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Between Autonomy and Effectiveness: Unravelling the Relationship between Fiscal Deficits, Monetary Base Evolution, and Central Bank Autonomy in Egypt ⁽¹⁾

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Abstract

This paper aims to clarify the extent to which monetary policy in Egypt is affected by the fiscal deficit by implementing a model that depicts how the monetary authorities, expressed in terms of changes in the monetary base, respond to the evolution of the monetary policy objectives, in the presence of a large and chronic fiscal deficit over the period 2000 to 2022. Considering the year 2011 (the year of the social revolution) as a turning point that resulted many far-reaching social, economic and political consequences; Accordingly, the period divided into two periods, the period preceding the social revolution in 2011, and the other following it. To ascertain the existence of a long-run equilibrium relationship between the variables, we applied autoregressive distributed lag (ARDL) modeling and the error correction model, with this ultimately revealing the existence of strong cointegration in the long run. Our findings showed different results before and after 2011. Before the revolution, fiscal policy seemed to play a slight role in determining monetary policy in Egypt and at some level, the Central Bank of Egypt (CBE) was seen to have a certain degree of autonomy during this period. Post-revolution, however, shows the fiscal deficit at a high level of influence on the monetary base. This result leads us to question the extent and ability of the CBE to avoid financial policy pressures resulting from conditions of economic instability during the post-2011 period.

Keywords: Central Bank Autonomy, Fiscal Deficits, Egypt.

بين الاستقلالية والفعالية: كشف العلاقة بين العجز المالي وتطور القاعدة

النقدية واستقلالية البنك المركزي في مصر

الملخص

تهدف هذه الدراسة إلى توضيح مدى تأثير السياسة النقدية في مصر بعجز الموازنة من خلال تطبيق نموذج يوضح كيفية استجابة السلطات النقدية، ممثلة بالتغيرات في القاعدة النقدية، لتطور أهداف السياسة النقدية في ظل وجود عجز مالي كبير ومزمن خلال الفترة من 2000 إلى 2022. وقد اعتُبر عام 2011 (عام الثورة الاجتماعية) نقطة تحول فارقة أدت إلى تغييرات اجتماعية واقتصادية وسياسية واسعة النطاق. بناءً على ذلك، قُسمت الدراسة إلى فترتين: الفترة التي سبقت الثورة الاجتماعية في عام 2011، والفترة التي تلتها. وللتأكد من وجود علاقة توازنية طويلة الأجل بين المتغيرات، تم

استخدام نماذج الانحدار الذاتي لفترات الإبطاء الموزعة (ARDL) ونموذج تصحيح الخطأ، وكشفت النتائج عن وجود تكامل مشترك قوي على المدى الطويل؛ كما أظهرت النتائج اختلافات ملحوظة بين الفترة التي سبقت الثورة والفترة التي تلتها؛ حيث بدا أن السياسة المالية كانت تلعب دورًا محدودًا في تحديد السياسة النقدية في مصر قبل الثورة، وكان للبنك المركزي المصري درجة من الاستقلالية خلال تلك الفترة. ومع ذلك، أظهرت فترة ما بعد الثورة تأثيرًا كبيرًا لعجز الموازنة على القاعدة النقدية، مما يدفعنا للتساؤل حول قدرة البنك المركزي المصري على مقاومة الضغوط المالية الناجمة عن عدم الاستقرار الاقتصادي بعد عام 2011.

الكلمات المفتاحية: استقلالية البنك المركزي، العجز المالي، مصر.

1. Introduction

Economics literature is filled with writings about the role that financial deficit plays in shaping the paths of economic variables. It would not be an exaggeration to say that the financial structure of the economy is a necessary gateway to understanding the key determinants of economic equilibrium, evaluating the overall performance of economic policies, and assessing monetary policy in particular. Given that knowing the autonomy (2) of the central bank is a prerequisite for developing more effective and suitable monetary policies for the conditions of the Egyptian economy, the existence of a large and chronic deficit in the state general budget makes it urgent to clarify the effects of this deficit on the temporal trajectory of the monetary base and on the effectiveness of monetary policy in achieving its objectives.

In the presence of an independent central bank adopting an anti-inflation policy, the financial authority's expectations diminish regarding the central bank's provision of necessary financing to cover the growing fiscal deficit. This will limit the financial authority's ability to generate this deficit. If the monetary authority is able to adhere to its policy and refuses to finance government debt, the financial authority will have no choice but to restrict this deficit.

The general hypothesis that this paper seeks to explore is that monetary authorities control over the monetary base and the performance of

(2) we preferred the term autonomy to the frequently used term independence because autonomy entails operational freedom, while independence indicates a lack of institutional constraints.

monetary policy is depending on the ability of financing fiscal deficits from real resources. The notion of this general hypothesis can be reduced to two sub-hypotheses. First, if fiscal authorities are unable to tap real resources into service to finance government spending in the absence of complete autonomy from monetary authorities, fiscal deficits will play a significant role in determining the temporal path of the monetary base. This sub-hypothesis will be referred to as the “Autonomy Hypothesis”. Second, the fiscal deficit weakens the ability of the monetary authorities to control the monetary base, which reduces the efficiency of monetary policy in achieving the objectives described in this hypothesis. This sub-hypothesis will be known as the “Effectiveness Hypothesis”.

From these two hypotheses, the paper models this relationship, describing the response of the monetary policy framework to the developments in monetary policy goals and fiscal deficits for the period 2000-2022. The model is composed of steps, increasing in complexity with the increased complexity of the two hypotheses under test. Steps are followed to develop the three fundamental concepts: general budget constraint, changes in the monetary base, and the reaction function.

The remainder of this paper is articulated as follows. Section 2 presents an overview of theoretical and empirical literature. Section 3 delves into the Egyptian case, offering an insight into the evolution of the financial deficit. Section 4 introduces the foundational concepts of the model, followed by development of the model, estimation techniques, and an assessment of findings concerning the short- and long-run impacts of the variables under consideration on monetary base in Section 5. Finally, in conclusion, we summarize our major findings recommendations and future research.

2. Literature Review

Monetary and fiscal policies are inextricably connected, reinforcing each other in many cases. The soundness of the financial system necessarily influences the management of monetary policy, and vice versa. The classic basis of theoretical work on central bank autonomy and the amount of conservatism on the part of the governor, as enunciated in the time-inconsistency problem of political decisions Kydland and Prescott (1977). The nub of this time-inconsistency problem points to the fact that a policy that appears optimal ex ante can turn out to be suboptimal ex post, allowing the government to violate the announced policy and indulge in opportunistic

behavior. When applied to monetary policy Barro and Gordon (1983a), (1983b), Backus and Drifill (1985), the instant consequence of this time-inconsistency problem is the erosion of the credibility of central banks and a propensity for inflation in discretionary monetary policy. One solution to this problem is the installation of a conservative central bank governor, who places a greater emphasis on price stability than the government Rogoff (1985).

Moreover, the theoretical literature by Masciandaro and Tabellini (1988), Castellani and Debrun (2001), and Montiel (2003) indicates a great impact of central bank autonomy on the formulation of fiscal policy. More precisely, the higher the level of independence, the greater the degree of fiscal discipline of the central government, the lower the independence, the less severe the fiscal policy. This perspective is closely related to the question of funding government deficits. The independence of a central bank ensures that an alternative to relying on inflation tax, always considered as a powerful signal of fiscal discipline enforcement, is not available. Mankiw (1987) continues that "inflation is a revenue source that has to be considered in the overall budgetary policy". In fact, while debt and interest rates are usually expressed in nominal terms, not adjusted for inflation, an increase in inflation reduces the real value of domestic public debt and related interest payments. Masciandaro and Tabellini (1988), continue that "the pivotal factor influencing fiscal policy is the monetary regime, specifically, the connection between current deficits and future monetization."

