



SIMULTANEOUS STUDY OF THE EQUILIBRIUM BETWEEN MACROECONOMIC VARIABLES: AN ECONOMETRIC STUDY DURING THE PERIOD 1970-2021

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Abstract: The goal of this study is to provide a standard model for the Algerian economy that will make it evident which basic factors regulate it and show the different financial and economic strategies, leading to some degree of stability. Using annual data from the years 1970 through 2021, the model was created and evaluated using a simultaneous equations model.

Keywords: macroeconomics, standard model, simultaneous equations, three-stage least squares method.

JEL Classification Codes : E2,E3,C3

Introduction:

All nations, whether advanced or developing, place a high priority on studying macroeconomic issues since it provides insight into the policies being implemented in each nation and addresses both consumer and producer concerns to find remedies or lessen them.

The interconnectedness and interdependence of phenomena amongst the many economic stakeholders, whether at the level of the money market, the labor market, or the commodities and services market, define the economy.

Whereas the economic intermediaries of the goods and services markets can be categorized into four main sectors based on the type of consumption, namely: the family sector, whose purpose is to consume and in turn save as well as supply the fundamental components of production, the productive or institutional sector, with its mission to carry out investment operations, the government sector, with its mission to provide security and stability in addition to the basic structures, and the sector. The territory outside of one's own country, where different exchange transactions between different nations take place. According to money supply and demand, the money market is segmented.

In the present research, we will attempt to combine a qualitative treatment based on the descriptive-analytic approach, in addition to mathematical formulae and equations, throughout four sectors, each of which includes concepts, as well as numerous economic theories and models.

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1. The first topic: the market for goods and services

1.1 Family I sector

1.1.1 Consumption:

Consumption can be described as a statement of how much money is spent on consumption at each income level (الوادي & العيساوي، 2007). It can also be characterized as the use of products and services to directly and ultimately satisfy an individual's needs and goals (خلف، 2007).

1- The Keynesian theory: Keynes is credited as being the first to recognize that consumption is a function of income, implying that consumption is dependent on income and that an increase in income leads to an increase in consumption. This is known as the consumption function, and it can be expressed by the following linear formula: $c = f(y_d)c = c_0 + by_d$

c_0 Consumption independent of income. T: taxes Y: Income

2- Permanent income consumption theory: One of the most influential proponents of this idea was economist Milton Friedman, who demonstrated that consumption is tied not just to current or current income but also to the future income, which he characterized as the concept of permanent income (Friedman, 1957). Individuals' permanent income can be estimated using the following equation (2002 (رمضان & سيد، 2002) (*Comportement Du Consommateur Par DARPY, DENIS*VOLLE, PIERRE, s. d.*):

$$y_p = y_{t-1} + b \Delta y$$

y_{t-1} : previous income y_t : current income b: a ratio between 0 and 1: $0 < b < 1$

3- Relative income theory: The American economist published this theory in 1949(Shackle, 1951), and he presented two new hypotheses: $c = by_{t-1} + b_1y_t$

Individuals will tend to consume a big proportion of their income if their income is smaller than the average income of society to maintain the same level of consumption as a society.

The second hypothesis holds that while individuals can cut their savings, it is difficult for them to reduce their current level of spending.

-2-1-I savings

Saving is referred to as "the portion of one's income that is not consumed." (الوزني، 2006) implying that the remainder of income is after consumption and can be expressed by the following equation: $\Rightarrow S = Y - C = -c_0 + sy_d$

1- The classical theory: Contrary to Keynes, the classics believed that saving is a function of interest rate, and they explained this using the following equation: $S = s(i)$

2- The Keynesian theory: The Keynesian theory treated saving as a residual variable of income after consumption and gave its definition according to the following function:

$$\text{Including } S = (1 - c)y - c_0$$

To reconcile the two theories, the saving function is a function of disposable income, and the interest rate: $S = f(y, i) S = -c_0 + sy_d + b_i$

2.1 Enterprises Sector:

2.1.1 Investment

Investment, according to Keynesian analysis, is the purchase of productive goods (Blanchard, 2016) to create a new production capacity for the national economy, which is the creation of employment.

