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CONSUMER PRICE INDEX AND ECONOMIC GROWTH: A CASE STUDY OF MAURITANIA 1990 – 2013

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Abstract

This study seeks to investigate the association between Consumer Price Index (CPI) and Gross Domestic Product (GDP) in Mauritania. An Empirical evidences are obtained from the Ordinary Least Square (OLS) and Granger Causality Test Model. The study utilizes time series data cover up the period from 1990 to 2013. Gross Domestic Product (GDP) was used as dependent variable, whereas Consumer Price Index (CPI) was used as independent variable. In order to check the stationarity of variables Augmented Dickey-Fuller Test (ADF) was employed. Result indicates that all variables found to be stationary at first difference at 5% level of significance. OLS Test revealed a positive and significant relationship between the GDP and CPI. Additional endeavour was made to verify the causal relationship between two variables by employing the Granger Causality Test. The result show unidirectional causality running from Inflation to economic growth. The most significant policy proposition of this outcome is that intensive exertion must be made by Mauritanian government to address the issues which are lead to an increase of price level (inflation) such as food and fuel crisis, exchange rate fluctuation, an increase in money supply, weak agriculture sector and so on.

Keywords: CPI, GDP, granger causality, OLS, Mauritania

1. INTRODUCTION

There is a high level of consensus among majority of economists that one of critical purposes of macroeconomics policies is to fulfil high economic growth with low level of inflation. Comparable to all its Sahelian counterparts, Mauritania is a country with low human development. It ranks 155th in the world (2012), with a Human Development Index (HDI) of 0.467. Mauritania is a country that relies profoundly on the export of a limited raw of materials (oil, minerals and fisheries), and, on the other side, on the import of fuel and food, Mauritania is exposed to global prices volatility, inflation and foreign exchange shocks. Inflation remained within a 4.9% to 6.3% range over the last three years: 6.3% in 2010; 5.6% in 2011, and 4.9% in 2012 (projected). The country dwells on highly vulnerable to changes in commodities prices, mostly fuel and foodstuff (Stiftung, 2014). This is for the reason that a high level of inflation disrupts the soft functioning of a market economy.

The influence of inflation on the economic growth has been a debatable issue among economists in both theoretical and empirical sides. A few agreements exist between these economists regarding to the potential association between inflation and economic performance, and the appliance by which inflation affects economic movement at the macroeconomic level. This has created a deep argument in both sides theoretically and empirically

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A sizeable numbers of studies establish no persuasive empirical proof for either a positive or a negative relationship between inflation and economic growth, noteworthy among these studies are (Wai, 1959; Bhatia, 1960; Dorrance, 1966; Johansen and Juselius, 1990). The second compilation of the literature identifies a negative linkage between inflation and economic growth. Among these literatures are (Faraji and Kenani, 2013; Quartey, 2010; Ahmed and Mortaza 2005). The third group of the literature found a positive connection between inflation and economic growth, notable among these studies (Umaru and Zubairu, 2012; Mallik and Chowdhury, 2001; Sweidan, 2004).

Although, the enormous studies in both industrialized and African countries, the literature on the impact of CPI on GDP of Mauritania is utterly scant. The rationale behind this study is to empirically check the effect of CPI on the GDP of Mauritania. This study is structured into five section: section (1) present introduction, section two deal with empirical literatures, section (3) address the data and econometrics methodology section (4) indicate the empirical findings, while section(5) provide the conclusion and recommendation drawing from the study.

1.1. Justification of the study

This study is significant for macroeconomists, policy makers, practitioners, and banking experts to acquire clear glance regarding to the reaction between economic growth and inflation. In addition, the study is vital to remove ambiguity as many studies on the correlation between inflation and economic growth remain questionable. Numerous of empirical literature confirms the existence of either a positive or negative relationship between these two macroeconomic variables. In the context of Mauritania, There is a lack of empirical works in this topic. Hence, this study will contribute to the economic background research of the country.