In this context, Taylor (1995) pointed out the direct relationship between fiscal and monetary policies in government budgeting. He showed that changes in the budget deficit are bound to change the volume of interest-bearing government bonds or the amount of high-powered money as far as financing the fiscal deficit is concerned. For instance, if attaining more financial discipline was a prerequisite of reducing the budget deficit, this has the implication of reducing the growth of interest-bearing debt and, therefore, the monetary base. Naturally, as long as the government has access to credit markets, a reduction in the deficit does not necessarily reduce the process of money creation. That is, for governments that have access to credit markets, there is no need to link the size of the fiscal deficit to the amount of money creation since the change in the budget deficit can be financed by issuing government bonds. In contrast, for governments that rely mostly on money

creation to finance most of their expenditures or those whose access to credit markets is not easy, reducing the budget deficit has a considerable positive impact on capping money creation, which in turn affects price stability. Hence, reducing the budget deficit is a vital step to ensure a reduction in monetary growth and lower inflation rates in most developing countries.

As argued by Neyapti (2003), the inadequacy in the development of financial markets with a low independence of the central bank will ultimately go on to have inflationary implications from budgetary deficits. The above-mentioned factors give way to relying on money creation as the only source of finance for the fiscal deficit.

Moreover, Sargent and Wallace (1981) tried to emphasize the effect of rising fiscal deficits on the effectiveness of monetary policy, called the fiscal dominance hypothesis. If the increase of fiscal deficits and government debt led to an increase of interest rates above the growth rate of the economy, monetary attempts to check inflation by reducing monetary growth would increase the proportion of debt-to-GDP. Monetary financing would shift into bond financing, increasing the interest outflow and the proportional size of the fiscal deficit. It will require greater monetary growth in the future. If the real interest rate is below the economic growth rate, it will restore the effectiveness of monetary policy in eliminating inflation, thus easing the task for the monetary policymaker.

King (1995) argues that the hypothesis of financial dominance is unconvincing, as its significance diminishes in major industrialized countries for two reasons. Firstly, there is a limited reliance on new money issuance to finance fiscal deficits compared to other sources of funding. The second reason is associated with the tendency of these countries' governments to commit to adopting policies aimed at price stability within the framework of central banks that operate independently from fiscal authorities.

Subsequently, Leeper (1991) categorized fiscal and monetary policies as active, or passive based on their behavior and their impact on debt. An entity employing an active policy possesses the autonomy to establish its strategy independently, without regard to the behavior of current and past variables controlled by a passive authority. Conversely, an authority utilizing a passive policy is constrained by optimization decisions made by consumers and the actions of the active authority. In the context of monetary policy, an active approach aims at controlling inflation, while a passive strategy adjusts

interest rates to bring debt within sustainable limits. In fiscal policy, an active stance involves spending without consideration of debt levels, whereas a passive approach adjusts taxes and expenditures to maintain debt within sustainable limits. The achievement of a unique equilibrium necessitates one policy to be active and the other passive. Determinate prices require the activation of one policy, while budget solvency conditions demand the passivity of the other. Other works along similar lines include those by Sims (1994) and Leith and Wren-Lewis (2000).

On the other hand, Taylor (1985) argues that the increase in levels of fiscal deficit and government debt can mitigate or even reverse the negative impact of rising interest rates on economic slowdown, thereby curbing inflation. Taylor attributes the reduced sensitivity of interest rates to the rise in income for debt holders accompanying the increase in interest rates. As higher incomes lead to increased consumption, the ultimate effect will reflect the time substitution impact of rising interest rates on expenditure.

The relevant applied studies have been divided into two parts: the first part discusses the relationship between the central bank's autonomy, inflation, and other indicators of economic performance. The second part discusses the relationship between the central bank's autonomy and fiscal deficit.

Most studies Rogoff (1985), Crowe and Meade (2007), Klomp and de Haan (2010), and Dincer and Eichengreen (2014) gave evidence to show that indeed, there exists a significant link between central bank autonomy and inflation. Indeed, average inflation is negatively correlated with central bank independence. This implies that, theoretically, an independent central bank should lead to better inflation outcomes. Other studies Alesina and Summers (1993) have pointed out that the relationship between central bank autonomy and economic growth is less clear, with central bank independence contributing to a more contractionary stance.

On the other side, studies have been conducted to explore the nature of the relationship between central bank independence and the fiscal deficit. One such study was conducted by Lucotte (2009), in which an attempt was made to explore the effect of central bank independence on the budget deficit of a group of developing countries between 1995 and 2004. The analysis showed a negative relationship between central bank independence and the budget deficit in developing countries. This is in line with the theoretical literature, namely that countries with a weakly independent central bank tend

to have higher budget deficits. Therefore, developing countries must implement structural reforms to increase the independence of their central banks.

In addition to the above, Bodea and Higashijima, (2015) has demonstrated a significant relationship between local political institutions and central bank autonomy, impacting fiscal policy. Political institutions, in this context, determine the degree of enforcement of the central bank's law. More specifically, the study revealed that democratic countries with independent central banks experience lower fiscal deficits, attributed to media freedom and restrictions imposed by these countries on executive power. The study also concluded that increased independence of the central bank would reduce fiscal deficits during non-election years. In contrast, there is no evidence in the study to suggest that central bank independence would optimally improve financial balance and counteract cyclical fluctuations during periods of economic growth.

The study conducted by Burdekin and Laney (2016) aimed to investigate the relationship between central bank autonomy and budget deficits for a sample of 14 Latin American countries during the period 1990-2012. The study concluded that reforms leading to greater independence of central banks can significantly enhance financial discipline even in countries that have experienced inflationary performance in the past. Despite significant differences in alternative measures of central bank autonomy, all measures show substantial negative relationships with budget deficits in Latin American countries.

The study conducted by Papadamou et al. (2017) investigated whether the central bank autonomy has an impact on the net balance of government securities and public debt. This was examined across 22 countries during the period from 1992 to 2000. The findings indicate that an increase in the central bank's autonomy can significantly affect a range of macroeconomic variables, and it also has a substantial impact on deficits, GDP growth, government bond yields, and public debt. In other words, an increase in the central bank autonomy may exacerbate the impact of deficits on debt, and the sensitivity of debt to borrowing costs is influenced by the degree of central bank autonomy. Finally, the beneficial effect of GDP growth on debt activity decreases significantly in countries that decide to increase the level of central bank independence.

On the other side, Bodea and Higashijima (2017) analyzed the impact of central bank independence on the budget deficit (surplus) in several countries, focusing on the preferences of independent central banks regarding fiscal policy and their ability and willingness to enforce these preferences. The researchers concluded that the legal independence of the central bank is a significant deterrent to financial deficits, influenced by the level of democracy in the country. The results of the estimation, using data from 78 countries during the period 1970-2007, indicated that central bank autonomy would affect financial balance and lead to improvements in outcomes regarding inflation or financial deficits in democratic countries with the rule of law, free press, and constraints on executive power. Consequently, central bank reform and granting it more legal independence have become a clear trend in the past two decades. As for non-democratic countries where central banks have nominal independence but not actual independence, they will not be able to influence financial balance and will not lead to improvements in outcomes regarding inflation or financial deficits. Therefore, fiscal discipline can be enhanced by increasing the independence of the central bank, and financial deficits are a possible result of reducing the independence of the central bank. The researchers also pointed out that the central bank is likely to contribute to financial surpluses during election years.

