Demand for Money in Ecuador since 2001-2022

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Summary

The following work focuses on explaining the determinants of the demand for money, through the creation of three models: OLS, VAR and VECM. To do this, data from the Central Bank of Ecuador has been used, which includes: interest rate, GDP at current prices, M2 (Total Liquidity), and CPI with a base year of 2014. Likewise, an extensive review of literature on the subject in various regions of the planet, with different models. In the OLS model it has been found that the demand for money in Ecuador is affected by inflation; for every percentage that inflation rises, the demand for money falls by 0.97%. In the VAR model, no significant values have been found that contribute to the discussion. Finally, we have that in the VECM model, as in the OLS model, inflation has a negative effect on the demand for money. That is to say, the most important determinant that we can find regarding the demand for money in Ecuador is inflation. In addition, we also carried out an analysis of the determinants of the exchange rate in Ecuador, of the dollar against the euro, using an OLS model and a VAR model. It was concluded that Ecuador's influence on the exchange rate is minimal in the markets.

1. Introduction

The study of the demand for money is vital for the functioning of a country's economy; thus, the central banks of various countries dedicate money and effort to have the best quality of models and data possible. There are cases such as that of the European Union that, since its transition to the Euro, has exercised the majority of its monetary policy with respect to the growth of the monetary mass, unlike the United Kingdom, which has established inflation objectives as its main growth strategy. , both are interconnected but the approach is different. “One of the most controversial issues remaining on the agenda is the formulation of the policies of the European Central Bank (ECB), which is deciding between monetary policy objectives or inflation objectives. While the first has strong support from the German Bundesbank, the second has been adopted by the United Kingdom government since 1993"[8]. In both cases, countries have control over their currency. In the Ecuadorian case it is totally different, since it does not have the power to affect its monetary policy directly due to the dollarization process.

Since the dollarization of Ecuador in 2000, inflation has not been one of the problems that permanently affects the Ecuadorian economy. According to data from the Central Bank of Ecuador, they have gone from 120% in May 2000 to less than 5% since 2015, but one of the arguments that remains a topic of conversation is how to take care of dollarization so as not to return to the times of economic distress due to currency instability. This is how the need arises to calculate the demand for money since knowing the reasons why people want to have money can provide information about the population's thinking about the state of the economy.

This indicator is so important that, in Hayo's work estimating the European demand for money, the authors consider that, if the demand for money in the past is reviewed, with the shocks and events that have occurred, the future can be estimated. and prevent possible events that negatively affect the economy. That is to say, the calculation of the demand for money offers more information than a figure, it is an image of past economic reality and future prevention.

2. Literature review

There are several approaches to the demand for money in the literature. So much so that in the paper*A Survey of Recent Empirical Studies on the Demand for Money*by researcher Subramanian S. Sriram provides an analysis of the demand for money using the error correction model approach in the 1990s. The article is mostly a reference tool for future research on the demand for money in various countries. It presents estimated long-term elasticities, elasticities or semi-elasticities for opportunity cost and other variables in a comparable framework. The research addresses relevant issues for modeling and estimating the demand for money,

synthesizes information on variables, period and frequency of data, unit root and cointegration techniques, stability tests and findings in tabular form (Sriram,2000). This research is generally quite complete, it has an extensive recapitulation to advise future researchers on the demand for money in various countries. The article concludes that error correction models (ECMs) have been shown to meet these criteria for selecting appropriate monetary policy actions. [12]. Overall, the article provides a detailed survey of selected studies that assessed the demand for money and presents its findings in an easily usable and comparable framework.

On the other hand, an example of the compilation interest in the topic of literature referring to the demand for money is the work of*Demand for money: theory, evidence, results*by Verónica Mies and Raimundo Soto M., which talks about the importance of money in today's societies, as well as the role of the Central Bank of Chile in strengthening and maintaining its monetary independence through inflation objectives and constant monitoring of macroeconomic figures such as the demand for money [10]. His article consists of the analysis of the different theories and models in which the following stand out: The quantitative theory of money, inventory models, Friedman's general theory of demand, etc. Likewise, they carry out a detailed analysis of the different works that have been carried out in Chile to estimate demand. This is interesting, since in Ecuador work has been carried out to measure the demand for money, but there is no article that compiles the results, analyzes them together to understand which model best fits and explains why Ecuadorians They demand money in a dollarized economy. With respect to the Chilean case, the authors conclude that the demand for money is close to 1, that the Chilean population uses money as a reserve of value and as a precaution in case of emergency.

While in the article titled*Estimation of European money demand*by Bernd Hayo explores the idea of how the European demand for money could be estimated and whether it would be stable or not, examining the literature surrounding this topic and the contributions of other studies. Furthermore, the paper addresses methodological issues that arise when drawing conclusions from estimates of Europe's money demand for monetary policy. In estimating the European demand for money, the author, Bernd Hayo, used an econometric approach based on a general VAR (Vector AutoRegressive) system, and the data used by Hayo consists of a group of ten countries likely to form the Economic and Monetary Union European Union (EMU), which includes Germany, France, the Netherlands, Belgium, Ireland, Austria, Finland, Italy, Spain and Portugal. The author begins by performing a univariate time series analysis to evaluate the seasonality of the variables, then proceeds to estimate long-term money demand equations through a hierarchical process of descending tests, before moving on to explore the demand functions. short-term money and dynamics through error correction models [8]. Deterministic dummy variables are also used to take into account the potential impact of a temporary shock. Finally, the study uses recursive testing of cointegration restrictions to ensure the statistical adequacy of the model.

The econometric approach used by Hayo demonstrates a rigorous analysis process

which covers both the short and long term, allowing a more complete understanding of the demand for money in the European context. Empirical analysis revealed that the income elasticity of the demand for money, for both narrow and broad measures of money, was unitary. However, large money was found to be relatively less sensitive to changes in interest rates than small money [8]. These findings suggest that there could be an aggregate demand relationship for the Euro. This meticulous approach contributes to the robustness and reliability of the conclusions drawn regarding the demand for money in the countries considered to form the EMU.

The paper*An Error-correction Approach to Money Demand*We are provided with an empirical analysis of the behavior of money demand in Sudan, with a focus on the dynamic error correction model. The authors provide a theoretical basis for the model, allowing an explicit and parameterized division of the effects into long-term influences, short-term adjustments and proportional equilibrium conditions, using ordinary least squares to estimate the model, the authors establish a precise correspondence between model parameters in levels and differences [6]. They present evidence for the validity of long-run constraints and the importance of equilibrium effects on inflation, indicating a stable money demand function for Sudan and suggesting their possible use in a quantitative examination of relevant relationships.

This analysis of the money demand function in Sudan reveals a number of significant findings. During the period 1958-1977, characterized by economic stability, there is a modest average annual inflation rate of 6.5% and an average annual growth of real gross domestic product of 3.8% [6]. However, starting in the 1970s, the country experiences a rapid increase in monetization and highly expansionary fiscal policies in the public sector. This change coincides with a 25% devaluation of the Sudanese currency and a series of economic challenges, including crop failure and production shortages [6]. Analysis of the stability of the money demand function using out-of-sample forecast performance metrics reveals that, despite significant changes in the behavior of the variables before and after 1978, the error correction model remains stable [6]. Formal tests, including a Chow test and a residual-based statistic, support the stability of the model coefficients. However, the model's ability to forecast economic peaks and troughs varies, highlighting the need for a deeper understanding of slack adjustment and the impact on money demand behavior in changing economic contexts. This analysis contributes to the literature by providing valuable insights into the stability and predictive ability of the money demand function in a dynamic economic context such as Sudan.

In the article*Estimating Money Demand Functions*, Hetzel explores various functional forms for money demand regression equations. The author argues that a useful functional form for empirical work is one that focuses on the ability of nominal money growth to predict the rate of inflation. To test this hypothesis, the author presents the results of simulations and estimations using different functional forms. Hetzel highlights the need for a satisfactory theoretical explanation for

the adjustment equation used in estimating the money demand regression equation. Furthermore, he points out that the problem of how a change in nominal money decomposes over time into changes in real output and the price level is an unsolved problem in economics. The empirical results of Hetzel's paper support the hypothesis that a functional form that focuses on the ability of nominal money growth to predict the inflation rate is a useful way to summarize the empirical evidence for the existence of a money demand function. stable money [9]. The text suggests that different regressions are subject to simultaneous equation biases, but still depend on the theory of dependent variables. Hetzel notes that estimating the parameters of the public's money demand function will require a more robust understanding of why money is not neutral in the short run, a requirement that remains formidable. However, the research concludes that the estimation of the parameters of the public's money demand function is crucial to investigate empirical evidence of a stable money demand function.