2. EMPIRICAL LITERATURE

A wide scope of practical research investigates the linkage between inflation and economic growth in the context of both developing and developed countries. Inflation is an economic concept describes as a perseverance rise in the general price level of sets of goods and services in a country for long period of time. Economists have observed that inflation is principally linked to money, as captured by the often heard maxim inflation is too much money chasing too few goods.

Khan and Senhadji (2001) conducted a study to explore the growth-inflation relationship. They used sample data of 140 from developing and developed countries while covering a time period from 1960 to 1998. Their finding showed that increasing inflation rate above a specific threshold has substantial deteriorate effect on the economic growth. The study asserted that stage point of inflation is dissimilar for developing and developed countries (e.g. for developing countries, it is 7-11 percent and for developed countries it is 1-3 percent).

Mallik and Chowdhury (2001) their study concluded with two basic outcomes: First, the empirical finding revealed positive and significant relationship between inflation and economic growth of Bangladesh, Pakistan, India and Sri Lanka. Second, the possibility of inflation to fluctuate in growth is greater than that of growth to fluctuate in inflation.

Gokal and Hanif (2004) employed diverse economic theories in order to discover the linkages between inflation and economic growth of Fiji. The findings revealed a scrawny negative relationship exists between CPI and GDP. The causality test indicates a one-way run from GDP to inflation.

Sweidan (2004) investigated the relationship between inflation and economic growth of Jordan for the time period 1970 - 2003. The result revealed a significant positive relationship between the two variables under investigation. Moreover, level rates of 2 percent have been documented beyond which, the relationship between the two variables have been observed to be negative.

Ahmed and Mortaza (2005) investigate the relationship between CPI and GDP of Bangladesh. The result indicated a threshold at level 6 percent of inflation for the economy of Bangladesh. The empirical proof shows a long run negative correlation between CPI and GDP.

Shahzad (2011) recognized a positive and significant correlation between inflation and economic growth in Pakistan. While Iqbal and Nawaz (2009) conclude that 6 percent level of inflation is better for economic growth and above 6 percent it has negative and significant relation with economic growth.

Umaru and Zubairu (2012) documented that all variable under investigation were stationary. Granger Causality test indicated that GDP grange cause inflation and not vice versa. The findings exposed a positive effect between economic growth and inflation through encouraging productivity and output level and by development of total factor productivity.

3. DATA AND ECONOMETRICS METHODOLOGY

An accurate data collection and adequate construction of the model are crucial to bring valid and reasonable empirical findings. Notable of literatures concerning about relationship between inflation and economic growth have been conducted during the last five years. Ordinary Least Square (OLS) method has been carried out in the majority of these studies to explore this relationship. Moreover, this study has used secondary data for analysis purpose. The method and variables for the current study have been selected with consideration of their relative importance on theoretical and empirical basis. The data of this study have been taken from World Bank Indicator (WBI). Based on available data the study covers the period from 1990 to 2013 and consist of two most important variables to explain relationship between CPI and GDP of Mauritania. The study employed both econometrics techniques OLS and Granger Causality Test.

3.1. Model specification
This study selects the variables based on choice made by previous literatures such as (Omoke, 2010; Hussain and Shahnawaz, 2011; Ahmad and Uma-Tul, 2012; Kasidi and Kenani, 2013). To investigate the correlation between CPI and GDP of Mauritania, the following multiple regression models adopted from above studies:

$$GDP = f\,(CPI) \qquad\qquad ………………………….. (1)$$

$$GDPt = \alpha 0 + \alpha 1\ CPIt + \varepsilon t \qquad\qquad ……………………….. (2)$$

Where:
GDP = Gross Domestic Product
CPI = Consumer Price Index
$\propto_0$ = Constant Term
T = Time Trend
'ε' = Random Error Term

