Sovereign Debt and Economic Growth: Explaining This Relation in The Case of Algeria's Economy During 1970 – 2015 By Using OLS Model

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Abstract:

With the sovereign debt crisis that hit the euro-zone area this last decade, many economists and governors interested to this debatable issue, and pushed many researchers to lunch studies to analyze and clarify the recess of this destructive issue impact on the economy growth.

Recently, many Algerian government officials' voices are going through the roof to borrow from abroad to face the current severe situation that is the drying of government financial resources due to the sharp decrease of oil prices in the international market that is being in glut. For that reason, we try to show to them in this piece of investigation, the impact of this kind of debt (sovereign debt) on Algeria's economic growth, for the purpose of measuring the burden of this debt and clarifying its hurdle to the growth of Algeria's economy. OLS regression model has been used to meet the aim of our study along with descriptive statistics, unit root test and Granger causality test over the time series data of the period 1970-2015.

The results show that all the dependent variables adopted in our study **are** statistically insignificant, with a very low positive impact of sovereign debt stock on Algeria's economic growth that is accompanied by a heavy negative impact of its service (burden).

Key words: Sovereign debt, economic growth, OLS regression, Algeria's **economy**, external debt.

Résumé:

Avec la crise de dette souveraine qui a frappé la zone euro cette dernière décennie, de nombreux économistes et gouverneurs se sont intéressés à ce sujet et lancer des études pour analyser et clarifier l'impact de ce phénomène destructive sur la croissance économique. Récemment, de nombreux responsables gouvernementaux algérien veulent s'orienter vers l'emprunt international afin de faire face à la grave situation actuelle de l'assèchement des ressources financière nationales à cause de la forte baisse du prix de pétrole dans le marché international. Dans ce travail, nous tenterons l'impact de ce type de dette (dette souveraine) sur la croissance économique de l'Algérie, par la mesure de sa charge (burden) et la clarification de son obstacle à la croissance de l'économie algérienne.

Nous avons eu recours à une analyse statistique descriptive, complétée par une analyse empirique en reprenant lemodèle de régression OLS, où nous utilisons le test de racine unitaire et le test de causalité de Granger sur une série chronologique de la période 1970-2015.

Les résultats montrent que toutes les variables dépendantes retenues dans notre étude sont statistiquement non significatives, avec un très faible impact positif de la dette souveraine sur la croissance économique de l'Algérie qui s'accompagne d'un fort impact négatif de ses implications.

Mots clés : Dette souveraine, croissance économique, régression OLS, économie Algérienne, dette externe.

ملخص:

مع بروز أزمة الديون السيادية التي كادت تعصف بمنطقة اليورو مؤخرا ، حول العديد من الاقتصاديين و كذا أصحاب القرار اهتماماتهم إلى دراسة و محاولة توضيح وتحليل تأثير هذه الأخيرة على النمو الاقتصادي .

في الآونة الأخيرة ، تعالت أصوات المسؤولين في الجزائر على تبني اختيار اللجوء إلى الديون السيادية لمجابهة أزمة شح المارد المالية للحكومة كنتيجة لتدهور سعر البترول في الأسواق العالمية.

على ضوء ذلك ، نحاول من خلال هذا البحث المتواضع ،دراسة اثر هذه الديون على نمو الاقتصاد الجزائري من خلال قياس عبء هذا النوع من الديون وتوضيح العقبات التي يمكن أن تشكلها على الاقتصاد الجزائري ،وللوصول إلى ذلك ،فقد قمنا باعتماد نموذج المربعات الصغرى OLS لتوضيح العلاقة بين الديون السيادية و نمو الاقتصاد الجزائري مستعينين على ذلك على أدوات إحصائية مساعدة أخرى منها :الإحصاء الوصفي ، اختبار وحدة الجذر(unit root test)، و اختبار Granger على سلسلة زمنية للفترة الممتدة ما بين 1975-2015 .

نتائج البحث توضح إن المتغيرات الإحصائية ليست لها دلالة إحصائية ومع وجود تأثير ايجابي طفيف للديون السيادية على النمو الاقتصادي الجزائري

الكلمات المفتاحية : الديون السيادية ، النمو الاقتصادي ، المربعات الصغرى OLS، الاقتصاد الجزائري ، الديون الخارجية .

1-Introduction:

Since the sovereign debt crisis almost blew up the euro zone area , as a result of odd disagreements among euro-zone area members , many studies have been lunched to investigate the deep impact of this kind of debts on the economy of different developed and developing countries ,noticing that the impact of foreign borrows funds on economic growth and development is a hot and debatable issue since the 80's of the last century, especially , the developing countries that suffered a massive external debt that held from the international monetary and capital markets to finance those countries investments and projects plans adopted especially after those countries independence .

Algeria, one of these developing countries, has adopted many national projects and development plans which were driven by the government. This one pushed the public expenses to rise hastily, and caused a serial of budget deficits as a result of expand in government consumption, transfers, subsidies, public investments..., etc. This situation motivated Algeria's officials to decide to go toward the external resources to finance its budget deficit and get a financial support to achieve the government objectives and back up the economic growth in the country .

