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Abstract

The macroeconomic effects of the policy mix have been the subject of a rich array of theoretical literature. Our research paper further enriches the empirical literature and goes beyond a single open economy analysis by proposing a multi-country assessment of the policy mix in the Middle East and North Africa (MENA) region, under the two hypotheses of monetary and fiscal dominance. We base our study on a structural vector autoregression (SVAR) approach performed on secondary data over the period 1977-2021 for three MENA countries: Morocco, Egypt, and Saudi Arabia. Our data is sourced from World Development Indicators and includes five variables: Current account balance (percent of GDP) (CA), inflation rate (INF), GDP growth (annual percent) (GDP), money supply (M3), and government expenditure (GEXP). The results show that the coordination scheme choice has no significant effect on the policy mix effectiveness in the three countries. The policy mix in Morocco is more effective in preserving price stability whereas stabilization policies in Egypt are more effective in boosting economic activity. Because of its limited exposure to energy price risk (i.e., imported inflation), Saudi Arabia has a wider margin of maneuver in implementing growth-oriented policies without imperiling price stability. Considering that previous studies gave different views on whether monetary or fiscal policies are more effective in a single open economy analysis, to our knowledge, no relevant studies have performed a multi-country assessment of the policy mix in the MENA region. This research provides an empirical framework for analyzing the macroeconomic implications of monetary and fiscal policies in the MENA region, allowing us to draw interesting conclusions about the effectiveness of the policy mix in the sample countries.

Keywords: Monetary policy, Fiscal policy, Joint analysis of fiscal and monetary policy, Inflation, Economic growth.

JEL Classifications: E31, E52, E62, E63, F43.

ملخص

كانت الآثار الاقتصادية الكلية لمزيج السياسات موضوع مجموعة غنية من المؤلفات النظرية. تزيد ورقتنا البحثية من إثراء الأدبيات التجريبية وتتجاوز تحليل الاقتصاد المفتوح الواحد من خلال اقتراح تقييم متعدد البلدان لمزيج السياسات في منطقة الشرق الأوسط وشمال إفريقيا، في ظل فرضيتي الهيمنة النقدية والمالية. نحن نبني دراستنا على نهج التشغيل الذاتي للناقلات الهيكلية الذي تم إجراؤه على بيانات ثانوية خلال الفترة 1977-2021 لثلاث دول في الشرق الأوسط وشمال إفريقيا: المغرب ومصر والمملكة العربية السعودية. يتم الحصول على بياناتنا من مؤشرات التنمية العالمية وتتضمن خمسة متغيرات: رصيد الحساب الجاري (٪ من الناتج المحلي الإجمالي)، ومعدل التضخم، ونمو الناتج المحلي الإجمالي (النسبة المئوية السنوية) (الناتج المحلي الإجمالي)، والعرض النقدي، والإنفاق الحكومي . وتبين النتائج أن اختيار مخطط التنسيق ليس له تأثير كبير على فعالية مزيج السياسات في البلدان الثلاثة. إن مزيج السياسات في المغرب أكثر فعالية في الحفاظ على استقرار الأسعار في حين أن سياسات الاستقرار في مصر أكثر فعالية في تعزيز النشاط الاقتصادي. بسبب تعرضها المحدود لمخاطر أسعار الطاقة (أي التضخم المستورد)، فإن المملكة العربية السعودية لديها هامش مناورة أوسع في تنفيذ سياسات موجهة نحو النمو دون تعريض استقرار الأسعار للخطر. بالنظر إلى أن الدراسات السابقة أعطت وجهات نظر مختلفة حول ما إذا كانت السياسات النقدية أو المالية أكثر فعالية في تحليل واحد للاقتصاد المفتوح، على حد علمنا، لم تقم أي دراسات ذات صلة بإجراء تقييم متعدد البلدان لمزيج السياسات في منطقة الشرق الأوسط وشمال إفريقيا. يوفر هذا البحث إطارًا تجريبيًا لتحليل الآثار الاقتصادية الكلية للسياسات النقدية والمالية في منطقة الشرق الأوسط وشمال إفريقيا، مما يسمح لنا باستخلاص استنتاجات مثيرة للاهتمام حول فعالية مزيج السياسات في بلدان العينة.

1. Introduction

Over the last decades, the world has experienced a series of economic crises with different causes (tech bubble burst, subprime meltdown, sovereign debt build-up, commodity price shock, and pandemic outbreak), leading to a global economic downturn as a major consequence. In this context, monetary and fiscal authorities around the world have joined their efforts to deliver the required macroeconomic support by adopting a growth-oriented policy mix. The aim of this combination of monetary and fiscal policy is to ensure a strong and rapid economic recovery.

The question of the macroeconomic effects of the policy mix has been the subject of a rich array of theoretical literature, which includes the contributions of Keynes (1936), Hicks (1937), Fleming (1962), and Mundell (1960, 1963). An important strand of the empirical literature has proposed an assessment of the policy mix effectiveness within the SVAR framework. It is all about analyzing the response of economic growth and inflation to structural shocks emanating from fiscal and/or monetary policy.

Our research paper contributes to the empirical literature based on a structural vector autoregression (SVAR) approach and goes beyond a single open economy analysis by proposing an assessment of the policy mix in three Middle East and North Africa (MENA) countries under the two hypotheses of monetary and fiscal dominance. Our approach considers the effects of the countries' economic structure as well as the implications of the stabilization policy choices.

2. Literature review

Several studies have examined the macroeconomic effects of the policy mix. The starting point for the theoretical framework is Keynes' General Theory (1936), which emphasizes the role of fiscal and monetary policy in tempering economic downturns and upturns. The Keynesian approach suggests a combination of monetary expansion, tax cuts, and increases in government spending to boost economic activity in periods of depression. In their research papers, Harrod (1937), Mead (1937), and Hicks (1937) gave a mathematical structure to the General Theory. Hansen (1949, 1951, and 1953) built on Hicks' work to formulate the IS-LM model, which analyzes the effects of macroeconomic policies in a closed economy with a fixed price level.

Mundell (1960, 1963) and Fleming (1962) extended the IS-LM model to deal with the open economy by introducing two parameters: the balance of payments equilibrium and the exchange rate system. The authors demonstrated that monetary policy has a strong effect on economic activity under flexible exchange rates whereas fiscal policy is an effective tool for boosting growth under fixed exchange rates.

In addition to the previous models, many authors of macroeconomics textbooks (e.g., Baumol et al., 1985; Stiglitz, 1993; McTaggart et al., 2003; McConnell et al., 2018) proposed the aggregate demand/aggregate supply framework as a simple tool for explaining real output and inflation dynamics. The model captures the effects of fiscal and monetary policy decisions in the context of flexible price levels.

Since the early 1980s, the question of creating a sound macroeconomic environment for growth has become the focus of a large array of theoretical contributions. Sargent and Wallace (1981) argued that the excessive public deficits arising from growth-oriented fiscal policies limit the

independence of central banks and hinder their ability to preserve price stability. Under fiscal dominance, the government independently sets its expansionary fiscal policy, and the central bank is constrained to finance part of the budget deficit through seigniorage, which results in additional inflation. In order to deal with this situation, Sargent and Wallace proposed a monetary dominance scheme that allows the central bank to independently set its inflation control policy and forces the government to reduce its fiscal deficit.

The fiscal theory of the price level provides another explanation of the inflationary pressures induced by loose fiscal policy. In contrast with the conventional monetarist approach, which treated inflation as a monetary phenomenon, the proponents of the fiscal theory (e.g., Leeper, 1991; Sims, 1994; Woodford, 1995, 1996, 2001) emphasized the direct impact of government budget deficit on the price level and concluded that inflation is a fiscal phenomenon. According to this view, it would be difficult for an independent central bank to achieve the goal of price stability without the government's commitment to setting an appropriate fiscal policy.

A large body of literature has sought to provide an empirical framework for analyzing the macroeconomic effects of the policy mix in small open economies. An important strand of this literature has proposed an assessment of policy mix effectiveness within the SVAR framework. It focuses on analyzing the response of economic growth and inflation to structural shocks emanating from fiscal and/or monetary policy. Table 1 presents a brief review of the empirical literature.

