Int. j. adv. multidisc. res. stud. 2023; 3(1):1-7

Received: 12-11-2022
Accepted: 22-12-2022

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Estimate the Determinants of Economic Stability in Sudan by Using the Linear Probability Logit Model (1985-2018)

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Abstract
The study aimed to identify the determinants of economic stability in Sudan using annual data on the Economic Stability, GDP, Exchange rate, Inflation, and Unemployment. The study examined the effect of GDP, exchange rate, inflation, and unemployment on the economic stability. The study assumed that there was appositive relationship between GDP, inflation and economic stability. The rate of unemployment had an inverse relationship with economic stability in the Sudan. The study indicates the existence of a positive relationship between GDP, inflation and economic stability, and an inverse relation between unemployment and economic stability. The study recommends the needs for coordination between fiscal policy and monetary policy to reduce the rate of inflation, and support the agricultural sector in order to increase GDP, employment and economic stability.

Keywords: Economic Stability, Probability Model, Economic Cycle, Unemployment, Exchange Rate

Introduction

Governments today are trying to make adjustments in general economic policy with the aim of achieving economic stability in macroeconomic variables and achieving economic growth and sustainable economic development through the use of a combination of monetary policy and fiscal policy. Economic stability in its simple concept means that macroeconomic indicators such as the rate of inflation and the general level of prices The volume of imports and the unemployment rate are in a state of decline so that the economy is in this path of balance and stability on the one hand, and on the other hand that the macroeconomic indicators such as economic growth, total output, total investment and total exports are in a state of increase also so that the economy is in the path of stability and balance. This study attempts to construct an econometric model to estimate the determinants of economic stability in Sudan by use annual data obtained from the annual statistics of the Central Bureau of Statistics, the financial and economic presentations of the Ministry of Finance and National Economy and the annual reports of the Central Bank of Sudan. The descriptive approach and the analytical approach were used and applied to the linear probability model of the nature of the variables.

Macroeconomic Theories

Adam Smith's theory: Adam Smith called for promoting competition and free trade as the best means to achieve the greatest amount of wealth and happiness. of wealth which can be multiplied by the division of labor. He also dealt with the freedom of the market and the hidden hand that contributes to advancing the economic movement and encouraging investment, and his call to limit direct state interference in organizing work, as Adam Smith had his own vision in the economy, which is that the state should not interfere in economic matters and leave the market to the movement of supply. And demand, and called for the freedom of the individual's disposal of his money commercially In the sense that if the state does not impose specific conditions or direction for people to dispose of their money, then each of them will work in the direction of his interest, which is in the interest of the whole nation, and he stressed the principle of absolute competitive advantage, meaning that each country has a specificity in its agricultural and industrial products, which makes the cost of some things it has much lower From its cost to other countries and nations, this is why free trade must be adopted between countries so that the country whose products are available outside it at a lower price than it has must import from the country with the lowest price, and pay attention to studying the accumulation of capital as a basic determinant of economic development and it must happen before dividing Work, the problem is the ability of individuals to save more and then invest more in the economy and thus benefit the nation and achieve stability and economic balance, According to Adam Smith [1].

Classical Theory

The basic principle of the classical theory is that the economy is self-regulating, and the classical economists assert that the economy is always able to achieve the normal level of real GDP or output, which is the level of real GDP that is obtained when the resources of the economy are fully employed, the classical economists view capital formation and accumulation as the key to progress, development, and economic balance, and that profit is the incentive for investment [2].