At the end of the 80's and the beginning of the 90's of the last century, Algeria as an oil exporter, was disable to meet its sovereign debt (public and publicly guaranteed debt) repayments, due to the sharp fall in oil prices in the international markets, while the country was at the beginning of a huge crisis at all levels (society, economy, insecurity,...), while Algeria's economy recorded a negative economic growth from -1,2% to -2,1% , in 1991, 1993 respectively, and moved to -0.9% in one year later, due to: the crisis mentioned above, the poor reforms and poor economic performance registered during the period of 90's, that was accompanied with inability to meet the repayments. That was one of the serious barriers to the inflow of foreign direct investments and external resources.

However, since the swollen of oil prices in 2002 that kept rising in the international oil markets to reach 112.94 $ / barrel in average in 2011[(1)], which made the financial health of Algeria very safe, and sufficient funds to meet its repayments without reducing the domestic resources available for development.

Despite of that, in a view of current situation of Algeria's economy that is in very critical conditions because of the luck of financial resources due to the massive fall down of oil prices that is almost 60 % (in average) of budget income resources in the international oil markets that are in glut. This situation makes Algeria's officials face the choice of foreign indebtedness to gradually solve the lack of financing resources to insure an acceptable level of public services and public investments, or continuing their abstinent policy year by year and make more socioeconomic pressure on citizens, especially the taxpayers' consumption capacity.

In this article, we investigate the implications of Algeria's sovereign debt (Public and publicly guaranteed debt) on Algeria's economic growth during 1970 - 2015.

The article is organized as follow: first, we present the theoretical and empirical studies review, second, we explain the importance of the model, data presentation (presentation of variables adopted in the

(1) - Annual report of bank of Algeria 2013 : http://www.bank-of-algeria.dz/pdf/rapportba2013/chap4_2013.pdf

model), third, we present the results and their interpretation and we finish this work with a conclusion.

2- Theoretical and Empirical Studies Review:

-The Classics Thoughts on Public Debt(1):

Historically, Classical economists like Smith, Ricardo and J.S. Mill had defended the idea of no need for the government intervention in the economic activities 'They have straitened the government responsibility in insuring some minimum functions such as : maintaining internal law, national defence , property rights protection ,... etc. They believe in individualism that lead to reach the public interest, which make nonsense for the government to bear huge expenditures that are considered as wasteful and unproductive charges. So, for the classics, the government doesn't need to increase his funds, especially by borrowing money as public debt. They claimed that the repayments of the public borrowing could make a heavy burden on private employment and private spending due to switching the withdrawals of repayments amounts from productive uses to the unproductive Channels.

The above idea was extended by the neo-classical economists like A.C.Pigou who adopted the principle of neutrality of the state in the economic path-(He has called this principle as:"leave them as you found them")(2), where the government intervention was limited to the correction of private market failures as a result of misallocation of economic resources.

- The Keynesian Theory of Public Debt:

The Great Depression of last century's 30s, pushed many economists to appear and explain what happened, the brilliant one of that period is the British economist Keynes (1936), who has criticized the classical thoughts and argued that a rise in public borrowing leads to increase the effective demand in the economy that also leads to more employment and more output thus rise the national income.

(1) - Tsoulfidis L.(2007) ," Classical Economists and Public Debt", International Review of Economics,vol.54 ,p.2.

(2) - Chand S.N.,"Public Finance ", ATALANTIC Publishers and Distributors, India, 2008, Page 91.

M.Buchanan (1958) had defined the basic assumptions of the "new orthodoxy". Those assumptions are(1):

1- The creation of public debt doesn't involve any transfer of the real primary real burden to future generation.

2- The analogy between private debt and public debt is wrong.

3- There is a sharp and important distinction between internal and external debt.

- Post-Keynesian Theory of Public Debt:

The remarkable rise of public debt that was being followed by inflation and price rise as well as a massive increase in government spending, led to reviving the debate on whether the public debt hamstring the economic growth and how to evaluate its burden .

Others like Modigliani (1961) and Meade (1958)(2) argued that the public borrowing is a burden on future generation, due to the sustainable reduction in future capital formation as a result of debt payback that could be financed by increasing taxes .that one directly drive the private capital formation and private consumption to decline.

The previous results were also argued by Musgrave (1988)(3) who declared that the burden of public debt exists, and leads to a reduction in private investment and consumption to future generations. Musgrave has also considered that the generation that issued the debt should repay it back within its life period.

In addition to the theoretical reviews mentioned above, many empirical investigations have been launched, among these empirical studies we mention:

- P.A. Diamond (1965) had presented: "National Debt in

(1) -Vandana M. Punnakal ," Some Aspects of Public Debt : A Select Study ",GOKHALE Institute of Politics and Economics , 1992 , page 14 .

