The Impact of Unconventional Monetary Policy on Economic Growth: *Empirical Evidence from Emerging Markets with Special Reference to Egypt*[1]

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ABSTRACT

Since the COVID-19 pandemic, central banks (CBs) globally have introduced substantial stimulus programs, relying heavily on unconventional monetary policy (UMP) tools, similar to the post-2007–2008 global financial crisis (GFC) period. Emerging markets and developing economies (EMDEs) have also adopted Asset Purchase Programs (APPs) for the first time to address disruptions and boost confidence. This paper investigates whether CBs in 25 EMDEs, including Egypt, influenced prices, financial market risk aversion and output through UMP tools. Using CB balance sheets as a proxy for UMP, a Panel VAR model was applied. Results show that, in the short run, UMP did not affect prices but positively impacted Gross Domestic Product (GDP). The response of the consumer price index (CPI) and Volatility index (VIX) varied, with significant effects on GDP observed over time. On the other hand, in the long-run, the CPI began to show a significant increase, indicating that CB asset expansion exerted upward pressure on prices over time. Besides, the response of the VIX began to taper off, stabilizing for the remainder of the forecast horizon, suggesting that the initial shock to central bank assets had a lasting, though diminishing, impact on market volatility. Regarding GDP, the response fluctuated, and the effect did not completely dissipate by the tenth period, indicating that the impact on GDP was more persistent than on inflation and financial market volatility.

Keywords: *unconventional monetary policy- Central banks-balance sheets- Asset purchase programs- Panel VAR model- Emerging markets and developing economies.*

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1- INTRODUCTION

CBs typically focus on maintaining price stability using short-term interest rates as their main tool. This approach signals to money markets, and the CBs' balance sheets traditionally functioned as reserve assets for the banking system, not as indicators of monetary policy stance (Eryilmaz & Yilmaz, 2020). However, during crises such as the Global Financial Crisis (GFC) of 2008 and the COVID-19 pandemic, CBs quickly turned to unconventional monetary policy (UMP) tools as interest rates approached to zero (Tonci, 2022). These UMP tools, which include forward guidance, asset purchases, term funding facilities, market operation adjustments, and negative interest rates, became essential for maintaining economic stability.

While much research has focused on the impact of UMP in advanced economies, less attention has been given to EMDEs, which have unique financial structures and vulnerabilities. The effects of UMP on these economies can be significant, especially during global crises, affecting exchange rates, inflation, investment, and overall economic performance. Hence, this paper investigates whether CBs in 25 EMDEs, including Egypt, influenced prices, financial market risk aversion and output through UMP tools.

UMPs rely on instruments other than policy rate changes, which include (1) forward guidance, (2) asset purchases, (3) term funding facilities, (4) adjustment to market operations and (5) negative interest rates. Forward guidance involves CBs signaling future policy paths, either based on time or economic conditions. Asset purchases, such as quantitative easing (QE), involve CBs buying assets to influence interest rates. Term funding facilities provide low-cost long-term financing to financial institutions, while market operation adjustments provide more liquidity to the financial system in times of stress. Negative interest rates are an unusual tool used by some CBs, setting rates below 0% to encourage borrowing and investment. (Haksar & Kopp,2020).

The main objective of this paper is to measure the impact of UMP tools, represented by expanding the CB balance sheets by observing the size of total assets, in enhancing the economic growth and price stability during the COVID-19 pandemic in the emerging markets through using a Panel VAR model. The

dataset covers the period from 2013 to 2022, providing annual data for 25 EMDEs, which are grouped into five regions.

1.1 Research Problem

All countries, including Egypt, adopted different policies to mitigate the severe unprecedented consequences of the recession caused by the pandemic. To combat this recession, CBs around the world engaged in implementing new monetary policy measures such as liquidity injections, asset purchases and forward guidance, which are known as: UMP tools. This paper is concerned with the UMP adopted by emerging markets at the time of Covid-19 crisis. The main question this study raises is to measure the impact of the UMP adopted by CBs of EMDEs, during the time of Covid-19 pandemic in boosting the economic growth, by using the CBs' balance sheet as an indicator of UMP. Other questions that this study is eager to answer are:

- To what extent were unconventional monetary policy tools effective in influencing economic outcomes in EMDEs during the COVID-19 pandemic?
- How does an increase in the central bank's balance sheet (QE) affect inflation, output and financial market uncertainty?

1.2 Research Significance

This paper tries to give an assessment of how successful the UMP adopted by the CBE in addition to CBs in emerging markets was during the Covid-19 pandemic in stabilizing prices and boosting the economic activity. Thus, it orients policy makers to find out the effectiveness of UMP on enhancing the economic growth, represented by the GDP through using a Panel VAR model, by giving a shock to a balance sheet and analyze the effects on output and prices, to serve as a guidance for policy makers in dealing with any potential shock. In the literature, some studies use the event-based method. Although it is simple and focuses on the immediate market response, it doesn't show causality or the evaluation of policy effectiveness (Aït-Sahalia et al., 2012). Since the aim of this study is to measure the effect of UMP on macro variables, the Panel VAR analysis is more appropriate. Besides, other studies used VAR method to assess the effects of UMP on macro variables by comparing two counterfactual scenarios: pre and post the crisis; for example, pre and post GFC as in the model provided by

(Lenza et al., 2010). These simulations based on pre-crisis data would reveal inaccurate results as the structure of the data has changed with the global crisis. Moreover, the VAR structure doesn't reflect the impact of a sudden change in one variable on other variables in the model. And Since the VAR allows researchers to examine the causal relationship between variables, in addition to examining the impact of external shocks on variables, it is considered the appropriate method in this thesis.

While prior research has extensively examined the effects of UMP in advanced economies, this paper makes several important contributions by focusing on a broader set of EMDEs—a group often underrepresented in empirical monetary policy literature. Thus, the significance of this study can be summarized as follows:

- Focus on EMDEs Using Panel VAR Approach: Most existing literature such as Bernanke and Gertler (1999), Lenza et al. (2010), and Gertler and Karadi (2011) focuses on individual advanced economies (U.S., Eurozone, U.K., Canada), often using country-specific models or event-based analyses. This paper differs by:
    - Analyzing 25 EMDEs across five regions, including Egypt.
    - Employing a Panel VAR model, which allows for capturing dynamic interdependencies and heterogeneity across countries while identifying causality and the transmission of UMP shocks.
- Use of CB Balance Sheet Size as a Proxy for UMP: While Eryilmaz and Yilmaz (2020) and others used CB balance sheet expansion as a proxy for UMP in Europe, this study extends this approach to EMDEs. The inclusion of total CB assets as an UMP indicator across multiple countries adds a comparative dimension that is rare in the literature.
- Incorporation of Financial Market Uncertainty via VIX: Unlike studies that focus only on macroeconomic outcomes (e.g., GDP or inflation), this paper introduces financial market uncertainty (VIX) for national stock markets as a key endogenous variable. This aligns more with Gertler and Karadi (2011) but is novel in the context of a multi-country EMDE panel.

- COVID-19 Specific Focus in EMDEs: Fratto et al. (2021) did highlight APPs during COVID-19, but their study was largely descriptive and limited to short-term impacts and program types. This paper, instead, is broader in terms of analyzing annual panel data from 2013–2022, enabling pre- and post-COVID comparison.
- Empirical rigor through Robustness Checks: the methodology in this paper includes a baseline model using CB balance sheet expansions and a robustness test with policy interest rates—strengthening the reliability and depth of our results beyond what many event-based or purely theoretical studies offer.

1.3 Research Objectives

This main objective of this thesis is to measure the impact of UMP tools, represented by expanding the CB balance sheets by observing the size of total assets, in enhancing the economic growth and price stability during the COVID-19 pandemic in the emerging markets through using a Panel VAR model. Other relevant objectives are as follows:

- To analyze the effectiveness of UMP tools in EMDEs: especially, APPs and its effect on economic growth and stability in (EMDEs) during the Covid-19 pandemic.
- To assess the impact of CB Balance Sheet expansions on key economic variables: examine how an increase in CB balance sheets, particularly through quantitative easing (QE), affected inflation, economic output (GDP), and financial market uncertainty in EMDEs.
- To Provide Policy Recommendations for EMDEs: Based on the findings, they offer policy recommendations on the effective use of UMP tools in emerging markets, particularly in times of economic crises or global recessions.

1.4 Research plan

This paper is structured as follows: The first section reviews the introduction, including research problem, significance and objectives. The second section presents the literature review. The third section discusses the stylized facts regarding the macroeconomy and UMP in the economies under consideration. Fourth section provides an overview of the panel VAR model and the data used

in the analysis, including the benchmark results, in addition to robustness checks to validate the findings. Fifth and last section provides the conclusion and policy recommendations.

2- LITERATURE REVIEW

Throughout the literature, studies have shed light on the role of UMP tools during different types of crises. Empirical literature generally agrees that UMP tools, especially QE programs, boost output, initially raises market uncertainty and lead to gradual buildup of inflationary pressures.

