

Inflation and economic growth: evidence from Burkina Faso based on cointegration and error-correction modelling techniques

ABDINASIR ABDULLAHI WARSAME¹, ABDIRAHMAN DAHIR ABDULLE²

¹Graduate student, UNIVERSITY OF MALAYA, FACULTY OF ECONOMICS AND ADMINISTRATION

²Graduate student, ISLAMIC ONLINE UNIVERSITY

Abstract: the main goal of this study is to re-investigate the relationship between inflation, economic growth, financial development and remittance in Burkina Faso employing the cointegration, vector Error- Correction Model (VECM) and Granger causality frameworks. This study covers the sample period from 1975 to 2017 and examined the presence of a short run and long-run equilibrium relationship using the Johansen cointegration approach and vector Error- Correction Model (VECM). additionally, we examine the direction of causality between inflation, economic growth, financial development and remittance in Burkina Faso using the Granger causality test. As a summary of the empirical findings, we find that inflation, economic growth, financial development and remittance in Burkina Faso are cointegrated and there is positive long run relationship between inflation and economic growth whereas financial development and remittance have long run negative relations with inflation and its statistically significant at 5% significance level. Furthermore, the results of granger causality indicate that there is no causality between all the variables that implies there is no short run relationship between inflation, economic growth, financial development and remittance in the context of Burkina Faso.

Keywords: Inflation, Economic growth, Burkina Faso, cointegration, Error-Correction Model.

1. INTRODUCTION

an important purpose of any monetary policy is to reduce the uncertainty of price variability that can lead lower level of investment and economic growth, and its necessary aspiration to have low and stable inflation along with high and sustainable rate of economic growth, therefore, acquainted with the direction(positive or negative) and significance relationship of inflation and economic growth is essential for the bases of formulating monetary policies, however, most recent studies concluded that low and stable Inflation is positively identified with Growth while high and unstable Inflation depressingly affects the Growth of the Economy.

There has been significant number of studies toward the relationship between inflation and economic growth, which remains a controversial issue in macroeconomic theory and a deliberated subject among the policy makers. Many studies have investigated the relationship between these two variables in both developing and developed countries. Lucas (1973) investigated relationship between inflation and economic growth, he proposed that there is positive relationship and stable trade-off between inflation and economic growth. On the other hand, there are numerous studies that found negative relationship, such us Fisher (1993), Barro (1996) and Bruno and Easterly (1998) were the pioneers who argued that there is negative relationship between inflation and economic growth.

examine the relationship between inflation and economic growth is not a novel area of study, it has been studied comprehensively over the last decades. however, whether inflation and economic growth have positive or negative relationship remains contradictory. A literature review proposes that there is a small number of empirical studies concerning the relationship between inflation and economic growth in Burkina Faso, To the best of my knowledge, only two studies have paid attention on it. First, Ndoricimpa, Arcade. (2017) performed a research on this area for 47 African countries, but no consideration was paid to clarifying the existence of short run causality and a long-run equilibrium

relationship. he only focused on Threshold Effects of Inflation on Economic Growth by using dynamic panel threshold regression. moreover, he found an inflation threshold of 6.7% for the whole sample, 9% for the sub-sample of low-income countries and 6.5% for middle-income countries. Second, Danladi. (2013). investigated the relationship between inflation and economic growth of four west African countries (Burkina Faso, Ghana, Nigeria and Senegal). Remarkably, they also found the existence of threshold level of 9% beyond which inflation exerts a negative effect on growth. such makes this study important to find out the behaviour of the relationship between the two macroeconomic variables. It is imperative to test the hypothesis if there is positive or negative relation between inflation and economic growth in Burkina Faso.

In this paper, we will attempt to investigate the relationship between inflation and economic growth in Burkina Faso with a sample data covering 1975-2017,specificilly,this study examines if there is long run and the short run relationship between inflation and economic growth in the context of Burkina Faso, this paper is constructed with 5 sections where the study begins with the brief introduction while section two discusses about the past studies in the same or similar fields of study about the relationship between inflation and Economic growth in terms of theory and empirical findings, section three presents the model and methodology while section four will be covered the findings and empirical results, Last but not least, section 5 summarises about main findings and covers the conclusion of all the paper.