Table 1. Brief literature review

Authors	Model	Period, frequency, and country	Variables	Main results
Dungey and Fry (2009)	SVAR	1983-2006; quarterly; New Zealand	Foreign output, export prices, import prices, real government expenditure, real taxation, real gross national expenditure, government debt to GDP, real GDP, house price inflation, consumer price inflation, short-term interest rate, and trade-weighted exchange rate. Climate and international interest rates are incorporated as exogenous variables.	Fiscal policy shocks have a greater impact on output than shocks emanating from monetary policy. Output behavior is mostly explained by foreign and domestic shocks linked to non-policy variables.
Ravnik and Zilic (2011)	SVAR	2001-09; monthly; Croatia.	Government expenditures, index of industrial production (proxy of output), consumer price index (first difference), government revenues, and overnight interest rate on the money market.	The impact of government expenditure shocks on industrial production is negative in the short term and vanishes within two years. The crowding-out effect is a possible explanation of this direction of influence. The effects of fiscal policy shocks are relatively the lowest on inflation and the highest on interest rate.

Table 1. Brief literature review (contd.)

Vinayagathasan (2013)	SVAR	1978-2011; monthly; Sri Lanka.	Foreign block (world oil price index and US interest rate); domestic block, i.e., non-policy variables (output and price index); domestic block, i.e., policy variables (exchange rate, interbank rate, and reserve money).	Monetary policy shocks, through the interest rate, play a significant role in explaining the variations of domestic economic indicators. The latter show no significant reaction to shocks emanating from the foreign block variables.
Fetai (2013)	SVAR	1997-2013; monthly; Macedonia.	Real GDP, Manufacturing Prices Index, Retail Prices Index, monetary aggregate (M1), government expenditures, and government revenues.	Money stock shocks exhibit a strong and persistent effect on price level (inflationary pressures), without any significant impact on real GDP. Monetary policy counteracts the effects of an increase in government expenditures. Expansionary fiscal policy seems to be ineffective unless it is based on tax cuts.
Coric, Simovic, and Deskar-Skrbic (2015)	SVAR	2004-12; monthly; Croatia.	Domestic industrial production, government expenditures-to-revenues ratio, monetary aggregate (M1), nominal effective exchange rate, and net exports (included as an exogenous variable).	Economic activity reacts positively to expansionary monetary and fiscal policies. Government expenditure shocks lead to nominal exchange rate appreciation while the effect of monetary expansion is negative (depreciation). Coordinated measures of monetary and fiscal policies can provide support to growth without inducing inflationary pressures
Tule, Onipede and Ebuh (2020)	SVAR	2003-17; monthly; Nigeria.	Real GDP growth, government expenditure to revenue growth, changes in the price level, global oil price, money supply (M1), and prime lending rate.	Economic activity shows a delayed positive reaction to expansionary monetary policy, accompanied by inflationary pressures. A positive shock in government expenditure leads to real GDP contraction and brings price levels up. A coordinated policy mix could help achieve the goal of economic growth and price stability.

Source: Authors.

3. Methodology

This study addresses the question of policy mix effectiveness with a focus on the MENA region. It aims to test two major hypotheses:

- Hypothesis I: The fiscal-monetary policy mix provides effective support to economic growth in the MENA region without imperiling price stability.
- Hypothesis II: The countries' economic structure and their stabilization policy choices (i.e., fiscal or monetary dominance) have an influence on policy mix effectiveness.

In light of available World Bank data, we use annual series from 1977 to 2021.

The model includes five variables: current account balance (percent of GDP) (CA), inflation rate (annual percent) (INF), GDP growth (annual percent) (GDP), money supply growth (annual percent) (M3), and government expenditure variation (variation of expense in current LCU) (GEXP).

The current account balance as a share of GDP considers the size of the sample economies and reflects the dynamics of their export and import activities as well as the implications of fluctuations in foreign prices. Inflation rate and GDP growth are the two goals that guide monetary and fiscal authorities' decisions as they seek to support economic activity and preserve price stability. The central bank and the government set their respective money supply and expenditure in line with their goals. Therefore, changes in these two policy variables reflect the stance of monetary and fiscal authorities.

We propose an assessment of policy mix effectiveness in a sample of three MENA countries: Morocco, Egypt, and Saudi Arabia. The three Arab economies have various economic development and structures (i.e., two oil-importing and one oil-exporting country) but have shown a common effort in the search for effective macroeconomic policy decisions.

We use the SVAR approach to impose restrictions on the response of a variable to a shock on another variable. These restrictions are based on economic theory. Thus, the SVAR is appropriate for predicting the impact of macroeconomic policy decisions (Ravnik and Zilic, 2011; Vinayagathasan, 2013; Fetai, 2013; Coric et al., 2015; Tule et al., 2020). In this study, we are interested in analyzing the response of economic growth and inflation to structural shocks emanating from monetary and fiscal policy.

The identification of our SVAR model requires the imposition of some short-term restrictions.

In light of the theoretical contributions of Mundell (1960, 1963) and Fleming (1962), the current account is a key variable in small open economies. This variable reacts to fluctuations in foreign prices and global economic activity (i.e., external shocks). Therefore, the current account is incorporated as a foreign block variable and assumed to have a contemporaneous effect on domestic prices and real output. Inflation responds contemporaneously to the current account and has an immediate impact on real output.

The current account balance is included as an exogenous variable in order to control the model for external shocks. This variable reflects the dynamics of exports, imports, and the prices of tradable goods (e.g., oil and other commodity prices), which are assumed to be exogenous in many empirical studies (e.g., Dungey and Fry, 2009; Vinayagathasan, 2013; Coric et al., 2015).

Since fiscal and monetary authorities base their decisions on the analysis of macroeconomic data, their policy variables (i.e., government expenditure and money supply) react instantaneously to shocks in current account, inflation, and real output. Indeed, central banks and governments constantly adjust their respective policies in response to the evolution of the macroeconomic situation.

In addition, by changing the policy variables ordering in the short-term restrictions matrix, we can account for the two main policy coordination schemes defined by Sargent and Wallace (1981). Monetary authorities are constrained by the government expenditure decisions under fiscal dominance (meaning, the central bank adjusts its money supply within the period in response to changes in government expenditure), and fiscal authorities are constrained by the

central bank stance under monetary dominance (meaning, the government adjusts its expenditure within the period in reaction to changes in money supply).

The sequential order of the variables (in Cholesky factorization) will be as follows (under monetary dominance, we can change the order of the variable under fiscal dominance and then put M3 at the end):

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 \end{bmatrix} \begin{bmatrix} CA_t \\ INF_t \\ GDP_t \\ M3_t \\ GEXP_t \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \\ a_{30} \\ a_{40} \\ a_{50} \end{bmatrix} +$$
$$\begin{bmatrix} b_{11} & b_{12} & b_{13} & b_{14} & b_{15} \\ b_{21} & b_{22} & b_{23} & b_{24} & b_{25} \\ b_{31} & b_{32} & b_{33} & b_{34} & b_{35} \\ b_{41} & b_{42} & b_{43} & b_{44} & b_{45} \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} \end{bmatrix} \begin{bmatrix} CA_{t-1} \\ INF_{t-1} \\ GDP_{t-1} \\ M3_{t-1} \\ GEXP_{t-1} \end{bmatrix} + \begin{bmatrix} \mu_t CA \\ \mu_t INF \\ \mu_t GDP \\ \mu_t M3 \\ \mu_t GEXP \end{bmatrix} (1)$$

This SVAR model can be written simply as: $AY_t = \lambda + \sum_{i=1}^{p} B_i Y_{t-1} + \mu_t$

Where:
A: Matrix of structural coefficients (instantaneous effects).
Y_t: Vector of endogenous variables (CA_t; INF_t; GDP_t; $M3_t$; $GEXP_t$).
λ: Vector of intercept terms.
B_i: Matrix of parameters associated with the exogenous (predetermined) variables.
u_t: Structural shocks for each variable in the model.

4. Results and discussion

The structural VAR model provides two main outputs. The first one concerns the impulse response graphs, and the second one is the decomposition of variance errors.

