



Financial and economic crises in Algeria Could first-generation models interpret it?

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Received :29/01/2024

Accepted :21/05/2024

Abstract

The Algerian economy is characterized by being rentier, non-diverse and earning its wealth from the high value of fossil extracts, to move it's economic and treatment of its social and economic problems. To move his economic machine and treat their social and economic problems. It has few corrective tools and mechanisms; therefore its economy is an all forms of crisis-prone.

This study aims to test the capacity of first generation models on the interpretation of financial and economic crises in Algeria by using standard tools, the Relying on style of KRUGMAN (1979), FLOOD and GARBER (1984). The results supported that these models are able to explain both 2009 and 2014 crisis.

Keywords: Crisis - First generation models - Balance of payments - Debt -Petroleum prices.

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1. INTRODUCTION

The capitalist system is characterized by a recurring crisis system, over different periods, including what constitutes the KITCHEN cycle, JUGLAR cycle, and KONDRATIEFF cycle. As a result of these recurring crises in nature, numerous studies have emerged trying to find mathematical models that combine several specific variables and interpreted a particular crisis.

Throughout the history of economics, facts we have seen different models for three generations, it interpreted the crises in South-east Asian and Latin American countries. Other models interpreted crises that occurred after 1997, but some crises remain Unexplained with any of the three generations' models. For example; the mortgage crisis for 2008 has not been interpreted by financial innovation models and no macroeconomic models.

In the case of Algeria, and compared with other world crises, its crises are mostly caused by speculation and selling debt as financial innovation. The crises that Algeria experienced resulted from the weakness of the economic machine which spoke about John Minard Keynes (effective demand, investment activation), and the excessive dependence on rent (oil) with no economic diversity, in the sense that not there is a diversity of revenue to balance with the needs. This makes the Algerian economy, its fragility in terms of financial needs in any faltering affect revenues from hydrocarbons.

To explain the crises that Algeria has known, can follow the first generation crises approach, as this model contains variables that can be applied to Algerian reality to give an appropriate explanation for crisis reasons. The second generation and third generation models were caused by the fact that speculation is absent in the absence of an effective financial market.

The main research question to be asked in this paper is: What is the ability of the first-generation models to explain the crises that occurred in Algeria?

To answer this problem, we assume, as a research hypothesis:

Hypothesis: The crises in Algeria are explained by the collapse of hydrocarbon prices, which directly affect foreign exchange reserves.

In order to test the hypothesis, this paper will focus on two points:

First: To study the nature of the first generation models, and what are the variables that the interpretation of crises, and to test their compatibility with the Algerian economy.

Second, building a model to explain the crisis in Algeria to approve the models of the first generation and show their ability to explain the financial and economic crises since 1986.

The study adopted two approaches, Inductive curriculum, and an analytical approach. The study also used a measurement tool and was represented in the statistical program to examine the results of the form that occurred in Algeria, through time series extended from 1970 until 2020.

From previous studies, we found:

- Peter Temin (2008), focused in his research on the German crisis for 1931, where the researcher focused on the causes of the crisis, is it caused by the currency or tumbling banks. The study found in the latter that the crisis was caused by speculation on the currency, The most appropriate model, which provides an explanation for this crisis is the first generation model Krugman's and the Mundell-Fleming redundant because they are more accurate. (Temin, 2007)

- Michael Berlemann & Nikolay Nenovsky (2004), The researcher studied the Bulgarian crisis for 1996/1997, It can be said that the Bulgarian financial crisis is a twin crisis involving both currency and banking crisis. It was interpreted by first-generation models. (Berlemann & Nenovsky, 2004)

- Mohamed Benbouziane and Zierar Soumia (2010), The researchers studied the financial crisis of 2008 and how it spread across Different international financial markets. Where they used models spread of crisis infection, the researchers focused on the first-generation models, They revealed how the effect of Speculative attack on the local currency and how foreign exchange precautions begin to decline. (Benbouziane & Zierar, 2010)

These studies dealt with the crises in Germany and Bulgaria and the ability of first-generation models to explain them. In our study, we try to explain the crises that occurred in Algeria from the first crisis in 1986 to the 2014 crisis through first-generation models.