What interests the aforementioned studies is that the majority of these studies have been applied to OECD countries. However, when developing countries are included in the sample, the results are often very weak and sensitive to the indicator of central bank autonomy. In fact, most studies have used an indicator known as the "Legal independence" index, which is based on existing central bank laws. However, this legal approach may not be suitable for developing countries because the "legal status of the central bank" is just one element among many that determine its actual independence, especially since many central bank laws are incomplete and leave a wide room for interpretation Cukierman et al. (1992). As a result, factors such as traditions, the personality of the governor, or the extent of interference by top officials in the bank contribute to the actual level of central bank autonomy. Thus, the legal independence of the central bank may differ significantly from its actual independence Fuhrer (1997). For this reason, realistic indicators of central bank autonomy have been developed to be more suitable than legal indicators, especially when studying central bank autonomy in developing

and emerging countries, using two integrated indicators to assess central bank autonomy: one legal, which is the most commonly used to express central bank autonomy, and the other behavioral, by examining the powers of central bank governors Cukierman et al. (1992), and Cukierman and Webb (1995). The theoretical literature also suggests that central bank autonomy should affect the design of monetary policy. More independence should influence the central government in fiscal discipline; thus, a lack of independence could lead the government to fiscal laxity, raising questions about the sources of government deficit financing Masciandaro and Tabellini (1988); Castellani and Debrun (2001); Montiel (2003).

As the above review shows, the available literature has largely dwelt on the links between fiscal deficits and economic performance, with very little attention given to how fiscal deficits undermine central banks' autonomy and blunt the effectiveness of monetary policy, especially in countries like Egypt that have long been suffering from a chronic case of budget deficit. While the previous research on this topic often focuses on advanced economies with more stable fiscal conditions, this study itself is rather unique in investigating the interaction of fiscal deficits and monetary policy within a developing economy. The current research also sets itself apart from other studies by testing two specific hypotheses, Autonomy and Effectiveness, in the case of Egypt through a multi-step model integrating budget constraint, change in monetary base, and response of a central bank. This approach covers the literature gap and simultaneously brings subtle insights into the complexities of fiscal-monetary interplay within a deficit-ridden economy.

3. An Overview of the Evolution of the Fiscal Deficit in Egypt

Historically, The State's General Budget of Egypt has recorded a relatively large total deficit. Even though the three sub-budgets - current, capital, and investment - contribute to this deficit, the responsibility for its increase varied among the mentioned budgets.

During the seventies and eighties, particularly in the period following the economic openness in 1974, the policy of general investment pursued by the country took the blame for the worsening financial deficit. From 1966 to 1973, the country followed a contractionary policy that led to a decrease in public investments, which did not contribute to the deficit during this stage. Consequently, the infrastructure deteriorated, and replacement and renewal operations were neglected.

In contrast, the period from 1974 to 1983 witnessed an increase in the value of public investments to develop the infrastructure, becoming an attraction for foreign investments targeted by the open-door policy for their increase. These investments imposed significant burdens on the public budget and were the main reasons for the deficit's growth during this period. Despite the growth in general revenues in subsequent periods until 1988, the deficit remained a distinctive feature of the country's general budget. The government failed to fund its expenses through additional taxes or domestic and external borrowing, forcing it to increasingly rely on the central bank to finance this deficit.

From the beginning of the nineties until 1997, the overall deficit, under the economic reform policy, took a different direction, declining as a percentage of the GDP to 8.1%. This result was achieved through a contractionary policy that aimed to reduce government spending without a corresponding increase in revenues Abdullah (2007). From 1997 until 2004, the government deficit started to escalate, with the responsibility for the deficit during this period falling on current expenditure items, while the size of investment expenditures decreased. This was associated with the weak tax performance and the volatility of tax revenue Ibrahim (2015).

From 2005 to 2007, the government began implementing a number of financial programs and policies aimed at controlling the deficit by targeting an increase in tax revenue while making a relative reduction in the annual growth rate of public expenditure by 1% annually Younes (2012). Despite the actual revenue increase resulting from previous policies, it did not succeed in controlling the budget deficit. On the contrary, there was a noticeable increase in the deficit, indicating that these policies were detached from the nature of the deficit. The deficit in subsequent years exceeded internationally recognized safe limits, reaching four times the globally accepted percentage, equivalent to 12.5% of the GDP in 2015.

One of the most significant reasons for the failure of policies and measures taken to control the financial deficit is attributed to external shocks that greatly impacted the performance of the Egyptian economy, specifically during the period under study. Among the most important of these shocks were the terrorist events in the United States, particularly the collapse of the World Trade Centre in 2001, and their effects on the global economic conditions, including those in Egypt. Additionally, the U.S. war in Iraq in

2003 and its impact on Egyptian labor and the overall economy, followed by the global economic crisis in 2008, during which the Egyptian government injected financial packages amounting to approximately 12 billion pounds to alleviate the burdens of that crisis.

Furthermore, the COVID-19 pandemic in 2019 led the Egyptian government to provide additional financial packages totaling around 100 billion pounds Breisinger et al. (2020). Finally, the Russian-Ukrainian war in 2022 and its effects on commodity prices, raw materials, energy prices, and metals, which affected all budgets globally, including Egypt. For example, the budget estimates for the fiscal year 2021/2022 assumed that the price of a barrel of oil would be 60\$, and any increase in the price by one dollar would cost the budget 2-3 billion pounds, depending on the prevailing exchange rate. Similarly, the purchase price of a ton of wheat was estimated at around 255\$, and any increase in the price by one dollar would cost the budget about 100 million pounds additionally, based on the prevailing exchange rate. Moreover, a one percentage point increase in interest rates affects the debt service bill of the state general budget by about 10-12 billion pounds. However, what actually happened was a doubling of oil prices, with the barrel reaching 120\$, and the price of wheat exceeding 420\$ per ton. The interest rate was raised by more than 4 percentage points since March 2022.

When calculating the average growth rate of both the fiscal and total deficits during the study period, it is observed that they averaged around 15.4% and 15.7%, respectively. This is significantly higher than the average growth rate of the real output, estimated at about 3.8% during the same period, and is close to or equivalent to the nominal output growth rate of 14.8%. It is also higher than the growth rate in the Consumer Price Index (inflation), estimated at about 11%. This indicates that the growth in the budget deficit exceeds the growth in real output and inflation, highlighting a clear problem in controlling this deficit.

Table 1: Evolution of the fiscal and total deficit during the period 2000 - 2022

Year	Fiscal Deficit	Total Deficit	GDP	Fiscal Deficit to GDP (%)	Total Deficit to GDP (%)
2000	8.9	10.2	342.8	30.5	32
2001	11.3	11.6	358.7	40.5	41.8
2002	11.3	11.8	378.9	42.8	44.8
2003	6.3	6.7	417.5	26.5	28.3
2004	10.6	10.8	407	43.1	44.1
2005	11.8	12.0	427.1	50.3	51.6
2006	8.9	9.1	617.7	55.1	56.5
2007	5.6	5.6	744.8	41.7	42.4
2008	6.9	6.8	859.5	59.2	61
2009	6.6	6.6	1042.2	68.4	69
2010	8.1	8.1	1206.2	97.6	97.8
2011	9.8	9.9	1371.1	134.4	136.6
2012	10.8	10.8	1542.3	166.7	167.4
2013	13.0	12.9	1843.8	239.7	237.9
2014	12.2	11.6	2101.9	255.8	244.7
2015	11.4	10.9	2443.9	279.4	268.1
2016	12.6	12.0	2708	341.2	326.3
2017	10.9	10.7	3470	379.6	372.7
2018	8.3	8.3	4437	423.6	423.3
2019	8.2	8.2	5250	430.0	428
2020	7.9	7.8	5820	462.8	495.2
2021	6.8	6.8	6900	472.3	470.1
2022	6.1	6.1	7925	484.8	486.5

Source: Ministry of finance – financial statements

4. The Concepts Underlying the Derivation of the Model

4.1 General Budget Constraint

The general budget deficit, specifically the total deficit, can be defined as the difference between the total government expenditures, including interest paid, excluding debt repayments, and the total government revenues, including grants, excluding loan proceeds. Measuring the deficit in this way aims to provide policymakers with an indicator of the additional resources that the government should borrow from the private sector, foreign sources, or from the central bank. Despite the limitations of this concept, it remains a useful tool when supported by appropriate economic analysis.