1- *The classical theory*: According to classical theory, saving is the primary determinant of investment (Mankiw, 2010) (Boubaker, s. d.), and it can be represented as follows:

$$I = F(i) I = I_0 - \alpha i$$

2- *National income and consumer demand*: there is a direct relationship in which when national

wealth improves, so does well-being, and individuals increase their demand for goods and services.

$$I = I_0 + \alpha_1 c + \alpha_2 y + \varepsilon$$

3- *Population size*: (2013, عبادي & حسين, ر.) There is a clear correlation between the growth in population and the rise in demand for products and services, as well as the rise in investments made to satisfy this need:

$$I = I_0 + \alpha N + \varepsilon$$

4- *Taxes*: The numerous taxes levied on investors are a representation of taxation (داودي & ين) (بوزيان, 2011) such as taxes on production and profits, and this leads to a negative relationship between investments and taxes.

$$I = I_0 - BT + \varepsilon$$

5- *Subsidies and facilities* or, in general, government spending on the construction of basic buildings.

$$I = F(G)$$

6- *Interest rate*: The relationship between the two can be understood by applying the following mathematical formula:

$$I = I_0 - \alpha_i.$$

1.2.2 Government Expenditure: Since expenditures are unrelated to national revenue, government spending is regarded as an independent variable. The accompanying graph explains why:

$$G = G_0$$

1.3 Taxes (Government Revenue):

Economist John Maurice Clark (2007, م. حسين & جاسم, ا.) was the first to introduce the phenomenon of incentive investment. Based on the above, it can be represented in the following equation:

$$T = T_0 + ty$$

1.4 Foreign Trade Sector: Foreign trade is defined (السواعي, s. d.) as a branch of economics concerned with the study of exchanges and trade deals between countries.

1.4.1 Exports: Exports can be thought of as an external variable because foreign countries' entry influences them Y^* (الخطيب & دياب, 1407) In addition to the exchange rate index e

The export function can be written in the following form:

$$X = X_0$$

2.4.2 Imports: Even though international trade has many advantages (Nyoni, 2004) (Ibrahim, 2014), most countries impose restrictions to protect their industries.

2. The second topic: the money market

2.1 Definition of Monetary Demand:

Fisher (2003, محمد الشريف) defined it in 1911 as "Every property right that may be accepted generally in exchange." while Aristotle defined it based on (2003, محمد الشريف) its functions:

- * The function of being a mediator in exchanges.
- * Function standard or unit of measurement values.
- * Value inventory function.

A- The theory of John Maynard Keynes, of "liquidity preferences," which he developed after the world experienced a recession in 1929, JM Keynes attacked classical ideas. He did this by highlighting the three motivations that motivate economists to hold onto their (الأفندي & الطيري, 2012):

- Aggregate demand (مندور et al., 2005) for cash balances: We now discuss the aggregate, which combines both demands for cash for transactions and speculation.

Aggregate demand for money:

$$M^d = L_1(y) + L_2(i) \text{ ie } M^d = L(y, i)$$

2.2 Definition of Money Supply:

It is the amount of money in circulation in a society at a particular time. (حداد، 2005) The money in circulation here includes the various forms of money held by individuals, which differed and were linked to the extent of economic and social development.

3. The third topic: the standard study

In an attempt to model the Algerian economy, represented in the goods and services market and the money market, using the real-time equations model.

3.1 Select variants and wording forms.

starting with theories of Financial and Some Forms of Studies done previously, adding to the analysis of the reality of economic change in the economics college from Algeria, Editing was finished with a sample theoretical evaluation of the shape.

