Is there a crowding-out effect in the Moroccan context ? Evidence from structural VAR Analysis

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Abstract

This paper investigates the crowding out effect hypothesis in Morocco. Accordingly, the interest rate reacts to the change of the level of government spending. The Empirical results obtained from the impulse response analysis of the structural VAR model indicate the absence of such an effect. Spending in infrastructure, in communication and in welfare seem to build the basis of modern economy that will attract private investments, and the result will not be materialized in the immediat short term.

1 Introduction

The present paper investigates the dynamic effects of shocks in government expenditure on the behavior of long term interest rate in Morocco during the period 1990-2015. Our methodolgy is based on the structural VAR modeling that seemed appropriate to this study, taking into account the purpose of the research and the nature of the data.

The rationale behind this study is the fact that this type of study has not been done for the case of Morocco and any consensus was found about the crowding out effect. During the eighties, Morocco has experienced a structural adjustment program that was intended for debt restructuring, which has attained record levels following the surge in commodity prices on the international market.

The program mainly consisted of the privatization of companies held at the time by the government. As a result, we witnessed an artificial increase in government's revenue which reduced public deficit. In addition, public debt had a shift towards internal debt instead of external debt. Which raises the question of the impact of the government interventions on macroeconomic aggregates, including the interest rate.

Much of the recent litterature has focused on the impact of public expenditure on private investment using several approaches. In Habib and Miller (1991), the paper showed for a panel of developing and developed countries that tax-financed government expenditure crowds out more investment than debt-financed expenditure. Spending on social security and welfare reduces investment in all countries in the sample while spending on transport and communication imply more investment in developing countries. Another work for the case of United States and Canada, Cebula (2007), used single equation models and multiequation systems to show that for both US and Canada the crowding out effect is there and it leads to long term inflation. For the case of developing countries, Fayed (2012) showed for the case

of Egypt that debt-financed deficits crowds out the private investment by reducing the available volume of credits to the economy. More older paper of Benjamin M. Friedman (1978) emphasized the effect of public spending by arguing that the direction of the effect depend on the relative substituabilities among the instruments for financing the deficit.

As the empirical litterature does not found any consensus about the effect of public spending on the private investment, one would not think that this task would be easy. In fact, the structural VAR modeling must include some fiscal variables that occur with annual frequency which is limiting in term of the number of observation. Moreover, in order to test our basic assumption we do not have to include only the government spending in our model. Once the government spending and revenue are presumably not independent, to estimate the effect of one it is necessary to include the other. One more challenge is related to the step of identification of our SVAR. When we are dealing with annual data, the fiscal variables have time to react to the changes of the interest rate, which imply that we have to proceed to the estimation of elasticities of fiscal variables with respect to interest rate. Finally, it should be noted that the fiscal variables are cyclical, that suggests some treatment before the modeling step. The method of dynamic factor model (DFM) was used to deal with such pattern. The real interest rate used in this study are those of 10 years bond yields, the real interest rate is calculated based on this nominal rate minus a trend of inflation considered as a proxy for the anticipated inflation.

This paper proposes then to empirically examine the effect of government spending on real interest rate. The rest of the paper is organized as follows, section two discusses the main theories concerned with the effect of government actions on the interest rate and the crowding out effect. Section 3 then proposes to conduct an empirical investigation to validate or reject our basic assumption. A final section concludes.

2 Theoretical background

The issue of government spending and its effects over the economy is largely debated. And there is no consensus yet about its impacts on the consumption, saving or capital formation decisions.

However, one can distinguish between two views mostly related to this issue. On the one hand, the conventional view asserts that government spending has an impact both in the short run and in the long run over the economic activity, which has an important implications for the interest rate setting. On the other hand, neutrality of government expenditure is the oldest theory underlying the relation between debt and economic decisions, which is commonly known as Recardian Equivalence. Firstly stated by David Ricardo on the case of financing war expenditure, and renewed by Robert Barro in more general form earlier.

