

An empirical analysis study of inflation and import of foods in Algeria (2001-2019)

دراسة تحليلية تجريبية للتضخم واستيراد المواد الغذائية في الجزائر (2001-2019)

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Abstract

Through this article, we have attempted to study the effect of the index of inflation transfer via food imports (ITM) on the Algerian consumer price index (CPI), during the period 2001-2019, and to do so. We used one of the dynamic modeling methods which are vector autoregressive models (VAR). The results showed a positive and significant impact of ITM on the Algerian consumer price index (CPI). Through the results of the co-integration test, there is a long-term relationship between the inflation transfer index via food imports (ITM) and the Algerian consumer price index (CPI), the relationship is a one-way relationship.

Key words: inflation, food imports, econometric model .

JEL classification codes: E31,F14,A10

المخلص

حاولنا من خلال هذا البحث دراسة تأثير مؤشر انتقال التضخم من خلال الواردات الغذائية (ITM) على مؤشر أسعار المستهلك الجزائري (CPI) ، خلال الفترة 2001-2019 ، وللقيام بذلك. استخدمنا إحدى طرق النمذجة الديناميكية وهي نماذج الانحدار الذاتي المتجه (VAR) وأظهرت النتائج تأثير إيجابي وهام لـ ITM على مؤشر أسعار المستهلك الجزائري (CPI). من خلال نتائج اختبار التكامل المشترك ، هناك علاقة طويلة الأمد بين مؤشر تحويل التضخم عن طريق الواردات الغذائية (ITM) ومؤشر أسعار المستهلك الجزائري (CPI) ، العلاقة هي علاقة أحادية الاتجاه.

الكلمات المفتاحية: التضخم ، الواردات الغذائية ، النموذج الاقتصادي القياسي

تصنيف JEL: E31 ، F14 ، A10

I-Introduction:

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Inflation has long monopolized the attention of economists and politicians as a negative economic phenomenon, it hammering economic development; it is also seen as a leading index to appreciate economic health. This interest has been reinforced in recent times mainly due to the impact of economic inflation in empirical results on developed as well as developing countries.

Currently, the inflation phenomenon is worsening at the pace of global concern, and several theories are advanced to explain its nature and its causes. Internationally, the oil shock, the food crisis, and the financial crisis seem to be the main sources of inflation. In Algeria, inflation can be explained by studying different factors: monetary factors such as the monetary mass and effective exchange rates; and structural factors such as the changes in the price of oil and other imported products and the change in average annual wages. This study evaluates food-product imports as one of the determinants of inflation in Algeria.

1.1 The aim of this study: This study aims to shed light on the relationship between food imports and inflation in Algeria.

1.2 The Problem:

What is the empirical relationship between inflation and the import of food products in Algeria?

1.3 Assumptions:

There is a causal relationship ranging between food imports and inflation in the Algerian economy.

- ✓ H1: There is a long-term relationship between the inflation transfer index through food imports and the Algerian consumption price index (CPI).
- ✓ H2: The relationship between the inflation transfer index via food imports and the Algerian Consumer Price Index (IPC) is a one-sided relationship.
- ✓ H3: There is a statistically significant Positive relation between the Food Import Inflation Transfer Index (FIT) and the Algerian Consumer Price Index (CPI)

II- Literature review:

Several previous studies have addressed the issue of imported inflation. However most have addressed the transfer of inflation to national economies through the total import channel. Among the studies that aimed to explore the role of imports in the transmission of inflation I find:

(Byung-Yeon, 2001) study's, which resulted in the existence of a complementary relationship between inflation and the group determinants include the European Union average consumer price index and the rate exchange of Polish currency against the US dollar.

(Benziane & Chekebkeb, 2017) had studied the effect of transmission of imported inflation on domestic inflation and foreign trade. There is a relationship between the exchange rates, foreign trade and the consumer price index, by using three behavioral equations and equations of identity. The results showed that international prices have a great impact on domestic inflation.

(Alhwij & Elbeydi, 2020) this study test for long run causality directions between inflation and imported inflation through food imports from Italy, the major trade partner of the Libyan economy. The main findings of the study have found a unidirectional causality relationship from food imported inflation index to local inflation in Libya in the long

Zemit Fouad's study: The effect of imported inflation on domestic inflation in Algeria during the period 1994-2015, the study found that a rise in global prices leads to an increase in domestic prices.

(AL-Mutairi, Al-Abduljader, & Naser, 2020): this study found that imports do not have any effect on the level of inflation in Kuwait.

(Azri Hamid, Khouri Rabah,2020): The study concluded that there is a significant positive relationship between imported inflation and domestic inflation in the short and long term, and an inverse significant relationship between the change in the money supply and domestic inflation in the long term.

III-Evolution of consumer prices in Algeria from 1970 to June 2020

The inflationary phenomenon in Algeria dated back to the early 1970 (oil boom) and accelerated in the following decade after the economic reforms undertaken during this period, including the liberalization of prices of various products.

Until early 1994, prices in Algeria had been subject to an expanded system of subsidies that removed any measure of scarcity and even fewer points of encounter between supply and demand. This neutral role of prices and their subsidies were consistent with a development strategy implemented from 1962 to 1989 (funded by the oil rent) and based on the principle of the fundamental subtraction of economic wheels from macro indicators (price and inflation as well as exchange rates, growth, currency and interest) that ensure tracking of the exchange rate. The rupture with the system came in 1994 in the context of the program with the IMF.

