

Determinants of the External Public Debt in Ecuador. Period 1990-2020

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Summary:

External public debt represents external resources that governments use to offset their fiscal deficits. The research aims to identify the determinants of external public debt in Ecuador between 1990 and 2020 using the ARDL methodology, which is ideal for analyzing the short- and long-term relationships between variables with limited data. The results of the study indicate that, in the short term, lagging debt, trade openness, inflation, and lagging inflation are significant, while in the long term, national savings, government spending, and oil prices are significant.

Keywords: indebtedness, economy, ARDL, Ecuador, financial obligation.

JEL Classification: H63, F34, C22.

1. Introduction

According to Stiglitz (2000), external public debt is a mechanism through which the State obtains resources from the external sector to correct fiscal deficits. However, it is important to emphasize that external indebtedness must be justified by the purpose of use given to the resources obtained, being the most appropriate to allocate them to finance permanent benefits such as those generated by the construction of schools, industrial projects and roads.

From an economic literature perspective, it is argued that public external debt can create obstacles to economic growth in developing and low-income countries. To prevent these negative effects, maximum debt thresholds are suggested that should not be exceeded. In the case of emerging economies such as Ecuador, it is estimated that debt should not exceed 30% of GDP. The main effect generated by external over-indebtedness is the stagnation of the economy; although in addition, several authors consider that there are social and economic implications that may arise, such as increased poverty, reduced subsidies, and increased unemployment (Zakaria, 2012; Ministry of Economy and Finance, 2016; Tesfaye, 2021).

The problem of indebtedness is a topic of interest because, in Latin America, several countries have exceeded the recommended debt limit, which has caused problems in the economy and has generated consequences such as the reduction of subsidies and the slowdown of economic growth. In Ecuador, Article 124 of the Constitution establishes that the external public debt must not exceed 40% of GDP; however, since 2017, the Ecuadorian economy has exceeded the 30% limit recommended by the literature, and as of 2020 it has exceeded the constitutional limit established in 2008 (Economic Commission for Latin America and the Caribbean, 2021; Ministry of Economy and Finance, 2012), which leads to

an investigation into the determinants of external public debt in Ecuador, which during the period 1990-2020 have caused this excess in indebtedness.

At the Latin American level, the internal economic crises of each country, including political and inflationary instabilities and the 2020 pandemic, were the causes of indebtedness that reduced tax collection and generated higher expenditures in sectors such as health and subsidies in the different economies and, in the case of Ecuador, external shocks such as the 2008 crisis. As a result, economies have experienced a decline in GDP, increased poverty, budget deficits, and increased indebtedness (Economic Commission for Latin America and the Caribbean, 2021).

The analysis of external debt is a subject that has been widely studied, especially in highly indebted countries, since this debt, on many occasions, is a great burden that restricts growth; For this reason, it is important to know what are the determinants that force a country to borrow. Studies on the subject are numerous at the international level; however, at the level of Latin America they are scarce and even more so in Ecuador, which allows us to determine the importance of this study in the contribution to literature. With this background, the research aims to identify the determinants of external public debt in Ecuador during the period 1990-2020.

Demissew and Kotosz (2020) examine the macroeconomic determinants of external indebtedness for the period 1981-2016 in Ethiopia using the same ARDL methodology; The results showed a direct long-term relationship between external debt and the savings-investment gap, the trade deficit, the budget deficit and debt service. In addition, it was found that inflation, trade openness and economic growth have an inverse relationship with external public debt.

Considering the importance of this article, it is described that the research is organized in seven sections: introduction, literature review, theoretical framework, methodology, results, discussion and conclusions.

2. Literature review

In Venezuela, a study by Hernández et al. (2007) is presented, which sought to measure the effect of the determinants on Venezuela's public debt during the period 1970-2005 through the primary gap indicator proposed by Blanchard; The results obtained indicate that economic growth, inflation and the primary surplus help to reduce public debt, with inflation being the variable that exerts the greatest influence on the reduction of Venezuelan public debt. A study carried out by Bittencourt (2015), using the MCO methodology, analyzes the determinants of the external public debt of 9 South American countries in the period 1970-2007, with the results that in the long term, trade liberalization, economic growth and inflation maintain an inverse relationship with external debt, while government restrictions have a direct relationship with external debt. Similarly, more variables were used, but they turned out to be non-significant.

At the level of other regions, there are more precedents on this subject. Forslund et al., 2011 analyzes the composition of public debt in developing and emerging market countries to observe the correlation, through a panel of data, between the characteristics of countries and

the proportion of domestic debt, finding that the characteristics of the countries cannot explain the regional differences in the composition of public debt and that there is a weak correlation between inflationary history and the composition of public debt. The research carried out by (Al-Fawwaz, 2016) aimed to investigate the main determinants that influenced Jordan's external debt during the period 1990-2014 and used annual data, through the application of the ARDL model that consists of the dependent (external debt) and independent variables (trade openness, terms of trade, exchange rate and gross domestic product per capita); The study denounced that there is a positive and statistically significant effect of the trade variable on external debt in the long term, and a negative and statistically significant effect of the Gross Domestic Product per capita variable on external debt.

