

The crowding out effect of public (internal) debt on private sector credit: Mozambique Experience

O impacto do efeito crowding out da dívida interna sobre o crédito ao sector privado

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Abstract

This Paper¹, using monthly data between 1998 (December) -2019 (May) through the application of the Autoregressive Lag Model (ARDL) through two channels (price and quantity) using three equations where two are to represent the quantity channel and one to represent the price channel accordingly to theory, aimed to address the existence of an inverse relationship between government internal debt and private sector credit.

In conclusion, we identified that an increase in government internal debt (by increasing lending by central bank and commercial banks to the government) has no negative effect on short and long term credit to the private sector through the price channel and the quantity channel when we maintain constant the lending rate, it shows a long-term crowding in effect.

Keywords: Domestic debt, Autoregressive Distributed Lag Model; Crowding Out;

¹ The present Working Paper documents the crowding out effect of public (internal) debt on private sector credit (Mozambique Experience) according to two different transmission channels of Crowding Out. The research was implemented by researchers from the [United Nations University World Institute for Development Economics Research](#) (UNU-WIDER) under the [Inclusive Growth Mozambique](#) Programme.

Abstracto

O presente Paper, utilizando dados mensais entre 1998 (Dezembro) -2019 (Maio) através da aplicação do Modelo Autoregressivo de Defasagem (ARDL) através de dois canais (preço e quantidade) utilizando três equações, onde duas são para representar o canal de quantidade e uma para representar o canal de preços conforme preconiza a teoria, tinha como objectivo debruçar sobre a existência de uma relação inversa entre a dívida interna do governo e o crédito concedido ao sector privado.

Concluindo que um aumento da dívida interna do governo (socorrida pelo aumento da concessão de empréstimos de instituições do banco central e dos bancos comerciais ao governo) não tem um efeito negativo sobre o crédito concedido ao sector privado no curto prazo e longo prazo pelo canal de preço e nem pelo canal de quantidade quando mantemos a taxa de empréstimo constante, que chega a evidenciar a existência de um efeito positivo (“crowding in” no longo prazo).

Palavras-Chave: Dívida interna, Modelo Autoregressivo de Defasagem, Efeito Expulsão

1. Introduction

Bank credit is extremely relevant for developing countries especially for Mozambique as it is a country with high needs in terms of goods and services but with low income levels, however, there is a certain limitation on credit granting by commercial banks and accordingly to USAID (2014) there are some factors that demotivate the borrowers as the following ones: high interest costs, limited access to credit and venture capital market, guarantees or collateral requirements, insufficient quantity and quality of financial services and its concentration in the capital of the country.

In Mozambique economic performance has become increasingly weak since the discovery of hidden debts in late 2014, as well as facing spending above revenues collected, government loans both externally and internally (internal market) have increased at increasing rates.

This increase was evident in the state's general accounts, as according to the 2016 CGE (government general account), the volume of public debt (internal and external) reached 701,708 million meticaís (9.3 billion euros) against 432,233 million meticaís in 2015 (5.7 billion euros)

where external debt registered the largest increase in 2016, in the order of 69.1% to 613.998 million meticaais, while the internal debt increased 26.7% to 87.710 million meticaais.

This increase in domestic financing raises specific issues when credit to the private sector is emerging and the main objective of the work is to assess to what extent the increase in government internal financing has influenced the increase or decrease in credit to the private sector. .

This study is structured in six chapters. First with introduction, in the second chapter we have the literature review, theoretical and empirical. In the third chapter the indicators of domestic (internal) debt and private sector credit, fourth chapter we have the methodology described in detail. In chapter 5 we have the empirical results and finally the conclusions and recommendations in chapter 6.

1.1. Research Question

- What is the effect of increasing government domestic (internal) debt on the private sector credit?

1.2. General objective

- Make a rigorous estimate of crowding out behavior in Mozambique.

1.3. Specific objectives

- To analyze the relationship between the internal financing of the Mozambican government and private sector credit.
- Evaluate whether the increase in domestic financing in Mozambique leads to the reduction of private sector credit and consequently crowding out.

1.4. Hypothesis

Ho: There is no effect of changes in government domestic debt on credit to the private sector;

H1: There is an effect of changes in government domestic debt on credit to the private sector accordingly to the quantity channel;

H2: There is an effect of changes in government domestic debt on credit to the private sector accordingly to the price channel;

Motivation

Economically, credit from banks can be granted to Individuals, Private Sector (financial and non-financial corporations), Public Sector (government) and the rest of the World meaning that, domestic economic agents may obtain bank credit from abroad. The present study analyzes the relationship between government borrowing and private credit is thought as negative one, generally in policies discussions. However, in theory, this relationship is known as ambiguous, because accordingly to Shetta and Kamaly (2014) the degree of crowding-out depends on the nature of the endogenous response of the banks to a higher government borrowing and how they alter their balance sheets so it's not a linear situation.

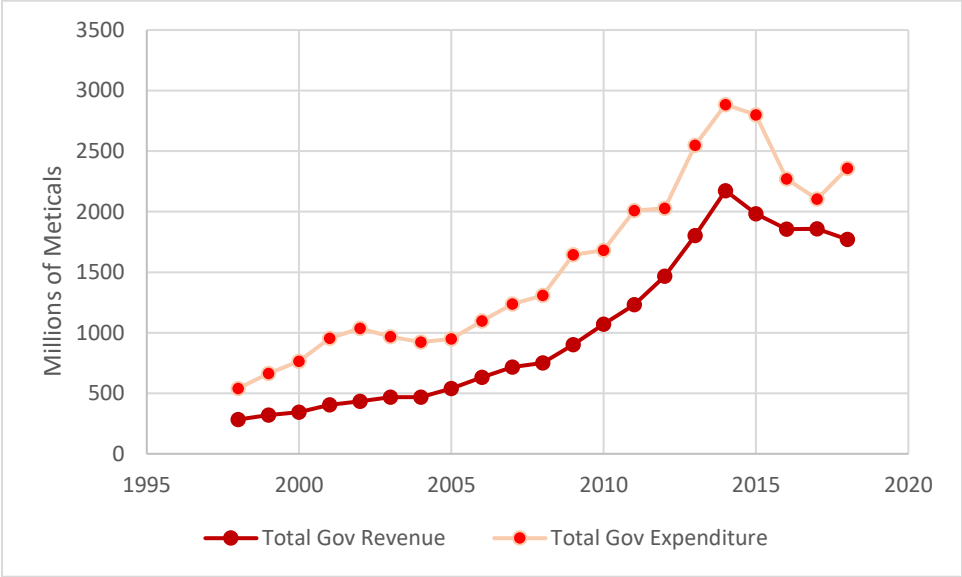
Banks generally adjust their loan portfolio optimally when lending is higher, due to characteristics of different assets and liabilities. As an example we can see that: If government borrows one dollar more from banking sector, the banks are automatically left with one dollar less for the private sector, and it is responded by banks with a higher government borrowing not necessarily taking to a crowding out situation because we might be facing a crowding in situation.