Consumer prices in Algeria have generally seen three trends:

- An increase trend during the period covering the years 1970-1980-1990; (Richard, J. C. & Michael, 1980)
- A trend towards some stability 2000-2012;

- A final trend in inflation recovery 2013-2020;

1- The price rises 1970-1999: Consumer prices rose continuously, from 8.2 percent in the 1970s to 9 percent in the 1980s and 18.6 percent in the 1990s: This continuing trend in prices reflects several factors, notably a demand exceeding the overall supply of goods and services (shortfall showed). At the end of the 1990s, the poverty level was 20.5%. As for the standard of living of the population, it has dropped by almost 3 percent. (Richard, J. C. & Michael, 1980)

2- Low price stability 2000-2012: the CPI experienced a significant slowdown to 3.2 percent on average (below 4 percent for the first time in 40 years), reflecting a substantial increase in imports of various products, particularly food products that have reinforced overall supply, and a slight depreciation of the national currency (Adolfson, M., S., Laséen, J. Lindé, & M. Villani, 2005). This performance also reflects monetary authorities' efforts to absorb excess liquidity in the banking sector through several measures, including:

- Increasing the amount of deposit auctions;
- The repeated increase in the guiding rate;
- Extending the deadlines of a large portion of the filing contracts from one week to three months in July 2005;
- The establishment of a day-to-day deposit facility in September 2005.

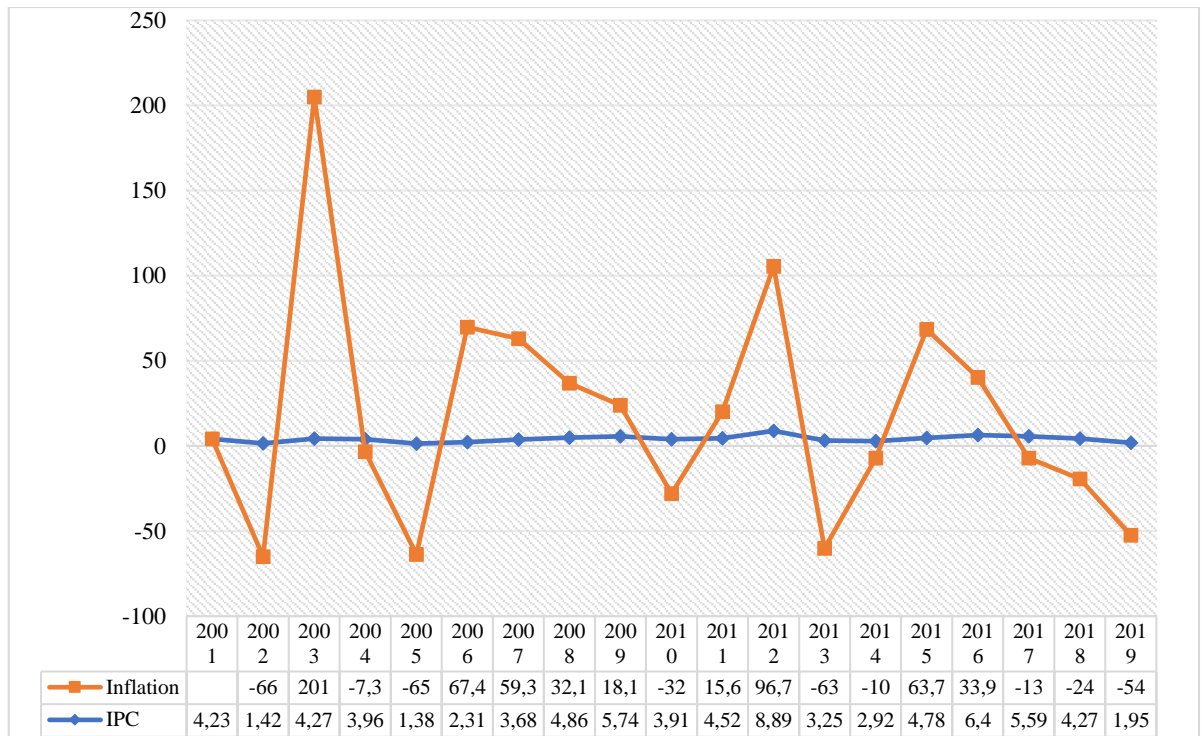
Consumer price stability and redistribution of the oil revenue (fed by constantly rising barrel prices) through the budget has improved the living conditions of the population by dropping the poverty rate to 6.7% and increase the standard of living from 2.4%.

3- The recovery of inflation, particularly in 2012, 2016 and 2020

In 2012, prices increased by 8.9% before falling between 2013 and 2015, then rising in 2016 (6.4%), then falling to 1.95% in 2019. By 2020, as a result of the health and oil shocks, the CPI is expected to go up to 5%. Inflationary pressures from 2012 are the result of a range of factors, including:

- The increase in food products, including fresh products;
- The high demand driven by public spending in the context of high liquidity;
- Strong increases in actual wages and other transfers.

Fig.01 Consumer price index: inflation rate in Algeria (2001-2019).



