Switching Monetary-Fiscal Regimes in Egypt: Is the Fiscal Stimulus necessarily good in bad times?

Dina KASSAB[1]

Abstract

This paper investigates the monetary-fiscal interaction in Egypt for the period 2001Q1 to 2020Q2, a period that includes several reform programs, the 2011 revolution but also the global financial and the Covid-crises. Markov-switching regression methods are employed to estimate fiscal and monetary policy feedback rules in Egypt and the overlay of the smoothed probabilities is used, in the spirit of Davig and Leeper (2007), to show the estimated timing of the joint monetary-fiscal regime and depict its evolution. A sign restricted vector autoregression (SRVAR) model is then used to analyze the effects of different potential fiscal-monetary policy mixes, similar to those undertaken by different governments the during the coronavirus pandemic, on macro variables in Egypt. Three main findings emerge from the analysis. First, fiscal policy in Egypt always responds to government debt, although the magnitude of this response differs throughout the periods. Second, regime-switches in monetary and fiscal policy rules do not exhibit any degree of synchronization which represents a novel way of tracking the time-series behaviour of government debt and inflation in Egypt. Third, the effect of a fiscal stimulus on real consumption and GDP in Egypt does not outlive the stimulus due to a Ricardian Equivalence effect, where agents expect higher future taxes to finance deficits resulting from the stimulus. This effect can be mitigated with an accommodating monetary policy, at the expense however of inflationary pressures that inflation targeting central bank will have to face.

Introduction

On September 22nd, 2020, the Egyptian government announced a USD 6.4 billion stimulus package (1.8% of GDP) in order to reverse the negative trends induced by the Covid-19 shock. On the monetary side, the Central Bank of Egypt (CBE) reduced policy interest rates by 400 basis points during 2020, with the overnight deposit rate cut from 12.25 percent to 8.25 percent. Despite the relative and apparent resilience of the economy, the government is accumulating debt at an alarming rate which reduces the fiscal policy bandwidth. The CBE is conducting unconventional monetary policies in a near zero lower bound environment (ZLB) which restricts its ability to stabilize the economy. This limited

[1] Assistant Professor, Faculty of Economics and Political Science, Cairo University; email: dina.kassab@feps.edu.eg

policy space highlights the need for a better understanding of how monetary and fiscal policies interact and a thorough investigation of whether the expansionary effects of the stimulus outlive the stimulus itself. In this paper, I follow a number of recent works, including Faria-e-Castro (2021), Liu et al. (2021) and Azad et al. (2021) and investigate the effectiveness of policy responses against the macroeconomic effects of the Covid-19 given the fiscal–monetary policy interactions in Egypt.

The relative effectiveness of fiscal or monetary policy measures has been the subject of an essential debate in the economic literature and gained even more importance during the Covid-19. From the monetary policy side, the most crucial concern is whether monetary transmission mechanism works effectively or not. While Eichenbaum (2019) highlight the limited ability of monetary policy in the ZLB case, this effect may be offset with unconventional monetary tools (Bernanke, 2020). Proponents of the fiscal stimulus argue that monetary policy alone would be unable to revive economies in the ZLB and advocate for a policy stimulus coming mainly from increasing public spending since even tax cuts may fail to reverse lack of confidence and deep risk aversion (Dervis, 2009; Bernanke et al., 1999; Motto et al., 2010). Faria-e-Castro (2021) constructs a calibrated DSGE model to determine the effectiveness of the different forms of fiscal measures; using a heterogeneous agent New Keynesian (HANK) model, Bayer et al. (2020) find that the transfers mitigate the output loss caused by Covid-19.

The objective of economic stimuli is to spur job creation by increasing aggregate demand. The typical argument has stimulus raise consumption demand, the demand for labor and employment. The transmission mechanism then relies on the response of consumption to an increase in government spending. However, there is no consensus among economic theory or empirical evidence that higher government purchases raise consumption. In fact, two features of the macroeconomic policy response are crucial and yet have received little attention. First, it is the monetary-fiscal *mix* that determines the outcome of the stimulus. As Davig and Leeper (2011) point out, the transmission mechanism of the fiscal stimulus crucially depends on the consumption response to public spending. However, in the presence of an active monetary policy and a passive fiscal policy,[2] the fiscal stimulus reduces private consumption. Thus, separating monetary and fiscal policies overlooks the important question of policy interactions that are important for determining equilibrium so that a tax cut in a policy environment where the monetary authority reacts aggressively to inflation will have a different outcome from one where interest rates are exogenous. Second, even once the policy mix is identified, it is not likely to persist indefinitely, that is, the regime-switching needs to be accounted for. For instance, is a tax cut expected to be followed by higher future taxes to service the increased debt or

[2] According to Leeper (1991), monetary and fiscal policy behavior can be active or passive. Monetary policy is active when it responds strongly to the inflation rate. By contrast, fiscal policy is passive, when it responds strongly to government debt by raising taxes. A passive fiscal policy creates a strong negative wealth effect since higher future taxes are to be expected after a fiscal stimulus. An active monetary policy increasing interest rates crowds out private consumption.

is it believed to be a switch to a different regime where higher debt-to-output ratios are tolerated so that lower future taxes are to be expected? The inter temporal aspects of policy interactions and their switches determine how a stimulus is expected to be financed which the theory suggests is a crucial determinant of the efficacy of the stimulus.

In this paper, I utilize Leeper's (1991) definitions to characterize the different monetary-fiscal regimes. To the best of my knowledge, this is the first paper to address policy regime shifts in Egypt. This research is policy-driven and aims to answer three questions. First, following the active–passive perspective proposed by Leeper (1991), which policy regime can best fit Egypt's macroeconomic data during the period from 2004 to 2021? Second, considering policy interactions, what were the transmission mechanisms underlying Egypt's monetary and fiscal policies during this period? Third, given our understanding of these transmission mechanisms, are direct fiscal measures more effective in mitigating negative economic impacts of Covid-19 on the Egyptian economy and should they be accompanied by accommodating monetary measures? And, if so, are the positive effects on economic activity expected to die out with the end of the fiscal stimulus?