The study (Waheed, 2017) uses panel data from 12 oil and gas exporting countries and 12 oil and gas importing countries covering the period 2004-2013, and identifies that macroeconomic factors such as increased economic growth, GGR, and gross domestic savings (GDS) are important factors in reducing external debt in oil and gas importing countries and that conversely, the increase in the trade deficit, the international price of oil, interest payments on external debt, FDI and domestic investment are resulting in higher external debt in oil and gas-importing countries. Another important study is that of (Gokmenoglu & Mohammed, 2018) which investigates the determinants of external debt in Malaysia, for the period from 1970 to 2013, using the Johansen cointegration test, the vector error correction model (VECM) and the Granger causality test; the findings show that there is a long-term relationship between variables and GDP, recurrent expenditure and capital expenditure that Granger causes in external debt, findings that indicate that GDP growth is a solution to the external debt problem.

(Omrane Belguith, S. and Omrane, H., 2017) elaborate an econometric investigation of the macroeconomic determinants of public debt in Tunisia using the VECM model for the period 1986-2015; the results reveal that inflation and investment reduce the value of public debt, although the real interest rate, the budget deficit and trade openness increase public debt and it is concluded that the budget deficit is the most important determinant of public debt in Tunisia. (Sadik-Zada and Gatto, 2019) investigate the main drivers of public debt growth in 184 countries finding that oil abundance, economic growth rate, mineral rent share of total income, interest rate payments on external borrowing, and being a developing country have a statistically significant impact on public debt growth.

Other articles prepared on other continents are that of (Sundus, 2022) that assesses in Pakistan between 1975 and 2021, the factors that influence changes in debt levels, as well as the sustainability of public debt, using an ARDL approach to study the dynamics of debt in the short and long term finds a positive and significant impact of the fiscal deficit, the depreciation of the exchange rate and the interest rate on public debt in Pakistan; Additionally, the stability analysis finds that the main driving forces for increasing the country's debt burden are fiscal indiscipline coupled with rising cost due to exchange rate depreciation and higher interest rates.

It is crucial to discuss the theoretical and practical implications of the study for a better interpretation of the fulfillment of the research objective. In theoretical terms, the results of the research can help improve the understanding of the factors that drive external

indebtedness in Ecuador. In addition, the findings may be relevant for other countries in the region that are also experiencing growth in external debt levels. In practical terms, the results can be useful for informed economic and political decision-making on external indebtedness in Ecuador, given that the findings could be used by the government and other key actors to identify the determinants that help reduce debt and enhance them for the benefit of the country.

3. Theoretical Framework

According to the Ministry of Economy and Finance (2021), external public debt is the financial obligations contracted by public sector entities vis-à-vis non-resident entities in the same economy, including loans acquired by the central government, regional or municipal bodies, decentralized governments, or state-owned enterprises. Likewise, the Economic Commission for Latin America and the Caribbean (2001) defines external public debt as the revenues used by the different levels of government to finance public deficits, which are contracted with non-resident organizations and/or countries in local or foreign currency.

3.1. Causes of external public debt

The causes of external public debt are a variety of reasons that induce governments to take on public debt, according to Retchkiman (1977) considers the budget deficit, construction of public works, the start of wars, political negligence, pandemics and natural disasters as the main causes. According to Mohammed and Rasiah (2016), the fiscal deficit is considered to be the negative result that forces governments to borrow abroad to cover the fiscal gap.

According to Retchkiman (1977), pandemics are considered as unpredictable external effects that also affect the economy in general, a clear example is the covid-19 pandemic generated at the end of 2019, which caused economies to collect less income and spend more on social and economic support programs, which was financed through greater indebtedness (Economic Commission for Latin America and the Caribbean, 2021). Likewise, natural disasters are considered unpredictable effects that generate deaths, injuries, and problems in the economy due to the destruction of infrastructure and productive, health, and educational facilities, which force the government to go into debt to spend on the reconstruction of these sectors (Economic Commission for Latin America and the Caribbean, 2017).

Political negligence is considered to be another cause of external public indebtedness, this is explained by the existence of poor government management, which requests unnecessary loans for various personal reasons or with benefit for certain groups, ending these resources in corruption (Retchkiman, 1977).