Keynesian Theory

A key element of the idea of the Keynesian theory is that the macro economy can be in a state of disequilibrium for a long time. Therefore, this theory calls for government intervention, to help overcome the decline in aggregate demand, in order to reduce unemployment and increase economic growth. This theory focuses on the role of both the public and private sectors in the economy, that is, the mixed economy, where Keynes differs with the free market (without state intervention). That is, with the intervention of the state in some areas. The theory believes that macroeconomic trends determine to a large extent the behavior of individuals at the microeconomic level, and Keynes emphasized the role of aggregate demand for commodities and that this demand has a major role in the economy in periods of economic recession, and through aggregate demand the government can fight unemployment and recession, especially during recession The great, and that the economy does not tend to tend to the full naturally according to the hidden, as the classics believed, and it was often satisfied with thanking the economist Smith for his writings, and the modern employment theory strongly contradicts the classical theory, as the modern theory considers that the economic system Capitalism does not contain a guarantee of the full realization that the national economy may achieve balance in the national product despite the existence of large unemployment or severe inflation. The case of full employment accompanied by relative stability in prices according to the Keynesian thought is an occasional case and not a permanent verification. According to the Keynesian point of view, the determinants of economic stability It is the full employment of resources, national income, investment, savings and unemployment [3].

Balanced Growth Theory: Innovated by the economist Ragnar Narksi (1907.1959), the theory assumes that the government of any underdeveloped country needs to make large investments in a number of industries at one time. Achieving balanced growth in all sectors, because expansion and balance between sectors between agriculture and manufacturing are necessary so that each of these sectors provides a market for the other's products, and thus provides the raw materials necessary for development and growth [4]. Another. The theory discusses how weak market size in underdeveloped countries perpetuates its underdeveloped state and explained the various determinants of market size and mainly focuses on productivity. According to it, if productivity levels rise in a less developed country, its market size will expand and thus it can eventually become a developed economy The theory showed that no importance should be given to promoting exports and pointed out that the incentive to invest is restricted by the size of the market, as well as the lack of sufficient purchasing power in underdeveloped countries and that the real income of individuals is low although it may. It is high in monetary terms. If the monetary income is low, the problem can be easily overcome by expanding the money supply [4]. Expansion of the money supply will only lead to inflationary pressure, and neither real output nor real investment will rise. Low purchasing power means that domestic demand for basic commodities is low and includes The demand for capital also determines the size of the market incentive for investment regardless of the nature of the economy, because entrepreneurs always make their production decisions by taking into account the demand for the product in question, the theory concluded that the limited size of the domestic market in a low-income country can be an obstacle to the application of capital by any individual company or industry operating in the market. In this sense, the small domestic market is an obstacle to development in general [4].

Unbalanced Growth Theory

Hirschman crystallized its features after he criticized the poles of growth and balanced growth, and emphasized that the development plan that implements the intended unbalanced growth strategy is the best way to achieve progress, because investment in the leading strategic sectors leads to new investments, and that the development process needs imbalance at the beginning of its stages. Where growth is transmitted from the leading sectors to the dependent sectors, and this is to create external resources from which the rest of the sectors benefit, and every new project would generate abundances and benefits from which every other new project would benefit, and that Developing countries need a strong push to finance the huge investment program allocated to some industries, but not all of them, which is what happened in the United States or Japan, and no country is able to provide the necessary financing for all sectors. The national plan must direct investments to build social capital, or to establish Direct productive activities, where one of them creates external abundances, while the other benefits from them, and every development of the first encourages private investment, and this work would create an economic imbalance that is the driving force for growth, and it occurs in two levels, either an imbalance between the social capital sector and the social capital sector Direct production with the condition that the leading sector contains the greatest amount of forward and backward momentum, for example, the establishment of the automobile industry leads to the creation of The industry of tires, glass and batteries, as well as prompting investors to establish intermediate industries, and the theory is flawed in its assumption that the economic, social and political conditions are similar between all or some countries that inherited a fragile economic system, colonialism and the historical conditions associated with the emergence of economic activity played an important role in the state of underdevelopment that these countries suffer from countries, as it neglected planning errors in studying the interrelationships between sectors that could lead to a negative trend in the development of the sectors themselves or the rest of their affiliated sectors, meaning: the forward and backward momentum may have a negative impact, deepening the development crisis in it more and more [5].