3.2. Estimation techniques

3.2.1. Unit root test
The first stage of estimation techniques is to check if the all variables under investigation have unit root or not. In Econometrics, researchers have enhanced a range of tools to check up the order of integration among variables. The most well-known ones is Augmented Dickey – Fuller (ADF), (1979, 1981). The ADF test is relied on the rejection of null hypothesis of unit root (the variables are not stationary) in favour to accept the alternative hypothesis of stationary. The test carried out with and without a deterministic trend (t) for each variable. The following regression estimated the ADF test:

$$\Delta^{yt} =\ \beta^0\ +\ \beta^1\ y^{t-1}\ +\ \sum_{i=1}^{n} \beta \Delta yi\ +\ e^t \qquad\qquad ……………………….. (3)$$

$$\Delta^{yt} = \beta^0 + \beta^1 y^{t-1} + \sum_{i=1}^{n} \beta \Delta yi + \delta_t + e^t \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where:
Y = Time series,
T = Linear Time Trend
Δ = First Difference Operator
β_0 = constant
N = Optimum Number of Lags
E= Random Error Term

The dissimilarity between equation (3) and (4) relies on that the first equation includes just drift. However, the second equation includes both drift and linear time trend pp.

$$\Delta_{yt=} \beta_0 + \beta_1 y_{t-1} + e_t \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

3.2.2. Ordinary least square method
OLS method has applied in this study. The summary of the test revealed that the model of the study is well fitted. All the variables under investigation are statistically significant. The coefficient of the constant variable recorded 4.315 318 which indicate a positive relationship between the constant parameter and the GDP.

3.2.3. Grange causality test
In order to identify the direction of causality among the variables, Grange Causality Method has been conducted. The bivariate auto regression equation for the causality test estimated as following:

$$GDP_t = \beta_0 + \sum_{i=1}^{n} \beta 1t \; GDP_{t-1} \; \sum_{i=1}^{m} \beta 2t \; CPI_{t-1} + \varepsilon_{1t} \qquad \ldots\ldots\ldots\ldots\ldots (6)$$

$$CPI_t = \alpha_0 + \sum_{i=1}^{n} \alpha 1t \; GDP_{t-1} \; \sum_{i=1}^{m} \alpha 2t \; CPI_{t-1} + \varepsilon_{1t} \qquad \ldots\ldots\ldots\ldots\ldots (7)$$

Refusing (accepting) H0; α21 = α22 =..... = α2m in equation (6 and 7) means that GDP does (does not) Granger cause CPI. However, refusing (accepting) H0; α11 = α12 = ...= β1m recommend that CPI does (does not) Granger Cause GDP. This test is conducted in order to disclose the direction of causality, no causality, unidirectional causality or Bi-directional causality, between CPI and GDP.

4. EMPIRICAL FINDINGS

4.1. Descriptive statistics
The Multiple Regression Model was run using E-Views6 software to ascertain the relationship between (CPI) and (GDP) of Mauritania. To assess the effect of CPI on GDP of Mauritania, the paper uses time sires data cover the period of 1990 to 2013. Descriptive statistics of GDP and CPI indicated as follows.

Table 1: Descriptive statistic

	LOGCPI	LOGGDP
Mean	4.090	6.529
Median	4.038	6.402
Maximum	4.748	7.018
Minimum	3.387	6.132
Std. Dev.	0.419	0.304

Source: Author's own calculation

The table 1 revealed an outline of the descriptive statistic for the two variables included in this study GDP and CPI. The table contains the mean, standard deviation, minimum and maximum for 24 observations covering the period 1990 – 2013.

