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Macroeconomic and monetary policy responses in selected highly indebted MENA countries post Covid 19: A structural VAR approach[☆]

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ABSTRACT

With limited fiscal space, MENA governments with flexible exchange rates have been relying extensively on accommodative monetary policy to circumvent external shocks such as Covid 19 and other domestic macroeconomic imbalances. Other MENA countries with high debt levels and fixed exchange rates are not able to use conventional monetary policy effectively. We use a battery of econometric models to identify domestic and external nominal shocks affecting the MENA region and their dynamic transmission mechanisms through impulse response functions and granger causality tests derived from a structural VAR. Once the nature of those shocks is identified, we formulate appropriate macroeconomic policy responses to mitigate their effects. We show that shocks to Saudi Arabia's macroeconomic fundamentals and oil prices have a significant impact on MENA countries' GDP, inflation, and interest rates. In the absence of an effective conventional monetary policy, MENA central banks will have to rely more on non-conventional monetary policy tools.

1. Introduction

The Middle East and North Africa (MENA) countries of Egypt, Tunisia, Jordan, and Lebanon stand at a crossroad in history, with negative exogenous and endogenous shocks sweeping through them. The Covid-19 pandemic, the social and political unrests, and the earlier series of financial and debt crises¹ have exposed the ineffectiveness of the adopted conventional monetary and fiscal policy tools and have raised questions about the sustainability and manageability of MENA countries' exchange rates, sovereign debts, balance of payments, and budget and current account deficits. The neo-liberal economic model (International Monetary Fund (IMF)) implemented in MENA countries since the late 1980s, which centered on the use of conventional monetary policy tools has yielded relatively acceptable levels of economic growth and has managed to meet the goals of macroeconomic stability in a non-crisis macroeconomic environment. Moreover, monetary, fiscal and inflationary pressures have, overall, been smoothed. However, and in light of the recent

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¹ For a detailed discussion of the recent debt and financial crises and their impact on the MENA region see [Neaime \(2000, 2012 and 2016\)](#).

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financial and debt crises and the more recent pandemic and its devastating consequences on the world economy, the impact of such conventional monetary policy instruments has not led to the desired outcomes in terms of financial stability and deficit and debt reductions and containment. Indeed, in certain cases, exogenous shocks, the Covid-19 pandemic, and the continuous use of conventional monetary pools in a crisis environment have in fact aggravated those macroeconomic imbalances. In the light of a critical reassessment of the achievements and failures of MENA's monetary policies, a new monetary/fiscal approach should emerge, one which is more holistic, integrating non-conventional monetary tools, to respond to current acute financial and macroeconomic imbalances. The new non-conventional monetary model will reconsider macroeconomic policies that incorporate fiscal discipline and a more efficient monetary policy in order to achieve a structural macroeconomic change. Moreover, fiscal and monetary policies will have to be reshaped to achieve not only macroeconomic stabilization, but also fiscal and monetary discipline in order to render sovereign debt more manageable. Within this context, such macroeconomic stabilization policies will have to be reassessed for the purpose of proposing new fiscal and monetary policies that are sustainable and that will be conducive to growth, development, and debt and budget deficit reductions.

In this study, we will answer the following questions. How can the MENA countries in sanitary, financial, and debt crises curb macroeconomic imbalances (high debt, budget and current account deficits) and use non-conventional monetary policy tools effectively at a time of limited fiscal space due to high debt levels, negative GDP growth rates, high unemployment rates, rising inflation, and sudden stops in capital inflows? If traditional macroeconomic policies and their modification in the context of the global crises have not helped, are there any new directions that one can think of that will not only solve the current sanitary/financial/debt crises, but also prevent future ones from developing? What about the introduction of macroeconomic stabilization programs, is there still room to use both monetary and fiscal policies in tandem to curb those macroeconomic imbalances? MENA Policy makers need to be very careful since joint austerity measures can create a vicious circle whereby recessionary budgets, high interest rates and high levels of debt tend to reinforce each other.

On the other hand, empirical studies on macroeconomic and debt sustainability are numerous and have gained extreme importance after the latest financial and debt crises worldwide. A major strand of the empirical literature looks at the time series properties of the fiscal variables. This approach has proven to be elegant and robust as it uses actual fiscal and macroeconomic variables and shy away from calibration empirical modeling. Two empirical frameworks have been used to test for fiscal sustainability. The first rests mainly on testing the stationarity of the various macroeconomic variables, while the second employs cointegration and granger causality tests deduced from VAR or VECM models and explores the short and long run dynamic equilibrium relationships and causality effects between the macroeconomic variables of interest. For instance, and through impulse response functions and granger causality tests derived from a structural VAR model, Neaime et al. (2018) identify domestic and external nominal shocks and their transmission mechanisms in the European Union within the context of the Greek debt crisis.

Under the above strand of the literature, Neaime (2015a and 2015b); Neaime et al. (2018) analyzed the conduct of fiscal and monetary policies and studied the sustainability of public debt and macroeconomic policies in MENA in the post US financial crisis period. Using time series econometric tests and the Present Value Constrained model for the period that ends in 2015, the empirical results show strong evidence of sustainability of fiscal policies in Tunisia given the country's fiscal discipline. The weak sustainability in Egypt is explained by the successful privatization plan introduced during the 1990s. Morocco's mixed results are explained by the recently introduced fiscal recovery reforms. The unsustainable debt and fiscal policies for Jordan and Turkey were explained by the size of the government causing major fiscal imbalances for Jordan's economy, and by the weakness of the financial and banking sectors in Turkey.

With the above in mind, and in this paper, we will first overview the latest macroeconomic fundamentals of some selected highly indebted MENA countries for the purpose of establishing the current sovereign debt situation, its sustainability, and how manageable is it in light of the consequences of the Covid-19 Pandemic. We then adopt a structural VAR model to identify various exogenous shocks affecting MENA's macro economy for the purpose of establishing the root cause of the current macroeconomic imbalances with the aim of establishing potential remedies and solutions. The SVAR approach permits to estimate the extent to which MENA can be resilient or vulnerable to exogenous nominal shocks, mainly shocks emanating from the Gulf Cooperation Council (GCC); MENA's main trading partner. Contrary to what is currently implemented in the traditional debt literature focusing on debt sustainability and default models to explain MENA's macroeconomic imbalances, this paper will identify exogenous/endogenous shocks that are the root cause of those imbalances and come up with policy recommendations for improved monetary policy implementation in the future. Moreover, the structural VAR approach identifies various exogenous shocks that have led to Egypt and Lebanon's exchange rate crises and will indicate the extent to which MENA can be resilient to external shocks. Accordingly, this paper adds to existing literature, which has so far tackled Egypt and Lebanon's crisis from a debt sustainability/default perspective,² by testing empirically and for the first time using a SVAR model the many factors driving those crises.

The remainder of the paper is divided as follows. Section 2 presents a macroeconomic overview. Section 3 lays down the empirical methodology and reviews related literature. The data set and empirical estimations and results are all summarized in Section 4. Finally, the last section offers some conclusions and policy recommendations.

² See for instance, Neaime (2015a), Guerreiro (2014), Kosteletou (2013), Shambaugh (2012), Lane (2012).

2. Recent macroeconomic and monetary developments in MENA

2.1. Tunisia

The macroeconomic improvements observed since 2015 in Tunisia's key macroeconomic fundamentals have been largely offset by the ongoing Covid-19 pandemic. Tunisia's national currency, the Dinar, has lost about 65 per cent of its value since 2012 and Tunisia's economy has shrunk by 4.3 per cent in 2020 (see [Table 1](#)). The severe depreciation of the local currency led to a further deterioration of living standards. Tunisia is now running a twin deficit. The budget/ fiscal deficits and the current account deficits are widening rapidly and have reached 10 per cent of GDP respectively by the end of 2021. As the twin deficits widen, there is growing concern of increased public debt accumulation. Eighty per cent of Tunisia's public debt is external and is being serviced in foreign currency thereby contributing to the rapid depletion of Tunisia's foreign exchange reserves. Foreign public debt now stands at more than 100 per cent of GDP. The bottom line is Tunisia's sovereign debt is becoming unsustainable. There has been renewed talks in early 2021 between the Tunisian authorities and the IMF, in order to extend the financial assistance program to help support economic reforms and bridge the financing gaps.³

In the absence of such financial support from international donors, there would be a further depreciation of the Dinar, making debt service in foreign currency even more expensive. More recently and in early 2021, Tunisia's public debt ratings were again downgraded by the international rating agencies, making it more difficult for Tunisia to borrow from the international financial market at low interest rates. It should also be noted that the 2017–2020 was a period of considerable economic hardship and uncertainty in Tunisia. Economic difficulties were amplified by the 2015 terrorist attacks which produced low GDP growth rates (below 2%) and high inflation rates (close to 8%), as well as, a decline in Foreign Direct Investments (FDI) to a low of 0.4 per cent of GDP in 2020 ([Table 1](#)). The aftermath of the attacks was characterized by a crumbling tourism industry and a rapid deterioration in tourism receipts, which constituted a major source of desperately needed foreign currency, with international reserves worth of month of imports declining to 3 months only in 2020. Despite the relatively small size of the international financial assistance, Tunisia's economic situation would have been far worse and would have further deteriorated without the IMF and European Union (EU) disbursements since 2015.

