

Macroeconomic determinants of public debt growth: A case study for Tunisia

Samia OMRANE BELGUTH

Faculty of Economics and Management of Sfax, University of Sfax, Tunisia
samiaomran80@yahoo.fr

Hanen OMRANE

Faculty of Economics and Management of Sfax, University of Sfax, Tunisia
hanenomrane@yahoo.fr

Abstract. *This article offers an econometric investigation of the macroeconomic determinants of public debt in Tunisia using VECM model for the period 1986-2015. The results of the full sample analysis reveal that inflation and investment reduce the value of public debt. However, real interest rate, budget deficit and trade openness increase public debt. The study shows also the budget deficit is the most important determinant of public debt in Tunisia.*

Keywords: Public debt, budget deficit, fiscal policy, Tunisia.

JEL Classification: E62, H62, H63.

Introduction

The rapid rise of public debt has drawn the attention of policy-makers and economists to the negative effects of excessive public debt (Omrane et al, 2015). As a result of the 2007-2008 financial crisis, an economic downturn caused severe public finance problems. In the Euro zone, the debt ratio increased from 66.2% of GDP in 2007 to 90.7% of GDP in 2015. The sharp increase in public debt is not restricted only to the euro countries, but it has been marked also in other regions and over the same period. For example, in the United Kingdom, public debt ratios increased from over 40% of GDP in 2007, to 89.2 % of GDP at the end of 2015. In the United States, the public debt ratio rose from 60% of GDP to about 104% of GDP at the end of 2015. Even in Japan, the debt ratio which was already high in 2007, 183% of GDP, rose to 229% of GDP. It is clear that this sharp increase in the debt ratio observed in recent times is directly linked to the support programs granted at the period of the crisis and, on the other hand, to the fall in revenues due to recession. It should be pointed out, therefore, that the growth of fiscal deficits forms the major determinant of the increase in the ratio of public debt. Even though the economic situation had finally been brought under control in 2010, the upward trend in the debt ratio of most of the mostly advanced countries continued. For this reason, a lot of studies have conducted a series of analyses to identify the factors that affect public debt size in the economy, which are divided into three major variables including economic variables, political institutional variables, and structural ones.

For Tunisia, the outbreak of the international debt crisis in the early 1980s and the drying up of international funding did not prevent the debt/GDP ratio from increasing and reaching a peak of 57.39 % of the GDP in 1986. This crisis required the intervention of the International Monetary Fund and the implementation of the Structural Adjustment Program in 1986 (Omrane, 2012). Public debt fell from 55.67% of GDP in 1987 to 40.66% of GDP in 2010. In the aftermath of the revolution, an expansionary fiscal policy, based on stimulus through raised government spending combined with a decline of the economic activity, explains the increase of the public debt to 44.49 percent of GDP in 2011 (Omrane and Gabsi, 2017). By the end of 2012, favorable growth dynamics kept the debt-to-GDP ratio constant at 44.47 percent, a relatively comfortable level which is lower than those in similar countries of the region, and achieved despite a wider fiscal deficit (IMF, 2014). The fiscal year 2015 was marked by a worsening security climate, besides persisting social pressure, the impact of which was however, offset by oil prices easing on the international market. Therefore, the budget deficit posted 4.8% of GDP against 5% a year earlier, while the rate of public indebtedness pursued its' upwards trend, rising by three percentage points to 53.9% (BCT, 2015). Thus, the objective of this paper is to deliver the most crucial factors of that support the increased level of public debt in Tunisia and to examine the importance of budget deficit reduction.

The article is organized as follows. Section two briefly reviews the theoretical and empirical literature on the determinant of public debt. The third section details the data. The fourth section describes the empirical strategy and reports the results. The final section offers some concluding remarks and provides policy recommendations.