This paper will especially focus on crowding out in the credit strand, since Mozambique consisting of an open economy has relations with the outside being to a certain point dependent on financing external flows, leading us to contract credit in large sums and may inhibit the granting of credit to private institutions. Thus, it is considered that the crowding out of credit, acts directly and is what interests us to investigate more effectively affecting the private sector credit in a more effective way.

2. Indicators of domestic (internal) debt and private sector credit

The internal financing of the government also known as internal government debt consists in the internal debt of the government generally characterized by the collection of money of the economy through the sale of treasury bills and monetary authority titles where a certain interest rate is

associated. This becomes a concrete alternative of investing funds by investors given the competitive interest rates and therefore also taking as a mechanism for developing the financial system the Government can use the savings mobilized to finance short-term deficits. But we have also known the internal debt of companies that is characterized by the mobilization of savings by companies through the issuance of their securities. The applied interest rates have to be competitive to attract investors. In the least developed countries this practice is not common because of the underdevelopment of companies in the issuance of securities.



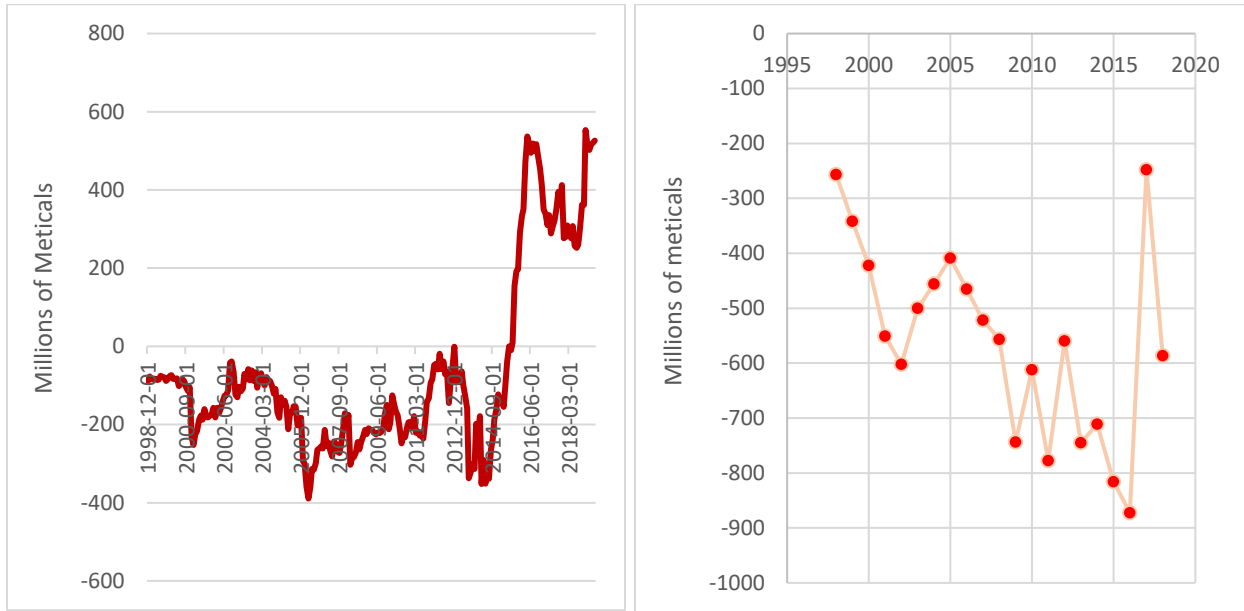
Source: Mozambique Central Bank (Annual data from 1997 to 2018)

Chat 1 Trend of Government expenditure and revenue in Mozambique

The main sources of government revenues in Mozambique are mainly contributed by the remuneration of workers due to the institutionalization of employees in important sectors of the economy, such as: education, health, agriculture, however government expenditure mainly comes from taxes levied on goods and services.

The budget deficit (which means the difference between revenues and government expenditure in which include the donations, that’s why, we call it the global deficit after donations) has increased rapidly in recent years, having been financed for a long time by donations as well as external financing. However, in recent years (from the end of 2014) domestic (internal) funding has been one of the main mechanisms for deficit solvency (as commonly known as domestic market),

having however registered a significant reduction in 2017 however, it has been increasing significantly in 2018.



Source: Mozambique Central Bank (monthly data from 1998 to 2019) (Annual data from 1997-2018)

Chart 2 Trend of Net Claims on Government in Mozambique *Chart 3 Trend of Budget Deficit in Mozambique*

Since second quarter of 2015 banking industry has been a resource widely used for the financing of the deficit, since, in terms of external financing the country faced a limitation from the supplier agents due to hidden debts that emerged in the country. Saying that, when there is an elevation of the budgetary deficit through loans there is a greater need to contract debts (both internally and externally) to cope with this phenomenon.

On account of the limitation of financing at the external level, the government ends up being obliged to finance mostly by domestic routes so, the periods where the deficit rapidly increases domestic indebtedness will also have a tendency to rise.

As the graphs above illustrates find out that the greater the deepening of the deficit the greater will be the internal indebtedness of the government having recorded a sharp growth at the end of 2014 until the beginning of 2019.

3. Literature Review

The crowding out effect can be defined, as an economic phenomenon suggesting that rising public sector spending drives down or even eliminates private sector spending.