During the same period, Tunisia's government did not have much fiscal space, owing to a large share of the budget allocated to reinforcing national security (especially after the 2015 attacks). While restructuring of subsidies and improving the targeting of social safety nets was ongoing, government revenues were on the rise since 2016. Fiscal reforms have been introduced to increase tax revenues (VAT rates have increased by 1% point as of January 2018) and efforts were devoted to fight tax evasion. Government revenue growth was, however, hampered by the low growth environment. Subsequently, Tunisia had to borrow from the international financial market through several Eurobond issues over the 2017–2020 period. However, borrowing on local and international financial markets has become increasingly difficult from 2019 onward.⁴ The persistent depreciation of the Dinar, rampant inflation, sustained macroeconomic imbalances, and eight consecutive downgrades in sovereign bond ratings have limited Tunisia's access to international financial markets.

2.2. Jordan

Jordan's main macroeconomic imbalances rest in its past-accumulated sovereign debt (forecast at 120% of GDP in 2022). The presence of such extensive debt has restricted Jordan's access to international financial markets. In the past, the IMF and EU's financing programs have secured Jordan's continued access to the international financial market. However, and despite the presence of these programs, trends in the Debt to GDP ratio appear to be unsustainable. In addition, Jordan does not have the needed fiscal space to finance its current account and budget deficits. Jordan's government is also hosting half a million Syrian refugees, which is exacerbating even further the government budget deficit, the accumulation of sovereign debt, as well as, Jordan's infrastructure. It should also be noted that the 2015–2020 was a period of considerable economic hardship and uncertainty. Economic difficulties were exacerbated by the Covid-19 Pandemic which produced low GDP growth rates (below 2%) and a contraction in the Jordanian economy in the order of 2% in 2020, as well as, a decline in FDI to a low of 1.3 per cent of GDP in 2020 ([Table 2](#)).

Another issue is Jordan's ineffective conventional monetary policy. In the presence of fixed exchange rates and an open capital account, monetary policy is impotent. These combined factors are also draining the central bank's foreign exchange reserves which have fallen by 3% in April 2021. International reserves were already being depleted and the import coverage of reserves has decreased considerably from 8 months in 2015–5 months' worth of imports in 2021. Furthermore, it should be stressed that the huge burden on Jordan's macro economy is public debt which is expected to climb to 120% of GDP in 2022. While Jordan is currently in a critical financial position, conventional monetary policy continues to be ineffective with no direct impact on the macro economy and the rate of growth of GDP. The current situation could be attributed to the impossible trinity, discussed above.⁵ Therefore, more credit rating

³ See e.g. <https://www.bloomberg.com/news/articles/2021-04-25/tunisia-requests-new-imf-program-to-back-reforms-letter-shows>.

⁴ This can be directly related to the "debt intolerance" problem suggested by [Reinhart et al. \(2003\)](#). Enhancing the domestic credit markets relating to the public sector can further expand the understanding of how to improve the international financial status (credit rating) domestically. [Caballero and Krishnamurthy \(2004\)](#) argue that the ability of countries to endure fiscal deficit is conditional on levels of financial market development. They found that more financial development leads to better investor confidence and lower liquidity premium demanded in times of crisis. Thus, an emerging economy with a more developed financial market will, on average, finance its fiscal deficit better.

⁵ That is, Jordan cannot maintain a fixed exchange rate and an open capital account and have in place an effective conventional monetary policy.

Table 1
Selected Macro-Economic Indicators for Tunisia: 2014–2020.

Indicator /Year	2014	2015	2016	2017	2018	2019	2020
Real GDP Growth, %	2.9	1.2	1.2	1.9	2.7	1	-4.3
Inflation rate, % of end of period	4.8	4.1	4.2	6.2	7.5	6	5.5
Interest rate, % end of period	4.75	4.25	4.25	5	6.75	7.75	7.98
Unemployment rate, %	15.0	15.4	15.5	15.5	15.5	14.9	16.7
Budget Deficit, % of GDP	-3.3	-5.2	-6.2	-6.0	-4.5	-3.9	-10.6
Gross Public Debt, % of GDP	51.5	55.4	62.3	70.9	77.5	71.8	87.6
Current Account Balance, % of GDP	-9.8	-9.7	-9.3	-10.3	-11.1	-8.4	-6.8
International Reserves, USD billion	7.7	7.4	6.0	5.6	5.3	7.4	6.5
International Reserves in Months of Imports	3.1	3.8	3.2	3.1	2.6	3.8	3.3
Gross External Public Debt, % of GDP	63.7	68.4	75.2	86.2	99.4	97.3	100.7
Foreign Direct Investment, % of GDP	2.2	2.3	1.5	2	2.5	2	0.4
Exchange Rate, per One USD	1.7	1.96	2.15	2.42	2.65	2.93	2.81

Source: IMF & World Development Indicators (2020). Tunisia's Central Bank & Ministry of Finance.

Table 2
Selected Macro-Economic Indicators for Jordan: 2014–2020.

Indicator /Year	2014	2015	2016	2017	2018	2019	2020
Real GDP change, %	3.4	2.5	2	2.1	1.9	2	-2
Inflation rate, % of end of period	1.6	-1.7	1.2	3.5	3.8	0.7	-0.3
Interest rate, % end of period	4	3.8	3.8	5	5.8	5	3.5
Unemployment rate, %	11.9	13.1	15.3	15.78	16.29	16.85	18.5
Budget Deficit, % of GDP	-2.3	-3.5	-3.2	-2.6	-2.4	-3.4	-5
Gross public Debt, % of GDP	75.0	78.4	77.4	76.0	75.1	78.0	88.5
Current Account Balance, % of GDP	-7.1	-9	-9.7	-10.6	-6.9	-2.25	
International Reserves, USD billion	14.7	15.7	14.8	15	12.9	14.3	16.9
International Reserves per Months of Imports	7.3	8.3	8.1	7.8	6.8	7.7	5
Gross External Public Debt, % of GDP	31.6	34.9	37	41.1	37.2	35.3	39.5
Foreign Direct Investment, % of GDP	5.8	4.2	3.9	5	2.3	2.1	1.3
Exchange rate, JOD per USD	1.41	1.41	1.41	1.41	1.41	1.41	1.41

Source: IMF & World Development Indicators (2020). Jordan's Central Bank & Ministry of Finance.

downgrades are to be expected from the international rating agencies, which could render servicing of Jordan's public debt even more expensive.

Since 2018, Jordan has been experiencing public debt manageability issues coupled with limited access to financial markets. In between 2015 and in 2018, Jordan still managed to borrow from the international financial markets through a Eurobond issue but at relatively high interest rates. Therefore, based on the current situation, it seems quite difficult for Jordan to issue new Eurobonds in 2022, i.e., tap again the international financial market. While Jordan may not have the ability/capacity to do so, it should perhaps resort to the domestic financial market, through the local issuance of government bonds. The development of the domestic financial market (local bond primary and secondary markets) was amongst the conditions to be fulfilled and specified under the IMF program. The importance of developing the domestic financial market should also be emphasized at a time when access to international markets is becoming more and more difficult.

Easy access to international financial markets (with favourable terms) may well have been the case in between 2015 and 2018 but has now been severely challenged as a result of the Covid-19 pandemic. While the use of fiscal policy to deal with macroeconomic imbalances is usually preferred in less developed economies, given limited fiscal space, social unrest, and fixed exchange rates, this alternative is not an option for Jordan, as it is becoming difficult to introduce any fiscal stimulus package. In this context, there were limited options in terms of cutting spending and increasing revenues. Tax evasion reform was, however, implemented successfully increasing subsequently tax revenues. While the presence of a fixed exchange rate regime⁶ has been used in the past to attract foreign investments, this still prevailing exchange rate arrangement is now draining the central bank's foreign exchange reserves and is rendering debt unsustainable and conventional monetary policy ineffective. The Jordanian dinar is overvalued – that is why Jordan is losing foreign exchange reserves putting pressure on Jordan's exports and producing current account deficits. Jordan should move and as soon as possible to a flexible exchange rate regime, otherwise a currency and debt crises may become inevitable.

2.3. Lebanon

An economic, currency, debt, banking, political, and social crisis of significant magnitude continue to unfold rapidly in Lebanon

⁶ Foreign investors would therefore know that under a fixed exchange rate system, the value of their investment will not lose its value as a result of exchange rate volatility/depreciation.

since October 2019. Unlike other recent crises in both emerging and mature economies, the current crisis qualifies as a perfect storm and as one of the most severe since the beginning of the 19th century according to a recent World Bank study. The current crisis is imbedded in Lebanon's corrupt political system and is the result of ill-guided monetary, fiscal and financial policies adopted since the early 1990s. The essence of the crisis goes back to uninformed decisions made by the Lebanese authorities coupled with unsustainable government borrowing in foreign currency, a central bank's Ponzi Scheme, widespread corruption and cronyisms which have benefitted Lebanon's political elite and have produced the current perfect storm. The WhatsApp tax, which ignited the protests in October 2019 became an emblem of the need to stop corruption and change the political class. The domino effect of such crisis which is now translating into a sovereign debt, banking, and currency crises is affecting all sectors of the society and has already wiped out the middle class with poverty rates climbing to 80% of the total population.