What matters to us regarding the deficit is not just its presence in the state general budget, but the means used to finance it. It is known that the public sector can finance its expenses using various means reflected in what

is called the Budget Constraint. The general budget constraint illustrates the relationship between the financial inflows and outflows of the government sector. Government spending is necessarily funded through tax revenues, the sale of government bonds, or through the issuance of new money. Two things are noteworthy in this regard. First, although the budget constraint places a constraint on the behavior of the government sector, it does not mean that the deficit and government debt cannot grow. Government debt cannot grow permanently at a rate higher than the net national output growth rate. Second, the fiscal deficit leads to what is known as the economic deficit, where real resources are transferred from future generations to the current generation. Consequently, future generations will bear the costs associated with the accumulation of the fiscal deficit in the form of interest on government debt and repayments, especially if loans are used to finance current consumption spending.

Algebraically, the general budget constraint can be expressed as follows:

$$BD = (TE - TR) = NL + MI \quad (1)$$

Where BD is the total deficit, i.e., the total government expenditures TE minus the total government receipts TR . NL represents the sum of new loans provided to the government from the private sector or foreign sources. Meanwhile, MI represents issued money to assist in financing the deficit. This equation suggests that the total deficit can be covered by borrowing from the private sector or by issuing new money as part of the monetary base. Our concern is whether MI is subject to the control of the fiscal authorities. Therefore, we can rewrite equation (1) as follows:

$$MI = (TE - TR) - NL \quad (2)$$

Equation (2) illustrates the reasons behind the increase in budget deficit financing through the issuance of new money. The equation also indicates the absence of a net impact on the new money issuance if the increase in government spending is met with an increase in financial revenues or domestic and external borrowing.

4.2 Changes in the Monetary Base

The money supply equation is calculated as follows:

$$MS = m \times MB \quad (3)$$

Where MS is the money supply, m is the money multiplier, and MB is the monetary base.

It is known that the money multiplier mainly depends on the ratio of currency in circulation to deposits and the ratio of reserves to deposits. However, the multiplier can be determined by dividing the money supply by the monetary base⁽³⁾.

Regarding the monetary base, it can be analyzed in two ways by examining the central bank's balance sheet. When considering liabilities, the monetary base encompasses the currency circulating outside the banking system, alongside the reserves held by commercial banks, which include both the currencies they possess, and the deposits lodged with the central bank. From an assets viewpoint, the entirety covering 100% of the monetary base is comprised of net foreign assets (NFA) and net domestic assets (NDA). To put it differently, the central bank's assets frame the monetary base as follows:

$$MB = NFA + NDA \quad (4)$$

Net foreign assets represent the Central Bank's assets in foreign currency, gold, Special Drawing Rights (SDRs), and the country's position in the International Monetary Fund, minus similar foreign liabilities. As for net domestic assets, in the case of Egypt, a significant component is the net indebtedness of the government sector to the central bank, as the banking sector's indebtedness to the central bank does not constitute a large portion. Considering that changes in NFA reflects the balance of payments (*BOP*), and the changes in NDA represent the amount of the deficit financed through new money issuance, the change in the *MB* can be expressed as follows:

$$MB = BOP + MI \quad (5)$$

Now, if we consider both the budget constraint and the changes in the monetary base, the relationship between the phenomenon of fiscal deficit and the phenomenon of growth in the monetary base becomes clear. In market economies, we find that the link between these two phenomena arises from the central monetary authorities' attempt to keep interest rates within certain limits. Therefore, unless the fiscal deficit is financed by the issuance of new currency, either by direct borrowing from the central bank or indirectly through the sale of government bonds, such a deficit can lead to an increase in interest rates. Consequently, the necessity for monetary authorities to defend the targeted interest rate makes the growth of the monetary base a cost they must accept.

(3) If the money multiplier is stable or predictable, changes in the monetary base will determine changes in the money supply.

The question being posed now is how to link the growth of fiscal deficit and the monetary base if the interest rate exhibits relative rigidity. One of the strongest justifications provided regarding the long-term relationship between budget deficit and the growth of the monetary base is that it does not depend on interest rate movements. This justification argues that if the deficit is a recurring phenomenon and public demand for government bonds is insufficient to finance the budget deficit, the available options for fiscal authorities in this case are either to reduce public spending, impose new taxes, or borrow from the central bank. If fiscal authorities have control over monetary authorities, the last option is the easiest, as the monetary authority would be forced to finance the remaining deficit.

4.3 Monetary Policy Reaction Function

The Monetary Policy Reaction Function is defined as the relationship between the instruments of monetary policy (control variables) and the objectives sought by monetary authorities (objective variables). In this function, the objective variables act as independent variables, while the control variables act as dependent variables. The general form of the reaction function can be specified as follows:

$$CV_t = F(O_t, O_{t-1}, \eta_t, CV_{t-1}) \quad (6)$$

Where CV_t represents the instruments of monetary policy or control variables in period t , O_t represents the desired values of objective variables in the same period, O_{t-1} represents the realized values of the objective variables in the previous period, and η_t represents the values of other variables that affect control variables in the current period. It is noted that the inclusion of O_{t-1} among the independent variables occurs only if the realized values of objective variables are difficult to change, or if the marginal cost of changing them increases with repeated adjustments. Similarly, the presence of CV_{t-1} occurs only if the marginal cost of this adjustment increases with the change of instruments. Therefore, the existence of these variables is rare as the time span of data accumulation used in estimating the parameters of the reaction function increases. Since our study is based on quarterly data, the reaction function will be limited only to the control variables in the current period, specifically the change in the level of the monetary base, while the other variables η_t will be limited to the fiscal deficit. The objective variables include economic growth, employment, and price stability.

Among the goals of monetary policy, the goal of external balance needs comment, as there is no doubt that what is meant by this goal depends on the exchange rate system followed. If the country follows a fixed exchange rate system, the goal of external balance translates into a balance of payments balance. In this case, international economic changes will find their way into the local economy through changes that occur in the NFA owned by the central bank, and thus in the monetary base, unless there is a sterilization of these changes. In such a situation, the central bank does not directly control what happens in NFA, but rather it can control them indirectly through its guidance of the domestic economy. In other words, the goal of monetary policy, in addition to other goals, is to stabilize NFA. However, if the country follows a flexible exchange rate system, the external balance will in this case translate into exchange rate stability. That is, exchange rate movements replace the change in NFA as a channel through which the impact of international economic changes is transmitted to the domestic economy. In this case, the central bank can directly control its NFA; by changing it, he can narrow the range of fluctuation in the exchange rate by intervening as a buyer or seller of foreign exchange. In such a situation, exchange rate stability becomes a goal of monetary policy, while the change in NFA itself becomes a new tool at the disposal of the monetary authorities.

5. Empirical Strategy: The Model and the Estimation Procedure and Results

5.1 The Model

5.1.A The Model and the Autonomy Hypothesis

In our derivation of the reaction function we will assume the following, first; the financial authorities are the ones who determine the amount of the general budget deficit. Second, it is the central bank that determines how the deficit is financed, meaning that the amount of new money issuance and the amount of government borrowing from the private sector are determined by monetary policy decisions.