Most economists and policymakers are in line with the story of the conventional view, maybe it describes the real world well. According to this theory, we suppose that government indebtedness increases because of some reasons, say a high spending policy. This policy affect the economy through different mechanisms. In the short run, household's current disposable income increases in response to this fiscal policy. Household's spending on consumption goods will increase, and thus the aggregate demand. Following the Keynesian analysis, we can conclude that this mechanism will lead to higher national income. This analysis constitutes a justification for such a policy of increasing spending when the economy suffers from recession. In this context, higher demand will create an inflationary pressure that will modify expectations of inflation in the future. Such modification has an important consequences on the real rates of interest.

The analysis of the impact of government debt in the long run need to appeal some accounting identities :

Starting by the private budget constraint :

$$Y = C + S + T \tag{1}$$

Where Y is the national revenue, C is the consumption, S is the saving and T refers to tax payments net from transfers.

This identity (1) tells us that the revenue is allowed, after payment of taxes, for consumption and saving. Another way to have the national income is by the demand side view :

$$Y = C + I + G + NX \tag{2}$$

Where I is the capital formation, G is the government expenditure and NX is the exports net of imports.

Combining the two previous identities (1) and (2) yield to the following expression :

$$S + (T - G) = I + NX \tag{3}$$

The term NXrepresents the current account balance, which must equal the negative of the capital account balance in order to have the balance of payment equilibrium. Then, we have the identity : $NX = CAB$ where the CAB is the capital account balance.

By replacing this identity in (3) found previously, we obtain :

$$S + (T - G) = I + CAB \tag{4}$$

Which indicates that national saving- composed by private and government saving- equal domestic and abroad investment.

We suppose that government creates a deficit by cutting taxes (which imply higher debt to finance it) for some reasons. Then, the government saving $T - G$ will fall down. In this case, the identity may hold in several ways : (i) the private saving will increase by the same amount, (ii) domestic investment will fall, that causes a decline in output and an increase in the interest rates (iii) abroad investment will fall, that imply a deterioration of the trade deficit.

The case (i) will be discussed in detail later in this section. For the case (ii), it is a clear case of the crowding out effect[1] . And the latter case (iii) is about the hypothesis of the " twin deficit", which is out the scope of this study.

Out of this framework, there exists other effects of government spending over the economy. Large spending may alter the monetary policy, in such an environment interest rates will be higher and monetary policy can act in an expansionary way to reduce this rates. This policy may be proof to be effective in the short run, but in the long run real rates return to the natural level, inflation and nominal rates will be higher. Moreover, with a large spending a country may finance their ongoing deficit by "monetizing debt", in this case the inflation will not be a monetary phenomena as Milton Friedman stated but it will be a fiscal one.

From the previous discussion, the conventional view of government spending and its impacts on the economy highlight some evidence on the relationship that can exist between public intervention and interest rates.

In contrast, Ricardian Equivalence[2] asserts that the choice between financing deficit by issuing debt or by collecting taxes is irrelevant. The policy of indebtedness to finance tax cut will not alter consumption, capital formation or growth. This analysis is based on the simple argument that lower taxes today will generate higher taxes tomorrow, thus cutting taxes and financing deficit by debt represents some form of postponement of taxes and not a reduction on it. If agents are forward looking, this policy will not affect their consumption decisions but it will have an impact on their saving decisions because they will look ahead to the future taxes implied by government debt. Two fundamental ideas are behind this theory ; the first idea is the government budget constraint. Lowering tax today must lead to higher taxes in the future in order to respect the inter temporal budget constraint. The second idea is the permanent income hypothesis. That is to say that household bases their consumption decisions on the permanent income.

This neutrality proposition "Ricardian Equivalence" deny all sort of impact that can be produced by government indebtedness. Even if this theory may be proved wrong, it provides an important benchmark.

[1]See Spencer, R. W., & Yohe, W. P. (1970). The" crowding out" of private expenditures by fiscal policy actions. Federal Reserve Bank of St. Louis Review, (October 1970).