2- Models of the first generation between scientific economic analysis and mathematical analysis:

The first generation models are exemplified by Krugman (1979) and Flood and Garber (1984). These models are also associated with a previous study by Henderson and Salant (1978) on speculative attacks. In effect explain crises as the product of budget deficits, the Sense of exchange rate collapse is the result of unstable fiscal policy.

The first generation models are characterized by having a link between the persistent balance of payments deficits depletion of foreign exchange reserves, and the onset of a currency crisis. (Giscard, 2017, p. 3)

We know in advance that in the case of a fixed exchange rate system, the government has to fix the money supply at the fixed exchange rate. This trend limits the government's ability to raise revenue. (Burnside, Eichenbaum, & Rebe, 2007)

Consequently, the government suffers from a persistent deficit, which means it must either deplete assets such as foreign reserves or borrow to cover the deficit. But the government cannot always remain at the same level of reserves. (Keddi, 2009) So, in the event of a downturn, the government must eventually finance the deficit by printing money. Since the printing of money is not compatible with the fixed exchange rate system, this type of model predicts the collapse of this system (Burnside, Eichenbaum, & Rebe, 2007, p. 1).

The first generation forms consist of the following assumptions: purchasing power parity - the government budget constraint - the timing of deficits - the money demand function - the government's rule for abandoning the fixed exchange rate. (Sotelsek & Pavón, 2008, p. 69)

If we consider that:

Domestic currency price is P_t ; Nominal exchange rate is S_t .

By purchasing power parity, we find $P_t = S_t$

real interest rate is r ; the monetary base is M_t .

Suppose that the government has a constant ongoing primary deficit, δ . It finances this deficit by reducing its stock of foreign reserves f_t .

The latter evolves according to: $f'_t = rf_t - \delta + M_t/S_t$

When foreign reserves change discontinuously: $\Delta f_t = \Delta(M_t/S_t)$.

Knowing that: $\delta > rf_t$ interest income from foreign assets will not be sufficient to finance the deficit.

To illustrate the main characteristics of first-generation models, we make three assumptions.

First, money demand takes the Cagan (1956) form, $M_t = \theta P_t \exp[-\eta(r + \pi_t)]$ where $\theta > 0$ and $\pi_t = \frac{P_t}{P_t}$.

The second is the Abandonment of the fixed exchange rate in case of depletion of foreign exchange reserves.

Third, after the depletion of foreign exchange reserves, the government had resorted to printing money at a steady rate μ to cover of financial deficit.

After the crisis, changes in these assumptions, Become a real cash real balances $m_t = \frac{M_t}{P_t}$ Thus become the monetary mass $\bar{m} = \theta \exp[-\rho(r + \mu)]$. Considering that t^* the history in which foreign reserves are exhausted and the government to abandon the fixed exchange rate system. With the preservation of purchasing power parity $S_t = P_t = \frac{\bar{M}^{\textcircled{1}}}{\bar{m}}$. It is also assumed that the price of foreign exchange does not happen to him jump discontinuously, because if it jumped the price of foreign exchange the arbitration operations appear.

With the impact of the crisis, we note a sudden drop in demand for real funds from m to $\bar{m}$. This means that reserves will gradually decrease to zero at time t^* , this is the date of the speculative attack. So that the collapse of the fixed exchange rate regime is inevitable, it does not generally occur if it was $m - \bar{m} > f_0$.

These models predict that ongoing fiscal deficits, rising debt levels, or falling reserves precede the collapse of a fixed exchange rate regime (This expectation is not suitable for the South-East Asia crisis). So that the crisis does not precede a problem in the financial deficit, rising debt levels, or falling reserves, but the problem in having bad news. Investors get this news from the banking sector, knowing that the government will prevent the failure of the bank, by providing them financing by printing money beginning at some time in the future. But according to Eichenbaum and Rebelo (2001), a currency crisis will occur before the government actually starts to print money. (Burnside, Eichenbaum, & Rebe, 2007, pp. 2-4)

Krugman sees on the contrary, that in the original first-generation models, crises have emerged because of some fundamental factors, such as the reserves level when they decrease below the critical level (KRUGMAN, 1999, p. 463) Therefore, Obstfeld identified the relationship between the domestic credit component with foreign exchange reserves through the following relationship: $M^s = M^d = D_t + R_t$. The relationship shows that the monetary mass is only in domestic debt and foreign exchange reserves, so the latter will show a negative relationship between the two variables. $R_t = - D_t$.

