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Vulnerability of Southern Mediterranean Countries to Exogenous Shocks: Structural VAR Approach

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Abstract

All statistics and empirical studies relating to the Mediterranean region show the irregular fluctuation of the main macroeconomic aggregates. It is appear that the vulnerability of these countries is largely the result of different range of shocks. Regarding their economic structures, the prospects of growth for Southern Mediterranean countries are largely driven by changes in their external environment. Among the external shocks affecting these countries, we include oil price shocks, terms of trade, the trend of global growth, turmoil in the international financial system, and the crises of international policies (2nd and 3rd war Gulf, event of September 11 ...) and obviously the current global financial crisis.

The interest of this work is to determine the various domestic and external shocks affecting the level of economic activity and prices and to identify, later, the main exogenous sources of economic fluctuations in the Southern Mediterranean countries. The sources of fluctuations are determined using a Structural VAR model.

Introduction

Developing countries are characterized by high volatility of economic performance mainly due to fluctuations whose origins are not well identified. Several studies have addressed the issue of economic fluctuations in the Mediterranean region because of the disappointment caused by their slow growth and the considerable variation in economic activity. These studies show the preponderance of the secular nature and erratic economic growth mainly due to the uneven development of key macroeconomic aggregates, particularly the growth rate. This irregularity results from the exposure of these countries to exogenous shocks.

Because of their economic structures, Mediterranean countries are open to the rest of the world and their growth paths are dependent on both the turbulent changes of international environment and various external shocks. The economic fluctuations of these countries have recently been shaken by violent turbulence shocks including oil price shocks and cons, changing terms of trade, the trend of global growth, the turbulent international financial system, the crises of political international and obviously the current financial crisis.

In the light of these findings, the identification of the nature of economic fluctuations is an important factor in macroeconomic management in these countries and constitutes an important step to minimize costs incurred by macroeconomic instability. To identify the relative importance of each type of shock, empirical studies literature use structural VAR models or stochastic general equilibrium models.

Recently a number of research purposes to analyze economic fluctuations in developing countries. Pindyck [1991], Aizenman and Marion [1993] have developed a theoretical framework to suggest that macroeconomic volatility has a negative effect in terms of economic growth. Ramey and Ramey [1995] found that developing countries have low growth rates because they suffer from a highly volatile environment.

Other authors support the idea that economic instability is linked to external shocks such as fluctuations in terms of trade, international economic conditions and natural disasters. Mendoza [1995] showed that external shocks, especially terms of trade shocks, explained 56% of the variability of GDP and the real exchange rate. However, Hausman and Gavin [1995] found that external shocks explain only a negligible proportion

of domestic GDP fluctuations and real exchange rate.

Roldos and Hoffmaister [1996] evaluated the contribution of domestic (supply and demand) and external shocks (oil shocks, changes in the global economy and structural reforms) in economic fluctuations of two developing countries Korea and Brazil. They identified two constraints; the first reflects the assumption of a small open economy so that domestic shocks do not affect the economies of the world. The second constraint is used to identify supply shocks and demand as the latter does not affect production in the long term. The results show the dominance of supply shocks in explaining output fluctuations, even in the short run. However, external shocks explain only 20% of economic fluctuations, which contradicts previous conclusions which attributed to the international environment an important weight in explaining economic fluctuations. Finally, nominal shocks and fiscal impulses are dominant in the explanation of inflation and exchange rates.

Roldos and Hoffmaister [1997] conducted empirical studies using VAR model to determine the source of macroeconomic fluctuations in developing countries. Their analysis focuses on the external shocks (terms of trade, the world interest rate) and domestic (supply or demand shocks). The results show that domestic shocks are the source of macroeconomic fluctuations in developing countries. The terms of trade and world interest rate account for 7% and 6% variations in production in Asia.

Hoffmaister, Roldos and Wickham [1998] compared the sources of macroeconomic fluctuations in African Franc Zone countries and other sub-Saharan countries. The results show that internal shocks are more dominant in explaining economic fluctuations. However, external shocks (terms of trade, foreign demand and international interest rate) are relatively low. The contribution of terms of trade dominates the role of external shocks and it appears to have a great influence (15%), while that of the world interest rate is 6%.

Kose and Riezman [2001] identified the role of external shocks in macroeconomic fluctuations in Africa using a multi-sector dynamic stochastic general equilibrium model that reproduces the main stylized facts of 22 African countries during the period 1970-1992. The economy is facing technological, trade and financial shocks. Technological shocks are represented by the total productivity factor in each activity sector, trade shocks correspond to the relative prices of capital goods and intermediate goods imported from the exported raw materials prices, while financial shocks are associated with world interest rates. The results show that 44% of economic fluctuations in are due to the trade shocks, 80% of the fluctuations of investment and labor supply are induced by external shocks as well. Thus, the importance of interest rates is significant only in cases where highly indebted countries were considered.

Arreaza and Dorta [2004] assessed changes in economic activities in Venezuela on the basis of quarterly data. They conclude that domestic shocks caused by supply shocks explain about 70% of the volatility of non-oil GDP. They found that nominal shocks contribute about 50% of the variability of inflation. These results are consistent with those proposed by Hoffmaister, Roldos ([1997], [2001]) and Ahmed [2003] for the countries of Latin America.

The interest of our paper is to determine the various domestic and external shocks affecting economic activities and to identify later the main exogenous sources of economic fluctuations in the Mediterranean region. The purpose of this paper is to present a framework for empirical analysis that will address the following questions:

What are the effects of exogenous shocks on economic fluctuations in the Mediterranean area?

What is the contribution of domestic and external shocks in the variability of real activity in the South Mediterranean area?

Do the countries of the Mediterranean area exhibit the same sensitivity to sources of external shocks?

Choice of variables

Two types of shocks are considered, domestic and external ones. The domestic shocks are measured by the industrial production index; this variable reflects changes in productivity with an innovation called "supply shock". The index of consumer prices, this indicator is an important predictor of production. We choose also the real exchange rate. The choice of this variable determines the transmission between the monetary sphere and the real economy. Indeed, we want to know how a shock on the real exchange rate affects the domestic GDP.

As far as external shocks are concerned, they are the terms of trade. Changes in the terms of trade are a major external shock to developing countries, because they affect the gains a country obtains or the losses it undergoes in international trade. These terms of trade were taken into account in several empirical studies, looking for sources of economic fluctuations in developing countries because they

are an essential part of mechanism for adjusting the balance of payments. The oil price is an external variable that is largely the decision of OPEC, and causes changes in GDP as well as the foreign terms of trade. The high oil prices affect the economy through four channels. The first is the transfer of income is the importing countries to oil exporting countries. The second channel is the increase in crude oil prices resulting in higher relative prices of goods and services. The third channel is that the price of oil can have a magnified impact on the price level and inflation. The last channel is the financial market. It is influenced directly and indirectly by increasing the price of oil. The current and anticipated changes in economic activity, inflation and monetary policy, which are due to increased oil prices affect the price of shares and bonds on the market and exchange rates.

Structural VAR model for Southern Mediterranean Countries

Before estimating VAR model, we must first determine the order of integration of series and the possible presence of co-integration relationships, that is to say, the long-term relationships between variables.

We use quarterly data covering the period 1980:1-2008: 4. All variables are expressed in logarithm. The statistical tests for stationary level variables for all countries are reported in Table (1), Augmented Dicky Fuller test *(ADF)* and Phillips-Perron *(PP)* test accept the presence of a unit root in the five series expressed in level. The statistical tests of stationary for the variables in first differences are reported in Table (2). The *(ADF)* and *(PP)* tests reject the null hypothesis of unit root at 5% for all variables. Thus, all variables are stationary in first difference.

To test the possible existence of cointegration relationship between variables, we rely on cointegration test implemented by Johansen [1991] and Johansen and Jesulius [1990]. To determine the number of cointegration vectors r, Johansen proposes two statistics: the trace test and the test of the Eigen value. Both tests are likelihood ratio tests; however, the test trace is used more than the Eigen value. We adopt the trace test in the development of our cointegration tests.

The results of cointegration tests are reported in Table (3). We can reject the null hypothesis of no cointegration at the statistical threshold of 5% for all countries. However, we accept the null hypothesis that there are at most two cointegration relationships between the five variables for all countries. However, the estimated Vector Error Correction model leads us to reject modelling a VECM. Indeed, despite the fact that the error correction terms are negative, their values are not significant. Moreover, the rejection of the VECM model is justified by the fact that modelling as SVAR is not yet applicable to the model to Vector Error Correction. Ultimately, different tests, make us conclude for reject of the stationary and cointegration of the five-level series in all countries, leading thus to adopt a specification in first difference.

We chose the identification of Blanchard and Quah [1989] which introduced restrictions on long-term impact. Economic theory offers a view concerning the persistence of shocks affecting an economic system. In particular, the neoclassical approach distinguished between supply shocks and demand shocks in terms of their degree of persistence: the supply shocks drive the dynamics of long-term, while demand shocks have an effect in the short term. In this logic, it is necessary to impose the zero long-term effect of shock. Such restrictions are particularly relevant in view of the business cycle analysis.