[2]See Barro, R. J. (1988). The Ricardian approach to budget deficits (No. w2685). National Bureau of Economic Research.

3 Empirical investigation

The data used in this empirical analysis are the government's spending and revenue and the real interest rate of 10 years bonds. The data for fiscal variables are corrected for the inflation by deflating them with a GDP deflator. Moreover, as this data are cyclical we use a dynamic factor model (DFM) to correct for cyclical factors and the model used for this purpose is explained in the first appendix. For the real interest rate, we calculate it as the nominal rate minus a trend of inflation taken as a proxy for the expected inflation. The data are expressed in annual frequency and it covers the period 1990-2015.[3]

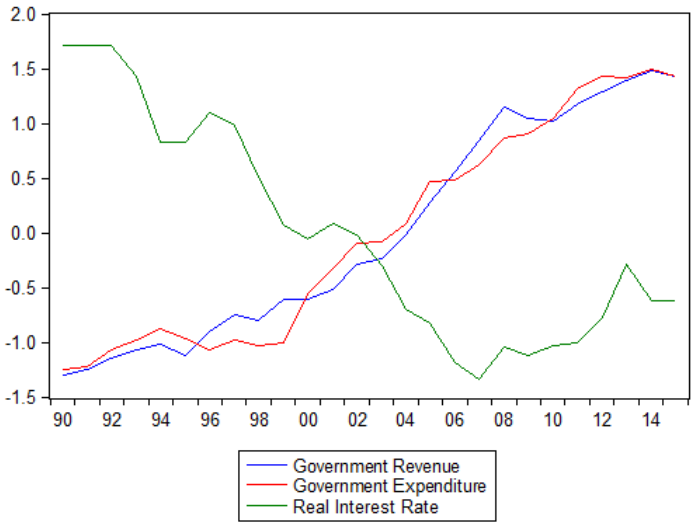

Figure 1: Fiscal variables and real interest rate trajectories (Normalized data)
Source : IMF, Ministery of Finance

The review of the evolution of fiscal variables and real interest rate reveals two distinct phases. The first phase covers the period 1990-2004, it is characterized by a downward trend for the interest rate and slowing upward trend for government spending and revenue. Several reasons explain those patterns. Firstly, the downward trend of interest rate is related to the development of the market bonds. As markets develop, the interest rate is declining to be in line with the monetary policy stance. Secondly, fiscal variables are growing slowly since the moroccan government had experienced an adjustment program and it must keep the budget deficit at a low level with respect to international obligations. The second phase is that of 2004-2015 which shows that both government spending and revenues are increasing while the level of the interest rate is much more moderated and slowly increasing.

[3]For fiscal variables we use the data of the IMF data mapper available at http://www.imf.org/external/datamapper/index.php, and for the interest rate we use the data provided by the Ministery of Finance.

Government revenue reacts to the faster growth known in this period, and the public expenditure was oriented into financing lot of sectoral programs and some social allocations in response to the Global Financial Crisis of 2008. The deterioration in terms of trade, the decline in external demand addressed to Morocco and soaring energy prices were all factors weighing heavy on public finances and therefore have led to an increase in public spending.
According to the figure 1, we cannot distinguish any relationship between government spending and real interest rate. In order to test the existence of such a relationship, more techniques are needed. This is what will be shown in the next two subsections.

3.1 The VAR

As a notation, we take r_t for the real interest rate, s_t for government spending and T_t for government revenue.
We construct the vector y_t defined by : $y_t = [T_t\ s_t\ r_t]'$ and our basic VAR will be :

$$y_t = \beta_0 + \beta_1 y_{t-1} + ... + \beta_{t-p} y_{t-p} + e_t$$

With : $e_t = [e_t^T\ e_t^s\ e_t^r]'$ is the vector of error forecasts.
We define a vector of structural shocks $u_t = [u_t^T\ u_t^s\ u_t^r]'$ and the identification problem will consist of specifying a linear relationship between u_t and e_t.
We aknowledge that we are using annual data[4]. They are expressed in real term and cyclically adjusted by dynamic factor model (DFM)[5].