3.2. Consequences of external public debt

The economic literature has identified that over-indebtedness can generate various consequences, which vary depending on the author's approach. According to Mankiw (2014), the general consequence of over-indebtedness is capital flight, which can trigger other negative consequences for the economy. For their part, Borensztein et al. (2007) argue that the consequences of external debt overhang may be the increase in inflationary rates and the possibility of a financial crisis.

With respect to capital flight, this occurs due to the loss of confidence in investors and lenders, which arises from the hypothesis that the higher the debt, the greater the temptation of the government not to pay it, which will generate uncertainties in investors and take their resources to other more stable economies. In this way, the country is left without resources, generating problems of economic growth and increasing poverty since there are not enough resources to finance social projects (Mankiw, 2014).

Similarly, inflationary states are generated because the external public debt entails the inflow of foreign currency, which if not allocated to productive sectors, can generate inflation since the money supply in circulation increases. All the consequences mentioned above end up impacting economic growth, which can be the cause of an economic crisis (Borensztein et al., 2007).

3.3. Theories on the determinants of external public debt

The study of theories on the determinants of external public debt involves analyzing and understanding the factors that influence the indebtedness of countries. There are different theoretical approaches that have been developed to explain these determinants, such as Bacha's theory of the three gaps and Krugman's theory of over-indebtedness.

3.3.1. Bacha's theory of the three gaps

The theory of the three gaps suggests that a country's external debt is the result of a gap between public resources and expenditures, a gap between national savings and investment, and a gap between exports and imports, i.e. the consideration of the gaps is based on the assessment of three key dimensions, namely: the fiscal gap, the savings-investment gap and the external gap respectively. According to this theory, a country will become indebted if it cannot close these gaps with its own resources, considering public spending, fiscal deficit, consumption, savings, trade deficit, imports, exports, and trade liberalization as determinants of debt (Bacha, 1990).

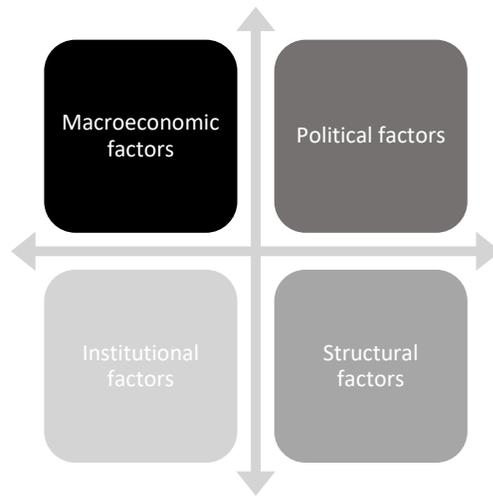
3.3.2. Krugman's theory of over-indebtedness

Krugman's theory of over-indebtedness suggests that a country will borrow if creditors believe the country can repay its debt. If creditors lose confidence in the country, then the country could find itself in a situation of over-indebtedness, considering foreign direct investment, economic growth, inflation, interest rates, among others, as determinants (Krugman, 1988).

3.4. Classification of the determinants of external public debt

Understanding the classification of the determinants of external public debt is essential to understand why economies borrow. In developed, emerging and underdeveloped economies, there are a series of determinants that explain the structure and level of debt that countries have with their international creditors. The research considers the classification of determinants proposed by (Omrane Belguith, S. & Omrane, H., 2017), which classifies by macroeconomic, political, institutional and structural factors.

Figure 1.
Classification of the determinants of external public debt.



Note: own elaboration.

Macroeconomic factors are those variables related to the economy such as positive savings, low public spending, economic growth, stable inflation and increase in export earnings (Swaray, 2005). On the other hand, Edwards and Tabellini (1991) and Lavigne (2011) explain that political factors also influence external public debt, including the political behavior of rulers and political instabilities that generate social instabilities, such as the number of strikes, damage to goods and services due to protests, and changes of leaders during a period of execution.

Institutional factors, such as the level of corruption in a country, are related to capital flight and the deficit balance in the government, since rulers or public servants spend resources on luxurious activities instead of investing in productive projects that benefit society. This can lead to a shortage of resources to finance the economy, leading governments to look for forms of financing abroad (Awan et al., 2014).

Finally, structural factors are those that are related to the behavior of the social situations of the economy, such as crime, insecurity, and unemployment rates. Likewise, the aging of the population is a structural factor that influences indebtedness, since, if a large part of the population is of adult age, the government must allocate more resources to provide frequent medical care, retirements, and public pensions, which may require more resources through indebtedness (Creel et al., 2012).

4. Methodology

4.1. Modelling

For data analysis, the research makes use of the ARDL econometric model with the aim of determining the short- and long-term relationship between the variables considered, for which secondary data of annual periodicity were used, from official notes such as the Central Bank of Ecuador, the World Bank and ECLAC.

