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Deficit, public debt and economic growth in Mexico

Déficit, deuda pública y crecimiento económico en México

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Abstract

Tax in response to the pro-cyclical policy followed in Mexico, the objective of the document is to analyze the debt-GDP relationship by addressing the relevance of a counter-cyclical fiscal policy. That same thing is tried to show as alternative of economic policy before the low economic growth. The econometric study is Carried out using the time series as a dynamic analysis technique. The selected period is from the second quarter of 1993 to the fourth of 2017. The results are consistent Obtained With what economic theory postulates. It is verified That the real interest rate has a positive effect greater in the face of the negative effect of the low growth rate of the product. What makes the quotient Between the debt and the real product is at the end of increase increasing each year. In another Important result, Argued That it is the debt accumulated since at the beginning of each year is always positive, the government is unable to finance it with a primary surplus to stabilize the indebtedness rate. In contrast, the budget balance always Tends towards a reduction in the primary deficit That Makes the debt rate decrease less and less.

Public debt, primary deficit, economic growth rate and actual interest rate

Resumen

En respuesta a la política fiscal pro-cíclica seguida en México, el objetivo del documento es analizar la relación deuda-PIB abordando la pertinencia de una política fiscal contra-cíclica. Misma que se intenta mostrar como alternativa de política económica ante el bajo crecimiento económico. El estudio econométrico se lleva a cabo utilizando como técnica de análisis dinámico a las series de tiempo. El periodo seleccionado es del segundo trimestre de 1993 al cuarto de 2017. Los resultados obtenidos son consistentes con lo que postula la teoría económica. Se comprueba que la tasa de interés real tiene un mayor efecto positivo ante el bajo efecto negativo de la tasa de crecimiento del producto. Lo que hace que el cociente entre la deuda y el producto real sea cada vez mayor al final de cada año. En otro resultado importante, se argumenta que como la deuda acumulada al principio de cada año siempre es positiva, el gobierno está imposibilitado para financiarlo con superávit primario para estabilizar su tasa de endeudamiento. En contraste, el balance presupuestario tiende siempre hacia una disminución en el déficit primario que hace que la tasa de endeudamiento disminuya cada vez menos.

Deuda pública, déficit primario, tasa de crecimiento económico y tasa de interés real

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Introduction

Undoubtedly one of the notes is striking, on a recurring basis in the mainstream of economic information is related to the low growth of the economy and the evolution of public debt. This is a central aspect of what it means and therefore involves important economic sectors in the country.

The performance of public spending despite being a very controversial issue in all countries of the world little known or is not deep enough. In view of this, this work represents an attempt to address the complex relationship between fiscal policy, public debt and economic growth. Thus, the research proposal represents an effort of analysis to contribute to the debate.

It argues that the economy remains stagnant because of fiscal discipline in order to meet the objectives required under the stability argument macroeconómica.1 The objective of the study is to analyze the relationship between public debt and economic growth. Since the first represents an alternative as a tool counter-cyclical economic policy way to counter low economic growth.

This situation is the result of pro-cyclical fiscal policy that has been previously instrumented. In this vein, the central hypothesis is that the primary balance (deficit or surplus is) imposes a constraint on economic growth and the debt ratio depends on it.

The work begins by addressing the theoretical arguments that are central to the investigation. To emphasize, first, the deficit and public debt. It shows that there is an inseparable relationship between these two variables. Second, public debt and economic growth. Here is relevant, the ratio between public debt and real GDP; and thirdly, budgetary restraint. In the latter basically what matters is the role of the primary balance.

Then it addressed concerning the relationship between growth and debt as a proportion of the actual product. This section describes the correlation analysis will be essential. The following section around the methodology described data and the model specified. The work closes with the presentation and analysis of the results of regression and finally,

Theoretical arguments

This section will be essential, first, to address the relationship between the deficit and public debt. That is, measuring the budget deficit to account for inflation and therefore the real interest rate. Secondly, an indicator that is critical to good economic performance as debt to GDP ratio. And, in the third part, an analysis of the relationship between the budget constraint and the product.