This relationship means that the level of foreign exchange will decrease at the same level to increase domestic debt size. This explains the inability to stay in a fixed exchange rate system, because the decline in foreign exchange reserves. In this case, monetary policy becomes obliged to abandon the fixed exchange system and follow the floating exchange rate system. (Obstfeld, 1984, p. 5).

Thus, the «the government follows an exogenous rule to decide when to abandon the fixed exchange rate regime». (Burnside, Eichenbaum, & Rebe, 2007, p. 4).

^① $\bar{M}$ Monetary base after crisis.

The first subtitle opens with an introduction that presents the specific problem under study and describes the research strategy. The first subtitle opens with an introduction that presents the specific problem under study and describes the research strategy. The first subtitle opens with an introduction that presents the specific problem under study and describes the research strategy.

3- The nature of crises in Algeria:

Algeria has seen much crisis, where it focuses its entirety on the structural problem of the economy, where we rely on a single resource to bring wealth. This resource is in oil, both in terms of exports and bring foreign currency as a foreign exchange reserve, or in terms of petroleum tax collection for financial budget preparation, this is what made the Algerian economy is every time in a crisis. (Escribano, 2016)

3/1- Characteristics of Algerian economy:

Most characteristics representing the Algerian economy can treat:

1-Weak integration into the international economy: No exports outside the petroleum in Algeria to ensure its earnings from foreign exchange, and doesn't contain an effective financial market to facilitate international financial operations, to bring capital to invest. (malki & boutouba, 2021)

2- The external economic dependency of the Algerian economy: in 2018 Algeria imported 48.5 billion dollars. Most of them are dietary materials and non-food consumer goods (19.4 billion dollars), Industrial Equipment, and semi-finished materials (23.2 billion dollars). While most exports are in the energy sector, at a rate of 94.4% of total exports. (ONS, 2019)

Thus, we conclude that the core components of the Algerian economy depend on what is imported from foreign countries. Considering the theory of relative advantage for Ricardo, we find Algeria can specialize in energy. This makes the Algerian economy always an exhibition of indirect pressure from exporting countries, and also from organizations such as OPEC¹.

3/2- The fact of crises in Algeria:

- Most of the economic risks in Algeria, are due to disruptions in oil exports, and actress: low oil prices, or low production. Example: Low oil prices in 1986, caused a sharp crisis. Then the second drop in 1998, which was not for a long time. Then drop for the third time in 2009 and did not lead its effects to a crisis. The last decline was in 2014, 2015, 2016, and 2017, leaving behind its effects on the national economy. However, the last crisis was characterized by some effects, which were not

¹ Organization of the Petroleum Exporting Countries.

significant. As a result of owning the Bank of Algeria's 200 billion dollars of foreign exchange reserves, most social and economic indications were in an acceptable improvement at individuals. (Unemployment rate 9%, inflation rate between 3.5% - 4.5%, low debt rate 3.4 billion \$, huge housing projects, infrastructure...). (bank-of-Algeria, 2018) These indicators contributed to the stability of the security situation and social status, but do not deny, there is a loss at the macroeconomic level:

- Foreign exchange reserves fell more than 34 billion \$ in 2014.
- Balance of payments deficit to 14.39 billion dollars in the first half of 2015.
- Petroleum taxes decreased by 16.5% during the second half of 2014.
- Banking liquidity fell by 29.7% during the first half of 2015.

These effects were due to low fuel prices, as a result of external factors. (bank-of-Algeria, 2018)

Examples:

- The discovery of Christ Gaz at a lower price in the market: make countries compete in the drilling and extracting it, push oil-producing countries to support reduce oil prices.
- High fuel prices above 146 dollars a barrel, pushing the producing countries to increase research and oil exploration. The cause of high supply from demand, and after oil prices will fall. (boutouba, 2016)

4- Testing the capacity of first-generation models on crisis interpretation in Algeria:

Taking into account the Algerian economic characteristics, we consider that the closest appropriate model for crisis interpretation is the first generation model. Given the variables that this model explains.