Using quarterly data on key macroeconomic variables in Egypt from 2001Q1 to 2020Q4, a period that includes several reform programs, the 2011 revolution but also the global financial and the Covid-crises, I estimate interest rate rules for monetary policy and tax rules for fiscal policy in Egypt that switch stochastically between two regimes. I then proceed to estimate the outcomes of different mixes of fiscal and monetary policies similar to those undertaken by many governments to counter the slowdown in economic activity after the Covid crisis. A sign restricted VAR model where each policy mix is identified by sign and/or zero restrictions on government spending, government revenues and T-bill rate (as proxies for fiscal and monetary policies). The results are then explained in the context of the regime-switching results obtained in the first section.

The main findings of this paper be summarized as follows. First, fiscal policy in Egypt may be classified, according to Leeper (1991) terminology, as passive, with taxes responding to government debt, particularly from 2006 to early 2013 (except for a brief episode of active behavior in 2008 due to the global financial crisis). In the aftermath of the 2011 revolution and the deteriorating economic conditions, the debt-financing motive was lessened, and fiscal policy opted for a more countercyclical behavior to revive the economic activity between 2013 and 2016. Then the fiscal policy switched back to passive starting 2016 with the ERSAP being put in place to enhance fiscal consolidation. Second, the monetary policy started out as active up to 2005, a year where the setup became one of fiscal dominance and the CBE then started responding weakly to inflation. With the floatation of the Egyptian pound and the unprecedented inflation rates, monetary policy reverted to active behavior late 2015. Third, regime-switches in monetary and fiscal policy rules do not exhibit any degree of synchronization, there were episodes where both policies prioritized debt financing, which led to high inflationary pressures, and others – albeit brief – where neither paid attention to budget balancing, which led to exacerbating the

government debt financing pressure. Fourth, due to the fiscal policy being responsive to government debt (to varying degrees throughout the periods), a Ricardian equivalence effect reduces agents' incentives to increase consumption after a fiscal stimulus; current deficits are expected to be financed with higher future taxes, the intertemporal substitution effect thus weakens the efficacy of the stimulus. The SVAR analysis shows that the effects of the stimulus on real consumption and GDP do not outlive the stimulus. A policy mix where a deficit-financed increase in spending is coupled with a fall in interest rate overcomes this problem and prolongs the effects of the stimulus on real consumption. This occurs however at the cost of inflationary pressures that inflation targeting central bank will have to face.

The paper proceeds as follows. Section 1 presents a brief review on the literature. Section 2 presents the regime-switching model and derives rules for monetary and fiscal policies in Egypt. In section 3, I use the sign restricted VAR to estimate the economic outcomes of different forms of fiscal stimuli. Section 4 concludes.

1. A Brief Review of the Literature

1.1. Monetary-Fiscal Regimes

Leeper (1991) defines an active or passive policy in terms of the constraints the policymaker faces. An active policy sets its control variable to pursue its objectives independently of the state of government debt. A passive policy is constrained by public debt balancing as well as the behavior of the active policy. The idea is, to balance the inter temporal government budget constraint, a shock to public debt has to be financed by some future tax. The question of whether this shock brings about a higher net-of-interest surplus or a higher inflation tax is crucial to understanding the fiscal financing time series of an economy. Higher taxes imply a passive fiscal behavior whereas the deficit being monetized reflects a passive monetary policy. Four disjoint monetary-fiscal regimes can then be identified according to whether monetary and fiscal policies are active or passive:

- *Active monetary and Passive fiscal regime (AM/PF)* This is the policy mix implicit in the literature on the Taylor principle where the active monetary policy is not constrained by budgetary considerations, the interest rate adjusts to respond to inflation. The fiscal authority's behavior is constrained by consumers' optimization and the active monetary authority's decisions, it must then generate sufficient revenues to balance the budget. Monetary policy stabilizes prices by preventing deficit shocks from affecting inflation. This policy combination implies a unique equilibrium consistent with *Ricardian equivalence*.[3]

[3] This regime is consistent with Sargent and Wallace's (1981) regime of monetary dominance.

- *Passive monetary and Active fiscal regime (PM/AF)* This is the case of a monetary authority that reacts weakly to inflation together with a fiscal policy that reacts weakly to debt. Monetary shocks have effects on the real variables as they affect consumers' arbitrage between money holdings and government bonds. Fiscal shocks bring about higher inflation taxes and thus reduce the nominal values of liabilities held by the public. This policy mix implies a locally unique stationary equilibrium associated with the *Fiscal Theory of the Price Level (FTPL)* where fiscal policy impacts are non-monetarist non-Ricardian and where the path of taxes affects the inflation rate.
- *Passive monetary and Passive fiscal regime (PM/PF)* This is the combination where each policy authority acts passively as though it is constrained to balance the budget. Without the constraint imposed by one active behavior, there are multiple equilibrium paths for money growth, what Sargent and Wallace (1975) refer to as the *price-level indeterminacy* result. This also arises when the interest rate depends on inflation, but the dependence is not overly strong.
- *Active monetary and active fiscal regime (AM/AF)* Each authority actively disregards budget balancing considerations. There does not exist a money growth process that ensures consumers will hold government debt. Such combination, if it persists, leads to explosion in Federal government debt and its associated interest payments.

Davig and Leeper (2007) conclude that active behavior is necessary for the existence of equilibrium, while passive policy – which prevents explosive debt paths – is necessary for uniqueness of equilibrium.

1.2. Regime Switches

Typical analyses assume either an AM/PM setup, which couples higher government spending with an equivalent increase in lump-sum taxes to pay for the spending, while interest rates respond to inflation (see Gali et al., 2007; Monacelli and Perotti, 2008) or a PM/AF regime (see, for example, Kim (2003)). However, there is growing evidence on regime switches in many parts of the world, and policy changes are inherently temporary, especially if they are due to the personalities of political players rather than the creation of new policy institutions or changing in existing ones' mandates. It is thus logically inconsistent to think of policy changes as occurring once and for all (Sims, 1987). This observation naturally led to the introduction of the idea of regime-switching into the analysis. For instance, in the U.S., evidence was found that the Fed led a passive monetary policy in the 1960s and 1970s, this policy then switched to active behavior since the early 1980s (Clarida et al., 2000; Lubik and Schorfheide, 2004; Favero and Monacelli, 2003; and Sala, 2004). While the U.S. fiscal policy may be characterized as active from the 1960s throughout the 1980s, switching gradually to passive in the early 1990s and switching back to active in early 2001 (Favero and Monacelli, 2003).