Deficit and public debt

One way to show the theoretical relationship between these two variables is started assuming a balanced budget. To cause a public deficit, the government may choose one of two options: 1) lower taxes and maintain public spending; or, 2) maintaining taxes and cut public spending. Here the question is what happens to public debt as it passes time.2 In this case, you can think that the state can raise taxes or increase spending. Using the theoretical development of Blanchard et. al (2012: 484, 486, 489-492), it is assumed that the public deficit in year t can be expressed as:

$$déficit_t = rB_{t-1} + (G - T) \quad (1)$$

Where,
Bt-1 = Is the public debt at the end of the year t-1 (or a previous year);

B = Are all bonds and bills of exchange by the state to the private sector;

r = Is the real interest rate;

RBT-1 = Is the actual interest paid on government bonds outstanding at year t-1;

Gt = Is the government spending on goods and services in year t;

Tt = They are taxes minus transfers in year t.

What equation (1) it indicates is that when the government faces a budget deficit, may ask the central bank that financie.3 Thus, the public sector budget constraint states that experienced by the public debt during the year t increase should equal the deficit in year t:

$$B_t - B_{t-1} = déficit_t \quad (2)$$

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An important question raised by the equation (2) is that if the public sector incurs a deficit, public debt increases. If you experience a surplus, public debt decreases. From equation (1) and (2) may expose the public sector budget constraint as:

$$B_t - B_{t-1} = rB_{t-1} + (G_t - T_t) \quad (3)$$

Where,

RBT-1 = Are the interest payments;

Gt-Tt = It is the primary deficit.

Now if Bt-1 is transferred to the second member of the equation (3) and rearranging terms, we have:

$$B_t = (1+r)B_{t-1} + (G-T)_t \quad (4)$$

Thus, public debt in year t is equal to (1 + r) times the debt in period t-1 plus the existing primary deficit during t.4

Public debt to GDP

A key indicator for their importance and what it means in economic terms is the ratio of debt to GDP also called the debt ratio. Returning to equation (4) and if both sides of this equation by the actual product, Yt is divided, we have:

$$\frac{B_t}{Y_t} = (1+r)\frac{B_{t-1}}{Y_t} + \frac{(G-T)_t}{Y_t} \quad (5)$$

If the numerator and denominator of the second member of equation (5) is multiplied by Yt-1, it reduces to:

$$\frac{B_t}{Y_t} = (1+r)\left(\frac{Y_{t-1}}{Y_t}\right)\left(\frac{B_{t-1}}{Y_t}\right) + \frac{(G-T)_t}{Y_t} \quad (6)$$

If ag is defined as the rate of growth of production where $\frac{Y_{t-1}}{Y_t} = \frac{1}{(1+g)}$. And if $\frac{(1+r)}{(1+g)} = (1+r+g)$ Equation (6) can be rewritten as:

$$\frac{B_t}{Y_t} = (1+r-g)\frac{B_{t-1}}{Y_{t-1}} + \frac{(G-T)_t}{Y_t} \quad (7)$$

Now if the term moves $\frac{B_{t-1}}{Y_{t-1}}$ the left side of equation (7) the medullary equation:

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = (r-g)\frac{B_{t-1}}{Y_{t-1}} + \frac{(G-T)_t}{Y_t} \quad (8)$$

The relevance of the equation (8) is that the debt ratio is equal to the sum of two terms:

1. The first term on the left side is a factor that increases or decreases the rate of borrowing. That is, ryg produce opposite effects on the dynamics of the debt ratio.

2. The second concerns the ratio between the primary deficit to GDP. In this case, the primary balance relative to GDP can produce a positive or negative effect on the growth of debt according to whether a deficit or a surplus.

The truth is that according to Alesina et al. (2018: 11), reducing the debt-GDP ratio will depend a lot on how the budget deficit is corrected. If a surplus is caused by increased taxes, decreased growth may be so large that increases rather than reduces the relationship. However, according to the authors, the deficit reduction policies based on spending cuts, very arguably, believe they have no effect on the product. As such, they can be a safe bet to reduce the debt-GDP ratio.