- $CONSM = C_0 + B_0 Y_d + B_1 Y_{dt-1} + B_2 CONSM_{t-1} + B_3 W - B_4 i + B_5 P - B_6 T + B_7 N - B_8 IPC + \varepsilon$
- saving function $S = C_0 + B_0 Y_d + B_1 S_{t-1} + B_2 i - B_3 P + B_4 T + \varepsilon$
- investment function $I = I_0 - B_0 i - B_1 T + B_2 Y + B_3 C + B_4 N + B_5 G + B_6 P_{OIL} + \varepsilon$
- government spending function $G = B_0 RT + B_1 T + B_2 H_t + \varepsilon$
- tax function $T = T_0 + t y + t y_d + B_1 P_{OIL} + B_2 I_t + B_3 N + \varepsilon$
- The export function $X = X_0 + P_{OIL} + TC + \varepsilon$
- The import function $M = m_0 + B_1 Y + B_2 TC_t - B_3 TJ_t + \varepsilon$
- The demand for cash $M_d = L_1(Y) - L_2(i) \quad M_d = B L_1(Y) - B L_2(i) + B TC + B P_{oil} - B D_{N+}$
- - Presentation of criticism $\underline{M_S} = M_S$

3.2 Estimating the system of simultaneous equations

3.2.1 Standard Estimation of the System of Simultaneous Equations Using the Least Squares Method:

The objective of this stage is to estimate individual equations for each of the simultaneous equations that model the Algerian economy. This involves identifying statistically significant determinants that explain each internal variable of the system under investigation, while also ensuring that the estimated models are free from measurement problems. Consequently, a set of standard models for each equation in the system will be estimated and compared, using appropriate statistical and methodological criteria to select the most suitable model for each equation. This rigorous approach enables the attainment of more accurate and objective results, thereby avoiding the possibility of false regressions in the final rates adopted for the system.

3.2.2 Diagnosis of the simultaneous equation system of the Algerian Economy

The least squares approach of estimating an equation system requires considering each equation separately, and it is still only partially applicable to models of simultaneous equations (2009, كاظم) These reasons can be summarized as follows:

- The presence of feedback between the variables of the model functions;
- It is not possible to determine the equilibrium values of endogenous variables by relying on a single equation;

- It appears that a correlation between external variables and random errors in the system's equations disrupts one of the least squares method's most crucial hypotheses.

The mathematical formula for the system of simultaneous equations of the Algerian economy is as follows:

- $CONSM_t = C_{1t} + C_{2t}NY_d + C_{3t}NCPI_t + C_{4t}CONSM_{t-1} - C_{5t}NUNM_t + \varepsilon_t$
- $S = C_{6t} + C_{7t}NY_{dt} + C_{8t}S_{t-1} + C_{9t}NINV_t + \varepsilon_t$
- $NINV_t = C_{10t} + C_{11t}NINV_{t-1} + C_{12t}NIMPX_t - C_{13t}IR_{t-1} + C_{14t}YNM_{t-1} + \varepsilon_t$
- $NGEXP_t = C_{15t} + C_{16t}NGREV_t + C_{17t}Y_t + C_{18t}AR_{t-1} + \varepsilon_t$
- $NIMPX_t = C_{19t} + C_{20t}Y_t + C_{21t}NIMPX_{t-1} + \varepsilon_t$
- $X_t = C_{22t} + C_{23t}Y_t + C_{24t}AR_{t-1} + \varepsilon_t$
- $M_t = C_{29t} + C_{30t}Y_t - C_{31t}P_t + C_{32t}AR_{t-1} + \varepsilon_t$
- $M2R_t = C_{25t} - C_{26t}IR_t + C_{27t}Y_t + C_{28t}M2R_{t-1} + \varepsilon_t$

3.2.2.1Applying the conditions for recognizing simultaneous equations:

To confirm the diagnosis (2012 محمد، 2001 هاري & هاري، كالجيان) (discrimination) of the equation we need to know the estimability of its parameters, the order-rank conditional test will be resorted to and the structural model will be overridden; Where we start by testing the order condition (degree), which is a necessary but not sufficient condition, as we assume that K stands for the number of external (predetermined) variables in the whole system; We also denote (M) the number of internal variables in the whole system, while the number of internal variables in each equation alone is denoted by (m).