(2) - Checherita C. , Rother Ph. (2011)," The Impact of Government Debt on Growth. An Empirical Investigation for the Euro Area », Revue économique ,Vol. 62, p.1017

(3) - Musgrave R. and Musgrave P.(1984),"Public Finance In Theory and Practice ",McGraw-Hill, Inc ,Fourth Edition ,USA,p.691-694

Neoclassical Growth Model" that serves two purposes. The first one is to examine long run competitive equilibrium in growth model and the second one is to explore the effect on that equilibrium of public debt where the author contended that external debt has two effects in the long run(1):

a-The more tax-cuts needed to cover debt servicing reduce the obtainable lifetime consumption of the individual taxpayer, because, the rise of tax cuts that taxpayers bear, lower their equilibrium wage points level and interest rate, without the option of financing a part of that debt service by additional debt .

b-The decrease of savings and capital stock due to the taxes, the taxpayer bear, reduce his disposable income.

The author mentioned also that whatever the debt is internal or external leads to raise the equilibrium interest rate, as a result of decreasing the supply of capital.

Also, T. K. Jayarama and E. Lau (2009)(2), had examined whether foreign debt funds to finance their raised budget deficits due to the sharp decrease of their annual aid inflows from developed countries including USA, Australia, EU,…etc, stifle the economic growth in pacific island countries whereas the empirical study findings show that the pacific island countries are efficient users of external debt as a result of reaching higher growth results.

The study also shows that the debt paybacks didn't cause a heavy burden due to the exports' earnings, so the authors' investigation results confirm that there is a positive impact of foreign funds borrowed to finance projects and programs, to enhance the export earnings capacity as well, on the economic growth.

E. Karagöl (2002)(3) argued that the debt service burden influences negatively the investments and capital accumulation. In his

(1) - Diamond P. A. (1965),"National Debt in Neoclassical Growth Model ", American Economic Review,Vol.55,December,p.1126-1150.

(2) - Jayaraman T.k. and Lau E. (2009),"Does External Debt Lead to Economic Growth in Pacific Island Countries?",Journal of Policy Modeling ,Vol.31,p. 272-288.

(3) - Karagol E. (2002),"The Causality Analysis of External Debt Service and GNP.The Case of Turkey ', Central Bank Review, ,p.39-64.

study : " The Causality Analysis of External Debt Service and GNP : the Case of Turkey ",he concluded that debt service has inversely contributed to the GNP in the long run as same as the short run, which means that the sovereign debts are mis-allocated or wasted in consumption. Moreover, the negative effect on productivity hamstring the economic growth in the future, resulting obstacles in repaying back the external public debt as a result of the cuts on future output that lower the government ability to intervene in the market as well as a decrease of the privet sector willingness to invest.

Another study of A.K Rose (2003)(1) explains three reasons that may push debtors' countries to repay their debts, which are:

1- Their overseas assets seized by foreign creditors.

2- Suffer the cut-off from capital flows in the future

3- Suffer reduced benefits of international trade

Moreover, debtor's countries could be excluded from capital markets. All these push the debtors to renegotiate their sovereigns that are accompanied with a fall in international trade transactions volume, as a result of a decline in a bilateral trade between debtors and creditors.

Another interesting investigation(2) examined the impact of budget deficits on economic growth, where the impact was complex, and its according to the choice of the countries to finance their budgets deficits (grant aid, tax revenue, money printing, or by internal and external debt,…).The authors also found that there is no linear regression between developing countries budgets deficits and economic growth, and showed that changes in debt stocks have a significant reverse contribution on growth . (C.Adam and D.L.Bevan (2005)).

(1) - Rose A. k. (2003),"One Reason Countries Pay Their Debts: Renegotiation and International Trade", December.

(2) - Adam C. S. and Bevan D L. (2005)," Fiscal Deficits and Growth in Developing Countries ", Journal of Public Economics 89, p.571-597.

The best way to think about a reverse contribution of sovereign debt on economic growth is explained by Krugman (1988)[(1)]. He argued that it is due to the situation where the actual value of the resource transfer that the creditors expect to make in the future is less than the borrowed loans. In other words, the country is unable to meet its repayments by the current resources that make the lenders face two choices: The First one is to keep financing the country regarding that the situation will be improved and make the country able to repay its debt in the future. The second one is to Forgive, by accepting to reduce the debt level to the level that make the country (debtor) able to repay it. He also declared that the choice between these two options (financing or forgiveness) represent a trade off that can be improved if both options are made contingent on states of nature that cant be affected by the country, such as oil prices, world interest rates ... etc, where debt funds' payback problem is associated with the liquidity problem that could result debt overhang.

In another study, Reinhart and Regoff (2010)[(2)] focused their analysis on the long run impact of much higher public and external debt. Their findings shows that for the emerging markets, when the gross external debt reaches 60 % of GDP, that drives the annual growth to decline by about 2%. And when the sovereign debt excesses the level of 90 %of GDP, the growth rates cut in half.

They also indicated that the public debt in some countries that suffered a systemic financial crisis such as: Iceland, Ireland, Spain, United Kingdom ...had risen their public debt by an average of 75%, while others countries that didn't experience a financial crisis had risen it by around 20% during 2007-2009. As a result of direct bailout costs for some countries and to deal with the global recession in many countries, and also to cover the keen decline in governments income, these authors have also noticed that there is no obvious link between debt and growth until public debt reaches a level of 90% Of GDP. They also mentioned that a higher debt levels (> 90% of GDP) is

(1) - krugman P. (1988),"Financing vs. Forgiving: A Debt Overhang ", National Bureau of Economic Research, Cambridge, January.
(2) - Reinhart C. M. and Regoff K. S. (2010) ," Growth in a Time of Debt ",American Economic Review: Papers & Proceedings 100 ,May,p.573–578 .

accompanied with higher levels of inflation in both, emerging and advanced economies.