2. CONTEXT OF BURKINA FASO

Burkina Faso is a country located in western Africa, formerly known as the republic of Upper Volta. In 2018, it consists of surface area of 274,200 square kilometres and approximately 19.7 million inhabitants in the economy. The Burkinabe economy is the choice for this study because of the following characteristics. Since joining the West African Economic and Monetary Union (UEMOA) , the Burkinabe economy has been growing steadily and has mainly specialised agro-based economy, such as livestock and Crops(sorghum, pearl millet, maize (corn), peanuts, rice and cotton,) despite the fact that Burkina Faso is a country that has few natural resources, fragile soil and high population density still manages to export its surplus but depends on international donors to fund large party of its economic activities. Although the Burkinabe economy has relatively small industry sector and most of it is controlled by government linked corporations, the government managed to keep inflation low and the recent data indicates increase of the export and overall economic growth. world bank report in December 2018 showed that gold production and the expanded investment in infrastructure led to increase the economy 6.4% in 2017.

Figure 1 shows the trends of inflations and economic growth from 1962 until 2017. Burkina Faso between the periods 2007 to 2016 recorded an average percentage rate of inflation of 1.99% as against 1.85% that was recorded in 2017, with the highest inflation rate in last two decades of 10.7% in 2008 and the lowest rate of -0.2% in 2016. These percentages were derived by using the consumer price index (CPI 2010=100) in recent data extracted from the world bank database (world development indicators, 2018). On the other hand, Economic growth can also be used to determine how healthy an economy is, and it can be measured by GDP growth rate. Thus, one can say an economy is doing well when active policies are put in place to increase GDP growth rate. Burkina Faso has recorded last decade a total average of 6.45 percentage of economic growth from 2006 to 2015, where the lowest rate was recorded in 2009 at 2.96 growth rate and the highest rate in 2012 at 6.6 (world development indictors, 2018).

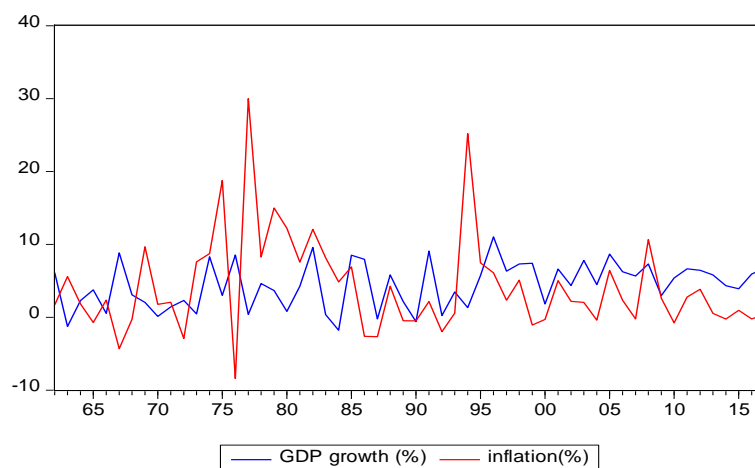


Figure 1: trends of inflation and economic growth in Burkina Faso

3. LITERATURE REVIEW

By reviewing the inflation-growth literatures, it is understandable that the relationship between inflation and economic growth has been studied broadly since the study of Lucas (1973). However, whether inflation has positive or negative effect on economic growth remains debateable. Mostly, empirical studies on the relationship between inflation and economic growth can be separated into two major parts. The first group focused on single-country studies, while another group focused on panel data studies. Table 2 presents a summary of the selected empirical studies on the inflation-growth nexus.

We start our analysis with the findings of single-country studies in the literature of inflation-growth nexus.

The overall assumption that we can extract from Panel I of Table 1 is that the relationship between inflation and economic growth has been diversified and remains uncertain. For example, Sweidan (2004), Doguwa, S. I. (2012), Osuala et al. (2013) and Antwi et al. (2013) revealed that inflation have positive effect on economic growth in Jordan, Nigeria and Ghana. However, Faria and Carneiro (2001), Mubarik(2005), Ahmed and Mortaza(2005), Veni and Choudhury(2007), Saaed (2007), Kasidi and Mwakemela (2013), and Madurapperuma, M. W. (2016) found that there was negative relationship between inflation and economic growth in Brazil, Pakistan, Bangladesh, India, Kuwait, Tanzania and Sri Lanka. Furthermore, there are studies that looked for the casual relationship between inflation and economic growth such as Gokal and Hanif (2004) and Singh, S., & Singh, A. (2015) found that there was unidirectional causality running from economic growth to inflation in the context of Fiji and Japan respectively, in addition, Erbaykal and Okuyan (2008) revealed that there was unidirectional causality coming from inflation to economic growth in Turkish economy, on the other hand, Xiao (2009) found that inflation and economic growth have bi-directional causality in China.