For the equation to be fully defined, it must be $(K - k = m - 1)$ In the case of the system of equations in our hands, it appears that the number of internal variables is $(M = 8)$, while the number of external variables is $(K = 14)$, which will be adopted to determine the order condition in each equation of the system.

The following table shows the results of applying the rank condition:

Table No. (1-3): Summary of the results of applying the degree condition to the equations of the system.

The result	Note	m-1	Kk	The number of external variables K = 14		The equation
				The number of internal variables is M =8		
				K	M	
Redundant	Kk > m-1	0	10	4	1	Consumption
Redundant	Kk > m-1	1	12	2	2	savings
Redundant	Kk > m-1	1	11	3	2	investment
Redundant	Kk > m-1	0	12	2	1	public expenditure
Redundant	Kk > m-1	0	12	2	1	taxes
Redundant	Kk > m-1	0	13	1	1	exports
Redundant	Kk > m-1	0	12	2	1	imports
Redundant	Kk > m-1	0	11	3	1	cash market

Source: Designed by the researcher based on the structural figure

The following results can be recorded based on the results presented in the previous table and related to the rank condition:

Consumption function: The number of internal variables in the consumption function that appear to be subtracted from it appears to be one $(m-1 = 1)$, while the number of external variables in the same

equation amounted to four, and therefore the value is ($Kk > N-1$), meaning that the equation for the consumption function is redundant.

The same is true for the remaining functions of the seven systems, where the rank condition test findings showed that all of the functions of the system under investigation are redundantly defined, and the next step will be to calculate the determinants of the matrices resulting from the deletion procedure for each equation of the system.

Order condition: previous (2015 جيجارتي) conditions are considered necessary but insufficient, unlike the rank condition, which is considered a sufficient condition. It is applied by following these steps:

In a model consisting of M equations, it can be argued that an equation can be described if there is at least one determinant of order $(M-1) \times (M-1)$ that differs from zero, and is composed of coefficients of variables (internal and pre-determined together) that are excluded from the equation to be described and found in the model, to do this we follow Next steps.

1. Convert the model equations into zero equations.
2. Write the parameters of the model in the form of a table with the neglect of random variables
3. Cross out the line of the equation to be recognized, then cross out the columns with non-null coefficients for the same equation
4. we calculate the determinants of order $(M-1) \times (M-1)$ until we get a non-null determinant.

We apply this condition to the following stages:

- Convert the structural equations of the model into zero equations

$$-CONSM_t + c1 + c2NY_d + c3NCPI_t + c4CONSM_{t-1} - c5NUNM_t = 0$$

- $-S + c6 + c7NY_{dt} + c8S_{t-1} + c9NINV_t = 0$

- $-NINV_t + c10 + c11NINV_{t-1} - c12NIMPX_t - c13IR_{t-1} + c14YNM_{t-1} = 0$

- $-NGEXP_t - c15 + c16NGREV_t + c17Y_t = 0$

- $-NIMPX_t - c18 + c19Y_t + c20NIMPX_{t-1} = 0$

- $-X_t + c21 + c22Y_t = 0$

- $-M_t + c23 + c24Y_t - c25P_t + c26AR_{t-1} = 0$

- $-M2R_t - c27 - c28IR_t + c29Y_t + c30M2R_{t-1} = 0$

Write the coefficients of the equations in a table:

Writing the structural equations features table with neglecting the random limits: where we write the parameters of the model variables in a table with neglecting the random terms as shown in the table below, where its structural equations lines and columns represent endogenous and predetermined variables

Table No. (3-2): Parameters of the structural equations of the model

equations	IR	Ngrev	NUNM	NYd	M2R	M	X	NIMPX	NGEX	NINV	S	CONSUM
consumption _	0	0	c5	c2	0	0	0	0	0	0	0	-1
savings	0	0	0	c7	0	0	0	0	0	c9	-1	0
investment	0	0	0	0	0	0	0	c12	0	-1	0	0
public expenditure	0	c16	0	0	0	0	0	0	-1	0	0	0
taxes	0	0	0	0	0	0	0	-1	0	0	0	0
exports	0	0	0	0	0	0	-1	0	0	0	0	0
imports	0	0	0	0	0	-1	0	0	0	0	0	0
cash market	c28	0	0	0	-1	0	0	0	0	0	0	0