C. Checharita and P.Rother (2010)(1) had confirmed these results. They found that when public borrowing to GDP ratio is between 90% - 100% this lead to a lower growth rates in the long run. In addition, the annual changes in debt level are also negatively related with the economic growth rates. These results drive us to know whether a Public Debt Level when it raises over 90% of GDP is a turning point between Public Debt and Economic Growth.

These authors also argued that the government budget deficits have a negative impact on the growth rate. In this case, the government spending could be driving the economic growth, which makes the government leaders have to swiftly implement strategies to reduce the share of the public debt, especially the sovereign debt.

In fact, Reinhart and Rogoff were criticized by T.Herndon et al (2014) (2)who found that Reinhart and Rogoff made significant mistakes in their study about countries with a public debt that excess 90% of their GDPs which made their economic growth rates experience a major decline. The key problem in Rogoff and Reinhart research was the exclusion of data, spreadsheet errors ,…etc , that led to reduce the measured average of GDP growth rate for the countries that registered debt ration over 90%. Herndon et al (2014) showed that the determination of the turning point of public debt that influence negatively the economic growth rate unclear, which means there is no clear level of public debt that can make the GDP growth fall sharply.

In another way, D. Cohen (1986) (3)has analyzed the economic growth during debt time in a country that has the option of neglecting

(1) - Checherita C. , Rother Ph. (2010),"The Impact of High and Growing Government Debt on Economic Growth ," An Empirical Investigation for The Euro Area ," European Central Bank ,August .

(2) - Herndon T. , Ash M. and Pollin R. (2014),"Does High Public Debt Consistently Stifle Economic Growth? A critique of Reinhart and Regoff ",Cambridge journal of economics ,Vol 38, ,p.257-279 .

(3) - Cohen D. and Sachs J. (1986),"Growth and External Debt Under Risk of Debt Repudiation ",European Economic Review 30, p.437-472

or acknowledging its foreign debt. He has articulated the equilibrium strategy of Lenders, which make the growth of sovereign debt move the same way with the economic growth rate of the borrowing country. He also mentioned that the borrower country never repays the full amount of its repayments, but only the amount that makes the debt grow at the same rate as its GDP growth rate. That's what drives the lenders to strategically weaken the probability of debt non-payment to the borrower country and get paid back. This situation also guides us to think also about the debt level that make the borrower country indifference between repaying and repudiating the debt. The decision here is related with the ability of the borrower country to borrow more in the future.

3- Methodology and Data Collection:

This study focuses on the investigation of sovereign debt (External Public and Publicly Guaranteed) and its repayments' impact on Algerian economic growth during 1970 - 2015, to investigate that, we adopted a method of LEAST SQUARE REGRESSION, in addition of pre-estimation statistics to back up the results of the model we used.

4-Data Collection and the significant model:

To obtain all the Data collection we have consulted several websites and annual reports that are generally as follow: Website of World Bank(1), Annual Reports of bank of Algeria(2), IMF web site (3), the website of index mund(4)i. In order to meet with the main objective of this study, that's the investigation of sovereign debt and its repayments impact on Algeria's economic growth represented by real DGP growth rate in Algeria during 1970 - 2015, we adopted an empirical model that's is explained in the following function :

Y = f (SD, GCF, GDS, SDS, SDSX, SDGNI, RESSD)

The Estimation Equation:

(1) - World Bank Data: https://data.worldbank.org/country/algeria.
(2) - Annual reports of Bank of Algeria 2002-2015.
(3) -IMF web site : https://www.imf.org/en/Countries/DZA.
(4) - Index mundi web site: https://www.indexmundi.com/algeria.

GDPr = a + a1 SD + a2 GCF + a3 GDS + a4 SDS + a5 SDSX + a6 SDGNI + a7 RESSD + 3i

Where:

GDPr : Real Gross Domestic Product Growth Rate

SD: Sovereign Debt (External Public and Publicly Guaranteed Debt)

GCF: Gross Capital Formation

GDS: Gross Domestic Saving

SDS: Sovereign Debt Service

SDSX: Sovereign Debt Service to Exports Ration

SDGNI: Sovereign Debt to Gross National Income Ration

RESSD: Country's Reserve (in foreign currencies) To Sovereign Debt Ratio.

3i: Error Term

a,a1,....,a7 : Coefficients : measure the impact of each dependent variable on real growth rate .

We notice that: the main variables that we used for our investigation are: SD, SDS, SDSX, SDGNI, and RESSD. According to several theoretical studies, SD has no clear relation with economic growth, its impact could be negative or positive (T.Herndon et al 2014). But, SDS, SDSX, SDGNI are considered to have negative coefficients (they refer to the sovereign debt burden. (Diamond (1965) Musgrave (1988)), and positive coefficient for RESSD variable as it is considered as insurance for the sovereign debt repayments.