For this purpose, before analyzing the impulse response graphs and interpreting the decomposition of variance errors for each country, several tests were performed.
5.

4.1 Results of unit root test

Before analyzing the response of economic growth and inflation to structural shocks emanating from monetary and fiscal policy, it is necessary to examine the stationarity of all variables included in the study.

Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests were used to examine if the variables are stationary in levels or after the first difference.

Table 2 in the Appendix displays the results of the non-stationarity tests (ADF and PP), showing that the variables of our model are all stationary in level for the three countries. Therefore, a co-integration test in the sense of Johansen is not necessary, since it assumes that the series are integrated in the same order. The SVAR approach will be our analysis method.

Prior to giving the SVAR outputs, it is necessary to determine the VAR order in which the SVAR restrictions will be implemented.

4.2 VAR order

The determination of the number of lags is done by estimating the VAR model for several values of the lag p, the optimal lag is the one that minimizes the Akaike (AIC) Schwarz (SC) and Hannan-Quinn (HQ) information criteria.

From Table 3, we can see that the three criteria lead us to retain a VAR (1) process. We will then summarize that the method we will use throughout the estimation is that of the VAR with a delay for the three countries, for the monetary and fiscal dominance perspectives.

4.3 Diagnostic tests

The validation of the VAR (1) model will be done by performing diagnostic tests on the residuals. According to Table 4, for the three countries and for both the monetary and fiscal dominance approaches, the results of the diagnostic tests show that the residuals are normal, uncorrelated, and homoscedastic. Thus, we conclude that our models are statistically valid, at a significance level of five percent.

Since all the VAR (1) models for the three countries are valid, we can now put structural restrictions to interpret the impulse responses and the variance decomposition of the errors under the two perspectives of monetary and fiscal dominance

4.4 Impulse response function analysis

4.4.1 Responses to monetary and fiscal policy shocks in Morocco

- **Under monetary dominance (Figure 1):**

Following a positive shock in government expenses (i.e., expansionary fiscal policy), the money supply shows a negative response over seven years and then moves gradually to its initial baseline. By reducing their money supply, monetary authorities attempt to alleviate the possible inflationary pressures induced by an increase in government spending, which is consistent with the monetary dominance approach (Sargent and Wallace, 1981). Inflation also reacts negatively to a loose fiscal policy and edges toward its initial level by the end of the analysis period. This reaction is inconsistent with the fiscal theory of the price level (e.g., Woodford, 1995, 1996, 2001) and can be explained by the restrictive stance of monetary authorities. The response of output is negative and short-lived, which seems to be the result of monetary contraction and a crowding-out effect. Thus, fiscal policy fails to produce the positive Keynesian effect on growth. In addition, positive shocks emanating from government expenditure lead to an improvement in the current account balance particularly over the five first years.

Fiscal authorities reduce their spending in reaction to a positive shock in the money supply. The impact of this shock vanishes within two years. Under monetary dominance, the government seems to adopt a prudent stance since it cannot rely on the central bank to back its stimulus policies. Furthermore, expansionary monetary policy generates inflationary pressures that last for several years and weaken by the end of the analysis period. This result is in line with the quantity theory of money (Friedman, 1956). The impact of positive monetary shocks on output is positive in the short term (i.e., the two first years), volatile in the medium term, and null in the long term. Therefore, monetary policy produces a positive Keynesian effect on growth in the short term. In addition, shocks induced by monetary expansion lead to a deterioration in the current account, especially over the five first years.

- **Under fiscal dominance (Figure 2):**

Even under fiscal dominance, monetary authorities focus on alleviating inflationary pressures by reducing their money supply in reaction to a positive shock in government expense. The reaction of the other variables (i.e., inflation, output, and current account) to fiscal shocks remains the same, which means that the coordination scheme choices (i.e., fiscal or monetary dominance) do not have any impact on the fiscal policy effectiveness in Morocco.

The government raises its expenditure in reaction to a positive monetary shock. The effect of this shock becomes less important starting from the sixth year and disappears in the long term. The favorable monetary conditions resulting from an increase in money supply reduce the cost of financing deficits and encourage fiscal authorities to spend more. A positive monetary policy shock has a short-lived negative effect on the current account, and its impact on inflation and output does not change under fiscal dominance compared to the monetary dominance scheme.

4.4.2 Responses to monetary and fiscal policy shocks in Egypt

- **Under monetary dominance (Figure 1):**

Following a positive fiscal shock, the money supply increases gradually until the sixth year and then edges toward its initial baseline. The central bank attempts to back government stimulus policy through an accommodative monetary stance, which is inconsistent with the monetary dominance approach (Sargent and Wallace, 1981). An expansionary fiscal policy generates permanent inflationary pressures. This direction of influence is in line with the fiscal theory of the price level (e.g., Woodford, 1995, 1996, 2001). The inflationary pressures are also consistent with the monetarist arithmetic since the expansionary fiscal policy is accompanied by an increase in money supply (Sargent and Wallace, 1981). The effect of government expense shock on output is positive and reaches its peak by the end of the second year, before starting to decline progressively, which means that fiscal policy yields the positive effects expected in the Keynesian model. Furthermore, the current account balance shows a negative response to fiscal expansion. This indicator decreases significantly over the four first years and returns gradually to its initial level.

The government reduces its expenses after a positive monetary shock. The expense contraction is particularly noticeable over four years and vanishes in the long term. This prudent fiscal authorities' stance is consistent with the monetary dominance scheme. Expansionary monetary policy is also the cause of substantial inflation pressures especially in the short-term (i.e., the four first years). This effect is consistent with the quantity theory of money (Friedman, 1956). The output shows a temporary positive response that lasts for four years, which confirms the ability of monetary policy to generate a positive Keynesian effect on activity in the short term. Finally, a positive shock in the money supply produces a negative short-term impact on the current account. Starting from the sixth year, the variable returns progressively to its initial baseline.

- **Under fiscal dominance (Figure 2):**

In accordance with the fiscal dominance approach, the central bank maintains its accommodative monetary policy (i.e., increase in money supply) in response to an expansionary fiscal stance. Overall, a positive fiscal policy shock puts upward pressure on inflation, stimulates growth, and leads to a deterioration in the current account, which means that the reaction of these macroeconomic variables does not change under fiscal dominance compared to the monetary dominance scheme.

Even under fiscal dominance, the government keeps its prudent stance following a monetary expansion. Government expenditure decreases in the first three years, before moving gradually to its initial level. Furthermore, including the fiscal dominance restrictions in the empirical analysis does not alter the reaction of inflation, output, and current account to monetary shocks.

4.4.3 Responses to monetary and fiscal policy shocks in Saudi Arabia

- **Under monetary dominance (Figure 1):**

The central bank adopts an expansionary monetary policy following a positive shock in government expenses. The money supply shows a delayed positive reaction that lasts for several years and vanishes in the long term. This direction of response is not in line with the monetary dominance approach (Sargent and Wallace, 1981). Moreover, the fiscal theory of the price level (e.g., Woodford, 1995, 1996, 2001) and the monetarist arithmetic (Sargent and Wallace, 1981) do not apply in the case of Saudi Arabia. The reaction of inflation to expansionary fiscal policy is negative and short-lived. Fiscal expansion produces the positive Keynesian effect on growth, which lasts for three years and disappears by the end of the fourth horizon. The current account also reacts positively and edges toward its initial baseline in the long term.

Following a positive shock in money supply, the government adopts an expansionary stance for two years before reducing its expenditure over the remaining period. This fiscal contraction is consistent with the monetary dominance scheme. In contrast to the quantity theory of money (Friedman, 1956), inflation shows a delayed negative reaction to shocks induced by monetary expansion. This downward pressure on inflation lasts for several years and disappears by the end of the analysis period. Furthermore, monetary policy fails to yield the expected Keynesian effect on activity. The impact of an increase in money supply on output is negative over the first four years and vanishes by the end of the fifth horizon. Finally, the central bank's accommodative policy is the cause of current account deterioration particularly in the short and medium term.

- **Under fiscal dominance (Figure 2):**

Monetary authorities raise their money supply in response to a positive fiscal shock. The response becomes less important in the third year and disappears in the long term. This accommodative stance is in line with the fiscal dominance system. Moreover, positive fiscal shocks put downward pressure on price levels, boost economic activity in the short-term, and lead to an improvement in the current account situation. The reaction of these non-policy variables remains the same under the two coordination schemes.