equations	M2R(-1)	NIMPX(-1)	YNM(-1)	IR(-1)	NINV(-1)	s(-1)	CONSUM(-1)	NCPI	P	Y	NOILP	CONSTANT
Consumption	0	0	0	0	0	0	c4	c3	0	0	0	c1
savings	0	0	0	0	0	c8	0	0	0	0	0	c6
investment	0	0	c14	c13	c11	0	0	0	0	0	0	c10
public expenditure	0	0	0	0	0	0	0	0	0	c17	0	c15
taxes	0	c20	0	0	0	0	0	0	0	c19	0	c18
exports	0	0	0	0	0	0	0	0	0	c22	0	c21
imports	0	0	0	0	0	0	0	0	c25	c24	0	c23
cash market	c30	0	0	0	0	0	0	0	0	c29	0	c27

Source: designed by the researcher by accrediting the structural form of the system of equations

The following will attempt to calculate the determinant of each of the system's equations based on the results displayed in the above table. The line of features for each equation that needs to be identified will be crossed out by deleting the columns that accompany it with features that aren't present, so that the determinant of the matrix resulting from the deletion process is then calculated the remaining features are of order $(N-1) \times (N-1)$, where N represents the number of equations.

3.2.2.1.1 Consumption function:

We remove the columns that are adjacent to the consumption function line and contain non-null arguments then we calculate the resulting matrix with the rank $(N-1) \times (N-1)$, and in this case, we have a matrix with the rank (7×7) and among the matrices that can be configured We find the pro matrix:

-1	0.69	0	0	0	0	0		
0	-1	0	0.0002	0	0	0		
0	0	-1	0	0	0	0		
0	0	0	-1	0	0	0	=	-1
0	0	0	0	-1	0	0		
0	0	0	0	0	-1	0		
0	0	0	0	0	0	-1		

Upon calculation of the determinant of the matrix depicted in the preceding figure, it was determined to be distinct from zero. As such, it may be inferred that the consumption function is well-defined. Similarly, the determinants of the matrices for the remaining seven functions comprising the system were computed using a comparable methodology. These determinants are presented below in sequential order:

3.2.2.1.2 Saving function:

-1	0	0	0	0	0	0		
0	0	0.0002	0	0	0	-12.26		
0	-1	0	0	0	0	0		
0	0	-1	0	0	0	0	=	12.26
0	0	0	-1	0	0	0		
0	0	0	0	-1	0	0		
0	0	0	0	0	-1	0		

Upon computation of the determinant of the matrix associated with the saving function as depicted above, it becomes evident that at least one potential matrix exists whose determinant is non-zero. Hence, it can be inferred that the saving function is also well-defined.

3.2.2.1.3 Investment function:

0	-1	0	0	0	0	0		
0	0	-1	0	0	0	0		
0.2	0	0	-1	0	0	0		
0.03	0	0	0	0	0	0	=	-0.03
0.25	0	0	0	-1	0	0		
0.63	0	0	0	0	-1	0		
0.28	0	0	0	0	0	-1		

After the deletion process, one matrix completely different from zero was obtained for the investment function, and therefore it can be judged that the investment function is also defined.

3.2.2.1.4 Public Expenditure function:

-1	0	0	0	0	0	0		
0	-1	0.69	0	0	0	0		
0	0	-1	0.0002	0	0	0		
0	0	0	-1	0	0	0	=	-1
0	0	0	0	-1	0	0		
0	0	0	0	0	-1	0		
0	0	0	0	0	0	-1		

Upon referring to the structure of the matrix depicted above and subsequent computation of its determinant, it was determined that the determinant is distinct from zero. Based on this criterion, it can be inferred that the public expenditure function is also well-defined.