This kind of effects can take place due to: economics, social welfare, and infrastructure circumstances. It suggests that government borrowing can actually increase demand by generating employment, thereby stimulating private spending.

3.1. Theoretical Literature

Accordingly to Engen and Hubbard (2004) the effects of government borrowing can operate through different channels, however, many of the concerns have focused on the potential interest rate effect. Government borrowing can affect private investment by crowding out private sector credit directly or indirectly, though the magnitude of these potential adverse consequences depends on the degree to which government borrowing raises interest rates and/or reduces private credit, so we have the following channels explaining crowding out:

In theory it is argued that an increase in public sector credit will imply a reduction in private sector credit. This crowding out effect can be manifested by reducing the credit available in the economy or by increasing its acquisition cost (interest rate) (Machava: 2017).

- **The interest rate channel (Price Channel)**

The increase in the interest rate leads to a partial loss of private capital formation in the economy due to the suppression of the government's tax deficit through the provision of securities, in the case of a consequence of public action that ultimately affects the Private behavior by altering the budgetary constraints by interest rates.

According to Anyanwu et al (2017) in order to understand the effect of government indebtedness on interest rates, a model based on an aggregate production function can be understood. It is a Coub-Douglas function where:

r- Interest rate;

K- Capital;

MPK- Marginal Capital product;

L-Labour Units;

A-Multifactor productivity;

D- Public Debt;

δ – Capital in production function;

$$Y=AL^\delta(1-\delta) \quad (1.1)$$

$$\delta=(MPK*K)/Y \quad (1.2)$$

So we determined the interest rate by joining the two equations (1.1) + (1.2) together:

$$r =MPK= \delta*(Y/K)= \delta*A*\left(\frac{L}{K}\right)^{1-\delta} \quad (2)$$

It means that, the level of interest rate is determined by level of capital stock and level of capital stock and level of government debt. However, the effect of this government debt under the interest rate is seen on different perspectives:

(1) *Neoclassic* -argues that by financing a budget deficit there is a need to increase the supply of bonds that will entail a higher interest rate which leads us to crowding out by discouraging investments.

(2) *Keynesian*-according to them, if a certain expansionist tax policy is instituted, will influence little or may even not influence an increase in the interest rate having rather an influence on the production (increase) leading us to witness a Crowding in instead of crowding out.

(3) *Ricardiana's Equivalence Theorem* – this theorem defends a null influence on the rate of interest soon, an increase in the deficit financed by tax expenditures will be accompanied by an increase in taxes (in the future) keeping interest rates unchanged.

However, according to (Dwyer: 1985) cited by Anywu et al (2017) brings the hypothesis that the demand for debt of government is infinitely elastic which leads us to defend that an increase in the deficit will be financed by the entry of foreign capital instead of domestic savings which may lead to the neutrality of the interest rate.

- **The credit channel(Quantity Channel)**

Government borrowing affects private investment through the lending rate, however in countries whose economy is relatively unstable (usually developing countries) interest rates may to some extent be insensitive to market variations. For it, is argued that government debts, has no effect on the interest rate but have, on private credit due to government intervention through: administrative procedures limiting the institutions wishing to enter the market causing these Institutions are not at risk, as it is not possible to implement higher interest rates by stimulating a credit rationing.

In this way we will not allocate according to returns in a project, but according to the guarantees and size of the loan of the institutions. So, if the interest rate channel is weak, the quantity channel will capture the effects of government borrowing.

Consequently, the degree of quantitative crowding out depends on the nature of the endogenous response of the banks to higher government borrowing and how they alter their balance sheets. Banks respond to higher government borrowing by adjusting their loan portfolio optimally given the risk-return characteristics of different assets and liabilities (Emran and Farazi: 2009).

3.2. Empirical Literature

Huang et al. (2018) using the interest rate channel (price channel) they analyze the relationship between high level of government debt and corporate investment for that, they use data for advanced and emerging economics concluding that, government debt, increases the sensitivity of corporate investment to cash flows indicating that the relationship between public debt and investment is likely to be casual and that public debt crowds out corporate investment by tightening credit constraints.

Accordingly to Anyanwu et al(2017) using the credit channel (quantity channel) putting the interest rate aside so the study examine the crowding out effect of government domestic borrowing using a panel data model on 28 oil dependent countries between 1990-2012 using GMM as methodology, we concluded that, an increase in government borrowing from domestic banks significantly decreases private sector credit by 0.22% having no significant effect on the lending rate banks charge to the private sector.

Using the price channel (interest rate) the study investigate the impact of government borrowing from the scheduled banks on the credit to private sector in Pakistan(monthly data), having conclude that, a one percentage point growth in the government borrowing leads to 8 basis points crowding out of the private sector credit in four months.(Zaheer, et al: 2017)

For Fayed (2012) Egypt have been dealing with an excessive public borrowing due to the domestic financing so a co-integration approach is used to investigate the relationship between public borrowing and private credit. The paper sheds light on the quantity channel of crowding out of private investment in Egypt by focusing on the volume of private credit. Concluding that, government borrowing from the domestic banks leads to a more than one to one crowding out of private credit however, the results implies that government borrowing from banks is not the only reason behind crowding out private credit.

For Shetta and Kamaly (2014) this paper tests the lazy banking hypothesis in Egypt, so according to the paper, government borrowing crowds out private investment through its effects on private credit, using a vector autoregressive model with quarterly data. And the results have showed that banks opt for lazy behavior (throwing their portfolio away) limiting their exposure to the private sector, hence reducing private investment, and affecting negatively growth. In addition, evidence shows that output growth positively impacts the willingness of the banking sector to extend more credit to both the government and the private sector. However accordingly to Machava (2017) which studied the relationship between private sector credit and the public sector through quarterly data concluding that both in the short and long term increasing public sector credit does not imply a reduction in public sector credit, as commercial banks in Mozambique allocates credit to both sectors in order to diversify risk also showing that inflation and economic growth have adverse effects on the relationship between credit to the private sector and the public sector affecting negatively and positively respectively.