- Bernanke and Gertler (1999) and Krishnamurthy and Vissing-Jorgensen (2011) suggested that prolonged QE leads to a gradual buildup of inflationary pressures as excess liquidity in the economy eventually leads to higher demand and upward pressure on prices.
- Besides, Lenza et al. (2010) studied the effectiveness of UMP in the euro-area through studying the response of three CBs to the 2007-09 financial crisis which are: the ECB, the Federal Reserve and the Bank of England. They concluded that QE has mainly worked through its effect on interest rates spreads; and suggested that the UMP measures have played a quantitatively significant role in stabilizing the financial sector and economy after the collapse of Lehman Brothers.
- Gertler and Karadi (2011), found out that CB asset expansion initially raises market uncertainty due to the unexpected nature of policy shifts and concerns over future inflation or asset bubbles.
- MacDonald and Popiel (2017) analyzed UMP in a small open economy, specifically Canada, by using shadow interest rates to account for policy actions at the zero-lower bound (ZLB) in a Bayesian structural vector autoregressive (SVAR) model. Their findings suggest that during the ZLB period, Canadian UMP boosted output by an average of 0.13 percent, while US unconventional monetary policy had a significantly larger impact, increasing Canadian output by an average of 1.2 percent. These results highlight the effectiveness of domestic UMP and the substantial spillover effects of foreign UMP on a small open economy.

- Eryilmaz and Yilmaz (2020) aimed to analyze the effectiveness of UMP measures adopted by the European Central Bank (ECB) in the period from 2008 till 2016, by using VAR methodology. The study used the size of the balance sheet of the ECB as an indicator of unconventional monetary policy, by giving a shock to a balance sheet and then analyzing the effects on VIX (as an estimate for financial market risk aversion and a general proxy for financial turmoil, economic risk and uncertainty), output and prices. Their findings indicate that the ECB's (UMP) is effective in stimulating the real economy but does not significantly alleviate stress in the financial markets.
- Fratto et al. (2021) introduced a new dataset of APPs implemented by 27 EMDEs as a kind of UMP used to mitigate the effects of COVID-19 pandemic from March till August 2020. The study found that although some of the EMDEs countries like Brazil, Chile, Ethiopia, Hungary, Israel, Korea and Mauritius targeted corporate or bank bond markets, Egypt was the only country that purchased equities to support asset prices, boost confidence and mitigate market volatility.
- Feldkircher et al. (2021) tried to measure the effectiveness of the US monetary measures taken to boost the U.S economic activity. They proposed a novel mixed frequency vector autoregressive (MF-VAR) model. This model allowed them to combine weekly and monthly information within a unified framework. Their model combined a set of macroeconomic aggregates such as industrial production, unemployment rates, and inflation with high frequency information from financial markets such as stock prices, interest rate spreads, and weekly information on the Fed's balance sheet size. The main results suggested that the US Fed was successful in stimulating growth by higher equity prices and more long-term financing conditions.

In conclusion, the empirical literature on UMP demonstrates the effectiveness of UMP tools, particularly in times of crisis. Studies consistently show that UMP measures, such as QE, can stimulate output, control inflation, and influence financial market dynamics. The following section reviews the evolution of key macroeconomic variables and CB balance sheets for the countries included in the dataset.

3- MONETARY POLICY IN EGYPT

This section presents the framework of the Monetary Policy (MP) in Egypt. It's divided into two parts. The first part presents the MP objective and framework in Egypt and its evolution through time. The second part reviews the main developments of the MP during the covid-19 pandemic.

3.1 Objectives

(MP) in Egypt is primarily guided by the CBE, with its core objectives defined by the Central Bank and Banking System Law No. 194 of 2020. These objectives have evolved over time but generally include:

- Price Stability: The main objective of MP in Egypt is to control inflation, aiming for stable prices. The focus has shifted from a dual mandate of promoting both growth and controlling inflation to a more targeted approach focused on inflation targeting.
- Exchange Rate Stability: Given Egypt's reliance on foreign trade, particularly with imports like oil and food, exchange rate stability remains a critical policy objective.
- Economic Growth: Although price stability is prioritized, economic growth is also an important goal. However, growth has often been limited by external shocks, political instability, and structural challenges.
- Financial Stability: The CBE plays a significant role in ensuring the stability of Egypt's banking system and financial markets, which has become increasingly important as Egypt's financial system is more integrated into global markets.

These objectives collectively guide the CBE's actions to ensure stability and resilience within Egypt's monetary and financial systems.

3.2 MP Framework in Egypt: Evolution Overview

Egypt's MP has evolved significantly over the past three decades, adapting to internal and external challenges. Below is a summary of its development:

1990-2005: Early Reforms and Financial Liberalization

In 1991, the CBE removed administrative controls on interest rate and credit ceilings to liberalize the financial sector and foster market-driven pricing and credit allocation. Regarding Operational Shifts, the CBE initially targeted broad money supply (M2), and shifted to manage short-term interest rates by 2005.

In this period, inflation spiked in the early 2000s, particularly after currency devaluations. In 2001, Egypt moved from a fixed exchange rate to a more flexible regime, culminating in a floating exchange rate system in 2003. As a result, the CBE gradually used indirect tools like open market operations and interest rates rather than direct controls.

2005-2010: Adopting Inflation Targeting (IT)

In 2005, the CBE shifted to an inflation-targeting approach, focusing on the overnight interbank interest rate as the primary operational target. The CBE introduced an interest rate corridor system to manage short-term interest rates within a specified range, enhancing transparency and flexibility. In 2009, a core inflation index was introduced to better gauge underlying inflation trends. The CBE faced challenges in fully implementing a functional monetary transmission mechanism and managing currency depreciation, especially after the float of the Egyptian pound in 2003.

2008-2009: Global Financial Crisis (GFC)

The GFC caused rising inflation and a slowdown in growth. Egypt faced a dual challenge of high inflation and declining global demand. The CBE eased monetary policy by cutting interest rates and providing liquidity support. It also took measures to support SMEs and stabilize the exchange rate, including foreign exchange interventions.

2011-2016: Post-Revolution Economic Challenges

Following the 2011 revolution, Egypt faced high inflation, declining foreign reserves, and a depreciating currency: In 2012, the CBE adopted a formal inflation-targeting framework, but high inflation persisted due to supply-side shocks and fiscal imbalances. In response to a foreign exchange crisis, the CBE

devalued the pound in 2016, leading to sharp inflation. The CBE raised interest rates significantly to control inflation, but this dampened economic growth.

COVID-19 Pandemic (2020)

The CBE responded swiftly to the economic impact of the pandemic, which caused both demand and supply shocks. To overcome the negative impacts of the pandemic, the CBE responded using the following tools:

- **Interest rate reduction:** The CBE reduced interest rates by 300 basis points in March 2020 to stimulate economic activity and support liquidity.
- **Liquidity Support:** The CBE injected liquidity into the banking system and implemented measures like loan repayment deferrals and low-interest loans to SMEs.
- **Foreign Exchange Management:** The CBE managed exchange rate fluctuations through market interventions and international reserves.
- **Inflation Management:** Despite expansive monetary measures, inflation remained relatively controlled, with the CBE targeting specific inflation ranges.

To conclude, Egypt's MP has undergone a transformation from a system reliant on direct controls and fixed exchange rates to a more market-oriented approach focused on inflation targeting and exchange rate flexibility. The CBE has progressively aligned its practices with global best practices, implementing reforms such as interest rate corridors, liquidity management tools, and inflation targeting. Despite challenges like political instability, global financial crises, and the COVID-19 pandemic, the CBE has shown adaptability, evolving its tools and frameworks to manage inflation, stabilize the currency, and support economic growth.

3.3 Evolution of key macroeconomic and financial variables in Egypt from 2013 till 2022

Between 2013 and 2022, Egypt's economy faced various challenges, from political transitions to external shocks like the COVID-19 pandemic. These events caused significant volatility in key macroeconomic indicators such as inflation (CPI), GDP growth, interest rates, and central bank assets. Key events, including the

2016 devaluation of the Egyptian pound and the IMF-backed reforms, as well as the global pandemic, had profound effects on these indicators. The aim of this analysis is to assess the effectiveness of Egypt's monetary policy in stabilizing the economy and fostering growth during periods of uncertainty (as shown in figure 1 below).

