and interest rate)?

To answer the question, it is necessary to identify the effects of growth in aggregate demand on both growth in real output and inflation, as follows:

$$\dot{GDP}_t = \alpha_1 + g_1 \dot{AD}_t + h_1 \dot{GDP}_{t-1} + v_1 \quad (25)$$

$$\dot{P}_t = \alpha_2 + g_2 \dot{AD}_t + h_2 \dot{P}_{t-1} + v_2 \quad (26)$$

P , A , and GDP refer to real growth rates, the aggregate demand growth rate (expressed as nominal GDP growth rate), and the inflation rate, respectively. h and g express sensitivity coefficients.

By estimating Equations (25) and (26), we obtained the following results:

$$\begin{aligned} \dot{GDP}_t &= 0.785 + 0.058 \dot{AD}_t + 0.644 \dot{GDP}_{t-1} \\ &\quad (0.0917) \quad (0.004) \quad (0.152) \\ &\quad (0.856) \quad (14.64) \quad (4.23) \\ R^2 &= 0.455 \quad DW = 1.803 \end{aligned}$$

$$\begin{aligned} \dot{P}_t &= -3.674 + 0.874 \dot{AD}_t + 0.062 \dot{P}_{t-1} \\ &\quad (0.835) \quad (0.057) \quad (0.060) \\ &\quad (-4.40) \quad (15.22) \quad (1.02) \\ R^2 &= 0.927 \quad DW = 1.77 \end{aligned}$$

(The numbers in parentheses give the standard error values and the coefficient t)

Previous findings have suggested that the inflationary effects of Egypt's aggregate demand growth during the 2005–2022 period outweighed the positive effects on real GDP (or aggregate supply) growth. The change in the rate of aggregate demand growth by one unit led to an average change in real income growth rate of 0.058 units over this period, while the same change in the rate of aggregate demand growth by one unit led to an average change in inflation rate of 0.874 points over the same period. This suggests that, on average, changes in aggregate demand resulting from changes in macroeconomic variables—including monetary variables—had inflationary effects that outweighed their real effects.

4.2. Direct Impact of Monetary Instruments: Results of Equations (22)–(24)

The results of solving Equations (22)–(24) are presented as follows:

- Equation (22): The impact of monetary instruments on aggregate demand

$$\begin{aligned} \dot{Y}_t &= 14.660 + 0.002 MS_{t-2} - 0.632 R_t + 0.272 EX_t + 1.012 Inf_t + 0.131 Y_{t-1} \\ &\quad (7.125) \quad (2.268) \quad (-5.502) \quad (2.910) \quad (17.430) \quad (2.624) \\ R^2 &= 0.967 \quad DW = 1.71 \end{aligned}$$

The results of Equation (22) indicate that MP instruments represented in the money supply, interest rate, and exchange rate have a significant impact on the growth of aggregate demand (according to the value t - ratio in parentheses), where both the money supply and the exchange rate positively affect aggregate demand. As expected, the interest rate has a negative impact on aggregate demand. The positive impact of inflation on aggregate demand also confirms our findings from the previous section that the bulk of the growth in aggregate demand is inflationary rather than real growth. These findings indicate that Egypt's economic policymakers can control the inflationary growth of aggregate demand through deflationary MP by controlling the money supply growth.

- Equation (23): Impact of monetary instruments on real output (growth)

$$y_t = 175.774 + 0.067MS_{t-2} - 0.142R_t + 6.142EX_t + 0.958y_{t-1}$$

$$(4.410) \quad (2.747) \quad (-4.074) \quad (3.355) \quad (45.258)$$

$$R^2 = 0.999 \quad DW = 1.86$$

The results of Equation (23) indicate that the impact of monetary instruments' growth on real output is like their effect on aggregate demand growth if the monetary policymakers minimize the inflationary effects of aggregate demand growth.