Source: established by the researcher based. (The National Statistics Office NSO/ONS, 2020) Data

For 2016, inflationary pressures have been justified by rising food prices. At the end of 2019, inflation resumption and the steps taken to counter the impact of the 2014 oil shock resulted in an 11 percent reduction in the standard of living.

4-Price’s projections in Algeria for 2020-2022:

For Algeria, given the structural, monetary and real aspects that underlie prices in Algeria, and in the light of the massive injections of liquidity from the Algeria bank to finance the public expenses at a time when the production of all goods collapses kinds. The expected trajectory is that of an upward rebound in consumer prices. Thus, a rise in inflation is expected, which is expected to reach approximately 5-5 percent between 2020 and 2022.

VI-Importation of foodstuffs into Algeria and inflation:

Many research was undertaken at the IMF and other institutions to understand the determinants of inflation in oil countries, notably Algeria. According to a study by the IMF monetary mass and prices of imported goods are short-term drivers of inflation in Algeria. The estimates from these studies highlight the elasticity below: a one-percent increase in import prices contributes to 0.2% increase in domestic prices (IFM, 2018)

Changes in imports of foodstuffs into Algeria:

Most of the trade in Algeria took place in 2019 with European countries, with 58.14% of the overall value trade (Directorate General of Customs , 2019)

The importation invoices for Food Products in Algeria reached 1.93 billion dollars for the first quarter of 2020, against 1.92 billion dollars for the same period in 2019, recording a relative stability of 0.6%, after the 3.5% decrease in the first two months of the current year (Customs Directorate). Food importations were in third position during the first three months of the current year in the country's overall import structure, at a rate of 21.23 percent, following industrial equipment assets (29.48%) and semi-products (21.27%). Representing over 32.5 percent of the food-importing structure, grains, semolina, and flour reached 629.50 million dollars in the first three months of 2020 versus 614.39 million dollars in the same period in 2019, an increase 2.46%, which 131.14 were from France. Algeria overseas purchases of dairy products have also increased to 363.96 million dollars, compared to 339.15 million dollars (+7.32%), of which 76.46 million dollars is French.

This upswing has also affected imports of sugar and sweets that have reached 180.75 million dollars compared with 168.01 million dollars (+7.58%), edible fruits (fresh and dry fruits). Which has increased by close to 54.5% totalling 87.61 million dollars, compared to 56.71 million dollars and various foods which totaled 81.5%.

Imports of fresh or chilled meats reached 55.71 million dollars compared to 45.23 million dollars, also up nearly 23.2%. On the other hand, Customs reports that imports from other food product groups declined during the first quarter of 2020 and compared to the same period in 2019. These are the purchases abroad of the residue and waste of the food industries; including the meals and other solid residues who have reached 110 million dollars versus 126.35 million dollars, down by almost 13 percent and imports from the coffee, tea and spices groups which have reached 83.34 million dollars versus 89.02 million dollars (-6.38%).

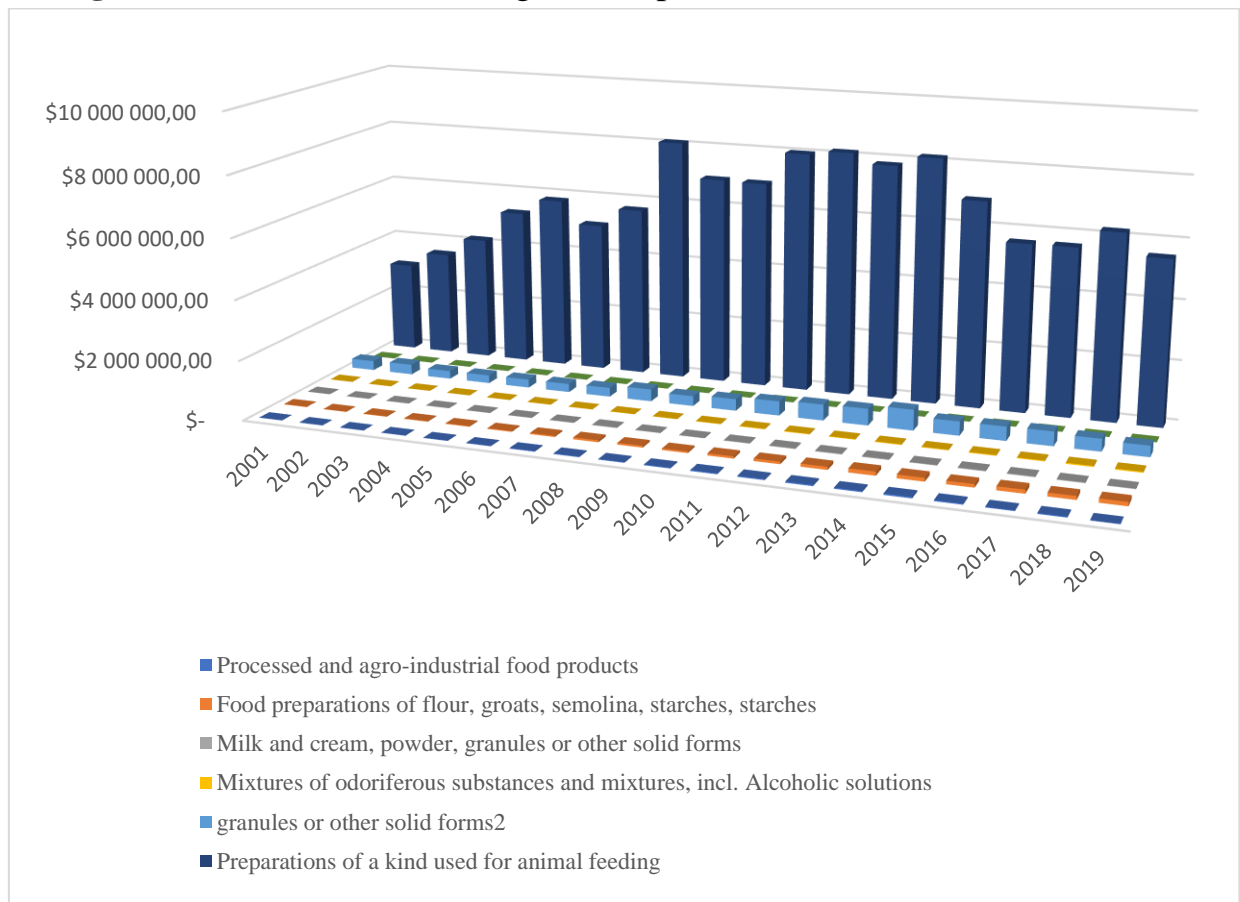
Vegetable importations also decreased by 14.87% to total 82.58 million dollars versus 97 million dollars, as well as those of manufactured tobacco products and tobacco replacements that totaled 59.70 million dollars versus 76.41 million (-21.86%).