Katrin Assenmacher and Andreas Beyer in their article*A cointegration model of money and wealth*They talk about the importance of obtaining the demand for money as a prerequisite for price stability. In its model it includes interesting variables such as the price of real estate as wealth to determine the homogeneity of prices, as well as the existence of a portfolio of goods and money. This is based on the article by Beyer (2009) that estimated the demand for money in the Euro zone from 1980 to 2007. This period does not include two important crises: the global financial crisis of 2008 and the debt crisis of the zone. Euro. To do this, in these two periods dummy variables have been included that reflect the period in which they are located, with this they will be able to adjust the results for these time periods. To avoid cointegration problems, the authors use Vector AutoRegressive (VAR) [1]. The research is divided into two, model I and model II, in which the same model is carried out but with changes in the dummy variables. In the end, more robust and empirically supported results are obtained in model I, on the other hand, model II offers an alternative analysis of the shocks that occur in an economy. Both visions could be transferred to the Ecuadorian reality to see how the shocks that have affected countries around the world also affect Ecuador. Likewise, observe which shocks have been merely local and have had no influence from outside.

Regarding the analysis of the determinants of the exchange rate, there is research *Determinants of the Choice of Exchange Rate Regimes in Six Central American Countries: An Empirical Analysis*by Michael G. Papaioannou which aims to examine whether the determinants of the choice of exchange rate regime in six Central American countries are based on long-term economic fundamentals or on the confluence of historical and political circumstances. The main data used in the research cover the period from 1974 to 2001 and are based on several probit and multinomial logit models of exchange rate regime choice [11]. The paper reviews three hypotheses on the choice of exchange rate regime: the optimal currency zone theory, the capital account opening hypothesis, and the institutional and historical characteristics hypothesis. It is found that the long-term theoretical determinants are adequate but not

robust predictors of the choice of exchange rate regime. Furthermore, trade openness, export share with the main trading partner, economic size and per capita income are found to be most associated with the choice of exchange rate regime. In conclusion, the empirical evidence shows that there are some statistically significant determinants of the choice of exchange rate regime in the six Central American countries studied. Certain long-term determinants, such as trade openness, export share, economic size, and per capita income, are considered adequate but not robust predictors [11]. The paper suggests that additional research on institutional factors could be beneficial to better understand the exchange rate regime choice process.

3. Data

Data from the Central Bank of Ecuador were used for the database. All the extracted data were thought according to the model established in the paper of*An errorcorrection approach to money demand: the case of Sudan*[6] The Gross Domestic Product was taken as the quarterly historical series of GDP at current prices, whose data were obtained from the Central Bank. The Consumer Price Index was taken as the historical series of consumer price index up to 2014 as the base year, and was extracted from the Ecuador in Figures report prepared by INEC [3]. While for Total Liquidity, M2 was made with the historical series of total liquidity M2, and for the Interest Rate the quarterly historical series of active interest rate was taken as data [5], all these data were extracted in the same way of the Central Bank.

For the exchange rate database we took several variables and ideas from the paper *Determinants of the Choice of Exchange Rate Regimes in Six Central American Countries: An Empirical Analysis*[eleven]. Thus, we take the data from the Central Bank of Ecuador for macroeconomic data such as real GDP and the interest rate [5]. The CPI and the inflation rate were obtained from INEC [3]. The Trade Balance of Ecuador was obtained from the central bank [4]. Macroeconomic aggregates for Europe were obtained through the free database of the European Central Bank. For the Eurozone we had the real GDP, the Price Index, the interest rate and inflation [2]. While the nominal exchange rate series was obtained from Google Finance [7]. In order to change this nominal exchange rate variable into a real exchange rate variable, a multiplication of the CPI of Ecuador against the CPI of Europe was carried out.

4. Methodology

Three estimable models were used for data analysis. For the first analysis, the model presented in the paper was used.*An Error-correction Approach to Money Demand*

which corresponds to a simple OLS where there are lags and log differences. The second we have a VAR model interacting all its possible variables, which are 4 lags, also derived from the model presented in*An Error-correction Approach to Money Demand*. Finally we have an error correction model that implements the same VAR model but with error correction coefficients and these error correction coefficients show how our model is adjusting in the long term.

The models for money demand specifically, as mentioned above, were derived primarily from the following formula used for the empirical analyzes for the country of Sudan in Domowitz's text, I. & Elbadawi (1987) [6]:

$$\begin{aligned}\Delta m_t = {} & y_0 + y_1 \Delta p_t + y_2 \Delta and_t + y_3 \Delta and_t + y_4 (m - p - y)_{t-1} \\ & + \; y_5 and_{t-1} + y_6 \Delta p_{t-1} + \sigma_1 p_{t-1} + \sigma_2 and_{t-1} + \varepsilon_t\end{aligned} \tag{1}$$

Where from $\Delta p_t$is the difference of inflation, $\Delta and_t$is the difference in GDP, $\Delta and_t$is the interest rate, $(m - p - y)_{t-1}$is the subtraction between liquidity, inflation and lagged GDP, and_{t-1} lag interest rate difference, Δp_{t-1}, is the lag of the inflation difference, andand_{t-1}It is the lagged difference in GDP.

While for the Exchange Rate, it was decided to apply a simple OLS regression and a VAR model, with all the variables that were considered important both for Ecuador and for the Eurozone.

Therefore, the following structure was followed for the OLS:

$$\begin{aligned}\Delta log(Exchange\ rate) = {} & \Delta log(GDP\ \ of\ \ Ecuador) \\ & + \Delta log(GDP\ \ of\ \ Eurozone) \\ & + \Delta log(CPI\ \ of\ \ Ecuador) \\ & + \Delta log(CPI\ \ of\ \ Eurozone) \\ & \\ & + \Delta log(Nominal\ exchange\ rate) \\ & + \Delta log(Ecuador\ interest\ rate) \\ & + \Delta log(Europe\ interest\ rate) \\ & + \Delta log(Ecuador\ inflation\ rate) \\ & + \Delta log(Europe\ inflation\ rate) \\ & + \Delta log(Balance\ of\ Payments\ Ecuador) + \varepsilon_t\end{aligned} \tag{2}$$

A similar structure was used for the VAR, except that many more variables were increased as seen in the VAR Model table in the annexes. There are more independent variables such as real GDP Ecuador I1, I1, I3, I4, since now there are more periods, this in itself due to the use of the 4 lags. The same logic is followed with each of the variables. In this case, the independent

variables, taking into account that the difference of the logarithm

of the Real Exchange Rate is the dependent variable in all its lags and all the others are the independent variable in all its lags.

5. Results

In line with the results presented in the Annexes table, the effectiveness of the Augmented Dickey Fuller Tests in identifying unit roots in the data is highlighted. By assuming the null hypothesis (H0) as the presence of a unit root and the alternative hypothesis (Ha) as the absence of a unit root, it is inferred that in the first table, which includes variables in logarithms of GDP, prices, M2 and interests, All variables exhibit a unit root, since the Augmented Dickey Fuller test does not allow the rejection of H0. Consequently, we proceed to apply the first differences to each variable, and by subjecting these transformations to the Dickey Fuller test, it is evident that the P values are statistically significant. In this way, the first differences of the logarithms of GDP, M2, prices and interests are revealed as stationary series, thus allowing their application in time series modeling.

Regarding the first model, it adopts an Ordinary Least Squares (OLS) approach with the inclusion of a trend term. The significant variables that affect the variation in the demand for money are inflation, the lag of the M2 difference, the logarithm of GDP and prices, the lag of GDP and the trend. The model suggests that a 1% increase in the inflation rate leads to a 0.95% decrease in the demand for money, indicating a detrimental effect of inflation in this context.

As for the second model, it is a Var Model with 3 lags, which helps us identify the demand for money in the short term. The number of lags was obtained by reference to money demand estimation papers. The Var Model shows how the variables are affected by the past values of the same variable, that is, it captures the linear relationship between several time series. In this model we do not find several significant coefficients. However, we have that an increase in the difference in the log of GDP with a delay of 1 period affects the demand for money by 0.37%. Likewise, the other significant variable is the three-period delay of inflation.

The last model corresponds to an Error Correction Vector (VECM), which uses error cointegration to adapt to changes and achieve long-term stability. In the money demand equation, the error correction terms indicate that, of the three periods considered, only the first is significant and negative. This result implies that the variable is adjusted to correct long-term deviations from equilibrium and, given its negative polarity, it will adjust in the opposite direction to restore equilibrium. Unfortunately, in relation to the lags of other variables, no significance is observed, suggesting the lack of a long-term balanced demand for money in the Ecuadorian context.

With respect to the determinants of the exchange rate, and according to the results presented in the Annexes table, it is highlighted again that the Augmented Dickey Fuller Tests are effective in identifying unit roots in the data. With the same null hypothesis (H0) as the presence of a unit root and the alternative hypothesis (Ha) as the absence of a unit root and presence of seasonality, it is inferred that in the first table, which includes variables in logarithm of the real GDP of Ecuador , logarithm of the real GDP of the Eurozone, logarithm of the price index (CPI) of Ecuador, logarithm of the price index (CPI) of the Eurozone, logarithm of the nominal exchange rate, logarithm of the real exchange rate, logarithm of the rate interest rate of Ecuador, and logarithm of the interest rate of Europe, it is possible to see that in effect, all the variables exhibit a unit root. This is because in this case the Augmented Dickey Fuller test does not allow the rejection of H0. In order to use the OLS estimation method, seasonality is needed in the series, since both the mean and the variance must be constant in the variable around time. To ensure that the series are constant, we proceed in line with the paper by Hetzel (1984) [9], to make first differences for each variable to achieve the null hypothesis H0, and achieve the seasonality of the variables. By performing transformations on the variables within the Dickey Fuller test, it is evident that the P values become statistically significant. So, the first differences of the logarithms of the real of Ecuador, logarithm of the real GDP of the Eurozone, logarithm of the price index (CPI) of Ecuador, logarithm of the nominal exchange rate, logarithm of the real exchange rate and the logarithm of the interest rate of Ecuador a are revealed as stationary series, thus allowing their application in time series modeling. It is seen that both the logarithm of the price index (CPI) of the Eurozone and the logarithm of the European interest rate failed to pass the Dickey Fuller test, and still do not have seasonality.