Chung et al. (2007) compare the case where regime is permanent and when agents put a positive probability on regime switching and investigate whether the impact of fiscal

and monetary shocks differs in the two scenarios. They find that, using a DSGE model, because agents' decisions embed the probability that policies will change in the future, monetary and tax shocks always produce wealth effects. The implications of regime-switching are highly sensitive to the initial regime: regime-switching matters only when the intial regime is an AM/PF setup but not when the economy is originally at a PM/AF regime. The reasoning goes as follows. In a permanent AM/PF environment, tax cuts keep the demand for goods unchanged as there is no change in net wealth: a bond-financed tax cut brings forth a rise in expected future taxes whose present value exactly equals the increase in the present value of debt, the present value of seignorage also remains unchanged since unchanged inflation implies unchanged nominal rates in that regime. This is the case where the fiscal stimulus is not effective in raising consumption. However, when agents place a positive probability on switching to a PM/AF regime, they perceive the tax cut initially as an increase in net wealth as the current tax reduction exceeds the expected present value of the future tax increase, due to the expected future inflation, and private consumption increases along with the price level. Active monetary policy then propagates the transitory tax cut and generates persistently higher inflation and nominal rates.

In a PM/AF regime where both taxes and nominal interest rates are exogenous where the tax cut cannot be financed by future revenues, the full tax cut is financed by a contemporaneous increase in inflation. In the periods following the tax cut, agents experience a net increase in wealth, and this induces them to increase their consumption paths. Debt is then devaluated and, by fixing interest rate, monetary policy prevents the tax shock from propagating. Allowing for the probability of regime switching does not alter the results; even though agents impute a positive probability to a passive tax policy and a Taylor rule in the future, the inflation rate jump leads to an unchanged present value of debt (or unchanged real debt) which is consistent with an unchanged present value of taxes and seignorage. In this case, debt is completely monetized. In conclusion, starting from an PM/AF regime, the fiscal stimulus always increases consumption. However, starting from a AM/PF, the tax cut raises consumption only if a positive probability is placed on switching to PM/AF.

In this paper, I follow Leeper (1991), Chung et al. (2007), Davig and Leeper (2011), and Xu and Serletis (2016) in estimating Markov-switching monetary and fiscal rules. Throughout the paper, regime change is treated as exogeneous. This is a first step of a more ambitious project where regime shifts are endogenized and economic variables feedback into policy parameters in a general computable model. As pointed out by Chung et al. (2007), a regime switch may be triggered by policy response to the state of the economy, but it could also be driven by political agenda, and this further complicates the analysis. The exogeneity assumption is a reasonable first step as it helps with tractability and more straightforward interpretations.

2. Monetary and Fiscal Interactions:

2.1. The Regime-Switching Rules

I consider interest rate rules for Egyptian monetary policy and tax rules for fiscal policy that switch stochastically between two regimes. Regarding monetary policy, a standard Taylor (1993) rule is considered

$$i_t = \alpha_0(S_t^M) + \alpha_\pi(S_t^M)\pi_t + \alpha_y(S_t^M)y_t + \sigma(S_t^M)\varepsilon_t \quad (1)$$

where i_t is the nominal interest rate, π_t the inflation rate, y_t the output gap[4] and $\varepsilon_t \sim N(0,1)$ is the disturbance term. S_t^M indicates the unobservable monetary regime and is assumed to follow a first order, homogenous, two-state (1=active, 2=passive) Markov chain governed by the transition matrix $P^m = \begin{bmatrix} p_{11}^m & p_{12}^m \\ p_{21}^m & p_{22}^m \end{bmatrix}$ where p_{ij}^m is the probability of the monetary regime transitioning from regime *i* in one period to regime *j* in the next, so that $p_{ij}^m = P[S_t^M = j | S_{t-1}^M = i], i, j = 1, 2$, and $p_{11}^m = 1 - p_{12}^m$. The monetary rule allows the variance of the errors to switch between the two regimes, with the changes being restricted to change simultaneously with the coefficients. The policy rule in (1) reflects the different objectives of the monetary authority; changes in the interest rate can be motivated either by inflation concerns or countercyclical objectives. An exogeneous monetary policy that does not respond to either is assumed to be passive.

Taxes can be increased on the grounds of budget balancing to finance deficit or debt service or as a countercyclical tool. The fiscal rule takes the form as in Davig and Leeper (2006, 2011). All parameters are restricted to change simultaneously; a change in the fiscal response to the output gap entails a change in the responses to debt and government purchases. The fiscal rule is

$$\tau_t = \beta_0(S_t^F) + \beta_b(S_t^F)b_{t-1} + \beta_y(S_t^F)y_t + \beta_g(S_t^F)g_t + \varepsilon_t^F \quad (2)$$

where τ_t the taxes-to-output ratio, b_{t-1} the lagged debt-to-output ratio and g_t the government purchases-to-output ratio. S_t^F indicates the unobservable fiscal policy regime which follows a Markov chain (1=active, 2=passive) with transition matrix $P^f = \begin{bmatrix} p_{11}^f & p_{12}^f \\ p_{21}^f & p_{22}^f \end{bmatrix}$. The fiscal rule Equations (1) and (2) are estimated using maximum likelihood estimation. The sample for estimating the fiscal period spans the period 2006Q1:2021Q2 due to data availability.

2.2. Data and Estimation results

The monetary stance i_t is measured by the discount rate. Inflation π_t is defined as the log difference of the Consumer Price Index (CPI). The output gap is calculated as the log

deviation of nominal GDP from potential nominal GDP, estimated by using the Hodrick-Prescott filter. The fiscal stance, τ_t is the tax-to-GDP ratio and b_{t-1} is the share of general government debt of nominal GDP. Appendix A describes the data used for the regime-switching model. Estimation of the policy rules then utilizes the Hamilton (1994) iterative algorithm which implies an expectation-maximization in models with a latent unobserved variable. The technique typically involves using a filtering algorithm to propose the path of the observed variable and then using maximum likelihood estimation to estimate the model parameters, including the transition probabilities, given the current regime. Tables 1 and 2 report the parameter estimates for the monetary and fiscal regimes respectively.