The determination of five shocks is through the vector of variable X_t: A supply shock ($\xi_{\Delta PIBR_t}$ domestic real GDP), a real demand shock ($\xi_{\Delta REER_t}$ shock of the real effective exchange rate), a nominal demand shock ($\xi_{\Delta DEFPIB_t}$ shock of GDP deflator), terms of trade shock($\xi_{\Delta TE_t}$ shock of terms of trade), and an oil price shock ($\xi_{\Delta PP_t}$, shock of oil prices).

$$\begin{pmatrix} \Delta PIBR_t \\ \Delta REER_t \\ \Delta DEFPIB_t \\ \Delta TE_t \\ \Delta PP_t \end{pmatrix} = D(L) \begin{pmatrix} \xi_{\Delta PIBR_t} \\ \xi_{\Delta REER_t} \\ \xi_{\Delta DEFPIB_t} \\ \xi_{\Delta TE_t} \\ \xi_{\Delta PP_t} \end{pmatrix}$$

The identification of these structural shocks required by Blanchard and Quah impose long term constraints. These long-term constraints are usually presented through the matrix denoted $D(1)$. For the system of selected variables, we identify the various shocks from the matrix $D(1)$ as follows:

$$D(1)=\begin{pmatrix} d_{11}(1) & d_{12}(1) & d_{13}(1) & d_{14}(1) & d_{15}(1) \\ d_{21}(1) & d_{22}(1) & d_{23}(1) & d_{24}(1) & d_{25}(1) \\ d_{31}(1) & d_{32}(1) & d_{33}(1) & d_{34}(1) & d_{35}(1) \\ d_{41}(1) & d_{42}(1) & d_{43}(1) & d_{44}(1) & d_{45}(1) \\ d_{51}(1) & d_{52}(1) & d_{53}(1) & d_{44}(1) & d_{55}(1) \end{pmatrix}$$

The identification of shocks in a 5 variables VAR system requires $\frac{n(n-1)}{2}$ constraints, where n = 5 and the model requires 10 constraints.

- External shocks do not affect domestic variables. It thus follows from the assumption of a small open economy: $d_{14}=d_{15}=d_{24}=d_{25}=d_{34}=d_{35}=0$.
- Economic theory, especially the RBC model, shows that only supply shocks can affect real economic activities in the long term. This results in two additional long-term constraints. The demand shocks generated by the real exchange rate and the GDP deflator can affect the level of economic activity $d_{12}=d_{13}=0$.
- An oil shock is identified as the only shock that can affect long-term price of oil. Hence $d_{45}=0$.
- The last constraint $d_{23}=0$ allows to distinguish between demand shocks: a shock to real demand (generally regarded as a fiscal shock or an adjustment of exchange rates) and a nominal shock (specifically a monetary shock) not affecting the level of rates real exchange long term.

Thus our matrix examining the effects of structural shocks on the variables of the model is as follows:

$$D(1)=\begin{pmatrix} d_{11}(1) & 0 & 0 & 0 & 0 \\ d_{21}(1) & d_{22}(1) & 0 & 0 & 0 \\ d_{31}(1) & d_{32}(1) & d_{33}(1) & 0 & 0 \\ d_{41}(1) & d_{42}(1) & d_{43}(1) & d_{44}(1) & 0 \\ d_{51}(1) & d_{52}(1) & d_{53}(1) & d_{44}(1) & d_{55}(1) \end{pmatrix}$$

Sources of Economic Fluctuations in the Southern Mediterranean Countries

The variance decomposition of real GDP gives the proportions of error forecast attributable to the impact on real GDP itself and other variables allowing assessing the relative importance of different types of shocks in explaining the variability of economic activities.

Source of Fluctuations of GDP Growth

Table 4 shows the contribution of each shock to economic growth through the variance decomposition of error forecast. We note the dominance of supply shocks in explaining the dynamics of the growth rate for all countries. Indeed, short term or long term impact has accounted for between 96% and 54% for Tunisia, 93% and 74% for Morocco, 87% and 76% for Egypt and 90% and 55% for Jordan of the variability of economic activities. This result is consistent with the findings of the real business cycle model.

As for the demand shocks (real or nominal), the variance decomposition of error forecast of real GDP reveals a contribution that does not exceed a threshold of 15% in the explanation of rate variability of economic growth even in the long term for all countries except Jordan, where it exceeds the threshold of 29% in the long term. This confirms our theoretical assumptions stating that demand shocks have no permanent effect on the GDP fluctuations.

The variance decomposition of error forecast of economic growth has a substantial effect on external shocks in both short term and long term. These external shocks contribute about 33%, 11%, 7% and 13% to fluctuations in real GDP in the long term respectively for Tunisia, Morocco, Egypt and Jordan,. In the case of Tunisia, the contribution of terms of trade is greater than 20% compared to that of the oil shock which is 13%. The contribution of terms of trade is more important than the oil shock for all countries

The domestic shocks explain respectively 67%, 89%, 85% and 86% of fluctuations in economic activity for Tunisia, Morocco, Egypt and Jordan with a predominance of supply shocks. It is now time to clarify the nature of the effects of shocks on the rate of economic growth.

The nature of the effects of the five structural shocks on real GDP is given by the functions of reactions to shocks. These are shown in Annex (1). The results of the reaction function of real GDP to shocks coincide largely with those of the decomposition of the variance. It appears from this graph that for all countries there is a positive, significant and very substantial impact of the supply shock on the rate of economic growth regardless of horizon. The supply shock maintains a

cumulative and very persistent effect on GDP. Indeed, as predicted by the new economic theory for the analysis of cyclical fluctuations, a positive monetary supply shock leads to an improved level of activity, and despite a slight decline in this positive effect, improving the situation remains fairly sustainable in the long term.

As far as monetary shocks, fiscal and exchange rate adjustment are concerned, we note a limited effect on the level of economic activity. It is insignificant and is close to 0 for any horizon chosen. The meaning is not apparent to the real demand shocks. In addition, the cumulative effect is minimal and not permanent. The response functions to shocks thus confirm the results of variance decomposition and show the transient contribution of demand shocks, both real and nominal exchange rate to economic growth. A

Finally the response functions of real GDP to external shocks can conclude that a negative effect of oil prices for all countries. This degradation can be explained by the current rise in oil prices. These functions show that improved terms of trade implies a positive effect on the rate of growth of domestic economic activity. An increase in the external shock (oil price shock and the exchange term) of 1% leads to a cumulative increase of domestic real GDP slight and insignificant. The reaction of GDP to shocks to the terms of trade is more significant in case of impact favourably.

To summarize, the decomposition of the variance and response functions of real GDP agree on the dominant effect and persistent supply shocks on the level of economic activity. The impact of external shocks is significant and increases economic activity. Finally, the contribution of pulses of economic policy is not significant.

Source of Fluctuations of Real Exchange Rate

Table 5 shows the variance decomposition of real exchange rate. We note for all countries a predominance of domestic shocks in explaining fluctuations in the real exchange rate, this particular real demand shocks studied in this model as well as fiscal shocks by adjustment of exchange rates. They account for respectively 61%, 85%, 75% and 73% for Tunisia, Morocco, Egypt and Jordan's fluctuations of real exchange rate in the long term. In theory a real demand shock, resulting from a worsening budget deficit, cause an appreciation of real exchange rate and a deteriorating of external position. Our empirical results are consistent with this theoretical concept. Thus it is clear that the fiscal shock affects the real value of domestic currency through its impact on the level of non-tradable prices.

On other domestic shocks, our estimates show that their contribution to the fluctuations of real exchange rate is very limited. The share of exchange rate variability due to supply shocks does not exceed, respectively, 11%, 3%, 13% and 10% for Tunisia, Morocco, Egypt and Jordan and that of nominal demand shocks is respectively 3%, 2.89%, 4.66% and 3.41. The insignificant contribution to the fluctuations of real exchange rate is due to the exogeneity of exchange rates in these countries. In addition, there is a low correlation with the exchange rate of money supply and inflation hence the very limited supply of the monetary stimulus to the variability of real exchange rates. For supply shocks, the negligible contribution is primarily due to the limited impact of GDP on the level of prices in these countries. Secondly, it is due to a weak correlation between changes in GDP and the exchange rate. The evolution of the nominal exchange rate is not affected by the irregularity of the rate of economic growth but by the politics of exchange rates. The insignificant effect of GDP on the exchange rate and inflation rate reflects the limited impact of supply shocks on the real exchange rate.

Finally, regarding the contribution of external shocks to fluctuations in the real exchange rate, the contribution is limited for all countries except the Tunisian case where the contribution is about 25% of the variability of exchange rates in long term. These shocks explain respectively 10%, 8% and 13% for Morocco, Egypt and Jordan. It should be noted that the limited contribution of changes in the terms of trade (18.84%, 6.39% and 4.22% respectively 10% for Tunisia, Morocco, Egypt and Jordan) on the real exchange rate is mainly explained by domestic pricing policies. The authorities intervene through fiscal and monetary impulses to counter any external pressure on the price level. This is particularly true if adverse terms of trade caused by higher prices of imported essential commodities (oil, cereals). In addition, changes in the terms of trade are not followed by adjustments of exchange rates. This leads first to a minor effect of terms of trade on the price level and the value of the currency of these countries and then the real exchange rate. In addition, the increase in oil prices contributes to the appreciation of the exchange rate in the short term and its depreciation in the long term. The recovery of the external position is possible through improving the terms of trade with the acquisition of new market shares.

Indeed, whatever the horizon features' responses to shocks (Annex 2) agree on the assessment of the real exchange rate following a real demand shock resulting from an overvalued domestic currency or increasing budget deficit. In contrast, the domestic currency devaluations combined with fiscal

restraint result in a depreciation of the real exchange rate that is verified for all countries. Finally, the variance decomposition and functions of responses to shocks show that fluctuations in the real exchange rate are mainly due to real demand shocks and external ones.

Sources of Fluctuations of Inflation

Table 6 describes the decomposition of the variance of the forecast error of inflation. It shows a very substantial contribution of economic policy impulses to the explanation of fluctuations in the level of prices. The contribution of changes in inflation is greater for nominal demand shocks; it is of the order, respectively 30%, 40%, 45% and 39% for Tunisia, Morocco, Egypt and Jordan. This predominance of nominal shocks remains short and long term. These nominal shocks primarily reflect changes in money and highlight the close correlation between the level of prices and monetary aggregates. The estimates show for nominal demand shock, that an increase of money supply, results in an increase in the price level. Moreover, in addition to the predominance of nominal demand shocks, the variance decomposition reveals a significant contribution of the fiscal stimulus to the variability of inflation.