After a positive shock in the money supply, the government increases its expense over the two first years and then adopts a restrictive stance over the remaining period. Thus, fiscal authorities maintain their prudent stance even under fiscal dominance. The introduction of this coordination scheme in the empirical study does not change the response of the output and current account. The reaction of inflation remains negative and shows moderate downward pressure.

4.5. Analysis of the decomposition of variance errors

4.5.1. Analysis of the decomposition of variance errors in Morocco

- **Under monetary dominance (Table 5):**

The variance of the forecast error of the inflation rate is due to 64.31 percent to its own innovations; of which 23.17 percent go toward innovations in the money supply and only 4.65

percent toward innovations in government spending. Regarding the GDP, the variance of its forecast error is due to 91.21 percent to its own innovations; of which 3.63 percent go toward innovations in the money supply and only 0.17 percent toward innovations in government spending.

- **Under fiscal dominance (Table 6):**

The variance of the forecast error of the inflation rate is due to 68.69 percent to its own innovations; only 7.65 percent of which go toward innovations in government spending and 16.36 percent toward innovations in the money supply. Regarding the GDP, the variance of its forecast error is due to 92.59 percent to its own innovations; only 0.42 percent of which go toward innovations in government spending and 2.89 percent toward innovations in the money supply.

4.5.2. Analysis of the decomposition of variance errors in Egypt

- **Under monetary dominance (Table 5):**

The variance of the forecast error of the inflation rate is due to 47.27 percent to its own innovations; of which 24.82 percent go toward innovations in the money supply and only 2.21 percent toward innovations in government spending. Regarding the GDP, the variance of its forecast error is due to 84.59 percent to its own innovations; of which 2.56 percent go toward innovations in the money supply and only 1.7 percent toward innovations in government spending.

- **Under fiscal dominance (Table 6):**

The variance of the forecast error of the inflation rate is due to 48.95 percent to its own innovations; only 5.46 percent of which go toward innovations in government spending and 20.89 percent toward innovations in the money supply. In terms of GDP, the variance of its forecast error is due to 83.33 percent to its own innovations; only 1.59 percent of which go toward innovations in government spending and 2.71 percent toward innovations in the money supply.

4.5.3. Analysis of the decomposition of variance errors in Saudi Arabia

- **Under monetary dominance (Table 5):**

The variance of the forecast error of the inflation rate is due to 71.84 percent to its own innovations; of which 0.45 percent go toward innovations in the money supply and only 1.06 percent toward innovations in government spending. Regarding the GDP, the variance of its forecast error is due to 68.73 percent to its own innovations; 6.3 percent of which go toward innovations in the money supply and only 4.53 percent toward innovations in government spending.

- **Under fiscal dominance (Table 6):**

The variance of the forecast error of the inflation rate is due to 62.97 percent to its own innovations; only 5.54 percent of which go toward innovations in government spending and 1.63 percent toward innovations in the money supply. Regarding the GDP, the variance of its forecast error is due to 71.44 percent to its own innovations; only 2.56 percent of which go toward innovations in government spending and 8.72 percent toward innovations in the money supply.

5. Conclusion

In this paper, we used the SVAR approach to assess the policy mix effectiveness in Morocco, Egypt, and Saudi Arabia. Particularly, we analyzed the impact of fiscal and monetary shocks on output, inflation, and current account in three MENA region countries. Our empirical framework considers the countries' economic structure as well as the implications of the coordination scheme choices. Based on our results, we can draw some interesting conclusions.

In Morocco, the analysis of macroeconomic indicators' response to shocks in policy variables (i.e., government spending and money supply) yields the same results under both fiscal and monetary dominance. Therefore, the coordination scheme choice has no effect on the policy mix effectiveness. A possible explanation for this result is that the central bank maintains the same restrictive stance under the two coordination schemes. Moroccan monetary authorities remain focused on alleviating inflationary pressures induced by fiscal expansion and potential commodity price shocks since Morocco is an oil-importing country.

An expansionary fiscal policy has no destabilizing effect on the price level and the current account in Morocco but seems to be ineffective in stimulating economic activity. The restrictive stance of monetary authorities counteracts the impact of an increase in government expenditure.

Moroccan monetary authorities managed to boost growth in the short term through a monetary expansion. Nevertheless, this accommodative stance puts upward pressure on inflation and leads to a deterioration in the current account.

In Egypt, the reaction of macroeconomic variables to fiscal and monetary policy decisions does not change under fiscal dominance compared to the monetary dominance system. Therefore, the coordination scheme choice has no significant impact on the effectiveness of stabilization policies. This result can be explained by the central bank's decision to uphold the same accommodative policy under the two coordination schemes in order to back government stimulus programs.

An expansionary fiscal policy seems to be an effective tool for stimulating economic activity in Egypt. Furthermore, the central bank provides great support for the government stimulus programs. However, these policy choices destabilize external balances and generate inflationary pressures. It is worth recalling that Egypt remains exposed to commodity price risk (i.e., imported inflation) since it is an oil-importing country.

The policy of the Egyptian central bank manages to generate a temporary positive effect on economic activity. This expansionary stance puts upward pressure on price levels and has a negative impact on the current account.

In Saudi Arabia, the coordination scheme choices do not alter the response of macroeconomic variables to shocks emanating from fiscal and monetary policy. Saudi monetary authorities maintain the same accommodative stance under fiscal and monetary dominance, which generates the same reaction from the non-policy variables under the two schemes.

In the short term, the Saudi government achieves the goal of growth stimulation through an effective fiscal policy that builds on the monetary authority's support. This expansionary stance

has no destabilizing effect on external balances and price levels. Saudi Arabia's exposure to energy price risks is limited (i.e., imported inflation) since it is an oil-exporting country.

An expansionary monetary policy does not cause any inflationary pressures in Saudi Arabia but remains ineffective since it produces a negative effect on output and external balances.

In our study, the two oil-importing countries make a trade-off between growth stimulation and inflation. Morocco adopts a fiscal/monetary policy combination that is more focused on preserving price stability, which explains the negative impact of fiscal expansion on growth. Egypt chooses a fiscal/monetary policy combination that is more focused on boosting economic activity, which explains the positive impact of fiscal expansion on price levels. A better coordination between fiscal and monetary policy could lead to growth stimulation in Morocco and price stability preservation in Egypt. In addition, the two countries could rely on expansionary monetary policy to generate a short-term increase in their output, especially in periods of low inflationary pressures. The oil-exporting country (Saudi Arabia) has limited exposure to energy price risk (imported inflation). Thus, it has a wider margin of maneuver in implementing a growth-oriented policy mix without imperiling price stability. However, fiscal policy remains the key component of this mix since monetary policy is still facing the constraint of pegging the Saudi Riyal to the US dollar under a fixed exchange rate regime.