Table 1. Regime-Switching Model of Monetary Policy

Dependent Variable: DISCOUNT RATE
Sample (adjusted): 2001Q2 2020Q4

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1: Active Monetary				
C	10.27842	0.382379	26.88020	0.0000
INFL_CPI	0.664146	0.255127	2.603198	0.0092
YGAP_CST	0.969611	0.250172	3.875773	0.0001
Regime 2: Passive Monetary				
C	6.654508	0.653893	10.17676	0.0000
INFL_CPI	0.210524	0.308615	0.682159	0.4951
YGAP_CST	0.170806	0.146300	1.167509	0.2430
Akaike info criterion	3.685963	Log likelihood		-135.5955

Transition summary - Monetary Policy

Constant transition probabilities:

	1	2
1	0.952322	0.047678
2	0.034536	0.965464

Constant expected durations:

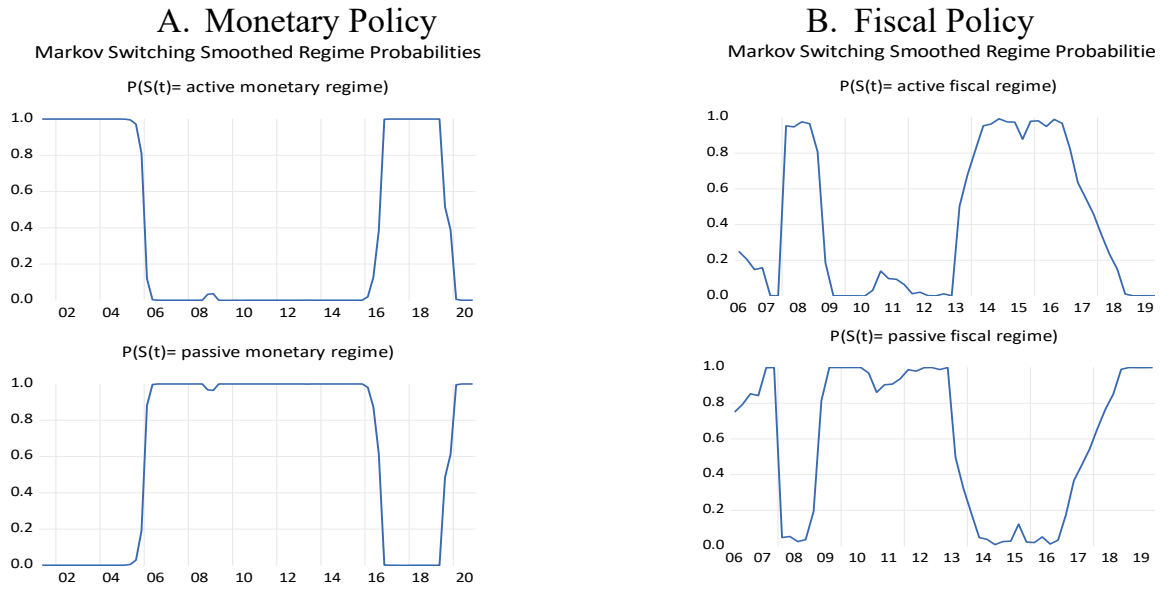
1	2
20.97398	28.95520

Monetary policy seems to be switching between actively responding to inflation, consistently with the Taylor principle (α_π^1 is estimated at 0.664 with a p-value of 0.0092) while also responding countercyclically to the output gap (α_y^1 is positive and significant), and being passive, reacting weakly to inflation (α_π^2 has a p-value of 0.495) and to the output gap. These results perhaps suggest phases of (in)dependence of the Central Bank; for some periods the CBE has complete autonomy to aggressively respond to inflation and stabilize the economy, whereas in others the interest rate was adjusted in response to the state of government indebtedness. Table 2 shows the passive regime to be relatively more persistent with an average duration of 7.5 years (28.9 quarters). Figure 1 shows the smoothed probabilities of the active and passive monetary policy. These probabilities are reported at time t conditional on the full sample information.

Regarding fiscal policy, it switched between being active, responding to economic activity (β_y^1 is estimated at 0.213 with a p-value 0.000) and being passive, prioritizing budget balance concerns over economic activity. It should be noted that, in both regimes, taxes are used to finance the government debt, however, this motive is less pronounced in

the active regime (β_b is estimated at 0.369 and 0.465 in the active and passive regimes respectively, with both estimates being highly significant). This suggests that, in Egypt, current deficits always induce higher future taxes, this result is crucial to the analysis of the effects of the fiscal stimulus as will be shown further below. It should also be noted that the fiscal policy, in its active state, is aggressively countercyclical; a one percent increase in the output gap increases the taxes ratio by 0.21 percentage points. Periods of passive fiscal behavior are far more persistent than the active episodes. The probability of

Figure 1. Regimes Smoothed Probabilities



transiting to a passive behavior when active is 0.862, whereas that of switching to an active behavior when passive is 0.918. The passive behavior persists around 3.1 years and the active 1.8 years. Overall and consistently with the literature (), the fiscal policy behavior is found to be less stable than the monetary.

Table 2. Regime-Switching Model of Fiscal Policy

Dependent Variable: TAX-TO-GDP
Sample (adjusted): 2006Q3 2019Q4

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1: Active Fiscal				
DEBT	0.369128	0.097943	3.768801	0.0002
GOV_CONS	0.269778	0.206663	1.305399	0.1918
YGAP_CST	0.212541	0.040156	5.292838	0.0000
Regime 2: Passive Fiscal				
DEBT	0.465123	0.053988	8.615319	0.0000
GOV_CONS	0.095177	0.115455	0.824361	0.4097
YGAP_CST	0.010783	0.012404	0.869311	0.3847
Common				
Akaike info criterion	-0.970603	Log likelihood		35.20629