The steep devaluation of the Lebanese Pound (LBP) has made Lebanon's financial crises even more severe because the government and the banking system have a significant amount of foreign currency debt leading to a problem of currency mismatch. With the fall of the local currency, the dollar denominated-debt has increased in value in local currency terms. Moreover, the deterioration in commercial banks' balance sheets has had a greater negative impact on lending and economic activity, than in other MENA countries. Thus, Lebanese banks halted lending and stopped performing their most important economic activity, in the absence of other financial institutions that are able to curb and better deal with adverse selection and moral hazard problems.

Lebanon's macroeconomic fundamentals are the worst among the MENA countries reviewed in this study. Today, Lebanon is the second most indebted countries in the world after Japan, with a debt-to-GDP ratio currently at 280%, and a gross public debt of US\$ 100 billion. Lebanon's debt and its service have become clearly unsustainable (Neaime, 2015b; and Neaime and Gaysset, 2017). Lebanon's fiscal policies have produced a large-scale debt, inequality, and chronic twin deficits inflated by rampant corruption. The country imports vastly more goods and services than what it exports. While the current account deficit averaged 25% of GDP over the 2010–2019 period, the budget deficit was estimated at 15% of GDP by the end of 2019 (see Table 3 below). Finally, GDP growth has been near 1% since the start of the Syrian crisis in 2011 with a severe 25% contraction in 2020.

Lebanon's current macroeconomic fundamentals can be summarized as follows. The country's exchange rate has been fixed since the mid-1990s at Lebanese Pounds (LBP) 1507/US\$ and has depreciated to 33,000 LBP to the US\$ in 2021. By the end of 2019, Lebanon's GDP was estimated at US\$ 53 billion with an estimated – 34% rate of growth in 2020. The current account deficit stands at US\$ 15 billion per year and has been on average 25% of GDP in between 2015 and 2020; the highest amongst all MENA countries during the last three decades. The total government budget in 2019 stood at US\$ 13.8 billion with government revenues at US\$ 11.6 billion (or 21% of GDP) and government expenditures at about US\$ 17.8 billion (or 160% of government revenues). Therefore, the government budget deficit in 2019 amounted to US\$ 6.2 billion or 10.5% of GDP and to US\$ 8.5 billion in 2020 or 15% of GDP (Table 3). Government revenues decreased by about 20% in 2019 widening even further the budget deficit.

Before the government debt default in 2020, government foreign currency debt (Eurobonds) stood at US\$ 32.6 billion in 2020 (or 37% of total debt) and is held by local banks (US\$ 20 billion) and international investors (US\$ 12.6 billion). Government debt denominated in LBP amounted to US\$ 54.5 billion (or 63% of total debt) and is mostly held by the Banque Du Liban (BdL) (US\$ 30 billion) and local commercial banks (US\$ 18 billion). With the steep fall of the LBP, acknowledging the losses at the central bank and the banking system will pave the way for an immediate debt restructuring. The gross central bank foreign reserves are currently estimated at a low of US\$ 11 billion. They include US\$ 11 billion in commercial banks' reserve requirements. This means that today the central bank is no longer able to pay for the country's strategic imports (oil, wheat, and medicine). More importantly, commercial banks total exposure to BdL and the government was estimated at US\$ 125 billion or about 71% of total bank assets. This significant exposure to the sovereign led to the downgrade of Bank MENA, Audi Bank, and BLOM bank to the SD (selective default) category by several rating agencies including Standard and Poor's. The recent government debt default will lead to the bankruptcy or mergers of several commercial banks, depending on their relative exposure to the government debt, with a significant loss of the banking sector's deposits at the central bank estimated at US\$ 80 billion. More importantly, and in order to increase seigniorage revenues and dilute the blocked US dollar deposits at commercial banks, the central bank has recently resorted to extensive money printing of the local currency. The use of a non-conventional monetary policy tool such as quantitative easing (or money printing) should have been employed for the purpose of buying back impaired assets of troubled commercial banks in a crisis situation and not as a mean to confiscate the savings of Lebanon's resident and non-resident population. Moreover, and after the default on foreign currency debt, the central bank continued with a generous government food and commodity subsidy program, draining an extra USD 10 billion in foreign exchange reserves; an amount that is much more significant than any financial support to be received from the IMF.

The recent default of the Government on its external debt and the exposure of Lebanon's commercial banks to the sovereign- with an estimated 70% of total assets invested in either Treasury bills or bonds or in Certificates of Deposits- have caused a severe banking crisis coupled with bank panics. For the past few decades, a dysfunctional electricity system, poor tap water quality, and solid waste mismanagement constitute examples of an inefficient system delivery by the authorities to the people of Lebanon. Finally, the estimated 1.5 million Syrian refugees in Lebanon have only exacerbated Lebanon's fiscal macroeconomic and social problems, the cost of which was recently estimated by the IMF to be around US\$ 25 billion since 2012.

2.4. Egypt

Between 2011 and 2014, Egypt suffered the worst economic crisis since the Great Depression. Following the fall of Hosni Mubarak in 2011, Egypt experienced a severe decline in FDI (–50%), in exports, and in tourism revenues. The government also suffered from a drop in revenues generated by the Suez Canal related to the slowdown of global trade and the oil price hikes that resulted from the 2008 global financial crisis. This caused a 60% drop in foreign exchange reserves at the central bank, a 3% drop in GDP growth, and a

Table 3
Selected Macro-Economic Indicators for Lebanon: 2014–2020.

Indicator /Year	2014	2015	2016	2017	2018	2019	2020
Real GDP change, %	2.5	0.2	1.5	0.9	-1.9	-6.7	-25
Inflation rate, % of end of period	-0.7	-3.4	3.1	5	5.6	7	150.4
Interest rate, % end of period	10	10	10	10	10		
Unemployment rate, %	6.35	6.31	6.26	6.18	6.1	6.04	–
Budget Deficit, % of GDP	-6.2	-7.5	-8.9	-8.6	-11.3	-10.5	-15.1
Gross Public Debt, % of GDP	138.3	140.8	146.2	149.7	154.9	174.3	154.4
Current account balance, % of GDP	-28.8	-19.9	-23.5	-26.3	-28.2	-26.5	-14.3
International Reserves, USD billion	39.5	38.7	43.3	43.5	40.6	38.2	17.4
International Reserves Per Months of Imports	16.8	17.2	18.9	18.8	17.1	17.7	–
Foreign direct investment, % of GDP	5.9	4.3	5.0	4.7	4.8	4.3	–
Exchange rate, LBP per One USD	1500	1500	1500	1500	1500	1500	9000

Source: IMF & World Development Indicators (2020). Lebanon's Central Bank & Ministry of Finance.

fast devaluation of the Egyptian pound (EGP). With a budget deficit reaching 11.5% of GDP in 2014, the government halted subsidizing basic necessities, which caused a significant increase in food prices, as well as, shortages in fuel and gas. According to Egypt's government, 25% of Egyptians were classified as living below the poverty line, and 24% just above it in 2014. Egypt needed to swiftly restore stability and restore tourism and export revenues. All this was awaiting a much-delayed US\$ 4.8 billion IMF loan, and a further US\$ 12 billion in contingent loans from the European Union (EU), which were both conditional on reforms.

Despite the economic and political challenges, the Central Bank of Egypt (CBE) first decided to maintain the EGP peg to the dollar by intervening on the foreign exchange market using its foreign currency reserves. As a result, the CBE's foreign exchange reserves dropped from US \$ 35 billion in 2009 to around US\$ 15 billion by the end of 2011. To limit capital flights abroad and the amount of dollars Egyptians can withdraw at the official exchange rate from banks, the CBE imposed a series of strict capital controls. For example, the CBE introduced a ceiling of US\$ 100,000 on transfers abroad by individuals. The government also sought to deter purchasing US dollars on the black market by limiting dollar bank deposits to US\$ 50,000 per month so that importers would be constrained in financing imports.

In 2012, concerns about social unrest and the country's inability to meet its financing gaps induced international rating agencies to lower Egypt's credit ratings on several occasions. Some policy makers and academics advised the CBE to devalue/float the currency in order to reduce the pressure on foreign exchange reserves. However, the CBE understandably was aiming at avoiding further increases in "imported" inflation, at a time when Egypt suffered from double-digit inflation. Even though the CBE tried to maintain the exchange rate within a certain band, the EGP continued depreciating against the dollar in the black market as importers were selling it within the context of capital controls put in place and given the limited access to sufficient dollars to finance imports.

Capital controls started to be lifted gradually in January 2014 allowing commercial banks to make one transfer per year in the amount of US\$ 100,000. The only significant capital control measure that was not lifted was the US\$ 50,000 monthly limit on cash deposits to cover imports of non-priority goods. Due to the appreciation of the US dollar against the EGP, (one dollar was equivalent to 8 EGP), Egypt's national poverty rate increased to 28% in 2015, up from 23% in 2010. In November 2016, the CBE announced that it would float the Egyptian pound in an effort to boost exports and GDP growth rates and comply with one of the IMF's conditions. Subsequently, and after floating the EGP, Egypt initiated a comprehensive reform program supported by a US\$ 12 billion IMF loan in a bid to restore macroeconomic stability and improve economic activity. In tandem, the government raised the deposit ceiling for importers of essential goods to US\$ 250,000.