Here we find a result consistent with the teachings of economic theory, confirming that increasing the money supply results in inflationary pressures, especially if it is not accompanied by improvements in the level of economic activity. But for all the countries studied estimates show a low uptake of supply shock fluctuations in the price level.

Considering the importance of the openness of all countries, it is interesting to highlight the impact of external shocks on the price level. Through the decomposition of the variance of the error forecast, we find a contribution that varies between 10% and 18% for all countries with a long-term horizon. It comes from both terms of trade and the oil shock. We note that the oil shock is accompanied by an increase in the price level mainly in the long term. In the short term, the relative contribution of the shock on the price of oil is almost null, whereas in the long run, it is around 2.5 to 5.5% for all countries. This increase amputated the purchasing power of households and lower consumption levels and growth. Rising oil prices in recent years due to the unstable geopolitical environment, the Gulf War and the conflict between Iran and the West seems to be sustainable and not cyclical. We should then expect a continuous rise in oil prices. Economic policies should take into account this new world order by setting more stringent energy policies.

Figure 3 of Annex 3 details the impact of various shocks on the change in the rate of inflation of all studied countries. According to the graph a positive impact of demand shocks on the nominal rate of inflation often reflects changes in money and highlights the close correlation between the level of prices and monetary aggregates. The graph shows that a nominal demand shock results in an increase in the general level of prices. Indeed, despite falling levels of specula prices in the short term, the price increase is sustained over the long term for all countries.

However, the nature of the impact of external shocks is not clear. The reaction functions indicate that identified shocks change the terms of trade in the direction of improving results by an increase in the price level. They also argue that increasing the price of oil is followed by a decline in prices, the result difficult to argue (price puzzle).

Moreover, the impulsion functions reveal the importance of the contribution of supply shocks in the variation in price level, their impacts are positive in the long term. Indeed, the short-term shocks cause a fall in prices, but specula grow eventually later over the long term. The effects of supply shocks are even more important than the impact of actual application. Finally, we note from our various empirical results a predominance of domestic shocks, especially the pulse of economic policy, in explaining fluctuations in the rate of inflation.

Source of Fluctuations of Terms of Trade

Table 7 shows the variance decomposition of terms of trade, we note for the entire country, a predominance of external shocks in explaining fluctuations of terms of trade, it is more specifically impact of terms of trade. They account for respectively 85%, 93%, 90% and 81% for Tunisia, Morocco, Egypt and Jordan fluctuations in the long term.

On the domestic shocks, our empirical results show that their contribution to fluctuations in the terms of trade is very limited. The part of the variability of terms of trade due to supply shocks in the long term do not exceed respectively 11%, 3%, 4% to 6% for Tunisia, Morocco, Egypt and Jordan , that demand shocks are nominal and real terms respectively, 12%, 17%, 16% and 19% with the contribution of nominal shocks are more important with the exception of Egypt.

Finally, regarding the contribution of external shocks to fluctuations in the terms of trade, it is important for all countries except the Tunisian case where the contribution is about 7% of the variability of terms of trade in the long term. These

shocks explain respectively 12%, 19% and 17% for Morocco, Egypt and Jordan.

Figure 4 of Annex 3 details the impact of various shocks on the change in the terms of trade for all countries studied. According to graph a negative impact of nominal demand shocks on the terms of trade. The figure shows that a positive shock to the terms of trade results in a lower overall level of prices. Indeed, the decline in prices is sustained over the long term for all countries.

Furthermore, response functions to shocks reveal the importance of the contribution of real demand shocks in the variation of terms of trade, their impacts are positive in the long term. Indeed, in the short term these shocks lead to a fall in terms of trade but they eventually grow over the long term. The effects of demand shocks are even more important than the impact of supply shocks.

Source of Fluctuations of Oil Prices

Table 8 shows the variance decomposition of the oil prices; we note for all countries, a predominance of external shocks in explaining fluctuations in the price of oil, they are particularly price oil shocks. They account for respectively 66%, 78%, 75% and 78% for Tunisia, Morocco, Egypt and Jordan fluctuations in oil prices in the long term. The terms of trade contributed respectively 19%, 3%, 5% and 10% in Tunisia, Morocco, Egypt and Jordan fluctuations in oil prices in the long term.

The first effect of fluctuating oil prices on the activity resulting from the transfer of purchasing power between importing and oil exporting countries. The magnitude of the loss of purchasing power in importing countries depends on the oil intensity of production and the elasticity of demand of oil. The impact on global demand depends on the part of additional revenues of oil exporters is spent. In general, these recipes are not fully recycled in the short term. Changes in the terms of trade have been very strong in the past, but these changes became more moderate in the current period.

On the domestic shocks, our empirical results show that their contribution to fluctuations in oil prices is limited. The proportion of the variability of oil prices is mainly due to supply shocks for Tunisia and Egypt, which does not exceed 11% in the long term. The real demand shocks and nominal does not exceed 9% including the impact of the real demand is higher. As for Morocco and Jordan variability in oil prices is mainly due to demand shocks, which is about respectively 16% and 7% long-term contribution of nominal shocks are more important.

Conclusion

In theory, the fluctuations are the result of the only real factors namely the agents' preferences, technological opportunities, endowments factor and possibly certain institutional constraints. For the Tunisian case, the growth rate is closely linked to TFP, which explains the predominance of the supply shock. In the case of Morocco, it is especially resource endowment, mainly rainfall, which can explain the fluctuations in the level of activity. Indeed, one can interpret the predominance of the supply shock in explaining fluctuations in economic activity in Morocco by the powerful effect of weather on the Moroccan economy. Despite the limited contribution of agriculture to overall GDP not exceeding 20%, GDP is strongly correlated with agricultural production, which is itself closely linked to rainfall. Agriculture is obeyed throughout the economy to its production cycle.

It should be noted that the impact of structural changes that have affected the economy of all countries studied since the early eighties is not negligible. In the context of economic liberalization and the establishment of a market economy, several measures aimed at stimulating the supply have been undertaken. The liberalization of prices, abolition of exchange controls, liberalization of foreign trade, financial market reforms, privatization transactions, reorganization operations, legal reform, the introduction of interbank foreign exchange market, the liberalization of interest rates should result in a possible improvement, qualitatively and quantitatively, at the level of economic activity.

For all countries, the small contribution of fiscal stimulus to growth reveals the failure of the administration of these countries in the management of public funds. Poor governance makes the impact of public spending on economic activity very limited. The absence of performance monitoring, control and policy evaluation of the results makes the output of public spending generally minimal compared to the cost incurred. Furthermore the structure of public expenditure is characterized by the dominance of operating expenses and debt service. The effect of these expenditures on GDP simulation is very limited. This public investment is expected to improve the level of activity in stimulating the private sector, a catalyst for growth. However, its share in total public expenditure has substantially deteriorated due to budgetary constraints.

As for the contribution of low nominal demand shock for all countries, monetary policy is generally passive. It aims more at regulating the money

based on the real economy than financing economic development. Its evolution shows concern for inflationary pressures mastery displayed by the monetary authorities without giving too much importance to economic growth. It is through interest rate that monetary shocks should boost the level of investment and mobilize savings' advantage. However, these rates do not react to changes in money supply as they are officially set by the monetary authorities before liberalization. This results in a very limited impact of monetary shock on the economy.

Like what is stated in theory, the small open economy where all countries would submit all countries to the effects of both favourable and unfavourable developments in the external environment. The estimates show a significant impact of both shocks to the terms of trade as the oil shock on the level of economic activity. The effect is more apparent in terms of trade, which is obvious since all countries studied are price takers.

Table 1: Test Results for Unit Roots in Level

Countries	Variables	ADF	PP	Order of integrati
EGYPT	LPIB	-2.114788	-2.742598	I(1)
	LREER	-1.901994	-1.927449	I(1)
	LDEFPIB	-1.483578	-1.125434	I(1)
	LTE	-1.757955	-1.077637	I(1)
	LPP	-1.585566	-1.651832	I(1)
JORDAN	LPIB	-0.845808	-1.232438	I(1)
	LREER	-1.810113*	-1.383328*	I(1)
	LDEFPIB	-1.819835	-1.707208	I(1)
	LTE	-2.680930	-2.645307	I(1)
	LPP	-1.585566	-1.651832	I(1)
MOROCCO	LPIB	-2.843323	-1.965211	I(1)
	LREER	-2.782869	-3.053584	I(1)
	LDEFPIB	-2.864262	-2.780140	I(1)
	LTE	-2.696694	-2.687636	I(1)
	LPP	-1.585566	-1.651832	I(1)
TUNISIA	LPIB	-3.085580	-2.725156	I(1)
	LREER	-2.220629	-1.714296	I(1)
	LDEFPIB	-1.133635	-1.467777	I(1)
	LTE	-1.484649	-1.669083	I(1)
	LPP	-1.036695*	-1.378210*	I(1)

Critical values	**1%**	**5%**	**10%**	**1%**	**5%**	**10%**
Constance and intercept	**-4.04281**	**-3.45080**	**-3.15076**	**-4.03979**	**-3.44936**	**-3.14992**
Constance	**-3.495677**	**-2.890037**	**-2.582041**	**-3.493129**	**-2.888932**	**-2.581453**