The starting point in formulating the model is equation (1) and the change in the monetary base in equation (5) we find that:

$$MI = MB - BOP \quad (7)$$

By compensating for the new money issuance in the general budget constraint, equivalent to the corresponding change in the monetary base, equation (5), we obtain:

$$MB + NL = BOP + BD \quad (8)$$

And this equation can be reformulated as follows:

$$MB = \alpha_0 - \alpha_1 BOP + \alpha_2 BD \quad (9)$$

$$NL = \beta_0 - \beta_1 BOP + \beta_2 BD \quad (10)$$

This formulation assumes that the parameters in equations (9) and (10) are subject to the following constraints:

$$\alpha_0 + \beta_0 = 0$$

$$\alpha_1 + \beta_1 = 1, i = 1, 2$$

These constraints ensure consistency in all circumstances, indicating that the two equations are not independent. If the parameters of one are estimated, it is possible to determine the values of the parameters of the other. Equations (9) and (10) represent the reaction functions of monetary authorities. Equation (9) explains the change in the monetary base, while the change in government borrowing in equation (10) is associated with changes in net foreign assets, total fiscal deficit, and other local objectives (economic growth, price stability), reflected by the constants in the equation. It is noteworthy that testing the basic hypotheses, autonomy, and effectiveness, will primarily depend on equation (9) due to the connection of these hypotheses to the behavior of the monetary base. In this context, we are interested in highlighting the key parameters mentioned in the equation.

By considering the parameter α_1 , we find that it measures the efforts of monetary authorities in sterilizing the effects of the balance of payments on the monetary base, and the value of this parameter ranges between zero and one. Sterilization is complete when this parameter equals one. If the value of the parameter is equal to one, it means that the monetary base responds to developments in the balance of payments. According to Kouri and Argy (1974), there are two ways in which developments in the balance of payments can affect the monetary base: firstly, monetary authorities may not be technically equipped with effective tools to cope with large movements in the balance of payments. Open market operations may be limited by the size of the financial market, and changes in the legal reserve ratio are rare. Finally, other methods such as imposing ceilings on commercial bank lending and changing government deposits with central banks are inflexible, as well as being unclear and difficult to predict their effects. Secondly, monetary authorities may take into account current developments in the balance of payments when determining the appropriate amount of change in the monetary base.

It is worth noting that the ability of monetary authorities to neutralize the effects of the balance of payments on the monetary base primarily depends on the degree of financial integration with global financial markets. As financial integration increases, monetary authorities may lose control over the monetary base, reducing the opportunities for implementing an independent monetary policy unaffected by developments in other countries.

In considering the parameter α_2 , we find that it represents the impact of the financial deficit on the monetary base. It can be viewed as the proportion of the central authorities' contribution to financing the financial deficit on average during the period. The value of this parameter depends on the extent to which the financial market can meet the government's financing needs and the government's ability to borrow from abroad. The value of this parameter ranges from zero to one. If it equals zero, it indicates that the central bank does not contribute to financing the financial deficit (complete autonomy of the monetary authority). If the value is equal to one, it means that the central bank finances the entire deficit (lack of autonomy of the monetary authority).

It is noted that the value of the increase in the monetary base resulting from the central bank financing the general budget deficit depends not only on the value of the parameter but also on the magnitude of this deficit, which in turn depends on the burden of external debt, the size of government spending, the growing social and economic role of the state, the effectiveness of its tax system, and the external threats to the national security.

5.1.B The Model and the Effectiveness Hypothesis

This part of the model aims to examine whether the weakness (or strength) of the monetary authorities' control over the monetary base enables the local objectives of monetary policy to be achieved, which include economic growth, employment, and price stability.

To test this hypothesis, we will modify function (9) to include the local objectives of monetary policy as follows:

$$MB = \gamma_0 - \gamma_1 GDP + \gamma_2 EMP + \gamma_3 INF + \gamma_4 BOP + \gamma_5 BD \quad (11)$$

Where GDP, EMP, INF are the economic growth rate, employment rate, and inflation rate respectively, all at logarithm. It is important to note that the independent variables, except for the fiscal deficit and the change in net foreign assets, should be considered as forecasts by policymakers. We will

assume that monetary policymakers have the ability to make accurate predictions by efficiently using all available information. Efficient use implies that the expected probability distribution of future outcomes matches the actual probability distribution of these outcomes in light of the available information. Finally, the logarithm transformation (\ln) is used to reduce skewness in the variables' distributions.

From equation (11), we find that achieving the three local objectives (growth, employment, and price stability) requires that changes in the monetary base be in the opposite direction of these objectives. This means that the expected signals for these three variables should be negative. The interpretation is that an increase in the monetary base can stimulate output and employment through the effect of the money balance on aggregate demand, assuming the existence of idle capacities. When there are idle resources, the overall supply can respond to changes in final demand. However, the response of overall supply, assuming a closed economy, depends on the labor market conditions, the degree of capital utilization, and the technological level. In the case of full employment, we find that changes in demand resulting from monetary base changes will only affect prices rather than expanding local production and reducing unemployment rates. Addressing inflation in this case requires reducing the monetary base.

5.2 Estimations Procedure

We use Engle and Granger's (1987) procedure to estimate our two models (9 and 11). This method seems interesting and appropriate for our study in the sense that it allows us to estimate not only the relationship between the monetary base and the considered explanatory variables in the long-run steady state, but also the dynamics of the monetary base evolution during the transition period toward this steady state.

Engel and Granger have looked at the problem of testing whether a set of $I(1)$ variables is cointegrated or not. They estimate the coefficients of a static relationship between them through OLS and apply well-known unit root tests to the residuals. If the null hypothesis of a unit root is rejected, then it is evidence in favor of cointegration. The major consequences of its existence are three:

1. There is a stable long-run relationship between the variables of $I(1)$.
2. It is possible to estimate the model (1) which uses the $I(1)$ variables in their levels, by simply employing OLS regressor.

It is possible to consider an ECM which represents the correction process of the gaps between a variable and its long-run value which is determined by the cointegrating relation.

To illustrate this idea, let us consider two cointegrated variables y_t and x_t . In this case, this ECM writes as:

$$\Delta y_t = \vartheta \varepsilon_{t-1} + \sum_{i=1}^s \partial_i \Delta(y_{t-i}) + \sum_{i=1}^q \kappa_i \Delta(x_{t-j}) + u_t$$

where u_t is a white noise; s and q are the numbers of lags of variables to be considered in the model; and ε_{t-1} is the one period lagged discrepancy (or disequilibrium) term, which is issued from the following cointegrating equation:

$$\varepsilon_{t-1} = y_{t-1} - a - b_i x_{t-j}$$

The coefficient ϑ in the Error Correction Model (ECM) reflects the adjustment speed and is expected to be statistically significant and negative. The estimation of the ECM involves two main steps. Initially, the cointegrating equation is estimated using Ordinary Least Squares (OLS) on the variables $I(1)$ in level. This OLS estimator is considered super-convergent if the variables are indeed cointegrated. To confirm cointegration, unit root tests such as the Dickey-Fuller and Phillips-Perron tests are applied to the predicted residuals, ε_t .

In the subsequent step, the ECM is estimated by incorporating the error correction term, which consists of the lagged residuals from the first step. Additionally, it is crucial to conduct two more significant tests in the context of ECM regressions.