If you look at the OLS model, almost no variable is really significant. Only the most significant variables are the difference in the log of the Ecuador Price Index, the difference in the log of the Eurozone Price Index, and the difference in the log of the nominal exchange rate. However, their coefficients are very small so they do not really move the dependent variable of the model. Therefore, there is not a very large effect on the Ecuadorian variables, on the exchange rate from dollar to euro. Which makes sense since the influence on the change that could occur within two giant economies like the Eurozone and the United States is very little.

Now, this does not mean that we have no influence at all. In the Var model, 4 lags are added to obtain past information that better explains the model. It is found that the real exchange rate difference variable l2 (period 2), which means that the real change in period t, is influenced by the exchange rate towards 2 quarters, periods. Which is logical, for example, if a currency is devalued usually the effects are not totally immediate and in certain economies the effects of this will probably be appreciated 1 or 2 periods later (it must be taken into account that each period in the model has been 3 months). So from this relationship, it is understood that if the currency was devalued 6 months ago that will have an effect on my exchange rate in the present.

With respect to the determinants of the exchange rate between the Euro and the Dollar, it can be

Note that another of the relevant variables in the model is the difference in the logarithm of the Eurozone in I3 (period 3). That is to say, if the quarterly difference in the logarithm of GDP grows by 1%, my exchange rate will increase by 0.62%. It can be seen that the rest of the Ecuador variables are not statistically significant, so they are not relevant for the determinants of the exchange rate between the Euro and the Dollar. Ecuador, being a very small country, does not have much influence on the exchange rate from Europe to the United States, or vice versa.

6. Conclusions

The main conclusion of this project is that the demand for money in Ecuador is mainly affected by inflation. As explained at the beginning of this work, inflation in Ecuador has been stable so the demand for money has not been dramatically affected. It must also be remembered that Ecuador is a dollarized country that has no effect on the amount of money it can issue, so its study is different from a country that has monetary sovereignty.

The model we have chosen and its different estimates have not provided us with so much significant information, however, we consider that this topic can and should be explored through other models that include different determinants and thus find functions that better explain the demand for money in Ecuador. Like the article by Mies and Soto, this work can be another contribution to the country's macroeconomic literature.

The exchange rate between Ecuador and Europe is a relationship that must be taken into account since commercial relations between both areas can be affected.

We recommend that the demand for money in Ecuador continue to be investigated and modeled, since with it the country will be able to make informed decisions regarding the reality of a dollarized country.

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7. Annexes

Modelo 1: Modelo OLS

	Variable dependiente
	diferecia_log_m2
inflacion	-0.957***
	(-0.301)
diferecia_log_pib	0.086
	(-0.145)
diferecia_log_interes	-0.002
	(-0.023)
lag_resta	0.310***
	(-0.07)
lag_log_interes	-0.023
	(-0.015)
lag_log_precios	-0.09
	(-0.148)
lag_log_pib	0.210***
	(-0.076)
tendencia	-0.006***
	(-0.002)
Constant	-3.690***
	(-1.19)
Observations	91
R2	0.345
Adjusted R2	0.281
Residual Std. Error	0.032 (df = 82)
F Statistic	5.401*** (df = 8; 82)
Note:	*p<0.1; **p<0.05; ***p<0.01

Figure 1: OLS Model

Prueba Dickey-Fuller Aumentada

Variables logarítmicas

Variable	Estadistico	P_valor
log_pib	-1.19	0.90
log_precios	-0.93	0.94
log_m2	-1.01	0.93
log_interes	-1.20	0.90

Variables logarítmicas primeras diferencias

Variable	Estadistico	P_valor
diferecia_log_pib	-4.51	0.01
inflacion	-4.14	0.01
diferecia_log_m2	-4.77	0.01
diferecia_log_interes	-4.24	0.01

Figure 2: Augmented Dickey-Fuller Test for Money Demand

Modelo 2: Modelo VAR

	Coeficientes	Error Estandar	T	Pr(>|t|)
diferecia_log_m2.l1	-0.17349	0.108466	-1.599	0.1139
inflacion.l1	-0.413947	0.391082	-1.058	0.2932
diferecia_log_pib.l1	0.376138	0.154145	2.44	0.0170 *
diferecia_log_interes.l1	-0.035371	0.025055	-1.412	0.1622
diferecia_log_m2.l2	-0.110792	0.11461	-0.967	0.3368
inflacion.l2	0.061684	0.384402	0.16	0.8729
diferecia_log_pib.l2	0.114161	0.15774	0.724	0.4715
diferecia_log_interes.l2	-0.026043	0.025067	-1.039	0.3022
diferecia_log_m2.l3	-0.261314	0.11284	-2.316	0.0233 *
inflacion.l3	0.472967	0.325052	1.455	0.1498
diferecia_log_pib.l3	0.05418	0.156781	0.346	0.7306
diferecia_log_interes.l3	-0.018358	0.025286	-0.726	0.4701
constante	0.033294	0.006837	4.87	6.04e-06 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0 .05 '.' 0.1 ' ' 1

Residual standard error: 0.03471 on 75 degrees of freedom
Multiple R-squared: 0.239 Adjusted R-squared: 0.1175
F-statistic: 1.965 on 12 and 75 DF, p-value: 0.0396

Figure 3: VAR Model Money Demand

Modelo 3: Modelo VECM				
	ECT1	ECT2	ECT3	Intercepto
Ecuacion diferecia_log_m2	-0.9624(0.2617)***	0.4005(0.5692)	0.4108(0.2892)	0.0168(0.0063)**
Ecuacion inflacion	0.0234(0.0506)	-0.6054(0.1100)***	0.1179(0.0559)*	0.0005(0.0012)
Ecuacion diferecia_log_pib	0.3005(0.2139)	0.5955(0.4652)	-0.6910(0.2363)**	-0.0050(0.0052)
Ecuacion diferecia_log_interes	-0.4077(1.2982)	1.6819(2.8234)	-2.8832(1.4343)*	0.0309(0.0313)
	diferecia_log_m2 -1	1 inflacion -1	diferecia_log_pib	-1 diferecia_log_interes -1
Ecuacion diferecia_log_m2	-0.0104(0.2090)	-0.1424(0.4227)	-0.0355(0.2559)	0.0205(0.0530)
Ecuacion inflacion	0.0232(0.0404)	-0.2455(0.0817)**	-0.0748(0.0494)	0.0269(0.0102)*
Ecuacion diferecia_log_pib	-0.0616(0.1708)	0.1874(0.3454)	-0.0823(0.2091)	0.0671(0.0433)
Ecuacion diferecia_log_interes	0.0529(1.0366)	-1.3188(2.0964)	1.0404(1.2692)	-0.0085(0.2629)
	diferecia_log_m2 -2	2 inflacion -2	diferecia_log_pib	-2 diferecia_log_interes -2
Ecuacion diferecia_log_m2	-0.0842(0.1633)	0.0604(0.4015)	-0.0016(0.1979)	-0.0075(0.0417)
Ecuacion inflacion	0.0124(0.0315)	-0.2858(0.0776)***	-0.0501(0.0382)	0.0150(0.0081).
Ecuacion diferecia_log_pib	-0.1016(0.1334)	0.0741(0.3281)	-0.2094(0.1617)	0.0346(0.0341)
Ecuacion diferecia_log_interes	0.5130(0.8099)	-0.0943(1.9914)	0.5191(0.9816)	-0.0024(0.2070)
	diferecia_log_m2 -3	3 inflacion -3	diferecia_log_pib	-3 diferecia_log_interes -3
Ecuacion diferecia_log_m2	-0.2894(0.1133)*	0.4253(0.3459)	0.0271(0.1495)	-0.0164(0.0266)
Ecuacion inflacion	0.0238(0.0219)	-0.2428(0.0668)***	-0.0165(0.0289)	0.0013(0.0051)
Ecuacion diferecia_log_pib	-0.0244(0.0925)	-0.2663(0.2826)	-0.0786(0.1221)	-0.0044(0.0218)
Ecuacion diferecia_log_interes	0.2615(0.5617)	1.7339(1.7156)	0.4802(0.7413)	-0.0196(0.1320)