The budget constraint

Returning to equation (3) set forth previously in this section, it is argued that the difference between incomes and budget expenditures can act as a constraint on economic growth. Thus, when performing a correlation analysis is expected to GDP and budget deficits appear highly correlated.

In the graph (1) this ratio is evident. The trend line fitted to the observations shows a negative slope. The correlation coefficient between two variables is approximately -0.60. Indicating that although there is a considerable factor if they are correlated at least 60%.

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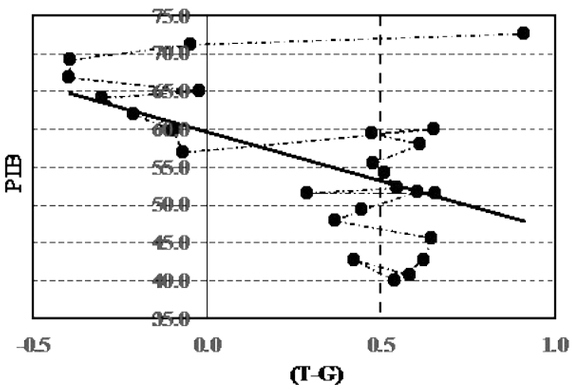

Figure 1 Real GDP Primary Balance (1993-2017) (millions of pesos of 2013)
Source: Estimates based on Banxico and SHCP

As explained by the graph (1), assuming that the government is experiencing a budget surplus (TG>0) is expected impinges with a fall in output. Otherwise, with a budget deficit (TG<0), a pickup in the product. However, for Hernandez (2011: 7) public spending policy is only part and not the whole explanation of why the product may be affected. After a thorough examination concludes that the role of public spending has been underestimated in terms of economic policy proposal to address structural change processes that promote sustained growth.

However if the trend toward budget balance (TG = 0) is chosen as normally occurs in the context of Mexico's economy, the economy does not experience more or less growth. That is, the economy moves toward a stalemate. Of the three scenarios presented, the latter seems to be the most contentious in the current context to the requirement imposed by external capital to maintain fiscal discipline. One issue that has been discussed since the implementation of pro-cyclical fiscal policy.

In fact it is properly characteristic that a country like Mexico–developing economy and highly dependent on the US economy–not only has an external constraint on growth in terms of forex (foreign exchange gap) and / or external saving (saving gap) but also from the point of view of the budget constraint is the issue at hand. Thus, fiscal restraint would be acting as a third gap (tax gap) thus limiting the growth expectation especially developing economies with high debt problems. Among the studies that have addressed these constraints are those of Bacha (1990), Solimano (1990) and Taylor (1994). These authors have developed a pooled analysis of these three gaps (gaps), which is also known as triple gap model (three-gap model).

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Public debt as a tool counter-cyclical economic policy

The argument argument is that public debt principal function redress the fiscal imbalance between revenues and government budget expenditures. This means that proper management of public debt would be relevant since its use as an instrument discussed counter-cyclical economic policy (CEFP, 2017: 1).

In contrast to the above, Huerta (2016: 32-33) points out that, with emphasis exchange rate stability, fiscal policy has been subordinated to this goal, so it has ceased to be counter-cyclical pro-growth policies. That is, that falling exports, consumption and investment as private sector fiscal discipline is maintained to avoid compromising that exchange rate stability.

Huerta presents his argument in the context of three sectors of the economy: Public Sector (GT), private sector (SI) and external sector (XM). In this case:

$$(S-I)=(G-T)+(X-M) \quad (9)$$

Where,

S = Private savings;
I = private investment;
G = public expenditure;
T = government revenues;
X = Exports of goods and services; Y
M = Imports of goods and services.

