Original Research Article

The Impact of Debt Financing on Economic Growth

ABSTRACT

Aims: This paper focuses on the issue of the impact of debt financing on economic growth, especially the long-term economic growth in Morocco.
Duration of Study: The public debt and economic growth evolution between 1984 and 2018.
Methodology: In order to answer our research question, we adopt a positivist epistemology with a deductive methodological approach through an econometric modeling. An autoregressive model "VAR" was applied using the stationarity and co-integration's tests and causality's tests.

Results: The findings revealed a significant positive relationship between public debt and economic growth in the period between 1984 and 2018. However, the level of the external public debt service has no significant impact on real growth rate.

Keywords: finance, debt management, economic growth, investment, VAR model, Moroccan economy.

1. INTRODUCTION

In a context of economic crisis and intensification of governments' effort to balance the risk between citizens' health and business, the use of public debt has become a strategic choice of financial and technical support to the majority of economies around the world. Many countries have injected millions of dollars to face the COVID-19 pandemic and stimulus the economic growth. Its level has experienced an unprecedented increase after the 2007/2012 crisis. The high level of public debt would weigh on economic activity and the live of future generations. It is tied to the financing needs of an economy that is due to its budget deficit, the more they get deeper, the more a country borrows on the financial markets, the higher the interest payable and the higher the debt. In recent decades, it has become an indispensable means of financing the economy, particularly in the developing countries.
Indeed, a large number of countries are seeking to strengthen their financing capacity for socio-economic development. This has become more demanding with the emergence of several social movements that demand social well-being. Thus, the governments use the debt, as a tool of the intergenerational solidarity, thanks to the financing and the realization of the investments allowing the development of the infrastructures and the setting up of the suitable conditions to the economy and the population [1].
On the other hand, the debt could be a source of risk if it is not tolerable and exceeds the productive capacities of a country. This risk is further aggravated if the debt is used to finance unprofitable investments or just to cover consumer spending. A debt that exceeds a country's repayment capacity, its future service will be a growing function of the country's level of production. Thus, to avoid any risk of vulnerability, it is essential to assess the potential effects of the public debt pathway on the economy. In these conditions, it has been noted in recent years an intensive flow of foreign capital to Morocco. The country's public debt has accelerated since 2009. It grew more rapidly between 2015 and 2019, reaching a very high level of 925 milliard Moroccan Dirhams (MAD) in 2019 [2]. This situation, to say the least alarming, can be detrimental to the national economy. To this end, and with the intention of containing this kind of financing, it is very interesting to undertake quantitative studies in order to examine the effects of

the public debt and to contribute to the determination of the measures likely to ensure control and recovery.
This worrying situation raises questions about the management of public debt in Morocco and its impact on national economic growth. Thus, we try to answer the following main research question: Does the public debt financing affect economic growth in Morocco?
In order to answer our research question, we have adopted a positivist epistemology with a deductive methodological approach because they are more efficient and objective, allowing from knowledge, theories and concepts to put forward hypotheses which will then be tested by analyzing quantitative data. Thus, we sought to verify the relationship that can exist between the "Real Growth rate" variable and the "Public Debt" composed of its two main variables "public debt" and "public debt charges" using a VAR econometric model.

2. THEORETICAL FRAMEWORK

Despite numerous theoretical and empirical studies that have investigated the relationship between public debt and economic growth, this issue remains controversial. Neoclassical think that the reduction of tax levies financed by indebtedness stimulates consumption in the short term. Indeed, a decrease in the tax burden increases household disposable income in accordance with the Keynesian principle. Thus, any increase in the latter leads to an increase in consumption, which in turn leads to an increase in demand, which results in an equivalent increase in supply to the equilibrium of the goods and services market. This ultimately implies an increase in production and income and of course GDP. On the other hand, the Barro-Ricardian school thinks that public debt has no effect on economic growth. This zero effect of government expenditure financed by debt is often called Ricardian equivalence theorem [3]. According to [4], the burden of public debt negatively affects long-term economic growth because of its negative impact on national savings. This leads to higher interest rates, therefore lower investment, and lower economic activity.
Based on this literature, in particular Keynesian theory, which assumes that public debt implies an increase in production and income, therefore GDP, the hypothesis 1 is proposed as follow: *Public debt promotes economic growth in Morocco*.
In addition to these theories, several models have been specified to evaluate the relationship between public debt and economic growth in order to highlight the existence of a positive impact under certain conditions or a negative impact on investment or on the growth. El Mahdy and Torayen [5] show the negative impact of debt on economic growth in Egypt. The authors used stationarity tests, Johansen co-integration tests, and the error-correction model for estimating the impact of domestic public debt on short and long-term growth.
In his article "The Empirical Analysis of the Impact of Public Debt on Economic Growth: A Case from Nigeria", Obademi [6] analyzed the long-term relationship and the impact of debt. It has integrated both forms of debt, such as external debt and domestic debt. The author uses a Cobb Douglas model developed by applying the co-integration technique. The main finding of the regression estimate is the negative proportional impact of long-term debt on the growth of Nigeria's economy. The ratio of external debt and domestic debt have a negative effect on the growth rate.
According to the Patillo et al [7] model, when the public debt ratio exceeds the 90% threshold, the debt will have a positive but low impact on GDP growth in the long term. However, the effect of a debt greater than 90% is negative and significant. In order to distinguish between developed and emerging countries, Reinhart and Rogoff [8] analyze the impact of different levels of public debt on real GDP growth over the long term. Using a sample of 20 advanced countries and 24 emerging countries over a span of 200 years, the authors reveal the effects of public debt, which amounts to more than 80% in the years following a crisis. The defaults and the bankruptcies have caused a prolonged slowdown in the economic growth and involved a very significant cost. Based on a panel of 38 advanced and emerging countries in a 38-year period from 1970 to 2007, Kumar