Transition summary: Fiscal Policy

	1	2
1	0.861994	0.138006
2	0.081862	0.918138

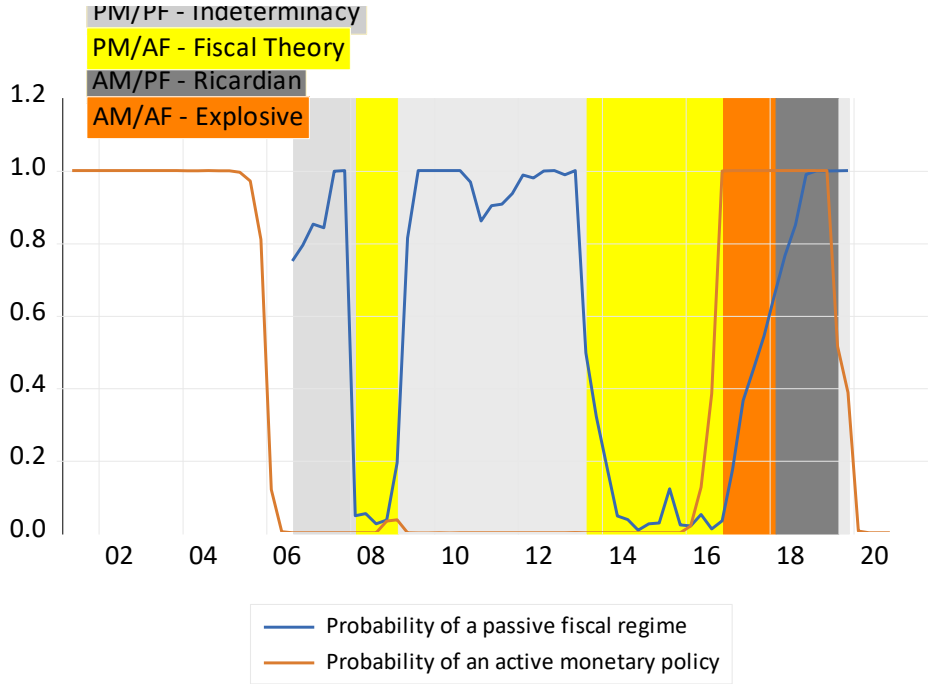
Constant expected durations:

1	2
7.246083	12.21566

2.3. A history of regime changes in Egypt

The policy rules are estimated using a sample that runs from 2001:Q1 to 2020:Q4, a period by some important events, both globally (the global financial crisis and part of the Covid-19 crisis) and nationally (the 2003 structural reforms, the 2011 revolution and the 2016 Structural Adjustment Program (ERSAP)), that shaped the monetary and fiscal policy behaviors and their interaction.

Figure 2. Estimated Egypt fiscal-monetary regimes



The model estimates show that the monetary policy has been active until 2005Q2. In fact, Egypt maintained a peg of its currency to the US dollar for over forty years, the CBE actively intervened on the market to stabilize the value for the exchange rate. The float of the Egyptian pound was announced in January 2003, however the CBE continued in a fixed adjustable peg regime until 2005 where the exchange rate volatility started to stabilize. Also, the CBE law no. 88 was issued in 2003, however the institutional amendments that followed, particularly the establishment of the monetary coordinating council by the presidential decree no. 17 of 2005, further reduced the autonomy of the CBE. This period exhibited a fiscal dominance setup with typically high inflation rates and a passive monetary authority.

Moreover, the exchange rate continued to appreciate between October 2004 and August 2008, which led to unprecedented accumulation of international reserves between 2005 and 2008, thus explaining the lack of intervention during this period. In the aftermath of the global financial crisis in 2008, the currency depreciated, and the CBE intervened in the foreign exchange rate market (thus explaining the spike in the smoothed probabilities curve after 2008). In November 2016, the CBE completely floated the Egyptian pound and shifted back to the active behavior, this was particularly motivated by the implementation of the IMF economic reform. The CBE put in place a formal inflation target of 9 percent and set interest rates according to the global economy conditions. Then again, in 2020, the monetary policy instrument switched to being exogeneous, perhaps reflecting the CBE's stimulating monetary policy during the pandemic.

The smoothed probabilities graph (see Figure 2) depicts the evolution of the fiscal conduct in Egypt. The abolishment of the Golden rule in 2005[5] led to discretionary interventions from the fiscal policy, prioritizing budget balance over economic stimulation, which translates here as a passive regime. This passive behavior was briefly interrupted by a switch to active behavior following the 2008 financial crisis to mitigate its effect on the economic activity. Over the period 2009Q1 to 2013Q3, the fiscal dominance setup persisted. With the arrival of the new president and the implementation of fiscal reforms such as the partial liberalization of the fuel prices in 2014, the focus shifted once again to reviving the economy activity after the dramatic fall in reserves and the overall slowdown in the economy resulting from the previous era. Starting 2016, and with the implementation of subsidies reforms and the value added tax as part of the 2016 ERSAP, restoring fiscal balances regained importance and this time it was coordinated with the monetary policy as to mitigate the effects of its contractionary policy.

The overlay of the smoothed probabilities in Figure 3 illustrates the estimated timing of the joint monetary-fiscal regime and depicts its evolution in Egypt over the sample period. Monetary policy was active until 2005 when the autonomy of the CBE was diminished by the institutional amendments as previously mentioned. Then, between 2006 and 2016, monetary policy remained passive. Fiscal policy however switched between

[5] The golden rule stipulates that the government will borrow only to finance investments, while current spending should be financed by fiscal revenues.

active and passive behaviors, thus creating an episode of indeterminacy between 2006-2013 (interrupted by a brief episode after the 2008 financial crisis), i.e. a setup of fiscal dominance where budget concerns are prioritized over economic stimulation. This period was then followed by a PM/AF scheme, where deficits are financed by future inflation taxes, thus leading to high levels of inflationary pressures. This naturally led to the floatation of the Egyptian pound in 2016.

Both policies were active between 2016 and 2018, a policy mix that leads to explosive debt paths if it persists indefinitely and is referred to in the literature as a case implying non-existence of equilibrium. This short *unsustainable* episode was terminated when the fiscal policy reverted to passive behavior to enhance the budget surplus of the government. Starting late 2019, the policy mix seems to tend to the indeterminacy setup where both policies utilize their instruments to finance the budget deficit.

3. Sign-Restricted VAR and Fiscal Policy Shocks:

Now I attempt to answer the key question in the paper: Is the fiscal stimulus necessarily good in bad times? To this end, I investigate three policy scenarios. In the first, I investigate the effects of a deficit-spending fiscal policy implementation, one in which government expenditures and revenues remain unchanged. In the second fiscal scenario, government revenues while expenditures rise. In the third, I consider the inflation-financed deficit where government revenues decrease, government expenditures increase and the T-bill rate falls. To identify each of the three shocks, I use the identification method proposed by Uhlig (2005).