On equation (9), two observations:

1) If exports fall and the economy incurs a growing trade deficit (X<M) and the government responds with increasing discipline (GT = 0), the financial problems of the private sector, which happens to have deficits (S accentuated<I), which it increases the fragility of the economy and no payment terms of debt service generated or private sector, or the public.5 industry

2) If the private sector is in deficit (S<I) and has debt problems, the government should work with deficit spending (G>T) for private finances improve. If consumption and investment do not grow, and exports are falling to the extent of incurring trade deficit (X<M), the government should increase its deficit spending to the private sector is surplus and can increase its consumption and investment.6

In this regard, Huerta (2011, 212) notes that there must be opposition to the fiscal deficit when it is a result of the reduction in tax collection arising from the contraction in economic activity. On the contrary it is better public deficit generated by the increase in spending, to boost demand and the economy, deficit spending derived from the lower tax collection derived from the economic downturn.

Moreover, according to the study Cuevas (2002: 1110), an increase of fiscal deficit induces individuals to save more, to make them aware that a larger deficit means more government borrowing and thus future increases tax to address the growing financial obligations of the State. The expectation of tax increases makes the domestic private sector savings will increase in the same proportion as tax deficit. That is, the increase in demand for loanable funds derived from a larger fiscal deficit is offset by the increase in the supply of these funds, the result of the increase in private domestic savings. Therefore, according to this, a large fiscal deficit does not affect interest rates, productive investment and economic growth in the long term.7 Accordingly,

When performing a correlation analysis between the federal government public debt and GDP growth two segments, one positive and one negative slope (see Figure 2) are appreciated. The first shows an inverse relationship between two variables; the second, a direct relationship. However, if a regression line to the observed observations line with positive slope reaching a correlation coefficient of about 72% is adjusted.

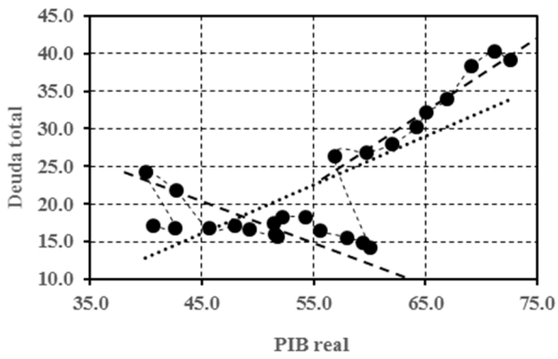

Figure 2 Total debt (% of GDP) and real GDP (Millions of pesos of 2013) (1993-2017)
Source: Estimates based on Banxico and SHCP

The magnitude of the coefficient is indicative of a high linear association between these two variables. In this case, the question is which of the two segments has a greater effect how to show what kind of correlation exists.

In theory a strong negative correlation is expected. This would imply that at increased real output growth, lower debt ratio and vice versa. As for the relationship between debt and primary deficit by graphic (3), we can see some degree of correlation. Especially after 2008 until 2016, when the increase in public deficits led in turn by an increase in public spending contrasts with an increase in public debt in the same period. For after this last year, an improvement in public finances and a reduction in total debt is observed.

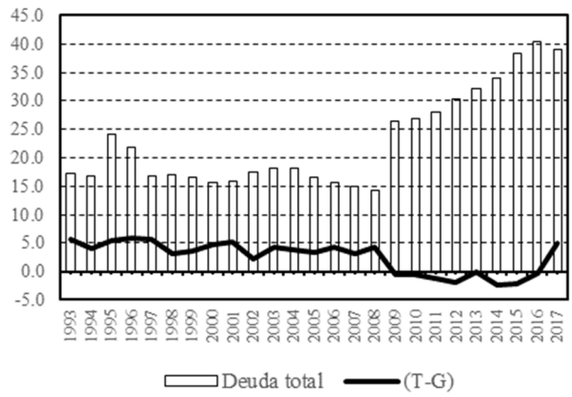

Figure 3 Total debt and primary deficit (% of GDP) (millions of pesos of 2013)
Source: Estimates based on Banxico and SHCP

For the rest of the analysis period from 1993 to 2007, this ratio has a constant behavior. It is noteworthy that from 2009 the public deficit soars and the total debt.

The behavior of these two variables can be best visualized with the correlation analysis shown by the graph (4). In this graph a clear negative correlation between total debt and primary deficit is observed. The correlation coefficient was reached -0597. A coefficient of about 60%, already has important policy implications.