Soya bean oil imports and its fractions (classified in the Gross Products Group) amounted to 151.84 million dollars (-3.21%). Throughout 2019, the import bill of food products decreased from 501 million dollars, or close to -6%, to 8.07 billion dollars, as compared to the year before.

The countries of Europe remain thus the main partners of Algeria; knowing that 63.69 percent of Algerian exports and 53.40 percent of their imports come from that region of the world, the countries of the European Union whose Exchanges between Algeria and this partner, reached \$45.21 billion for 2019, versus 51.96 a year ago, recording a bay. For its part, Algeria imported countries from Europe for 22.39 billion dollars, compared with nearly dollars 25.41 billion also down 11.87%.

The main products imported by Algeria from France for the period (2001-2019) (Directorate General of Customs , 2019)

Fig.2: The overall value of Algerian imports from France (2001-2019)



Source: (TRADMAP, 2020)

France remains the principal partner country of Algeria, with a food import bill of 551,37 million dollars in 2019. Since 2008, a growth the import 41.2% for the period between 2008 and 2014 has followed, followed by a decrease of 53.3% over the period 2014-2019. These fluctuations as a whole are affected by the volatility of oil prices and austerity policies that lead to a reduction in imports.

V-The measures to be taken to lower inflationary tensions in Algeria

Inflation in Algeria remains a phenomenon to monitor closely given the characteristics of the domestic economy; the authorities must take certain action to manage the inflation risk, that is:
 Improving the quality of the labor factor (health, education, training, etc.) and mobilizing capital while strengthening its performance in order to encourage growth in real GDP and address the distortions of supply. (Sbordone, A .M, 2002)

Improving the distribution network whose efficiency is crucial for stabilizing consumer prices.

Strengthen the efficiency of the transmission channel and act on price stability. Monetary transmission works through different channels;

-The channel of interest rates: an increase in nominal interest rates translates into an increase in real rates, which, in turn, reduces the desired consumption and investment, thereby putting downward pressure on prices.

-The exchange rate channel: rising domestic interest rates lead to a stronger currency, cutting the prices of tradable goods in the basket defining the consumer price index (Barth, M.J & V.A. Ramey, 2001) Moreover, a stronger exchange rate generally leads to a reduction in both net exports and the overall level of overall demand.

Improving inflation measurement:

(The National Statistics Office NSO/ONS, 2020) calculates the consumer price index by two criteria's; one for Algiers and another which covers the whole country. That of Algiers seems to be the reference;

The weighting is biased toward food products which represent 43 percent of the basket of which 26 percent of these foodstuffs are subject to price checks. Imported products, meanwhile, represent 26% of the basket;

The reference period is 2001 with weights beginning with the basic year 2000 (the annual expenditures from 2000 serve as the basis of calculation);

The publication: the monthly consumer price index is published with a delay of less than one month. For its part, the quarterly index of production prices is published with a delay of less than a quarter. The NSB has made remarkable progress in the area of price statistics. Which are globally sufficient for macroeconomic. It is desirable to unify the IPC. Revise, its coverage for refreshments and optimum coverage, change the weight of the subs indexes so as to reflect new household habits and change the base year because the faster the base year is, the faster the index will become inaccurate. Furthermore, since spending patterns vary depending on location and time; one index has a very limited value for comparison of price variations in different locations (Bessaha, 2020)

IV- Methodology

To determine the relationship between the inflation transfer index through food importations (FIT) and the Algerian Consumer Prices Index (CPI), we analyzed data for the inflation transfer index via the food imports (FTI) and the Algerian Consumer Price Index (CPI) by dealing with time series, to help with food imports (FTI) and to the consumer price index (CPI). The data from the study have been obtained from a database of World Bank 2020 and the statistical reports of the Bank of Algeria for the period 2001-2019.