and Woo [9] affirm the impact of high debt levels on growth. They include in their model the high level of the long-term interest rate, the high level of a high future distortion of taxes, high inflation and high vulnerability to the crisis.
In a model estimated by the ordinary least squares method and the generalized method of moments, Checherita and Rother [10] show the significant, positive and non-linear impact of domestic debt on economic growth. The optimal threshold of public debt ranges from 43 to 63% of GDP for 93 OECD countries. Taking into account the level of development of a country in the stuy of the impact of the public debt, Mencinger and al [11] highlight the mechanisms of transmission of the short-term impact of the public debt on the growth by an empirical analysis including panel data from 25 European Union's countries. This heterogeneous sample is divided into two sub-groups distinguishing between the old member countries over a period from 1980 to 2010 and the sub-sample of new member countries covering the period from 1995 to 2010. The main results of the authors are that the impact of public debt ratios on the rate of economic growth of GDP per capita is non-linear and statistically significant for the sub-groups of countries in the sample. The coefficient of the quadratic variable "Debt / GDP" is negative, which shows the concave (U inverted) relationship between public debt and economic growth. Notwithstanding, the positive effect of the debt on economic growth becomes negative by crossing the threshold of 80% to 94% for the new European Union countries. In addition, the threshold effect is different for the new countries. It is estimated between 53% and 54% by the econometric models. As a result, the value of the public debt threshold is lower in the new countries than in the former countries of the European Union.
In their research Broni et al. [12] analyse ten years' monthly data using VECM, to find that there is a positive relationship between the external debt and Islamic banking development.

Table 1. Short summary of results of selected empirical studies

Authors	**Period and sample**	**Methods**	**Principal results**
El mahdy et Totayen (2009)	1981- 2006 Egypt	-Co-integration. -ECM -VAR Model	The existence of a strong and negative impact of domestic public debt on economic growth.
Obademi Olalekan (2012)	1975-2005 Nigeria	Cobb Douglas production model estimated by the three-step integration method.	The external debt ratio and the domestic debt ratio have a negative effect on the growth rate.
Patillon et al. (2002)	1969 - 1998 93 Developing countries	The fixed effects method and the system generalized moments method (MMGS)	*Linear growth*: Debt negatively affects growth if it is not reasonable. *Non-linear growth*: The average debt impact becomes negative from a certain threshold (160 to 170% of exports or 35 to 40% of GDP).
Reinhart et Rogoff (2010)	1945 - 2009 20 advanced countries and 24 emergent countries	Simple statistic correlation	- *For emerging countries*: when the external debt ratio exceeds 60% of GDP; the economic growth rate fell by 2%. If the external debt exceeds the 90% of GDP threshold, the growth rate decreases by half. - *For advanced countries*: below a threshold of 90% of GDP, debt has a positive but weak impact on GDP growth in the long term. If the debt rate exceeds 90% of GDP, the debt will have a negative and significant effect on economic growth.

Kumar et Woo (2010)	40 Years 38 advanced and emergent countries	- OLS ; - Fixed effects panel regression; - MMG system dynamic panel regression.	- The public debt coefficients are negative and significant in the two regressions of the advanced countries: MCO and SMMG (-0.014 and -0.024). - The negative effect of initial debt on growth in advanced countries is weaker than in emerging countries (-0.034 and -0.041).
Chercherita, Hallett et Rother (2010)	40 years 1970-2011	The panel fixed effects method	- Non-linear and concave relationship between the debt ratio and the rate of economic growth. - The point of reflection is between 90% and 100%, this threshold represents the average for the 12 countries of the euro zone studied.
Mencinger, Aristovnik et Verbič (2014)	1980-2010 and 1995-2010	The panel regression method of fixed effects	- Non-linear and concave relationship between the debt ratio and the rate of economic growth. - When the debt ratio exceeds 53% and 54%, the debt will have a negative effect on the new European Union countries. - When the debt ratio exceeds the value between 80% and 92%, the debt will have a negative effect on the new European Union countries.

Source: Authors

The analysis of classics approach which postulates that public debt reinforces the dependence of nations on the outside, which generates a flight of capital to abroad and a reduction in savings available to finance the economy, which implies that public debt is detrimental to economic growth. Based on this the Hypothesis 2 was supposed: *The service of the external public debt negatively influences economic growth.*

3. METHODOLOGY

To verify the research hypotheses, a gradual methodological process is opted: firstly, the content analysis method which consists of a documentary study by making reference to books, articles, institutional reports and theses. Then, in a second time, the descriptive method which aims describing the external public debt, the internal debt, economic growth and public investment in Morocco. The third method is the econometric method which consists in applying statistical and mathematical tools on quantified data of the conceptual model of variables.

The models of the literature review, notably the model of El-Mahdy Adel et al. (2010) and that of Patillo (2002) inspires our conceptual model and the determination of the exogenous and endogenous variables. Indeed, to verify the relationship between economic growth and public debt, we opted for a hypothetical deductive research method. More specifically, we sought to verify the association that can exist between the variable "Real Growth Rate" and the variable “Public Debt” composed of its two main components: "Domestic debt" and "External debt" using a Vector Autoregressive (VAR) model.