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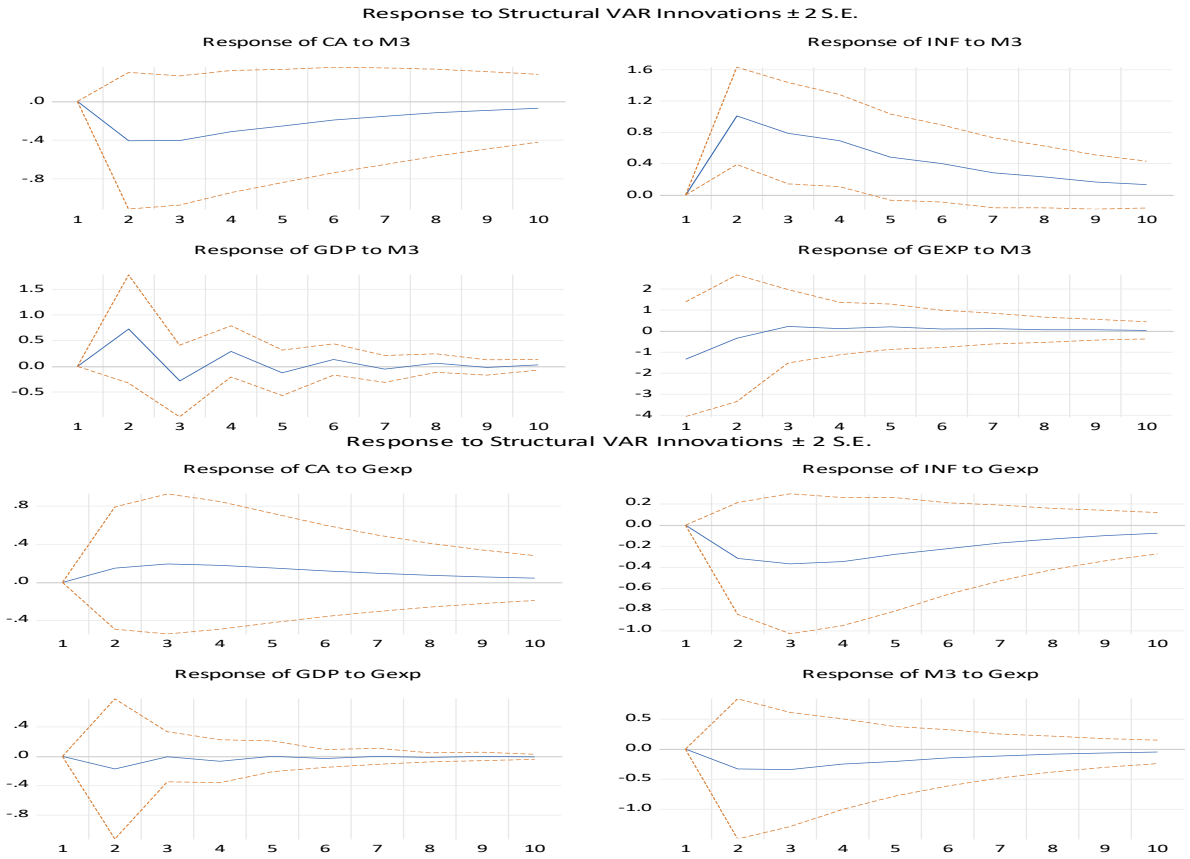
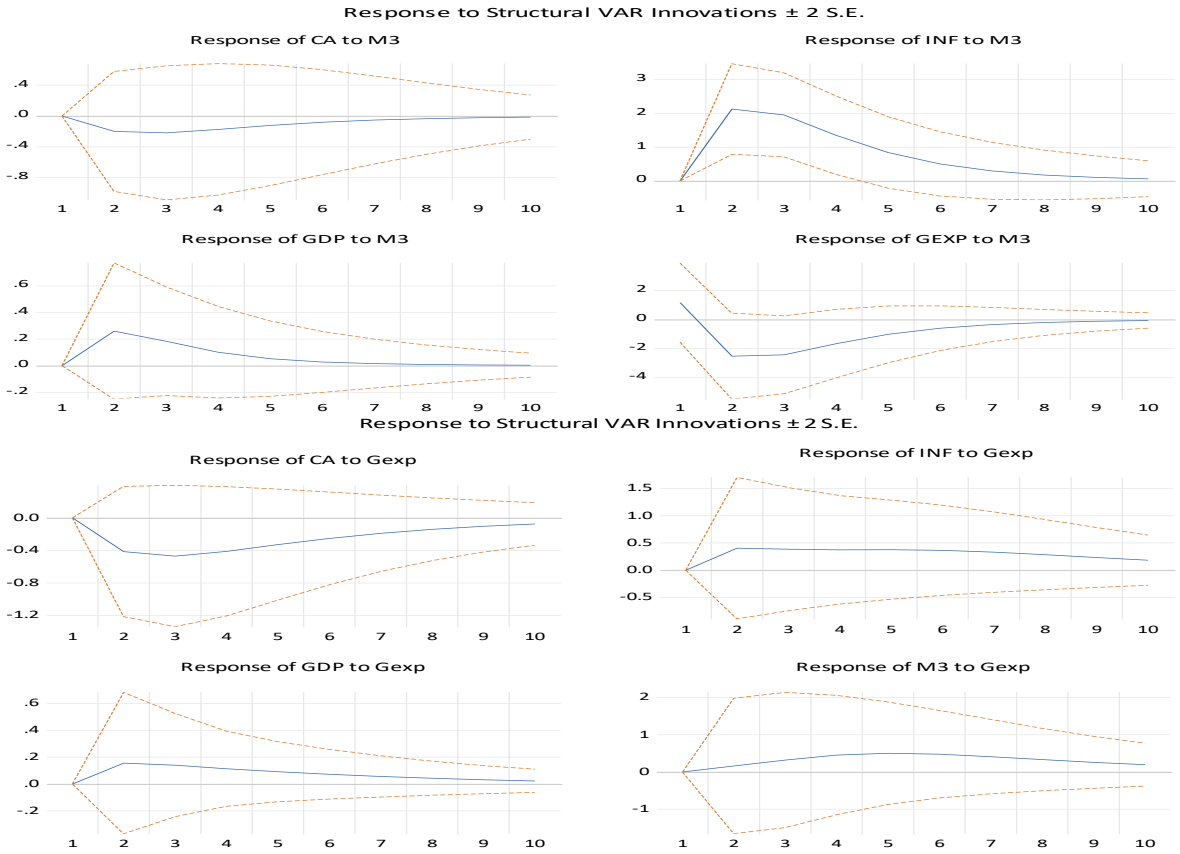
Figure 1: Impulse responses of the SVAR model under monetary dominance