The reduced form representation of the VAR is given by

$$Y_t = \sum_{i=1}^{L} \boldsymbol{B_i Y_{t-i}} + \boldsymbol{u_t}$$

where Y_t is a $m \times 1$ vector of endogenous variables, L the lag length and $\boldsymbol{B_i}$ are the $m \times m$ coefficient matrices and $\boldsymbol{u_t}$ the vector of the one-step-ahead prediction errors with $E[\boldsymbol{u_t u_t'}] = \boldsymbol{\Sigma}$. I assume that the m fundamental shocks, $\boldsymbol{v_t}$, are mutually orthogonal and normalized to have unit variance, such that $E[\boldsymbol{v_t v_t'}] = \mathbf{I_m}$. To form a relationship between the one-step-ahead prediction errors and the fundamental shocks, the common practice is to identify a matrix $\boldsymbol{A}$ such that $\boldsymbol{u_t} = \boldsymbol{A v_t}$ and $\boldsymbol{AA'} = \boldsymbol{\Sigma}$. The jth column of this matrix thus represents the contemporaneous impact of a one standard error innovation to the jth fundamental innovation, which is the jth element of $\boldsymbol{v}$. An impulse rank n matrix is also a sub-matrix of $\boldsymbol{A}$. The novelty of Uhlig (2005) approach however is that it allows to identify an impulse vector $a \in R^m$ which is a column vector of $\boldsymbol{A}$ if and only if there is an m-dimensional vector $\boldsymbol{\alpha}$ a of unit length so that $\boldsymbol{a} = \widetilde{\boldsymbol{A}}\boldsymbol{\alpha}$ such that $\widetilde{\boldsymbol{A}}\widetilde{\mathbf{A}}' = \boldsymbol{\Sigma}$ is the Cholesky decomposition of $\boldsymbol{\Sigma}$. Let $r_i(k) \in R^m$ be the vector response at horizon k to the ith shock in

a Cholesky decomposition of $\boldsymbol{\Sigma}$: The impulse response $ra\ (k)$ for a is then simply given by

$$r_a\ (k) = \sum_{i=1}^{m} \alpha_i r_i(k)$$

Numerically, many impulse vectors are generated and heir implied impulse response functions calculated then we checking whether or not the sign restrictions defining a particular shock, are satisfied. A penalty function is then applied to reject draws non-compatible with sign restrictions. See Uhlig (2005) and Mountford and Uhlig (2009) for more details on the methodology.

In this model, $\boldsymbol{Y_t}$ includes real GDP, real private final consumption expenditure, real gross fixed capital formation (a proxy for domestic investment), real government expenditure (including government consumption, investment and "other"), the GDP implicit price deflator, real general government revenue, the interest rate on Treasury bills. Quarterly data from 2006:Q1 to 2021:Q1 on key macroeconomic variables are retrieved from the Ministry of Planning, Monitoring and Administrative Reform, the IMF-IFS database and the Central Bank of Egypt.

3.1. A Government Spending Shock

I identify a government spending shock as one that moves government expenditures up for 4 quarters while maintaining government revenues and T-bill rate unchanged. A criterion function is used which puts more weight on on large impulse responses in the right direction than comparatively small responses and penalizes responses that do not match the imposed sign restrictions. The impulse responses for all 7 variables are shown in Fig. X.[6]

Real GDP and real private consumption increase after the shock. If the economy is operating with a negative output gap, then an expansionary fiscal policy can reduce the gap in the short run. However, it can also be seen that this impact does not last beyond the 4th quarter, implying that the impact of the stimulus does not outlive the stimulus itself. This result is partly consistent with Blanchard and Perotti (2002) who find positive government spending shocks to have a positive effect on output in the U.S. The reason why consumption is not so responsive to the stimulus is that the fiscal policy in Egypt, whether active or passive, responds to debt. This produces a Ricardian equivalence effect which

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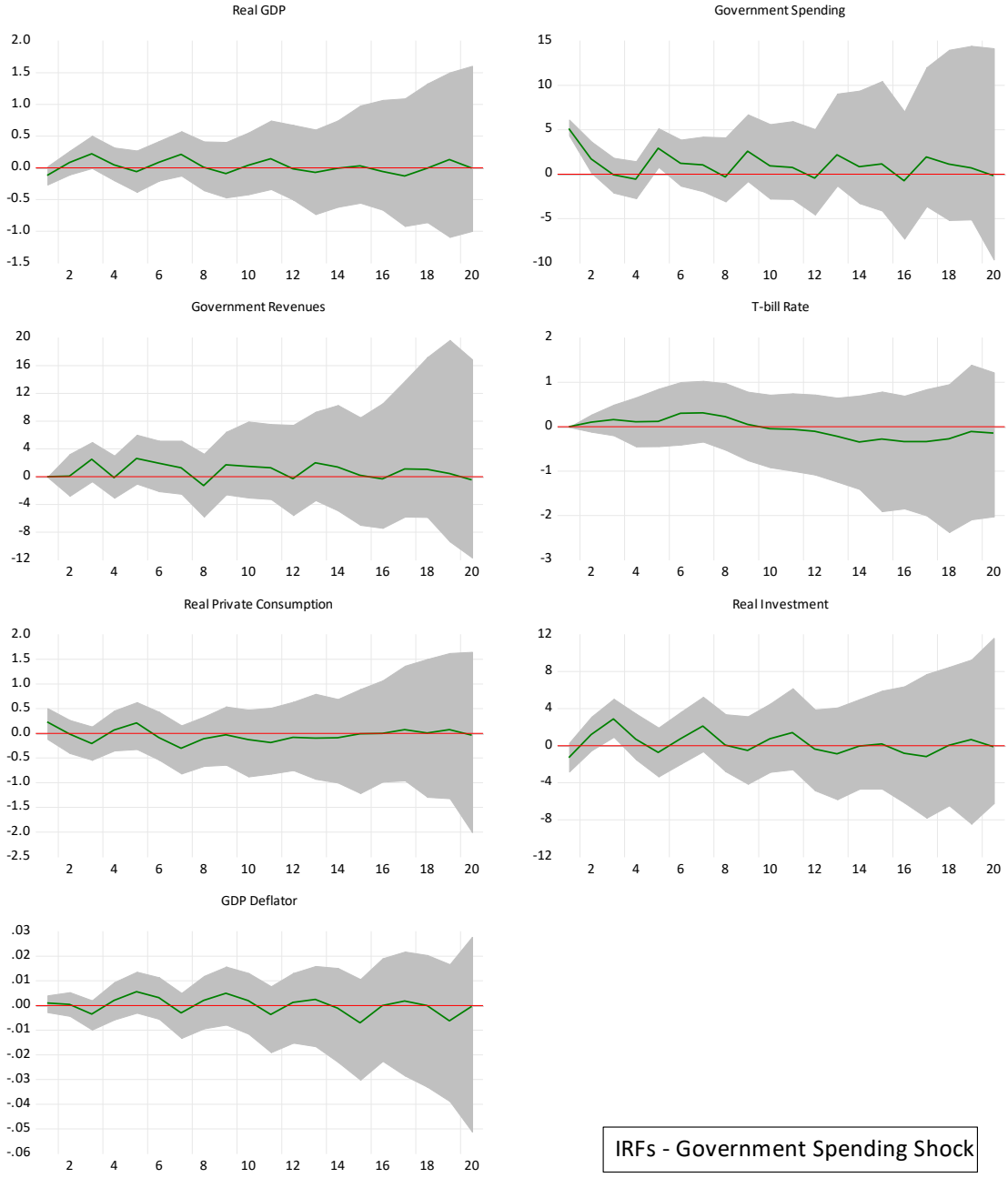
[6] The figure plots the 16th, 50th and 84th quantiles of impulse responses, calculated at each horizon for the first 20 quarters after the shock.