While moving to a floating exchange rate regime as part of a \$12 billion IMF loan reform program has rendered monetary policy more effective, it did not boost Egypt's exports and GDP growth instantaneously. Inflation increased significantly after the EGP was floated and GDP growth rates did not pick up in parallel as the manufacturing, agricultural, and service industries depend on the imports of raw materials in their production processes. In 2017, the annual inflation rate increased by 33% leading consequently to the most serious economic crises. By early 2018, some macroeconomic indicators and the exchange rate started to gradually stabilize (Table 4). The CBE's net foreign exchange reserves increased by almost 50% from US\$ 20.9 billion in 2016 to US\$ 33.2 billion in 2017. The exchange rate stabilized at about EGP 17/US\$ despite a dollar liquidity squeeze. While the GDP growth rate was up again to about 5%, interest and inflation rates were on the decline (Table 4). Egypt succeeded in lowering the debt to GDP ratio from 103% in 2017 to less than 85% in 2019, coupled with an improvement in the inflow of FDI up to 3% of GDP in 2019 (Table 4). By the end of 2017, the

Table 4
Selected Macro-Economic Indicators for Egypt: 2014–2020.

Macroeconomic Indicators	2014	2015	2016	2017	2018	2019	2020
Real GDP change, (%)	2.9	4.4	4.3	4.1	5.3	5.6	3.6
Inflation rate, (%)	8.3	11.3	14	29.8	14.4	9.4	5.7
Interest rate, (%)	9.75	9.8	15.3	19.3	17.3	12.8	8.8
Unemployment rate (%)	13.4	12.9	12.7	12.2	10.9	8.6	8.3
Budget Deficit, % of GDP	-11.3	-10.9	-12.5	-10.4	-9.4	-8	-7.9
Gross Public Debt, % of GDP	85.1	88.3	96.8	103.0	92.5	84.2	90.2
Current account balance, % of GDP	-0.9	-3.7	-6.0	-6.1	-2.4	-3.6	-3.1
International Reserves, USD billion	12.0	13.3	20.9	33.2	38.6	40.7	41.2
International Reserves, Months of Imports	2.2	2.6	3.9	5.7	5.9	5.8	6.0
Foreign Direct Investment, % of GDP	1.5	2.1	2.4	3.1	3.3	3.0	3.1
Exchange rate, per USD	7.07	7.71	10.07	17.83	17.8	16.8	15.81

Source: CBE, Ministry of Finance, IMF, World Bank World Development Indicators.

CBE announced that the currency crisis was put under control.

By March 2019, Egypt had received US\$ 10 billion of the US\$ 12 billion loan from the IMF.⁷ Egypt implemented a first wave of macro-economic and structural reform measures that successfully addressed a number of deep-seated macroeconomic imbalances.⁸ Those measures helped to stabilize the economy, sustain growth and paved the way for a more dynamic private sector's participation in the economy. The real GDP growth rate reached 5.6% in 2019, up from 5.3% in 2018. Table 4 also shows improvements in the months of imports worth of foreign exchange, and in the deficit to GDP and debt to GDP ratios. Egypt's external position has stabilized at broadly favorable levels, as foreign reserves reached a comfortable US\$ 41.2 billion in 2020.

3. Econometric methodology and related literature

There is significant empirical evidence in the literature that unconventional monetary policy and tools are highly important in times of crises and in terms of spillovers from advanced economies towards emerging and developing ones. The estimated spillover effects for the same set of countries differ in terms of magnitudes, signs as well as with respect to detected operative transmission channels and factors determining these spillovers. For this reason some emerging economies such as Brazil, Colombia, India, Indonesia, Peru, Philippines, Russia, South Africa, Thailand and Turkey have implemented restrictions on capital flows. It should be emphasized that some MENA countries such as Egypt, Tunisia and Egypt and under an IMF funded program have implemented macroeconomic prudential reforms. Surprisingly, there is evidence that those macro-prudential policies implemented due to nonconventional monetary practices have succeeded and to some extent in attracting rather than preventing capital flows. The implemented macro-prudential policies in Egypt, Tunisia and Jordan have created higher levels of trust regarding domestic institutions and has led to better expectations that a possible future financial and debt crisis will be effectively handled (see Belke and Volz, 2019, and Belke, and Dubova, 2018).

After the Covid 19 pandemic, the recent currency crises in Egypt and Lebanon, the numerous downgrades of Tunisia, Jordan, and Lebanon's sovereign debts coupled with restrictions on access to the international financial market, and the ineffectiveness of conventional monetary policies to respond to domestic and regional financial shocks, MENA countries started recently to employ unconventional monetary policy and tools to respond to domestic and external financial shocks. Table 5 below summarizes the set of conventional and unconventional monetary policy and tools that have been used in the four MENA countries under investigation. In Jordan, Egypt and Lebanon conventional monetary policy exchange rate targeting to fix the exchange rate coupled with massive losses in foreign exchange reserves have rendered conventional monetary policy ineffective. Subsequently, Egypt and Lebanon floated their exchange rate after a currency crisis erupted in both countries. In 2020, the Central bank of Lebanon implemented quantitative easing through massive printing of money in local currency without resorting to the purchase of commercial banks' impaired assets. After the banking crisis that ensued, the central bank's lender of last resort function for troubled commercial banks was also not implemented. In Jordan and Tunisia, both central banks resorted to unconventional forward guidance in an effort to lower long-term real interest rates within an IMF and a European Union's Macroeconomic and Financial Assistance programs. Unconventional monetary policy instruments were also used in an attempt to flatten the yield curve in order to boost aggregate demand, despite numerous downgrades of sovereign debt ratings and the subsequent interest rates hikes. More recently in Egypt unconventional monetary policy has been

⁷ The 2016 IMF US\$ 12 billion loan was conditional on a) US\$ 6 billion being raised externally, b) liberalization of the exchange rate (floating the Egyptian pound), c) fiscal consolidation to lower budget expenditures (cutting fuel subsidies while expanding spending on vulnerable groups, d) tax increases, e) deep structural reforms (streamline industrial licensing; providing financing to SMEs; decriminalizing insolvency; simplifying bankruptcy laws), and f) lifting business regulations to spur economic growth.

⁸ Those measures included: (1) Introduce a market-determined exchange rate system; (2) Introduce a Value Added Tax (VAT); (3) Increase energy prices by removing related subsidies; (4) Cut food subsidies; (5) Rolled out program for increased spending on transportation for children, infant formula, and children's medicines; (6) Ratify legislation on investment law, reducing regulations for starting a business; (7) Introduce Capital controls (limits on dollar transfers); (8) Plan to expand key social safety nets programs; (9) Reduce public sector expenditures (decreasing the public wage bill); And (10) Sell telecom licenses and land.

Table 5
Conventional Versus Unconventional Monetary Policy and Tools: 2010–2022.

MENA Country	Egypt	Jordan	Tunisia	Lebanon
Conventional Monetary Policy and Tools Used	<ul style="list-style-type: none"> -Exchange Rate targeting then floating the exchange rate under the IMF Program in 2016, rendering conventional monetary policy more effective. -Currency crisis and the introduction of capital controls in 2012. -Open Market purchase and sale of Government bonds. -Sovereign debt downgrades by the international rating agencies. 	<ul style="list-style-type: none"> Exchange rate targeting to fix the exchange rate coupled with massive losses in foreign exchange reserves and conventional monetary policy ineffectiveness. -Open Market purchase and sale of government bonds on the local and international financial markets. -Since 2019, limited access to the international financial market for further Eurobond issues. 	<ul style="list-style-type: none"> -Manage float exchange rate and a depreciation of the Dinar, rendering conventional monetary policy more effective. -Open Market sale of government bonds in foreign currency; Eurobonds estimated at 80% of total public debt. -Limited access to the international financial market for further Eurobond issues since 2018. 	<ul style="list-style-type: none"> -Exchange rate targeting to fix the exchange rate, coupled with massive losses in foreign exchange reserves and conventional monetary policy ineffectiveness. Exchange rate crisis and floating of the exchange rate in 2020. -Open Market sale of Government domestic and Eurobonds before 2018. -Ponzi Scheme and sovereign Default on Eurobonds in 2020. -No access to the international financial market for further bond issues since 2019. -Impaired credit and balance sheet channels of monetary policy transmission mechanism.
Unconventional Monetary Policy and Tools Used	<ul style="list-style-type: none"> -Forward Guidance to lower long-term real interest rates under the IMF program -Efforts have been recently devoted to flatten the yield curve by lowering long-term interest rates and boost aggregate demand. -Rebalancing of the central bank's balance sheet 	<ul style="list-style-type: none"> -Forward Guidance to lower long-term real interest rates within the IMF and European Union's Macroeconomic and Financial Assistance programs. - Efforts to Flatten the yield curve to boost aggregate demand, despite numerous downgrades of sovereign debt ratings. 	<ul style="list-style-type: none"> -Forward Guidance to lower long-term real interest rates within the IMF and the European Union's Macroeconomic and Financial Assistance programs. - Efforts to Flatten the yield curve by reducing long-term interest rates in order to boost aggregate demand, despite numerous downgrades of sovereign debt ratings. -Rebalancing of the central bank's balance sheet. 	<ul style="list-style-type: none"> -Quantitative easing through massive printing of money in local currency without resorting to the purchase of commercial banks' impaired assets. -No central bank's lender of last resort function for troubled commercial banks. -Central Bank balance sheet rebalancing with losses estimated at \$60 billion. -IMF program being negotiated

Source: Authors' Estimates.

introduced in order to flatten the yield curve coupled with active forward guidance to lower long-term real interest rates under the IMF program with a rebalancing of the central bank's balance sheet.⁹