From the practical point of view, we will attempt to employ one of the dynamic modelling methods, namely the auto-regressive models. Which are considered an alternative to the structural economic models. Which was the subject of many criticisms "Granger 1969 and Sims 1980" due to their vulnerability in the face of economic imbalances, as well as the invalidity of the resulting predictions. To arrive at a vector auto-regulation (VAR) model, we are following the following methodology steps:

1- The variables:

We use two variables in this study:

1-The level of inflation: expressed by the consumer price index (base 2001). The sources of the data are extracted from the data of the Algerian Bank and the NSO. The estimate period is from 2001 to 2019.

2-the inflation transfer index through imported food products. This variable is the result the consumer prices index of French products (the first European partner of Algeria) to which we will attribute the ICC code and importations of food products from Algeria from France coded IMF.

Data regarding the 2001-2019 consumer price index of French products are obtained from the National Institute of Statistics and Economic Studies (INSEE). Data on imports from Algeria are obtained from the (TRADMAP, 2020) database. We will use the ITM code to represent this variable.

$$ITM = FTI * CPI_{fr}$$

From this, the standard model of the study can be drawn as follows:

$$ICP = f(ITM)$$

- Consumer Price Index (Algeria): inflation rate (IPC).
- Inflation transfer index via imports of food products (ITM)

2- The econometric model:

To find the appropriate mathematical formulas for estimating, we will insert the logarithm in the series so that the model becomes as follows:

$$\text{Log}(IPC) = \alpha + \beta_i \text{Log}(IMT) + u_i$$

As it stands:

Log (IPC) : la variable dépendante

Log (IMT): the independent variable.

α The Constant Element

β_i : slope coefficients compared to explanatory variables.

: Random Estimate Error

3- Results of the descriptive study.**Table 1:** Results of the descriptive study.

| | CPI | ITM |
|-------------|----------|----------|
| Mean | 4.122976 | 8499676. |
| Median | 4.225988 | 8472348. |
| Maximum | 8.891451 | 22807154 |
| Minimum | 1.382447 | 258674.8 |
| Std. Dev. | 1.812997 | 5733205. |
| Skewness | 0.663448 | 0.717697 |
| Kurtosis | 3.806975 | 3.389487 |
| Jarque-Bera | 1.909393 | 1.751211 |
| Probability | 0.384929 | 0.416610 |

Source: established by the researcher

The arithmetic mean of the variable difference in relation to the index of the transfer of inflation by the imports has reached a value of 8499676, and through the maximum and minimum values it becomes clear that the dispersion of the values from its arithmetic average is great; this is confirmed by the value of the standard deviation, which has reached a value of 5733205, thus this value. In addition, both series follow the normal distribution thanks to the probability of Jarque-Bera greater than 5%.

4- Results of Economic Analysis:**1. Stability test.**

To determine the non-stationary properties of the two chronological series variables at either level or in the first difference, the choice of Dickie Fuller (DF) or the developed Dickie Fuller (ADF) is used (in this article we will be happy with the last test). Where it is temporal trend test or without. The general mathematical formula of the Dickie Fuller (DF) test is as follows (Damodar N. & Gujarati., 2003).

$$\Delta Z_t = \chi + (\rho - 1)Z_{t-1} + \gamma T + e_{1t}$$

The test (ADF) is a test development (DF), and adding offset values to the dependent variables added in the evaluation of the DF test mathematical formula, and the developed mathematical formula is as follows;

$$\Delta Z_t = \chi + (\rho - 1)Z_{t-1} + \gamma T + \delta \Delta Z_{t-1} + e_{2t}$$

The following table presents the results achieved.

Table 02: Unitary root tests.

| VARIABLE | Levels | | | 1st Differences | | |
|----------|----------|----------|--------|-----------------|----------|-------------|
| | ADF | 5% level | Prob | ADF | 5% level | Probability |
| IPC | -4,79623 | -4,4436 | 0.0180 | - | - | - |
| ITM | - | - | 0.0153 | - | - | - |
| | 3.645443 | 3.040391 | | | | |

Source : established by the researcher

The results of the study of stability for variables indicate that all variables are stable so that they contain one root, considering that the calculated values are completely lower than the Mackinnon critical values. In this case, the overall determinant trend hypothesis is also rejected. While the chronological series of the variables are complementary in the order of I (1), so the value of $d_{max} = 1$

2. Selection criteria for the VAR shift order

Before conducting the model estimation process, it should be determined according to the AIC and HQ criteria. The value of these two parameters were as follows :

Table 03: VAR shift order selection criteria.

| Lag | P=0 | P=1 | P=2 | P=3 | P=4 |
|-----|-------|-------|-------|-------|---------------|
| AIC | 38,43 | 38,91 | 39,27 | 39,65 | 37,81* |
| HQ | 38,27 | 38,91 | 39,26 | 39,65 | 37,80* |

Source: established by the researcher

The model can be estimated by the VAR model (5).

3. Co-integration Test

This test is superior to the Engel Granger test for covariant integration, as it is suitable for small-scale samples, and in the case of more than two variables, is more important. This test reveals whether there is a single covalent integration, i.e. that joint integration is only realised in a decreasing state. The variable depending on the independent variables, has its importance in the theory of co-integration, since this shows that in the absence of a unique co-integration. The balance of variables remains a question of doubt and question .