Table 2: Test Results for Unit Roots in First Difference

Countries	**Variables**	**ADF**	**PP**	**Order of integration**
EGYPT	ΔLPIB	-7.641044	-12.33403	I(0)
	ΔLREER	-4.094427	-8.517193	I(0)
	ΔLDEFPIB	-3.599319	-8.838513	I(0)
	ΔLTE	-3.716170	-5.174122	I(0)
	ΔLPP	-6.139164	-5.858801	I(0)
JORDAN	ΔLPIB	-3.698198	-7.222397	I(0)
	ΔLREER	-2.911863*	-7.669556*	I(0)
	ΔLDEFPIB	-3.470116	-8.661115	I(0)
	ΔLTE	-3.715300	-3.861672	I(0)
	ΔLPP	-6.139164	-5.858801	I(0)
MOROCCO	ΔLPIB	-5.102618	-6.991976	I(0)
	ΔLREER	-4.573857	-9.285081	I(0)
	ΔLDEFPIB	-4.474977	-8.260141	I(0)
	ΔLTE	-3.624578	-3.514409	I(0)
	ΔLPP	-6.139164	-5.858801	I(0)
TUNISIA	ΔLPIB	-3.650096	-6.116830	I(0)
	ΔLREER	-4.188752	-8.631431	I(0)
	ΔLDEFPIB	-4.080658	-6.216152	I(0)
	ΔLTE	-2.868596*	-3.789325*	I(0)
	ΔLPP	-5.785271*	-6.254309*	I(0)

Critical values	**1%**	**5%**	**10%**	**1%**	**5%**	**10%**
Constance and intercept	**-4.04360**	**-3.45118**	**-3.15098**	**-4.04053**	**-3.449716**	**-3.15012**
Constance	**-3.49634**	**-2.89032**	**-2.58219**	**-4.04053**	**-3.449716**	**-3.15012**

Table 3: Test Results for Cointegration

Countries	Null Hypothesis	Eigen value	Trace test	P values
	r =0	0.303963	**104.9767**	0.0001
	r ≤1	0.213455	64.75549	0.0042
	r ≤2	0.161752	**35.19275**	0.0236
	r ≤3	0.101273	18.51885	0.0853
EGYPT	r ≤4	0.058292	6.666707	0.1452
	r =0	0.570939	**86.30804**	0.0000
	r ≤1	0.425472	56.52906	0.0001
	r ≤2	0.217881	**25.06632**	0.2145
	r ≤3	0.122734	13.35635	0.6460
JORDAN	r ≤4	0.073909	7.831853	0.6214
	r =0	0.458857	**118.5073**	0.0000
	r ≤1	0.360760	69.99558	0.0057
MORROCO	r ≤2	0.181209	**34.64497**	0.2081
	r ≤3	0.151538	18.85078	0.2075
	r ≤4	0.059158	5.868694	0.4522
	r =0	0.422647	**146.5373**	0.0000
	r ≤1	0.386747	103.1425	0.0001
TUNISIA	r ≤2	0.335377	**54.07904**	0.1345
	r ≤3	0.118864	16.96877	0.1337
	r ≤4	0.084469	6.971812	0.1279

Table 4: Decomposition Variance of Economic Growth

	Periods	Supply shocks	Real demand shocks	Nominal demand shocks	Term of trade shocks	Oil prices shocks
	2	**96.05339**	1.635896	0.268230	1.179213	0.863267
	4	80.93432	10.45921	1.789008	1.725763	5.091702
TUNISIA	**8**	59.70185	9.831689	1.748854	18.84932	9.868284
	12	57.61696	9.231334	2.585575	18.37268	12.19345
	16	55.70176	8.919733	3.168169	19.00941	13.20092
	20	54.34251	8.929215	3.482098	19.82265	13.42352
	2	**93.65054**	1.473868	0.172291	4.090197	0.613107
	4	84.85353	6.049670	2.216489	6.022429	0.857881
MOROCCO	**8**	77.14619	8.801692	3.891341	8.323381	1.837398
	12	75.44602	9.359128	4.462632	8.785156	1.947069
	16	74.97930	9.503000	4.546483	9.002927	1.968291
	20	74.81463	9.535721	4.562313	9.120274	1.967067
	2	**87.44288**	9.080607	1.163434	1.586118	0.726960
	4	79.56156	12.64945	2.923288	2.945568	1.920135
EGYPT	**8**	78.28263	11.43110	4.149940	4.424383	1.711950
	12	77.32945	11.20870	4.383841	5.294460	1.783550
	16	76.93547	11.17584	4.533839	5.525113	1.829734
	20	76.81485	11.17607	4.591202	5.575364	1.842515
	2	**89.97490**	6.064048	1.599393	1.735371	0.626291
	4	78.63280	14.70002	3.596140	1.957501	1.113537

JORDAN	**8**	66.35493	18.21271	4.975389	6.422214	4.034754
	12	60.60569	17.77947	7.850883	8.008063	5.755897
	16	57.72424	20.86227	8.629620	7.445765	5.338102
	20	55.51943	21.97827	8.873963	7.606315	6.022025

Table 5: Decomposition Variance of Real Exchange Rate

	Periods	Supply shocks	Real demand shocks	Nominal demand shocks	Term of trade shocks	Oil prices shocks
TUNISIA	**2**	1.034946	**93.61851**	0.124292	3.691953	1.530299
	4	9.495290	71.37628	1.367905	13.45159	4.308934
	8	11.20573	64.23079	2.664826	15.84503	6.053624
	12	11.11081	62.84803	2.808358	17.17302	6.059776
TUNISIA	**16**	11.12050	61.71478	2.913146	18.29887	5.952702
	20	11.12867	61.08767	3.011708	18.84575	5.926199
	2	2.059054	**92.56354**	0.639216	4.713046	0.025141
	4	2.164582	90.62129	0.914926	5.610311	0.688892
MOROCCO	**8**	2.156933	86.62888	2.689122	6.390203	2.134856
	12	2.320683	85.63923	2.865567	6.395840	2.778677
	16	2.350246	85.49473	2.890983	6.392761	2.871284
	20	2.355004	85.48117	2.894774	6.393477	2.875572
	2	12.16804	**85.52559**	1.085568	0.595367	0.625432
	4	12.95634	80.10309	3.030120	3.240685	0.669758
EGYPT	**8**	12.50818	76.85010	4.214022	3.858702	2.569000
	12	12.41926	75.21321	4.621955	4.196180	3.549398
	16	12.46521	74.95306	4.652395	4.244526	3.684812
	20	12.47145	74.90710	4.664174	4.253638	3.703631
	2	8.364856	**90.57569**	0.129413	0.258590	0.671449
	4	9.372467	85.35426	1.387244	3.096199	0.789826
JORDAN	**8**	8.553108	76.22272	2.414679	9.862475	2.947022
	12	9.426919	74.33224	2.814568	10.07306	3.353207
	16	9.658008	73.33887	3.295043	10.18707	3.521014
	20	9.710702	73.21085	3.411374	10.10226	3.564807

Table 6: Decomposition Variance of Inflation

	Periods	Supply shocks	Real demand shocks	Nominal demand shocks	Term of trade shocks	Oil prices shocks
TUNISIA	**2**	1.921610	35.55149	**52.37417**	10.00544	0.152190
	4	1.458226	31.44137	51.88601	14.93644	0.277962
	8	13.56421	30.01633	40.14945	15.64200	0.628001
	12	15.23253	38.27385	32.55145	12.60671	1.335455
	16	15.95930	37.74756	30.65971	13.31557	2.317849
	20	115.9502	37.54046	30.51010	13.46704	2.532106
	2	1.570028	33.02100	**55.13362**	10.00890	0.265459
	4	1.792949	36.35724	48.55273	11.03650	2.260578
	8	2.535521	39.91082	42.55244	12.13802	2.863147

MOROCCO	**12**	2.698085	39.80380	41.29385	12.25360	3.950660
	16	2.742673	39.69462	40.86943	12.26714	4.426129
	20	2.752783	39.67364	40.80851	12.27099	4.494080
EGYPT	**2**	10.33167	21.50915	**57.75910**	10.07635	0.323728
	4	18.12097	20.23724	47.96239	11.15329	2.526107
	8	10.00998	28.85405	46.03081	11.33729	3.767860
	12	9.934305	28.99084	45.55812	11.32419	4.192547
	16	10.18063	28.90154	45.21140	11.35238	4.354049
	20	10.23412	28.95229	45.09962	11.34602	4.367947
JORDAN	**2**	12.85368	19.57492	**54.69040**	12.15314	0.727858
	4	12.40950	23.27217	50.56513	11.94497	1.808228
	8	8.174141	33.16235	42.99413	12.90914	2.760232
	12	5.978997	35.81439	40.15545	13.64295	4.408215
	16	5.964258	35.31930	39.74011	13.76020	5.216141
	20	5.779902	36.01711	39.05601	13.77089	5.376085

Table 7: Decomposition Variance of Terms of Trade

	Periods	**Supply shocks**	**Real demand shocks**	**Nominal demand shocks**	**Term of trade shocks**	**Oil prices shocks**
TUNISIA	**2**	5.139150	1.452577	5.906307	**85.51141**	1.990551
	4	8.302413	3.430950	4.749603	79.57685	3.940188
	8	10.01642	3.845092	6.590078	72.87433	6.674089
	12	10.42261	3.950068	8.111072	70.35450	7.161746
	16	10.42914	3.999642	7.924905	70.90504	6.741267
	20	10.31540	4.069898	8.060650	70.92365	6.630401
MOROCCO	**2**	1.162238	0.076102	5.221206	**93.50729**	0.033161
	4	1.835314	0.178053	9.46761	86.76327	1.755760
	8	3.183693	7.929244	9.44813	71.07242	8.366512
	12	3.209606	7.866796	9.97116	67.90264	11.04980
	16	3.206433	7.755637	10.24157	67.19818	11.59818
	20	3.217098	7.735007	10.26944	67.09009	11.68836
EGYPT	**2**	6.404203	0.294387	2.486455	**90.79875**	0.016205
	4	3.969278	0.205593	6.649101	85.40350	3.772528
	8	3.274504	8.398156	3.977866	63.73385	20.61562
	12	3.150282	12.19137	4.435896	60.69000	19.53245
	16	3.915183	12.45686	4.698362	59.71372	19.21587
	20	4.098016	12.48528	4.748274	59.50899	19.15944
JORDAN	**2**	8.397221	2.822960	5.686758	**81.42579**	1.667270
	4	10.60469	4.35329	8.669121	75.27304	1.099859
	8	6.58238	7.50827	12.93582	56.79893	16.17460
	12	4.70881	3.98227	13.94702	50.13466	17.22723
	16	3.88913	7.47428	13.06416	58.84243	16.73000
	20	3.80682	7.63029	12.82457	58.42841	17.30991