The first test is whether the variable x_t is exogenous or rather is caused by the variable y_t . In the case of endogeneity of both y_t and x_t , one should regress a vector error correction model (VECM) in which y_t and x_t depend mutually one on each other. In this case, the cointegrating equation appears in both equations of y_t and x_t . The second test aims to determine the number of lags associated with the variables used in the model (the parameters s and q in the ECM). The number of these lags is chosen by referring to the 'information criteria' statistics (such as the Akaike or Schwartz or Bayesian Information Criteria).

5.3 Preliminary Tests: Stationarity and Exogeneity

Before turning to the estimation results, it is important to make two preliminary tests which assess whether the variables used in model (9 and 11) are stationary or integrated (namely, $I(1)$). The stationary character of the variables to be included in the regressions is assessed by applying Dickey-Fuller (DF) and Phillips Perron (PP) unit root tests. Table 2 reports the results of these tests for the variables used in the two models. The results of these tests are identical and show clearly that all variables are non-stationary in levels but stationary in their first differences. That is, these variables are $I(1)$, and therefore can be used in their levels provided that they are cointegrated.

Table 2: Unit root tests

Variables	Dickey-Fuller test		Phillips-Perron test		Order of integration
	MacKinnon	Trend	PP	Trend	
<i>LnMB</i>	2.87 (---)	Yes	2.48 (---)	Yes	$I(1)$
$\Delta LnMB$	-5.44*** (-3.65)	No	-5.71*** (-3.65)	No	$I(0)$
<i>LnBD</i>	-2.73 (---)	No	-2.60 (---)	No	$I(1)$
$\Delta LnBD$	-5.60*** (-2.63)	No	-5.70*** (-2.63)	No	$I(0)$
<i>LnBOP</i>	-0.01 (---)	No	-0.005 (---)	No	$I(1)$
$\Delta LnBOP$	-6.95*** (-2.68)	No	-7.31*** (-2.68)	No	$I(0)$
<i>LnGDP</i>	-2.91 (---)	No	-2.75 (---)	No	$I(1)$
$\Delta LnGDP$	-6.48*** (-3.27)	No	-6.61*** (-3.27)	No	$I(0)$
<i>lnEMP</i>	5.92 (---)	No	4.12 (---)	No	$I(1)$
$\Delta LnEMP$	-2.29** (-1.95)	No	-2.08** (-1.95)	No	$I(0)$
<i>LnINF</i>	-0.86 (---)	No	-1.07 (---)	No	$I(1)$
$\Delta LnINF$	-4.39*** (-2.61)	No	-4.32*** (-2.61)	No	$I(0)$

Notes: MacKinnon and PP are the MacKinnon and Phillips Perron statistics, respectively. Both tests are run by introducing a deterministic trend (Trend) if the latter is statistically significant.

---indicates that the variable is not significant at the confidence levels of 1%, 5% or 10%.

*** and ** imply statistical significance of the variable at the 1% and 5% confidence levels, respectively. We indicate in parentheses the critical values of the MacKinnon and PP statistics at the retained significance levels.

The Exogeneity hypothesis made on the explanatory variables implies the use of a simple ECM - in the case of the presence of cointegration between them - rather than a VECM. This hypothesis can be tested by regressing a VECM based on models 9 and 11 by using the Johansen method. Estimation

results, not reported here, show clearly that the error correction model can be reduced to a single equation as the error correction term (ε_{t-1}) is only significant in the equation of the differenced monetary base. That is, the cointegrating equation appears only in the equation containing the differenced monetary base. Hence, the hypothesis of exogeneity of the explanatory variables used in models (9 and 11) is accepted, which implies a use hereafter of a simple ECM.

5.4 Estimations Results

Table 3 reports the results of our two models' regressions. The left side part of this table contains estimations of the cointegrating equation, while its right-side part provides the estimation results of the ECM. Estimated coefficients associated with the variables in the cointegrating equations should be interpreted as the long-run elasticities of these variables with respect to monetary base. By contrast, those reported in the ECM reflect short-run elasticities with respect to monetary base or also short-run marginal effects on the evolution of the monetary base.

Notice that the hypothesis of cointegration - that is the stationarity of the residuals - is evaluated by running the Phillips-Perron test on these residuals. This test (shown at the bottom of the left-side part of the table) confirms unambiguously the stationarity of the residuals, ε_t , at the 1 percent confidence level, which is evidence in favour of the existence of a cointegration relation. The ECM is then regressed in the right-side of Table 3 by using the discrepancy term, that is, the estimated residuals lagged by one period ε_{t-1} .

Let us, in a first step, examine the estimation results of the long run cointegrating equation. Looking at these estimates, three major facts stand out.

First, according to the first hypothesis test (equation 9), which states that the fiscal deficit is a crucial determinant of the time path of the monetary base. This means that if the total financial deficit and the contribution of the local and foreign private sectors to financing it is determined, the remainder represents what the central bank commits to finance through the issuance of new money, regardless of any other economic conditions that may not necessitate such an increase in the monetary base, such as inflation or external imbalances. Consequently, this deficit becomes, from the perspective of monetary authorities, one of the key variables.

Based on the results obtained from equation (9), which is expressed in column 1, the coefficients on both balance of payment and budget deficit are exactly one and significantly different from zero at a confidence level of 1%. The R^2 value of 0.91 implies that about 91 percent of the variation in the dependent variable are explained by variations in the explanatory variable. The Durbin-Watson (DW) statistic provides evidence of no autocorrelation in the residuals of the regression equation.

The results suggest that the monetary authorities in Egypt allow developments in the balance of payments and the budget deficit to impact the monetary base by 100% for each. This can be attributed to the problems facing the Egyptian economy due to the shortage of foreign exchange, prompting the monetary authorities to give considerable attention to stopping the drain of international reserves on one hand. It also implies the weakened autonomy of the monetary authority of the central bank, and the monetary policy is subordinated to fiscal policy objectives.

Second, Columns (2 and 2/), represent the two time periods under study, Illustrates the results of testing the second hypothesis (equation 11), which aims to determine whether weak monetary authorities' control over the monetary base has achieved the local objectives of monetary policy, which include economic growth, employment, and price stability.

The results indicate that the performance of the monetary authority did not align with the goal of boosting economic growth during both study periods. An increase in the growth rate leads to an increase in the monetary base (positively signed), but it is not statistically different from zero. The results also suggest that authorities responded to achieving full employment during the period (2000–2010), as the estimated parameter was negative but not statistically different from zero. In contrast, this parameter showed a positive sign during the second period indicating that the performance of monetary authorities no longer aimed at full employment compared to the pre-revolution period. Regarding the goal of price stability, the results indicate that monetary authorities do not respond appropriately and fundamentally to address inflation. The inflation parameter is positive and not statistically different from zero for both study periods.

Third, it should be noted that the entry of the three local objectives of monetary policy into the reaction function had varied effects on the essential impacts associated with both fiscal deficit and the balance of payments. While

the parameters of the fiscal deficit and the balance of payments did not show a significant impact on the behavior of the monetary base during the initial period, these parameters showed a significant impact during the second period. Additionally, the balance of payments was the most influential variable on the monetary base. As indicated by the results, the effects associated with the developments in the balance of payments (firstly) and the existence of the fiscal deficit (secondly) in this reaction function, specifically in the post-revolution period, suggest that monetary policy no longer substantially contributes to boosting economic growth, addressing unemployment, or stabilizing prices and limiting inflation. In other words, the dominance of the balance of payments deficit and fiscal deficit over the growth of the monetary rule weakened the effectiveness of this regulatory tool in achieving its objectives compared to the pre-revolution period, which aimed at least to achieve the goal of full employment. It can also be said that the persistence of inflation, which the Egyptian economy is suffering from, is attributed to structural roots that are linked to institutional distortions and shortcomings in the interconnections within the economic structure. There is a lack of integration among its elements, weak performance and productivity in its economic sectors, and their inability to respond automatically to the continuous increase in demand, in addition to significant changes in the exchange rate of the Egyptian pound. These changes led to an increase in the prices of intermediate, investment, and consumer goods. Although the previous results confirm a greater autonomy of the monetary authority for the central bank, especially during the period before the social revolution in 2011, the emergence of a significant impact of the fiscal deficit indicates a decline in the degree of autonomy of the monetary authority. This raises questions about the central bank's ability to avoid pressures from fiscal policy.