By examining the lag length of the VAR, we find that $p = 1$, and all the propreties are validated for the specification proposed[6] .

3.2 Identification

We follow the methodology of Blanchard and Perotti [7] for the identification of our structural shocks u_t,since the errors e_t does not have any economic interpretation.

We have to set three eqution that link the structural shocks with the error forecasts.

$$e_t^T = a_1 e_t^r + a_2 u_t^s + u_t^T \tag{5}$$

$$e_t^s = b_1 e_t^r + b_2 u_t^T + u_t^s \tag{6}$$

$$e_t^r = c_1 e_t^T + c_2 e_t^s + u_t^r \tag{7}$$

The first equation states that unexpected movements in government revenue are due to unexpected movement in interest rate, structural shock in government

[4]Fiscal variables for the case of Morocco exist only in an annual frequency.
[5]Presentation of the DFM is shown in the appendix 1.
[6]Appendix 2 presents the results for the validation tests of our model.
[7]Blanchard, Perotti, R. (1999). An empirical characterization of the dynamic effects of changes in government spending and taxes on output (No. w7269). National bureau of economic research.

spending and structural shock to government revenue. The second equation can be inerpreted in the same way. And the third equation allows unexpected movements in real interest rates in respect with movements in government revenue and expenditure as well as a structural shock of the interest rate.

Now we turn to estimate our coefficients a_1, b_1, c_1 and c_2 in order to identify our structural VAR. Moreover, a_1 is interpreted as the semi-elasticity of government revenue to real interest rate, b_1 is the semi-elasticity of public spending to rela interest rate. c_1 and c_2 will be estimated by a simple regression of e_t^r on e_t^T and e_t^s.

As fiscal variables exclude debt and property income, and according to Perotti (2004) and Parkyn and Vehbi (2013) we set : $a_1 = 0$ and $b_1 = 0$. For the estimation of c_1 and c_2 we find that[8] : $c_1 = -0.38$ and $c_2 = 0.06$

Fianlly, our indentification is presented as follows :

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ -c_1 & -c_2 & 1 \end{bmatrix} \begin{bmatrix} e_t^T \\ e_t^s \\ e_t^r \end{bmatrix} = \begin{bmatrix} 1 & a_2 & 0 \\ b_2 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} u_t^T \\ u_t^s \\ u_t^r \end{bmatrix}$$

3.3 Impulse Response Analysis

The results from the impulse response functions are plotted in the figure below. It shows the reaction of real interest rate to a structural shock on the government expenditure.

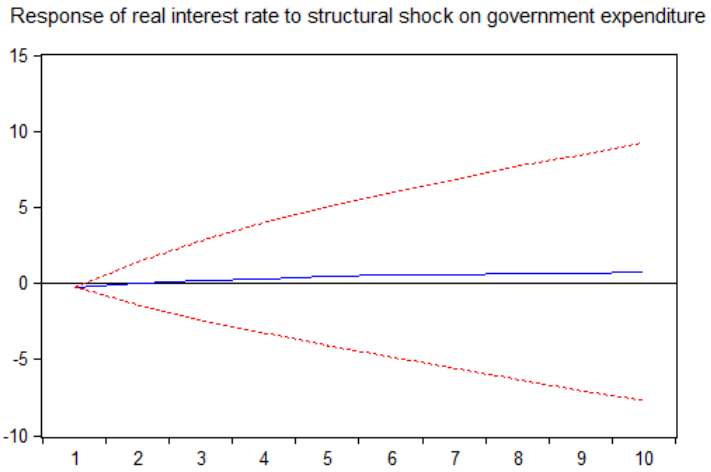

Figure 2: Impact of structural shock of government spending on real interest rate

Figure 2 shows the response of the long real interest rate (maturity of 10 years) to a structural shock of govrnment spending. Overall, the figure illustrates the real

[8]By using the methods of GMM and OLS we found similar results

interest rate constancy facing such a shock. The conclusion that arises is the absence of the crowding out effect.