The use of the ARDL model in research is important because it is considered as a suitable model to analyze short- and long-term relationships between macroeconomic variables. Likewise, the ARDL model is useful because the variables in question show a trend, which means that they change over time and considers the previous periods of the dependent and independent variables to explain the present behavior of the dependent variable. In addition, ARDL is easy to apply and produces accurate results with small samples as in the case of this study.

In its basic form, an ARDL regression model is described as follows:

$$Y_t = \alpha + \sum_{p=0}^{\infty} \beta_p X_{t-p} + \mu_t \quad (1)$$

Where Y_t represents a dependent variable figured in a time series, X_{t-p} represents the independent variables of the model, considering all lags in the time series $Y_t X_{t-p}$ ($p = 0, 1, 2 \dots n$). Finally, μ_t indicate the term error or perturbation of the model. As an analysis of the model, it can be said that, in the event of a change in the independent variable in any period of time, the dependent variable can be affected in the current periods (Greene, 2003).

The econometric expression of the ARDL model was proposed by Davidson and Mackinnon (2004), and is shown below.

$$Y_t = \beta_0 + \beta_1 y_{t-1} + \gamma_0 x_t + \gamma_1 x_{t-1} + \mu_t \quad (2)$$

In this equation it is explained that the model is an ARDL in the sense that the endogenous variable can be explained by its same lagging values and by the lags of the independent variables. In the equation it can be seen that there are parameters such as β_0 that indicate the estimation of the independent variables in the short term, while parameters such as β_1 , indicate the estimated result in the long term of the independent variables (Davidson & Mackinnon, 2004).

The ARDL method involves the validation of a series of key assumptions before proceeding with the application of the model, for which diagnostic tests are carried out for each scenario. The assumption of normality in the errors is validated by the Jarque-Bera contrast, the absence of serial autocorrelation is validated by the Breusch-Godfrey test, the homoscedasticity is validated by the Breusch-Pagan-Godfrey contrast and the absence of specification error in the model is validated by the Ramsey RESET test. In this case, the research first validates these assumptions to guarantee the robustness and reliability of the results obtained, after which the methodological process involving the ARDL is applied (Özata, 2017).

It is important to note that the economic literature presents a discussion about the choice of the most appropriate method to assess cointegration, either by the ARDL or Johansen method, but it is mentioned that the ARDL method is suitable for small sample data and for variables with different orders of integration that do not exceed order 2, while the Johansen method requires that time series have a sufficient amount of sample and that the variables are

non-stationary, they can even be of order 2. It is explained that, in the research in question, variables with a small data sample and without evidence of order 2 integration have been used, which makes the ARDL method more suitable for examining the relationships between the variables. In summary, the choice of the appropriate method to assess cointegration will depend on the characteristics of the data and the variables analyzed. The methodological process of the ARDL is as follows:

Stationarity analysis. It is used to know the order of integration by means of the ADF unit root test or the Phillips-Perrón test. Some authors recommend using the two methodologies to estimate the order of integration because both have complementary advantages between them, which are that the ARDL model considers that the variables can be integrated of order 0 and order 1, but cannot be integrated of order 2, because the model would present critical values between the variables and the result would be spurious (Bentzen & Engsted, 2001).

Analysis of lags. The Hannan Quinn, Akaike Information Criterion and Schwarz Information Criterion are used, considering that the variables may have different maximum amount of delay. It should be noted that Narayan in 2005, and previously Pesaran and Shin in 1999 established that when the data taken as a sample present an annual temporality, it is advisable to use a maximum amount of two delays, although the literature establishes only 1 delay. If the data were quarterly, the same literature recommends using a maximum of 4 delays (Narayan, 2005; Pesaran & Shin, 1999).

Cointegration analysis. To analyze the cointegration or long-term relationship, the F test of limits or Wald's test is used, taking into consideration the critical values proposed by Narayan (2004).

Estimation of the Error Correction Method. The fourth step is to estimate the error correction term, this coefficient must meet the condition of being negative and significant, thus indicating that, the greater the magnitude of the term, the better the adjustment speed (Özata, 2017).

Analysis of the stability of the model and estimation of long-term coefficients. Diagnostic tests should be carried out to verify some assumptions and avoid econometric problems. The diagnostic tests analyzed are the serial correlation using the Breusch-Godfrey contrast, the heteroskedasticity test using the Breusch-Pagan-Godfrey test, the normality test using the Jarque-Bera contrast and the Ramsey RESET test to study the specification error in the model. As a final part, and after having performed the F-limit test and having found that there is a long-term relationship, the coefficients of the long-term variables are calculated (Özata, 2017).

4.2. Data and Preliminary Analysis

Following the ideas of (Abdullahi et al., 2015; Mohammed, 2019; Demissew & Kotosz, 2020), the dependent variable and the independent variables used in the research are described in order to understand their unit of measurement and the relationship with economic theory. The selection of the variables was based on their relevance and potential impact, considering that the following are those that could influence the external public debt:

trade openness, national savings, public spending by the central government, inflation and oil prices.