On the other hand, it is well known that VAR models (Sims, 1980) have become an increasingly powerful macroeconomic tool to gauge the dynamic response of a set of endogenous variables to exogenous shocks, and to identify the particular shocks that dominate the intrinsic volatility in a set of endogenous variables. Within this context and following Kong (2012), MENA countries are all assumed to be small open economies subject to exogenous shocks originating in the Gulf Cooperation Council (GCC), and proxied by Saudi Arabia which is the largest economy within the GCC. It is also well known that the GCC is MENA's main trading partner. MENA countries do not only import GCC oil but also export all sorts of agricultural and food products to the GCC. It is, therefore, indeed the case that nominal oil price shocks and GCC's business cycles have adversely affected MENA's economy with devastating consequences on growth, unemployment, trade, balance of payment, public debt, and fiscal deficits. As noted above, it is not only domestic fiscal factors that are contributing elements behind MENA's fiscal/monetary imbalances, but also the fiscal and external macroeconomic policies of other GCC member countries; namely Saudi Arabia which has registered over the past decade successive current account surpluses, mainly relative to MENA. Other factors that can potentially ignite a financial crisis in emerging MENA economies include: (1) A rise in interest rates resulting from negative shocks in the GCC and Europe; (2) A decline in government bond prices that causes a deterioration in MENA's commercial banks' balance sheets from asset write-downs; (3) A decline in GDP growth rates resulting from the Covid-19 Pandemic; and (4) the continuous increase in uncertainty in MENA due to unstable political/social infrastructure.

SVAR models embody an identification problem, where additional $(n^2 - n)/2$ theory-derived restrictions need to be imposed in order to recover the SVAR specification. Following Blanchard and Quah (1989), the orthogonalization of structural disturbances, which is a common practice in applied macroeconomics, or the contemporaneous cross equation effects, manifest themselves through the matrix of contemporaneous effects between different variables. As a result, the cross-equation error variance-covariance matrix Σ of the structural shocks is necessary diagonal. However, and more generally, Lutkepohl's (2005) representation of SVAR models, also referred to as AB systems, does not assume orthogonalization of structural shocks, and allows for a larger set of restrictions on both cross-equation error variance-covariance matrix, and the matrix of contemporaneous effects. In the context of AB systems, $2n^2 - n(n + 1)/2$ restrictions are necessary to obtain a well identified SVAR model.

There are various ways to place restrictions within the process of identification. One must caution, however, that placing arbitrary

⁹ See Papademou et al., (2020) for a detailed survey on the empirical findings on unconventional central bank policies.

restrictions like the Choleski decomposition distorts the estimated dynamic behavior of the system and may lead to misguided results at best. Instead, restrictions must be guided by economic theory or by what is known in the literature as “a priori restrictions.” These allow the data to capture the unknown dynamic relationships among various components of the system that are left unconstrained. A priori restrictions fall in one of three categories: (1) [Bernanke's \(1986\)](#) short-run restrictions, also referred to as contemporaneous restrictions; (2) [Blanchard and Quah's \(1989\)](#) long-run restrictions; And [Gali's \(1992\)](#) type restrictions which are a combination of both short and long run restrictions.

A Structural VAR model for y_t , a vector of n observable variables, can be written as

$$A(L)y_t = A_0 (I_n - B_1L - B_2L^2 \dots - B_pL^p)y_t = A_0e_t = B e_t, \quad (1)$$

where e_t is an $n \times n$ column vector of structural shocks; e_t is a n -column vector of reduced-form shocks; A_0 an $n \times n$ matrix of contemporaneous effects between variables; and $A(L)$ is a matrix lag polynomials such that

$$A(L) = A_0 - \sum_{k=1}^p A_k L^k. \quad (2)$$

The variance covariance matrix is

$$\Sigma_{e_t} = E(e_t e_t^T); \quad (3)$$

And

$$\Sigma_{e_t} = P \Sigma_{e_t} P^T, \quad (4)$$

$$\text{where } P = B^{-1}A_0. \quad (5)$$

Following Sims-Bernanki's (1986) decomposition method, short run restrictions are imposed on matrix A_0 , the matrix of contemporaneous effects and on matrix B . Restrictions on matrix B manifest themselves in [Eq. \(4\)](#) which is an additional set of equations to solve for the estimated parameters in [Eq. \(1\)](#).¹⁰ An alternative set of restrictions that can be used relies on long-run relationships. Following [Blanchard and Quah \(1989\)](#), the widespread use of this type of restrictions is due to the existing consensus among economists in the long run regarding macroeconomic theory and derived policy implications and results. [Blanchard and Quah \(1989\)](#) used the money neutrality hypothesis in the long run to impose long run restrictions. Also, [King et. al \(1991\)](#) used economic theory implications to justify the inclusion of long-run restrictions as follows.

Assume that $A(L)$ in [Eq. \(1\)](#) is a 2×2 matrix with elements $y_t = A(L)^{-1}e_t$, and $A(L)^{-1}$ is a 2×2 matrix with entries C_{ij} . If a variable has no permanent effect on another variable, then it must be the case that the cumulative effect of that variable's shock on the other variable is zero. This corresponds to restricting one of the off-diagonal entries of $A(L)^{-1}$, the C_{ij} , to be zero. This restriction can be viewed as a restriction on the sum of the auto regressive coefficients of $A(L)^{-1}$ and, therefore, $A(L)$. [Gali \(1992\)](#) used a combination of long and short run restrictions as in [Shapiro and Watson \(1998\)](#). In his argument of the usefulness and predictive power of the IS-LM model, he used a set of restrictions that are believed to have no long term effects on GDP along with another set of short term shocks that are believed to have no contemporaneous effects on other variables in his paper. Gali restricted money demand, IS, and money supply shocks to have no long-term effects on GDP. In addition to the restrictions on the absence of contemporaneous effects of monetary shocks on contemporaneous GDP, the price level is assumed not to affect the monetary policy rule due to information and decision lags, and the price level is assumed not to affect the demand for real money balances contemporaneously.

If the variables of interest are assumed to be integrated of order zero, then the identification scheme will not include any cointegrating relationship. If, however, the variables of interest are found to be cointegrated, then the identification scheme must follow [King's et. al \(1991\)](#) approach. Our identification procedure for nominal shocks follows [Blanchard and Watson \(1986\)](#). As noted above, this identification approach invokes contemporaneous restrictions. As in, [Blanchard and Quah \(1989\)](#), and since we have orthogonalization of structural disturbances, matrix B in each of [Eqs. \(1\)–\(5\)](#) above is necessary diagonal. By normalizing n diagonal elements of matrix A_0 to 1's, we are left with $(n^2 - n)/2$ restrictions to be imposed on A_0 , the matrix of contemporaneous effects between variables, to achieve proper identification. Recall that relationships between structural and reduced forms follow [Eq. \(1\)](#). After imposing the appropriate orthogonalization of structural disturbance restrictions, [Eq. \(1\)](#) becomes:

¹⁰ Note that [Blanchard and Watson \(1986\)](#) and [King and Watson \(1997\)](#) also followed this approach.

$$\begin{bmatrix} 1 & a_{12} & 0 & 0 & 0 & a_{16} & a_{17} & 0 \\ a_{21} & 1 & a_{23} & a_{24} & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & a_{34} & 0 & a_{36} & 0 & a_{38} \\ 0 & 0 & 0 & 1 & 0 & a_{46} & 0 & a_{48} \\ 0 & 0 & 0 & 0 & 1 & a_{56} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ a_{71} & a_{72} & a_{73} & a_{74} & a_{75} & a_{76} & 1 & a_{78} \\ 0 & 0 & 0 & 0 & 0 & a_{86} & 0 & 1 \end{bmatrix} \begin{bmatrix} e_{IR} \\ e_M \\ e_{INF} \\ e_{GDP} \\ e_{IRSA} \\ e_{OIL} \\ e_{EX} \\ e_{GDPSA} \end{bmatrix} = \begin{bmatrix} b_{12} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & b_{55} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{66} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & b_{77} & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & b_{88} \end{bmatrix} \begin{bmatrix} \epsilon_{IR} \\ \epsilon_M \\ \epsilon_{INF} \\ \epsilon_{IP} \\ \epsilon_{IRSA} \\ \epsilon_{OIL} \\ \epsilon_{EX} \\ \epsilon_{GDPSA} \end{bmatrix}$$

where, e_{IR} is specific MENA countries' interest rates reduced form shock; e_M is a monetary aggregate reduced form shock; e_{INF} is the rate of inflation reduced form shock; e_{GDP} is MENA countries individual GDP reduced form shock; e_{IRSA} is Saudi Arabia's interest rate reduced form shock; e_{OIL} is the price of oil reduced form shock; e_{EX} : is the respective exchange rate reduced form shock; e_{GDPSA} is Saudi Arabia's GDP reduced form shock; ϵ_t is an n-column vector of structural shocks; and e_t an n-column vector of reduced-form shocks.

We impose the following restrictions on the contemporaneous structural parameter matrix A_0 . Monetary policy is assumed to be a rule with feedback. It, therefore, responds to changes in lag GDP and the price level. The central bank observes changes in the latter variables and then acts accordingly. This is referred to in the literature as "information lag" and is an embodied virtue of the monetary policy practice. In addition, and in line with Kim and Roubini (2000), and Sims and Zha (1995), the monetary authorities do not respond contemporaneously to changes in US federal funds rate; Saudi Arabia's Monetary Agency (SAMA) rate in our case. This is because the monetary authority cares more about unexpected changes in the exchange rate rather than unexpected changes in the SAMA rate, i.e., $a_{13} = a_{14} = a_{15} = a_{18} = 0$.