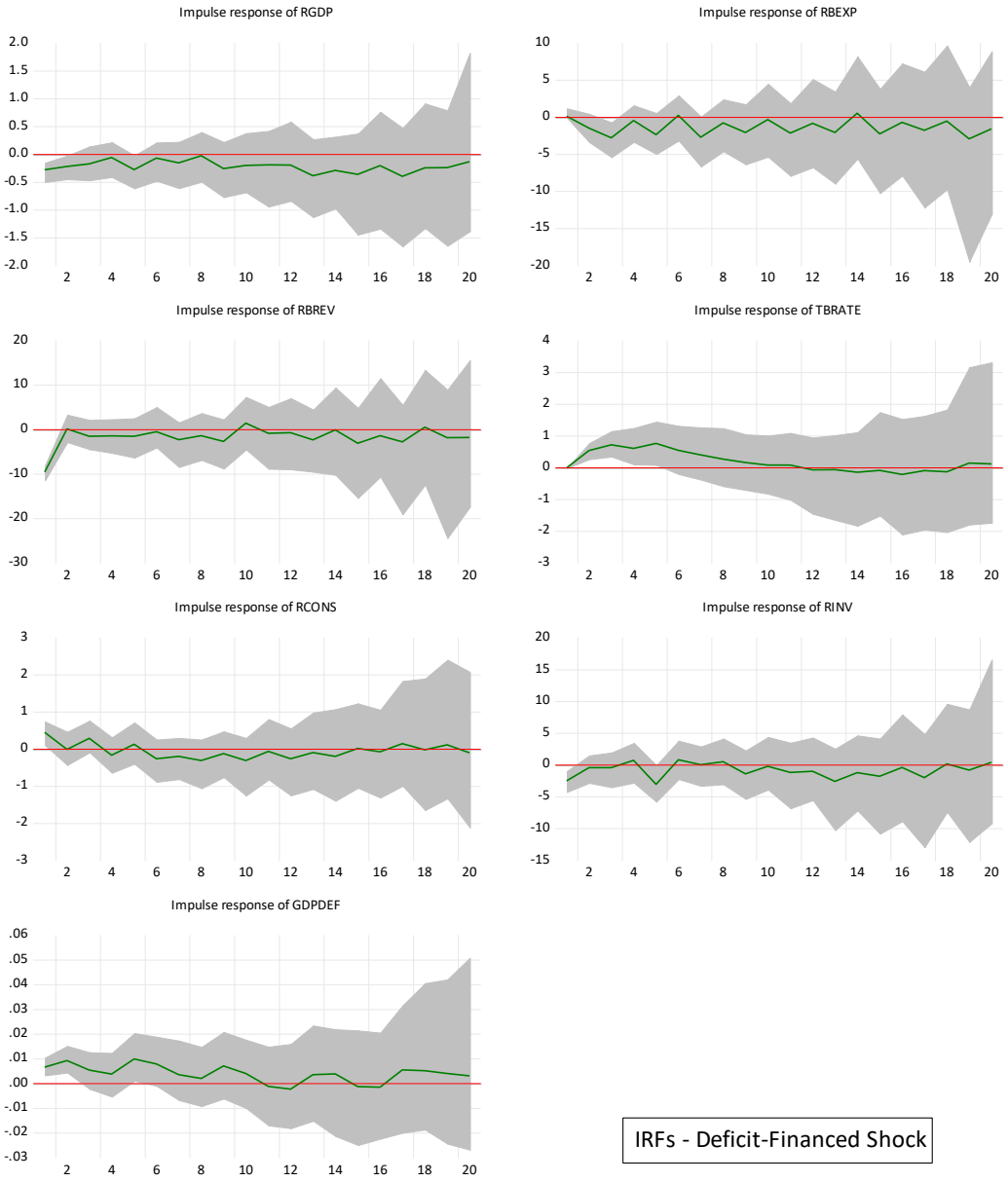
reduces the incentives to consume since higher future taxes are to be expected. The increase in real gross capital formation is somewhat sharper and more prolonged, compared to consumption. Government revenues and the treasury bill rate do not increase at first by construction but then the T-bill rate increases. This is because the now larger debt outstanding requires a higher premium for T-bills. The spending shock induces a slight increase in the GDP deflator perhaps due to the demand-pull inflation. However, this effect fades away and prices fluctuate since the effect on private consumption is short-lived.