For this research, the expression of the model is as follows:

$$DEX_t = \beta_0 + \beta_1 DPE_{t-i} + \beta_2 APC_{t-i} + \beta_3 AHN_{t-i} + \beta_4 GGC_{t-i} + \beta_5 INF_{t-i} + \beta_6 OIL_{t-i} + \lambda_1 DPE_{t-i} + \lambda_2 APC_{t-i} + \lambda_3 AHN_{t-i} + \lambda_4 GGC_{t-i} + \lambda_5 INF_{t-i} + \lambda_6 OIL_{t-i} + \mu_t \quad (3)$$

Where:

DPE_t = External public debt. It refers to the obligations contracted by the State with international organizations to finance the local economy, this debt includes the debt of the financial and non-financial public sector.

APC_{t-i} = Trade openness, Corresponds to the degree of freedom that the country has to relate through exports and imports with the outside. This variable is expressed as a percentage and is calculated as the sum of exports (X) and imports (M) divided by the country's GDP (Kizilgol & Ipek, 2014).

AHN_{t-i} = National savings, refers to the amount of money available after having carried out the different activities as obligations, this savings is determined by the savings capacity of the internal and external sectors (Kandil, 2010).

GGC_{t-i} = Public Expenditure of the Central Government. It is executed by the Government to offer goods and services to citizens, this is determined by the sum of the expenditure of the financial public sector and the non-financial public sector, considering current expenditure and capital expenditure (Dawood et al., 2021; Gokmenoglu & Mohamed, 2018).

INF_{t-i} = Inflation. Measured through the consumer price index, it reflects the sustained increase in the prices of a food basket over a period of time (Kizilgol & Ipek, 2014).

OIL_{t-i} = International Oil Price. It is the price in dollars per barrel with annual average data that is quoted in the international market taken as a reference index to WTI (Waheed, 2017).

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ = These are the parameters to be estimated that explain the relationship of the variables in the short term

$\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5, \lambda_6$ = These are the parameters to be estimated that explain the relationship of the variables in the long term

μ_t = Error term

$t - i$ = Temporal data minus and lags

Table 1.
Summary of the variables.

Description	Expression	Measure	Note
External Public Debt	DPE	Millions of dollars	ECB
Trade Opening	APC	Percentage	ECLAC
National Savings	AHN	Millions of dollars	ECLAC
Central Government Public Expenditure	Good game	Millions of dollars	ECLAC
Inflation	INF	Percentage	BM
Oil Price	OIL	Dollars	ECB

Note: own elaboration.

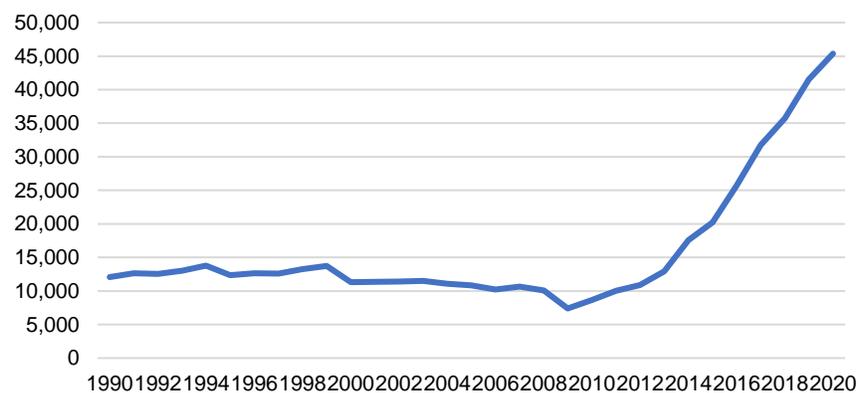
5. Results

In general, Ecuador's external public debt shows a downward trend from 1990 to 2009, with a fall of -39% in this period. This decrease is due to the improvement of the economy through the renegotiation of Brady and Eurobonds, dollarization and the renegotiation with the Paris Club. In 2009, the lowest debt of the period analyzed was recorded due to the suspension of interest payments on the debt after receiving a report issued by the Commission for the Comprehensive Audit of Public Credit. This report declared the existence of legality problems in the debt contracted (Acosta & Cajas, 2018; Central Bank of Ecuador, 2020).

In the period 2009-2020, Ecuador's external public debt experienced rapid growth, increasing by 514% from 7,392 million dollars to 45,369 million dollars respectively. This growth is due to expansionary fiscal policies with higher public spending since 2009, recurrent deficits and crises such as the financial crisis of 2008, the oil crisis and the earthquake of 2016. In addition, in 2014, the government received a disbursement of \$400 million from Goldman Sachs bank, which caused speculation about its legality. In 2020, the IMF granted the country 6,500 million dollars to deal with the crisis caused by the pandemic (Acosta & Cajas, 2018; Central Bank of Ecuador, 2020).