The real demand for money function depends on real income and nominal interest rate. Therefore, the price of oil, the respective exchange rate, Saudi Arabia's GDP, and both Saudi Arabia and MENA's interest rates do not contemporaneously affect the real demand for money balances; i.e., $a_{25} = a_{26} = a_{27} = a_{28}$. MENA's interest rate and money supply, Saudi Arabia's interest rate, and the exchange rate are assumed not to affect the price level and real economic activity (proxied by GDP) contemporaneously. Instead, these variables affect the price level with a one-period lag.¹¹ Also, the price level is assumed to affect real economic activity with some lags, but not contemporaneously. Therefore, $a_{31} = a_{32} = a_{35} = a_{37} = 0$, and $a_{41} = a_{42} = a_{43} = a_{45} = a_{47} = 0$. Oil prices and Saudi interest rates are not affected by any of MENA countries' macroeconomic variables. This follows from MENA countries' small open economy assumption. The price of oil is determined internationally by the law of supply and demand. The same is true for Saudi Arabia's interest rate with the exception that the price of oil is allowed to affect the interest rate contemporaneously; the intuition behind this is that SAMA might react contemporaneously to an oil price shock. Thus, $a_{51} = a_{52} = a_{53} = a_{54} = a_{57} = a_{58} = 0$; and $a_{61} = a_{62} = a_{63} = a_{64} = a_{65} = a_{67} = a_{68} = 0$. Saudi Arabia's GDP is not affected by any of MENA's macroeconomic variables. Also, Saudi Arabia's interest rate and the exchange rate do not affect its GDP contemporaneously, that is: $a_{81} = a_{82} = a_{83} = a_{84} = a_{85} = a_{87} = 0$.

4. Data sample and empirical results

4.1. Data description and choice of macroeconomic variables

The choice of the macroeconomic variables included in the SVAR model which is estimated for each individual MENA country, is motivated by the fact that these variables must be classified as endogenous variables in the theoretical/textbook sense for them to be helpful in identifying structural disturbances. Modeling MENA's monetary policy must be conducted under the small open economy assumption. It is well known that small open economies are sensitive to external macroeconomic shocks, and therefore, a foreign set of variables-in our case Saudi Arabia's variables- must be included along with domestic variables to isolate the effect of exogenous monetary policy changes on MENA's small open economies. As in Kim and Roubini (2000), Cushman and Zha (1997), and Fung (2002),¹² we include foreign (Saudi) and domestic (MENA) macroeconomic variables. Our data vector is {IR, M, Inflation, GDP, IRSA, OIL, EX, GDPSA}, where OIL is the World price of oil denominated in US dollars; IRSA is Saudi Arabia's interest rates; GDPSA is Saudi Arabia's GDP; and EX is the exchange rate expressed as units of foreign currency (Saudi Rial) for one unit of the respective domestic MENA country.¹³ The domestic variables include IR, MENA countries interest rates, M which is a monetary aggregate defined as M_1 ; Inflation is the rate of inflation; and GDP is individual MENA countries' GDP. All variables are taken in log difference except oil prices and inflation rates, which are denominated in percentage change and percentage points respectively. The data set spans the period: Q1-2002 through Q4-2020 and has been retrieved from the Organization of Cooperation and Economic Development (OCED), the World

¹¹ See Goldberg and Knetter (1996) for a more detailed discussion.

¹² Inclusion of foreign variables in Kim and Roubini (2000) and Cushman and Zha (1997) solved previous anomalies, such as liquidity, price, exchange rate, and forward discount rate bias puzzles.

¹³ Saudi variables were frequently used in the MENA literature as proxies for regional macroeconomic variables given the relatively large size of the Saudi economy in terms of GDP.

Bank's World Development Indicators, the IMF's International Financial Statistics, and the Saint Louis Federal reserve databases.

4.2. Empirical results

We start our empirical analysis by checking the stability condition, which is a necessary first step to establish stationarity of the variables of interest. We then determine the lag length of the variables to be used in the SVAR models. We use a lag length of 4,¹⁴ as indicated by the AIC, SBIC, and HQIC criteria. A lag length of four ensures that the SVAR model is stable i.e.; all characteristic roots lie within the unit circle (see Fig. 1). Moreover, our identification procedure to recover structural shocks and, therefore, impulse response functions uses restrictions on the contemporaneous structural parameters. The impulse response analysis is expected to generate an inference into the dynamic patterns and time path of reactions of MENA's macroeconomic variables to shocks originating in Saudi Arabia. Additionally, the impulse response analysis will shed light on the duration of the effect of Saudi shocks on the respective MENA economies.¹⁵

Impulse response functions¹⁶ for the four MENA countries under investigation indicate that with the exception of Jordan and Lebanon all shocks appear to be transitory in nature over a period of 6 quarters and tend to vanish in the long run. While Saudi Arabia's GDP and interest rate shocks have permanent effects on Lebanon and Jordan's GDP, inflation, and interest rates, these shocks appear to have transitory effects in the case of Tunisia and Egypt. Moreover, shocks to Saudi Arabia's GDP and interest rate, as well as oil prices affect MENA's inflation rates significantly with either an alternating or pure positive effects, i.e.; MENA countries' rates of inflation respond positively to Saudi shocks, like for instance, technological shocks, the growth rate of GDP, and changes in Saudi Arabia's competitiveness. This has been indeed the case, whereby improved productivity, higher Saudi GDP growth rates and higher oil prices have been contributing factors in increasing MENA countries' inflation rates with devastating consequences on competitiveness and subsequent trade and current account deficits. Likewise, Lebanon and Jordan's interest rate do not respond to shocks in Saudi interest rates due to the ineffectiveness of conventional monetary policy under the fixed exchange rate regime to the US dollar in place. The significant impact of Saudi interest rates on Egypt and Tunisia is because the two MENA countries are vulnerable to external macroeconomic disequilibria. This has further widened their interest rate differential with Saudi Arabia. Since these disequilibria have been persistent over the last decade, they subsequently triggered a balance of payment crisis in Egypt, because real adjustments have been hard to implement given the absence of conventional monetary instruments to tackle Egypt's external disequilibrium in the presence of fixed exchange rates before Egypt's crisis in 2014. Accordingly, MENA countries' current account deficits have been widening, so have the interest rate differentials, further worsening the national debt and the government budget deficits via increases in Egypt, Jordan, Tunisia and Lebanon's debt service (see also Neaime, 2015b).

It is well known that MENA's real exchange rates vis-a-vis Saudi Arabia have been appreciating over time, especially during the period 2010–2020, right after the global financial crisis. After the crisis, MENA countries experienced huge losses in international competitiveness, and in their trade balances relative to Saudi Arabia, which had started registering recurrent deficits. If Saudi Arabia agrees to inflate its economy through either a more accommodative domestic fiscal policy or as a result of higher oil prices, then Saudi goods will become less competitive internationally. Saudi Arabia will run a current account deficit, which will subsequently help MENA countries reduce their trade deficits relative to Saudi Arabia.

In order to further corroborate our impulse response functions results, we conduct next Granger-causality tests to trace the short run dynamics and direction of causality between both sets of endogenous and exogenous variables. We are mainly interested in identifying whether Saudi interest rates and GDP granger cause respective MENA countries' macroeconomic variables. Table 6 above indicates that Saudi interest rates are found to granger cause Tunisia's interest rates, money supply, inflation, and GDP at the one percent level of significance. Moreover, Saudi Arabia's GDP affects significantly Tunisia's inflation rates, money supply, and GDP.

The presence of a flexible exchange rate regime in Tunisia has paved the way for the central bank to have a more effective conventional monetary policy that is able to better respond to exogenous interest rates and oil price shocks emanating from Saudi Arabia. Moreover, with more fiscal space, Tunisia has been able to use accommodating fiscal and monetary policies to dampen the effects of external shocks on its domestic economy. With an accommodating conventional monetary policy, Tunisia's interest rate differentials with Saudi Arabia have been kept at acceptable levels with adequate management of unwanted pressure on the exchange rate. In an attempt to further lower long term interest rates, unconventional monetary policy tools such as forward guidance have also been used more recently under the umbrella of an IMF and the European Union's Macroeconomic and Financial Assistance (MFA I&II) programs. These attempts were also coupled with other efforts devoted to flatten the yield curve by lowering long-term rates in order to boost aggregate demand despite several downgrades of sovereign debt ratings. Subsequently, acceptable levels of the interest rate impacted positively on fiscal variables with debt service costs kept under acceptable margins. With an effective and accommodating unconventional monetary policy, Tunisia has been able to use both monetary and fiscal policies to appropriately dampen the effects of external nominal shocks on its domestic economy.

Table 7 above indicates that Saudi interest rates granger cause Jordan's GDP at the one percent level of significance. There is no

¹⁴ At a lag length of 4, which is widely used in the empirical literature for quarterly data, the SVAR model satisfies the stability condition and all the variables turned out to exhibit stationarity.