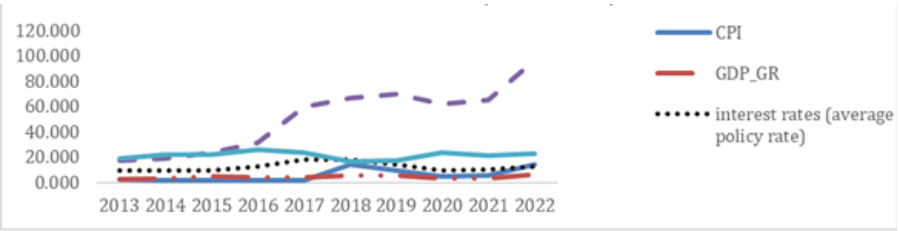


Figure 1: Egypt's Key Variables and the Responce of MP from 2013- 2022 (annual %)

Volatility, as measured by the VIX, spiked notably in 2016 and 2020, reflecting uncertainty following Egypt's currency float and the global economic disruption caused by the pandemic. Inflation surged after the 2016 devaluation, reaching 14.4%, but moderated to 5.1% in 2020 due to lower global demand. However, it rebounded to 13.8% in 2022, driven by supply chain disruptions and imported inflation. GDP growth initially slowed in 2016 due to the economic reforms, but recovered strongly thereafter, peaking at 5.33% in 2018 and again at 6.59% in 2022. Interest rates tracked inflationary trends, with the CBE raising rates in 2016 to stabilize the economy, easing them during the pandemic, and tightening them again in 2022 in response to renewed inflationary pressures. Meanwhile, the CBE's assets grew significantly from $17.7 billion in 2013 to $96.5 billion in 2022, reflecting the accumulation of foreign reserves and the central bank's use of liquidity management tools to stabilize the economy.

In summary, Egypt's macroeconomic performance over the last decade reflects a complex but coordinated response to reform, crisis, and recovery. The interplay between inflation, interest rates, output growth, financial volatility, and central bank strength demonstrates a maturing monetary policy framework increasingly capable of absorbing shocks and supporting economic stability. While vulnerabilities remain—especially in terms of inflation sensitivity and external

exposure—the broader trend points toward institutional strengthening and policy evolution in pursuit of long-term economic resilience.

Correlation analysis

When conducting the correlation between the CB assets, VIX, GDP and CPI variables, the analysis showed the following:

- A **strong positive correlation** (0.73) between CBE assets and GDP growth, indicating that as CBE assets grew, economic output tended to expand.
- A **moderately strong positive correlation** (0.78) between CBE assets and inflation, suggesting that as assets grew, inflation also tended to rise due to increased liquidity in the economy.
- A **weak negative correlation** (-0.10) between CBE assets and VIX, indicating that as CBE assets increased, market volatility decreased, reflecting greater financial stability.

Overall, Egypt's economy demonstrated resilience through effective monetary policy responses, including the central bank's management of its assets, which helped mitigate volatility and supported growth. However, external factors, like currency devaluation and global crises, presented ongoing challenges. The central bank's capacity to manage assets and balance inflationary pressures played a critical role in stabilizing Egypt's economy during a tumultuous decade.

4- Stylized facts

The dataset covers the period from 2013 to 2022, providing annual data for 25 EMDEs[1], which are grouped into five regions. This approach ensures representation from a diverse set of emerging markets across different parts of the world.

[1] The IMF World Economic Outlook divides the world into two major groups: advanced economies and emerging market and developing economies. This classification is not based on specific criteria and has changed over time. The group of EMDEs consists of 155 countries, and the regional breakdowns of these countries are as follows: emerging and developing Asia; emerging and developing Europe, Latin America and the Caribbean; Middle East and Central and Sub-Saharan Africa (IMF, 2023).

These groups include (1) Emerging and Developing Asia, which includes the following countries: China, Malaysia, Thailand, India, Indonesia and the Philippines; (2) Emerging and Developing Europe, which includes the following countries: Hungary, Poland, Russia and Türkiye; (3) Latin America and the Caribbean, which includes the following countries: Argentina, Brazil, Chile, Colombia and Mexico; (4) Middle East, Central Asia and Sub-Saharan Africa, which includes the following countries: Pakistan, Bahrain, Egypt, Jordan, Kuwait, Saudi Arabia, Tunisia, U.A.E and Morocco, and South Africa.

The evolution of key macroeconomic variables for the countries included in the dataset:

The COVID-19 pandemic has been a significant common economic factor all over the world. Figures (1-5) shows the evolution of the chosen variables in the model: CB Assets, VIX, CPI and GDP over the period from 2013 till 2022 (comprehensive table for the sources and definitions of variables are mentioned in the methodology). All charts show that all economies faced a notable decline in economic activity following the pandemic, followed by a decline in inflation.

When analyzing Emerging and developing Asia indicators from 2013 to 2022 according to each country, data reveals the following (as shown in Figure 2 below): China remains the dominant economic force in the region, with a strong and sustained increase in central bank assets and GDP recovery. Malaysia and Thailand showed significant volatility but are on a steady recovery path post-pandemic, although they are still lagging behind China in terms of growth in central bank reserves. India, Indonesia, and the Philippines had more moderate economic performances but showed positive signs of recovery in 2021-2022, with gradual increases in central bank assets indicating their focus on strengthening financial stability. The overall trend points to a robust recovery trajectory across the region, with countries leveraging CB assets to stabilize their economies and mitigate the long-term effects of the pandemic. However, inflationary pressures and slow GDP recoveries in some countries indicate challenges that still lie ahead.

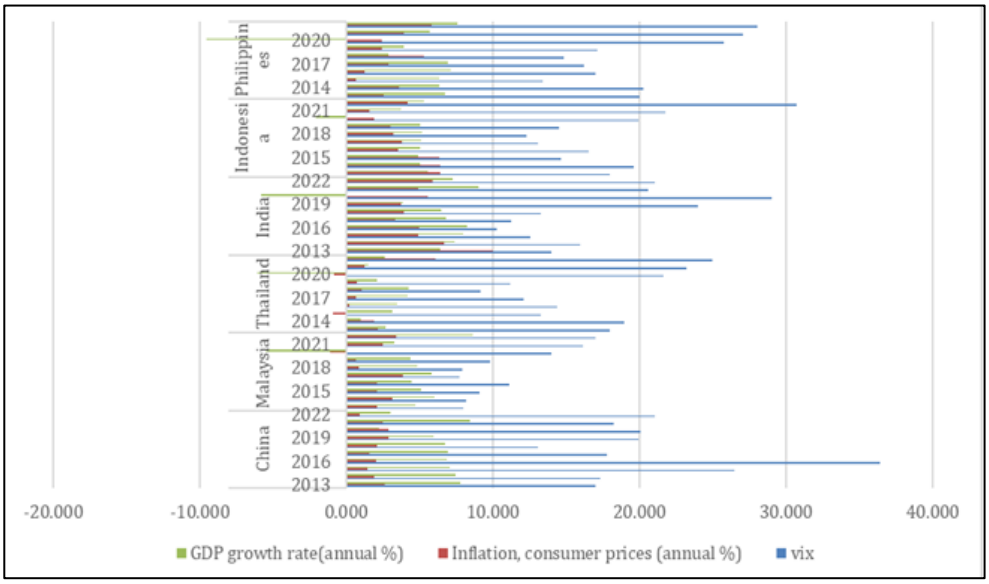
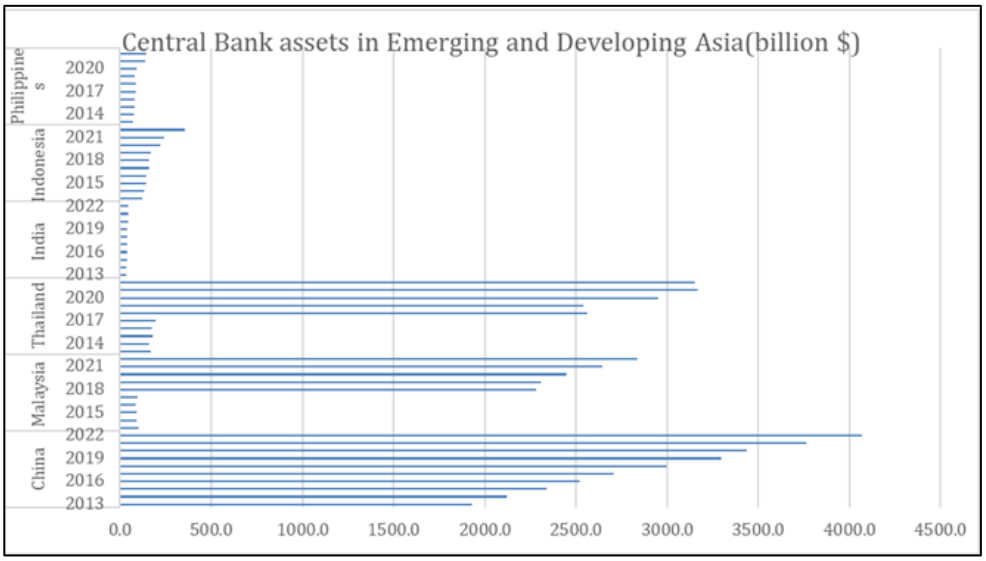


Figure 2: Macroeconomic Variables for Emerging and Developing Asia



Source of figures (1-5): Data on CB assets were obtained from the balance sheets of the CBs of the 25 selected EMDEs, CPI and GDP data were sourced from the World Bank's database, and VIX index was sourced from CBOE volatility index website.