Figure 2.

Behavior of Ecuador's external public debt in millions of dollars, period 1990-2020.



Note: own elaboration.

Regarding the results obtained in the modeling (Table 2), it was found that the variables are significant in the first difference, which indicates that they are integrated of order 1 and no longer have a unit root. Therefore, the necessary condition is met to continue with the study of the model, as established by Pesaran et al. (2001), that all variables must be I (0) or I (1), but cannot be I (2) because this could generate spurious results due to a critical link between the variables.

Table 2.

Unit root test result using ADF contrast.

Variables	Tiered ADF			ADF in first dispute		
	Intercept	Trending and intercept	None	Intercept	Trending and intercept	None
LOGDPE	1,76	0,51	1,17	-3,38**	-4,23***	-2,02**
LOGAPC	-1,87	-1,63	-0,19	-5,15***	-5,21***	-5,25***
LOG HERE	-1,36	-1,42	0,64	-6,35***	-6,30***	-4,91***
LOGGGC	-1,20	-1,60	2,43	-4,66***	-4,70***	-3,49***
INF	-2,12	-3,17	-1,91**	-5,22***	-5,14***	-5,25***
LOGOIL	-1,38	-1,14	0,18	-4,80***	-4,41***	-4,86***

Note: Authors' elaboration based on the results of EVIEWS.

Through the delay length criterion test, it has been determined that several statistical criteria, such as the Sequential Modified Test (LR), the Final Prediction Error (FPE), the Akaike Information Criterion (AIC), the Schwarz Information Criterion (SC), and the Hannan-Quinn Information Criterion indicate that a delay should be included in the study model. Subsequently, using the Akaike information criterion and without considering any trend, the established order of the ARDL model (1,1,0,0,1,0) has been determined, which is evidenced in Figure 3, which shows that the External Public Debt (LOGDPE) has 1 lag, the Trade Openness (LOGAPC) has 1 lag, the National Savings (LOGAHN) has 0 lags, Public Expenditure (LOGGGC) has 0 lags, Inflation (INF) has 1 lag and Oil Price (LOGOIL) has 0 lags.

Table 3.

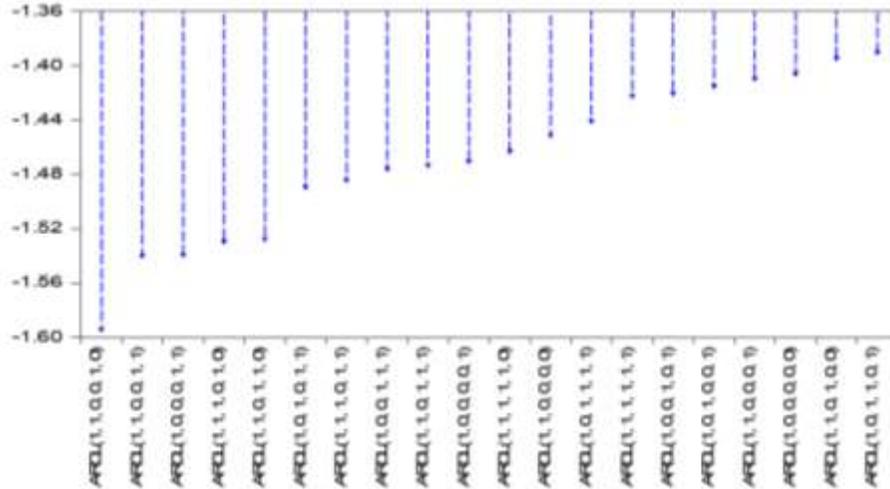
Result of the delay length criterion.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-95,48468	NA	4.41E-05	6,998944	7,281833	7,087541
1	42,6969	209,6548*	4.07E-	-	1,932160*	0,572119*
2	77,44203	38,33946	6.32E-08	0,038481	3,716035	1,190245

Note: Authors' elaboration based on the results of EVIEWS.

Figure 3.

Top 20 models based on Akaike information criteria.



Note: direct result from EViews.

The limit test is interpreted in three respects: first, if the calculated statistical F is higher than the upper critical values, then the null hypothesis is rejected. Second, if the statistical F is less than the lower critical values, then the null hypothesis is not rejected. Third, if the statistical F is between the lower and upper critical limits, the F test of limits is inconclusive (Zahir & Mohamed, 2021). In the result obtained, the F limit test shows evidence of cointegration or long-term relationship, since the calculated F statistic (5.04) is greater than the upper critical value at all levels.