And, for Chebet and Kiemo (2017) this paper confirms that government domestic borrowing from the banking sector crowds out investment as every shilling lend to the government from the banking sector reduces private sector credit by 15 cents. Evidence affirms that crowding out is prevalent via the quantity channel where government borrowing competes with loanable funds that would otherwise be lend to the private sector. Consistent with popular empirical findings, the price channel though present is muted and impulse response functions confirm that crowding out via the quantity channel dissipates within two years.

4. Methodological procedures

Focusing on Mozambique over the period 1998-2019, this paper studies the effect of domestic (internal) debt in private sector and consequently in private credit. More specifically, we analyze whether the increase in domestic borrowing (debt) in Mozambique resulted in a decrease in private credit, offering a richer specification compared to the existing literature.

Inspired by the Chebet and Kiemo (2017) paper related to relationship between governments domestic borrowing from commercial banks and private sector credit in Kenya, my data will be based on the frequency of government cash flows that occur on monthly bases. To assess the long run relationship between government domestic borrowing from the banking sector and private sector credit, the investigation will apply to the Autoregressive Distributed Lag Model (ADRL) permitting, correct for any correlation that might exist between independent variables in the model leading to endogeneity and account for potential co-integration and multicollinearity.

4.1. Description of data and it's sources

In this study, we are looking at a time series analysis with a sample of 1998 to 2019, the frequency of which is monthly with a total of 216 observations that will be in levels, taken from the site of the Bank of Mozambique.

Accordingly to Chebet and Kiemo (2017) the variables used will be: private sector credit, nominal lending rate, public sector credit (where the variables of interest consist of credit to the private sector for quantity channel and nominal lending rate for price channel) however we are not including 91 treasury bill rate and interbank rate due to the reduced number of observations in

Mozambique, that would compromise the inferences about the results and we will not be including inflation also since we are using variables in real terms it would automatically, create autocorrelation between the variables.

Variables:

- Private Sector Credit in log (c)-Credit to non-financial public companies, private companies, private and other non-monetary financial institutions and nonprofit collective organization. (Machava:2017);
- Public Sector Credit² in log (gc) - consists of the sum of credits of central government institutions and other institutions that depend on the general budget of the state and the National Institute of Social Security (BM:2017).
- Nominal Lending Rate (LR) - is the rate of interest that you have to pay when you are repaying a loan.

5. Estimation (Procedures used)

Before the model is estimated, the variables (dependent and independent) are subjected to a stationarity test (unit root test) that will allow us to analyze if the variables follow the assumptions (zero mean and constant variance). Thus the unit root test used is Augmented Dickey Fuller (ADF), determined as according to (Liedema, 2017):

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \lambda \Delta Y_{t-1} + \epsilon_t$$

This empirical analysis begins with an econometric model specification according to the formulation by Chebet and Kiemo (2017) express a model for each channel as the following:

$$\Theta(L) Y_t = \alpha + \hat{\Theta}(L) X_t + \mu_t \tag{1}$$

Where:

$$\Theta(L) Y_t = 1 - \Theta_1 L - \Theta_2 L^2 - \dots - \Theta_2 L^p \tag{1.1}$$

$$\hat{\Theta}(L) = \hat{\Theta}_0 + \hat{\Theta}_1 L + \hat{\Theta}_2 L^2 + \dots + \hat{\Theta}_q L^q \tag{1.2}$$

² Gross Credit to the Government

Long Run Solution:

$$Y_t = \frac{\delta}{\theta(1)} + \frac{\theta(1)}{\theta(1)} X_t \quad (2)$$

Using the Autoregressive Distributed Lag Model (ARDL) approach to test a co-integration relationship having been chosen for having certain advantages over the other co-integration procedures.

- Allow us to use a larger number of variables compared to other models;
- Can be applied independently if we have allows for variables that do not meet base stationarity properties;

However with some differences due to temporal limitation of data availability. However, unlike the Chebet and Kiemo (2017) model, the variables will not be presented in terms of differences but in terms of levels because it is an ARDL approach by Pesaran et al (2001) and with 3 lags for Quantity Channel and Price Channel, choosing the number of lags based on the presence of auto correlation using a semi-log model.

Therefore, this mechanism will allow us to verify whether changes in domestic government debt have an influence on credit granted to the private sector and which channel is responsible for this predominance, and we hope to find that changes in domestic government debt have an influence on credit granted. The private sector is the price channel most affected by being directly linked to the loan interest rate.

5.1. Analysis and interpretation of results

The results of analyzes are presented below: Unit root test, examination of short and long term coefficients using the ARDL model.

- The first model refers to the Quantity channel that allows us to find out the effects of domestic borrowing on private sector credit.
- The second model refers to the Price channel that allows us to find out net claims on government on the interest rate (lending rate).

5.1.1. Unit Root Test (Augmented Dickey Fuller)

The first step is to perform a unit root test for each variable belonging to the model to ascertain its stationary, and in this case the test chosen was the ADF, which presupposes:

$$H_0: \beta_0 = 0 \quad (\text{Unit Root})$$

$$H_1: \beta_1 < 0 \quad (\text{Stationarity})$$

The ADF employed to test for the time series, properties of model variables with trend and intercept. The results lead us to conclude that all the variables in terms of levels are not stationary (presence of unit root) however become stationary when the first difference is made. The fact that we have all variables as non-stationary justifies the use of the ARDL model (applying an OLS)³ indicating for non-stationary time series and mixed time series where this model takes sufficient number of lags to capture the data generating process in general to specific modeling framework provided that the order of co-integration is not greater than 1.

Variables	D-lag	t-ADF
c(Private Sector Credit)	3	0.1113
	2	0.2831
	1	0.4443
	0	0.3549

Table 1 Unit Root Test of private sector credit

Rejection of the null hypothesis of unitary root at the level of statistical significance of 1% (** *), 5% (* *) and 10% (*).

Variables	D-lag	t-ADF
LR(lending rate)	3	-1.838
	2	-1.825
	1	-1.526

³ Ordinary Least Squares (OLS) matching the Gauss Markov with Blue assumptions.

	0	-1.123
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Table 2 Unit Root Test of lending rate

Rejection of the null hypothesis of unitary root at the level of statistical significance of 1% (**), 5% (*) and 10% (*).