When analyzing Emerging and developing Europe indicators by breaking down the data to individual countries, it reveals the following (as shown in figure 3 below): Poland demonstrated strong economic resilience, with robust GDP growth and a substantial increase in CB assets, though inflationary pressures

remained a challenge in 2022. Hungary showed moderate inflation and growth, with gradual increases in central bank assets, reflecting a steady but cautious economic recovery. Russia and Türkiye faced significant economic challenges, including geopolitical tensions, inflation, and market volatility, with more mixed results in terms of economic growth and CB reserves. Türkiye's severe inflation and volatility stood out as the most significant economic challenge among these countries. These countries have navigated varying levels of economic volatility, inflation, and geopolitical issues, with CB asset growth being a critical measure of their responses to global and domestic challenges.

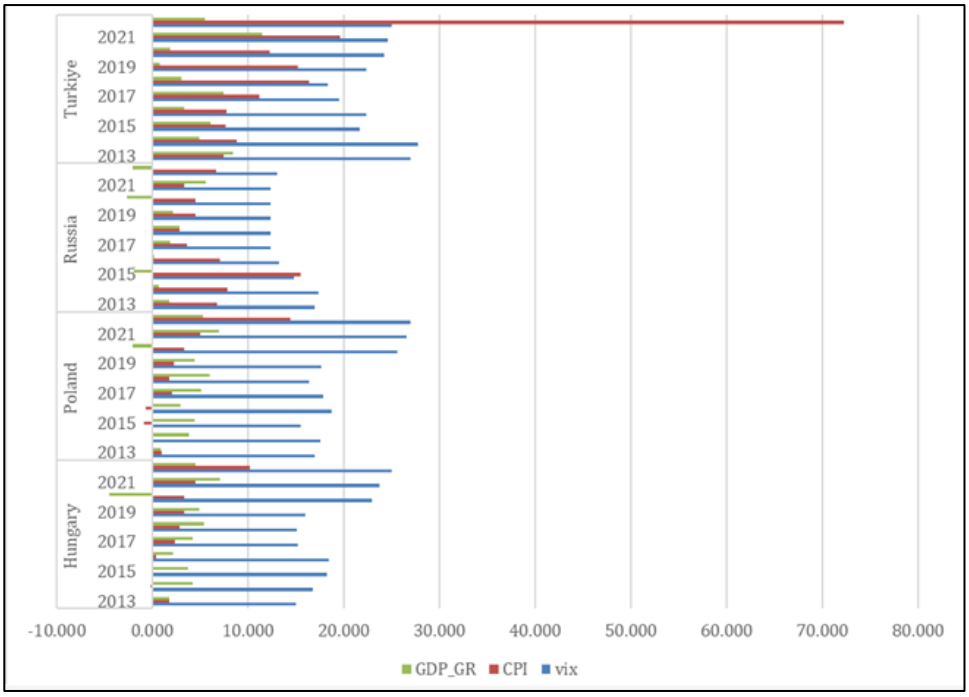
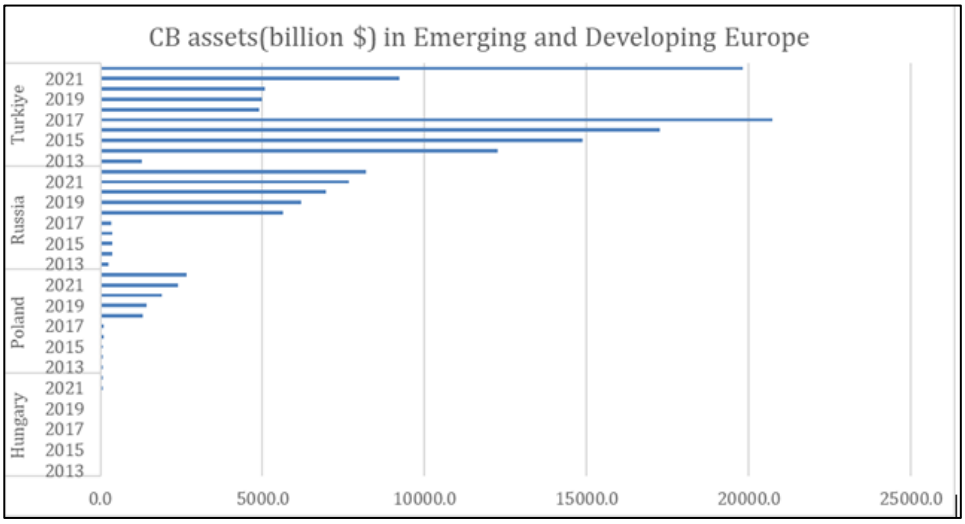


Figure 3: Macroeconomic Variables for Emerging and Development Europe



When analyzing Emerging and developing Latin America and the Caribbean indicators, by breaking down the data to individual countries, it reveals the following (as shown in figure 4 below): Argentina faced extreme economic instability with high volatility, hyperinflation, fluctuating GDP, and a sharp increase in CB assets due to crises and intervention measures. Brazil showed moderate volatility with fluctuating inflation and GDP growth, recovering post-pandemic but facing significant CB asset fluctuations. Chile remained stable with low volatility, consistent growth, and a steady increase in CB assets, showing resilience despite the 2020 contraction. Colombia has a stable economic profile with moderate volatility, steady growth, and consistent CB asset increases, indicating prudent financial management. Mexico experienced moderate volatility, recovering well from the pandemic with positive GDP growth and a steady increase in central bank assets. Overall, Chile and Colombia are the most stable economies, while Argentina faces the greatest instability, with Brazil and Mexico showing moderate resilience.

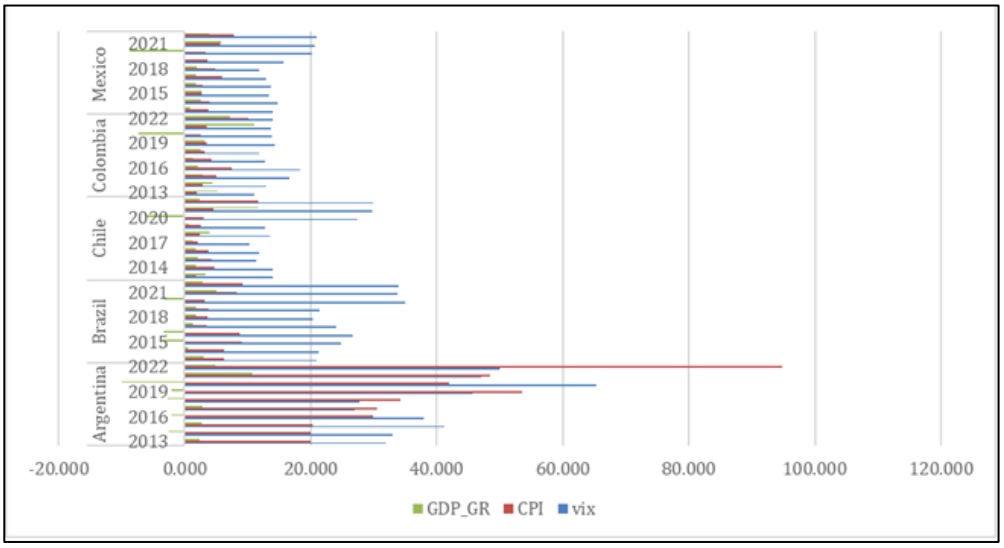
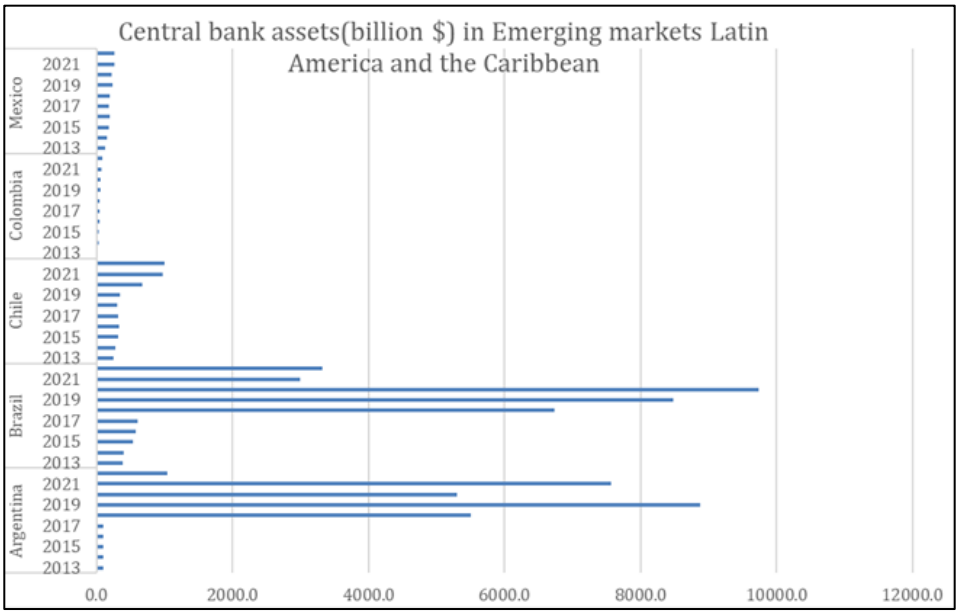