Table 3: Estimation of an error correction model (ECM) using Engle and Granger’s method

	Cointegration equations: LnMB				ECM: Δ LnMB		
	(1)	(2)	(2')		(1)	(2)	(2')
<i>Cst</i>	4.03 (9.89)***	0.587 (0.51)	0.930 (0.84)	ε_{t-1}	-0.416 (-3.14)***	-0.392 (-3.08)***	-0.389 (-3.24)***
<i>LnBD</i>	1.00 (4.26)***	0.289 (0.65)	0.371 (2.07)**	Δ LnMB _{t-1}	0.457 (3.61)***	0.441 (3.407)***	0.424 (3.287)***
<i>LnBOP</i>	1.00 (7.11)***	0.531 (1.06)	0.592 (6.17)***	Δ LnBD	0.227 (1.88)*	0.219 (0.31)	0.202 (2.46)**
<i>LnGDP</i>	.....	0.758 (0.31)	0.916 (0.49)	Δ LnBOP	0.482 (2.81)**	0.375 (1.08)	0.394 (2.36)**
<i>lnEMP</i>	.....	-0.235 (-1.01)	0.559 (0.68)	Δ lnGDP	.....	0.492 (0.52)	0.480 (0.81)
<i>LnINF</i>	.....	0.273 (0.64)	0.211 (0.83)	Δ lnEMP	.....	-0.173 (-0.31)	0.151 (0.418)
				Δ LnINF	.....	0.044 (0.72)	0.051 (0.95)
Adj. R2	0.91	0.98	0.98	Adj. R ²	0.67	0.67	0.89
Breusch-P	0.676	0.650	0.603	Breusch-P (<i>p</i> > X ²)	0.367	0.367	0.222
Phillips-P	-4.46 (< -2.63(1%))	-4.09 (< -2.63(1%))	-4.02 (< -2.63(1%))	D-W (<i>p</i> > X ²)	-6.66 (< -2.63(1%))	-6.66 (< -2.63(1%))	-6.44 (< -2.63(1%))
				Phillips-P	0.085 (0.44)	0.080 (0.42)	0.095 (0.48)
				LM (1) (<i>p</i> > X ²)	-148.4 (-139.7)	-144.1 (-133.1)	-140.2 (-126.3)
				LM (2) (<i>p</i> > X ²)			
				IC: BIC (1) (2)			

Let us now move to the ECM which shows the short-run dynamics of monetary base evolution. Notice, first, that this model has been subject to a set of preliminary and necessary tests. Some of these tests concern the residuals, u_t , associated with this model. The statistics, ‘Breusch-Pagan’, ‘Durbin-Watson’, ‘LM1’ and ‘LM2’ shown in Table 3 refer to tests for heteroscedasticity, serial autocorrelation, and autoregressive conditional heteroscedasticity with one and with two lags, respectively. ‘Phillips-P’ is the Phillips-Perron test run on the residuals, u_t , in order to check their stationarity in the differenced model.

The findings from these tests demonstrate that the specified ECM respects the well-known standard hypotheses on the residuals and that these residuals are stationary, which implies that the OLS regressor can well be run. Another test run on this model is the Bayesian Information Criteria (IC: BIC

(1) (2)) which allows to determine the number of lags to be included for the explanatory variables in the ECM. The results clearly indicate that the optimal number of lags to consider is one.

The estimation results of the considered ECM can be summarized as follows:

First, it can be noticed that in all equations of the ECM, the adjustment force (i.e., the error correction term (ε_{t-1})) is negative and statistically highly significant, in accordance with Granger's representation theorem. The adjustment force is around 0.39, implying that 39 per cent of the disequilibrium of the period $t - 1$ is revised in period t . This relatively high speed of adjustment allows GDP per capita to approach rapidly its long-run value determined by the cointegrating equation.

Second, the results obtained also confirm that the performance of the monetary authorities is not consistent with the three local objectives, as these variables showed wrong signs, except for the employment indicator in the first period. Nonetheless, the reported estimates of elasticities are lower than those estimated in the long run.

Third, monetary base evolution depends significantly and positively on its past value, which can reflect a phenomenon of memory effect.

6. Conclusion, recommendations and future research:

The aim of this paper is to build a model that illustrates how the monetary authority responds to government control in the face of a growing budget deficit, and its impact on the evolution of monetary policy objectives, using changes in the monetary base. The model has been expanded to include fiscal deficits, demonstrating the effects of fiscal policy on the monetary base. The construction of the model is based on three fundamental concepts: the constraint of the general budget, the matched changes in the monetary base, and the reaction function. In this model, we assume that the monetary authorities control the monetary base or can control it if they wish. The model aims to test two hypotheses: first, that the fiscal deficit is one of the determinants of the time path of the monetary base (autonomy hypothesis), and second, the resultant loss of control by the monetary authority weakens its performance. (effectiveness hypothesis).

Through testing these two hypotheses, it has become clear that fiscal policy plays a fundamental role in determining how monetary policy is managed in Egypt and the goals that this policy aims to achieve. This result

implies implicitly less autonomy of the monetary authority for the CBE in achieving its objectives. The results indicated the inability of monetary authorities to control and direct the monetary base in a way that serves the goals of the Egyptian economy in terms of growth, employment, and price stability. These objectives did not receive attention from the central bank except for the employment goal in the years before the revolution. This means that the central bank allowed budget developments to impact the monetary base. Despite the central bank's declared goal of maintaining price stability as the primary objective of monetary policy, the results revealed a reality diverging from achieving this goal. This raises questions about the effectiveness of targeting price control with traditional monetary tools. The answer becomes apparent from the nature of inflation itself, driven by a series of local and international shocks exacerbated by various factors, including: (1) price distortions resulting from monopolistic practices, (2) a shortage of goods due to the inflexibility of the production apparatus, and (3) supply constraints resulting from deficiencies in distribution channels.

With these findings in mind, several key recommendations can be addressed to the decision makers and economic policy makers. One such recommendation is strengthening coordination between fiscal and monetary policies. While it is true that, in principle, efficient communication and collaboration between the Ministry of Finance and CBE are necessary for ensuring that fiscal policy is consistent with the objectives of monetary policy, experience from developed countries indicates that effective communication and collaboration between both parties are very important. This would help forestall the possible negative impact of fiscal deficits on the independence and potency of monetary policy. Besides that, structural measures likely to reduce fiscal deficits should be foregrounded. Addressing the fundamentals of budget deficits—things related to inefficient public spending, revenue leakages, and poor tax systems—may offer more room for flexibility toward attaining the CBE economic objectives without the severe restrictions imposed by budgetary pressures.

The level of autonomy of the Central Bank should be boosted. This, for instance, will imply revisiting the legal and institutional framework governing the CBE with the purpose of having a more autonomous central bank independent from the fiscal authorities. This will suitably give the central bank full powers in an insulated position vis-à-vis political pressures

in managing monetary policy—clear mandates with a priority toward price stability on the one hand and insulation from political pressures regarding government deficits on the other. Moreover, since some of the multiple drivers of inflation in Egypt also include monopolistic practices and supply constraints, the set of instruments that will be adopted by the policymakers should be broader than the traditional monetary policy tools. Regulatory measures related to fighting monopolies, incentivizing production capacity expansion, and improving distribution channels are at the core of tackling the very roots of inflation.