The study uses a secondary data collected mainly from various national institutions’ data sources. Central Bank of Morocco, Ministry of Economics and Finance, High Commission of Planning, Exchange Office and The General Treasury. Table 2 describes the variables of the conceptual model and the sources of data collection.

Table 2. Description of variables and data sources

Variables	Description	Sources	Code
Real Growth Rate	Is a measure of a country's gross domestic product growth that has been adjusted for inflation.	Ministry of economics and finances of Morocco. Central Bank of Morocco	GROR
Public Investment	Measured by the amount of Gross Fixed Capital Formation.	Central Bank of Morocco	GFCF
Public Debt	The total amount of public loans received by the General Treasury of the country or guaranteed for the benefit of companies. It is equal to the sum of the external debt plus the domestic debt.	-Moroccan General Treasury -Direction of Treasury and External Finance -World Development Indicators of World Bank	PD
Consumption	Household final consumption expenditure includes expenditure actually made by resident households to acquire goods and services intended to meet their needs.	Moroccan Central Bank	CONS
Inflation rate	The inflation rate refers to the percentage change in the price index over a given period, compared to the index calculated in a previous period.	Moroccan Central Bank	INFR
Exportations	The sum of exports of all new or existing goods leaving the territory definitively valued at their Franco A Board (FOB) value	Moroccan Exchange Office	EXP
Population	It is a demographic indicator, which is listing the total of active and inactive people.	Moroccan High Commission for Planning.	POP
External Public Debt Service	The sum of government expenses spent on debt repayments.	-Ministry of economics and finances of Morocco. -Direction of Treasury and External Finance	EPDS

Source: authors

The dataset of the research comprises annual macroeconomics' aggregates data for Morocco, over the period 1984-2018. The choice of the chronological bounds of the 34-year model is justified on the one hand by the years following the debt rescheduling in Morocco concerning the lower bound of the study period, and secondly (for the upper limit) by the economic and financial crises, in particular the debt crisis that several countries experienced in 2011 and which affected the Moroccan macroeconomic balances. We are particularly interested in the phase following the 2011 financial crisis in Euro Zone, which has been characterized by the increase of public debt due to the widening of the budget deficit and which has created very strong debates between the politicians, citizens and academicians.

Therefore, the model research is including eight variables: one dependent variable "GROR" as an indicator of economic growth and seven independent variables namely: Gross fixed capital formation "GFCF", Public debt "PD", Exportations "EXP "Consumption " CONS ", Inflation's Rate "INFR", External Public Debt Service "EPDS" and "POP" population. The functional form of the econometric model is written as follows:

$$GROR^{i}_{t} = \alpha_0 + \alpha X^{i}_{t} + PDY^{i}_{t} + \varepsilon^{i}_{t} \qquad (1)$$

Where GROR is the growth rate of GDP. X is a vector of control variables. PDY denotes to the public debt and captures ε random disturbance term. The final multiple regression equation of the dynamic estimated model is given as:

$$GROR^{i}_{t} = \alpha_0 + \alpha_1 POP^{i}_{t} + \alpha_2 EPDS^{i}_{t} + \alpha_3 INFR^{i}_{t} + \alpha_4 GFCF^{\,i}_{t} + \alpha_5 EXP^{\,i}_{t} + \alpha_6 PD^{\,i}_{t} + \alpha_7 CONS^{\,i}_{t} + \varepsilon^{i}_{t} \quad (2)$$

We provide the conceptual model framework in figure 1. The Arrows are used to denote the proposed relationships among the eight variables in the research model.

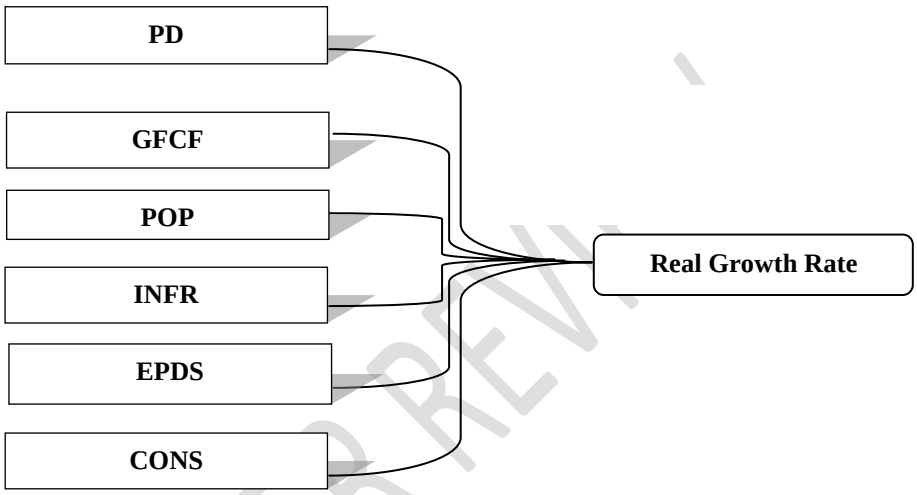


Fig. 1. Model research

Source: authors

4. RESULTS AND DISCUSSION

This section presents the empirical assessment of the relationship between public debt and economic growth. First, the research considers a descriptive analysis to highlight the model's variables trends throughout the study period. The second step, measures the impact using econometric regression.