Figure 4: Macroeconomic Variables for Emerging and Development Latin America and the Caribbean



When analyzing Emerging and developing Middle East, Central Asia and South Africa indicators (as shown in figure 5 below), by breaking down the data to individual countries, it reveals the following: the economic performance of countries in the MENA region showed varied responses to global challenges,

particularly the COVID-19 pandemic. Countries like Pakistan, Saudi Arabia, and UAE saw significant volatility, particularly during the pandemic, reflecting external economic pressures and geopolitical tensions. Bahrain, Jordan, and Tunisia had more stable markets with lower volatility. Besides, Pakistan experienced severe inflation, while Saudi Arabia and UAE maintained low inflation. Egypt and Tunisia had fluctuating inflation rates, driven by currency issues and global factors. Economies like Saudi Arabia, UAE, and Morocco recovered strongly in 2021 and 2022, benefiting from oil price rebounds and diversification efforts. Pakistan and Egypt faced contractions in 2020 but showed some recovery afterward. Saudi Arabia, UAE, and Egypt saw strong CB asset growth, signaling financial stability, while Kuwait faced a decline in reserves. Pakistan experienced a reduction in assets, indicating financial challenges. Overall, oil-dependent economies like Saudi Arabia and UAE managed to recover more quickly than the other countries. Besides, South Africa's economy showed resilience, with recovery post-2020, although inflationary pressures emerged in 2022. The increase in CB assets during this period reflects the bank's efforts to mitigate volatility and stimulate the economy.

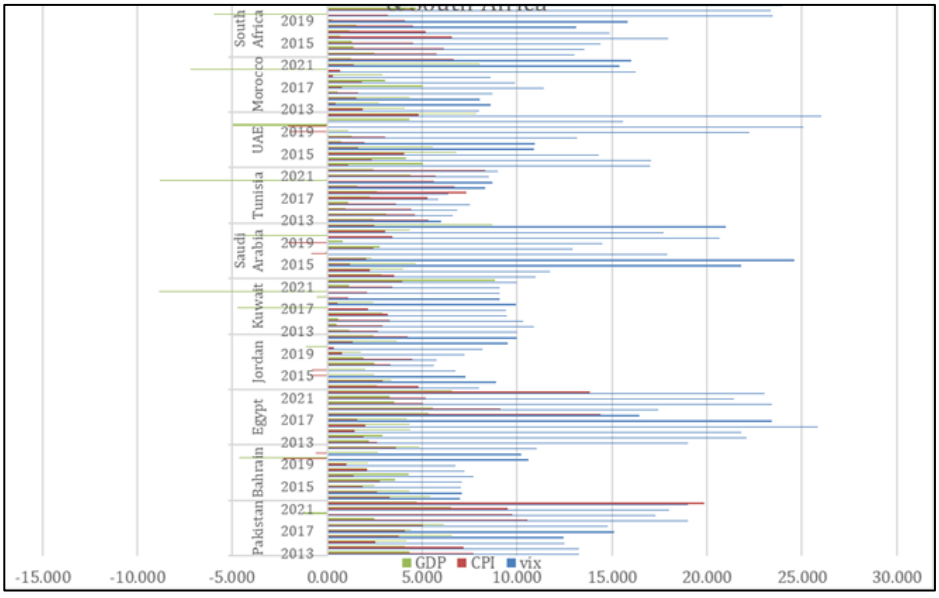
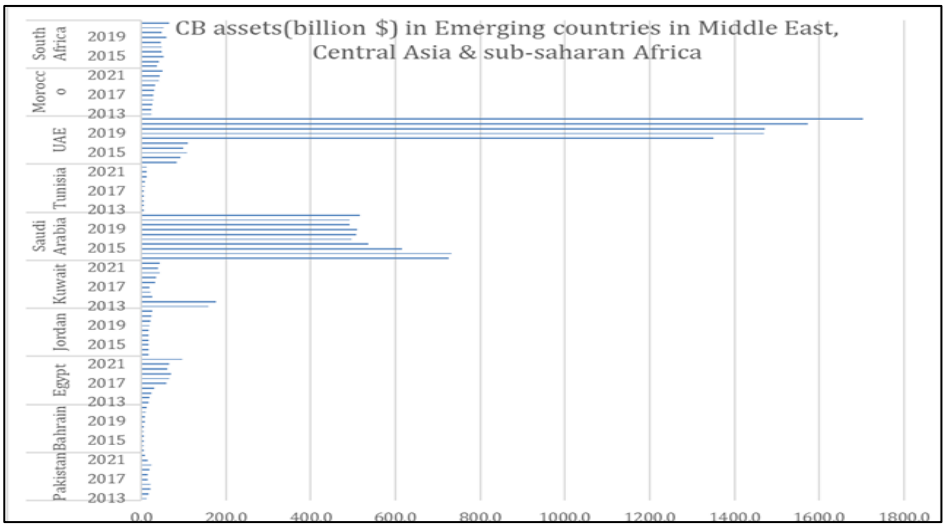


Figure 5: Macroeconomic Variables for Middle East, Central Asia & South Africa



To conclude, across all countries, the COVID-19 pandemic had a profound effect, marked by significant economic contractions, drops in CPI, negative GDP growth, and fluctuations in the VIX. CBs responded by ramping up their CB assets significantly during 2020-2021, to mitigate volatility and stimulate the economy. As when CBs used UMP through purchasing assets like government bonds or other securities, they inject liquidity into the financial system, which lowers the cost of borrowing. This encourages businesses and individuals to take loans for investment and consumption, boosting demand in the economy. In addition, when CBs expand their balance sheets, they increase the amount of money circulating in the economy. This is particularly important during economic downturns when businesses and financial institutions may be reluctant to lend or borrow due to uncertainty. Increased liquidity helps stabilize financial markets and ensures that credit remains available, which can encourage investment and consumer spending. Besides, CBs managed to mitigate volatility through stepping in to stabilize financial markets by purchasing assets. This creates a safety net, reducing panic selling and preventing a further deterioration in asset prices. In turn, this reduces systemic risks in the financial system and creates a sense of stability, encouraging investors to remain active in the markets. (Li, 2024).

5- EMPIRICAL FRAMEWORK AND METHODOLOGY

As highlighted in the introduction, the primary objective of this paper is to evaluate the effectiveness of UMPT in enhancing economic activity during the COVID-19 pandemic, with a particular focus on emerging markets, including Egypt. The analysis aims to understand how the expansion of central bank balance sheets, through mechanisms like asset purchases, influenced key macroeconomic variables such as inflation, GDP, and financial market volatility in these countries during the crisis.

VAR models were widely used in the literature as a tool to analyze the macroeconomic effects of conventional and UCMP tools used at times of crises. Examples include: Neaime and Gaysset (2022), Lenza et al. (2010), Gambacorta et al. (2012), Baumeister and Benati (2012) and Briciu and Lisi (2015). The econometric model employed in this paper is a Panel VAR, designed to measure the impact of central bank balance sheet expansions (through asset purchases) on both financial and real economic variables in emerging markets. The modelling technique was in accordance with Gambacorta et al. (2013). The effects of the COVID-19 pandemic were largely similar across countries, allowing for the use of panel estimation techniques. These techniques not only account for cross-country variation but also enhance the robustness and validity of the results by exploiting the panel structure. Mean Group Estimator (MGE) was used, following Gambacorta et al. (2012), as it accommodates differences across countries and doesn't necessitate that the economic structures of the economies in the VAR model are identical (Assenmacher-Wesche & Gerlach, 2010).

5.1 Data and Variables Definition

The dataset for this analysis covers 25 Emerging Market and Developing Economies (EMDEs). The primary variables used in the analysis were utilized in accordance with Gambacorta et al. (2012) as follows:

Variable	Description	Data Source
CB Assets	This variable serves as a proxy for the (UMPT) and reflects the size of the CB's balance sheet. It reflects the total assets held by the CB, which is an indicator of the financial stability and the monetary policy strength of a country.	CB balance sheets of 25 selected EMDEs
Volatility Index (VIX)	The VIX is used as an indicator of financial market uncertainty and disorder. It represents the market's expectation of 30-day future volatility in the stock market. The VIX is commonly referred to as the "fear gauge" of the market, and it captures the degree of investor uncertainty, which was particularly significant during the COVID-19 pandemic. (Whaley, 2009).	CBOE Volatility Index website
Inflation (CPI)	Inflation is measured using the CPI, and is used here to reflect how the expansion of CB balance sheets influences price levels across these economies.	World Bank database
GDP	GDP serves as a proxy for real economic activity and is used to assess the impact of CB balance sheet expansion on the broader economy. This helps to understand how changes in CB policies may translate into economic growth or contraction.	World Bank database

5.2 Model Results discussion

The panel VAR model we examine is represented as follows, (in accordance to Gambacorta et al. (2012)):

$$Y_{i,t} = \alpha_i + A(L)_i Y_{i,t-1+} + B_i \varepsilon_{i,t}$$

where; $Y_{i,t}$ is a vector of endogenous variables, α_i is a vector of constants, $A(L)_i$ is a matrix polynomial in the lag operator L, and B_i represents the contemporaneous impact matrix of the mutually uncorrelated disturbances ε_i for each economy i=1,...,N. In the baseline specification, the vector of endogenous variables $Y_{i,t}$ includes four variables: the log of seasonally adjusted: real GDP, CPI, CB assets, and (VIX) for the national stock market index. CB assets is used as a proxy of UCMP in the baseline specifications, while the conventional monetary policy tool, which is policy rate, will be used in the robustness test as a variation to the baseline scenario, in the following section.