2. Literature review

Governments may accumulate public debt to support public and profitable investment, for example in physical infrastructures and human resources, by public spending in education and healthcare. Also, in advanced economies, the existence of developed social safety nets partially financed by public deficits that respond, for example, to the increase of the unemployment rate has a vital role as economic automatic stabilizers. Public debt can grow in these circumstances to avoid distorting taxes fluctuations (Barro, 1979). Public debt allows governments to smooth and redistribute tax burdens over time and across generations (Cukierman and Meltzer, 1989). The existing literature on public debt determinant shows that the factors that can affect public debt are macroeconomic, political, institutional and structural variables. Several economic factors can influence the trajectory of public debt such as interest rate, economic growth, inflation, debt stock, budget deficit, public spending, credibility of monetary policy and openness (Drazen, 2000; Imbeau and Pétry, 2004; Swaray, 2005). The level of political instability and political polarization in a country can also affect the size of public debt. Indeed, Edwards and Tabellini (1991) are the supporters of the influence of political instability on the size of budget deficit. In their opinion, the more politically unstable a country is, the larger will be its budget deficit. Political instability increases the frequency of government changes and lowers the likelihood of reelection of a current policymaker. Institutional stability, i.e. absence of government's corruption and quality of the bureaucracy, has also a great impact on the public debt level (Lavigne, 2011). According to Cooray et al. (2016), a higher level of corruption leads to the accumulation of larger public debt. The growth of public debt was also stimulated by structural factors. In fact, population ageing puts strong upward pressure on public expenditure and public debt through two channels: age-related health care and public pension expenditure (Creel et al., 2012). In their research, Veiga and Veiga (2014) indicates that the structure of expenditures and revenues affects the debt level, and higher unemployment rates generate higher debt. The empirical studies estimating the main determinant of public debt remain scarce and limited. In this context, Pirtea et al. (2013) analyze the factors that influence the debt to GDP ratio in Romania. They found that the primary fiscal balance, the real interest rate, the real GDP growth rate, and exchange rate are significant factors. The same results are found by Dumitrescu (2014). Swamy (2015) used Panel Granger causality method and found that real GDP growth, foreign direct investment, government expenditure, inflation and population growth have a negative effect on debt. However, Gross fixed capital formation, final consumption expenditure, and trade openness have a positive effect on debt. Using panel regression, Sinha et al. (2011) confirmed that the main indicators that impact the size of sovereign debt are economic growth, interest rates, inflation, level of current account balance and the level of FDI. The studies of Gargouri and Ksantini (2016) focus-on the identification of the Europeans public debt determinants using the correlated panels corrected errors model. The results show a positive impact of bank nonperforming loans, military expenditures and imports and a negative influence of GDP growth and bank liquid reserves on public debt. The empirical study of Galinski (2015) shows that in Poland, the debt limit growth was significantly determined by the variables concerning the financial situation both in the public finance sector and in the local governments as well as a cost of capital. Recently, Globan and

Matosec (2016) analyse public debt determinants in EU new member states. The results showed that by achieving a more balanced government budget, the growth rate of public debt should decrease. Furthermore, the GDP growth rate appeared to be highly significant, which is expected and consistent with economic theory, higher economic growth should certainly diminish the pressure on internal and external borrowing. In addition, long-term interest rates on government bonds proved to be significant and positively impacting the public debt growth rate, as well as primary budget balance and election year interaction term indicating that, in accordance with the political-budget cycles theory, greater public expenditure in pre-election quarters generates a public debt increase.

3. Data and methodology

Our dataset comprises annual macroeconomic data for Tunisia, over the period 1986-2015. Our empirical analysis is based on the following model:

$$Debt_t^j = \hat{\beta} X_t^j + \mu_j + \vartheta_t + \varepsilon_{jt} \quad \text{Equation (1)}$$

X_t^j is a vector of regressors including lagged GDP, Gross fixed capital formation (gfcf), openness (tgdp), inflation (infl), budget deficit (DB), real interest rate (rir). The dependent variable in the analysis below is the public debt-to-GDP growth rate. It also includes the constant. μ_j is country-specific fixed effects, ϑ_t is time-fixed effects, ε_{jt} is the unobservable error term. The final equation estimated in the model is given as:

$$Debt_t^j = GDPgrowth_{t-1}^j + gfcf_t^j + tgdp_t^j + INFL_t^j + DB_t^j + rir_t^j + \mu_j + \vartheta_t + \varepsilon_{jt} \quad \text{Equation (2)}$$

We provide in Table 1 the description of variables and data sources.