5- Definition and Evolution of the variables:

GDPr : Real Gross Domestic Product growth rate that is considered to represent the real economic growth in my study as a dependent variable that is very complex task based on , social , political, economical and technological factors. This variable registered its lowest value by - 11,33% in 1971 and its highest value ever just one year after 27% (1972). This high rate was due to the nationalization of hydrocarbons resources that made a tremendous

upward in governments abilities to produce and to finance its planned economic development projects adopted according to the industrialization policy in that decade (GDPr development is represented in graph GDPr , Appendix 2).

SD: Sovereign Debt is one of the main variables in the model adopted in our study, that's defined here as public and publicly guaranteed debt denominated in foreign currencies. This variable is an independent variable where it has an unclear direct effect on economic growth. Generally, one of the import causes that drive governments that suffer low economic growth rates is the lack or the insufficiency of internal savings. This situation pushes the governments' officials to turn to the external markets to compensate that lack of internal savings (financial resources), to meet with the planed projects that may accelerate and rise the economic growth rate. However, the accumulation of these sovereign debts (debt overhang), has a negative impact on economic growth. In this case, the paybacks of the sovereign debt are heavy and countless for the economies which means transfer important financial resources and make them unproductive by using them in paying back the previous borrowings in foreign currencies.

Algerian sovereign debt hit its highest level at 31,31 billion dollar in 1995, as a result of the severe period that started in 1986 ,where the price of the main exported product (oil) felt down sharply to reach 8 $/barrel. That led to a scarcity of financial resources and drove the government to borrow more from the external market where the debt level jumped by almost 19% to reach 23,12 billion dollar in 1987, against 19,48 billion dollars in 1986 . That period was followed by serious crisis in all levels in Algeria (the black decade: insecurity due to terror, social crisis, economic crisis ...etc).

With the back of oil prices in the international markets to increase which was accompanied with the change for better in national security since 2002 that made a huge improvement in Algeria's solvency that let the officials negotiates to anticipate payback its sovereign debt in several ways (debt equity swap, and debt equity back,….) lowering them to a very low level at 1,112 billion dollars. (SD's evolution is represented in graph SD, Appendix 2)

GCF: Gross Capital Formation refers to the net capital accumulation that is the value of a proportion of GDP such as tools, equipments, transportation saved to replace the assets that are current used to create goods and services, which lead to accelerate the increase in output. So, it drives the economy to register a fast progress and create an additional wealth. This variable is supposed to have a positive direct effect on the economic growth.

Since 1970, gross capital formation raised rapidly, especially after 2000, in Algeria. Where its lowest value (according to my data) registered in 1970 by 1, 66 billion dollars against 78, 33 billion dollars (45, 6% of GDP) as its maximum share in 2014. We mention that this variable is supposed to have a direct positive impact on economic growth of Algeria. (GCF evolution is represented in graph GCF, Appendix 2).

GDS: Gross Domestic Savings refers here to the sold of gross domestic product minus final consumption expenditure which means that it is an available resource that would be used to invest. we observe that gross domestic savings raised progressively, especially since 1998 due to economic growth registered that year by 5,1% till 2008 ,where this variable registered a massive fall down to 63 ,52 billion dollars in 2009 as a normal result of the sub-prime crisis shocks that hit the world economy. The graph GDS (Appendix 2) shows that the gross domestic savings evolution since 1970 reached its highest value in 2012 by around 99, 36 billion dollars (almost 48 % of GDP), against 1, 32 billion dollars as its minimal level registered in 1971. In our study, this variable is supposed to have a positive direct effect on economic growth of Algeria.

SDS: Sovereign Debt Service is one of the main variables in the model. This variable measures the weight of sovereign debt paybacks as a burden on the economy of Algeria. We expect that this variable has a negative direct influence on the national economy, where the paybacks are considered as a transfer of available financial resources to unproductive path which reverse contribute the economic growth.

We observe (From the SDS's graph, Appendix 2)) that this variable is gradually raised since 1970 up to 1991 due to the high growth of indebtedness scrounged by Algerian government to meet

with the projects planned for the development of the country, then , massively dropped to the level of 3,98 billion dollars in 1995 . because , the severe crisis hit the country in its all levels (security , social , economy ,...) .this variable still wobbling among 3,9 billion dollars and 4,7 billion dollars and 3,82 billion dollars in2003 , to start raising one year after , reaching its highest level in 2006 by 13,19 billion dollars. That is due to the good financial health of the country that was cured by the tremendous increase in oil prices that made the country's solvency very healthy, which encouraged the officials to renegotiate debt payback with Algeria's foreign lenders.

SDSX: Sovereign Debt Service to Exports, this variable refers to the burden of sovereign debt service on exportations which means the ability of the exports to provide foreign currencies to cover the payback of the funds borrowed. It is also considered as a measure unit of the burden of unproductive expenses with the level of providing foreign currencies that are used to repay those sovereign debt services.