¹⁵ Convergence criterion of the maximum likelihood maximization/estimation was set to be less than or equal to 10^{-6} . Moreover, the gradient vector of the underlying estimated system approached zero at convergence values. It is therefore safe to assume that our estimates are optimal and, thus, empirical results such as impulse response functions and confidence intervals are reliable.

¹⁶ Impulse response functions charts are available from authors and have not been included for the sake of space.

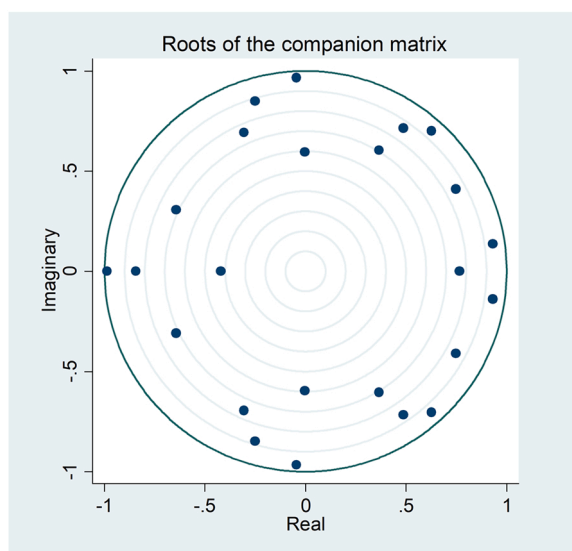


Fig. 1. Structural VAR Stability Condition, 2002–2020, Notes: All eigenvalues lie inside the unit circle pointing to stability of the SVAR model. Source: Authors' Estimates.

Table 6
Granger Causality Wald Tests: Tunisia.

Equation		chi2	Probability
IRSA	IR	19.54 **	0.000
IRSA	Money	20.26 **	0.000
IRSA	Inflation	19.87 **	0.006
IRSA	GDP	14.32 **	0.002
IRSA	OIL	5.34	0.070
IRSA	EX	12.43 **	0.000
IRSA	GDPSA	11.76 *	0.010
IRSA	ALL	110.8	0.000
Equation		chi2	Probability
GDPSA	IR	6.99	0.072
GDPSA	Money	9.71 **	0.003
GDPSA	Inflation	2.57 **	0.001
GDPSA	GDP	13.33 **	0.002
GDPSA	IRSA	2.66	0.302
GDPSA	OIL	7.67	0.06
GDPSA	EX	21.34 **	0.000
GDPSA	ALL	102.74	0.000

Notes: A * and ** Corresponds to significance level at 5% and 1% respectively.

Source: Authors' Estimates.

impact of Saudi's interest rate changes on Jordan's interest rates or the money supply. This is because Jordan's conventional monetary policy has been ineffective in the presence of fixed exchange rates and capital mobility. Jordan was not able to effectively use conventional monetary policy to circumvent the effects of exogenous shocks on its domestic economy. Moreover, limited fiscal space has also rendered fiscal policy ineffective in circumventing endogenous or exogenous financial shocks. Jordan has secured financial assistance from the IMF and the European Union in order to manage its deteriorating macroeconomic fundamentals. Jordan will soon lose the ability to access financial markets in order to bridge its financing gaps and secure its strategic imports. It is clear drastic fiscal and unconventional monetary adjustment measures are timely needed so that Jordan does not default on its debt and experience a balance of payment and exchange rate crises similar to Lebanon's current debt and financial crises. More recently in 2021, and under the IMF and EU's financial assistance programs, and in an attempt to lower long term interest rates, unconventional monetary policy tools such as forward guidance has also been used. These attempts were also coupled with other efforts devoted to flatten the yield curve by lowering long-term rates in order to boost aggregate demand, despite several downgrades of sovereign debt ratings.

Moreover, Saudi Arabia's GDP affects significantly Jordan's inflation rates and GDP. With the exception of the exchange rate, it is thus clear that Saudi Arabia's business cycles have an impact on Jordan's macroeconomic fundamentals, mainly GDP and inflation with no significant monetary policy response to those shocks. Conventional monetary policy remains impotent in dealing with exogenous and endogenous shocks impinging Jordan's economy. Prices and inflation have been the only nominal variables responding

Table 7
Granger Causality Wald Tests: Jordan.

Equation		chi2	Probability
IRSA	IR	18.67	0.876
IRSA	Money	0.26	0.966
IRSA	Inflation	7.56	0.080
IRSA	GDP	12.38**	0.002
IRSA	OIL	42.35**	0.000
IRSA	EX	1.67	0.765
IRSA	GDPSA	12.23**	0.002
IRSA	ALL	106.09	0.000
Equation		chi2	Probability
GDPSA	IR	3.55	0.054
GDPSA	Money	8.56	0.009
GDPSA	Inflation	21.66**	0.002
GDPSA	GDP	13.22**	0.002
GDPSA	IRSA	20.77**	0.001
GDPSA	OIL	5.43	0.027
GDPSA	EX	4.32	0.321
GDPSA	ALL	102.77	0.000

Notes: A * and ** Corresponds to significance level at 5% and 1% respectively.
Source: Authors' Estimates.

Table 8
Granger Causality Wald Tests: Egypt.

Equation		chi2	Probability
IRSA	IR	18.67**	0.000
IRSA	Money	10.13**	0.006
IRSA	Inflation	7.56**	0.006
IRSA	GDP	15.38**	0.002
IRSA	OIL	39.35**	0.000
IRSA	EX	18.98**	0.000
IRSA	GDPSA	13.33*	0.012
IRSA	ALL	108.19	0.001
Equation		chi2	Probability
GDPSA	IR	6.99	0.072
GDPSA	Money	10.71*	0.013
GDPSA	Inflation	2.57**	0.003
GDPSA	GDP	15.38**	0.002
GDPSA	IRSA	3.65	0.302
GDPSA	OIL	17.67**	0.001
GDPSA	EX	23.27**	0.001
GDPSA	ALL	102.74	0.000

Notes: A * and ** Corresponds to significance level at 5% and 1% respectively.
Source: Authors' Estimates.

significantly to those shocks.

Table 8 below indicates that Saudi interest rates are found to granger cause Egypt's interest rates, money supply, inflation, exchange rate, and GDP at the one percent level of significance. Egypt has successfully moved to a flexible exchange rate system through a comprehensive IMF financing program after the currency crisis of 2014. As a result, Egypt's monetary policy variables such as interest rates and money supply are effectively responding to external nominal monetary shocks. Egypt is now able to effectively use monetary policy in tandem with fiscal policy to tackle endogenous and exogenous macroeconomic/monetary imbalances. An effective conventional monetary policy has recently produced an appreciation of Egypt's pound against the US dollar and the containment of the interest rate differentials with Saudi Arabia, reducing thus the pressure on the outflow of capital. Other unconventional monetary policy tools such as forward guidance have also been used to further reduce long term interest rates. Those efforts are expected to flatten the yield curve even further in the medium run. Moreover, the effective use of both monetary and fiscal policies has also produced positive real GDP growth rates in 2020 despite the Covid-19 pandemic and its devastating impact on real GDP growth of the more advanced economies. Finally, Saudi Arabia's GDP affects significantly Egypt's inflation and exchange rates, money supply, and GDP.

Table 9 below indicates that while changes in Saudi interest rates are found not to granger cause Lebanon's interest rates and money supply, they have a significant impact on inflation rates and GDP at the one percent level of significance. Since the early 1990s Lebanon has had a fixed exchange rate system in place which has rendered conventional monetary policy ineffective in dealing with endogenous or exogenous economic and financial shocks. The result has been a currency and debt crises coupled with a sudden stop in the inflow of capital. Today the central bank's monetary policy has been downgraded to the management of the foreign exchange

Table 9
Granger Causality Wald Tests: Lebanon.

Equation		chi2	Probability
IRSA	IR	1.67	0.850
IRSA	Money	0.33	0.944
IRSA	Inflation	7.56**	0.006
IRSA	GDP	12.38**	0.001
IRSA	OIL	27.12**	0.000
IRSA	EX	22.55	0.986
IRSA	GDPSA	10.86*	0.012
IRSA	ALL	109.19	0.000
Equation		chi2	Probability
GDPSA	IR	5.11	0.068
GDPSA	Money	1.63	0.019
GDPSA	Inflation	11.54**	0.001
GDPSA	GDP	22.76**	0.002
GDPSA	IRSA	2.86	0.302
GDPSA	OIL	19.13**	0.001
GDPSA	EX	3.45	0.451
GDPSA	ALL	103.74	0.000

Notes: A * and ** Corresponds to significance level at 5% and 1% respectively.

Source: Authors' Estimates.

account in order to secure basic fuel imports with no ability to tackle any type of macroeconomic and financial imbalances. During the financial and debt crises, Lebanon's central bank used some unconventional monetary policy tools to manage the crisis such as quantitative easing through massive printing of money in local currency without resorting to the purchase of commercial banks' impaired assets. While the unconventional quantitative easing policy resulted in triple digit inflation hikes and to the further depreciation of the local currency, it succeeded in reducing short term and long term interest rates by more than 8%.

At this point, an IMF financing program would secure a plausible solution to the current crisis moving Lebanon's economy to a market determined exchange rate which would subsequently render both conventional and unconventional monetary policy effective macroeconomic stabilization tools. Moreover, Saudi Arabia's GDP affects significantly Lebanon's inflation rates and GDP but not the exchange rate. In the presence of a fixed exchange rate regime, inflation rates have continued to absorb negative endogenous shocks and exogenous shocks emanating from regional business cycles and oil price hikes.