4.2. Measures the dependent variable GDP

The study used GDP as dependent variable to check up the correlation between CPI and GDP of Mauritania. Annual series data covers the period from 1990 – 2013, and it is taken from WBI. GDP measured in Million US$. It is used as dependent variable. The result from descriptive statistic indicates that Mauritania GDP recorded 6.52 Million US$. The minimum value of GDP was 6.13 Million US$, while the maximum value was 7.01 Million US$.
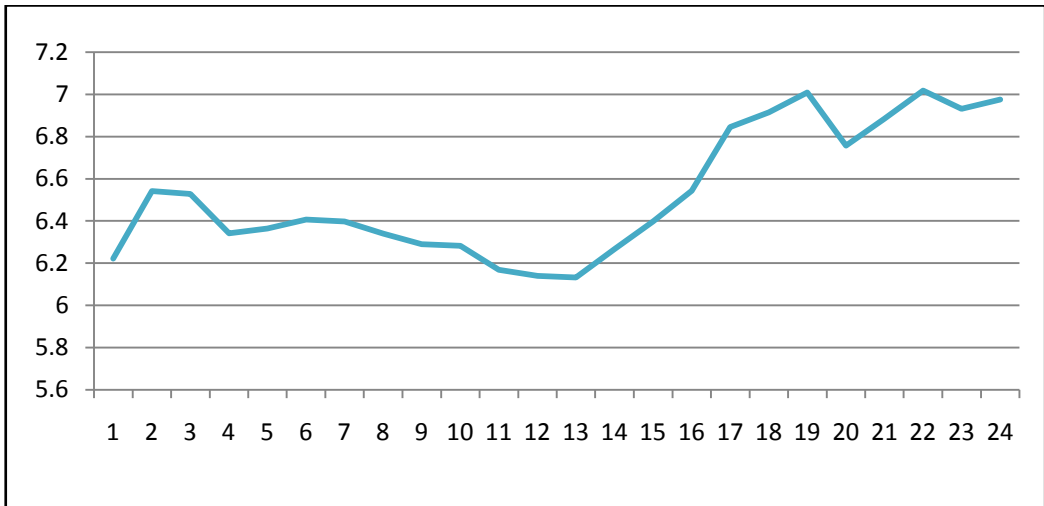

Figure 1: Mauritania's GDP from 1990 To 2013

4.3. Measures the dependent variable CPI

The study used Consumer Price Index as independent variable. The value for Consumer Prices Index (CPI) in Mauritania was 4.6 as of 2013. According to the graph in figure 2, over the past 24 years this indicator achieved a maximum value of 4.8 in 2013 and a minimum value was 3.4 in 1990.
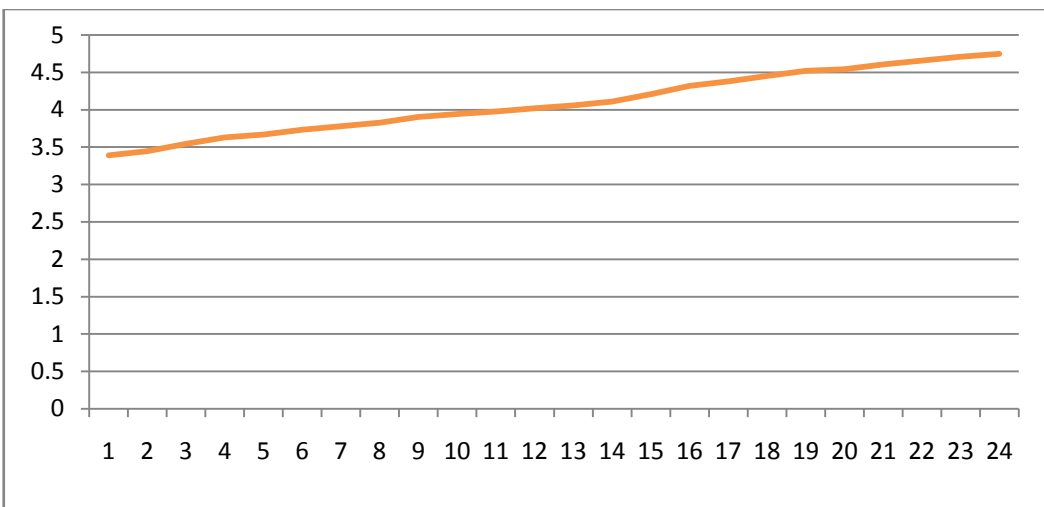

Figure 2: Mauritania's CPI from 1990 To 2013

4.4. Unit root test result

The results of ADF test shown that all series included in the model were not stationary at level of significant. This can be clearly seen when we compare the value of ADF (in absolute terms) with the critical value (in absolute value as well) of the T-statistic of the variables under investigation at the 1%, 5%, and 10% level of significance. The principle of ADF assumes that when the critical value is greater that ADF value meaning that the variable is not stationary. Conversely, when the critical

value of the variable recorded less than the ADF value the variable is stationary. Another criterion for the stationary test is that the p-value of the variables under investigation should be less than 5%. To sup up, all variables are stationary at first difference level.