Table 8: Decomposition Variance of Oil Prices

	Periods	Supply shocks	Real demand shocks	Nominal demand shocks	Term of trade shocks	Oil prices shocks
	2	6.491498	2.383730	2.130405	15.47094	**73.52343**
	4	9.041442	2.594858	2.650710	15.51921	70.19378
TUNISIA	**8**	11.38506	3.649790	5.230014	13.13997	66.59517
	12	10.59902	4.338021	5.342557	16.70386	63.01654
	16	10.48872	4.351798	5.185920	18.64300	61.33056
	20	10.56185	4.313881	5.303965	18.81095	61.00935
MOROCCO	**2**	0.775632	0.776119	2.191511	0.540351	**95.71639**
	4	0.869851	5.141968	9.905538	2.566722	81.51592
MOROCCO	**8**	0.873029	5.384011	10.42709	3.709344	79.60653
	12	0.891425	5.460930	10.48251	3.845481	79.31966
	16	0.893986	5.564558	10.68515	3.848896	79.00741
	20	0.893495	5.584754	10.78906	3.849220	78.88347
	2	1.124765	0.109996	5.511386	2.930051	**90.32380**
	4	6.528345	0.772783	6.445122	4.377467	81.87628
EGYPT	**8**	6.546102	2.058635	7.975784	5.171375	78.24810
	12	8.775685	2.088669	7.645024	5.290978	76.19964
	16	9.413377	2.163979	7.621845	5.266148	75.53465
	20	9.940909	2.202842	7.581207	5.224678	75.05036
	2	0.558486	0.332168	1.761533	0.737338	**96.61048**
	4	1.369312	0.437271	1.943811	8.543726	87.70588
JORDANIE	**8**	3.718570	2.206161	3.065174	10.20693	80.80316
	12	3.922643	2.778345	3.959518	10.06398	79.27551
	16	4.124249	2.984320	4.157696	10.05704	78.67670
	20	4.334129	3.017851	4.204493	10.06510	78.37843

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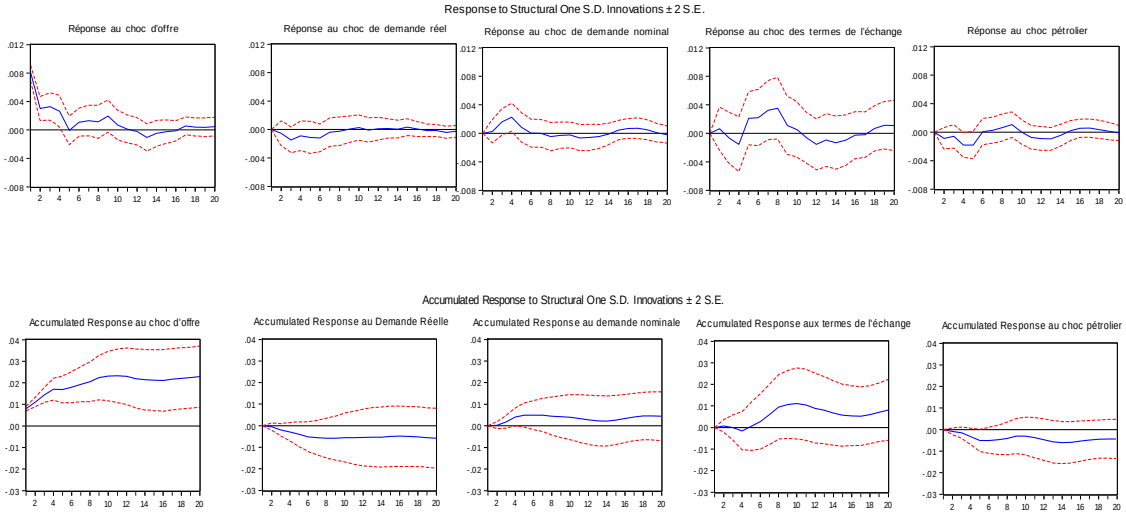
ANNEX (1): Impulsions Functions of GDP Growth

Tunisia



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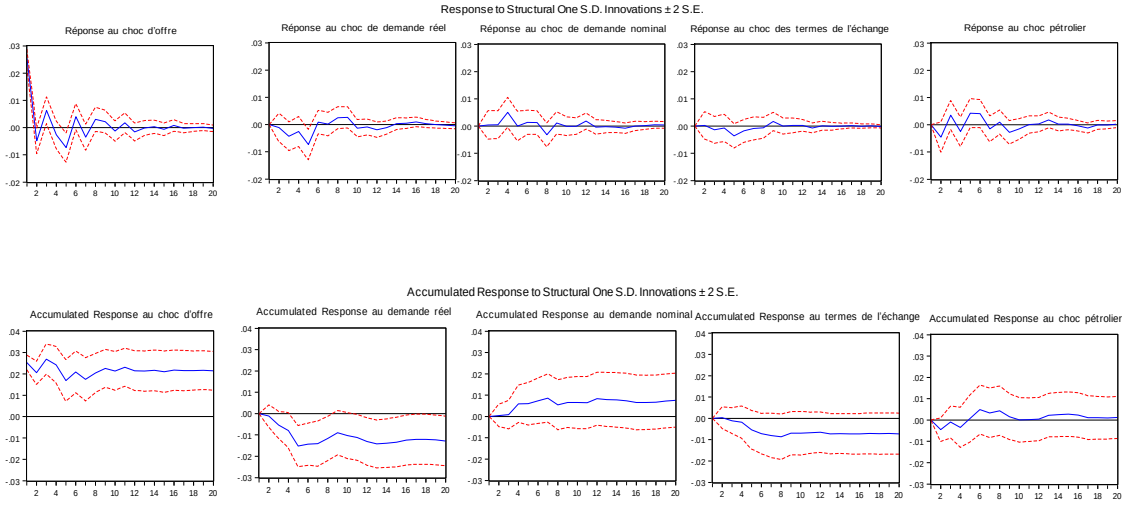

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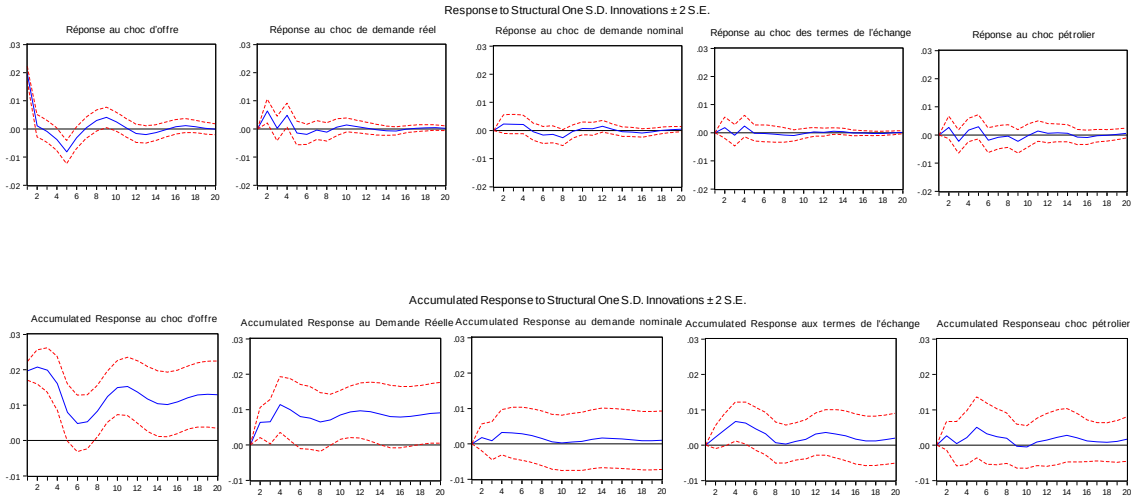