Economic Cycle

It is a set of changes that occur periodically in the economic indicators of countries, total output, employment, inflation, deflation and unemployment. Or the lower turning point, or the bottom of the cycle that represents the state of recession and the period of time that it takes for deflationary trends that are represented by shifts from the upper turning point or the peak that represents the situation of recovery or prosperity when the economy is in a state of peak, there are factors and variables that push it to a state of contraction, stagnation, and then recession. Likewise, when the economy is in a state of recession, there are factors and variables that push it to shift to a state of expansion and recovery. The crisis occurs when fluctuations occur between (peak) and (bottom), and the seriousness of the crisis depends on the speed of transformations of macroeconomic variables. The economic cycle is like a mountain, as its summit represents a state of recovery and below it a state of recession. The deeper and wider the valley, the greater the impact of the crisis and its seriousness. It happened in the recession, the great event in 1929, which is considered less dangerous than what happened in 1970. What is happening today is called the global financial crisis, which began to surface after the emergence of the mortgage crisis in America in 2008. Economic crises are the most dangerous stages of economic cycles that occur in capitalist economies and their effects are transmitted to other economies and according to the degree of correlation. Real and financial variables to form a mixture of mutual influences between the aggregate supply and aggregate demand sides, given that money is a right on the commodity economy that allows it to satisfy basic needs. Thus, money is a financial asset that represents the commodity economy, and it becomes clear to us that money is the first influencing economic cycles. The economic cycle consists of four main phases [6]:

Growth: This stage is characterized by prosperity and economic expansion, during which employment rises, economic indicators record positive readings, and economic activity continues to grow slowly [5].

Peak: At this stage, economic growth reaches its peak, and the economy witnesses a rise in prices and production volume, and economic activity reaches levels of total employment. This stage is considered a turning point after which the economy moves from upswing to downswing [4].

Decline: This stage is characterized by a decline in prices and production, during which unemployment rates rise and economic activity, is in a contractionary state, and most economic indicators record negative readings [3].

Bottom: in which economic growth reaches its lowest levels, and the economy witnesses a sharp decline in prices and production volume, and unemployment prevails. This stage is a turning point after which the economy moves from decline to rise [2].

Economic Stability

Economic policies aim to achieve economic stability, and there is no agreement among economists on the type of stability required, as those who defend policies to achieve employment for the economy do not agree with those who want policies that focus on stabilizing price levels, and when instability takes the form of inflation or deflation, this causes Lack of efficiency and lack of fairness, as inflation or deflation has led to poor distribution of incomes between lenders and borrowers, fixed-income owners, non-fixed-income owners, merchants, owners of land and real estate, and others, and that high price levels lead to the escape of individuals from using the currency, which depreciates in value as a result [4, 5]. And to the weakness of the country's ability to export. There is a reservation about the desire for economic stability, as some economists believe that growth and stability are contradictory and incomplete because high-degree stability is at the expense of growth, as growth necessitates change in the structure of the economy, which leads to instability, but it moves the economy from one state of stability to another at Level up. Despite the prevalence of the concept of economic stability, there are few definitions agreed upon internationally, as the International Monetary Fund defines economic stability as the situation in which countries avoid risks of exposure to economic or financial shocks, and this situation would enable countries to overcome fluctuations and sharp changes [2, 3]. In economic activity, exchange rates, interest and inflation rates and financial markets, as these fluctuations increase the levels of uncertainty and negatively affect the levels of countries' ability to attract investments and raise economic growth rates. Therefore, it is of great importance to ensure the ability of the various economies of the world to enhance opportunities for economic growth and solutions without fluctuations that would harm stability. Economic and financial, and when fluctuations occur, the state of economic and financial stability enhances the chances of countries to overcome the impact of shocks and their negative effects on economic and financial performance. The International Monetary Fund stresses the importance of countries adopting appropriate policies that are able to mitigate fluctuations if they occur without affecting economic growth rates and living standards by focusing on policies that increase the level of productivity and efficiency and raise employment rates. Fiscal and monetary policies play an important role in achieving economic stability. Fiscal policy tools are taxes, spending, and government borrowing. They derive their importance from their impact on four aspects of economic activity (prices, consumption, employment, and income distribution). The concept of fiscal policy differs. And its importance in developed societies than in developing societies, as it seeks in the first to achieve the stability of the national economy, while its primary interest in the second is to provide financing for economic development [5, 6].