Variables	D-lag	t-ADF
gc(Public Sector Credit)	3	-0.2023
	2	-0.3027
	1	0.00985
	0	-0.2456

Table 3 Unit Root Test of public sector credit

Rejection of the null hypothesis of unitary root at the level of statistical significance of 1% (**), 5% (*) and 10% (*).

5.1.2. Empirical Results

	Equation 2.1		Equation 2.2		Equation 3 Price:	
	Quantity: Private Sector Credit		Quantity: Private Sector Credit		Nominal Lending rate	
	Coeff	SE	Coeff	SE	Coeff	SE
Constant	0.09945	(0.0435)	0.2531 4	(0.0537)	0.00547	(0.00396)
c_1	0.93637	(0.0696)	0.8372 9	(0.0697)		
c_2	0.12408	(0.0950)	0.1605 4	(0.0912)		
c_3	-0.07522	(0.0690)	-0.0238	(0.0684)		
gc	-0.11184	(0.0325)	-0.1062	(0.0315)	-0.00318	(0.06790)
gc_1	0.13055	(0.0463)	0.1408 6	(0.0449)	0.01812	(0.10790)

gc_2	0.00000	(0.0465)	-0.0135	(0.0455)	-0.01497	(0.06714)
gc_3	0.00638	(0.0325)	-0.0023	(0.0317)	-0.00041	(0.00396)
LR			-1.0610	(0.4752)		
LR_1			1.3048	(0.7427)	1.22969	(0.00452)
			3			
LR_2			0.6471	(0.7395)	-0.40016	(0.00640)
			6			
LR_3			-1.2330	(0.4761)	-0.20960	(0.00648)
R^2	0.99815		0.9983		0.98105	(0.00442)
	7		7			
n obs	217		217		218	
AR 1-7 test						
F(7,202)	1.1131	(0.3561)				
AR 1-7 test			0.3285	(0.9403)		
F(7,198)			9			
AR 1-7 test					1.7407	(0.1013)
F(7,203)						
Hetero test						
F(14,202)	1.2417	(0.2475)				
Hetero test						
F(22,194)			1.2679	(0.1972)		
Hetero test					2.91	(0.0005)*
F(14,203)						*
Normality		(0.0000)*				
chi^2(2)	76.34					*
Normality				(0.0000)*		
chi^2(2)			55.698			*
Normality						(0.0000)*
chi^2(2)					166.62	*
Wald test		(0.0005)*				
chi^2(1)	12.2963					*

Wald test	76.798	(0.0000)*	
chi ² (1)	8	*	
Wald test		0.38345	
chi ² (1)		9	(0.5358)

Table 4 Empirical results of ARDL estimation

- **The Quantity Channel**

Regarding the quantity channel, we seek to see the effect that explanatory variables have on the explained variable by dividing the model in two. First we estimate a model that evaluates the effect of the public sector credit on private credit by keeping the interest rate constant so that the effect can be assessed.

Next, we estimate the second model where we include the interest rate as one of the explanatory variables of the model in order to evaluate its effect. It is important to note that we will look at both the short term and long term (through the error correction mechanism).

Both equations 2.1 and 2.2 were estimated with 3 lags for each variable. It is important to highlight that for equation 2.1 we do not have autocorrelation or heteroscedasticity. Thus it can be said that as for the credit to the public sector a negative sign is expected (an inverse relationship) since the larger the loan to the government tends to be the smaller the loan to the private sector, and this is verifiable because when the credit the government increases by 1% the private credit granted reduces by 0.11%. Which shows that in the short term we have a weak crowding out presence.

However this relationship in the long run no longer holds, on the contrary, we will see that in the long run we will have the presence of crowding in (an economic principle in which private credit increases as debt financed government spending increases which represents the opposite of crowding out) Since the Wald test coefficient is statistically significant at significance levels of 5 and 10% which shows that there is a long-term relationship but a positive relationship, and this is due to the fact that most credits The government asks the economy to focus on deposits. And theoretically if deposits exceed credit, the state has more funds to be able to make investments as the credit to the private sector will be greater then will be a greater stimulus of the economy.

Long Run solution: $ECM = c - 6.73141 - 0.831709*gc$

For equation 2.2, which includes the interest rate, we find that we do not have autocorrelation and heteroscedasticity, and the inverse relationship expected by the public sector credit in the short term is confirmed, as it is expected that The theory is that by increasing credit to the public sector there is a reduction in credit to the private sector, and this relationship is effective because by increasing the public sector credit by 1%, the credit to the public sector is reduced by about 0.10%. About the lending rate, it was expected that as the rate increased in the economy, there would be a tendency for borrowing to become more expensive for borrowers. So, if borrowers find it difficult to borrow because of the high level at which they find themselves, the acquisition rates will have an influence on the demand for credit.

Therefore, the beta coefficient belonging to the lending rate has the expected signal as this indicates a negative effect of a higher rate on credit to the private sector, because when the lending rate increases 1% the private sector credit tends to decrease in 1.06% being This is a short-term effect. As for the long term it is possible to verify through the Wald test that it is also significant at significance levels of 5% and 10% demonstrates that there is a tendency of crowding out although relatively weak where the 1% increase in lending rate will reduce credit to the private sector by 13.15%.

Long Run solution: $ECM = c - 9.73194 - 0.72197*gc + 13.1531*LR$

- **The Price Channel**

As for the price channel (equation 3), we established the relationship between public sector credit and the lending rate. A model with 3 lags was estimated for each variable where we do not have autocorrelation but we have heteroscedasticity. In terms of what was expected, that the increase in credit to the public sector would increase the lending rate but according to the results, the 1% increase in public sector credit rating the lending rate by 0.003% may soon conclude that we are not facing crowding out in the short term.

According to Wald's test, this is not significant for all levels of significance, revealing the absence of crowding out or any kind of long-term relationship between both variables, so we identify that we don't have a short and long run relationship between those variables and consequently no crowding out.

Long Run solution: $ECM = LR - 0.272484 + 0.0137847*gc$

6. Conclusion

This study used monthly data to analyze through two channels (price and quantity) by the Autoregressive Distributed Lag Model (ARDL) method if there is an effect of increased domestic debt (borrowing from the banking sector) on credit to the private sector. For this purpose two models are used in the quantity channel and one model for the price channel.