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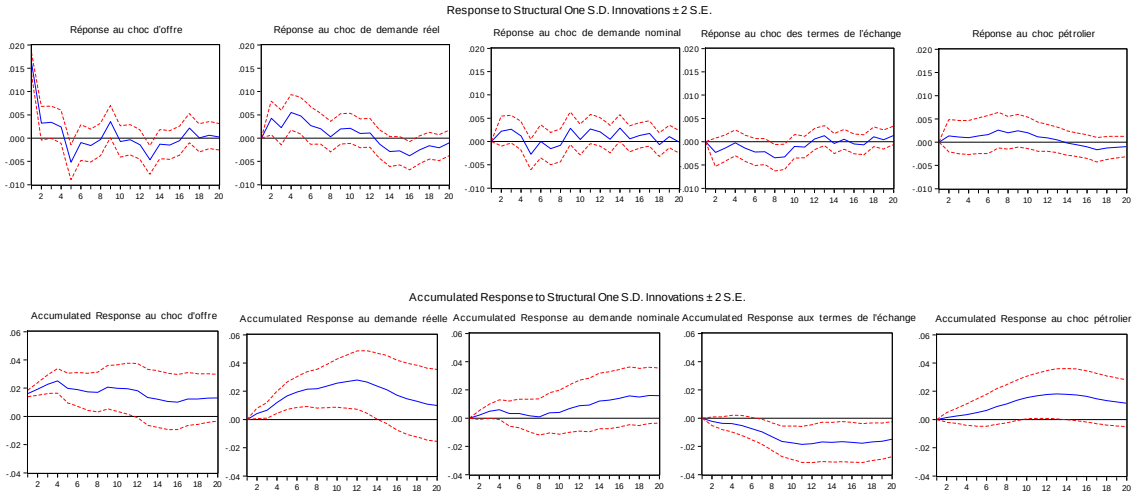
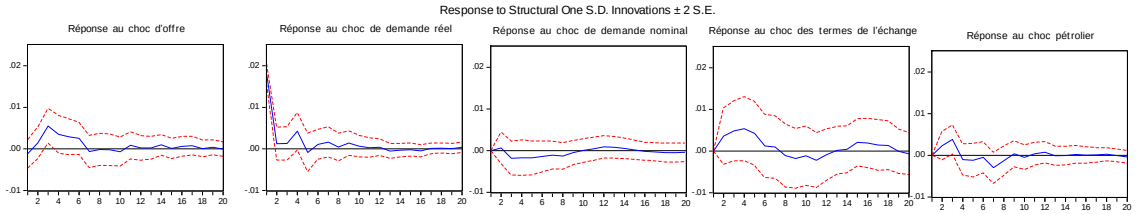
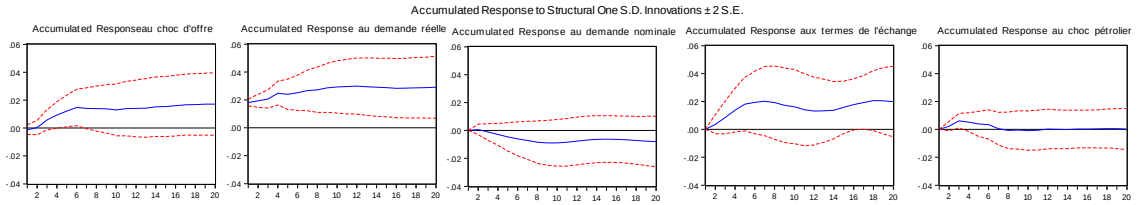


ANNEX (2): Impulsion Functions of Real Exchange Rate

Tunisia





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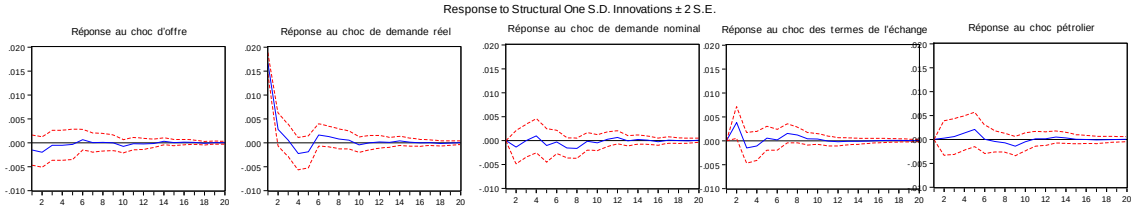

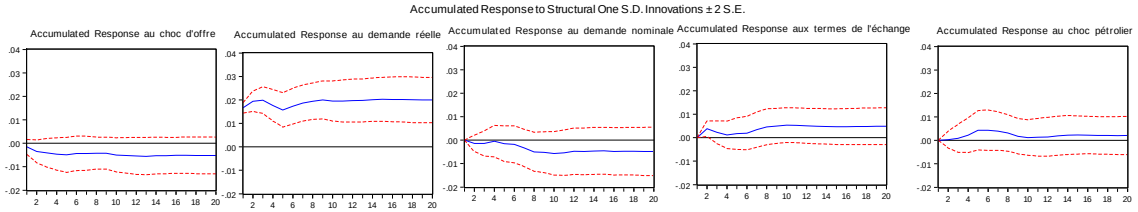

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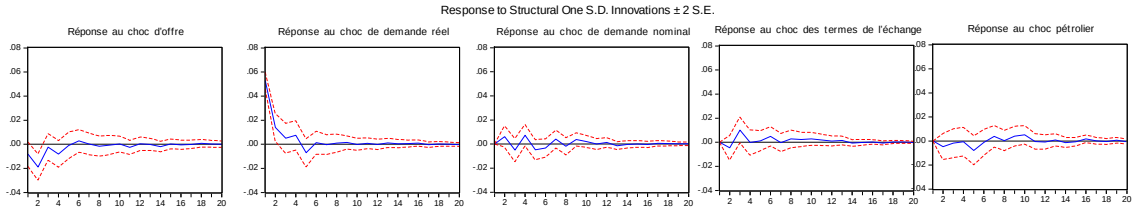

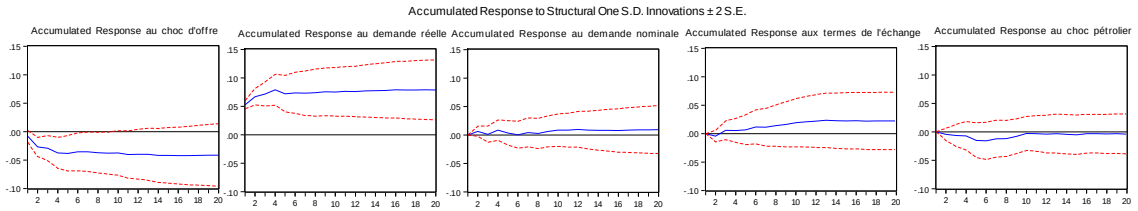

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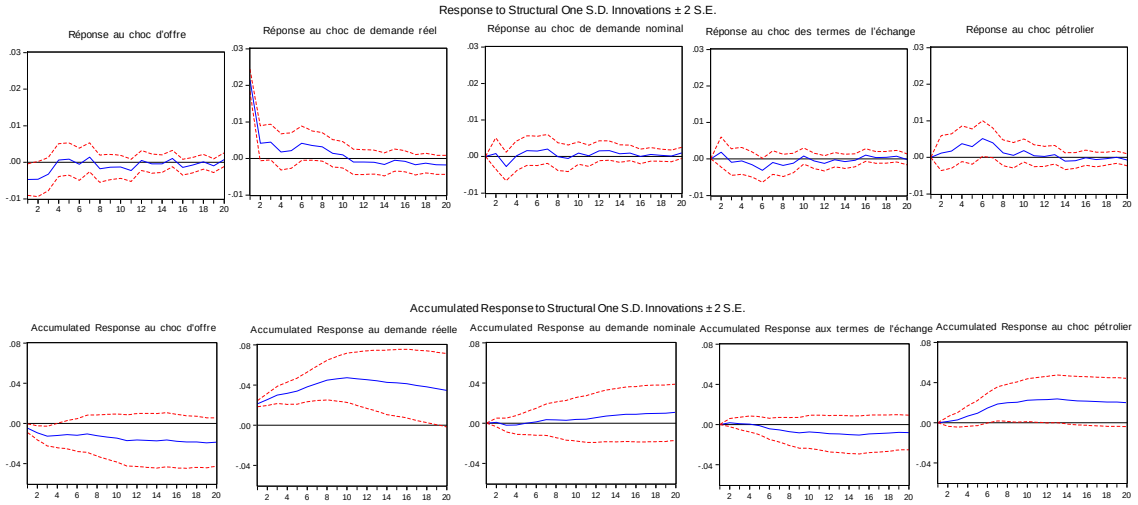
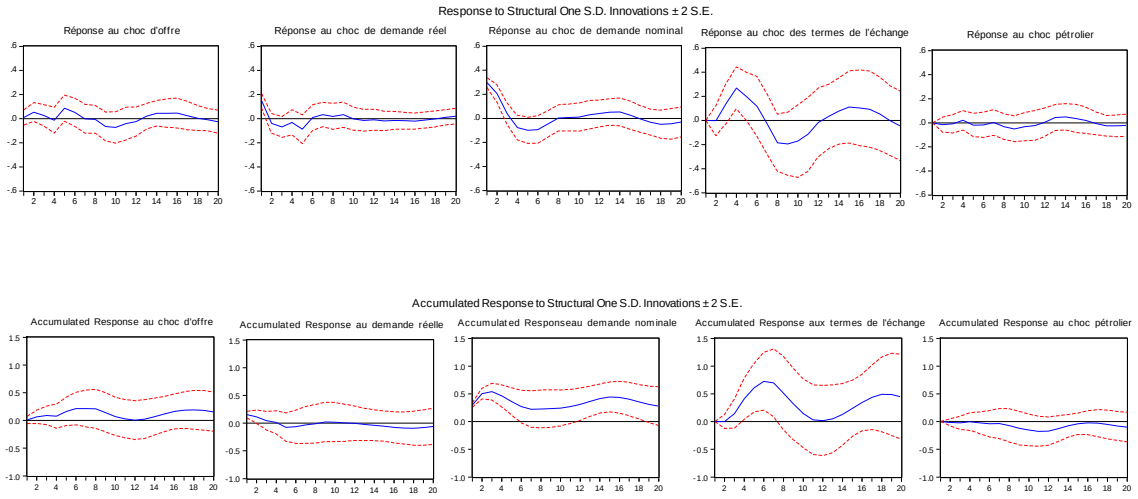