Determinants of economic stability in Sudan

Exchange Rate

Sudan adopted a fixed exchange rate system in the year (1975), and the value of the pound was determined at (2.562 grams / gold) or (88.2) US dollars, and the situation continued until the year (1972), a policy of the exchange rate was adopted as a tool for the external budget, with the aim of bringing about economic stability. However, an internal and external imbalance occurred, and the budget deficit and external debt increased, prompting the Bank of Sudan and the Ministry of Finance to work to reduce the exchange rate to (50.2) dollars to raise the competitiveness of exports and reduce imports. In the year (1992), Sudan pursued a policy of economic liberalization, which allowed banks to buy and sell foreign exchange completely freely. The exchange rate was constantly reduced, but it did not lead to positive results in the economy, because the reduction was not accompanied by production. Which led to

a decrease in production and productivity, which caused a state of economic instability, given that the exchange rate is one of the most important determinants of economic stability in Sudan. After that, many developments occurred in the exchange rate during the period (1956-2012), but the economic situation remained the same in great decline [8].

Inflation

Inflation means an increase in the amount of money in circulation to a greater extent than the commodity supply. Inflation may result from an increase in national spending without being accompanied by an increase in production. Inflation is attributed to the rise in production costs and to the structural changes in the economy that must be accompanied by a rise in prices. The rate of inflation is calculated as follows:

$$INF_t = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}}$$

Foreign Investment

Foreign direct investment is an important part of the economies of countries because it is a direct reason for its progress and development. Therefore, investment has become one of the topics that require research and study, especially in developing countries, as it is the main engine of economic activity for any country and its direct link to capital formation, which contributes to increasing productive capacities, innovation and development in the economy. In a way that is reflected in increasing economic growth rates, increasing employment opportunities, national product, and raising the standard of living, and this can only be achieved by the availability of quality information that enables measuring and evaluating foreign direct investment in order to develop plans and strategies that help increase its size, improve the economic situation of the state, and stimulate economic growth. and achieving economic stability.

The Unemployment

The International Labor Organization defined unemployment as the situation in which the individual is able and willing to work and searches for and accepts it at the prevailing wage level, but does not get it, and then the ascetic in work is not considered unemployed and does not face, therefore, an economic problem, and an example of asceticism in work is a woman The house, she devotes herself entirely to the housework, and she is not looking for work, but if she is able to work and is looking for it, then she is unemployed, and examples of ascetics in work are those who have real estate, shares or bonds, and do not work and generate income that does not expose them to the problems of poverty, And they loathe work because wealth helps them to become dull and retire, although there are those who work at least as business owners, and they are looking for work in order to fill their free time, and if a person is able to work and is not looking for it, then he is not considered unemployed. The concept of unemployment is mainly related to the ability, desire, and the search for work and not finding it. Unemployment is a feature of the market system and is linked to its structure. Its size depends on the effectiveness of businessmen and countries represented in their policies in eliminating unemployment and minimizing its effects in a timely manner. Most economists in these systems acknowledge that unemployment is the price that these societies pay for the interest of the systems in maintaining on the freedom of the labor market, it is considered a price for freedom and getting rid of slavery, enslavement and feudalism. The most important thing that preoccupied the thought of the classics was the problem of distribution and profit and its impact on the accumulation of capital, as Ricardo says in his letter to Maltus that political economy is not research in the nature of wealth and its causes, but it is a study of the laws that help to divide the output of industry among the classes that will participate in its formation. Contract through their prominent slogan (Let it work...let it pass). Keynes focused on the importance of effective aggregate demand, which he divided into demand for consumption commodities on the one hand, and demand for investment commodities, and this demand determines the volume of aggregate supply, volume of output, wages, and employment. It was necessary for Likens to break even with savings investment, he considered recession and unemployment to be the objective outcome of the imbalance between saving and investment, and then he called for the intervention of the state in economic life, and the balance of national income was determined at a level lower than its level at the beginning of the period, and there was a contraction that occurred, causing unemployment with it.