Figure 4: VECM Money Demand Model

Prueba Dickey-Fuller Aumentada					
Variables logarítmicas			Variables logarítmicas primeras diferencias		
Variable	Estadistico	P_valor	Variable	Estadistico	P_valor
log_pib_real_ecuador	-2.01	0.57	diferencia_log_pib_real_ecuador	-3.74	0.03
log_pib_real_eurozona	-2.31	0.45	diferencia_log_pib_real_eurozona	-3.78	0.02
log_indice_precios_ecuador	-1.45	0.80	diferencia_log_indice_precios_ecuador	-3.54	0.04
log_indice_precios_eurozona	-2.62	0.32	diferencia_log_indice_precios_eurozona	-1.44	0.80
log_tipo_cambio_nominal	-2.45	0.39	diferencia_log_tipo_cambio_nominal	-4.76	0.01
log_tipo_cambio_real	-1.61	0.73	diferencia_log_tipo_cambio_real	-4.42	0.01
log_tasa_ecuador	-2.14	0.52	diferencia_log_tasa_ecuador	-3.88	0.02
log_tasa_europa	0.62	0.99	diferencia_log_tasa_europa	-0.58	0.98
			diferencia_inflacion_ecuador	-4.80	0.01
			diferencia_inflacion_eurozona	-3.70	0.03
			diferencia_balanza_ecuador	-5.98	0.01

Figure 5: Augmented Dickey-Fuller Test for the Exchange Rate

Modelo VAR				
	Coeficientes	Error Estandar	T	Pr(>|t|)
diferencia_log_pib_real_ecuador.l1	-0.39	3.25E-01	-1.198	0.2407
diferencia_log_pib_real_eurozona.l1	0.60	3.66E-01	1.632	0.11357
diferencia_log_indice_precios_ecuador.l1	33.28	1.26E+02	0.264	0.79352
diferencia_log_indice_precios_eurozona.l1	-137.20	1.30E+02	-1.056	0.29975
diferencia_log_tipo_cambio_real.l1	0.10	1.54E-01	0.68	0.50195
diferencia_log_tasa_ecuador.l1	0.05	3.07E-02	1.742	0.09208 .
diferencia_log_tasa_europa.l1	-0.10	3.57E-02	-2.744	0.01030 *
diferencia_inflacion_ecuador.l1	-32.69	1.25E+02	-0.263	0.79477
diferencia_inflacion_eurozona.l1	136.70	1.29E+02	1.063	0.29655
diferencia_balanza_ecuador.l1	0.00	2.92E-11	1.204	0.23827
diferencia_log_pib_real_ecuador.l2	-0.39	2.95E-01	-1.309	0.20088
diferencia_log_pib_real_eurozona.l2	0.42	3.12E-01	1.343	0.18963
diferencia_log_indice_precios_ecuador.l2	-137.50	1.32E+02	-1.046	0.30424
diferencia_log_indice_precios_eurozona.l2	-129.10	1.78E+02	-0.725	0.4744
diferencia_log_tipo_cambio_real.l2	-0.44	1.46E-01	-3.045	0.00491 **
diferencia_log_tasa_ecuador.l2	0.02	3.06E-02	0.761	0.45298
diferencia_log_tasa_europa.l2	-0.07	4.09E-02	-1.757	0.08949 .
diferencia_inflacion_ecuador.l2	107.50	1.31E+02	0.824	0.41691
diferencia_inflacion_eurozona.l2	268.70	2.44E+02	1.102	0.27951
diferencia_balanza_ecuador.l2	0.00	3.16E-11	0.79	0.43594
diferencia_log_pib_real_ecuador.l3	-0.12	2.92E-01	-0.418	0.67888
diferencia_log_pib_real_eurozona.l3	0.62	3.13E-01	1.974	0.05792 .
diferencia_log_indice_precios_ecuador.l3	112.90	1.23E+02	0.92	0.36504
diferencia_log_indice_precios_eurozona.l3	399.10	2.38E+02	1.677	0.10429
diferencia_log_tipo_cambio_real.l3	-0.05	1.31E-01	-0.375	0.71031
diferencia_log_tasa_ecuador.l3	0.06	4.74E-02	1.324	0.19574
diferencia_log_tasa_europa.l3	0.00	4.23E-02	0.099	0.92171
diferencia_inflacion_ecuador.l3	-3.03	9.49E+01	-0.032	0.97473
diferencia_inflacion_eurozona.l3	-131.40	2.24E+02	-0.587	0.56149
diferencia_balanza_ecuador.l3	0.00	3.31E-11	0.885	0.38331
diferencia_log_pib_real_ecuador.l4	0.25	3.21E-01	0.766	0.44968
diferencia_log_pib_real_eurozona.l4	-0.45	3.32E-01	-1.342	0.18995
diferencia_log_indice_precios_ecuador.l4	-3.94	9.63E+01	-0.041	0.96765
diferencia_log_indice_precios_eurozona.l4	-135.90	2.24E+02	-0.608	0.54797
diferencia_log_tipo_cambio_real.l4	-0.48	1.32E-01	-3.631	0.00108 **
diferencia_log_tasa_ecuador.l4	0.06	5.02E-02	1.266	0.21554
diferencia_log_tasa_europa.l4	0.02	4.15E-02	0.536	0.59631
diferencia_inflacion_ecuador.l4	1.98	9.44E-01	2.097	0.04485 *
diferencia_inflacion_eurozona.l4	2.58	1.93E+00	1.34	0.19077
diferencia_balanza_ecuador.l4	0.00	3.27E-11	-0.045	0.96481
const	-0.01	1.39E-02	-0.916	0.36743

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.03155 on 29 degrees of freedom
Multiple R-squared: 0.8167, Adjusted R-squared: 0.5639
F-statistic: 3.231 on 40 and 29 DF, p-value: 0.0007428

Figure 6: VAR Model for the Exchange Rate

Modelo OLS

	Coeficientes	Error Estandar	T	Pr(>|t|)
(Intercept)	-9.50E-17	9.53E-17	-9.97E-01	0.3228
diferencia_log_pib_real_ecuador	6.11E-16	2.65E-15	2.30E-01	0.8186
diferencia_log_pib_real_eurozona	2.65E-15	2.02E-15	1.31E+00	0.1943
diferencia_log_indice_precios_ecuador	1.00E+00	1.00E-14	9.96E+13	<2e-16 ***
diferencia_log_indice_precios_eurozona	-1.00E+00	1.34E-14	-7.44E+13	<2e-16 ***
diferencia_log_tipo_cambio_nominal	1.00E+00	1.42E-15	7.04E+14	<2e-16 ***
diferencia_log_tasa_ecuador	3.11E-16	3.83E-16	8.14E-01	0.4189
diferencia_log_tasa_europa	-6.76E-16	3.27E-16	-2.07E+00	0.0426 *
diferencia_inflacion_ecuador	9.88E-16	8.80E-15	1.12E-01	0.9109
diferencia_inflacion_eurozona	-9.09E-15	9.12E-15	-9.96E-01	0.3229
diferencia_balanza_ecuador	1.26E-25	3.16E-25	3.99E-01	0.6909

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 5.061e-16 on 63 degrees of freedom
Multiple R-squared: 1, Adjusted R-squared: 1
F-statistic: 6.654e+28 on 10 and 63 DF, p-value: < 2.2e-16