Additionally, the study aimed to test if in increasing domestic financing in Mozambique leads to a reduction of private sector credit and consequently crowding out. According to the data it is possible to ascertain that in general it can be concluded that there is not a sufficiently strong crowding out relationship between public sector credit (which has an influence on the increase in domestic debt) and private sector credit.

However, the null hypothesis that there is no effect of changes in government domestic debt on credit to the private sector is rejected as well as the alternative hypothesis two that there is an effect of changes in government domestic debt on credit to the private sector accordingly. Therefore, through the quantity channel it is possible to verify that although it is not a strong relation when the interest rate is included as one of the explanatory variables there is a long term relationship with the existence of crowding out, thus accepting the alternative hypothesis 1.

This weak long-term relationship to the quantity channel and the lack of crowding out to the long-term price channel underscores what Baldacci et al (2003) quoted by Chebet and Kiemo (2017) argued, that fiscal policies in countries such as Mozambique are transmitted by the increase in the productivity of their factors and not by the increase in investment, which reaffirms that in the long run there is a tendency to not crowding out.

7. Bibliographies

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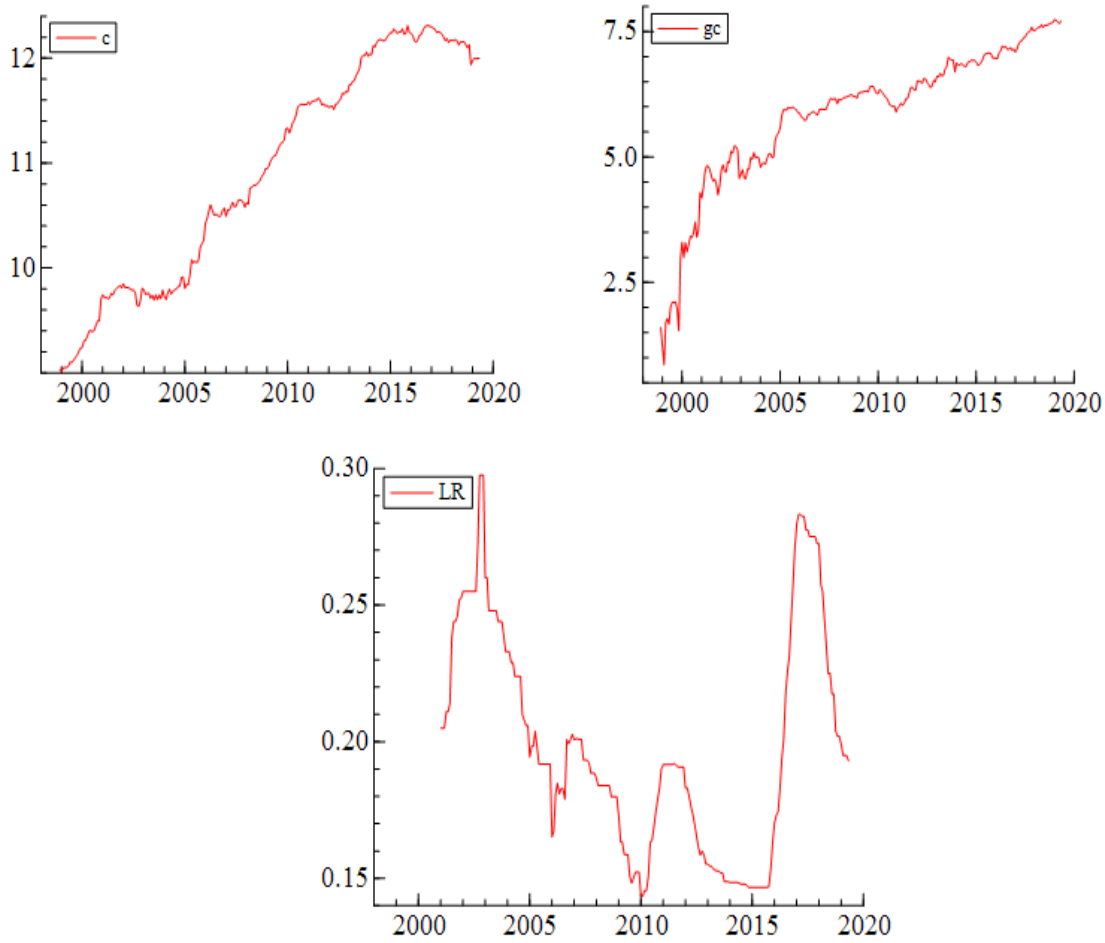
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8. Annex

8.1 Graphics of the variables analyzed evolution over time



8.2. Variables Stability

Generally this type of test is performed to evaluate if the data presents some kind of structural break that will lead us to specify two models due to breaks as it is possible to check below where in the first case we have a single regression line that can be expressed as:

$$y_t = \alpha_0 + \alpha_1 x_t + u_t \quad (4)$$

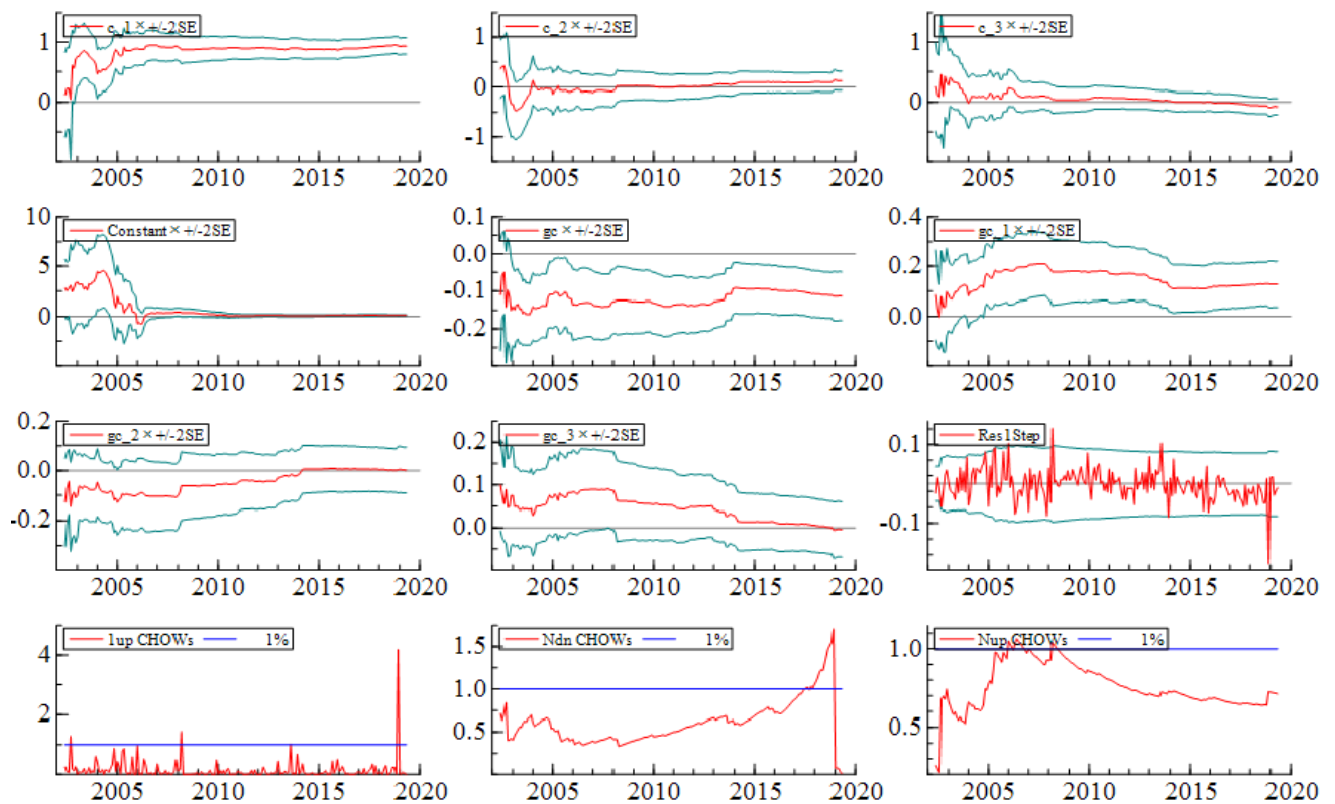
However, in the second case, where there is a structural break, we have two separate models, expressed as:

$$\begin{aligned}
 y_t &= \beta_1 + \beta_2 x_t + u_{1t} \\
 y_t &= \delta_1 + \delta_2 x_t + u_{2t}
 \end{aligned}
 \tag{4.1}$$

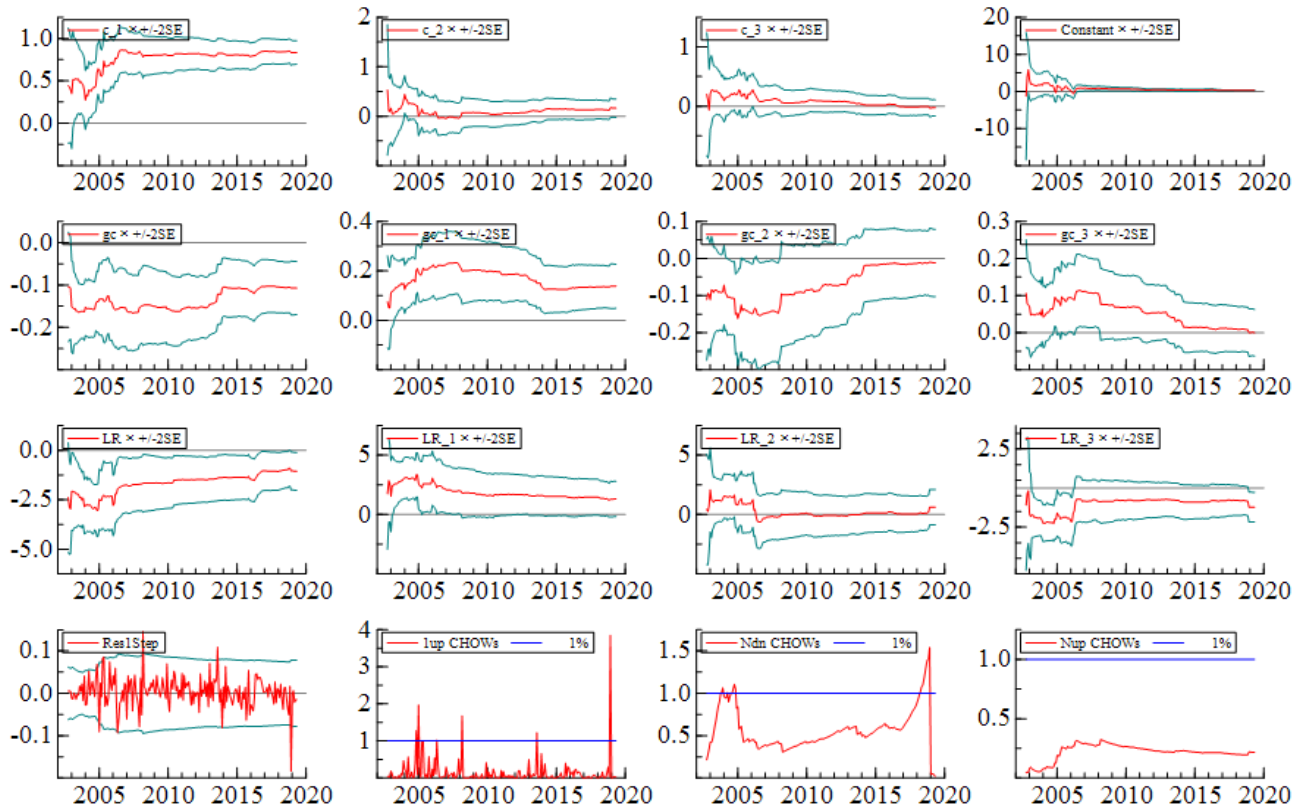
Being able to verify that according to the quantity channel and price channels we haven't necessarily registered a structural break that could imply divide the sample in two.