Linear Probability Model

Linear probability model A linear probability model that contains the interpretation of the predictive value as a probability of the dependent variable, and the model may face the problem of predictive values falling outside the range, even if the model is correct, it is certain that the values will fall outside the period (-2.2), sometimes the original model is transformed so that the predictions are for all values in the period, leading The restricted linear probability model has this purpose for some cost and the main objective of the model is to interpret the dependent variable as a certain alternative probability and writes the model in the following form:

$$P_i = f(\alpha_0 + \alpha_1 X_i) = F(Z) \quad (1)$$

Where is the cumulative probability distribution function when assuming that the form of the distribution takes the form of the cumulative distribution function of the uniform distribution and thus, we get a restricted type of linear probability model and is written in the following form:

$$P_i = \alpha_0 + \alpha_1 X_i \quad (2)$$

The Probit model is compatible with the cumulative natural probability function, assuming that there is a standard number that measures the individual's feeling towards voting in the ballot, and the larger the index, the greater the possibility of knowing yes voting.

$$Z_i = \alpha_0 + \alpha_1 X_i \quad (3)$$

In addition, a critical value is suitable to predict the voting behavior of the individual, if the value is yes, and if the value is no, the cumulative distribution function is written in the following form:

$$P = F(Z) = \frac{1}{\sqrt{2\pi\sum}} \sum_{\infty}^{z} e^{S^2/2} ds \quad (4)$$

According to the method of calculation, the probability value lies between, and to obtain a value that is supposed to be a formula with unknown parameters, we use the inverse of the cumulative natural probability function (aggregate) as follows:

$$Z = F^{-1}(P) = \beta_0 + \beta_1 X_i \quad (5)$$

The probability resulting from the Probit model measures the estimate of the conditional probability that when given the income of the individual that he will vote yes, this is equivalent to the probability of the standard normal distribution, which is equal to the amount, and adds this to the model and to the cost of the estimate because he used the nonlinear method [10].

Logit Model

The exponential logit model is based on an exponential aggregate probability function written in the following form [9]:

$$P = F(Z) = \frac{1}{1+e^{-(\beta_0+\beta_1 X_I)}} \quad (6)$$

It represents the probability of selecting the given alternative if the state of the variable is known. We get the equation by rewriting equation (6):

$$(1 - e^{-Z})P_i = 1$$

So

$$e^{-Z} = \frac{1 - P_i}{P_i}$$

$$e^{Z} = \frac{P_i}{1 - P_i}$$

If we take the logarithm of both sides, we get the following:

$$Z = ln(\frac{P_i}{1 - P_i}) = \beta_0 + \beta_1 X_i$$

$$ln(\frac{P_i}{1 - P_i}) = \beta_0 + \beta_1 X_i$$

The dependent variable in this regression is the logarithm of the odd numbers and a given choice. One of the most desirable characteristics of this model is that it transforms the problem of forecasting probabilities and the test of individual numbers in the interval (0.1) into a problem of forecasting the individual numbers occurring in Even numbers every real line. The slope of the distribution is larger at $P = \frac{1}{2}$ which has the greatest effect on the probability of a particular choice and is located in the middle of the distribution. If we want to estimate the last equation directly, we will face an acute problem. If $(P_i = 1)$or $(P_i = 0)$ are odd individual numbers in the interval (0,1). The dependent variable in this regression is the logarithm of the odd numbers and a given choice. One of the most desirable characteristics of this model is that it transforms the problem of prediction probabilities and the test of odd numbers in the interval into a problem of predicting the odd numbers by the even numbers occurring in every real line. The slope of the distribution is larger [11]. At which has the greatest effect on the probability of a particular choice and is located in the middle of the distribution. If we want to estimate the last equation directly, we will face an acute problem. If or are odd numbers equal to zero or Infinity and the logarithm of odd numbers is indefinite and this leads to the possibility of applying ordinary least squares that make if the choice is equal to zero which is not true. The correct exponential model estimation can be understood when differentiating between two cases, namely that the samples include repeated observations and that the samples do not include repeated observations for each independent variable. Take first the case in which a sample is made from the independent variable (income). It is composed of a different value and that a number of individuals have income and that a number of individuals have income and so on [12]. If it represents the number of times that income individuals choose the first option (voting yes), it represents the number of times income individuals choose the first option (voting yes), and so it seems logical to estimate the exponential model by exploiting the probability of a particular choice for each income group, we approximate as follows [13]:

$$\hat{P}_i = \frac{r_1}{n_1}$$

Then we estimate the probability model of the exponential function as follows:

$$ln\left[\frac{ln(\frac{r_1}{n_1})}{1-(\frac{r_1}{n_1})}\right] = ln[\frac{r_1}{n_1 - r_1}] = \beta_0^* + \beta_1^* X_t \quad (7)$$

Equation (7) is a linear equation in the parameters and can be estimated by least squares, which produces consistent estimates in only one case, when the frequencies in each sample of the independent variable(X) (income) are composed of (k) different value and (n_1) that the number of individuals with income (X_1) grows in an improvised manner very quickly and appears The importance of this large number to ensure the normal distribution of the variable as it is not normally distributed in small samples. In addition, efficiency can be improved when some modifications are made to the above equation. One of these proposed modifications is the correction [14].

The difference of variance resulting from that is $ln(\frac{r_1}{n_1 - r_1}) = \beta_0 + \beta_1 X_t$ approximately normally distributed with a mean equal to zero and a variance of [15]:

$$V_i = \frac{n_1}{r_1(n_1 - r_1)}$$

he added Cox, Domenich & McFadden Modifications to help improve the approximation in equation (7) are as follows:

$$V_i^* = \frac{r_1 + \frac{1}{2}}{(n_1 - r_1 + 1/2)} = \beta_0 + \beta_1 X_i$$

These adjustments help to improve the estimation in small samples, but they do not add anything to the estimates of large samples. It makes sense to approximate the equation if you put some restrictions on it. Ordinary minimum on the previous approximation, the number of individuals with the same value of the variable (X_i) must be equal to 5. While this method is useless when the number of repeated cases is close to zero or one correct, and this can be seen when the probability $\hat{P}_i = \frac{r_1}{n_1}$ approaches zero or one correct, then Contrast is high (This is not true of modifications that produce contrast V_i^* High variance leads to inaccurate estimates of parameters, which necessitates the addition of new observations. Here we are faced with the problem that economic data is connected data, which complicates the estimation method. Fortunately, the presence of the method of estimating the greatest possibility helps to overcome this problem, of course, with some cost to the estimation [16].

Model estimation

Annual data were used for the study variables for the period (1956.2012) and due to the nature of the dependent variable (qualitative), the linear probability model was used in the estimate by relying on the Logit model through the Eveiws-10 computer package, so the following estimated economic stability model was reached (see Appendix (1)):

$$ES = 50.77649 + 9.01GDP + 1.931541\ @\ PCH\ (INF) - 4.304943\ U$$

$$\begin{array}{lllll} S.d & (25.3) & (4.7) & (1.01) & (2.2) \\ McF & (0.80) & & & \\ LR & (38.27) & & & \end{array}$$

$$\Pr ob(LR.statistic) = 0.000$$

Interpretation of the result

Economic criterion: The model fulfilled the economic criterion of the signal and magnitude of the estimated parameters.

Statistical standard

Individual significance (T-test): We find that the probability value of the model parameters (0.5, 0.5, 0.5, 0.6), respectively, is less than (0.10), and this indicates that all independent variables are important in explaining economic stability in Sudan.

Total significance (LR test): We note that the probability value of LR (0.00) is less than (0.05), and this indicates that the model is significant and that the variables of GDP, unemployment and inflation are important variables in explaining economic stability in Sudan and that the estimated model can be applied.