Morocco



Egypt



Saudi Arabia

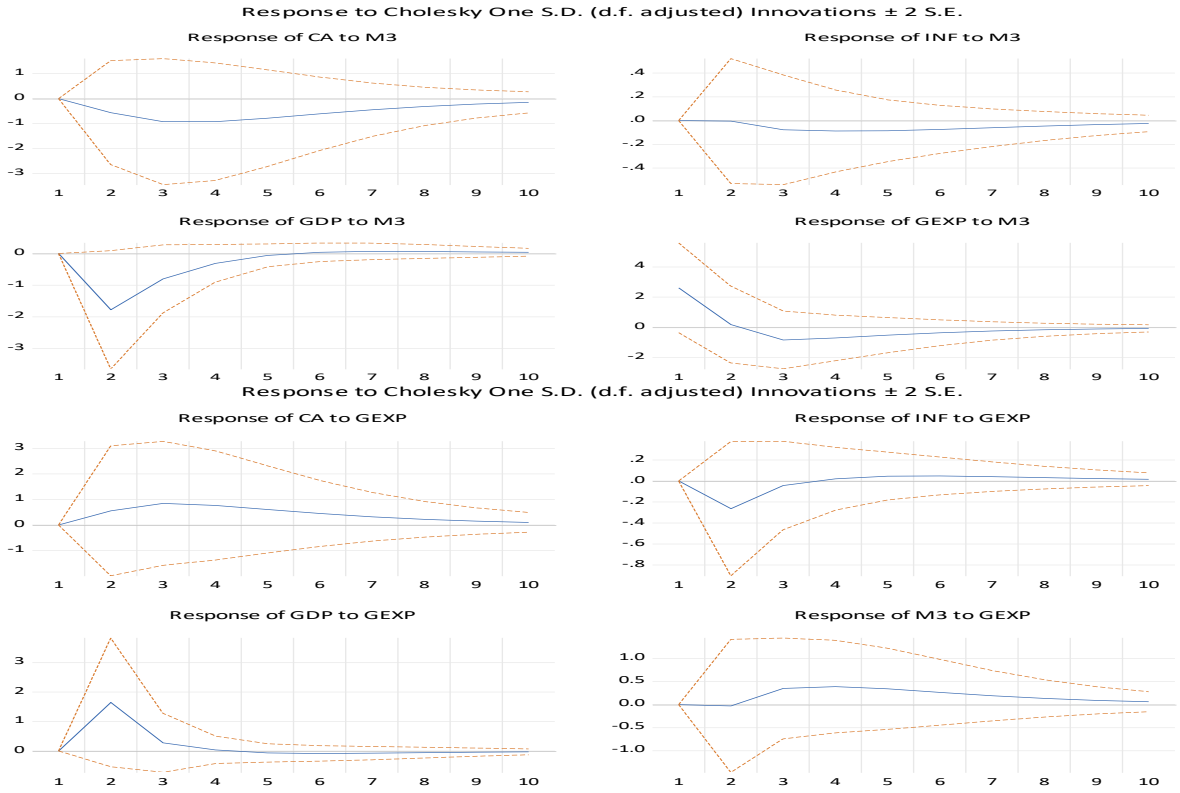
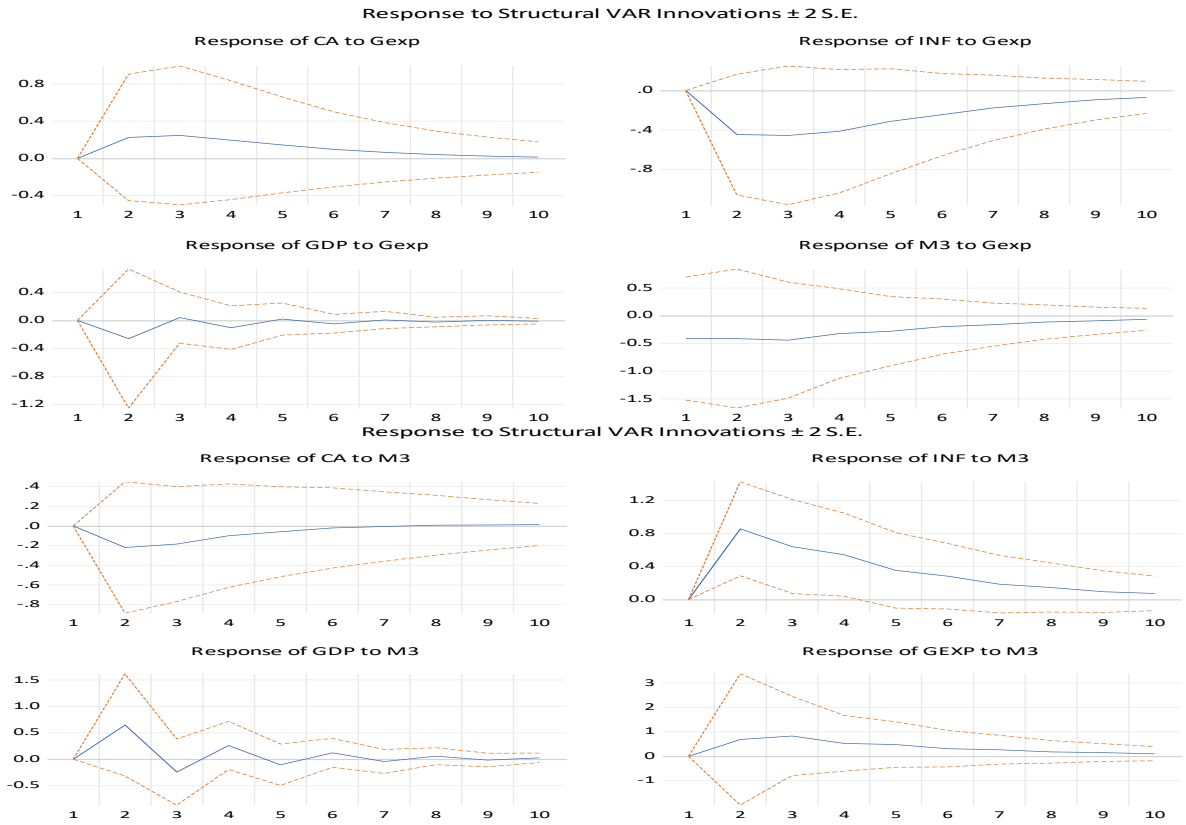


Figure 2: Impulse responses of the SVAR model under fiscal dominance

Morocco



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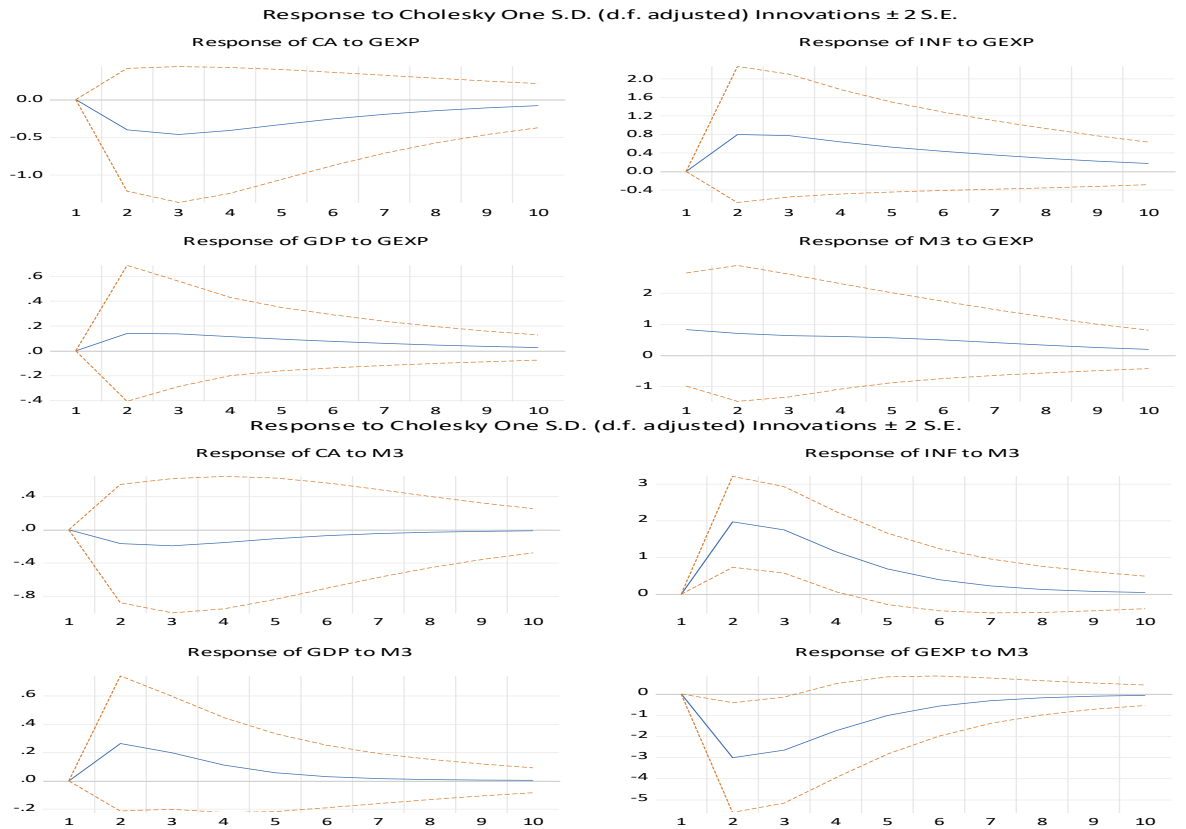
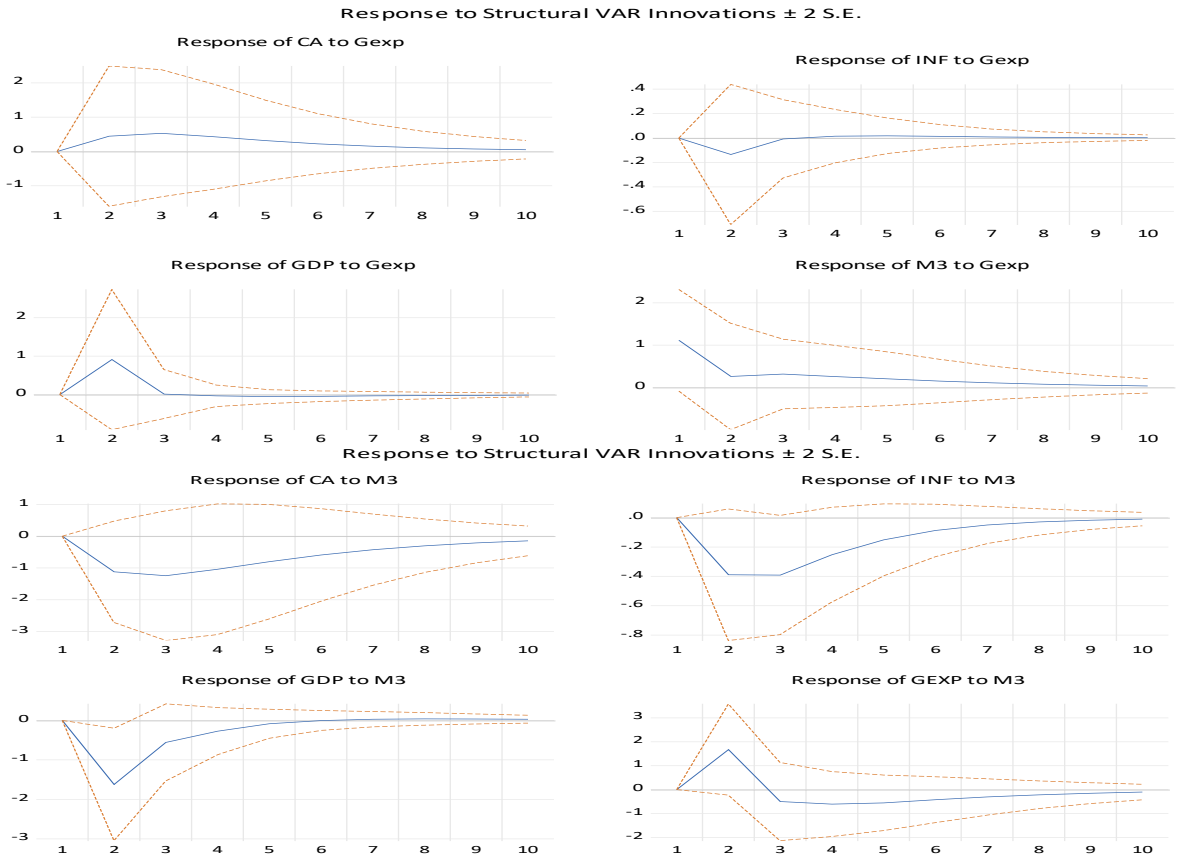