8.2.1 Stability for Quantity Channel

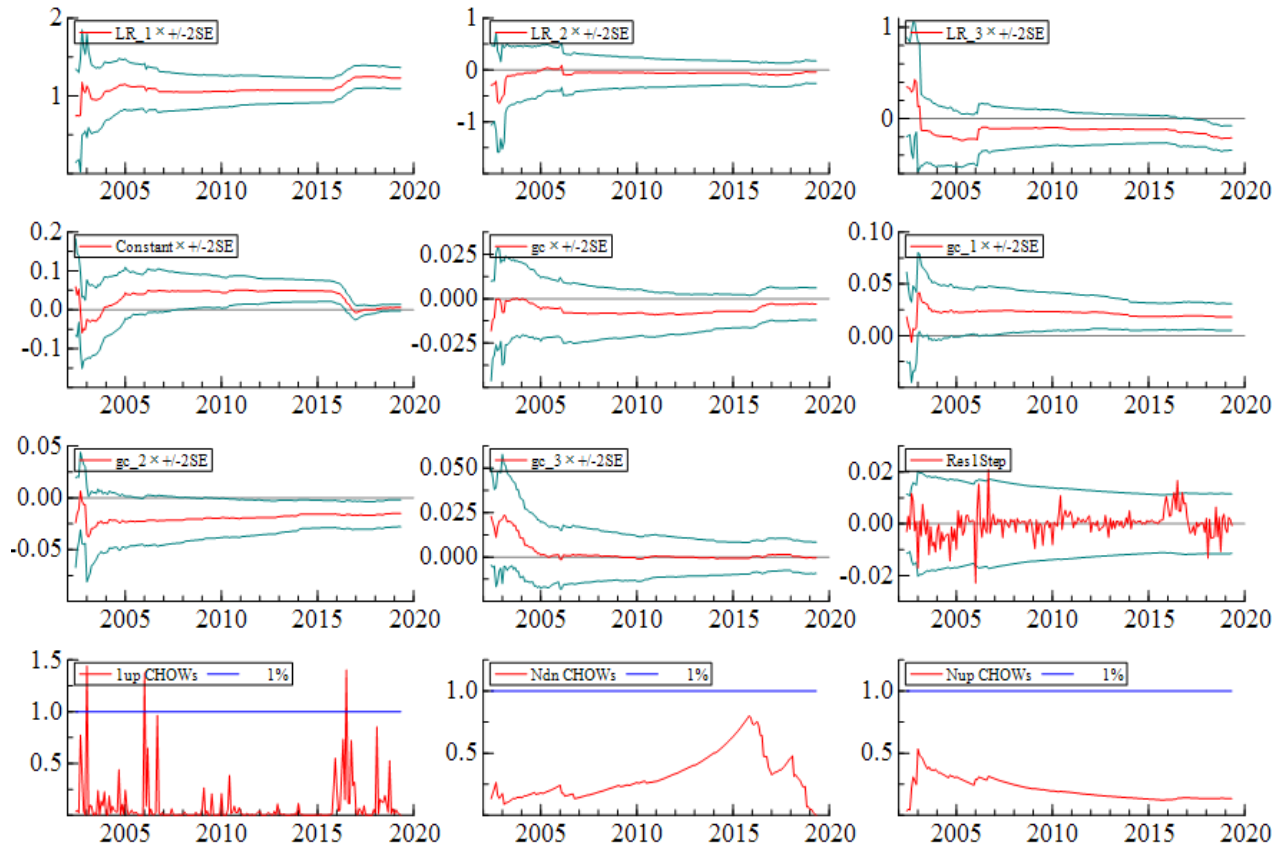
Equation 2.1



Equation 2.2



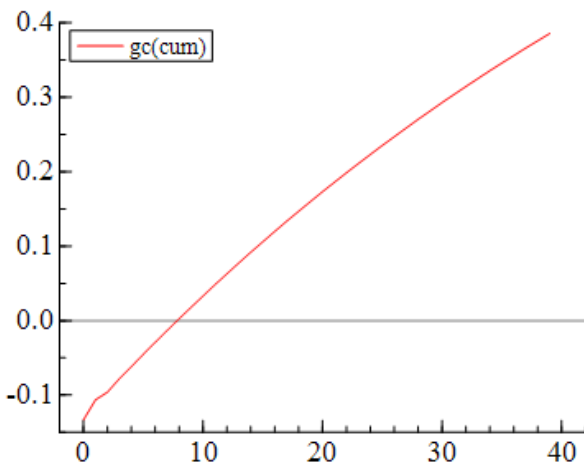
8.2.3 Stability for Price Channel



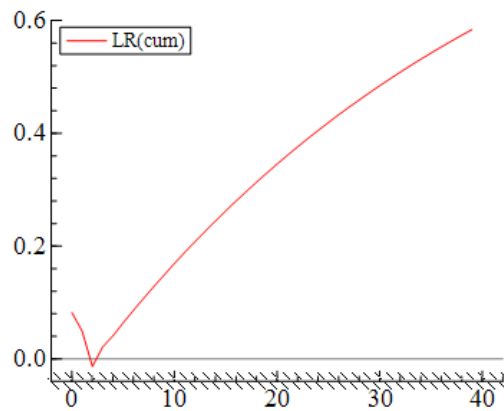
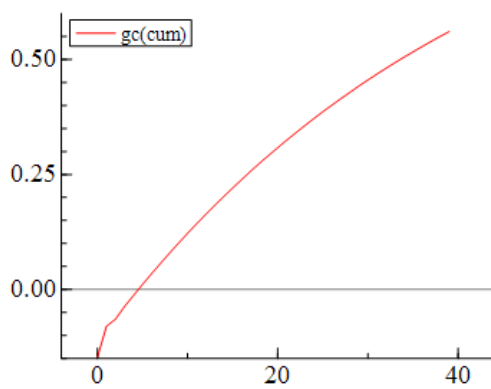
8.3. Speed of adjustment of Quantity Channel

It allows us to evaluate the speed of adjustment of each variable over the dependent variable to achieve long-term equilibrium.

Equation 2.1



Equation 2.2



8.4. Speed of adjustment of Price Channel