Figure 7: OLS Model for Exchange Rates

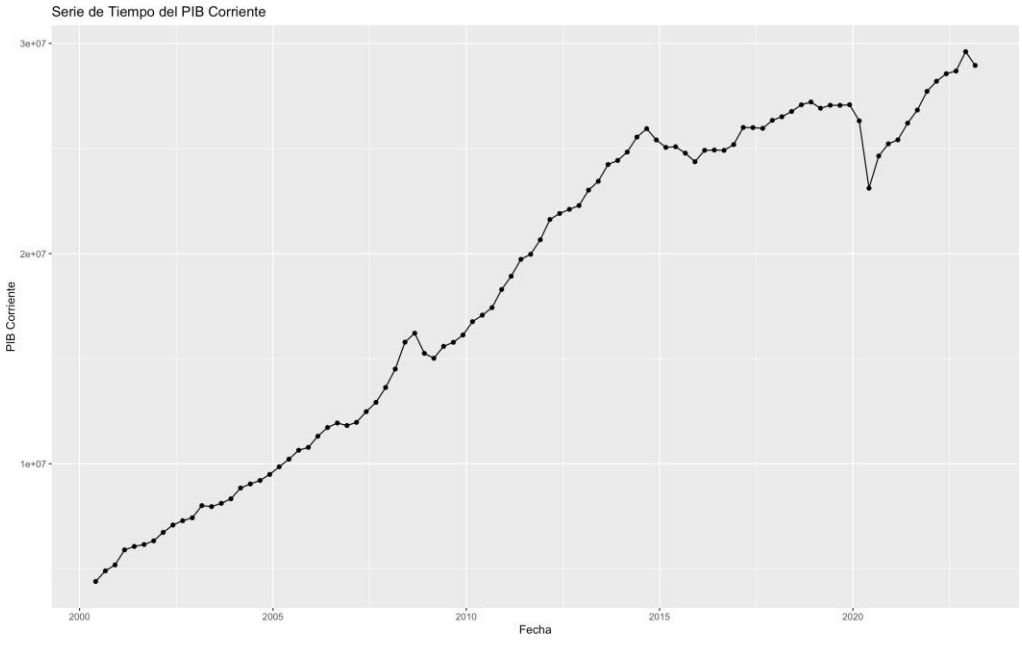

Figure 8: Current GDP Time Series

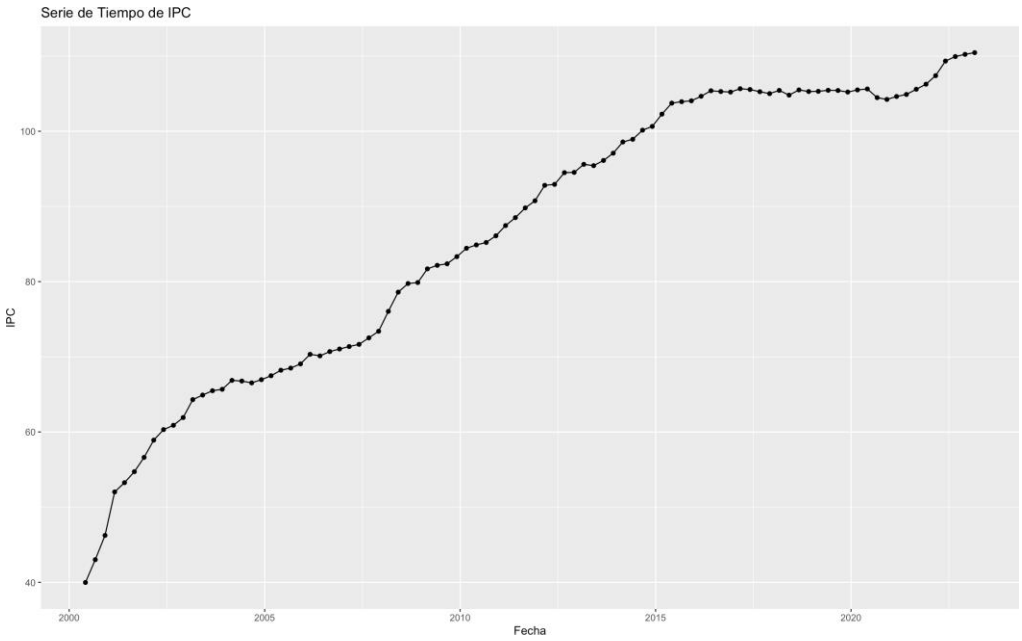

Figure 9: Price Index (CPI) Time Series

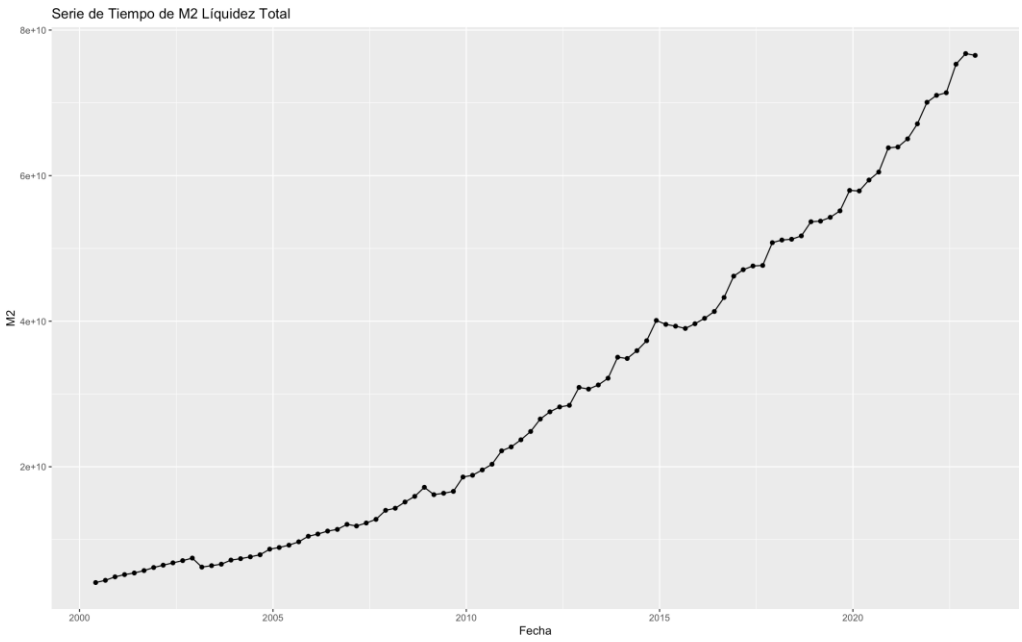

Figure 10: Time Series of M2 Total Liquidity

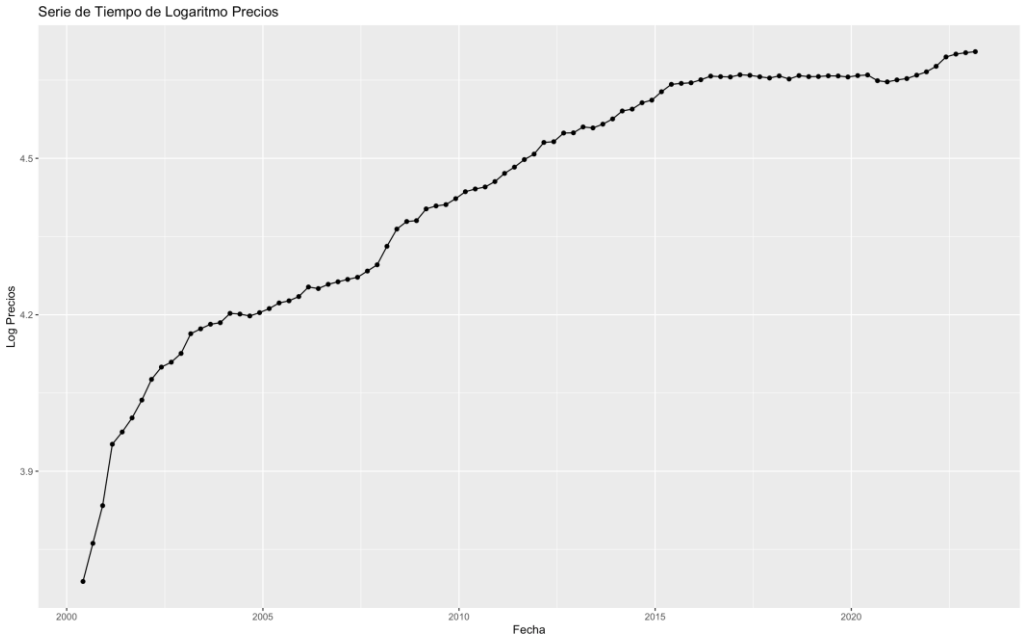

Figure 11: Time Series of Logarithm Price Index (CPI)