3.2.2.1.5 Tax function:

-1	0	0	0	0	0	0		
0	-1	0.69	0	0	0	0		
0	0	-1	0	0	0	0		
0	0	0	-1	0	0	0	=	-1
0	0	0	0	-1	0	0		
0	0	0	0	0	-1	0		
0	0	0	0	0	0	-1		

There is at least one matrix with dimensions (7×7) whose determinant is completely different from zero with respect to the tax function, which is shown above, and therefore the tax function is also considered defined.

3.2.2.1.6 Export function:

-1	0	0	0	0	0	0		
0	-1	0.69	0	0	0	0		
0	0	-1	0	0.0002	0	0		
0	0	0	-1	0	0	0	=	-1
0	0	0	0	-1	0	0		
0	0	0	0	0	-1	0		
0	0	0	0	0	0	-1		

Based on the results of calculating the matrix determinant of the exports function, which appeared to completely disappear from zero, the exports function is also defined.

3.2.2.1.7 Imports Function:

-1	0	0	0	0	0	0		
0	-1	0.69	0	0	0	0		
0	0	-1	0	0.0002	0	0		
0	0	0	-1	0	0	0	=	-1
0	0	0	0	-1	0	0		
0	0	0	0	0	-1	0		
0	0	0	0	0	0	-1		

There is at least one matrix whose determinant is different from zero with respect to the import function, which is shown above, and therefore the import function is also defined.

3.2.2.1.8 Money Demand Function:

-1	0	0	0	0	0	0		
0	-1	0.69	0	0	0	0		
0	0	-1	0	0.0002	0	0		
0	0	0	-1	0	0	0	=	-1
0	0	0	0	-1	0	0		
0	0	0	0	0	-1	0		
0	0	0	0	0	0	-1		

An array of matrices with dimensions (77) was obtained after performing the previously indicated specific deletion procedure for the money demand function. The matrix mentioned above was chosen from the group because its determinant is not zero as it first looks, and as a result, the money demand function is also defined. Based on the order condition of each of the equations of the model under study, it appears based on this condition that all the parameters of the equation are defined.

It turns out that all functions are specified based on the order condition as indicated above, which is a basic description of the step of identifying the equations of the model through the application of the rank and order requirements. When it comes to the rank condition, it shows that all of the model equations have redundant definitions, and from it, we can derive the standard model as well as the definition.

3.2.2.2 Formulation of the system of equations using the method of least squares with three stages

After confirming the availability of the two necessary and sufficient conditions (rank and arrangement) for estimating the system of instantaneous equations that models the Algerian economy from 1970 to 2021, this model will be estimated at this stage using the method of least squares with three stages, due to considerations, the most important of which are (Gujarati, 1988).

- The method of least squares with three stages uses a larger amount of information, which makes it more efficient than the rest of the estimation methods that can be used.
- The length of the study period, which extends from 1970-2021, is equivalent to 52 observations, and therefore the method of least squares with three stages is considered the most appropriate in the estimation process, in addition to that it is considered one of the most appropriate methods of estimation in the case of problems of linear multiplicity in the study model.
- The results of the estimation according to the three-stage least squares method is characterized by consistency and convergence.

One of the most significant issues confronting simultaneous equation systems, as previously stated, is the existence of a correlation between the explanatory variables and the random limit. Therefore, the use of the three-stage least squares method (3SLS) requires finding intermediate variables to be used instead of the explanatory variable associated with the random limit and with the same methodology previously adopted in modeling the system Simultaneous equations The various predetermined variables and the time-lagging variables were included as intermediate variables, and using the EVIEWS12 program, the results of estimating the proposed model for the Algerian economy were as follows:

Table No. (3-3) Estimating the system of simultaneous equations using the three-stage least squares method

Three-stage least-squares regression																			
Equation		Obs		Parms		RMSE		R-sq		chi2		P							
CONSM		48.00		4.00		94.78		0.99		10053.23		0.00							
S		48.00		3.00		411.44		0.97		1650.49		0.00							
NINV		48.00		4.00		160.19		0.99		5503.70		0.00							
NGEXP		48.00		2.00		474.89		0.90		486.90		0.00							
NIMPX		48.00		2.00		235.13		0.95		879.27		0.00							
X		48.00		1.00		932.08		0.58		67.24		0.00							
M		48.00		2.00		355.09		0.93		648.63		0.00							
M2R		48.00		3.00		522.48		0.98		2615.56		0.00							
		Coef		Std. Err.		Z		P>z											
CONS										S									
NCPI		0.38		0.13		2.80		0.01		SI1		0.64		0.07		8.86		0.00	