ANNEX (3): Impulsion Functions of Inflation

Tunisia



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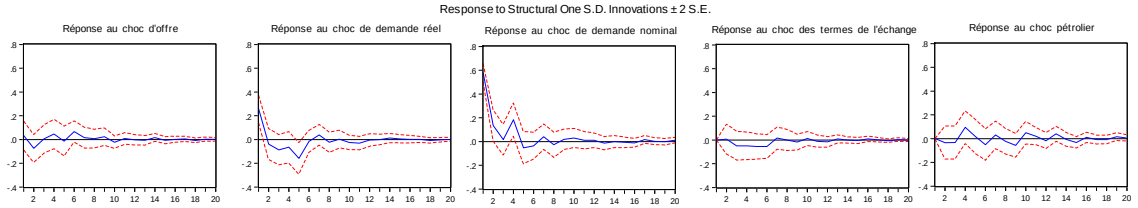

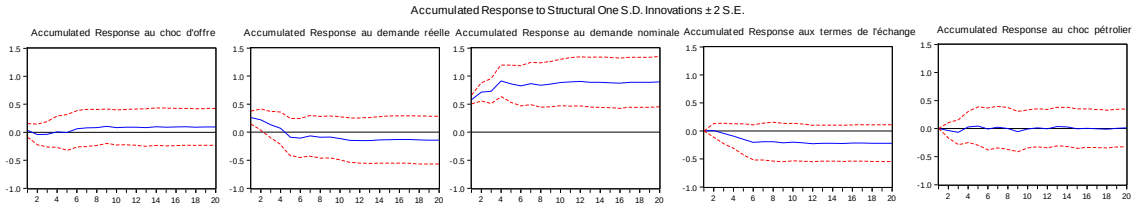

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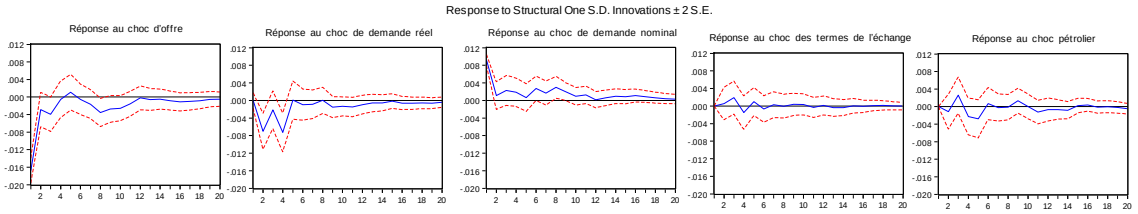

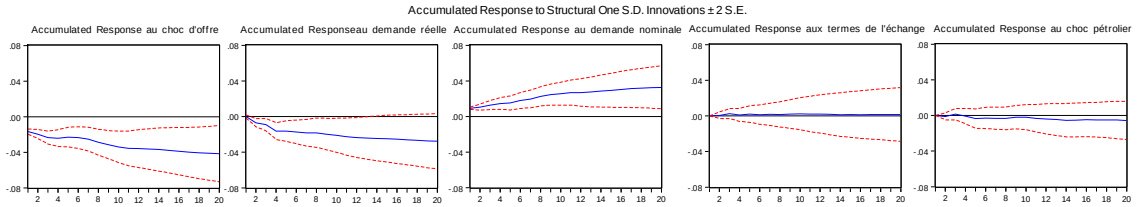

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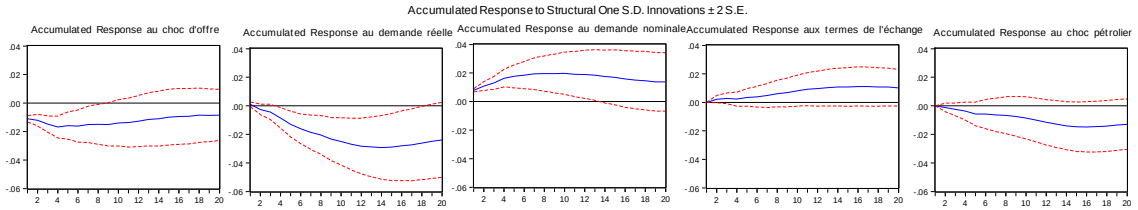
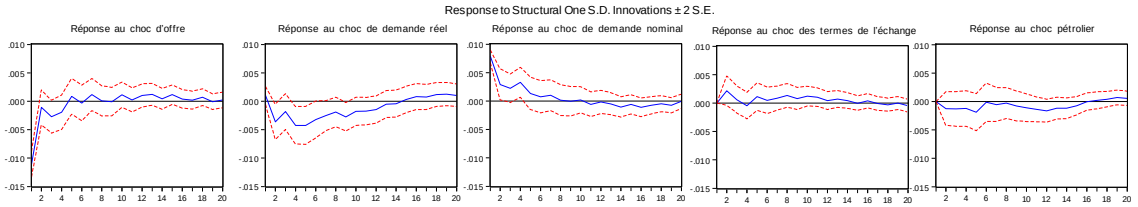
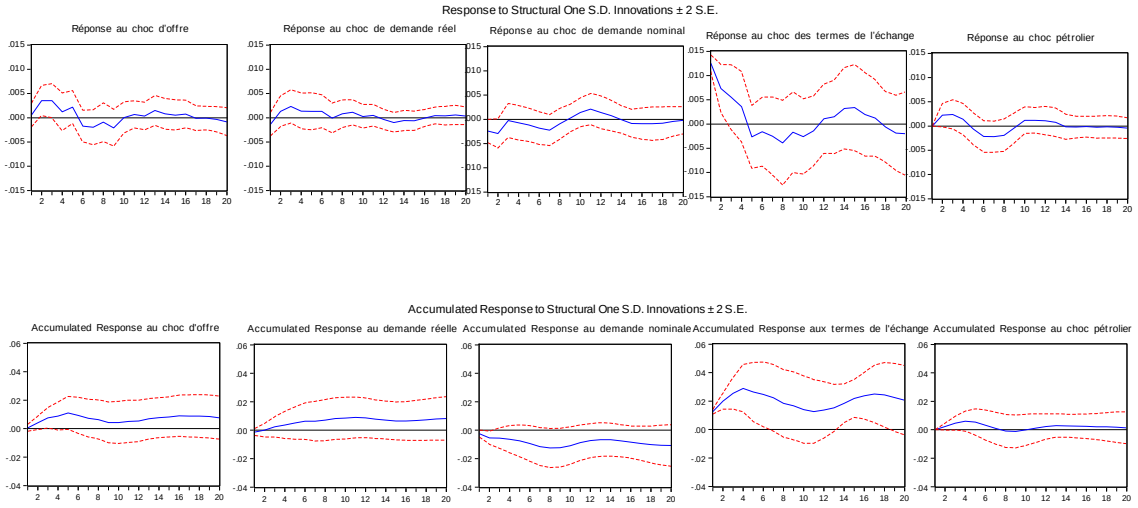