Similarly, the relationship between inflation and economic growth for panel data studies have conflicted results, for instance, Barro (1995) performed an empirical study to analyse the relationship between inflation and economic growth for around 100 countries using data covering 1960-1990. nevertheless, the results empirical study varies among several cases, on one hand, if several selected countries characteristics are kept constant, then the regression estimates show that a decrease of 0.2-0.3 percentage points per year in the growth rate of real GDP per capita and a reduction of 0.4-0.6 percentage points in the ratio of investment to GDP by from a rise of 10 percentage in average inflation per year. on the other hand, the author argued that inflation would always have adverse effect on standard of living in the long-term if even the current sample do not indicate higher risk on economic growth, although the sample of the study seems to be statistically significance only when high inflation time frame is added in the sample.

Muzaffar & Junankar(2014) investigated the relationship between inflation and economic growth in the context of 14 Asian countries for the period 1961–2010. they argued that the suggestion of IMF to keep inflation below 5% in developing countries, do not applicable for these 14 Asian countries and the inflation would not be harmful until it reaches the threshold level that ranges 7% until 13% maximum, they suggested that IMF should be careful to conclude one rate to fit all the nation due the fact every country have its own circumstance and opportunities.

Eggoh, J. C., & Khan, M. (2014). investigated the nonlinearity of the relationship between inflation and growth for 102 developed and developing countries. over the period of 1960–2009. The results show evidence of non-linear relationship between inflation-growth and the threshold level of every country depends on their level of income. For instance, the fluctuation of inflation rate is sensitive issue in developed countries comparing to the developing countries who have more inflation tolerance, although every country has unique macroeconomic performance, the results of this study supports the effectiveness in describing the differences in the strength of the association between inflation and growth.

Kremer, Bick and Nautz (2013) explored the relationship between inflation and economic growth for 124 countries for the period 1950–2004. Hansen (1999) and Caner and Hansen(2004) threshold regression model was used to discover the threshold level that inflation can be positively contribute if its below or harm the economic growth if exceeds this level, and they discovered evidence of 2 percent inflation level that these countries ought to target, more ever, they noted that if inflation goes up beyond 17 percent are linked with decrease of economic growth. however, they concluded that inflation lower than this threshold is did not have any significant on economic growth in these sample group of countries and the time frame.

Manamperi, N. (2014). explored the relationship between inflation and economic growth in BRICS (Brazil, Russia, India, China and South Africa) using over the period 1980–2012. to test the short run and long run relationship between inflation and economic growth this study employed The Johansen cointegration and the autoregressive distributed lag model (ARDL) bound test. the empirical evidence found that no long run relationship for Brazil, Russia, China and South Africa. in the case of India, the results indicate positive long run relationship between inflation and economic growth, furthermore, there was positive short run relationship in India while other four countries found negative short run and statistically significant.

More recently, Baharumshah et al. (2016) examined the relationship between inflation, inflation uncertainty, and economic growth for 94 countries using system generalized method of moments (SGMM). They found evidence inflation have negative affect on growth in the case of non-inflation crisis countries. Moreover, neglecting the volatile and uprising of the inflation leads higher uncertainty in the context of non-inflation crisis countries, on the other hand, the results of this study indicates that when inflation reaches the range of 5.6-15.9% there was positive correlation between inflation and growth led by inflation uncertainty.

López-Villavicencio et al. (2011) assessed the linkage between inflation and economic growth Relying upon the estimation of Generalised Method of Moments (GMM) and smooth transition models over the period 1980–2003 in 44 industrialized and emerging countries. The empirical evidence revealed non-linear relationship between inflation and growth. more precisely, the existence of the threshold level has different measurement among developing and developed countries, in one hand, the results indicate 2.7 percent inflation in average per year would be the target threshold level in developed economies, while developing countries is 17.5%. in addition, 3 % inflation rate is associated with positive linkage on inflation-growth, in the case of developing countries any inflation level below 17.5% is insignificant.