4.1. Descriptive analysis results

Morocco's public debt has accelerated since 2009. It grew more rapidly between 2015 and 2019, reaching a very high level of 925 milliard Moroccan Dirhams (MAD) in 2019 (Direction of the treasury and external finance, 2020). 585,2 milliard MAD of domestic debt and 339,8 of external debt. This stock of debt is accounting for 84% of GDP. It doubled between 2009 (418 milliard MAD) and 2019. In parallel, the level of investment in Morocco is the medium in comparison with other developing countries, its ratio to GDP equal to 32.6% in 2017. Infrastructure (Trams, ports, high speed train, motorways...) and buildings dominate these investments. The main feature of the investment trend is that its rate has shown a steady trend from 1994 to 2008 (almost 37% of GDP) and then began to fall gradually from 2008 to 2015 to decline until rate of 30.8%. After that, it resumed a slight increase from 2016 to 2019 to reach 318.5 billion MAD against GDP, which amounts to 1151.3 billion MAD in 2019.

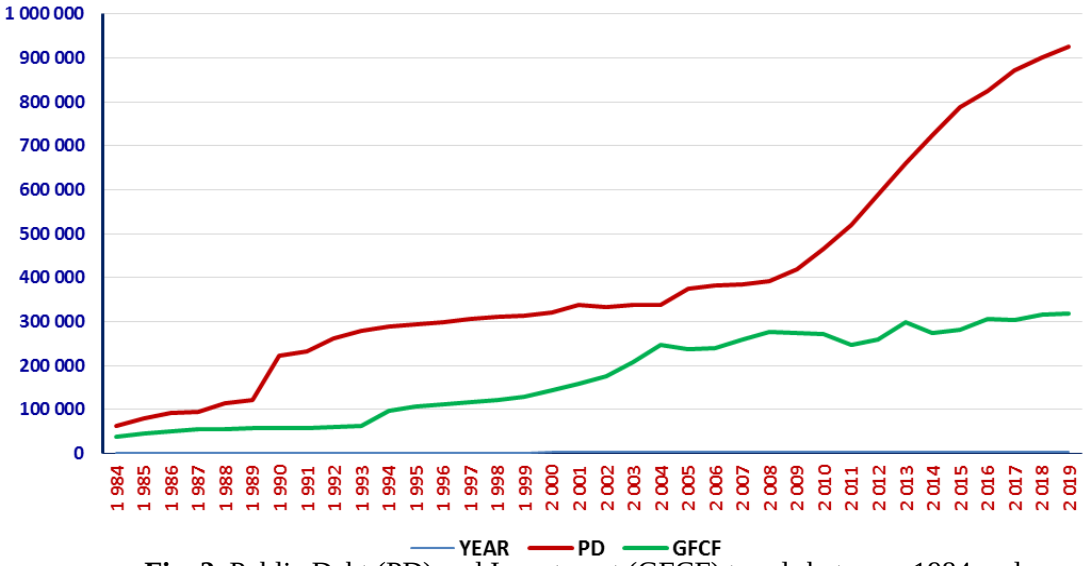
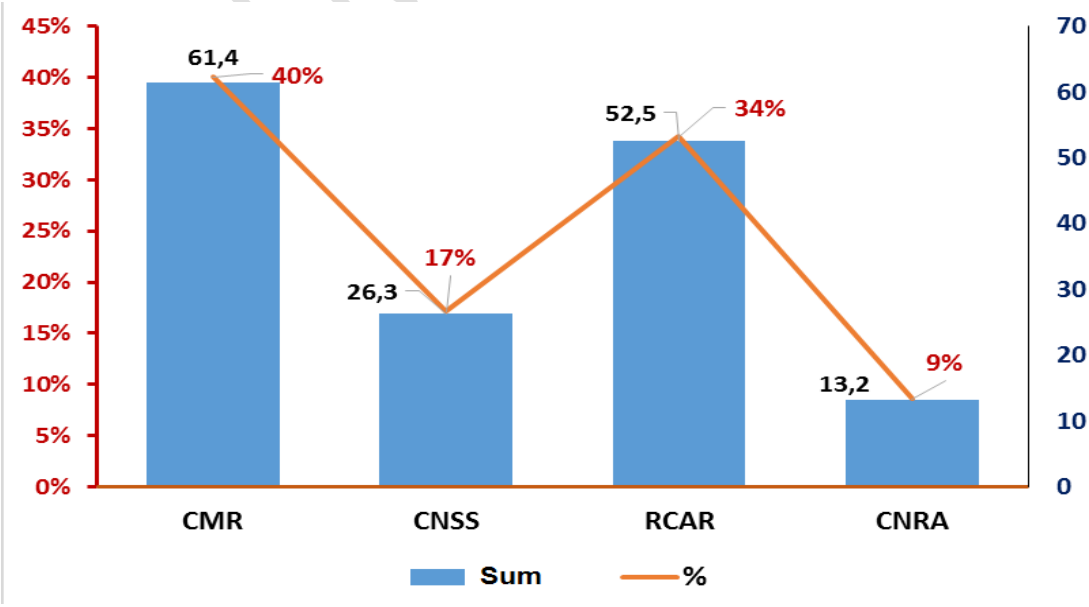


Fig. 2. Public Debt (PD) and Investment (GFCF) trends between 1984 and 2019

Source : authors computation

The last Moroccan institutional reports point to the importance of domestic debt in the Treasury debt portfolio with an average of 77% over the period 2012 to 2019. It is made up of the Treasury's domestic debt and the guaranteed external debt relating to bonds issued by certain public enterprises and public banking institutions. The principal enterprises are, the National office of railways, the Moroccan port of Tangier, the Moroccan agency for sustainable energy, the Moroccan national society of motorways and Credit real estate and hotel bank. For domestic debt contracted by the Treasury, it is held mainly by pension and insurance organizations.