IRFs - Government Spending Shock

3.2. A Deficit-Financed Shock

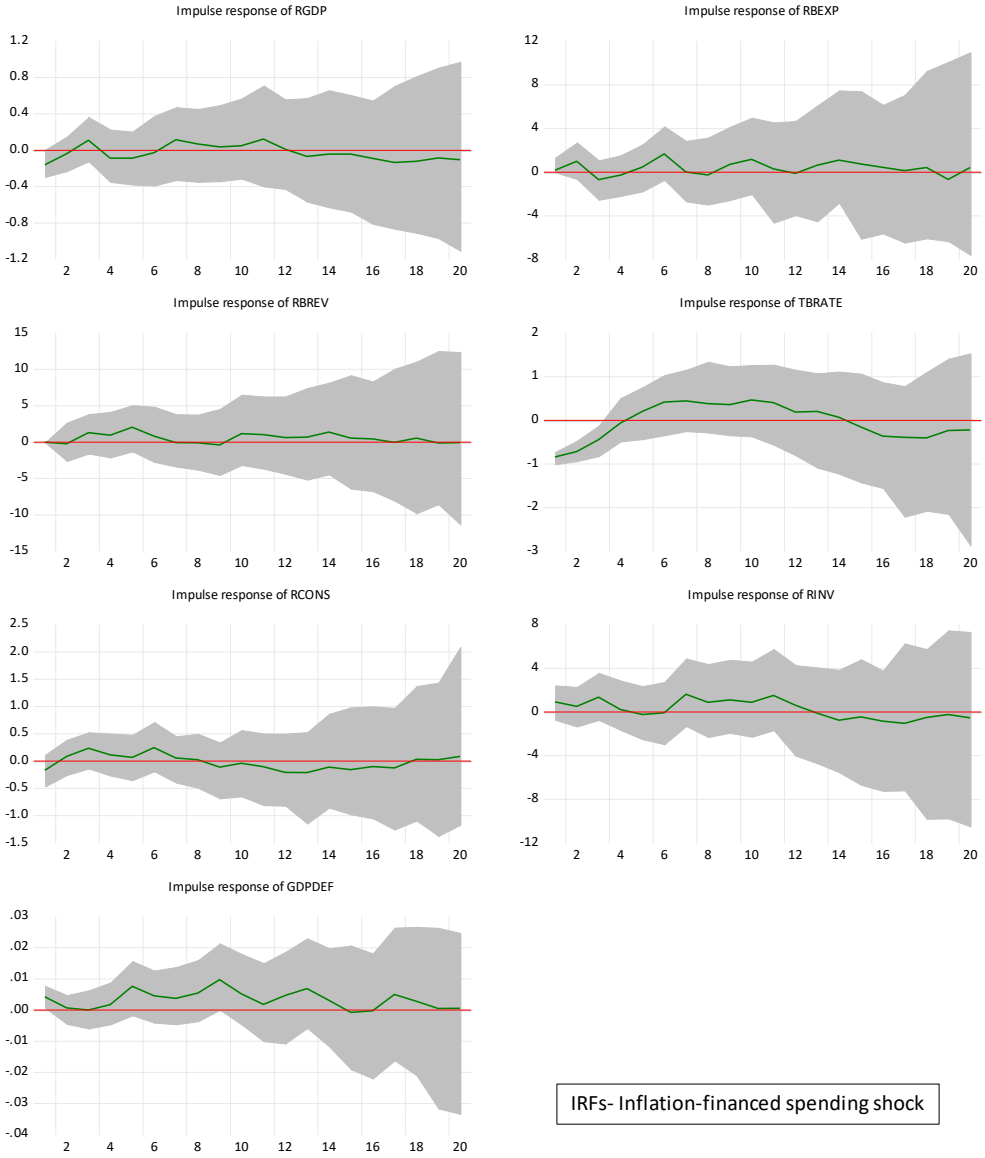
Due to the pandemic and the lockdown imposed for prolonged periods of time, the economic activity slowed down, and this entails a fall in taxes and government revenues. This motivates us to investigate a spending shock coupled with a fall in revenues, what we refer to as a deficit-financed shock. Real consumption increases for the first 4 quarters then returns to its pre-stimulus level. The GDP deflator rises reflecting demand pull inflation. The real interest rate decreases and this explains the fall in investment and consequently in real GDP. Thus, the increase in government expenditure coupled with a fall in government revenue, helps to stimulate output and consumption in the short run, but creates inflationary pressures that inflation targeting central bank will have to face.



IRFs - Deficit-Financed Shock

3.3. An inflation-Financed Shock

Here I investigate a scenario where government revenues fall, government expenditures rise and interest rates fall. In terms of private consumption, this shock has the most prolonged stimulating effect. Real private consumption increases up to 8 quarters after the shock, at the cost of a higher more persistent inflation. Since an active behavior from both policies cannot be expected to persist indefinitely, this AM/AF setup is expected to change. Despite the expected future taxes, there are inflation expectations (due to the probability of the monetary policy switching to PM), this enhances the consumers' intertemporal substitution effect, and increases present consumption. Real investment also increases over the short and medium run due to the stimulus.



IRFs- Inflation-financed spending shock

Conclusion

During the recent coronavirus pandemic, several governments have reacted to the economic slowdown with expansionary policies. The fiscal authorities implemented large stimulus packages with increased spending and/or tax exemptions. The monetary authorities reduced the interest rates to the zero lower bound and introduced unconventional policies. In this paper, I investigate the impact of such policies if implemented in Egypt and interpret the results in the context of a regime-switching model.

Using data on key macroeconomic variables in Egypt over the period 2001Q1 to 2020Q2, I employ Markov-switching regression methods to estimate fiscal and monetary policy feedback rules in Egypt and use the smoothed probabilities overlay to illustrate the evolution of monetary-fiscal interactions throughout the period. I then use a sign restricted vector autoregression (SRVAR) model which imposes signs and/or zero restrictions to identify shocks to analyze the effects of different fiscal-monetary policy mixes. Regime-switches in monetary and fiscal policy rules do not exhibit any degree of synchronization and this represents a novel way of tracking the time-series behavior of government debt and inflation in Egypt. Fiscal policy appears to have always been passive in Egypt, in the sense that taxes rise in response to government debt, this creates a Ricardian equivalence effect that reduces the effectiveness of the fiscal stimulus. The effects of the stimulus on real consumption and GDP then do not outlive the stimulus, due to agents' expectations regarding future taxes. A policy mix where a deficit-financed increase in spending is coupled with a fall in interest rate helps mitigate this problem and prolongs the effects of the stimulus on real consumption, at the expense, however, of inflationary pressures that inflation targeting central bank will have to face.

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