Determination coefficient (R-square): We find that the probability value of the coefficient of determination is (0.80), and this indicates that (80%) of the independent variables that explain economic stability in Sudan are present and included in the model, and that only (20%) are independent variables that explain economic stability, but they are not Inline in the model and inline in the random variable.

Unit root test for the variables of the study

From Appendix (2), we find that the absolute value of the ADF test is greater than the critical values at the levels of significance (1%, 5%, 10%), which means that the series of study variables is static and stable.

Co integration test for study variables

From Appendix (3), the co-integration test indicates that there are two equations for co integration at a significant level (5%), and this means that the study variables have a long-term equilibrium relationship.

Findings

1. The unemployment rate is associated with an inverse relationship with economic stability
2. Gross domestic product has a positive relationship with economic stability
3. The inflation rate is directly related to economic stability
4. Foreign direct investment contributes to achieving economic stability.

Recommendations

1. The state should adopt a financial and monetary economic policy to reduce inflation in order to achieve more economic stability.
2. Improving the position of the local market to support and market the commodities produced by youth and family projects.
3. Supporting the productive sector to produce export commodities to provide hard currencies to improve the balance of payments and achieve balance
4. Training and qualifying youth and graduates in various fields to be absorbed in private and public institutions.

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Appendix (1)

Dependent Variable: ES
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 11/14/17 Time: 02:09 Sample (adjusted): 1956 2012
Included observations: 38 after adjustments
Convergence achieved after 15 iterations
Covariance matrix computed using second derivatives

Variables	Coefficient	Std. Error	z-Statistic	Prob.
GDP	9.01E-07	4.66E-07	1.933389	0.0532
C	50.77649	25.32786	2.004769	0.0450
U	-4.304943	2.154394	-1.998215	0.0457
@PCH(INF)	1.931541	1.016916	1.899410	0.0575
McFadden R-squared	0.807325	Mean dependent var		0.315789
S.D. dependent var	0.471069	S.E. of regression		0.218087
Akaike info criterion	0.450852	Sum squared resid		1.617112
Schwarz criterion	0.623230	Log likelihood		-4.566194
Hannan-Quinn criterion.	0.512183	Deviance		9.132388
Restr. deviance	47.39777	Restr. log likelihood		-23.69888
LR statistic	38.26538	Avg. log likelihood		-0.120163
Prob(LR statistic)	0.000000			
Obs with Dep=0 26		Total obs 38		
Obs with Dep=1 12				

Appendix (2): The result of the unit roots test for the study variables

Null Hypothesis: ES has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

Augmented Dickey-Fuller test statistic		t-Statistic	Prob.*
		-3.271271	0.0216
Test critical values:	1% level	-3.568308	
	5% level	-2.921175	
	10% level	-2.598551	

Null Hypothesis: D(GDP,2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=10)

Augmented Dickey-Fuller test statistic		t-Statistic	Prob.*
		-4.722293	0.0023
Test critical values:	1% level	-4.180911	
	5% level	-3.515523	
	10% level	-3.188259	

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

Augmented Dickey-Fuller test statistic		t-Statistic	Prob.*
		-9.812927	0.0000
Test critical values:	1% level	-3.571310	
	5% level	-2.922449	
	10% level	-2.599224	

Null Hypothesis: D(U,2) has a unit root
Exogenous: Constant,
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

Augmented Dickey-Fuller test statistic		t-Statistic	Prob.*
		-15.84537	0.0000
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

Appendix (3): The result of the co integration test for the variables of the study

Date: 11/14/17 Time: 02:32
Sample (adjusted): 1956 2012
Included observations: 46 after adjustments
Trend assumption: No deterministic trend
Series: ES GDP INF U
Lags interval (in first differences): 1 to 1
Unrestricted Co integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.678444	77.28472	40.17493	0.0000
At most 1 *	0.308710	25.09387	24.27596	0.0394
At most 2	0.161198	8.110886	12.32090	0.2282
At most 3	0.000543	0.024968	4.129906	0.8972

Trace test indicates 2 co integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values