On the revenue side of government, the impact of structural shock of government revenue on real interest rate is shown in Figure 3.

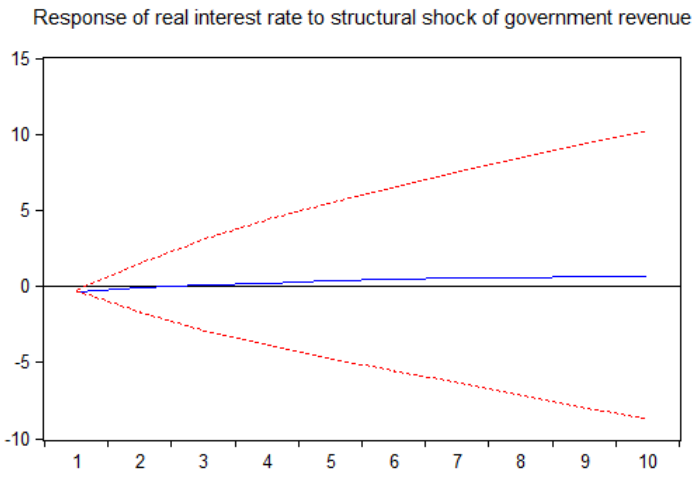

Figure 3: Impact of structural shock of government revenue on real interest rate

As figure 3 shows, the impact of structural shock of government revenue on real interest rate is not significant. In both cases, the real interest rate seems not reacting to an increase in government spending which suggests that the Moroccan economy does not experience the crowding out phenomena.

Public spending in Morocco covers mainly critical infrastructures in order to build a modern economy. These spending includes investments in transportation networks, communications and sectoral programs. Which constitutes a necessary precondition for deployment of private investment. In contrast, in developed countries, public investment becomes a competitor to private investment; it creates pressure on liquidity and imply then higher interest rates that discourage private investment.

Moreover, in developed countries as in developing countries, the component of public expenditure in destination to investment is characterized by a counter-cyclical behavior. Since the consumption goods and personnel expenditure are incompressible in the budget, the economic stabilization action of fiscal policy goes further through public investment. Thus, it can be an engine of investment in times of recession. However, this action is only possible if fiscal policy remains sustainable. Otherwise, presumably, the debt-financed investment leads to higher costs like the crowding out effect.

In Morocco, the weight of public administration in the effort of national investment accounted for 11 percent in the old System of National Accounts. The overhaul of the system has raised the share of public investment to 15 percent due to the integration of military equipment following the international recommendations. This share may seem modest, particularly, relative to government announcements at annual budget of the State. Note that this is due to two factors; the first is that the data of the annual budget class in terms of investment expenses that are not considered as such by the System of National Accounts. The second reason is that the public sector according to the System of National Accounts does not include all the public entrerises.

From another perspective, we see that before the crisis, in 2004-2008, the growth of public investment was higher than private investment and when public expenditure on capital goods was accelerating, private investment seems to react. Similarly, after the crisis, at first public investment tried to play a countercyclical role, it grows from 9 percent to 15 percent, responding to a total collapse of private investment, which declined from 16 percent to -1.2 percent. Then, in a second step, and following the deterioration of budget deficits, public investment has collapsed too.

Taking into account all this considerations, the results found from the structural VAR seems very well explained and the crowding out effect is far from being a preoccupation in the Moroccan context.

4 Conclusion

The present paper has studied the impact of an increase in public spending on real interest rate, in order to state about the crowding-out effect hypothesis. The analysis was performed through a SVAR model and it leads to reject our basic hypothesis .

As developing country, Morocco has been engaged in several investments that weigh on the public finance. Spending in infrastructure, in communication and in welfare seem to build the basis of modern economy that will attract private investments, and the result will not be materialized in the immediat short term.

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Appendices

Appendix 1 : Dynamic Facotr Model à la Stock, Watson (1991)

The model consists of two blocks of equations : Measurement equations and Transition equations.