With: CMR is Moroccan Pension Fund, CNSS is the National Fund of National Security, RCAR is Group Retirement Allowance Plan and CNRA is the National Pension and Insurance Fund.

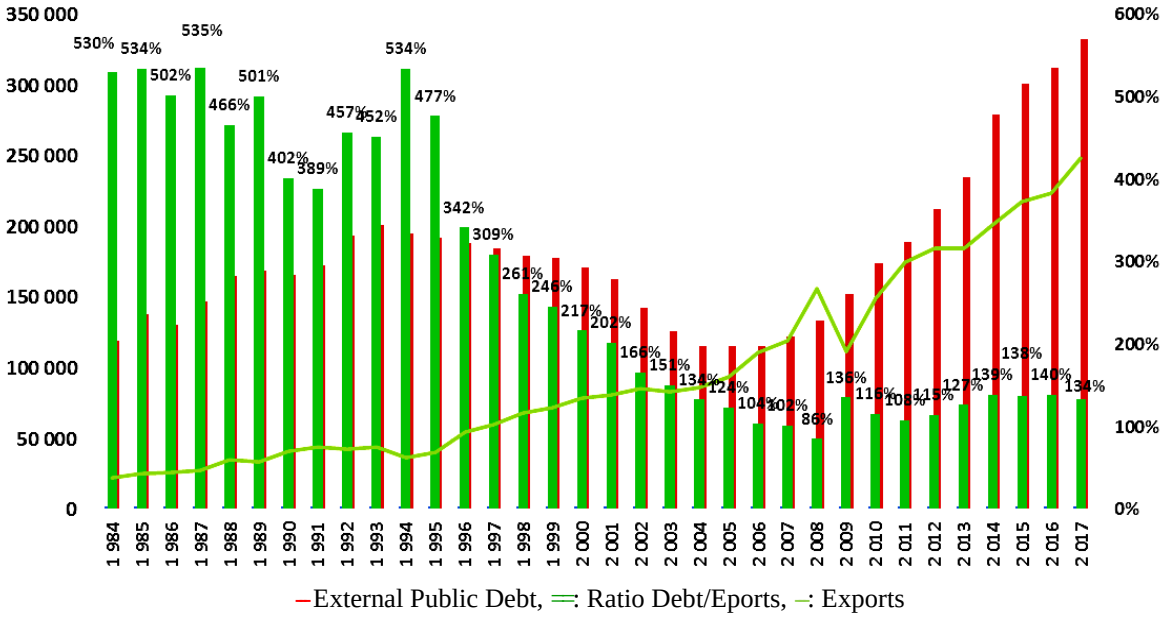
Fig. 3: Structure of domestic debt by holders (Sums on milliard Moroccan Dirhams)

Source : Moroccan Court of Audit, 2018

The structure of domestic debt consists mainly of bonds issued by the Treasury and Sukuk certificates issued for the first time in 2018. Sukuks are securities of equal value representing undivided shares. Its technical characteristics are that they are intended to be placed with resident investors and that the regulatory way fixes their terms of issue.

In addition, public external debt has increased over the last decade, but it remains manageable due to Morocco's debt reduction strategy and its orientation towards the internal market for financing. The ratio of external debt and exports of goods and services has had a downward trend since 1985. Since 2010, its variation is approximately stable, stopping at around 10%. This favorable trend is mainly due to the increase in exports, which doubled between 2009 and 2018, rising from 111,967 million MDH to 275,4 million MDH in 2017. This is due to the dynamics of the automobile industry, the growth of exports of products excluding phosphates and derivatives and improved sales of agriculture and agro-food (Moroccan Central Bank, 2017)[1].

Figure 4. Trend of External Public Debt/exports ratio from 1984 to 2017



Source : authors' compulation.

[1] Moroccan Central Bank, (2017), Rapport annuel, Rabat, p. 76.

4.2. Econometric analysis results

Chronological analysis requires the study of its stochastic characteristics before starting the estimation. It is advisable then to study the stationarity of the series of the model's research. The rule is that if the expectation and the variance of a time series are modified over time, the time series will be considered as non-stationary [13]. On the other hand, they are stationary in the case of the constant of its stochastic process.

4.2.1. Model Specification

The first step is to test the stationarity of the series. The results of the Augmented Dickey Fuller test in table 3, shows that we cannot reject the null hypothesis (H_0) and we therefore confirm that the variables of the model are non-stationary because the ADF statistical test values which are lower than the absolute values of the critical values of the test corresponding to the 5% threshold. This is also confirmed by using the second method *P*-value (*P* *) of the Dicky Fuller's test are well above the critical threshold *P* = 5%.