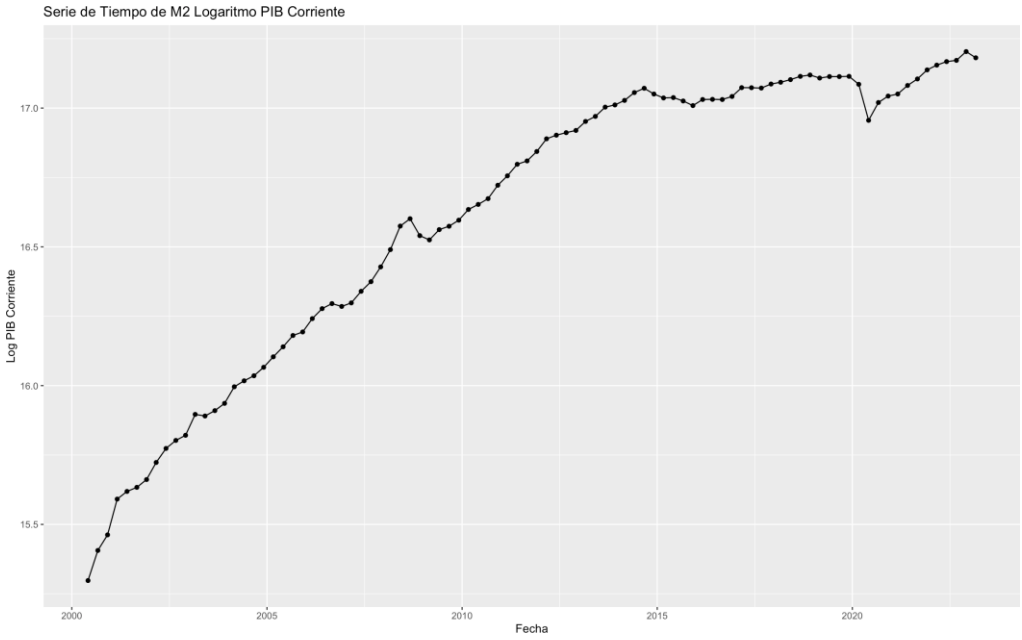

Figure 12: M2 Time Series Log Current GDP

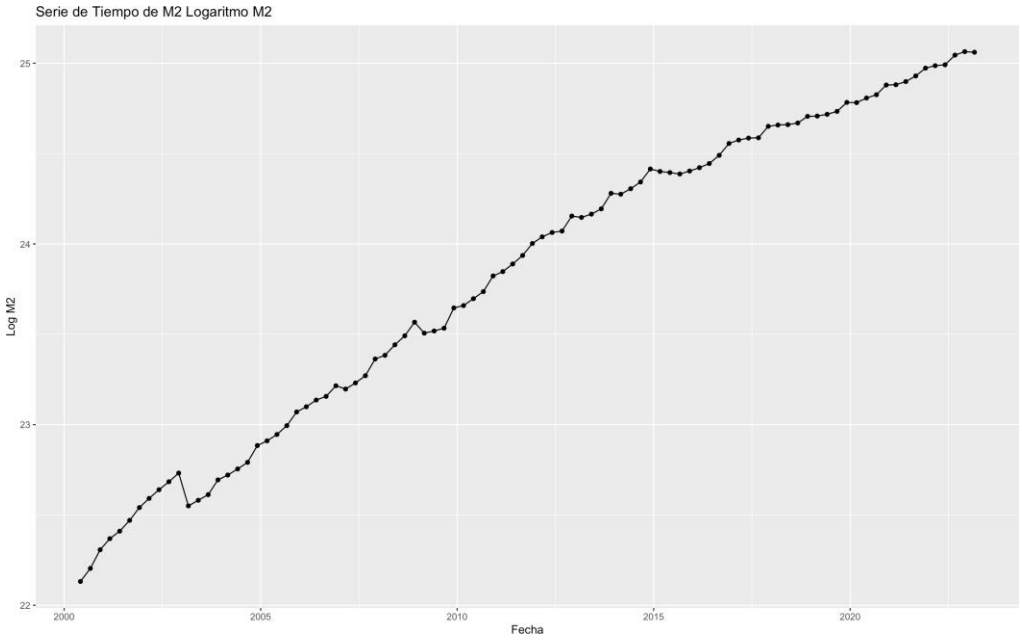

Figure 13: Time Series M2 Logarithm M2

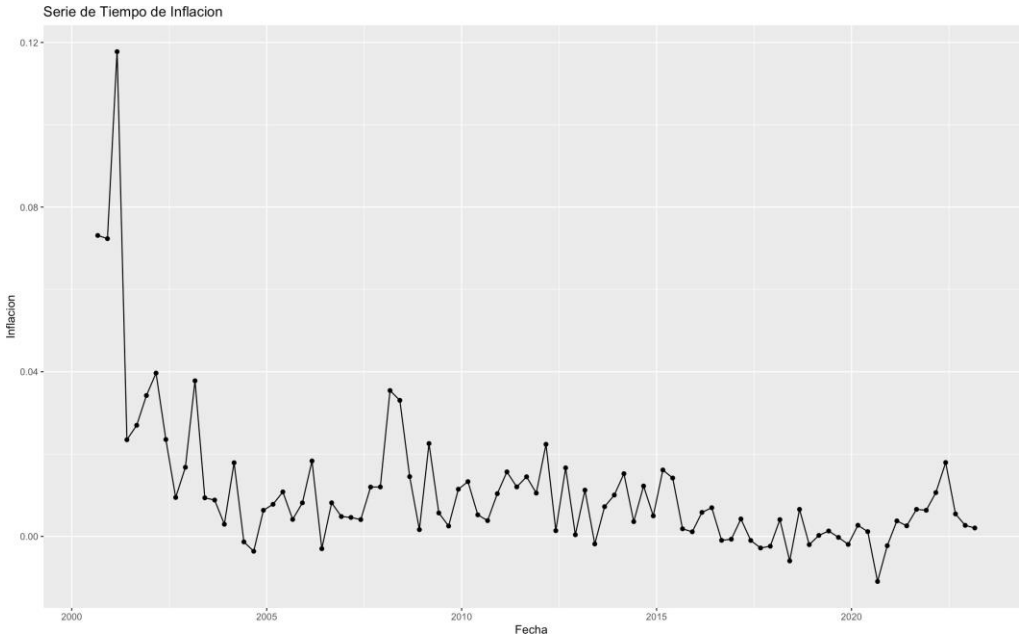

Figure 14: Inflation Time Series

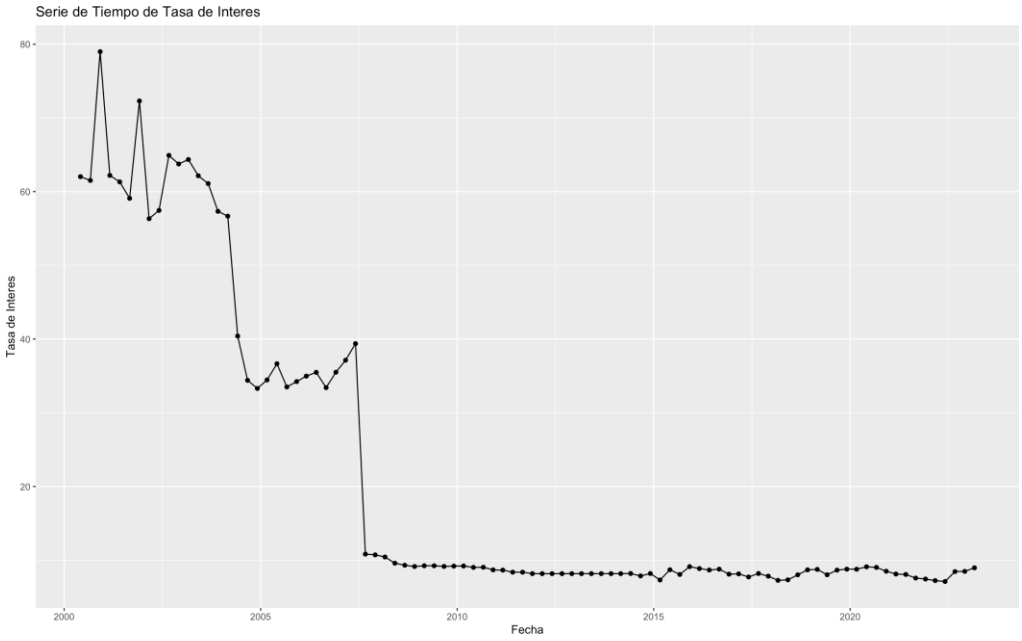

Figure 15: Interest Rate Time Series

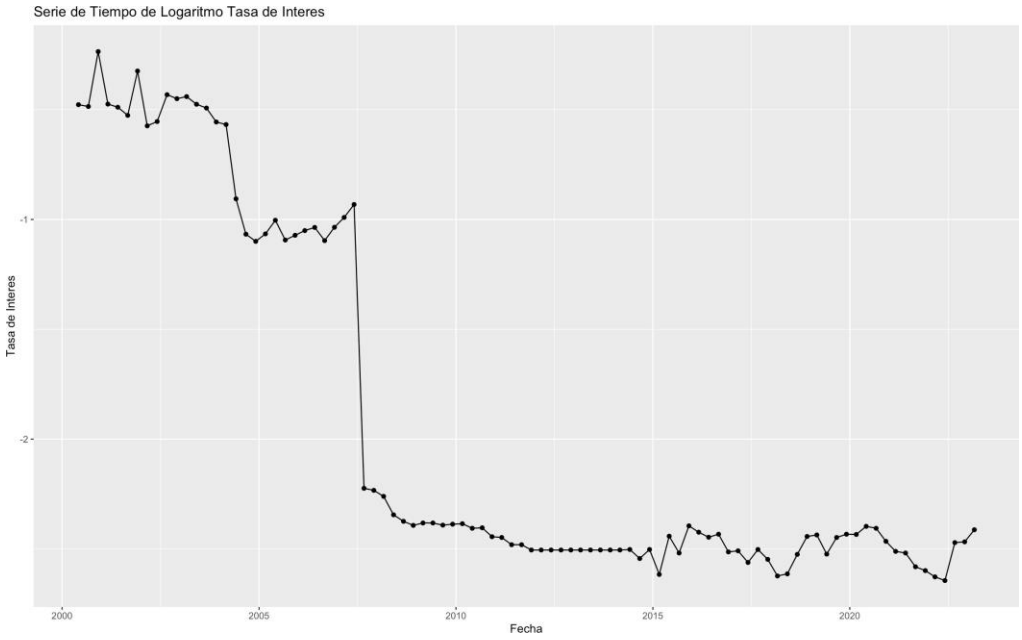

Figure 16: Logarithm of Interest Rate Time Series