In this study, we will depend on most variables, especially those used by OBSTFELD. (Obstfeld, 1984)

For explanatory variables and affiliate variables, we will depend on the method of KRUGMAN, FLOOD and GARBER, and OBSTFELD to determining variables. (KRUGMAN, 1999)

4/1- Variables:

Through the study by KRUGMAN (1979), FLOOD and GARBER (1984) and OBSTFELD (1983), we find that the variables that explain crises are:

- Variables related to the monetary market: Local Monetary mass - General level of prices - interest rate.

$$\frac{M_t}{P_t} = \alpha_0 - \alpha_1 i_t \text{ avec } \alpha > 0 \dots \dots \dots (1)$$

- Variables for money supply equation: The monetary mass is only in domestic debt and foreign exchange reserves.

$$M_t = R_t + D_t \dots \dots \dots (2)$$

- Variables equation Parity of purchasing power: exchange rate - General level for foreign prices.

$$P_t = S_t P_t^* \dots \dots \dots (3)$$

- Variables equation Parity of interest rate: local interest rate - foreign interest rate - the potential drop in the exchange rate.

$$i = i_t^* + \frac{S_t^\square}{S_t} \dots \dots \dots (4)$$

From equation (1), we find:

$$\frac{M_t}{P_t} = \alpha_0 - \alpha_1 i_t \text{ avec } \alpha > 0 \dots \dots \dots (1)$$

$$M_t = P_t \alpha_0 - P_t \alpha_1 i_t$$

By adding equation (1) to (3), we find:

$$M_t = S_t P_t^* \alpha_0 - S_t P_t^* \alpha_1 i_t$$

By adding equation (1) (3) to (4), we find:

$$M_t = S_t P_t^* \alpha_0 - S_t P_t^* \alpha_1 \left(i_t^* + \frac{S_t^\square}{S_t} \right)$$

$$M_t = S_t P_t^* \alpha_0 - S_t P_t^* \alpha_1 i_t^* + S_t P_t^* \alpha_1 \frac{S_t^\square}{S_t}$$

$$M_t = S_t P_t^* \alpha_0 - S_t P_t^* \alpha_1 i_t^* + P_t^* \alpha_1 S_t^\square$$

$$M_t = (P_t^* \alpha_0 - P_t^* \alpha_1 i_t^*) S_t + (P_t^* \alpha_1) S_t^\square \dots \dots \dots (5)$$

States will always strive to stabilize exchange rates and stay in the fixed exchange system, The first generation models assume that the change in the exchange rate remains constant, $S^\square = 0$, this means that The exchange rate has not changed $s_t = s^*$. so the equation become n° (4) $i^* = i$.

Equation N° (5) can be reformulated as follows:

$$M_t = (P_t^* \alpha_0 - P_t^* \alpha_1 i_t^*) S_t$$

From equation (2) we get:

$$(P_t^* \alpha_0 - P_t^* \alpha_1 i_t^*) S_t = R_t + D_t$$

$$R_t = (P_t^* \alpha_0 - P_t^* \alpha_1 i_t^*) S_t - D_t$$

if S_t and M constant, the increase will be corrected in local debt of foreign exchange reserves.

So;

$$R_t = -D_t$$

Foreign exchange precautions are the same amount of local debt.

4/2- Study period:

The study period has consisted of a time series stretching from 1970 until 2020. According to data available on the Algerian economy.

4/3- Data collection:

Data are collected from the following sources: the World Bank and the Bank of Algeria, In addition to the National Bureau of Statistics data.

4/4- The econometric model and used tests:

The appropriate form and tests are as follows: Stationary time series to seek there is no unit root, common integration test In order to search for a long-term interpretation, chow test to reveal the point of inflection.

4/4/1- Stability Study: Through the study of stability, we disclose whether the chain is stable or not by testing augmented dickey fuller, this test takes into account the linear link between P . It can be corrected by adding an appropriate number of borders of the back difference.