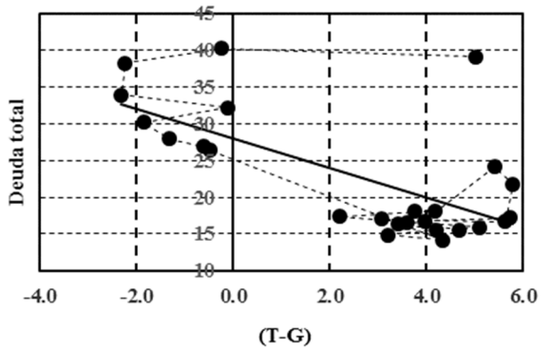

Figure 4 Total debt and primary deficit (% of GDP) (millions of pesos of 2013) (1993-2017)
Source: Estimates based on Banxico and SHCP

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As can be seen from the scatterplot, the inverse relationship involves two situations shown. First, the reduction in the public deficit prompted by a cut in public spending (or an increase in budget revenues), is related to a decrease in total debt. Otherwise, the increase in the public deficit (or increase public spending) is associated with a higher rate of indebtedness. This inverse relationship is consistent with what economic theory predicts.

Therefore, if you choose to follow the pro-cyclical fiscal policy it is to cut public spending in order to maintain the careful fiscal discipline against economic growth. In sense, the study by Diaz (2016: 20) emphasizes that fiscal policy in Mexico has traditionally pursued a pro-cyclical stance. This is that in periods of economic growth public spending is growing steadily, while in periods of slowdown and possible recession, the expenditure is incurred significantly.

Therefore economic policy response has been proposed to pursue a counter-cyclical fiscal policy. Thus, the hypothesis to be discussed in this research is that the budget deficit imposes a constraint on economic growth so that an increase in spending not only stimulates growth but in turn promotes a lower borrowing rate. In this sense, the economy does not grow sufficiently, it is expected to experience a higher rate of indebtedness.

Discussion of still maintain a pro-cyclical fiscal policy becomes controversial mainly because of the negative effect that results in other important areas of public spending such as education and health. This can be seen by CEFP (2017: 8). The study shows that in the case of education and health, in the period of greatest growth in debt, 2013-2016, the budget allocated to both showed a tendency to stagnation with low growth rates in relation to observed by the debt.

Methodology

Statistical information with regard to economic growth and budgetary components of expenditure and income as well as public debt is extracted Banxico and INEGI and SHCP. Analysis technique for this research is based on an econometric model time series. In the following two subsections describe some characteristics of the data used and the approach detailed model.

Data

Economic variables is used primarily real GDP. Total revenues as budget revenue for the federal government. These are classified as tax and non-tax. Government expenditures to budget expenditures classified between programmable and non-programmable. The first is divided between current expenditure and capital expenditure; the second, in units, Adefas and others, as well as financial cost. To measure the deficit balance primario.8 This indicator is basically the difference between income and total expenses, deducting from the latter the financial cost is used. As the public debt broad economic debt total.9 All variables were deflated by inflation with the implicit price index of GDP. To calculate the real rate of interest, It used to CETES 28 days to measure the nominal interest rate. In addition, the growth rate of CPI to measure inflation. Appendix detailed formulation.

Model

The functional relationship model, in general terms, proposed in this research is:

$$y_t = f(\overset{+}{r}, \overset{-}{g}, \overset{+}{y_{t-1}}, \overset{-/+}{bp}) \quad (10)$$

Where,

yt = Total debt as a percentage of GDP in period t;

r = Real interest rate;

g = Growth rate of the product;

$t\text{-}1$ = Total debt at time t-1;

bp = Primary balance to GDP.