The existence of a long-term equilibrium between the two stable series of equal rank is tested despite the presence of an imbalance in the short term, by testing the covariance between the two variables with the methodology (Johansen, Johansen) and (Johansen-Juselius) used in the models consisting of more than two variables. Which is best even though there are only two variables; because the latter is the same as the one of the stable series.

The methodology ‘Johansen’ and ‘Johansen-Gosselius’ is a test of Matrix Rank II. The existence of a co-integration among time series requires that Matrix Π is not in a perfect order ($0 < r(\Pi) = r < n$). To determine the number of integration vectors, two statistical tests are used based on the Likelihood Ratio Test (LR), the trace test (λ_{trace}) and the test of the maximal own values λ_{max}

The impact test is known as:

$$\lambda_{trace} = -T \sum_{i=r+1}^n \log(\hat{\lambda}_i)$$

The null hypothesis is tested that the number of Co-integration vectors $\leq r$ versus the alternative hypothesis that the number of simultaneous integration vectors r (where $r = 0, 1, 2$). The maximum characteristic test is called:

$$\lambda_{max} = -T \log(1 - \hat{\lambda}_i)$$

Where the null hypothesis is tested as a number of Co-integration vectors = r in relation to the alternative hypothesis than the number of simultaneous integration vectors = $r + 1$ (Khalid bin Hamad bin Abdullah Al-Qadeer, 2005)

Test results are summarised in Table (03) under the following assumptions.

$$H_0: r = 0 / H_1: r > 0$$

$$H_0: r = 1 / H_1: r > 1$$

$$H_0: r = 2 / H_1: r = 3$$

Table 4: Results of the Johansen & Juselius co-integration test.

| Hypothesised | Eigenvalue | Trace Statistic | 0.05 Value | Critical | Prob.** |
|--------------|------------|-----------------|---------------|----------|---------|
| None | 0.904103 | 36.05430 | 15.49471 | | 0.0000 |
| At most 1 * | 0.206121 | 3.231542 | 3.841466 | | 0.0722 |

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

| Hypothesised | Eigenvalue | Max- EigenStatistic | 0.05 Value | Critical | Prob.** |
|--------------|------------|------------------------|---------------|----------|---------|
| None | 0.904103 | 32.82276 | 14.26460 | | 0.0000 |
| At most 1 * | 0.206121 | 3.231542 | 3.841466 | | 0.0722 |

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level

Source: established by the researcher

Through the table above, we accept the null hypothesis for all hypotheses at the 1% significance level, based on the trace test and maximum eigenvalue because Johnson’s

statistic for both tests is lower than their critical values. Therefore there is a joint complementarity relationship between the study variables, i.e. there is a long-term equilibrium relationship between the two variables, which proves the validity of the second hypothesis of the study. Namely that there is a long-term relationship between the index of inflation transfers via imports of food products (ITM) and the Algerian consumer price index (CPI).

Therefore it is possible to rely on the results of this test that there exists at least one integral vector between the two variables, which means that both variables can have a representation of the radius model VAR(5).

4. Granger’s Causal Test

The Causal Test is utilised to identify the causal trend among economic variables, for instance if changes in current and past values of the dependent variable (IPC) lead to change in the independent variable (ITM). This depends on the stability condition of the chronological series, and this test includes estimating of the VAR ray model (Foresti 2006).

$$\begin{aligned}
 y_t &= \alpha_1 + \sum_{i=1}^p \beta_i x_{t-i} + \sum_{j=1}^q \gamma_j y_{t-j} + U_{1t} & - 1 \\
 x_t &= \alpha_2 + \sum_{i=1}^p \theta_i x_{t-i} + \sum_{j=1}^q \delta_j y_{t-j} + v_{2t} & - 2
 \end{aligned}$$

Whereas (U_t, V_t) the parameters must be estimated, $(\gamma_j, \alpha_1, \delta_j, \alpha_2)$ two random terms with a constant variance and an arithmetic average equal to zero, and the two equations are estimated using the lower square method the test of causality was applying under two aspects, the ITM effect on the Algerian Consumer Price Index (IPC) and effect I. The results are presented in the following table.

Table 05: VAR Block Exogeneity Wald Causality Tests

| Excluded | Chi-sq | Df | Prob | Decision |
|----------------------------------|----------|----|--------|-----------------|
| LITM does not Granger Cause LIPC | 16.66843 | 4 | 0.0022 | Rejeter |
| LIPC does not Granger Cause LITM | 1.235333 | 4 | 0.8722 | Acceptor |

Source: established by the researcher

Through Table 10, we note that the likelihood of zero hypothesis in the first cases is lower than (0.05), so we reject the null hypothesis and accept the alternative hypothesis that the inflation transfer index via imports of foodstuffs (ITM) cause amendments to the Algerian Consumer Price Index (IPC).

In the second case, we see the probability that the hypothesis is null higher than (0.05), and we thus accept the null hypothesis and reject the alternative hypothesis that indicates the existence of a causal relationship between the two variables resulting from the index of inflation transfer through the imports of foodstuffs (ITM) to the consumer price index Algeria IPC (i.e. a one-way influence relationship).

This confirms the validity of the third hypothesis in the study: the relationship between the inflation transfer index via food imports (ITM) and the Algerian Consumer Price Index (IPC) is a single-way effect.