In the unit root test, if the chain is unstable, the probability of ADF is greater than 5%, which represents the H_0 hypothesis. As for the alternative hypothesis, when the chain is stable, and there is no unit root, the probability of ADF is less than 5%.

4/4/2- Study of common integration: We use Johanson's common integration test since they are suitable for small samples, as well as in the case of more than two variables, and more importantly, this test reveals whether there is unique involvement. This has its importance in the theory of joint integration, suggesting that in the absence of unique joint integration, the relationship between variables remains suspicious and questionable.

4/4/3- chow test it order to reveal the Point of inflection, a point that occurs as a result of economic, political, or social changes.

4/5- Measurement:

4/5/1: We disclose the stability of the chain using Augmented Dickey-Fuller, This test takes into account the linear link; this is corrected by making first-order differences. The test results are shown as follows:

Table 01: Unit root test

			Lin, Levin, Chu LLC	Test
			Lag 0 to 1 max lag =5	
Lag	(N)	Prob	LLC	Variables
0	(49)	0.00	-2.92	<u>local debt (D)</u>
0	(49)	0.00	-3.50	D(Intercept)
0	(49)	0.00	-1.49	D (Inter-trend)
				D (None)
0	(49)	0.000	-2.92	<u>Exchange precautions (R)</u>
0	(49)	0.001	-3.50	D(Intercept)
0	(49)	0.000	-1.94	D(Inter-trend)
				D(None)
				Note: D first-order variances

Source: Preparation of researchers depending on the results EVIEWS.

The results of Table N°01 show that there is no unit root for two series after using first-degree differences. This means that all chains are stable and integrated of the first degree. Since the study variables are stable first order. A common integration test can be performed in order to find a long-run equilibrium relationship.

4/5/2- The results of the Fisher-Johansen test for homogeneous integration are shown, Critical Value is smaller than Trace Statistic. Accordingly, there is a homogeneous integration relationship between the variables; And Table n° 02 shows that all bilateral relations have an equilibrium relationship in the long run.

The results in Annex N° 02 shows that the optimal time lag is lag=2.

Table 02: Johanson cointegration test

Sample (adjusted): 1973 2020				
Included observations: 48 after adjustments				
Trend assumption: Linear deterministic trend				
Series: R D				
Lags interval (in first differences): 1 to 2				
	Eigenvalue	Trace Statistic	Critical Value 0.05	Prob.*
None *	0.239985	17.57012	15.49471	0.024
At most 1	0.087555	4.398096	3.841466	0.036

Source: Preparation of researchers depending on the results EVIEWS.

4/5/3- Estimation results:

After proving the stability of the first-order time series, and Determining the degree of lag, and we prove the co-integration relationship of the first degree. We estimate the model using VECM. The results of the Estimation were as follows:

The long-term model indicates a significant value; the long-term model indicates the significance of the parameters at the level of 5%. We note that the foreign exchange reserve parameter is negative, and the local debt parameter is positive, and this is consistent with the logic of the first-generation models.

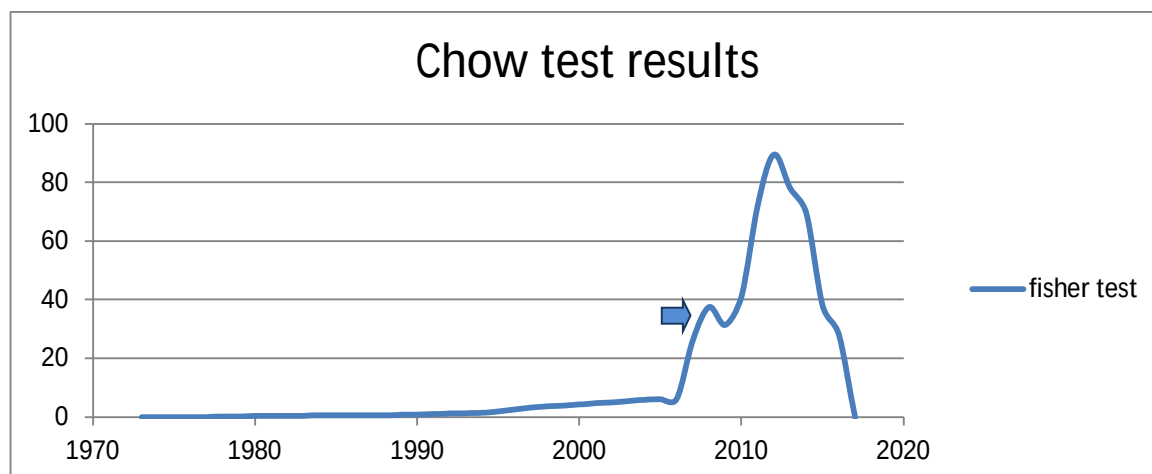
$$E_{ct_{-1}} = 1.00 \log d_{t-1} - 0.0019 \log r_{t-1} - 19.32$$