It is expected that the total debt is positively related to the real interest rate; negatively with the growth rate of the product; positively with total debt of an earlier period; and, negatively or positively (according, the case of a deficit or surplus public) with the primary balance. And the regression equation to estimate in simplified form:

$$y_t = \beta_i z_i + \mu_t \quad (11)$$

Where,

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yt = The dependent variable research in period t;

zi = Is the explanatory variable i

βi = Are the estimation parameters i explanatory variables;

i = 1, 2, 3, 4. That is, i = 1, refers to the real interest rate; i = 2, the growth rate of the product; i = 3, public debt in the period t-1 and i = 4, the primary deficit.

uT = Is the error term in period t.

Results

Model results represented by equation (11) are exposed. The model was fitted with an AR and moving averages MA. In addition dichotomous variables were also introduced to capture the effects of devaluations and cyclical periods.

The unit root tests Augmented Dickey-Fuller indicate that the variables are stationary in first differences. However, being tougher, better results are observed with the Phillips-Perron test. Using variables in second differences equilibrium relationship is checked long term indicating that there are at least four equations cointegrating with a significance level of 5%.

The test results of causality in Granger, with the variables in second differences, showed some variation according to what was expected. It was found that the real interest rate is caused by the debt relative to the product with two, four and five lags. There Causation two-way, three and four lags, between the rate of output growth and the debt to GDP ratio; Causation with two lags far the growth rate debt; with five lags the reverse happens. No causality was found in the Granger sense between debt and primary balance. All tests can be found in the appendices section.

The variables were statistically significant with a significance level of 99 and 95 percent. The coefficient of determination (R2) was 77 percent with a DW 2.26.

Taking reading results elasticity coefficients are specified in Table 1:

Variable dependent / independent variables	Δ log (y)
Δ log (r)	**0.031** (1.92) **
Δ (G)	**- 0.009** (-4.49) ***
Δ log (t-1)	**0.30** (4.55) ***
Δ (Bp)	**- 0.04** (-3.31) ***
D1994: 4-1995: 2	**0.10** (3.45) ***
D2008: 4-2009: 1	**0.27** (8.36) ***
Δ log (r) * D1994: 4-1995: 2	**- 0.97** (-4.61) ***
AR (4)	**0.80** (10.01) ***
MA (1)	**- 0.30** (-3.16) ***
MA (4)	**- 0.64** (-6.38) ***
R2 = 0.77 DW = 2.26 n = 1994: 4-2017: 4	

Note: ΔIt refers to the first difference variable. The value of t-statistic in parentheses. Significance is: () *** 99%; () **, 95%; () *, 90%

Table 1 Elasticity of total debt (1993: 2-2017: 4)
Source: Estimates based on Banxico and SHCP

As mentioned above, the debt as a proportion of GDP depends on the real interest rate is higher or lower than the growth rate of real GDP. In this case, the coefficient of elasticity of the ratio between debt and real output with respect to the real interest rate was positive (0.03). Which means that for every percentage increase of one percent in this rate, the debt ratio will increase by 3 percent. In contrast, the coefficient with respect to the rate of real GDP growth was negative (-0.009). That is, for every percentage point increase in output, the debt ratio will grow at a slower pace at 0.9 percent. As can be seen the real interest rate (r) is greater than the growth rate of the economy (g) consistent with what is predicted theoretically.

For the period of depreciation in late 1994 and early 1995, a dummy variable is introduced. In the case of the real interest rate change in the intercept it was positive (0.10). This may be because nominal interest rates were always higher than the rate of inflation so the real interest rate was positive in that span.

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However, the change in slope was negative (-0.97). Since in that period nominal interest rates soared to almost 75% in April 1995. And the real interest rate decreased going from 9.2 to 7.5 percent. For the economic and financial crisis between 2008 and 2009 in the United States, a dummy variable was also used, the change in the intercept was positive (0.27).

In theory if the initial debt is positive primary surplus required to stabilize the debt ratio. In this case, it is observed in Table 1, the coefficient of elasticity of debt relative to real GDP over a period lagged value is positive (0.30). This means that for every percentage point increase in accumulated debt, the debt ratio will grow by 30 percent from one period to another. On the other hand, the primary balance relative to GDP can have a negative or positive effect on the growth of debt. In this case, it is noted that the coefficient relative to the primary balance was negative (-0.04). That is, since the growth rate of the economy is lower than the interest rate real interest, the government incurs primary deficit or issue new debt and, therefore,

Conclusions

The real interest rate tends to grow more than the rate of output growth. What makes the ratio between debt and real output is increasing at the end of each year. This difference has important implications for the country's economy. That is, the economy does not grow enough because of fiscal discipline that acts as a constraint. This is because the objectives pursued macroeconomic stability.