5.3 Impulse Response Functions (IRFs)

The core objective of this paper is to evaluate the effectiveness of (UCMP) implemented by central banks in emerging markets. To achieve this, (IRFs) were used derived from the VAR model to trace the effect of shocks to central bank balance sheet expansion on the macroeconomic variables of interest, namely inflation, GDP, and financial market volatility (as shown in figure 6).

IRFs were obtained using Cholesky Decomposition, a widely used method that helps to identify the responses of each variable to shocks in the system.

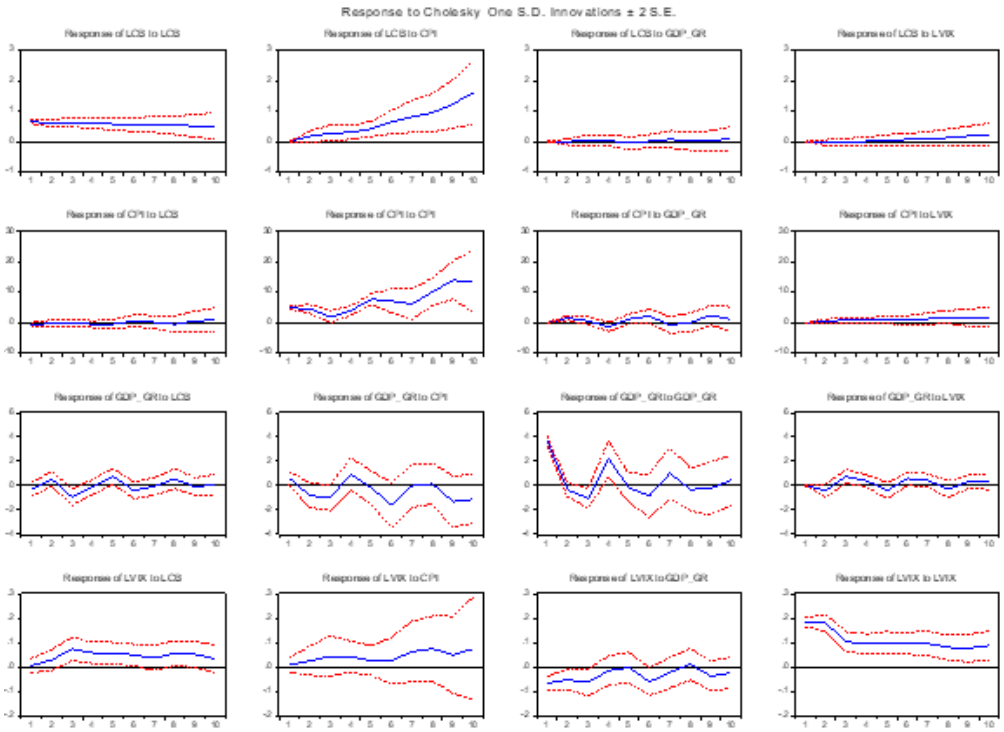


Figure 6: Impulse Response Function of Central Bank Assets Shock

5.4 Findings from Impulse Response Analysis

- **Response of CPI to the CB Assets Shock**: The analysis showed that in the first four periods following a shock to central bank assets, CPI was largely unresponsive. However, from the fifth period onward, the CPI began to show a significant increase, with the response persisting even at the end of the forecast horizon, indicating that central bank asset expansion exerted upward pressure on prices over time.

This finding aligns with the expectations of the "inflationary effect" of CB asset expansions, as highlighted in the work of Bernanke and Gertler (1999) and Krishnamurthy and Vissing-Jorgensen (2011). Their studies suggest that prolonged (QE) leads to a gradual buildup of inflationary pressures as excess liquidity in the economy eventually leads to higher demand and upward pressure

on prices. The delayed response of CPI suggests that the impact of CB asset expansion on inflation is not instantaneous. This could be due to the time needed for liquidity to circulate through the economy and influence demand-side pressures (Blanchard, 2020). Therefore, CBs need to monitor the evolving inflation expectations over a longer period to make effective policy adjustments.

- **Response of VIX to the CB Assets Shock:** The VIX responded strongly to the initial shock, rising steadily in the first three periods, reflecting increased market uncertainty. After the third period, the response of the VIX began to taper off, stabilizing for the remainder of the forecast horizon, suggesting that the initial shock to central bank assets had a lasting, though diminishing, impact on market volatility.

This result is consistent with earlier studies such as Eryilmaz and Yilmaz (2020) and Gertler and Karadi (2011), which observed a transient spike in market volatility following CB interventions, particularly during periods of crisis. CB asset expansion initially raises market uncertainty due to the unexpected nature of policy shifts and concerns over future inflation.

Our findings show that the diminishing impact of the shock on the VIX suggests that while CB asset expansions can initially create uncertainty in the financial markets, the effect may be temporary. As market participants adjust to the new liquidity conditions, volatility tends to stabilize. This suggests that while CB interventions can initially increase volatility, their longer-term effect may be more stabilizing as markets find equilibrium.

- **Response of GDP to the Central Bank Assets Shock**: GDP showed a positive response to the shock in the first two periods, suggesting that central bank asset expansion had an initial positive effect on economic activity. However, after the second period, the response fluctuated, and the effect did not completely dissipate by the tenth period, indicating that the impact on GDP was more persistent than on inflation and financial market volatility.

The positive initial response of GDP to CB asset expansion is consistent with the findings of studies like Fratto et al. (2021) and Feldkircher, et al. (2021), which suggest that monetary stimulus (such as QE) has a significant initial impact on

economic growth by reducing borrowing costs and increasing demand for goods and services, and that asset purchases can provide an economic boost by enhancing liquidity and supporting credit markets.

Our findings show that the persistence of the GDP response indicates that CB asset expansion can have a sustained impact on economic growth, and that even after the initial period of economic stimulus, the effects of asset purchases continue to support economic activity by maintaining low borrowing costs and improving business confidence. This finding highlights the long-term benefits of monetary stimulus in fostering growth, especially in times of economic downturn.

- **Response of Central Bank Assets to its Own Shock:** Unsurprisingly, central bank assets exhibited a strong positive response to its own shock, with the response being significant throughout the entire forecast horizon.

This finding is consistent with the expected behavior in studies examining the dynamics of CB balance sheets. When a shock occurs to CB assets, typically through the purchase of government bonds or other securities, the assets of the CB increase immediately and persistently, as outlined by Krishnamurthy and Vissing-Jorgensen (2011) and Fratto et al. (2021).

Our finding suggests that the strong and persistent response of CB assets to their own shock indicates that CBs are likely to maintain or even expand their balance sheets over the medium to long term to achieve their policy goals, such as economic stabilization and price stability.

5.5 Robustness analysis: Model extension

In order to evaluate how the benchmark results, hold up when additional variables are added, one extension was included off the benchmark model: which is interest rate. There is a possibility that the effects of UMP shocks may partially reflect the impact of interest rate cuts. To evaluate the significance of this potential issue, interest rate is included as an extension to the benchmark VAR (Gambacorta et al. (2012). Figure 7 below shows the average policy interest rates for EMDEs in different regions over the years 2013 to 2022.

Figure 7-1 shows that most countries in Emerging and Developing (EMD) Asia have shown a downward trend in interest rates over the decade, reflecting global monetary policy trends, including accommodating inflation, boosting growth, and responding to economic shocks like COVID-19 pandemic. While countries like Thailand, China, and India showed gradual decreases, Malaysia, Indonesia, and the Philippines had more noticeable fluctuations. The overall trend in these countries appears to lean towards lowering interest rates to promote economic activity and manage inflationary pressures.

Figure 7-2 illustrates how CBs in EMD Europe have adjusted their monetary policies over the past decade in response to both domestic and global economic conditions. While there was a general trend of lowering interest rates in the years following the global financial crisis, the sharp increases in 2022 reflect growing inflation concerns, especially in light of the pandemic and regional geopolitical instability. Each country's response to these challenges varies, with Russia and Turkey showing particularly high volatility due to domestic and external shocks.