Table 2: Result of Augmented Dickey-fuller test

Variables	Level data	1st diff.	5% cri .Value	P-value at level	P- value at 1st	Status
GDP	-0.775	-4.560	-2.998	0.807	0.002	I(1)
CPI	-0.826	-3.391	-3.005	0.792	0.022	I(1)

Source: Author's own calculation

4.5. Granger causality result

As both variables are stationary at first difference so it can be used Ordinary Least Square method to ascertain the potential connection between the variables. Nevertheless, before conducting OLS test we carried out Granger Causality Test to check the causality relationship among the variables. The findings showed in the following table 3.

Table 3: Results of Granger causality test

Null Hypothesis	Obs	F-Statistic	Prob.
LOGCPI does not Granger cause LOGGDP	22	3.765	0.044
LOGGDP does not Granger cause LOGCPI		1.875	0.183

Source: Author's own calculation

The findings revealed that CPI does Granger cause GDP of Mauritania and in this way null hypothesis is rejected at 0.45% (prob. 0.0443) and F. Statistic are 3.76550. Result also showed that GDP does not Grange cause CPI of Mauritania and the null hypothesis is accepted at 18% (prob.01836) and F-statistic 1.87564. We adopted level of significance as 5 – 10 percent. Thus, Granger Causality test defines uni-directional relation from CPI to GDP of Mauritania. This findings is consistent with studies (Omoke, 2010) and (Shahzad, 2011)

4.6. Ordinary least square result

OLS method has been conducted to check the validity of model and the significant of variables under investigation. The summary of OLS test indicate that model is very well fitted with $R^2 = 0.557929$. The value of R^2 recorded 0.54which reflected that 54% of the disparity in GDP has been explained by CPI variable. Furthermore, the remaining 46% was detained through other factors which have considerable control over GDP but were disqualified from the model. Additionally, all the variables in the model are statistically significant successively with P-value 0.0000. Result also demonstrate that if one percent change in CPI occurs, it will increase GDP by 0.54% .The summary of OLS result showed in the following table 4.

Table 4: Results of ordinary least square method

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.315	0.422	10.220	0.000
LOGCPI	0.541	0.103	5.269	0.000
R-squared				0.558

Note: Dependent Variable: LOGGDP
Source: Author's own calculation

5. CONCLUSION AND RECOMMENDATION

The study is an attempt to investigate the association between inflation and economic growth of Mauritania with time series data covers the period 1990 – 2013. Different econometrics techniques have been employed in this study encompasses Augmented Dickey-Fuller technique (ADF), Ordinary Least Square (OLS), and Granger Causality. The finding obtained from unit root test showed that both variables in the model were stationary at first level of significance. The result from OLS indicated a positive and significant relationship between CPI and GDP of Mauritania. These

results are consistent with previous literatures such as a study conducted by Malik and Chowdhury (2001) in South Asian Countries. They found out that a positive and significant relationship was existed between CPI and GDP in some of these countries. This outcome refer to that moderate inflation encourage productivity and output level. The manufacturers will increase their production when they saw huge profit. The Granger Causality Test revealed that CPI Grange cause GDP of Mauritania but not vice-versa. The findings of this paper recognize that any change in the price level will automatically cause fluctuation in the economy growth of Mauritania. These outcomes have very critical implication for Mauritanian policy makers which is implying that controlling the level of inflation is very pivotal for the sustainable economic growth. Therefore, policy makers should be able to keep inflation rate at law level. The stability of inflation rate plays a very significant role in economic growth of Mauritania as revealed by this paper finding, approximately 56% of GDP variation have been explained by CPI. This implies that fluctuation of general price has vital effect on economic growth of Mauritania. In this circumstance, the study suggest that all aspect which cause an increase of price level such as food and oil crisis, exchange rate, an increase in money supply, weak agriculture sector and so on should be discussed and strong and appropriate policies should be applied to solve these matters and help economic development of the country.

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