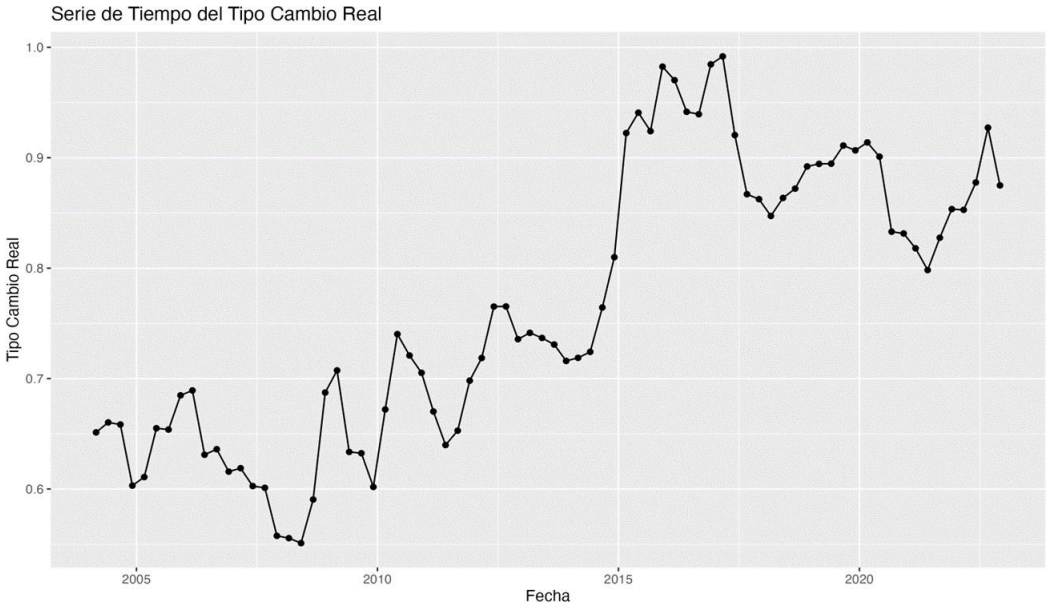

Figure 17: Real Exchange Rate Time Series

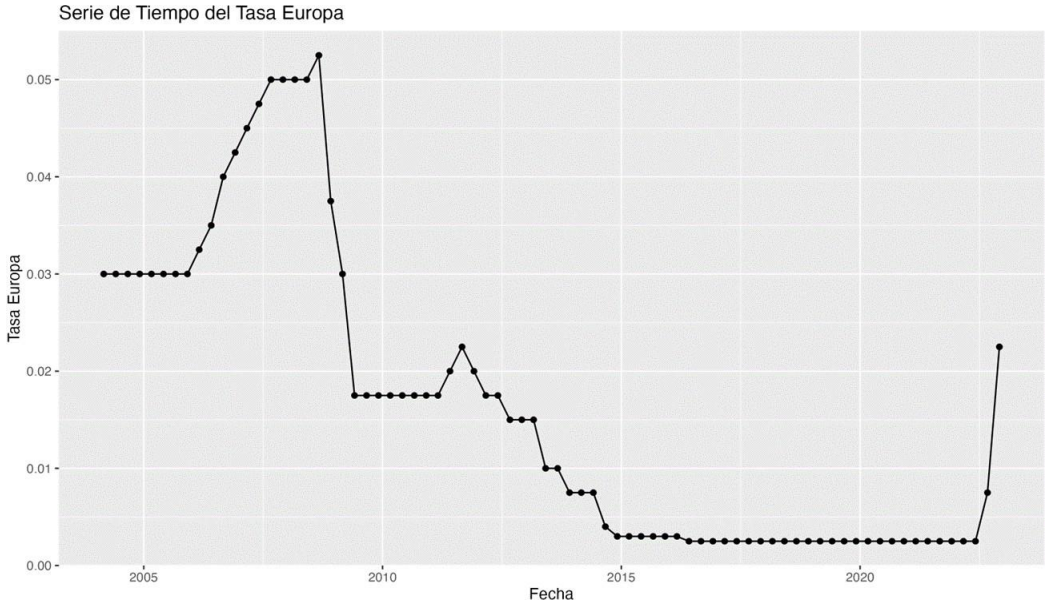

Figure 18: Time Series of the European Interest Rate

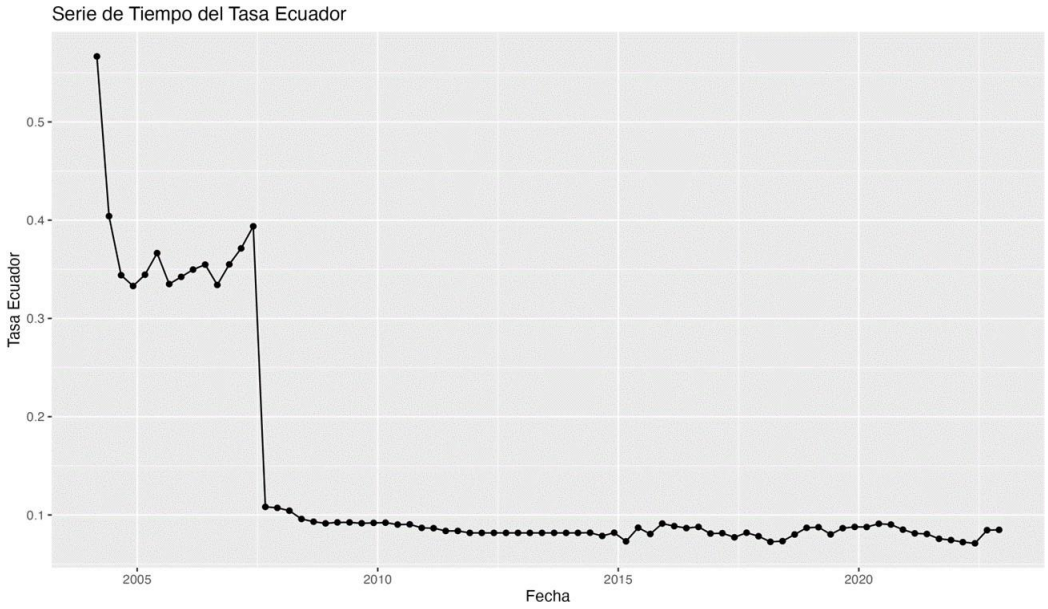

Figure 19: Time Series of the Ecuadorian Interest Rate

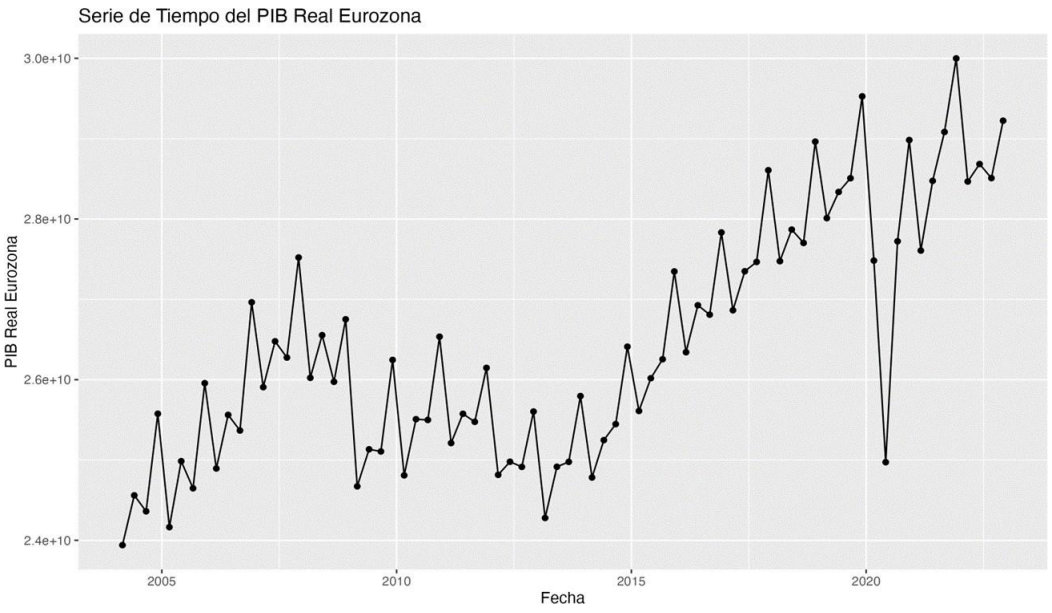

Figure 20: Eurozone Real GDP Time Series

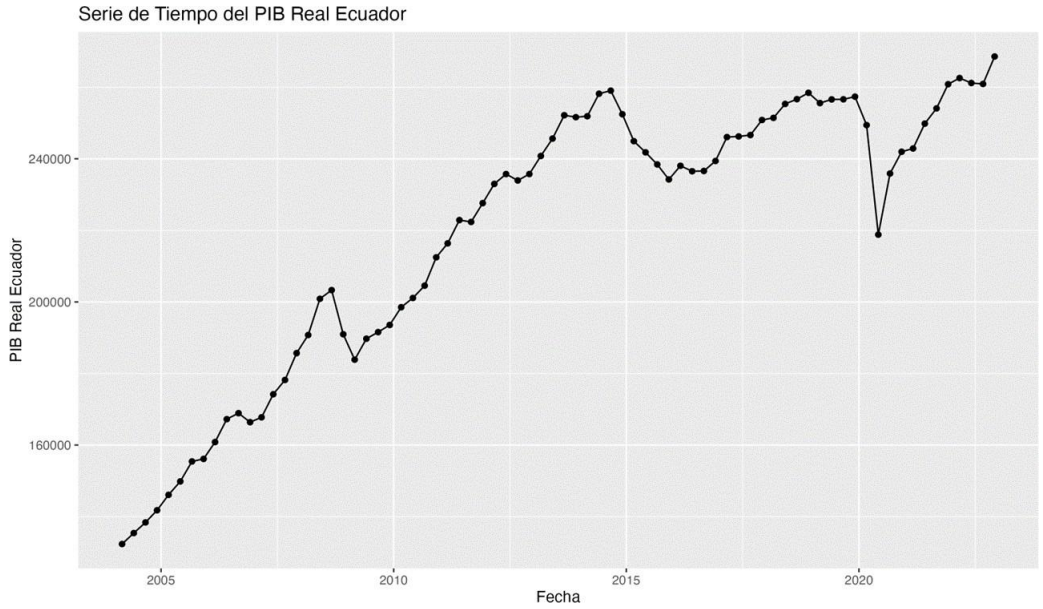