GROR = C(1)*GROR(-1) + C(2)*GROR(-2) + C(3)*GROR(-3) + C(4)*CONS(-1) + C(5)*CONS(-2) + C(6)*CONS(-3) + C(7)*EPDS(-1) + C(8)*EPDS(-2) + C(9)*EPDS(-3) + C(10)*EXP01(-1) + C(11)*EXP01(-2) + C(12)*EXP01(-3) + C(13)*GFCF(-1) + C(14)*GFCF(-2) + C(15)*GFCF(-3) + C(16)*INFR(-1) + C(17)*INFR(-2) + C(18)*INFR(-3) + C(19)*PD(-1) + C(20)*PD(-2) + C(21)*PD(-3) + C(22)*POP(-1) + C(23)*POP(-2) + C(24)*POP(-3) + C(25)

Table 3. Augmented Dickey-Fuller test statistic at levels

Variables	t-statistic	Critical value	Decision at 5%	Integration order
GROR	-6.416807	-2.954021	Stationary	I(0)
PD	-1.190199	-2.957110	Non Stationary	I(0)
GFCF	-0.289578	-2.954021	Non Stationary	I(0)
INFR	-3.201629	-2.957110	Stationary	I(0)
EXP	-3.589521	-2.981038	Stationary	I(0)
EPDS	-2.975362	-2.954021	Stationary	I(0)
CONS	3.427188	-2.981038	Stationary	I(0)
POP	-1.002091	-2.954021	Non Stationary	I(0)

Source: authors' data analysis

Table 4. Augmented Dickey-Fuller test statistic at first difference

	Augmented Dickey-Fuller test statistic			
Variables	t-statistic	Critical value	Decision at 5%	Integration order
PD	-3.387545	-2.957110	Stationary	I(1)
GFCF	-5.622425	-2.957110	Stationary	I(1)
POP	-5.855120	-2.957110	Stationary	I(1)

Source: authors' data analysis

Coefficients of the VAR model can only be estimated from stationary statistical series [14]. Therefore, we use the co-integration tests to stationarize the variables' series before its estimation. To conduct the Johansen test for co-integration, it is necessary to determine the number of lags, We use several measures for testing the lag length including likelihood ratio tests (LR), Akaike information criterion (AIC), and Schwarz criterion (SC). The analysis of the table 5 shows that the majority of criteria accept a maximum lag of three. Based on these criteria, we find the appropriate lag length corresponding to the lowest value of the criteria, which is lag "3".

Table 5. VAR Lag Order Selection Criteria

Endogenous variables: GROR PD INFR CONS EPDS EXP POP
Exogenous variables: C
Sample: 1985 2018
Included observations: 33

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2415.956	NA	1.38e+57	151.4347	151.7554	151.5410
1	-2188.514	341.1628	2.13e+52	140.2821	142.8472	141.1324
2	-2114.138	79.02389*	7.07e+51	138.6961	143.5056	140.2903
3	-2017.723	60.25931	1.85e+51*	135.7327*	142.7866*	138.0709*

* 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

Source: authors' data analysis

We therefore retain a VAR order (3). Then we specify the system of our model below and which consists of eight models which correspond to the eight variables retained in our research. Using this lag length information, the Johansen co-integration test is conducted for no cointegrating equations, as well as, for up to one cointegrating equation. The Eigen test demonstrates the absence of co-integration for five equations of the econometric model. Therefore, not all variables are integrated and there is no association ship between the variables. So, we can develop a VAR model.

Table 6. Tests of Eigen and Johanson of cointégration

Sample (adjusted): 1986 2018
Included observations: 33 after adjustments
Trend assumption: Linear deterministic trend
Series: GROR PD CONS INFR EXP01 GFCF EPDS POP
Lags interval (in first differences): 1 to 1

Unrestricted Co-integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.935850	279.4877	159.5297	0.0000
At most 1 *	0.875850	188.8521	125.6154	0.0000
At most 2 *	0.777184	120.0055	95.75366	0.0004

At most 3 *	0.561868	70.45900	69.81889	0.0444
At most 4	0.504634	43.22627	47.85613	0.1272
At most 5	0.321069	20.04515	29.79707	0.4198
At most 6	0.196316	7.266387	15.49471	0.5469
At most 7	0.001643	0.054270	3.841466	0.8158

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.935850	90.63558	52.36261	0.0000
At most 1 *	0.875850	68.84664	46.23142	0.0001
At most 2 *	0.777184	49.54651	40.07757	0.0033
At most 3	0.561868	27.23273	33.87687	0.2511
At most 4	0.504634	23.18112	27.58434	0.1659
At most 5	0.321069	12.77876	21.13162	0.4728
At most 6	0.196316	7.212117	14.26460	0.4644
At most 7	0.001643	0.054270	3.841466	0.8158

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: authors' data analysis

4.2.2. Model estimation

The estimation of the parameters can be obtained either by OLS (ordinary least squares) or by maximum likelihood. The use of the OLS is conditional on the confirmation of the hypotheses of the normality, absence of autocorrelation, homoscedasticity.