According to SDSX graph(Appendix 2) ,we observe that since 1970 , the value of this ratio has gradually raised to reach its highest level ever by almost 91 % in 1993 ,which constitute a very heavy burden where 91% of the foreign currency provided by the exportation cover Algeria's sovereign debt payback .However , one year after(1994) , this ratio dropped to 44% , and still decreasing to its minimal level by 0,3 % In 2014 , due to the sharp decrease in sovereign debt service value against high level of exportation due to the high price of oil. This study expects a negative direct impact on Algeria's economic growth.

SDGNI: Sovereign Debt to Gross National Income, this ratio measures the indebtedness level to the gross national income of the country, which refers to the ability of the country to face and meet its repayments by making a proportion of the national income to switch to unproductive expenses.

We observe (from SDGNI's Graph, Appendix 2) that this ratio was progressively increased during the period 1970 - 1979. it was due to the raise of the borrowed funds to cover the lack of funds to finance the national growth projects, which made the burden to raise from 20% in 1970 to 42,5 % in 1979.one year after (1980)this ratio declined to 38% , keeping its fall to reach a low level in 1985 by almost 27%

due to the positive growth of GNI registered during the period 1980 to 1985 .after, this ration back to raise (debt burden) , and moved from 29% in 1986 to its highest level from independence to 70% in 1995 due to the high indebtedness as a result of a sharp increase in public expenses needed to meet the costs of the insecurity crisis that made the country in severe crisis in its all levels (economic , social ,...) .this situation pushed the government to borrow more. One year after, this ratio started to decrease due to the relative stability of oil prices in the international markets and the progress of the economic performance of the country that influence the value of this burden to drop to its lowest level ever at 5%. In our study, we suppose that this ratio has a direct negative effect on Algeria's economic growth.

RES/SD: Reserves to Sovereign Debt, this ratio refers to Algeria's government reserves performance in evaluating the ability of the government to insure its sovereign debt repayments. We observe (From the RESSD graph ,Appendix 2) that this ratio was too low since 1970 up to 2000, where its value was under 100%, which refers to the risk of insuring the payback of the country's sovereign debt, due to the low prices of oil in that period. However, with the improvement of economic stability, the back of the security to the country that was accompanied by the raise of oil prices in international markets, drove this ratio to overpass 100% in 2001 (120%), to keep its gradual increase to reach its highest value in 2014 by 16629%. This investigation expects a positive effect of this ratio on Algeria's economic growth.

6- Pre-Estimation Statistics:

- Unit root test:

Before, we start our investigation about the impact of sovereign debt on Algeria's economic growth, we have first to verify that the data we use doesn't have any bogus as a result of non-stationary data, for this purpose, group unit root test summary is used to test the presence of unit root .

Group unit root test: Summary
Series: GDPR, SD, GCF, GDS, SDS, SDSX, SDGNI, RESSD
Date: 07/20/17 Time: 22:23
Sample: 1970 2015
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 8
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.91110	0.0280	8	334
Breitung t-stat	0.69682	0.7570	8	326
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-4.08044	0.0000	8	334
ADF - Fisher Chi-square	88.7557	0.0000	8	334
PP - Fisher Chi-square	43.7487	0.0002	8	360

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

According to the results in the table of group unit root test summary:

All tests show that H0 must be rejected but we accept the alternative hypothesis H1 (all probabilities < 5%), that is a stationary data which leads to avoid any spurious results in estimating through OLS model.

- GRANGER Causality Test:

In this investigation, we use this causality test to define the nature of the relation between each dependent variable in my investigation model and the independent variable, which is the real gross domestic product growth rate that represents the economic growth in Algeria.

-GRANGER Causality Test:

Pairwise Granger Causality Tests
Date: 07/20/17 Time: 22:20
Sample: 1970 2015
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
SD does not Granger Cause GDPR	44	3.07914	0.0573
GDPR does not Granger Cause SD		0.39153	0.6786
GCF does not Granger Cause GDPR	44	1.13502	0.3318
GDPR does not Granger Cause GCF		0.09362	0.9108
GDS does not Granger Cause GDPR	44	0.78776	0.4620
GDPR does not Granger Cause GDS		0.23245	0.7937
SDS does not Granger Cause GDPR	44	7.28141	0.0021
GDPR does not Granger Cause SDS		0.19825	0.8210
SDSX does not Granger Cause GDPR	44	5.35695	0.0088
GDPR does not Granger Cause SDSX		0.10147	0.9037
SDGNI does not Granger Cause GDPR	44	0.89645	0.4163
GDPR does not Granger Cause SDGNI		2.70218	0.0796
RESSD does not Granger Cause GDPR	44	0.23457	0.7920
GDPR does not Granger Cause RESSD		0.01172	0.9884

From the above results, we conclude:

1- There is no causality link between sovereign debt and economic growth in Algeria, where sovereign debt doesn't cause gross domestic product growth rate (F= 3,07 < 3,84 → H0 is accepted) either, gross domestic product growth rate doesn't cause sovereign debt (F= 0,39 < 3,84 → H0 is accepted).
2- There is no causality relation between both variables , gross capital formation and gross domestic product growth rate ,where GCF doesn't cause GDPr (F= 1,13 < 3,84 → H0 is accepted), GDPr doesn't cause GCF (F= 0,09 < 3,84 → H0 is accepted).
3- There is no causality link between gross domestic savings and gross domestic product growth rate ,where , GDS doesn't cause GDPr (F= 0,78 < 3,84 → H0 is accepted) ,GDPr doesn't cause GDS(F= 0,23 < 3,84 → H0 is accepted)
4- We observe that sovereign debt service causes gross domestic product growth rate (F= 7,28 > 3,84 → H1 is accepted) but , gross

domestic product growth rate doesn't cause sovereign debt service (F= 0,19 < 3,84 → H0 is accepted).