Figure 21: Ecuador Real GDP Time Series

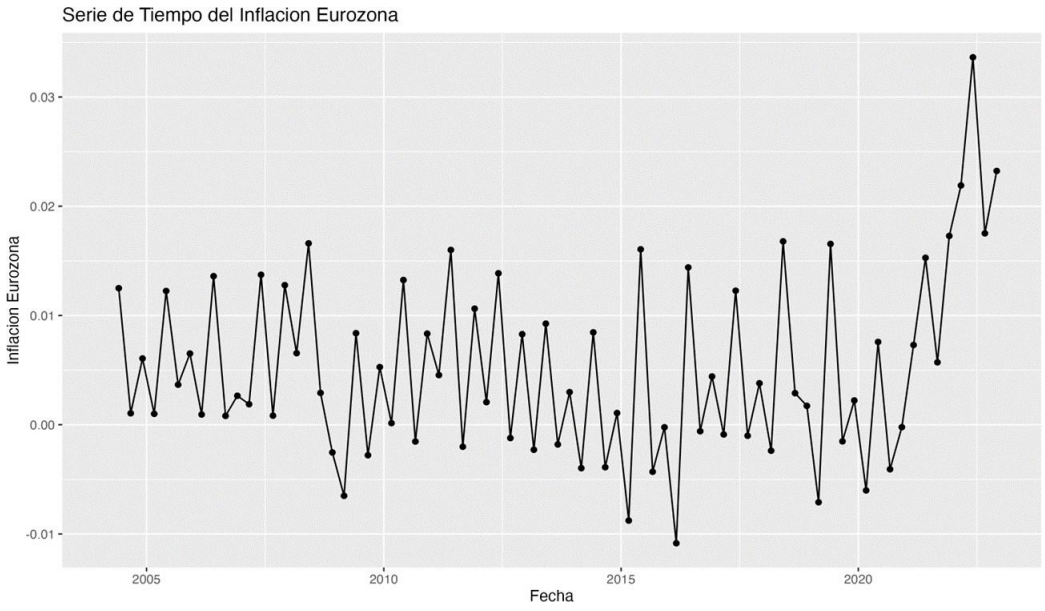

Figure 22: Eurozone Inflation Time Series

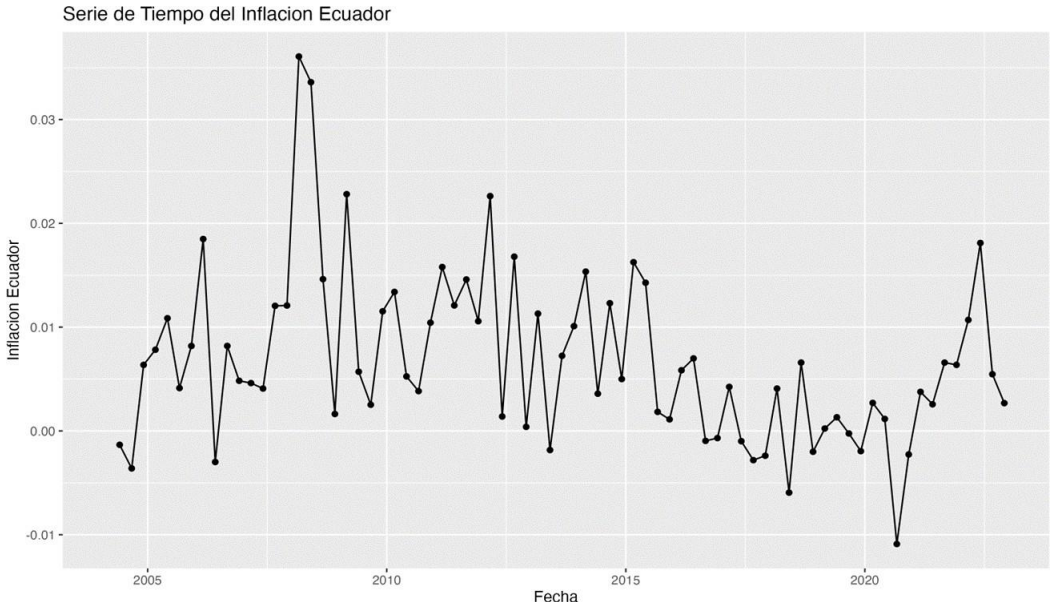

Figure 23: Ecuador Inflation Time Series

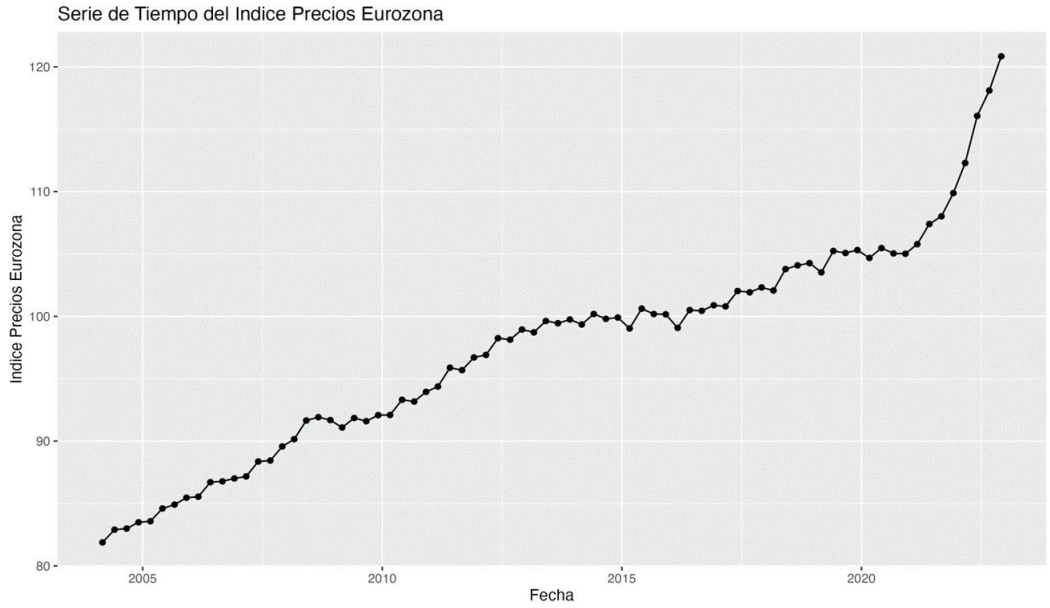

Figure 24: Eurozone Price Index (CPI) Time Series

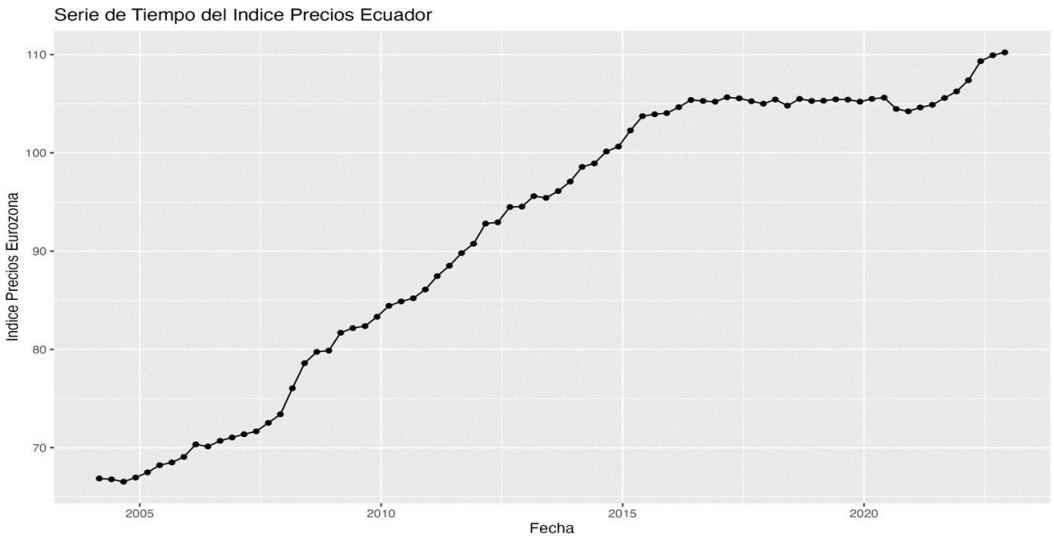

Figure 25: Time Series of the Price Index (CPI) Ecuador