Table 7. VAR model estimation

Dependent Variable: GROR
Method: Least Squares (Gauss-Newton / Marquardt steps)
Sample (adjusted): 1988 2018
Included observations: 31 after adjustments

Variables	Coefficient	Std. Error	t-Statistic	Prob.
GROR(-1)	-1.578596	0.430558	-3.666398	0.0105
GROR(-2)	-0.698315	0.328258	-2.127337	0.0775
GROR(-3)	-0.719965	0.245467	-2.933048	0.0262
CONS(-1)	-1.12E-06	2.47E-06	-0.452404	0.6669
CONS(-2)	-3.31E-07	3.19E-06	-0.103603	0.9209
CONS(-3)	-2.53E-06	2.50E-06	-1.012069	0.3506
EPDS(-1)	-1.12E-05	8.14E-06	-1.370630	0.2196
EPDS(-2)	-7.61E-06	4.80E-06	-1.585093	0.1640
EPDS(-3)	-2.14E-05	9.78E-06	-2.189596	0.0711
EXP(-1)	-1.51E-06	1.36E-06	-1.106912	0.3107
EXP(-2)	-2.95E-07	8.15E-07	-0.361583	0.7301
EXP(-3)	1.15E-06	1.74E-06	0.657495	0.5353
GFCF(-1)	1.98E-06	1.08E-06	1.837818	0.1157

GFCF(-2)	1.15E-06	1.11E-06	1.041123	0.3379
GFCF(-3)	1.40E-06	9.29E-07	1.503835	0.1833
INFR(-1)	0.041674	0.015305	2.722819	0.0345
INFR(-2)	-0.030205	0.010521	-2.870837	0.0284
INFR(-3)	-0.042986	0.009852	-4.363145	0.0048
PD(-1)	2.67E-06	1.76E-06	1.518531	0.0179
PD(-2)	-4.10E-06	1.73E-06	-2.373849	0.0552
PD(-3)	4.96E-06	1.61E-06	3.078575	0.0217
POP(-1)	1.50E-07	9.68E-08	1.549341	0.1723
POP(-2)	-2.05E-07	9.00E-08	-2.278099	0.0630
POP(-3)	-2.43E-08	7.11E-08	-0.342564	0.7436
Const	3.117250	1.459353	2.136050	0.0766
R-squared	0.956669	Adjusted R-squared		0.783347
F-statistic	5.519582	Prob(F-statistic)		0.020677

Source: authors' data analysis

According to the estimation of the VAR system, the representation of the model is as shown in the table below.

Table 8. VAR Substituted Coefficients

==========

GROR = -1.57859565006*GROR(-1) - 0.698315155305*GROR(-2) - 0.719965014042*GROR(-3) - 1.11922765384e-06*CONS(-1) - 3.30962539827e-07*CONS(-2) - 2.52931564414e-06*CONS(-3) - 1.11509929574e-05*EPDS(-1) - 7.60767979587e-06*EPDS(-2) - 2.14153153634e-05*EPDS(-3) - 1.5054251768e-06*EXP01(-1) - 2.94665472376e-07*EXP01(-2) + 1.14658584579e-06*EXP01(-3) + 1.9774585864e-06*GFCF(-1) + 1.15448515439e-06*GFCF(-2) + 1.39749973211e-06*GFCF(-3) + 0.0416735762969*INFR(-1) - 0.030204551791*INFR(-2) - 0.0429856439452*INFR(-3) + 2.67378511399e-06*PD(-1) - 4.10724280115e-06*PD(-2) + 4.9643851951e-06*PD(-3) + 1.49998690373e-07*POP(-1) - 2.04928507765e-07*POP(-2) - 2.43421783121e-08*POP(-3) + 3.11725043535

Source: authors' data analysis

To ensure the validation of the econometric model, we apply seven statistical tests on the regression function. First, we confirm the normality of the residues because the probability (0.9314) of Jarque-Bera test is more than 5% (figure 5). The Fisher test shows that the coefficients are globally significant as the F-statistic 576.19 is more than t-statistic 3.06 read on the Fisher table. The Student significance tests show that the individual significance of the public debt and the no-significance of the service of the external debt, exportations, population and consumption. On the other hand, the significance of the GFCF and the inflation as well as the overall significance of the model.

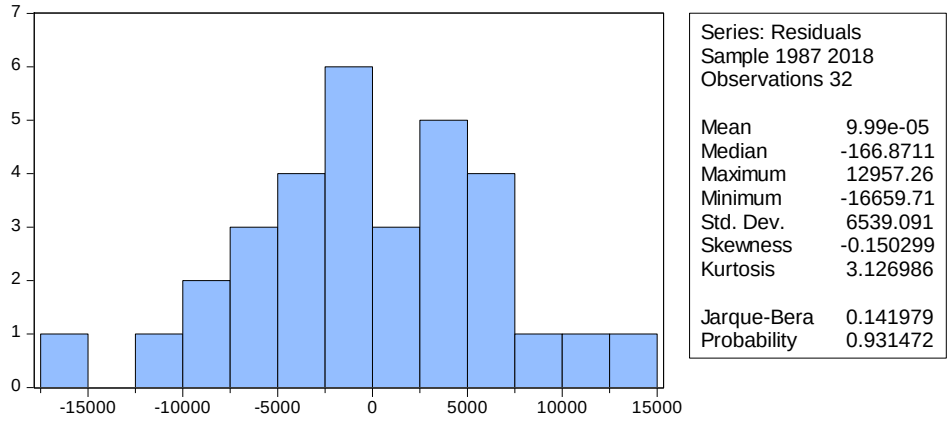


Fig. 5. Jarque-Bera test

Source: authors' data analysis

In addition, we confirm, using the diagnostic stability, the correct specification of the model and the appropriate choice of variables that remain stable throughout the period's study.