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NUNM	-11.77	3.28	-3.59	0.00	NINV	-0.54	0.15	-3.56	0.00		
NYD	0.05	0.01	5.33	0.00	NYD	0.54	0.10	5.36	0.00		
CONSMI1	0.89	0.02	38.74	0.00	_cons	863.97	176.39	4.90	0.00		
_cons	453.68	82.62	5.49	0.00							
	Coef	Std. Err.	Z	P>z		Coef	Std. Err.	Z	P>z		
NINV					NGEXP						
NIMPX	0.31	0.04	7.15	0.00	Ngrev	0.77	0.10	7.40	0.00		
NINVI1	0.52	0.07	7.12	0.00	Y	0.15	0.03	4.99	0.00		
YNML1	0.09	0.02	4.72	0.00	_cons	-1041.09	230.11	-4.52	0.00		
IRI1	-12.35	5.58	-2.21	0.03							
_cons	41.57	44.18	0.94	0.35							
	Coef	Std. Err.	Z	P>z		Coef	Std. Err.	Z	P>z		
grev					NIMPX						
Ngrev	0.77	0.10	7.40	0.00	NIMPXI1	0.87	0.07	12.29	0.00		
Y	0.15	0.03	4.99	0.00	Y	0.03	0.02	1.96	0.05		
_cons	-1041.09	230.11	-4.52	0.00	_cons	-179.44	129.51	-1.39	0.17		
	Coef	Std. Err.	Z	P>z		Coef	Std. Err.	Z	P>z		
X					M						
Y	0.26	0.03	8.20	0.00	P	-248.68	21.88	-11.36	0.00		
_cons	2356.39	347.48	6.78	0.00	Y	0.71	0.04	17.35	0.00		
					_cons	2375.85	245.96	9.66	0.00		
		M2R									
M2RI1		0.59		0.06		9.70				0.00	
IR		-101.95		18.03		-5.65				0.00	
Y		0.36		0.05		7.29				0.00	
_cons		-204.43		211.80		-0.97				0.33	
Endogenous variables: CONSM S NINV NGEXP NIMPX XM M2R											
Exogenous variables: NCPI NUNM NYD CONSMI1 SI1 NINVI1 YNMI1 IRI1 NGREV Y											
NIMPXI1PM2RI1IR											

The various functions are calculated by the least squares method with three stages, which models the Algerian economy model through eight structural equations which demonstrate the economic complexes and main determinants in addition to tariff equations and the equation of the

condition of balance in the services market and the money market, and from it, the model under study for the Algerian economy takes the following form:

- $CONSM_t = 453.68 + 0.05NY_d + 0.38NCPI_t + 0.89CONSM_{t-1} - 11,77NUNM_t$
- $S = 863.97 + 0.54NY_{dt} + 0,64S_{t-1} + 0.54NINV_t$
- $NINV_t = 41.57 + 0.52NINV_{t-1} + 0.31NIMPX_t - 12.35IR_{t-1} + 0.09YNM_{t-1}$
- $NGEXP_t = -1041.09 + 0.15NGREV_t + 0.77Y_t$
- $NIMPX_t = -179.44 + 0.03Y_t + 0.87NIMPX_{t-1}$
- $X_t = 2356.39 + 0.25Y_t$
- $M_t = 2375.85 + 0.71Y_t - 248.68P_t +$
- $M2R_t = -204.43 - 101.95IR_t + 0.36Y_t + 0.59M2R_{t-1}$

3.2.2.2.1 Statistical and economic analysis of the estimated model:

The remainder of this paper will concentrate on two main aspects. The first will be a brief presentation of the most important statistical characteristics of the system of estimated equations, followed by an attempt to interpret the results from an economic standpoint.