Supply-side interventions, on their part, require more emphasis by economic policy makers. This would help alleviate the supply-side inflationary pressures by enhancing the flexibility of production and sorting out bottlenecks in distribution. They can be addressed by investing in infrastructure, reducing business regulation, and increasing competition. The last point is related to increasing the transparency and communication of the CBE. It should clearly communicate the policies and their aims, difficulties, and purpose to the public. This would align public expectations and help bridge the trust gap between the common people and the monetary policy decisions.

Therefore, the conclusion of the research suggests that future studies may be conducted regarding central bank independence in other countries within the MENA region. Mainly, such research studies could attempt to find out how fiscal deficits may affect the autonomy of the central bank. The comparative studies from country to country among MENA states shall also help to observe the influence of legal and institutional structures on the effectiveness of monetary policy. The other possible line of research in this regard is the efficacy of monetary policy under different fiscal regimes, namely that of an austerity vis-a-vis an expansionary policy, and how these affects central bank autonomy.

Future work could also look into how international financial shocks, such as commodity price fluctuations, serve to further blur the questions of central bank autonomy and effectiveness in countries such as Egypt. Another promising area the Department could engage in is research into the potential of non-traditional monetary tools in emerging economies, particularly given the structural limitations most of these countries face. The last general area is that of the interface between political economy and central bank operations:

particularly, how governance, political instability, and institutional quality affect central bank autonomy and performance in the management of fiscal deficits and monetary policy. This gives such recommendations for study in the future, indeed adding some value to the tough complexities that exist between fiscal and monetary policies in Egypt and other places as well.

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Appendix

The Concept of Central Bank Autonomy:

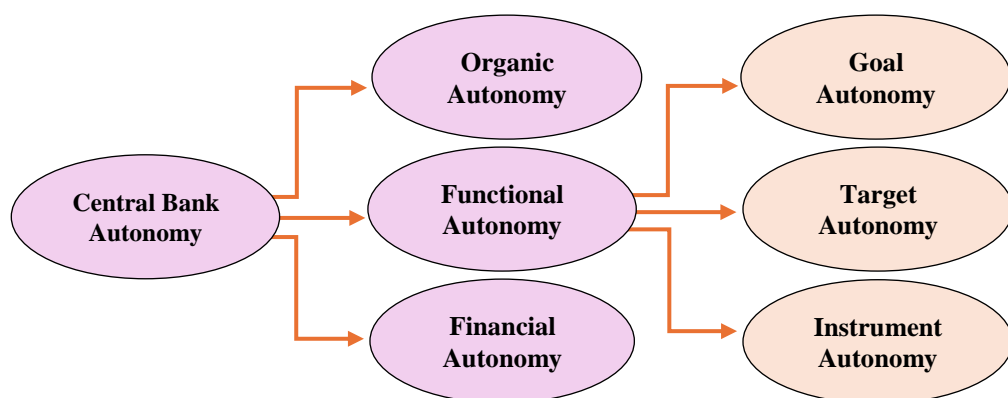
The notion of central bank autonomy involves the detachment of the central bank from governmental influence, akin to the autonomy observed in the judiciary. An autonomous institution is characterized by the ability to establish its objectives and reach decisions without intervention from political and executive bodies. Essentially, autonomy of the monetary authority implies that the government is unable to compel the central bank to fund budget deficit, allowing the central bank the liberty to employ monetary policy tools without external constraints.

The use of the term "central bank autonomy of the monetary authority" does not imply a complete separation between the government and the central bank. The central bank is, in fact, a governmental institution operating within the institutional framework of the state to achieve the objectives outlined in the constitution through the functions legally assigned to it. However, autonomy of the monetary authority refers to the autonomy of the central bank's decisions regarding monetary policy and how it selects and employs its monetary tools, aiming to achieve the objectives set by law. Despite the central bank not acting as an agent or advisor to the government, the relationship should be free from governmental pressures or any interference from other state institutions in managing monetary policy. As Panizza (2000) observes, monetary policy autonomy of the monetary authority, free from financial considerations, implies that public expenditures are entirely financed from real funding sources, and the government does not rely on seigniorage.

In more specific terms, central bank autonomy pertains to three key domains in which the government's impact must be either eliminated or significantly restricted, as outlined by Ahsan et al, (2006), Pisha (2011), and

Cargill and O'Driscoll (2012): organic autonomy, functional autonomy, and financial autonomy.

The concept of organic autonomy pertains to the circumstances surrounding the appointment of executive officials in the central bank, the tenure and potential renewal of their terms (particularly those of governors), and the makeup of the central bank's governing bodies. This includes considerations about whether government representatives are granted the privilege to participate and cast votes in these authorities.



On the contrary, operational autonomy (alternatively termed functional independence) pertains to the genuine autonomy that the central bank possesses, not only in defining its desired objectives but also in executing monetary policy, encompassing the selection of instruments. As outlined by Henning (1994) independence denotes the central bank's capacity to employ monetary control mechanisms without directives, counsel, or interference from the government. Consequently, some scholars categorize operational autonomy into specific types, delineating (1) goal autonomy, (2) instrument autonomy, and (3) operational autonomy. Nevertheless, the demarcation between these three tiers is nuanced and necessitates elucidation, particularly in the context of the initial two levels.

Regarding the subsidiary concepts derived from operational autonomy, the central bank's autonomy in setting monetary policy and managing the exchange rate system, particularly in the context of a floating exchange rate, is attributed to goal autonomy. To elaborate further, this autonomy confers the authority upon the monetary institution to specify its primary objective from a range of objectives stipulated in the central bank law. In instances where the law lacks precise definitions of objectives, goal

autonomy enables the determination of the central bank's primary goal. Target autonomy, as the precursor concept to independence, entrusts the monetary authority with the responsibility of determining either both the monetary policy and exchange rate system or solely the monetary policy when a floating exchange rate is in place. Nevertheless, it differs from goal autonomy in that the specific objective mandated by legislation for the central bank to attain through its monetary policy is clearly articulated within the legal framework. As a result, the central bank has full autonomy in choosing a particular target, such as the monetary base, interest rate, or inflation rate, to accomplish its legislatively defined goal, such as upholding price stability. Finally, the instrument autonomy involves the government or legislative body setting monetary policy and its objectives, coordinating with the central bank and the exchange rate regime. However, the monetary authority maintains significant autonomy in implementing this policy using appropriate tools.

In accordance with the perspectives outlined by Debelle and Fischer (1994), the assertion is made that a central bank's possession of instrument autonomy need not necessarily extend to goal autonomy. Grilli et al. (1992) introduced the terms "political independence" and "economic independence" to delineate these two facets. Although goal autonomy affords a heightened level of autonomy to a central bank, concerns raised by Lybek (1999), and Blinder (1998) question the rationale behind delegating such authority to governors who are not directly elected by the public. They express reservations about non-elected officials having the authority to determine the short-term trade-off between inflation and unemployment. In contrast, we argue that addressing inflation should be regarded as a crucial public good rather than a mere balancing act with unemployment, particularly in developing economies where inflation disproportionately impacts impoverished and vulnerable populations.

Financial autonomy is the ability of a government to fund its expenses through direct or indirect reliance on advances and loans from the central bank. Additionally, as articulated by Bassoni and Cartapanis (1995), financial autonomy enables the evaluation of the budgetary leeway that the central bank possesses-meaning its autonomy in terms of the financial resources essential for its operations. This aspect of financial autonomy is often characterized as budgetary autonomy.