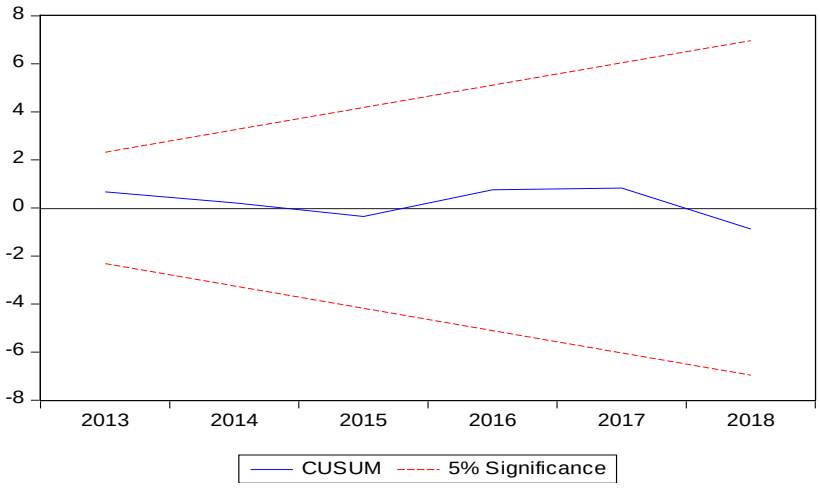


Fig. 6. CUSUM test of diagnostic stability

Source: authors' data analysis

According to Glejser test of Heteroscedasticity, we accept the null hypothesis of the homoscedasticity of the residuals and we reject the heteroscedasticity. In addition, the Durbin Watson statistic (2.530977) is more than zero, which means that there is no residuals autocorrelation problem. So we confirm the performance and the accuracy of the econometric model that is unaffected by the heteroscedasticity and autocorrelation problem. In addition, we have shown that the explanatory power of the model is very strong from the adjusted R-squared value (78%), this value indicated that the variance of the economic growth is explained to about 78% by the explanatory variables.

Table 9. Glejser test of Heteroskedasticity

F-statistic	1.030194	Prob. F(24,7)	0.5256
Obs*R-squared	24.93925	Prob. Chi-Square(24)	0.4091
Scaled explained SS	5.869743	Prob. Chi-Square(24)	0.9999

Source: authors' data analysis

The Wald test was conducted to check the causality's effect. The critical probability of this test is less than the critical threshold of 5%, which allows us to reject the hypothesis of the nullity of the regression coefficients of the variable public debt H_0: C (19) = C (20) = C (21). Consequently, the public debt delayed by 1, the public debt delayed by 2 and that delayed by 3 jointly cause real GDP growth.

Table 10. Wald test

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	3.239315	(3, 6)	0.1027
Chi-square	9.717944	3	0.0211

Null Hypothesis: C(19)=C(20)=C(21)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(19)	2.67E-06	1.76E-06
C(20)	-4.11E-06	1.73E-06
C(21)	4.96E-06	1.61E-06

Restrictions are linear in coefficients.

Source: authors' data analysis

5. CONCLUSION AND RECOMMENDATIONS

The objective of this paper is to examine the effect of public debt on the economy growth.

Based on the descriptive statistics analysis, we observe that the stock's level of public debt in percentage of GDP reached 84%. It doubled between 2009 and 2019. This strong raise of public debt in Morocco and its probable impact on national economic growth were the source of our research question: Does the public debt financing affect economic growth in Morocco?

In order to answer this question, we have adopted a positivist epistemology with a deductive methodological approach. Thus, we examined the relationship that can exist between the "real growth rate" variable and the public debt using a VAR econometric model. Our analysis is based on a multiple model of eight-variable using annual data for the period 1985 to 2018.

First, we have used a VAR econometric model after using the stationarity and cointegration tests which motivated us to choose this type of model instead of Error correction model "MCE". Through the results of the econometric model's estimation, we notice, that the Moroccan public debt has a significant and positive impact on economic

growth. It is statistically significant according to the coefficient of public debt estimated in the regression equation. This result confirms the theory of Pattillo that a debt contained within reasonable limits positively influence economic growth. Whereas, debt service does not affect economic growth or investment, as is well indicated in the model estimation table. These results also confirm Ricardo-Baro's theory of neutrality of public debt. Thus, we deduce that the debt management strategy adopted by Morocco since 1996, which aims to reduce the weight and cost of debt and mitigate risks, has led to significant benefits in recent years.

Second, our findings were confirmed by the Wald test of causality effect which shows that the public debt delayed by 1, 2 and 3 jointly cause the real GDP growth. Also, in accordance with theories of the public debt burden, we conclude that the public debt affects inflation from its coefficient, which is positively significant. This means that any increase in the public debt generates an increase in the rate of inflation. In other words, the state increases taxes to be able to honor its loans, which causes an increase in prices.

In this study, both the econometric Model VAR and Wald causality test highlight the positive effect of public debt on economic growth in Morocco and that the debt service does not affect economic growth. These findings confirm the first hypothesis (H_1: Public debt promotes economic growth in Morocco) and invalidate the second hypothesis (H_2: The service of the external public debt negatively influences economic growth).

In terms of economic policy, despite the good management strategy of the public debt and the good institutional governance of the latter, its recourse to external debt constitutes a real risk that could expose the country to a serious financial, economic and social crisis. In addition, the evolution of the public debt recorded a continuous increase from 2007, while economic growth recorded, in the same period, an average and approximately stable growth rate.

In order to reduce the burden of debt service, the Moroccan government should adopt a strategic and unavoidable choice in national debt reduction policies. In addition, the State should put the necessary mechanisms (studies of high quality public projects, qualified human capital, good governance, choice of productive projects ...) in order to increase the profitability of the debt invested.

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