We include the GDP because this variable is the best related to cyclical fluctuations. And S_t will be our latent variable that is driving the cycle.

Measurement Equations

$$log(GDP_t) = c_1 S_t + \epsilon_{GDP,t}$$
$$T_t = c_2 S_t + \epsilon_{T,t}$$
$$s_t = c_3 S_t + \epsilon_{s,t}$$

Transition Equations

$$S_t = \rho_S S_{t-1} + \eta_{S,t}$$
$$\epsilon_{i,t} = \phi_i \epsilon_{i,t-1} + \eta_{i,t}$$

With $i = log(GDP_t), T_t, s_t$

Appendix 2 : Validation of the VAR

VAR Lag Order Selection Criteria
Endogenous variables: LGR LGE R
Exogenous variables: C
Date: 01/21/16 Time: 11:10
Sample: 1990 2015
Included observations: 22

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-21.97237	NA	0.001944	2.270215	2.418994	2.305263
1	47.64023	113.9115*	7.96e-06*	-3.240021*	-2.644907*	-3.099830*
2	54.43258	9.262283	1.03e-05	-3.039325	-1.997875	-2.793991
3	64.32570	10.79250	1.10e-05	-3.120518	-1.632733	-2.770041
4	73.62035	7.604712	1.46e-05	-3.147305	-1.213184	-2.691684

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Figure 4: Lag length criteria

VAR Residual Portmanteau Tests for Autocorrelations
Null Hypothesis: no residual autocorrelations up to lag h
Date: 01/21/16 Time: 11:20
Sample: 1990 2015
Included observations: 25

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	6.644200	NA*	6.921042	NA*	NA*
2	16.97251	0.3874	18.14746	0.3153	16
3	22.04828	0.6330	23.91538	0.5243	25
4	34.38376	0.4494	38.60048	0.2694	34
5	41.63143	0.5307	47.66007	0.2888	43

*The test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution

Figure 5: Residuals autocorrelation

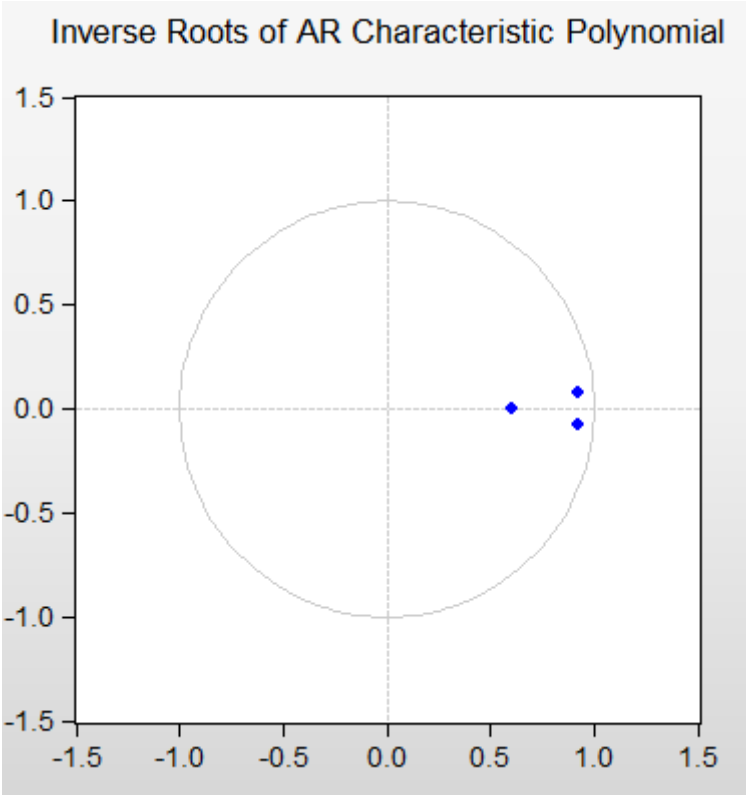

Figure 6: Stability test