Figure 7-3 graph illustrates that the policy rate adjustments across the EMD Middle East and Central Asia region demonstrate a combination of factors, including inflation control, currency stabilization, and efforts to mitigate the impact of the COVID-19 pandemic. Countries with higher levels of economic instability, such as Pakistan, Egypt, and Tunisia, have had more pronounced rate fluctuations, while those with more stable economies, like the UAE and Bahrain, have seen more gradual adjustments.

Figure 7-4 reviews the policy rate changes across EMD Latin America and the Caribbean, which reflect a complex economic environment with varied regional challenges. Countries like Argentina and Brazil have had to contend with persistent inflation, leading to high and volatile rates, while others like Chile and Colombia have adjusted their policies more gradually. The sharp rise in rates in 2022 across the region is largely a response to inflation and the economic impact of the pandemic, following a global trend of tightening monetary policy.

Figure 7-5 shows South Africa's interest rate movements over the 2013-2022 period, reflecting a balance act between controlling inflation, stimulating economic growth, and responding to external shocks like the COVID-19

pandemic. The rate cuts in 2020 were a direct response to the pandemic's economic impact, while the rate hikes in 2021 and 2022 align with the global trend of tightening monetary policies to combat inflation.

Figure 7-1: Average CB Policy Rates in Emerging and Developing Asia (%)

Figure 7-2: Average CB Policy Rates in Emerging and Developing Europe (%)

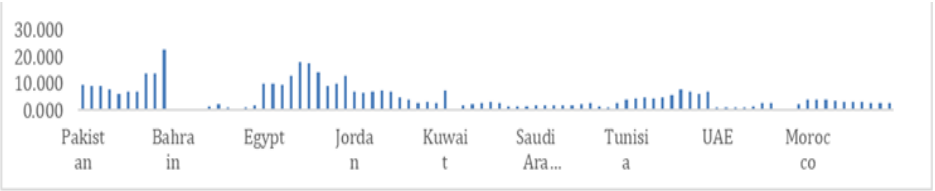


Figure 7-3: Average CB Policy Rates in Emerging and Developing Middle East and Central Asia (%)

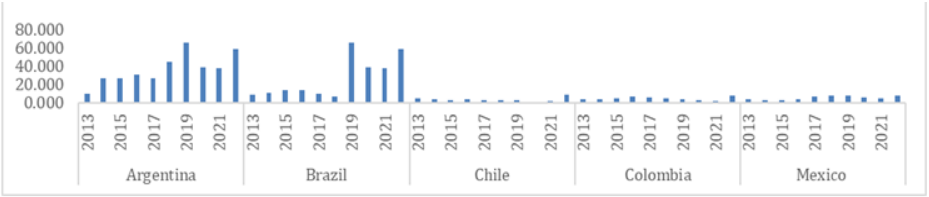


Figure 7-4: Average CB Policy Rates in Emerging and Developing America and the Carribean (%)

Figure 7-5: Average CB Policy Rates in Emerging and Developing Sub Saharan Africa (%)

Source of all graphs of figure 7: BIS data portal, CB policy rates

5.6 IRFs of model extension

Figure 8 below shows the impulse responses obtained from the extended model after adding interest rates; where Y1 refers to VIX, Y2 refers to CPI, Y3 refers to GDP, X2 refers to interest rate & X1 refers to CB assets.

The charts indicate that there is almost no notable difference between the results. The bands for all 15 variables are strikingly similar in shape, and they overlap significantly. This suggests that the CB balance sheet shocks identified in the benchmark model are not substantially influenced or distorted by the effects of changes in policy rates. In other words, the policy rate fluctuations do not appear to have a major impact on the outcomes observed in the model. Therefore, we can conclude that the balance sheet shocks remain largely independent from the variations in interest rates, allowing for a more accurate representation of the CB's actions. This finding reinforces the reliability of the benchmark model in capturing the true dynamics of the CB's balance sheet adjustments without significant interference from other monetary policy tools.

This finding shows a contrast to previous studies which often investigates the interaction between different monetary policy tools, such as interest rates and balance sheet policies (QE, APP, etc.). Some studies have suggested that these tools might influence one another (e.g., Krishnamurthy & Vissing-Jorgensen, 2011; Gertler & Karadi, 2011). On the contrary, literature on the ZLB agrees with our finding as they validate the notion that balance sheet actions (like changes in asset holdings) have independent effects from other monetary policy tools, such as interest rates on the economy. For instance, Canada, the euro area, Japan, Norway, Switzerland, Sweden, the United Kingdom and the United States have

used balance sheet policies without necessarily changing interest rates to stimulate the economy during periods of low interest rates (Gambacorta et al., 2012) and (Wu, Zhang, 2019).

Therefore, the absence of significant interactions between balance sheet shocks and variations in interest rates indicates that CBs can use balance sheet policies to directly influence financial markets and economic conditions independently of the nominal policy rate. This could have important implications for CBs operating near the ZLB or in an environment of low interest rates, where the policy rate is constrained, and balance sheet actions may be more effective.

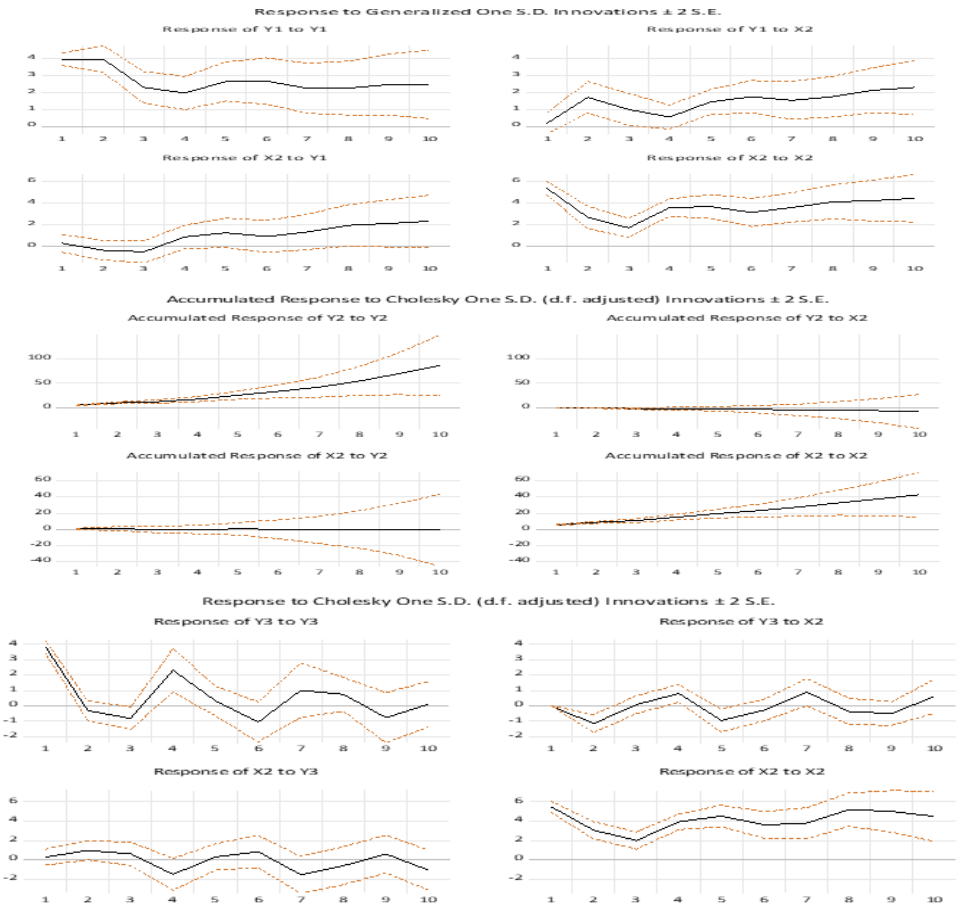


Figure 8: IRF of the extended model after adding interest rates

6- CONCLUSION AND POLICY RECOMMENDATIONS

6.1 General conclusion

The paper examines the impact of CB assets, as a proxy for UCMP, on prices and output in (EMDEs), including Egypt. A Panel VAR model was used to analyze the effects of CB balance sheet size on key economic indicators like the CPI, VIX, and GDP, through IRFs. Key findings include remained unresponsive to CB asset shocks in the short run, but showed an increasing response over time. VIX increased sharply in the first three periods but then declined and stabilized, potentially reflecting the announcement effect of the policy. GDP showed a positive response to CB asset shocks initially but fluctuated over time without disappearing by the 10th period.

When interest rates were added to the model, the results remained largely unchanged, suggesting that changes in interest rates did not significantly influence the impact of CB asset shocks.

In conclusion, CB assets, as a UCMP tool, did not significantly affect prices in the short term but had a positive impact on GDP.

6.2 Conclusion regarding Egypt

Over the past decade, Egypt's MP has evolved significantly, shifting from direct controls to a market-oriented approach focused on inflation targeting, exchange rate flexibility, and financial stability. The CBE has adapted its policy tools to respond to internal challenges, such as political instability and economic reforms, as well as external shocks like the 2016 currency devaluation and the COVID-19 pandemic. These efforts have contributed to stabilizing inflation, supporting economic growth, and managing volatility.