In the dynamic short-term model, we find that the foreign exchange reserve parameter is significant at the level of 10%, in the case of t-1 and t-2. as explained in Annex N° 03.

$$\log d_t = -0.917 E_{ct} + 0.133 \Delta \log d_{t-1} + 0.159 \Delta \log d_{t-2} + 0.057 \Delta \log r_{t-1} - 0.014 \Delta \log r_{t-2} - 0.0096$$

To find out the extent of the ability of the variables of the first generation models (D-R) to explain the crises that occurred in Algeria, we use the SHOW test.

4/5/3- The results of the SHOW test are the following: There is one inflection point in the 2007-2008-2009 time series, and one decline in the series in 2013, determining a peak of 89.6. Figure 01 explains this.

Figure 01: Chow test (inflection point)

Source: Preparation of researchers depending on the results EVIEWS and EXCEL.

We note from the statement that there is only one inflection point. The statement also shows another decline in 2013 without returning to the rise.

Shaw's test does not show an interpretation of the 1970-1999 time series because of $F_{tab} > F_{cal}$. And therefore, the lack of significance during this period through this test. On the other hand, we accept the significance time series from the year 2000-2016 as a result that $F_{tab} < F_{cal}$.

5. RESULTS AND DISCUSSION

The study shows an inverse relationship between the variables of domestic debt and foreign exchange reserves. Which represent the most important variables that enter into the formation of the first generation models? Thus, the first-generation models can be considered suitable for explaining the crises in Algeria.

The study was able to reveal two crises: the crisis fuel prices collapse of for the year 2008/2009, as well as the fuel prices, collapse of for the year 2013/2014. As the price of a barrel decreased from 99.9 dollars per barrel in 2008 to 62.25 dollars per barrel in 2009, a decline of 39.4%. As for the second crisis, fuel prices were 108.9 dollars per barrel in 2013 to 100.2 dollars per barrel in 2014, to continue the collapse into 2015 and 2016 at prices of 53 and 45 dollars per barrel. This coincided with a decrease in foreign exchange reserves by 141% from 2013, when foreign exchange reserves amounted to 194 billion dollars to reach 80 billion dollars in 2018. (bank-of-algeria, EVOLUTION ECONOMIQUE ET MONETAIRE EN ALGERIE, 2018) (bank-of-algeria, 2009)

The first generation models are the closest to explaining the economic crises in Algeria, which are due to the deterioration of macroeconomic fundamentals and a

deficit in the balance of payments. Because of the heavy dependence on oil taxes for 42.7% of total revenue, (bank-of-Algeria, 2018) any decrease in oil revenues may lead to a crisis. Therefore, Algeria mostly resorts to the foreign exchange reserve to cover the deficit, and that's what makes the foreign exchange reserves continue to decrease, especially if the crisis continues for a long time. Which makes the foreign exchange reserve back to zero? Which pushes the state to external borrowing? This leads to an increase in debt.

6. CONCLUSION

Algeria's economic and financial crises are caused by the collapse of oil prices, which results in a decline in foreign exchange reserves. If this decline continues for a long time, foreign exchange precautions may become zero, and then Asylum to debt.