2. Estimation of the VAR self-regression model (5);

the real relationship between the time series can be estimated using the regular method of lower squares to estimate the VAR pattern, because the concept of self-regressive vector revolves around the variables that explain the dependent variable, and the interpreted variables also explain the variables that shortened it (the variable is explained through the temporal returns).

Accordingly, it is estimated using the lesser square method, and with the help of Eviews 9, we get what follows:

Table 06: Estimation of the VAR model (5).

| | Coefficient | Std. Error | t-Statistic | Prob. |
|---|-------------|--------------------|-------------|----------|
| C (1) | 0.783213 | 0.248964 | 3.145892 | 0.0084 |
| C (2) | -0.462139 | 0.229556 | -2.013187 | 0.0671 |
| C (3) | 0.418513 | 0.188282 | 2.222794 | 0.0462 |
| C (4) | -0.124783 | 0.199697 | -0.624859 | 0.5438 |
| C (5) | 0.037184 | 0.074166 | 0.501362 | 0.6252 |
| C (6) | -0.058159 | 0.070037 | -0.830409 | 0.4225 |
| C (7) | -0.030795 | 0.072153 | -0.426792 | 0.6771 |
| C (8) | 0.304929 | 0.081729 | 3.730981 | 0.0029 |
| C (9) | -3.446986 | 2.707176 | -1.273278 | 0.2270 |
| C (10) | -0.716758 | 1.343468 | -0.533513 | 0.6034 |
| C (11) | 0.544491 | 1.238738 | 0.439553 | 0.6681 |
| C (12) | -1.122224 | 1.016016 | -1.104534 | 0.2910 |
| C (13) | 0.385458 | 1.077612 | 0.357696 | 0.7268 |
| C (14) | 0.154960 | 0.400220 | 0.387189 | 0.7054 |
| C (15) | -0.083697 | 0.377935 | -0.221459 | 0.8285 |
| C (16) | -0.310421 | 0.389357 | -0.797267 | 0.4408 |
| C (17) | -0.140232 | 0.441028 | -0.317967 | 0.7560 |
| C (18) | 22.62119 | 14.60856 | 1.548489 | 0.1475 |
| Equation: LOG (CPI) = C (1)*LOG (CPI (-1)) +C (2)*LOG (CPI (-2)) +C (3)*LOG (CPI (-3)) +C (4)*LOG (CPI (-4)) +C (5)*LOG (ITM(-1)) +C (6)*LOG (ITM(-2)) +C (7)*LOG (ITM(-3)) +C (8)*LOG (ITM(-4)) +C (9) | | | | |
| R-squared | 0.821647 | Meandependent var | | 1.357584 |
| Adjusted R-squared | 0.583843 | S.D. dependent var | | 0.483440 |
| S.E. of regression | 0.311868 | Sumsquaredresid | | 0.583571 |
| F-statistic | 3.455146 | | | |
| Durbin-Watson stat | 2.275728 | | | |

Source: established by the researcher

Choosing the equation (IPC) alone will be enough, given our interest in researching the effect of PCI on MTI. The following is the formula of the VAR self-regression beam model (5) for (PCI);

$$\begin{aligned}
 \text{ICP} &= 0,78 + 0,42 * \text{ICP}_{(t-3)} + 0,31 * \text{ITM}_{(t-4)} \\
 (3,15) \quad (2,22) \quad (3,73) \\
 R^2 &= 0.82 \quad R^2 \text{ ajd} = 0.58 \quad F_{\text{cal}} = 3.45
 \end{aligned}$$

Based on results from the estimate, we note that the inflation transfer rate via food importation (FTI) is explained by 82.16%. The rest of the variables are 17.84% due to other variables not included in the model.

Since calculated Fisher statistics are higher than the table value ($F_{\text{cal}} = 3.45 > F_{\text{tab}} = 2.82$), we accept the alternative H1 hypothesis, meaning by accepting the model.

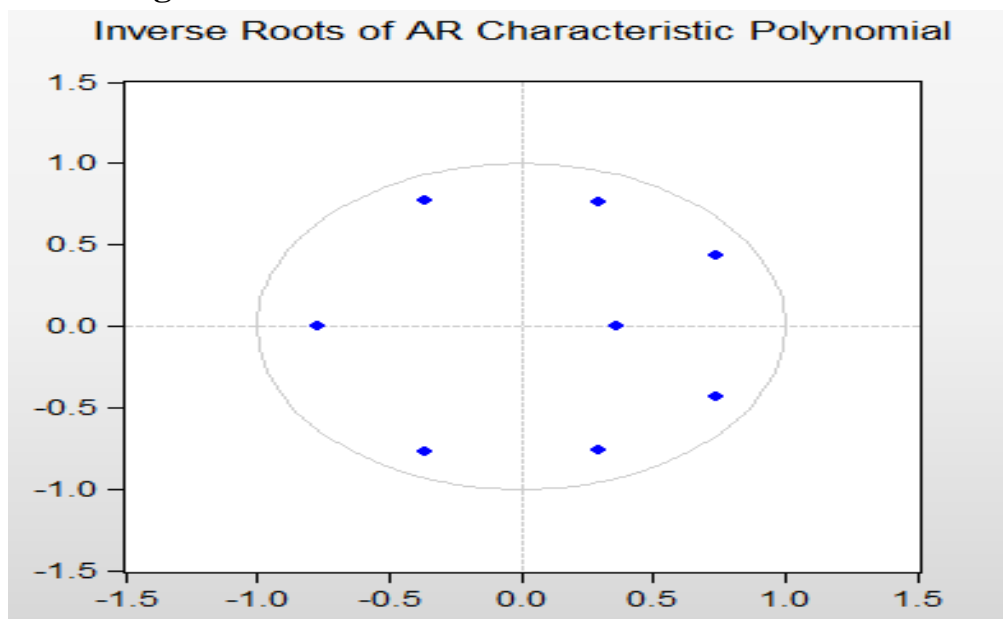
There is a positive ITM (0.31). This confirms the positive impact of the inflation transfer index via food imports (ITM) on the Algerian consumer price index (IPC). This is consistent with the economic theory which considers the Food Import Inflation transfer index (FII) one of the most important factors in the consumer price index of Algeria (CPI) because of its negative effects on the economy. This confirms the validity of the third hypothesis, therefore there is a positive relationship between the inflation transfer index through food imports (ITM) and the Algerian consumption price index (IPC).