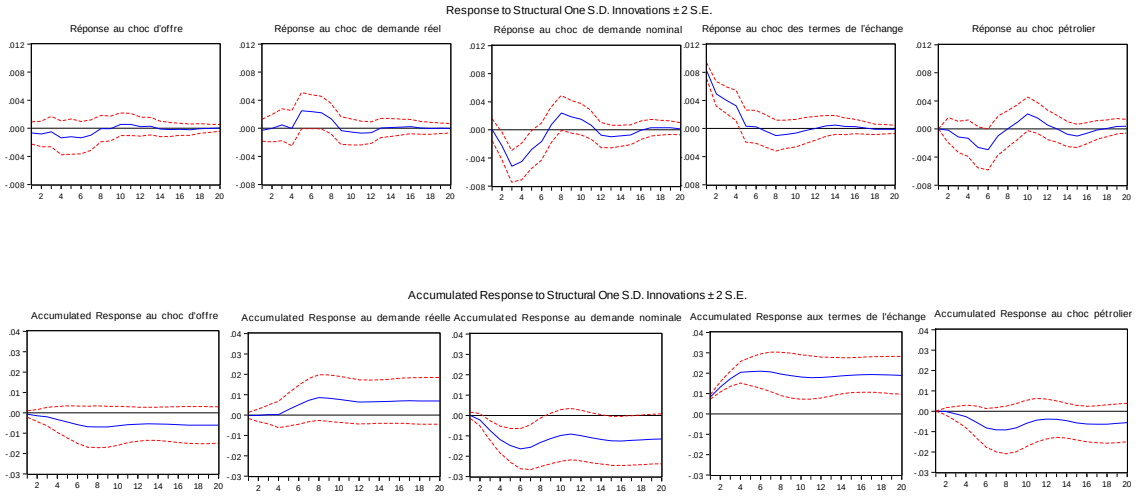


ANNEX (4): Impulsions Function of Terms of Trade

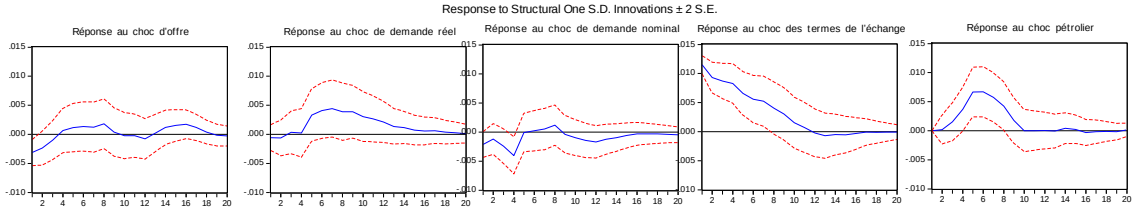
Tunisia

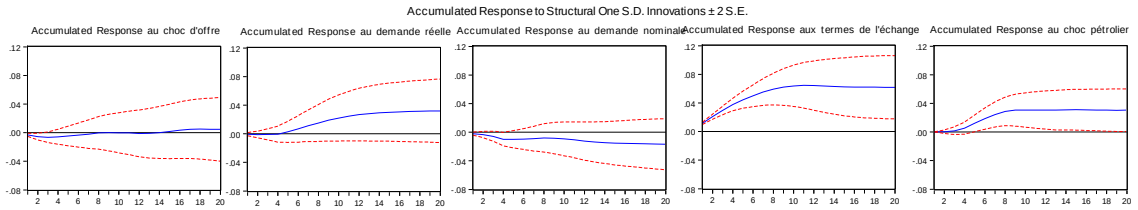


Morocco



Egypt





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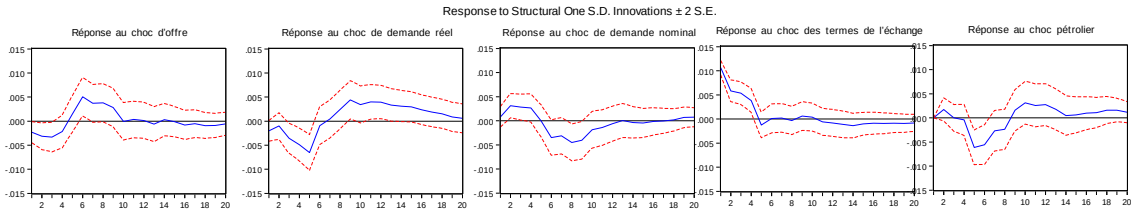
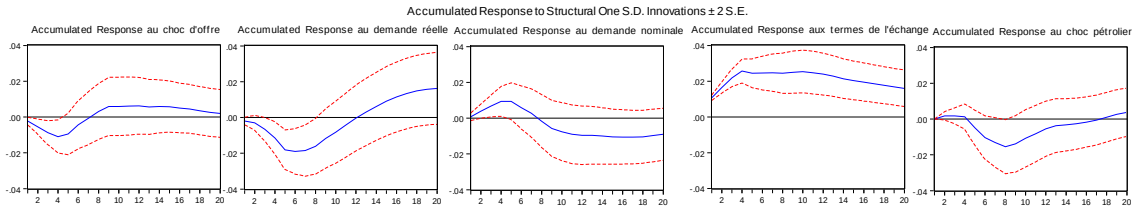
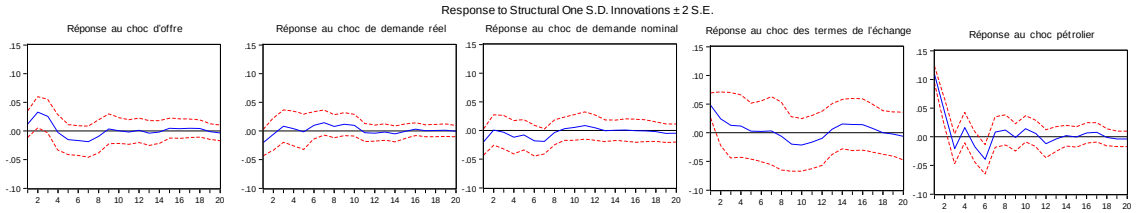
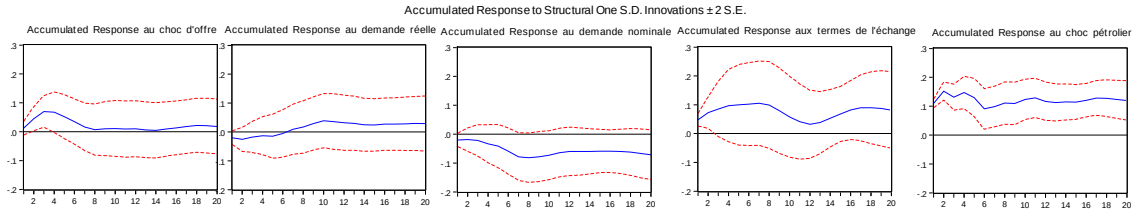




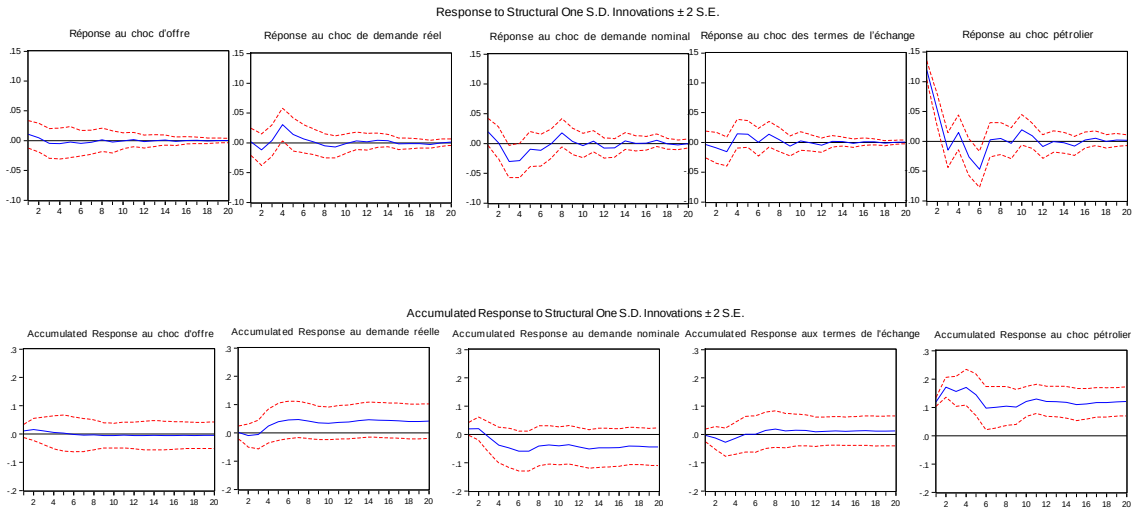
ANNEX (5): Impulsion Functions of Oil Prices

Tunisia





Morocco



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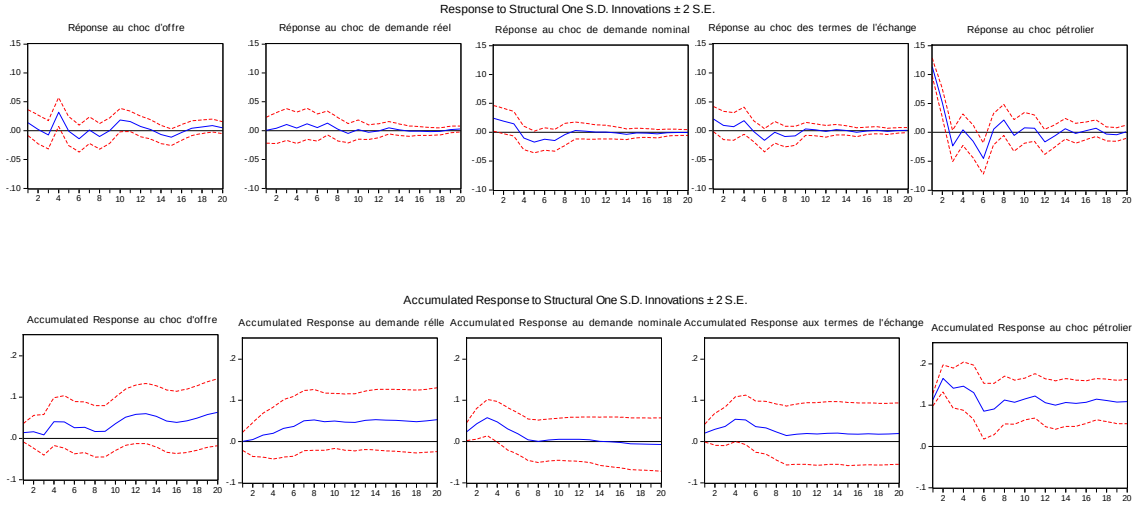

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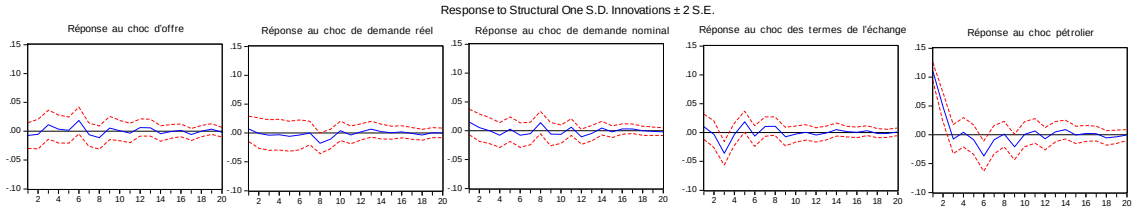

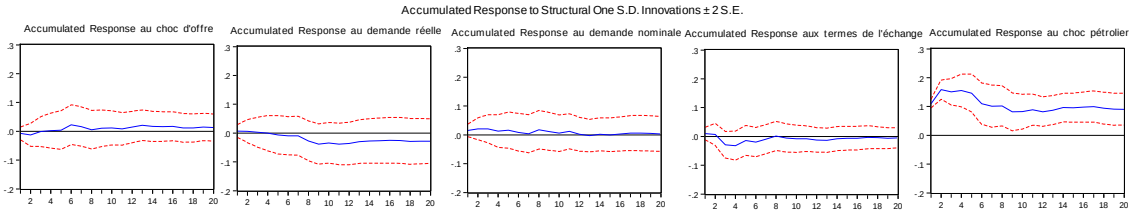
Accumulated Response to Structural One S.D. Innovations ± 2 S.E.
Accumulated Response au choc d'offre
Accumulated Response au demande réelle
Accumulated Response au demande nominale
Accumulated Response aux termes de l'échange
Accumulated Response au choc pétrolier