The results of the study show that there is an inverse relationship between debt and foreign exchange reserves in the long run. Hence, the first generation models have the ability to explain the crises in Algeria, and thus we have proven the first hypothesis. Because the open macroeconomic variables of the Algerian state change according to the variables of the first-generation models, it can be said that the reality of the financial and economic crises in Algeria is explained by the first generation models. According to the logic of KRUGMAN (1979), FLOOD, and GARBER (1984).

The study findings:

The crisis explosion time can be determined according to the first generation models when foreign exchange precautions are less or equal to the lowest precautions that meet the basic needs of the state for a specific and short period of time.

When the state economy is suffering from a permanent deficit in the balance of payments and is trying to install the exchange rate, this leads to a low level of foreign exchange reserves, leading to the possibility of a crisis.

The government goes to domestic religion for the purpose of financing the budget deficit, the state may gradually lose its foreign exchange reserves, and from the possibility of falling into a crisis.

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8. Appendices:

Annex N° 01: Chow test

year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
t _{tab}				4.03	4.03	4.03	4.03	4.03	4.03	4.03
t _{cal}				0.03	0.05	0.07	0.09	0.11	0.18	0.27
1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03
0.39	0.45	0.5	0.56	0.64	0.70	0.72	0.75	0.76	0.78	0.87
1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03
1.08	1.26	1.41	1.51	1.95	2.53*	3.28	3.71	4.01	4.31	4.77
2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.03
5.07	5.49	5.98	6.06	6.07	26.36	37.6	31.45	41.49	72.38	89.65
2013	2014	2015	2016	2017	2018	2019	2020			
4.03	4.03	4.03	4.03	4.03						
78.01	69.47	38.14	28.06	0.01						

Source: Preparation of researchers depending on the results EVIEWS

Annex N° 02: lag

VAR Lag Order Selection Criteria Endogenous variables: R DD Exogenous variables: C Sample: 1970 2020 Included observations: 47						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2843.250	NA	1.31e+50	121.0745	121.1532	121.1041
1	-2780.214	118.0251	1.06e+49	118.5623	118.7985*	118.6512
2	-2773.031	12.83643*	9.29e+48*	118.4269*	118.8205	118.5750*
3	-2770.984	3.485149	1.01e+49	118.5100	119.0611	118.7173
4	-2770.042	1.523207	1.16e+49	118.6401	119.3486	118.9067
* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level)						

Source: the results EViews

Annex N° 03: VECM

Vector Error Correction Estimates Sample (adjusted): 1973 2020 Included observations: 48 after adjustments Standard errors in () & t-statistics in []		
Cointegrating Eq:	CointEq1	
LOGD(-1)	1.000000	
LOGR(-1)	-0.001900	
	(0.03067)	
	[-0.06195]	
C	-19.32427	
Error Correction:	D(LOGD)	D(LOGR)
CointEq1	-0.917938 (0.22973) [-3.99574]	0.946346 (0.42849) [2.20858]
D(LOGD(-1))	0.133406 (0.20346) [0.65568]	-0.653600 (0.37949) [-1.72230]
D(LOGD(-2))	0.159195 (0.15698) [1.01409]	-0.204929 (0.29280) [-0.69989]
D(LOGR(-1))	0.057446 (0.08226) [0.69838]	-0.030078 (0.15342) [-0.19605]
D(LOGR(-2))	-0.014993 (0.07971) [-0.18809]	0.017373 (0.14868) [0.11685]
C	-0.009621 (0.18982) [-0.05068]	0.113524 (0.35405) [0.32064]
R-squared	0.417385	0.115623
Adj. R-squared	0.348026	0.010340
Sum sq. resids	72.16201	251.0441
S.E. equation	1.310780	2.444840
F-statistic	6.017750	1.098215
Log likelihood	-77.89415	-107.8153
Akaike AIC	3.495590	4.742305
Schwarz SC	3.729490	4.976205
Mean dependent	-0.001345	0.107173
S.D. dependent	1.623359	2.457579
Determinant resid covariance (dof adj.)	10.21996	
Determinant resid covariance	7.824656	
Log likelihood	-185.5928	
Akaike information criterion	8.316367	
Schwarz criterion	8.862134	

Source: the results EViews