A- Statistical analysis of the model:

The estimation findings revealed that they are statistically significant since the probability values of the STUDENT statistic (السواحي، 2018) are all smaller than the crucial value (0.05), and hence the values calculated for STUDENT are more than the equivalent tabular value. Except for the presence of some parameters (constants) that were not statistically significant as shown in the table above, all of the estimated equations have the partial significance property of their parameters for all of the estimated parameters associated with the variables of each of the model equations.

In terms of the estimated models' explanatory ability for each equation of the system under study, the estimation results showed that the model has a high explanatory ability, as the explanatory ability of each equation of the system was limited to the value (58%) for the export function (x) and up to (99%)) for the consumption function (CONSUM). Accordingly, the value of the determination coefficients is high and acceptable from a standard and statistical point of view, meaning that the model for the system of equations of the Algerian economy during the period (1970-2021) is characterized by an acceptable quality from a statistical and standard point of view, and it is possible to rely on the results of the estimate in this Case for economic analysis with a high degree of accuracy and reliability.

B- Economic analysis of the Algerian economic system:

Following that, an economic analysis will be attempted for each of the system's equations estimated by the previous table, by attempting to explain the direction of influence imposed by the independent variables included in each of the eight systems' equations on each internal variable in this system.

Economic Analysis of Consumption Equation:

According to the above table, it is apparent that both changes in the consumer price index (NCPI), real disposable income (NYD), and the one-period delay in total consumption (CONSM t-1) had a positive impact on the total consumption in the Algerian economy during the study period. For example, an increase in the consumer price index by (100%) results in an increase in total consumption with the flexibility of (38%).

The increase in the total real income by (100 %) leads to an increase in total consumption with a relative elasticity estimated at (5 %).

Moreover, the total consumption is affected by high flexibility in its delay of one year, as the increase in the total consumption in the previous year leads to an increase in consumption in the following year by up to (89%). Concerning the unemployment rate, it had an adverse effect on total consumption, as a rise in the unemployment rate by (1 %) leads to a decline in consumption by more than (11 %).

In the same way, the equations of saving and investment functions and other equations of the model are analyzed from the economic angle.

Conclusion

Given the numerous definitions and theories about various macroeconomic variables, it is difficult to study the equilibrium and interactions between the variables of the goods and services market and the money market. And there is still a great deal of controversy and argument among the many research. The ruling authorities in each nation have a major role in how each country determines the balance of the economy on the two markets, even when there is a relative difference.

We chose to use simplified economic models to explain the economic relationships between the various economic variables and to analyze the economic relationships between the dependent variable and other economic variables that affect it (independent variables) because the study requires greater accuracy and a good identification of the study variables. We calculated to a conclusion. The aim of estimating it using appropriate econometric methods is to know the impact of economic policies on the national economy later on, especially fiscal and monetary policies. It is characterized by the mutual influence between its variables, which makes it achieve the characteristics of simultaneous equations models.

subsequently, we will construct and estimate a standard model for the macroeconomics of Algeria from 1970 to 2021, and then test these equations to show that they are valid from a statistical, economic, and standard perspective by examining the reciprocal relationships between the various constituent sectors of the goods and services markets and the money market. Using the simultaneous equations approach, we were also able to pinpoint the key factors that influence and govern the macroeconomic balance in Algeria and illustrate its features.

Following the completion of the process of estimating the various behavioral and tariff equations of the macro-econometric model of the Algerian economy, we came to the following conclusions: The available national income is the first determinant of the consumption of Algerian families. In addition, Algerian families maintain their customs and traditions by maintaining their consumption following the nature of need and satisfaction. Finally, we observed that the interest rate explains the relationship between investment and consumption.

The national income, which represents the collection of petroleum taxes, is a function of government revenues and taxation. Regarding the trade balance, although real income and global competitiveness have an impact on exports, the size of the population—which represents domestic demand—has an impact on imports. The amount of government revenues as well as the interest rate have an impact on the money supply.

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