Given Saudi Arabia's factor endowments, advanced technology and sophisticated manufacturing sector, regional capital and foreign direct investment flows have been diverted away from MENA countries and into Saudi Arabia. This has induced MENA countries to constantly increase domestic interest rates and money supply to finance their budget and current account deficits, service a significant debt, meet domestic money demand and prevent real interest rates from increasing further. Such significant increases in interest rates have had devastating consequences on debt service and subsequently on past accumulated public debt, in the absence of appropriate central bank monetary intervention, especially in Lebanon and Jordan.¹⁷ As capital has been diverted away from MENA countries and into Saudi Arabia, MENA countries have been experiencing, higher inflation rates, losses in competitiveness, trade and current account deficits, recession, and fiscal imbalances. In short, one can safely assume that Saudi nominal shocks appear to have a significant impact on MENA's macroeconomic fundamentals. The Granger causality results have reinforced the impulse response analysis above.

5. Conclusion and policy recommendations

Using a structural VAR time series model, this paper explored the dynamic effects of external and internal financial and macroeconomic shocks on selected highly indebted MENA countries. After recovering structural shocks using short-run theory derived restrictions, impulse response functions and Granger causality tests were constructed and estimated. It was shown that shocks to Saudi Arabia's GDP and interest rate, as well as oil prices affect MENA's inflation rate significantly, i.e.; MENA's inflation rates respond significantly to shocks originating in Saudi Arabia. Likewise, while Tunisia and Egypt's interest rates respond positively to shocks in Saudi interest rates, Jordan and Lebanon's money supply and interest rates were found not to react to changes in Saudi Arabia's interest rates. Moreover, Saudi business cycles affects significantly MENA's inflation rates, money supply, and GDP. In short, one can safely assume that Saudi nominal shocks appear to have a significant impact on MENA's macroeconomic fundamentals.

Our empirical results suggest that the weaknesses in MENA countries macroeconomic fundamentals emanate from external economic shocks and from balance of payment and domestic fiscal imbalances, high debt levels and limited fiscal space, and the lack of nominal adjustment measures through conventional monetary policy due to the presence of fixed exchange rates in Jordan and Lebanon. In the absence of nominal adjustment mechanisms, some MENA countries have recently resorted to unconventional monetary policy and tools and will probably have to go through prolonged inflationary and exchange rate depreciation episodes. Since Jordan has a fixed exchange rate regime, a potential devaluation of its domestic currency is not a policy option in order to restore

¹⁷ See Krugman, and (2013, 2015).

macroeconomic equilibrium following a balance of payment crisis and inflation rates will continue to absorb external shocks. Lebanon, however, has been recently forced to float its exchange rate and to default on its external debt. The crisis translated into a significant reduction in income and GDP.

MENA central banks will have to rely more on non-conventional monetary policy tools in order to better adapt to the repercussions of the Covid19 pandemic and the various shocks that are impacting the region. Financial stability should become one of the main and more important goals of monetary policy. Moreover, the development of the domestic bond market should be made a priority to tackle the existing public debt issues and ensure new sources of funds to bridge MENA's financing gaps. MENA's newly introduced austerity measures will fail to reduce debt and will continue to have a negative impact on economic growth, causing further downgrades of Jordan and Tunisia's economies with further hikes in interest rates. Austerity measures are creating a trap whereby recessionary budgets, high interest rates and high levels of debt are reinforcing each other. Tunisia and Egypt will need to further improve private sector's expectations through adequate forward guidance and encourage commercial banks to give out more loans. Both countries also need to become more competitive in order to turn their current account deficits into surpluses, and subsequently use these surpluses to trim down public debt and regain investor's confidence and revert the flow of capital to the advantage of their domestic economies. Once the above is achieved, further austerity and structural adjustment measures may be introduced to consolidate fiscal spending and tax collection. This will insure sustainable economic growth and will reduce the likelihood of a future debt and currency crises from occurring.

Over the past few years, increased financial support from multilateral donors (IMF, EU and World Bank) has remained weak making it more difficult for Jordan and Tunisia to continue managing their debt. Such assistance whenever possible will help both countries approach bilateral donors and would also help open the door to the international financial markets. In the absence of international funding, the servicing of the public debt would become rather costly owing to rising interest rate differentials and the depreciation of the domestic currency– which would further exacerbate the current macroeconomic imbalances.

Lebanon shares similar macroeconomic fundamentals with Jordan (e.g., fixed exchange rates, a huge number of Syrian refugees in the order of 1.5 million, and a huge accumulated public debt). However, Lebanon did not yet benefit from financing from international donors. Lebanon's current economic situation (currency, debt and banking crises) is exactly what could have happened in Jordan if the IMF and EU funding programs were not introduced back in 2015. Short of an IMF program, the debt situation would not have been manageable and Jordan would have already defaulted on its public debt.

Unlike other recent financial and debt crises in both emerging and mature economies, Lebanon's accumulation of the interrelated political, social, and economic crises can best be described as a perfect storm scenario rooted in Lebanon's past failed economic policies and a corrupt political class. The consequences of these crises individually, and even more so combined, for Lebanon and all stakeholders involved (people, government, universities, civil society, private sector, NGOs, etc.) could be devastating unless urgent policy action are implemented. It is critical that Lebanon begins under an IMF umbrella a process of significant fiscal and monetary consolidation and structural reforms to curb corruption, restructure public debt, restructure and capitalize the banking system, and increase economic growth (Neaime, 2015b). Structural fiscal, monetary, and social adjustment and reform measures are the only path out of Lebanon's current situation. One way to curb hyperinflation and currency depreciation could be the establishment of a currency board in the short run after the US\$ 60 billion losses at the central bank are acknowledged and evenly redistributed amongst the government, commercial banks, and depositors, and after the central bank's balance sheet is published and audited. The currency board would impose fiscal discipline and cut off the central bank's funding of government expenditures through money printing. Currency boards have proven to be effective in crises situations. Some past examples are as follows. Hong Kong in 1983 introduced a currency board to combat exchange rate devaluation and succeeded in curbing the huge depreciation of the local currency. Similarly, Estonia in June 1992 and Lithuania in 1994 adopted a currency board and were successful in combatting hyperinflation and exchange rate depreciation. In 1997, Bulgaria experienced hyperinflation and a banking crisis. With the currency board installed, hyperinflation was brought under control. By 1998, the banking system was solvent, money- market interest rates had plunged from triple digits to below 3%, a massive fiscal deficit turned into a surplus, a deep depression turned into positive economic growth, and Bulgaria's foreign-exchange reserves more than tripled.

It should be noted, finally, that Lebanon's debt crisis is the result not only of economic deficits but also of political and institutional deficits, which have been developing over the last few decades. Lebanon needs to reform the electoral process to revamp its political class, adjust public sector wages and pension plans to public sector productivity and eliminate institutionalized corruption. It is well known that Lebanon's government has forced commercial banks to purchase its debts. Investors who lost confidence in the ability of the government to repay its debt, unloaded those bonds, causing their prices to plummet. Lebanese banks that held this debt then faced a big hole on the asset side of their balance sheets, with a huge decline in their net worth. With less capital, these institutions have fewer resources to lend and lending declined. The situation became even worse when the decline in bank capital led to a bank panic. The result of severe fiscal imbalances is therefore a weakening of the banking system, which is leading to a worsening of adverse selection and moral hazard problems.

MENA's Financial liberalization should be implemented gradually because there is a need to ensure that proper institutional infrastructures such as strong prudential regulations and supervision are put in place in order to avoid any potential future financial crises. Unfortunately, these infrastructures were not in place when liberalization occurred in Egypt and Tunisia. Moreover, since implementing these reforms takes time, financial liberalization may have to be phased in gradually, with some restrictions on credit issuance imposed along the way.

Financial liberalization and globalization in themselves would not lead to financial crises in MENA economies. Rather, it is the mismanagement of these two processes that might lead to financial crises. Because of financial liberalization and globalization, restrictions of financial institutions and capital flows across MENA countries were eliminated. However, emerging MENA economies lack

the institutions that can supervise and manage these two processes effectively, especially in terms of screening and monitoring borrowers. Therefore, the two processes have led to a lending boom, and most funds were channeled towards high-risk projects. The lending boom ultimately ends in a lending crash resulting in heavy losses and weakening of banks' balance sheets. Another factor that would explain why the two processes might lead to financial crises is that in MENA economies, the existence of powerful business interests prevents the supervisory institutions from performing their job properly and weakens the regulations that restrict their banks from engaging in high-risk/high-payoff strategies.

Author statement

Thank you for your email of February 2, 2022 and the Referees' report on our manuscript (RIBAF-D-21-00626) entitled: "Macroeconomic and Monetary Policy Responses in Selected Highly Indebted MENA Countries Post Covid 19: A Structural VAR Approach," submitted on November 11, 2021 for possible publication in a regular issue of the Research in International Business and Finance.

Please find attached the revised version of the paper with revisions highlighted in red. In this version, we have taken complete account of all the comments made by yourself and the Referees. I would like to thank you and the Referees for very insightful comments, which have substantially improved the quality of this paper.

I believe the paper is substantially improved. I, therefore, hope you will now find the manuscript, in its revised version, suitable for publication in the RIBAF.

I look forward to hearing from you.

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