From 2013 to 2022, Egypt's macroeconomic performance demonstrated the CBE's ability to mitigate disruptions using monetary policy tools. The growth in CBE assets helped support economic expansion and reduce market volatility, though inflation remained sensitive to external factors. Despite challenges, Egypt showed resilience, with GDP growth recovering strongly after reforms and the pandemic, and inflation being relatively controlled at times.

However, vulnerabilities remain, particularly regarding inflation sensitivity and external exposure. These challenges highlight the need for continued refinement of the CBE's policy framework to better manage inflation and minimize the impact of global economic shocks.

6.3 policy recommendations for EMDEs

- **Focus on Long-Term Policy Effectiveness**: Since CB assets did not significantly affect prices in the short term, EMDEs should adopt complementary policies, like tightening fiscal policies or targeted price stabilization, to manage inflation.
- **Strengthen Communication and Credibility**: CBs should improve transparency and communication to shape market expectations and reduce uncertainty, especially when using unconventional tools like APPs.
- **Diversify Monetary Policy Tools**: EMDEs should combine UCMP with other tools, such as forward guidance and targeted liquidity injections, while carefully assessing financial risks and ensuring operational preparedness.
- **Adopt a Gradual Approach**: CBs in EMDEs should implement asset purchase programs gradually to avoid market distortions and excessive volatility, assessing the effects before continuing or modifying the approach.
- **Weigh Risks of APP**: While asset purchases can help meet policy goals, they carry risks, including financial losses and fiscal dominance. CBs should ensure they can exit APP without compromising price stability or credibility.
- **Focus on Monitoring and Evaluation**: EMDEs should establish robust monitoring frameworks to track the impact of UCMP on inflation, GDP, and market volatility, ensuring policies are effective without long-term destabilizing effects.
- **Strong Fiscal Position**: Governments should ensure fiscal strength to support potential losses and maintain the CB's independence, avoiding excessive reliance on cheap financing from the central bank.
- By adopting a more comprehensive and tailored approach to UCMP, CBs in EMDEs can improve policy effectiveness and support economic recovery while mitigating risks.

6.4 policy recommendations for Egypt

Short-Run Recommendations:

In the short run, Egypt's MP needs to address immediate economic challenges and stabilize key variables such as inflation, growth, and financial market volatility. The focus should be on quickly responsive measures that can provide temporary relief or stability to the economy.

- **Inflation Management through Interest Rates:** The CBE can adjust interest rates to control inflationary pressures in the short term. For instance, if inflation spikes due to global supply disruptions or domestic factors, the CBE can raise interest rates to curb demand and reduce inflation. Conversely, if inflation is low or economic growth is slow, the CBE may reduce interest rates to stimulate demand.
- **Liquidity Support for the Banking System:** In response to economic shocks (such as the COVID-19 pandemic), the CBE can provide liquidity support to banks, ensuring that credit remains accessible to businesses and consumers. This can involve injecting liquidity into the banking system and facilitating loan repayment deferrals or offering low-interest loans to SMEs and other critical sectors.
- **Foreign Exchange Interventions:** The CBE can intervene in the foreign exchange market to stabilize the Egyptian pound, particularly if there is a sharp depreciation or volatility. These interventions might involve utilizing foreign reserves to manage the exchange rate in the short term, reducing pressure on the currency.
- **Targeted Financial Support and Crisis Response**: During economic crises (like the pandemic), immediate financial support for sectors most affected by the crisis (tourism, trade, services) should be prioritized. The CBE can collaborate with the government to offer targeted stimulus packages, such as tax breaks or direct financial aid to vulnerable sectors.
- **Clear Communication on MP:** In times of uncertainty or crisis, clear and transparent communication about the CBE's actions and its commitment to

stabilizing the economy is critical. This helps reduce market uncertainty and manage expectations regarding inflation, interest rates, and growth.

Long-Run Recommendations:

In the long run, Egypt's MP should focus on structural reforms that will enhance economic stability, sustainable growth, and resilience to external shocks. These policies aim to create a more robust and diversified economy while addressing deep-rooted issues that may hinder long-term prosperity.

- **Strengthening the Foreign Exchange System**: In the long term, Egypt should focus on diversifying its sources of foreign exchange to reduce vulnerability to external shocks. This includes improving export competitiveness, attracting foreign direct investment, and diversifying the sources of remittances. Over time, these measures will reduce the reliance on volatile capital flows and help stabilize the currency.
- **Structural Reforms to Support Sustainable Growth:** Egypt should focus on long-term structural reforms in areas such as education, energy, labor markets, and industrial diversification. These reforms will improve productivity, increase private-sector investment, and create jobs, ultimately supporting sustainable economic growth. This will also help reduce the economy's reliance on external factors such as oil prices or global trade dynamics.
- **Establishing a Robust Crisis Management Framework:** To mitigate the impact of future global economic crises, Egypt should establish a more proactive and comprehensive crisis management framework. This should involve improving fiscal policy coordination, enhancing social safety nets, and creating contingency plans that can be quickly activated during periods of global economic stress.
- **Effective use of Macroprudential policy**: Macro prudential policy plays a vital role in supporting Egypt's financial, economic, and monetary stability, particularly given the country's vulnerability to external shocks, currency volatility, and structural weaknesses in its financial system. By strengthening the resilience of the banking sector through higher capital adequacy

requirements and tighter loan provisioning rules, Egypt has managed to maintain financial stability amid inflationary spikes and crises such as the COVID-19 pandemic. Tools like loan-to-value and debt-to-income ratios help curb excessive household debt and prevent credit bubbles, especially as the country promotes housing finance. Additionally, foreign exchange exposure limits and liquidity requirements have proven essential in managing risks associated with currency devaluation and capital outflows. Measures such as liquidity coverage ratios and targeted credit support during the pandemic ensured the continuity of economic activity and protected vulnerable sectors. Furthermore, enhancing macro-financial surveillance and systemic risk monitoring through improved data and institutional coordination strengthens Egypt's capacity to detect and mitigate emerging threats. Overall, macroprudential policy complements monetary policy by preserving financial sector health, containing systemic risk, and building investor confidence, which are all crucial for achieving long-term economic resilience in Egypt.

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أثر السياسة النقدية غير التقليدية على النمو الاقتصادي: أدلة تطبيقية من الأسواق الناشئة مع الإشارة الخاصة لمصر

د. هبة يوسف هاشم سارة محمود كامل

ملخص البحث باللغة العربية

منذ جائحة كوفيد-19، قامت البنوك المركزية حول العالم بتنفيذ برامج تحفيزية واسعة، معتمدة بشكل كبير على أدوات السياسة النقدية غير التقليدية، كما حدث بعد الأزمة المالية العالمية في 2007–2008. وقد تبنت الأسواق الناشئة والاقتصادات النامية لأول مرة برامج شراء الأصول لمعالجة الاضطرابات الاقتصادية وتعزيز الثقة.

يستعرض هذا البحث ما إذا كانت البنوك المركزية في 25 اقتصادًا ناشئًا ونامياً – بما في ذلك مصر- قد أثرت على الأسعار، مستوى معالجة المخاطر في الأسواق المالية، والإنتاج، من خلال أدوات السياسة النقدية غير التقليدية.

وباستخدام الميزانيات العمومية للبنوك المركزية كمؤشر تقريبي لتلك السياسات، تم تطبيق نموذج Panel VAR (الانحدار الذاتي الهيكلي متعدد البلدان). تشير النتائج إلى أنه على المدى القصير، لم تؤثر السياسات النقدية غير التقليدية على الأسعار، لكنها أثرت بشكل إيجابي على الناتج المحلي الإجمالي (GDP)، كما تنوعت استجابة مؤشر أسعار المستهلك (CPI) ومؤشر التقلب (VIX). أما على المدى الطويل، فقد بدأ مؤشر أسعار المستهلك في الارتفاع بشكل ملحوظ، مما يشير إلى أن توسع أصول البنك المركزي أدى إلى ضغوط تضخمية تدريجية.

في المقابل، بدأت استجابة مؤشر التقلب في الانحسار، واستقرت لبقية أفق التنبؤ، مما يشير إلى أن الصدمة الأولية لأصول البنك المركزي كان لها أثر دائم لكنه متناقص على تقلبات السوق.

وبالنسبة للناتج المحلي الإجمالي، فقد كانت الاستجابة متذبذبة، واستمر الأثر حتى الفترة العاشرة، ما يدل على أن أثر السياسات النقدية غير التقليدية على الناتج كان أكثر استمرارية مقارنةً بتأثيرها على التضخم وتقلب الأسواق المالية.

الكلمات الدالة: السياسة النقدية غير التقليدية، البنوك المركزية، برامج شراء الأصول، نموذج الانحدار الذاتي، الأسواق الناشئة والاقتصادات النامية، الميزانيات العمومية.

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