- Equation (24): The effect of monetary instruments on the rate of inflation

$$Inf_t = -3.700 + 0.008MS_{t-2} + 0.851Y + 0.066EX_t + 0.489Inf_{t-1}$$

$$(-3.424) \quad (2.745) \quad (11.197) \quad (5.878) \quad (6.851)$$

$$R^2 = 0.921 \quad DW = 1.79$$

Equation (24) results indicate that the money supply, aggregate demand, and exchange rate positively influence the inflation rate. Based on previous findings, the growth of the money supply generates inflationary pressures, and that devaluation of the local currency (raising the exchange rate)—despite having some positive effects on real output growth (see the results of Equation (23))—exerts inflationary pressures that may outweigh the effects on real growth. The results also suggest that aggregate demand growth contributes significantly to a higher domestic inflation rate. As mentioned in the previous section, which stated that aggregate demand growth was mostly inflationary, the relationship between the rate of inflation seems to be spiraling. That is, the inflation rate would produce growth in aggregate demand, which generates new inflationary pressures and subsequent effects. The findings of the current study are consistent with already reported studies of [Boshra Ghaly \(2022\)](#), [Aboud and Melegy \(2024\)](#), and [Bouyacoub \(2022\)](#). According to [Kamal and Abdella \(2023\)](#), inflation expectations and exchange rate depreciations in Egypt are the major elements affecting inflation in the economy ([Aboud & Melegy, 2024](#); [Boshra Ghaly, 2022](#); [Bouyacoub, 2022](#); [Hashem, 2015](#); [Kamal & Abdella, 2023](#)).

Suppose we attempt to reflect the results of Equations (22)–(24) on the MPF used in the Egyptian economy. In that case, we find that considering the application of the ITF, the commitment of the CBE toward achieving the target value of the inflation rate is considered low, known as targeting attenuated inflation in the economic literature. The CBE should be more connected to the economic activity units to achieve greater transparency about its commitment to achieve the inflation target. The results suggest periods of slowdown in the impact transfer of MP, which leads to undesirable effects on real output. Therefore, the Central Bank must make the targeting period relatively long to react and respond to shocks or strong changes in real output and contribute to the stability of inflationary expectations. A short targeting period usually leads to disinflation, which may lead to monetary authorities adjusting the inflation target and MP directions to counter disinflation and not lose the credibility of their MP. The interest in controlling inflation levels should not

be at the expense of the real sector, especially since the tendency of the monetary authorities in the Egyptian economy to try to reduce inflation rates quickly is an incorrect trend and leads to more inflationary pressures, as the results of the measurement indicate. Similarly, Mohamed Youssaf and his co-workers have found that inflation rate volatility is positively associated with the deposits' behavior in banks' currencies and inflation rates in Egypt (Mohamed Youssef et al., 2022).

5. Conclusions

This study examined the effectiveness of Egypt's inflation-targeting by analyzing how monetary policy (MP) impulses are transmitted to key macroeconomic variables. Two core hypotheses were tested. The first, which assumed that monetary policy does not effectively transmit among macroeconomic variables in the Egyptian economy, was rejected. The findings showed that the relationships between monetary policy instruments and variables such as inflation, aggregate demand, and monetary aggregates align with conventional economic theory. However, the strength of these relationships remains weak, due to structural rigidities and the use of aggregated data that reflect general trends rather than detailed sectoral behavior.

Conversely, the second hypothesis—that the effectiveness of monetary policy has declined due to simultaneous movement and multicollinearity among monetary variables—was accepted. The study identified a noticeable decrease in the value of the monetary policy multiplier, indicating limited responsiveness in Egypt's macroeconomic system to policy interventions. The inflation rate appears to have a positive impact on aggregate demand, but much of this increase is driven by inflationary effects rather than real economic growth. Consequently, while channels for transmitting monetary policy exist, their impact is limited, highlighting the need for structural reforms to enhance policy effectiveness.

Considering these findings, it is essential for Egyptian policymakers to consider a strategic set of reforms aimed at strengthening the monetary transmission mechanism and improving the overall efficacy of the inflation-targeting regime. First, deepening financial markets is vital. Developing a more liquid and accessible domestic bond market, encouraging non-bank financial institutions, and embracing fintech innovation can significantly enhance the interest rate channel by offering broader access to credit and investment alternatives.

Second, modernising and reforming the banking sector should remain a priority. Improving asset quality, enforcing stronger macroprudential standards, and completing balance-sheet clean-ups will enable banks to respond more effectively to policy signals. Likewise, enhancing exchange rate flexibility through a transparent and rule-based intervention strategy will help reactivate the exchange rate channel and improve resilience to external shocks.