5- Sovereign debt service to exports ratio causes gross domestic product growth rate (F= 5,35 > 3,84 →H1 is accepted, but, GDPr doesn't cause SDSX ratio (F= 0,1 < 3,84 → H0 is accepted).

6- There is no causality link between SDGNI and DGPr, where sovereign debt to GNI ratio doesn't cause GDPr, (F= 0,89<3,84 → H0 is accepted), but, GDPr doesn't cause SDGNI ratio (F= 2,7 < 3,84 → H0 is accepted).

7- There is no causality relation between reserves to sovereign debt ratio and gross domestic product growth rate, where, ressd ratio doesn't cause GDPr (F=0,23 < 3,84 → H0 is accepted), and GDPr doesn't cause RESSD (F=0,01 < 3,84 → H0 is accepted).

7- **Regression Results**:

Dependent Variable: GDPR
Method: Least Squares
Date: 07/20/17 Time: 22:28
Sample: 1970 2015
Included observations: 46

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.329164	3.577526	2.607714	0.0130
SD	0.006732	0.216834	0.031047	0.9754
GCF	-0.065178	0.240434	-0.271085	0.7878
GDS	-0.024427	0.130582	-0.187061	0.8526
SDS	-0.170013	0.535455	-0.317511	0.7526
SDSX	-6.638326	8.033102	-0.826371	0.4138
SDGNI	-3.185326	11.18641	-0.284750	0.7774
RESSD	0.012724	0.074987	0.169677	0.8662

R-squared	0.168159	Mean dependent var	3.793435
Adjusted R-squared	0.014925	S.D. dependent var	4.964789
S.E. of regression	4.927601	Akaike info criterion	6.184352
Sum squared resid	922.6876	Schwarz criterion	6.502377
Log likelihood	-134.2401	Hannan-Quinn criter.	6.303486
F-statistic	1.097397	Durbin-Watson stat	2.998439
Prob(F-statistic)	0.384450		

8- Results' Interpretation:

The regression results table shows that:

1- All the variables are statistically insignificant.

2- Sovereign Debt (Public and Publicly Guaranteed Debt): has a positive effect on the economic growth, where each increase in sovereign debt by 1% will drive the economy to grow up by 0,006% (a very low impact).

3- Gross Capital Formation: has a negative impact on the economic growth where in our study we expected that this variable would have a positive impact, we mention that according to the table of results, each increase in gross capital formation by 1% leads the economic growth in Algeria to fall by almost 0,065%.

4- Gross Domestic Savings: has a negative impact on the economic growth of Algeria and in our study, we expected that this variable would have a positive contribution to the economic growth, but in fact, each raise in sovereign debt by a 1% will reduce the economic growth by 0,024%.

5- Sovereign Debt Service: as we expected, this variable has a negative impact on Algeria's economic growth, where the burden of this repayments is almost 0, 17 % in each raise of this variable by 1%.

6- Sovereign Debt Service / Exports ,ratio : as it was expected at the beginning of this work ,the coefficient of this ratio is negative , which refers to a negative impact of Sovereign debt service on economic growth (burden) of Algeria, where each increase in this ratio by 1% would lead the economic growth of Algeria to fall by 6,63% .

7-Sovereign Debt / GNI: the coefficient of this ratio shows also a negative impact of sovereign debt on the economic growth, where each raise of this ratio by 1% leads the economic growth of Algeria to fall by more than 3,18%.

8- RES/SD: this ratio that measures the country's capacity in insuring the debt payback, has a positive sign, which refers to a positive impact on the economic growth of Algeria, as it was expected

in the theoretical part in this study, each increase of this ratio by 1% would drive the economy of Algeria to grow by almost 0,012 %.

Conclusion:

In this study, the impact of sovereign debt on Algeria's economic growth during 1970 – 2015 is examined through OLS regression model. The study findings show that all the dependent variables are statistically insignificant. The model presented above also show that the sovereign debt funds have a very light positive impact on economic growth against a heavy burden of its services during 1970-2015. Therefore, the sovereign funds were misallocated and have been used to finance unproductive sectors and the financial gains from high oil prices have not imposed discipline on government spending.

In addition to the non-expected negative impact of gross domestic savings and gross capital formation registered in the same period due to: the use of the investments made to foster and modernize the existing equipments to enhance the production tool efficiency, the mis-allocation of the savings in economic activities and the absence of a real financial system to capture the savings, the delay registered in achieving the various investments that were sometimes repudiated, moreover, the political and socioeconomic crisis (the black decade 1989-2000) had a big reverse contribution to the economic growth of Algeria .

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19- World Bank data: https://data.worldbank.org/country/algeria.