Table 1. Description of variables and data sources

Variables	Description	Source
Debt	Public debt in percentage of GDP	Ministry of finance of Tunisia
Gdpgr	GDP growth	(WDI)
Gfcf	Gross fixed capital formation in percentage of GDP	(WDI)
Infl	Inflation is measured by consumer price index	(WDI)
Rir	Real interest rate	National Institute Of Statistics of Tunisia
Tgdp	Openness/ Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product	(WDI)
DB	Budget deficit in percentage of GDP	Ministry of finance of Tunisia

4. Results and interpretation

Stationarity of all variables has been tested and variables which initially proved to be non-stationary were transformed by taking first differences. The Augmented Dickey-Fuller (ADF) test and Phillips-Perron test are applied to test the stationarity of variables. The results of the unit root test are presented in Table 2.

Table 2. Unit root test (ADF and PP)

Augmented Dickey-Fuller				PP		
Variables	t-statistic	Critical value	Integration order	t-statistic	Critical value	Integration order
Debt	-12.24053	-3.699871	I(1)	-5.138662	-3.689194	I(1)
Gdpgr	-5.857143	-3.679322	I(0)	-5.828742	-3.679322	I(0)
Gfcf	-5.385843	-2.685718	I(1)	-4.293228	-3.689194	I(1)
Infl	-9.070850	-3.689194	I(1)	-9.739121	-3.689194	I(1)
Rir	-5.359216	-2.685718	I(1)	-8.687911	-3.689194	I(1)
Tgdp	-5.909413	-3.699871	I(1)	-6.332247	-3.699871	I(1)
Db	-6.906401	-3.689194	I(1)	-12.35988	-3.689194	I(1)

The results show that the GDP growth is stationary in level but all other variables are stationary in first difference, so this concludes that there is a possibility of a long-term association between these variables integrated of the same order. To discover the long-term association between variables under study, Johansen's Cointegration test is applied.

The first step is to select appropriate lag length for co-integration by using VAR (Vector Auto Regressive) test based on SIC and AIC (Akaike Info Criterion). The VAR estimation test recommended two lag to be the optimum lag length for this model (Table 3).

Table 3. Determination of Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-364.3275	NA	12392.95	26.45196	26.73744	26.53923
1	-265.9601	147.5511	153.6753	21.99715	23.99546	22.60805
2	-193.5616	77.56987*	16.97420*	19.39725*	23.10840*	20.53179*

* indicates lag order selected by the criterion

Next process is to conduct Johansen co-integration test. The results of unrestricted cointegration rank test (trace test and Eigenvalue) are presented in Table 4. From Table 4, we can conclude that the null hypothesis of no cointegration among the variables is rejected in both tests. Both Trace test and Maximum eigenvalue test indicate two cointegrating equation at 5% level of significance. This means that all variables Debt, Gfcf, Rir, Infl, Tgdp and DB are cointegrated or have relationship in the long-run.

Table 4. Johansen Cointegration Test

Trace statistics		Max-Eigen Statistics			
Nul hypothesis	P-Value	Trace statistic	5% critical value	Max-Eigen Statistics	5% critical value
$r = 0$	0.919587	166.0302	95.7536	70.576	40.077
$r < 0 \text{ or } = 1$	0.834433	95.45386	69.8188	50.354	33.876
$r < 0 \text{ or } = 2^*$	0.534045	45.09912	47.856	21.382	27.584

*denotes rejection of null hypothesis at 5% level. Trace Test and Max-eigenvalue Test indicates 2 cointegrating equation at 5% level.

Since the existence of cointegration is found among the variables of interest, the study proceeds to estimate the long-run relationship between public debt and its determinants. Restricted VAR (Vector Autoregressive) is run to estimate the long-run relationship model of public debt in Tunisia. This model is also known as VECM (Vector Error Correction model).