Table 4.

F limit test of the ARDL model.

Test	Value	Signif	I (0)	I (1)
F-statistic	5,046939	10%	1,81	2,93
		5%	2,14	3,34
		2,50%	2,44	3,71
		1%	2,82	4,21

Notes: I (0) is integration of order 0; I (1) is integration of order 1.

HO: there is no long-term co-integration;

H1: There is long-term co-integration.

The results in Table 5 present the estimated coefficients of the ARDL model (1,1,0,0,1,0) in the short term using the Akaike information criterion. It is observed that all the variables are significant, with the exception of the Public Expenditure of the Central Government. However, some variables such as Trade Openness lagged by one period, National Savings and Oil Price do not meet the condition of having a statistical t greater than 2 to be considered valid.

The results of the ARDL model (1,1,0,0,1,0) show that the external debt variable lagging a period has a positive and significant coefficient, indicating that a 1% increase in external debt in the previous year results in a 0.87% increase in external debt in the present. Similarly, a

1% increase in trade openness results in a 0.38% increase in external public debt. Inflation has a negative and significant coefficient, which means that a 1% increase in inflation decreases external public debt by 0.003%, indicating that inflation is not a significant macroeconomic variable that contributes to debt reduction. Finally, a 1% increase in external debt in the previous period generates a 0.004% increase in external public debt.

The coefficient of the error correction method satisfies the condition of being negative and significant at 1%, as recommended in theory, with a value of -0.13. This indicates that the variables that interact with each other are highly reliable. In addition, it can be interpreted as a 13% adjustment speed towards long-term equilibrium after a shock occurred in the previous year.

Table 5.

Estimation of the method of correction of errors and coefficients in the short term.

Dependent variable: LOGDPE			
Variable	Coefficient	T-Statistic	Prob.
DLOGDPEt-1	0,874471	11,79093	0,0000
DLOGAPC	0,375895	2,119529	0,0456
DLOGAPCt-1	-0,605871	0,226646	0,0139
LOG	0,397656	1,841372	0,0791
DLOGGGC	-0,082288	-0,579286	0,5683
DINF	-0,00254	-2,121363	0,0454
DINFt-1	0,003711	2,266563	0,0336
DLOGOIL	-0,220778	-1,72445	0,0987
ECMt-1	-0,125529	-6,096214	0,0000
R squared = 0.96			
Durbin Watson = 1.43			

Note: Authors.

The results obtained from the diagnostic tests (Table 6) indicate that the serial correlation test has a probability greater than 5%, indicating that there is no autocorrelation in the model. Likewise, the heteroskedasticity test presents a probability greater than 5%, evidencing that there is homoscedasticity in the model. The normality test studied using the Jarque-Bera contrast has a probability greater than 5%, therefore, normal distribution is indicated in the model. Finally, the Ramsey RESET test has a probability greater than 5%, thus indicating that no specification error has been made in the model, i.e. that the estimated models have been specified correctly.

Table 6.

Results of the model's diagnostic tests.

ARDL Model (1,1,0,0,1,0)		
Diagnostic tests	Hypothesis	Prob.
Serial correlation	H0: no autocorrelation H1: no autocorrelation	0,284
Heteroskedasticity	H0: homoscedasticity H1: heteroskedasticity	0,8486
Normality	H0: there is normality H1: there is no normality	0,9358
Ramsey RESET	H0: No specification error H1: Specification error exists	0,1877

Note: Authors' elaboration based on the results of EVIEWS.

The results of Table 7 show that only three estimated coefficients are significant in the long term and one of them with an unexpected sign. National savings, public expenditure and the price of oil are significant, and there is an unexpected direct relationship between savings and external public debt; expected direct relationship between public expenditure and external public debt; while there is an expected inverse relationship between the price of oil and external public debt. When national savings increase by 1%, considering whether international aid is available and at less interest than domestic aid, external public debt increases by 3.16%, it was expected that the relationship would be inverse; however, the positive relationship is explained by the fact that as Ecuador obtained positive savings balances, this served as a good indicator of creditworthiness to access more credit.

Likewise, it is shown that the estimated coefficient for the price of oil is negative. This result indicates that, if the price of oil increases by 1%, external public debt will decrease by 1.75%. This is because when oil prices rise, Ecuador, being an oil-exporting country, receives more revenue from oil exports, allowing it to finance public spending and reduce the need for external financing. Finally, the results show a direct relationship between expenditure and external public debt, in which it is expected that in the face of a 1% increase in public spending, external public debt will increase by 2.65%. This relationship is due to the increase in public spending that has generated budget deficits since 2009, which has led to higher indebtedness. However, the other estimated coefficients, such as trade openness and inflation, were not significant, indicating that these factors do not explain the variation in external public debt in the long term.