Saudi Arabia



Appendices

Table 2: Unit root tests results

Country	Variables	Unit root test at level		Conclusion
		ADF	PP	
Morocco	CA	-3.327319**	-3.327319**	I(0)
	INF	-2.119304**	-2.453705**	I(0)
	GDP	-12.03162***	-11.06093***	I(0)
	M3	-4.999486***	-5.028902***	I(0)
	Gexp	-3.850872**	-3.850872**	I(0)
Egypt	CA	-2.402696**	-2.398849**	I(0)
	INF	-3.333464**	-3.274006**	I(0)
	GDP	-4.224393***	-4.068890 ***	I(0)
	M3	-3.360703 **	-3.360703**	I(0)
	Gexp	-3.110380***	-3.166386 ***	I(0)
Saudi Arabia	CA	-2.391547**	-2.322311**	I(0)
	INF	-2.022338**	-4.827084***	I(0)
	GDP	-3.008354***	-5.404713***	I(0)
	M3	-5.759316***	-5.699030***	I(0)
	Gexp	-3.956638***	-3.870810***	I(0)

Note: ***, ** and * reveal, respectively, significance at the 1%, 5%, and 10% levels.

Table 3. VAR order

	Lag	AIC	SC	HQ
Monetary dominance				
Morocco	0	29.03468	29.24366	29.11078
	1	27.06822*	28.32205*	27.52480*
	2	27.50699	29.80569	28.34405
	3	27.26021	30.60377	28.47775
Egypt	0	30.13027	30.34138	30.20660
	1	28.64453	29.91119*	29.10251*
	2	28.34122*	30.66343	29.18086
	3	28.70038	32.07814	29.92167
Saudi Arabia	0	33.02223	33.22909	33.09805
	1	31.81655*	33.05774*	32.27150*
	2	32.08258	34.35810	32.91665
	3	32.28762	35.59747	33.50081
Fiscal dominance				
Morocco	0	29.03468	29.24366	29.11078
	1	27.06822*	28.32205*	27.52480*
	2	27.50699	29.80569	28.34405
	3	27.26021	30.60377	28.47775
Egypt	0	30.23326	30.44437	30.30959
	1	28.36625*	29.63291*	28.82424*
	2	28.56917	30.89137	29.40880
	3	28.99880	32.37655	30.22009
Saudi Arabia	0	33.02223	33.22909	33.09805
	1	31.81655*	33.05774*	32.27150*
	2	32.08258	34.35810	32.91665
	3	32.28762	35.59747	33.50081

Table 4: Diagnostic tests

	Autocorrelation LM Test	White Heteroskedasticity Test	Normality Test
Monetary dominance			
Morocco	0.3702	0.1314	0.1167
Egypt	0.1119	0.2018	0.4190
Saudi Arabia	0.2945	0.0646	0.5861
Fiscal dominance			
Morocco	0.7655	0.0983	0.4376
Egypt	0.1013	0.1066	0.0877
Saudi Arabia	0.2039	0.0895	0.1424

Table 5: Variance decomposition of the SVAR model under monetary dominance

Morocco

Variance Decomposition of INF

Period	S.E.	CA	INF	GDP	M3	GEXP
1	2.318043	7.054471	92.94553	0.000000	0.000000	0.000000
2	2.960694	5.802222	77.15709	0.711633	14.87757	1.451489
3	3.307495	5.529134	71.63233	1.268986	18.87599	2.693562
4	3.509711	5.637894	68.37973	1.187675	21.25793	3.536773
5	3.632203	5.838538	66.80796	1.223414	22.10048	4.029602
6	3.707584	6.077870	65.75311	1.186733	22.66755	4.314731
7	3.754558	6.282505	65.15005	1.189103	22.90150	4.476847
8	3.783951	6.459701	64.73687	1.174259	23.06003	4.569141
9	3.802427	6.593736	64.48278	1.174128	23.12790	4.621453
10	3.814053	**6.697584**	**64.31035**	**1.168791**	**23.17210**	**4.651170**

Variance Decomposition of GDP

Period	S.E.	CA	INF	GDP	M3	GEXP
1	1.903072	2.587164	1.855150	95.55769	0.000000	0.000000
2	2.616291	1.843664	3.122830	91.69688	3.162662	0.173969
3	2.946315	1.950528	2.878725	91.73819	3.275897	0.156658
4	3.158471	1.853060	3.102143	91.32920	3.543787	0.171813
5	3.263685	1.885709	3.051468	91.33629	3.557924	0.168608
6	3.330687	1.868102	3.104838	91.24449	3.611188	0.171384
7	3.365901	1.878573	3.093881	91.24488	3.611910	0.170759
8	3.388194	1.875516	3.107730	91.22160	3.623706	0.171447
9	3.400515	1.878809	3.105467	91.22100	3.623391	0.171330
10	3.408291	**1.878396**	**3.109161**	**91.21484**	**3.626084**	**0.171516**

Egypt

Variance decomposition of INF

Period	S.E.	CA	INF	GDP	M3	GEXP
1	2.852789	11.08985	88.91015	0.000000	0.000000	0.000000
2	3.493175	8.460766	73.11076	2.351089	15.51687	0.560515
3	3.819256	9.227064	62.18768	3.474434	24.20445	0.906375
4	3.997316	12.80381	56.04956	3.383233	26.58307	1.180330
5	4.095165	16.39697	52.40897	3.164802	26.58138	1.447888
6	4.148501	18.95074	50.17017	3.148649	26.03441	1.696028
7	4.177218	20.50234	48.80489	3.266985	25.52594	1.899854
8	4.192481	21.37050	47.99521	3.413169	25.17175	2.049367
9	4.200496	21.83440	47.52983	3.533936	24.95232	2.149510
10	4.204662	**22.07574**	**47.26989**	**3.617492**	**24.82484**	**2.212031**