As accumulated at the beginning of each period debt is always positive, the government can not finance it with the primary surplus to stabilize the debt ratio. As suggested by the negative coefficient of elasticity obtained for the case of initial balance, it has always a primary deficit makes debt ratio decreases increasingly.

These arguments raise the negative effects that pro-cyclical fiscal policy has on the economy and convenience of a counter-cyclical policy. Ie reverse the declining trend in public spending. Thus with more prudent spending it is expected that the rate of real output growth is greater and therefore the debt ratio decreases each year.

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Appendix

The real interest rate was calculated as:

$r = \frac{1+i}{1+\pi} - 1$. If the denominator is rationalized extends equation:

$r = \frac{(1+i)-(i+\pi)}{(i+\pi)}$. And it has finally simplifying:

$r = \frac{i-\pi}{1+\pi}$.

Where,
r = Real interest rate;
i = Nominal interest rate;
π = Inflation rate.

Annexes

A. Source of data:

Bank of Mexico (www.banxico.org.mx)

INEGI (www.inegi.org.mx)

Secretariat of Finance and Public Credit (www.shcp.gob.mx)
primary balance at current prices (millions of pesos) (1993: 01-2017: 12).

financial cost at current prices (millions of pesos) (1993: 01-2017: 12).

Cetes 28 days. Average monthly yield percent per annum (1993: 01-2017: 12).

broad economic debt at current prices (millions of pesos) (1993: 01-2017: 12).

Federal Government budget expenditures in millions of pesos (1993: 01-2017: 12).

Implicit price index of GDP (2013 = 100).

Federal Government budget revenues in millions of pesos (1993: 01-2017: 12).

National Consumer Price Index (NCPI). Second half of December 2010 = 100. (1993: 01 to 2017: 12).
GDP in millions of pesos at current prices (1993: 1-2017: 4).

B. Evidence of causation:

variables		Direction of causality lags included			
		two	3	4	5
one	*and versus. r*	Y→r	No causality	Y→r	Y→r
two	*and versus. g*	g→Y	Y↔g	Y↔g	Y→g
3	*and versus. bp*	No causality	No causality	No causality	No causality

Table 2 Testing of Granger causality (variables in second differences) (1993: 2-2017: 4)
Source: Estimates based on information from INEGI and Banxico.

C. Testing cointegration:

Ho	**r = 0 ****	**r≤1 ****	**r≤2 ****	**r≤3 ****
Eigen values	0.89	0.78	0.60	0.51
Statistical λ_{trace}	508.57	300.96	154.62	68.23
critical value (5%)	47.85	29.79	15.49	3.84
Max *Eigen-Statistics*	207.61	143.33	86.39	68.23
critical value (5%)	27.58	21.13	14.26	3.84

* (**) denotes the rejection of the null hypothesis (Ho) to a level of significance of 5%. Trace test Max-Eigenvalues and identifies four cointegrating equations at a level of 5%.

Table 3 Tests cointegration (Johansen) (In second differences) (1993: 2-2017: 4)
Source: Estimates based on information from INEGI and Banxico.

C. Testing unit roots:

Test / Variables	Augmented Dickey-Fuller (ADF) t-Statistic	Phillips-Perron (PP)
Total debt	-9.85	-9.85
Real interest rate	-5.86	-25.67
Real GDP	-4.33	-20.72
primary balance	-4.34	-16.53

critical value: 1% (-4.05), 5% (-3.45), 10% (-3.15).

Table 4 Testing unit roots (including constant term and trend) (in first differences) (1993: 2-2017: 4)
Source: Estimates based on information from INEGI and Banxico.

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