Table 7.

Estimation of the coefficients in the long term.

Dependent variable: LOGDPE			
Variable	Coefficient	T-Statistic	Prob.
LOGAPC	-1,832059	-1,067437	0,2973
LOG HERE	3,167854	2,174968	0,0407
LOGGGC	2,655532	-2,614638	0,0251
INF	0,009334	0,734286	0,4705
LOGOIL	-1,75879	-3,440852	0,0023

Notes: All variables are in logarithm except for inflation.

Note: Authors' elaboration based on the results of EVIEWS.

6. Discussion

In the present research, two unexpected results have been found that will be discussed in this section, on the one hand, there is an inverse relationship between inflation and external public debt in the short term and a direct relationship between national savings and external public debt in the long term. The inverse relationship between inflation and Ecuador's external public debt in the short term is consistent with Hall and Sargent's (2011) idea of financial inflation, in which inflation is considered as a strategy to reduce external public debt in the short term. In addition, this inverse relationship is in line with the studies of Adane et al. (2018) and Lich and Tu (2017), who concluded that increases in inflation in the short term

can generate higher revenues for the government through the collection of VAT, reflecting the increase in the prices of goods and services, which are channeled to the payment of the debt. Also, in the face of rising inflation, central governments often increase interest rates, which can make the country less attractive to foreign investors.

In contrast to the inverse relationship between inflation and external public debt in the short term found in this research, other studies such as that of Zakaria (2012) and Demissew and Kotosz (2019) have found a direct relationship between inflation and external debt, in line with the economic literature that indicates that an increase in inflation makes production more expensive, which decreases exports. In addition, some countries may pursue policies of immediate effect in which rising inflation leads to an increase in government spending on programs or subsidies through debt to deal with the rising cost of living.

In summary, in the Ecuadorian context it has been observed that the direct relationship between inflation and external public debt is not fulfilled due to the stabilization of inflation after the adoption of the dollar as the official currency. In addition, macroeconomic stabilization and greater institutional credibility have allowed greater access to international financing markets, which has led to an increase in the country's external indebtedness. In the 1990s, when inflation was high, the government paid off the debt by printing money, which eventually led to the dollarization of the country.

The direct relationship between national savings and Ecuador's external public debt in the long run is considered unexpected according to economic theory. The theory states that an increase in national savings should reduce the country's need for debt, since it would have its own resources to finance the economy. However, in the case of Ecuador, this direct result appears to be related to expansionary fiscal policies that have led governments to increase spending on unprofitable projects at times of positive savings. This result is similar to the study conducted by Abdullahi et al. (2015), who found a direct relationship in the Nigerian economy. In contrast, Mohammed and Rasiah (2016), Özata (2017) and Okoye (2000) found an inverse relationship between the variables, which is in line with economic theory. These economies with lower external debt are characterized by higher national savings and lower public spending.

7. Conclusions

This paper fulfills the objective of identifying the determinants of external public debt in Ecuador during the period 1990-2020. By means of econometric estimation, clear results were obtained that allow identifying the factors or determinants that generate the structure of Ecuador's external public debt, these being that in the short term trade liberalization and inflation help to reduce the country's external public debt, while in the long term only oil prices help to reduce the external public debt, concluding that if oil prices continue to rise in the long term, the income received from exports will be higher and would help reduce the country's external public debt.

The statistical description of the external public debt shows that the behavior of the debt is increasing rapidly since 2013, thus concluding that the country is becoming increasingly dependent on external debt to achieve economic growth, which can lead to payment complications in the future and probably cause problems in the economy. To reduce the

country's dependence on foreign debt, the government could implement fiscal and monetary policies that encourage productive diversification, increase the efficiency of public spending, and reduce the fiscal deficit. Likewise, the possibility of alternative external financing notes, such as trade agreements, investment agreements with other countries and the promotion of foreign direct investment in strategic sectors of the national economy, could be explored.

The control of excessive public spending in unprofitable sectors such as current expenditure can be a great alternative to reduce indebtedness or alleviate to a certain extent the dependence on external public debt. Therefore, the government can implement measures to control and reduce public spending in unprofitable sectors, in addition, it can boost investment through public spending in profitable sectors of the national economy, such as agriculture and industry, to generate higher revenues and reduce the high dependence on oil to reduce external public debt.

Among the most prominent limitations that arose during the development of this research, the lack of data on several variables stands out. This lack is mainly attributed to the scarcity of data availability in Ecuador, particularly with regard to long-term studies. As a result, the ability to select and evaluate other possible determinants that could have demonstrated significance in the Ecuadorian context was restricted. Future research is recommended to develop predictive models that take into account the data limitations and particularities of the Ecuadorian economy. These models can help anticipate economic trends and make informed decisions in the absence of comprehensive data.

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