Variance Decomposition of GDP

Period	S.E.	CA	INF	GDP	M3	GEXP
1	4.658793	1.670769	1.008672	97.32056	0.000000	0.000000
2	5.406211	4.018245	0.896263	92.79738	1.684512	0.603599
3	5.874709	6.469513	0.883381	89.20895	2.398414	1.039745
4	6.188190	8.206745	0.868417	87.05418	2.564945	1.305709
5	6.400610	9.226558	0.855080	85.86047	2.585487	1.472401
6	6.542392	9.772973	0.847131	85.22430	2.579135	1.576462
7	6.633366	10.05354	0.843188	84.89253	2.571599	1.639144
8	6.689084	10.19500	0.841381	84.72169	2.566622	1.675305
9	6.721769	10.26585	0.840575	84.63442	2.563775	1.695382
10	6.740261	**10.30126**	**0.840214**	**84.59008**	**2.562239**	**1.706200**

Saudi Arabia

Variance Decomposition of INF

Period	S.E.	CA	INF	GDP	M3	GEXP
1	8.629599	4.527641	95.47236	0.000000	0.000000	0.000000
2	11.44185	12.57083	85.91446	0.386391	0.000367	1.127952
3	12.92385	18.37836	80.03774	0.437751	0.089857	1.056285
4	13.69716	22.01894	76.28737	0.488299	0.194613	1.010778
5	14.08495	24.05242	74.12364	0.521538	0.290430	1.011974
6	14.27208	25.11731	72.95220	0.541403	0.361574	1.027511
7	14.35946	25.64976	72.34868	0.552150	0.407701	1.041701
8	14.39917	25.90650	72.05020	0.557595	0.434727	1.050979
9	14.41683	26.02663	71.90757	0.560223	0.449395	1.056190
10	14.42456	**26.08146**	**71.84133**	**0.561447**	**0.456899**	**1.058866**

Variance Decomposition of GDP

	S.E.	CA	INF	GDP	M3	GEXP
1	2.160672	12.96231	7.478853	79.55884	0.000000	0.000000
2	2.477590	11.92699	6.860066	71.39013	5.284408	4.538397
3	2.594764	11.86299	6.929043	70.35087	6.262045	4.595052
4	2.660828	12.31262	6.971525	69.78601	6.369681	4.560166
5	2.699489	12.79424	6.981649	69.35132	6.334502	4.538282
6	2.721106	13.12749	6.977173	69.05624	6.309327	4.529767
7	2.732515	13.31786	6.970725	68.88403	6.300351	4.527039
8	2.738240	13.41576	6.966052	68.79344	6.298493	4.526259
9	2.740998	13.46289	6.963334	68.74901	6.298698	4.526064
10	2.742284	**13.48462**	**6.961922**	**68.72825**	**6.299193**	**4.526024**

Table 6: Variance decomposition of the SVAR model under fiscal dominance

Morocco

Variance Decomposition of INF

Period	S.E.	CA	INF	GDP	GEXP	M3
1	2.367010	9.107050	90.89295	0.000000	0.000000	0.000000
2	2.931200	6.718310	77.99942	1.264912	3.010181	11.00718
3	3.200166	6.090062	73.65886	1.468186	4.942255	13.84064
4	3.338374	5.828368	71.06001	1.509251	6.208674	15.39370
5	3.411548	5.776287	70.01393	1.475199	6.877981	15.85660
6	3.450945	5.769757	69.33920	1.481961	7.259161	16.14992
7	3.472331	5.789035	69.03606	1.466667	7.457177	16.25106
8	3.484097	5.807959	68.84164	1.466136	7.565981	16.31828
9	3.490567	5.824878	68.74892	1.461362	7.622043	16.34280
10	3.494177	**5.837100**	**68.69116**	**1.460572**	**7.652313**	**16.35886**

Variance Decomposition of GDP

Period	S.E.	CA	INF	GDP	GEXP	M3
1	1.913382	2.012847	1.525293	96.46186	0.000000	0.000000
2	2.577716	1.484094	2.658379	92.87614	0.415911	2.565472
3	2.871885	1.502315	2.435876	93.06341	0.381876	2.616519
4	3.054152	1.437250	2.645000	92.66417	0.418900	2.834676
5	3.137180	1.447542	2.598960	92.70447	0.412893	2.836135
6	3.186955	1.436541	2.650955	92.60920	0.420566	2.882737
7	3.209951	1.440219	2.641284	92.61871	0.419198	2.880593
8	3.223377	1.438324	2.655301	92.59338	0.421243	2.891755
9	3.229667	1.439443	2.653457	92.59533	0.420941	2.890827
10	3.233259	**1.439132**	**2.657319**	**92.58843**	**0.421527**	**2.893588**

Egypt

Variance Decomposition of INF

Period	S.E.	CA	INF	GDP	GEXP	M3
1	2.824527	11.56549	88.43451	0.000000	0.000000	0.000000
2	3.465627	8.803559	72.46805	3.298480	2.169731	13.26018
3	3.796307	9.114047	62.14548	4.976407	3.580907	20.18316
4	3.980012	12.05313	56.67396	4.962711	4.347481	21.96271
5	4.083225	15.09529	53.50213	4.685537	4.794485	21.92256
6	4.140948	17.27898	51.54613	4.608095	5.071501	21.49530
7	4.172911	18.62110	50.34065	4.679982	5.247238	21.11103
8	4.190414	19.38670	49.61708	4.791694	5.357965	20.84656
9	4.199900	19.80743	49.19544	4.888120	5.426109	20.68290
10	4.204997	**20.03418**	**48.95594**	**4.955898**	**5.466852**	**20.58713**

Variance Decomposition of GDP

Period	S.E.	CA	INF	GDP	GEXP	M3
1	4.633310	1.984044	0.691750	97.32421	0.000000	0.000000
2	5.416026	4.394402	0.643076	92.77457	0.482660	1.705292
3	5.871940	7.062879	0.690566	88.83256	0.890761	2.523234
4	6.149449	9.064018	0.700739	86.35344	1.157960	2.723844
5	6.329149	10.29449	0.694298	84.93496	1.330595	2.745655
6	6.448171	10.98060	0.687283	84.15661	1.441035	2.734472
7	6.524928	11.34657	0.682878	83.73820	1.509548	2.722801
8	6.572333	11.53847	0.680501	83.51543	1.550469	2.715128
9	6.600445	11.63860	0.679279	83.39739	1.574072	2.710657
10	6.616583	**11.69084**	**0.678659**	**83.33501**	**1.587312**	**2.708174**

Saudi Arabia

Variance Decomposition of INF

Period	S.E.	CA	INF	GDP	GEXP	M3
1	7.832494	2.411947	97.58805	0.000000	0.000000	0.000000
2	10.94501	5.959882	85.32800	2.102517	5.223866	1.385736
3	12.60432	7.898105	79.63728	5.824984	5.049431	1.590196
4	13.42356	12.88967	71.83179	8.516843	5.159694	1.602008
5	13.84873	15.86846	67.29025	9.938104	5.188518	1.714671
6	14.07461	17.20715	64.66909	11.05637	5.393464	1.673939
7	14.19901	17.74840	63.57267	11.51051	5.515337	1.653083
8	14.25071	17.89106	63.12066	11.79777	5.551965	1.638546
9	14.27044	17.93183	62.99403	11.89348	5.547084	1.633580
10	14.27964	**17.92669**	**62.97455**	**11.92481**	**5.540020**	**1.633928**

Variance Decomposition of GDP

Period	S.E.	CA	INF	GDP	GEXP	M3
1	2.125662	5.969581	7.999101	86.03132	0.000000	0.000000
2	2.407707	7.268545	7.115048	75.76718	0.000140	9.849084
3	2.564449	7.207705	6.370024	75.83356	1.634160	8.954547
4	2.707312	7.928771	6.931286	73.79048	2.329595	9.019872
5	2.798474	9.814116	6.752952	72.28404	2.347881	8.801015
6	2.855200	10.23252	6.731400	71.84844	2.425204	8.762435
7	2.880802	10.39805	6.715992	71.68242	2.459091	8.744446
8	2.893676	10.47679	6.734037	71.58833	2.463784	8.737061
9	2.898924	10.56328	6.750420	71.50115	2.460492	8.724658
10	2.901280	**10.60735**	**6.774696**	**71.44370**	**2.457610**	**8.716647**