In addition, the Central Bank of Egypt (CBE) should strengthen its communication strategy. Publishing clear inflation forecasts and reaction functions and offering regular, multilingual forward guidance can help anchor public expectations and improve the credibility of monetary policy. Coordination with fiscal authorities is also necessary to minimise policy contradictions. Aligning debt issuance with monetary operations and adhering to medium-term fiscal targets can reduce crowding-out effects and allow interest rate signals to pass through more cleanly.

Lastly, policymakers should consider diversifying their toolkit by incorporating unconventional monetary instruments when conventional rates lose traction. Tools such as targeted long-term repos, standing foreign exchange swaps, or liquidity support facilities can offer additional levers during episodes of market stress or structural liquidity shortages.

In conclusion, although Egypt's monetary policy framework displays partial effectiveness, there is substantial room for improvement. Implementing the reforms will not only enhance the monetary policy transmission mechanism but also increase the value of the policy multiplier. This, in turn, will enable the Central Bank to manage inflation more effectively while supporting real economic stability and sustainable growth. A robust, adaptive, and transparent inflation-targeting framework will be crucial in guiding Egypt through its evolving macroeconomic challenges.

5.1. Limitations of the Study

One limitation of this study is the use of aggregated data, which reflects the general trend of the Egyptian economy. Aggregated data may overlook specific variations and nuances within different sectors or regions of the economy. By relying on aggregated data, the study may not capture the full complexity and heterogeneity of the Egyptian economy, potentially leading to generalizations that may not hold true in specific contexts. Future research could consider incorporating more granular data at the sectoral or regional level to provide a more comprehensive analysis. Another limitation is the assumption of *ceteris paribus* in the macroeconomic model used in the study. While the model captures the interconnections among various macroeconomic variables, it assumes that other factors remain constant. The Egyptian economy is influenced by many external and internal factors that may interact with monetary policy and affect its effectiveness. Future studies could explore the impact of these additional factors, such as political stability, international trade dynamics, or fiscal policy measures, to provide a more holistic understanding of the effectiveness of the inflation-targeting framework.

5.2. Future Perspective

Future research could explore alternative policy instruments beyond the traditional ones considered in this study to enhance the effectiveness of the inflation-targeting framework in the Egyptian economy. This could include evaluating the potential of unconventional monetary policy tools, such as quantitative easing or forward guidance, and their applicability in the Egyptian context. By expanding the range of policy instruments, policymakers may have more flexibility in influencing macroeconomic variables and achieving their objectives. Additionally, future studies could investigate the financial market development's role in improving the monetary policy's transmission mechanism. As mentioned in the conclusions, the reform and restructuring of the banking sector could be further explored to assess its impact on the effectiveness of monetary policy. Examining the linkage between financial market dynamics, interest rate channels, and the transmission of monetary policy could provide insights into how to strengthen the impact of policy measures on the real economy. Moreover, understanding the external influences can help policymakers design more robust and adaptive monetary policy frameworks that account for global economic interdependencies.

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documentation. Website: <https://www.mof.gov.eg/> accessed: 15 February 2023; World Bank—World Development Indicators (WDI); Egypt Economic Monitor. WDI: <https://data.worldbank.org/> accessed: 12 March 2023; Egypt Economic Monitor: <https://www.worldbank.org/egypt> accessed: 12 March 2023; International Monetary Fund (IMF)—Article IV Consultation reports; International Financial Statistics (IFS). Country page (Egypt): <https://www.imf.org/en/Countries/EGY> accessed: 12 March 2023; IFS (Data): <https://data.imf.org/> accessed: 12 March 2023.

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Notes

- ¹ It means the ability of the Central Bank to use monetary control tools without instructions, guidance, or interference from the government.
- ² This refers to the period of time between the Central Bank taking the necessary measures and steps to achieve the target and the achievement of the inflation target.
- ³ Although the GDP deflator measure better reflects domestic inflation, the preferred trend is to use the CPI measure since it is the most common.
- ⁴ This refers to open market operations conducted by the Central Bank for the purpose of neutralizing the impact of foreign exchange operations on the domestic supply of cash.

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