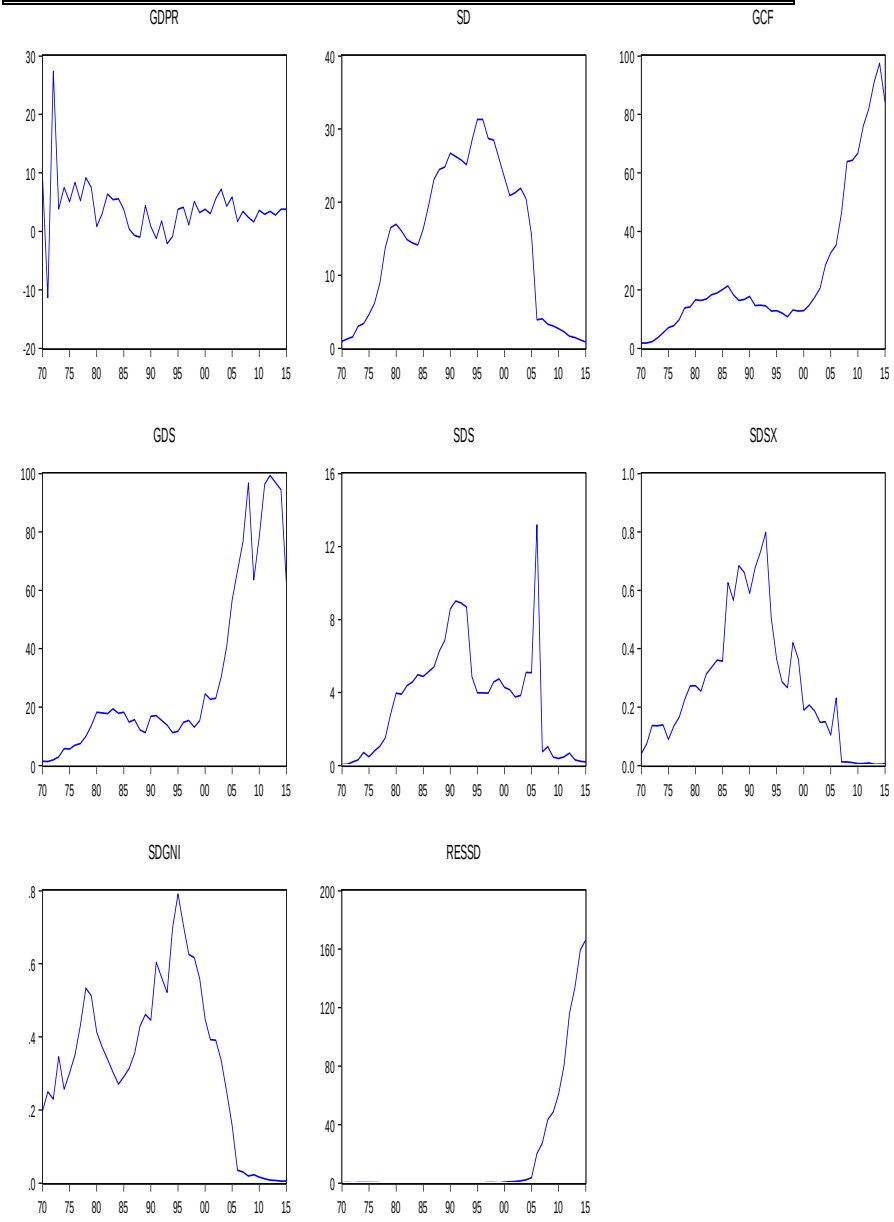
Appendices:

Appendix 1: Descriptive Statistics Table:

	GDPR	SD	GCF	GDS	SDS	SDSX	SDGNI	RESSD
Mean	3.793435	14.57575	26.46478	30.31344	3.554535	0.263820	0.330877	18.95125
Median	3.730000	15.79000	16.47600	16.94538	3.965144	0.216106	0.342526	0.233644
Maximum	27.42400	31.31300	97.55400	99.36332	13.19674	0.798619	0.791252	166.2954
Minimum	-11.33200	0.870000	1.782000	1.323000	0.044704	0.003585	0.005379	0.027161
Std. Dev.	4.964789	10.37423	25.84020	30.43732	3.019754	0.227137	0.216087	43.13759
Skewness	1.750241	-0.011544	1.527289	1.261997	0.849853	0.774296	-0.002346	2.392958
Kurtosis	13.84824	1.507163	4.014990	3.111261	3.692565	2.582788	2.219791	7.553583
Jarque-Bera	249.0474	4.272431	19.85790	12.23395	6.456569	4.930054	1.166768	83.64356
Probability	0.000000	0.118101	0.000049	0.002205	0.039625	0.085007	0.558007	0.000000
Sum	174.4980	670.4846	1217.380	1394.418	163.5086	12.13572	15.22036	871.7576
Sum Sq. Dev.	1109.211	4843.110	30047.23	41689.38	410.3511	2.321596	2.101210	83738.32
Observations	46	46	46	46	46	46	46	46

Source: EViews using data collected by the authors

Appendix 2: Graphs of model's variables:



Source: EViews using data collected by the authors