In short, the model is statistically acceptable and valid to explain the relationship between economic variables.

3. Residue stability verification:

To ensure the stability of the model protectors we use multiple root testing where the auto-regression beam results are considered stable if all the roots are less than 1, and the figure below shows the results of this test.

Fig 03: The inverse of the roots associated with AR.



Source: established by the researcher

Through the figure above, we can see that the reverse from the unique root of the polynomial inside the single circuit, and from there, the stable form (1) VAR is stable.

Table 07: LM autocorrelation test

| Lags | LM-Stat | Prob |
|------|----------|--------|
| 1 | 4.842082 | 0.3039 |
| 2 | 2.738365 | 0.6025 |
| 3 | 2.116832 | 0.7143 |
| 4 | 4.150307 | 0.3860 |

Source: established by the researcher

The table shows the acceptance of the zero assumption, that is to say, there is no self-relation between the remainder of the model because the probability value is higher than the signification level of 5%.

4. Test for normal residue distribution:

The Jarque-Bura test is used to reveal the nature of the distribution of the residual motif as indicated in the following table.

Table 08: Results of normality test.

| Component | Jarque-Bera | Df | Prob. |
|-----------|-------------|----|--------|
| 1 | 1.851992 | 2 | 0.3961 |
| 2 | 0.664632 | 2 | 0.7173 |
| Joint | 2.516623 | 4 | 0.6417 |

Source: established by the researcher

From the table, it is clear that the probability value exceeds the 5 percent significance level, in that the zero assumption is accepted that the remainder of the model's distribution series follows the normal distribution.

Based on past tests, in particular auto-relationship tests for the rest of the model and its normal distribution, we conclude that the residual series is a white signal. As a result, we can say that the estimated model VAR (5) is statistically acceptable and can therefore be adopted in the analysis.

Results:

The results of this study showed a positive and significant impact of 5% of MIIs on the Algerian Consumer Price Index (CPI). Through the results of the co-integration test, there is a long-term link between the inflation-transfer index via food imports (FTI) and the consumption index in Algeria (CPI), as well as a one-way relation that begins with the inflation-transfer index via food imports towards local inflation, which results in the co-integration test. This is consistent with economic theory and this is what causality tests have shown.

The actual rate of inflation is impacted by imported inflation induced, in part, by higher global food and other commodities. Meanwhile, tightening import barriers would likely feed inflationary pressures by reducing supply — or even leading to shortages of some products.

Without adequate sterilization, increasing liquidity would boost nominal, perceived or real wealth and stimulate demand, resulting in a short-term increase in prices owing to inadequate domestic supply and saving opportunities. Wage and price expectations could be rapidly adjusted and mutually strengthened. The authorities could then be forced to use money financing during the following years, which could lead the economy to an inflationary spiral. By the end of 2020, it is anticipated that inflation will rise by 5 percent; a negative growth of 6 percent; a budget deficit of 15.3 percent of GDP; a balance of payments deficiency of 16.3 percent of GDP, and a drop of international foreign exchange reserves to about 44 billion dollars. (Besaha Abdelrahmi, 2020)

Conclusion:

In this article, we have attempted to study the impact of the inflation transfer index through food importations (FIIs) on the Algerian Consumer Price Index (CPI) in the 2000-2019 period. In this context, we have used one of the methods for dynamic modelling, which are the self-regressive vector models (SRMs). We also tested the stability of each series, and determined the order of its integration using unit root tests. The results showed that the two series are stable at the first difference.

We also studied a long-term relationship between the two variables and since the two series are stable at the first difference, we tested Co-integration. We also performed causality tests to detect the direction of the relationship between variables.

Algeria faces great challenges. Stabilize its heavily damaged economy. The challenge will take time, given today's profound macroeconomic imbalances, structural rigidities binding on the national economy, lack of strategic direction and, above all, sufficient resources to finance reforms which have become indispensable. These profound reforms must form part of a new, long-term vision, serving as a basis for a new model of developing a dynamic, diverse, modern, inclusive and outward-looking economy.

The vision at the end of 2050 will be to raise Algeria into the rank of leading emerging countries as well as a powerful regional economic player (with growth of around 7 per cent per year compared with the anemic rates recorded so far). This vision will target the construction of an off-oil economy, whose drivers of growth will be agriculture, including Saharan agriculture, industry and services articulated around digital, climate activities and the sea.

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