The VECM is specified as follows:

$$Debt_t = \alpha_0 + \alpha_1 tce_{t-1} + \sum_{i=1}^k \beta_i \Delta Db_{t-1} + \sum_{i=1}^k \gamma_i \Delta gf_{t-1} + \sum_{i=1}^k \delta_i \Delta rir_{t-1} + \sum_{i=1}^k \varepsilon_i \Delta infl_{t-1} + \sum_{i=1}^k \theta_i \Delta tgdp_{t-1}$$

Where:

k represents lag length, $I = 1, \dots, K$, tce_{t-1} is the error-correction term, which is the cointegrating vectors and α_1 is the adjustment coefficient indicating the weight of adjusted disequilibrium in the past. To get a long-run relationship among the variables, the coefficient of all variables should be statistically significant (For our study we eliminated the variable of GDP growth because it is not significant).

The estimated results of the VECM are illustrated in Table 5. It is observed that budget deficit has a positive and significant impact on public debt at 1% level of significance respectively. Large deficits caused the debt rise. The same result is found by Sulley (2010), Forslund et al. (2011) and Matiti (2013). In addition, budget deficit coefficient is the highest which shows that budget deficit is the most important determinant of Tunisian public debt. The association of real interest rate with debt is found to be positive and statistically significant. The same result is reached by Gabsi (2004), who showed that the increase of Tunisian public debt cost can be explained by the rise in the real interest rate. Trade openness has a statistically significant positive association with debt, in line with our theoretical propositions. We conclude that more open countries suffer less from balance sheets effects associated with external borrowing (Calvo et al., 2003), and open countries may be more successful in attracting foreign investors into the domestic market. Inflation has a statistically significant negative effect on debt. This result is in conformity with Aizenman and Marion (2009), who also found that inflation reduces the value of debt. Gross fixed capital formation has a negative and significant impact on public debt. Indeed, public investment can boost growth and reduce public debt (Mourougane et al., 2016).

Table 5. Vector Error correction estimate

	Coefficient	Std. Error	t-Statistic	Prob.
TCE(-1)	-0.506974	0.156502	-3.239414	0.0071
Db(-1)	3.100732	0.641632	4.832571	0.0004
dGf(-1)	-2.125722	0.531377	-4.000404	0.0018
drir(-1)	2.880628	0.772896	3.727056	0.0029
dinfl(-2)	-1.079161	0.518837	-2.079963	0.0596
dtgdp(-1)	0.347343	0.083733	4.148234	0.0014
R-squared	0.884635	Mean dependent var		-0.140741
Adjusted R-squared	0.750042	S.D. dependent var		2.512317
S.E. of regression	1.256054	Akaike info criterion		3.594008
Sum squared resid	18.93206	Schwarz criterion		4.313917
Log likelihood	-33.51911	Hannan-Quinn criter.		3.808075
F-statistic	6.572667	Durbin-Watson stat		1.551424
Prob(F-statistic)	0.001171			

Conclusion

The main objective of this study is to examine the principal determinant of public debt in Tunisia using a VECM approach during the 1986-2015 period. The results of the full sample analysis reveal that inflation and investment reduce public debt, whereas real interest rate, budget deficit and trade openness are the main factors that contributed to the increase in the public debt in Tunisia. The above results suggest that the only way to stop the process of debt accumulation is to reduce the primary deficit by continued fiscal adjustment.

The economic situation in Tunisia today is the best proof of our results. In other words, a lack of accumulated resources for debt financing is explained by the increase in external borrowing from international organizations especially after the revolution. The decline in investment, the high level of unemployment and the rise in the inflation rate remain threatening.

Thus, Tunisia must consider the improvement of the productive apparatus for a sustained growth rate of more than 5%, the adjustment of the interest rate to a lower average, the orientation towards a participatory tax system and the rationalization of budgetary choices.

Acknowledgements

We would like to thank Professor Foued Badr GABSI for his significant suggestions and for his beneficial guidance.

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