Table 1: summary of selected empirical studies on inflation and economic growth

| Panel I: country-specific studies | | | | |
|-----------------------------------|------------|-----------|--|---|
| Authors | Countries | period | Empirical method | Results |
| Faria and Carneiro (2001) | Brazil | 1980-1995 | Vector Auto Regression (VAR) | Negative relationship |
| Mubarik (2005) | Pakistan | 1973-2000 | OLs, 2ols and granger test | INF → GDP |
| Ahmed and Mortaza (2005) | Bangladesh | 1981-2005 | Error correction model (ECM). | Negative relationship |
| Veni and Choudhury (2007) | India | 1981-2004 | Granger causality tests | no causality |
| Saaed (2007) | Kuwait | 1985-2005 | Error correction model | Negative relationship |
| Antwi et al. (2013) | Ghana | 1980-2010 | Cointegration tests and error correction model (ECM) | Positive relationship |
| Osuala et al. (2013) | Nigeria | 1970-2011 | (OLS) and Granger causality tests. | Positive relationship |
| Munir and Mansur (2009) | Malaysia | 1970-2005 | Threshold Autoregressive (TAR) | Positive relationship less than 3.89 % threshold level of inflation |
| Sweidan (2004) | Jordan | 1970-2013 | Autoregressive Conditional Heteroscedasticity (ARCH) | Positive relationship |
| Erbaykal and Okuyan (2008) | Turkey | 1987-2006 | Toda Yamamoto causality. | INF → GDP |
| Singh, S., & Singh, A. (2015). | Japan | 1980-2014 | Granger-causality using VAR | GDP → INF |
| Gokal and Hanif (2004) | Fiji | 1970-2003 | Granger Causality | GDP → INF |
| Kasidi and Mwanemela (2013) | Tanzania | 1990-2001 | Correlation matrix | Negative relationship |
| Xiao (2009) | China | 1978-2007 | Granger Causality | INF ↔ GDP |

| | | | | |
|--|----------------------|---------------|--|---|
| Doguwa, S. I. (2012). | Nigeria | 2005Q1-2012Q1 | Threshold regression | Positive relationship below 10.5% threshold level. |
| Madurapperuma, M. W. (2016). | Sri Lanka | 1988-2012 | Johansen cointegration test and ECM. | Negative relationship |
| Panel II: multi-country studies | | | | |
| Fisher (1993) | 101 countries | 1960-1989 | OLS and GLS | Negative relationship |
| Barro (1995) | 100 countries | 1960-1990 | Instrumental variables (IV) | Negative relationship |
| Ghosh and Phillips (1998) | 145 countries. | 1960-1996 | OLS, 2ols | Negative relationship |
| Chowdhury and Mallik (2001) | Four Asian countries | 1970-2000 | Cointegration tests and error correction model (ECM) | positive relationship |
| Mamo (2012) | 13 African countries | 1969-2009 | Correlation matrix, Fixed effect and Panel granger causality tests | -negative correlation -INF→GDP |
| Kremer et al. (2013) | 124 | 1950-2004 | dynamic panel threshold model | Negative correlation if inflation exceeds 17% |
| Pollin, R., & Zhu, A. (2006) | 80 countries | 1961-2000 | Nonlinear regression | Positive correlation up to 18% of inflation |
| Eggoh, J. C., & Khan, M. (2014). | 102 countries | 1960–2009 | PSTR and dynamic GMM | negative and nonlinear relationship |
| López-Villavicencio et al. (2011) | 44 countries | 1961–2007 | GMM method | positive correlation below threshold level |
| Baharumshah et al. (2016) | 94 countries | 1976–2010 | system generalized method of moments (SGMM) | Inflation harms growth |
| Muzaffar, A. T., & Junankar, P. N. (2014). | 14 countries | 1961-2010 | Generalized Method of Moments(GMM) | Positive relationship below 13% threshold level |
| Manamperi, N. (2014). | BRICS | 1980-2012 | Johansen cointegration and ARDL | Positive relationship in India and negative affect on others. |

4. DATA AND METHODOLOGY

The study used annual data on the sample period from 1975 to 2017 on inflation rate calculated from consumer price index (2010=100), and economic growth measured annual real gross domestic product (GDP), also utilize other control variables in the models such as financial development and remittance. all the data for relevant variables is sourced from world development indicators (WDI) for the period 1975 to 2017.

Philip-Perron (PP) and Augmented Dickey-Fuller (ADF) tests has been conducted to prove that the variables are integrated. If both the variables are stationary at I (1), then Johanssen cointegration test will be conducted to investigate the existence of the long-run equilibrium relationship between the variables by having various hypothesis tested in it (Johansen, 2000). Error Correction Model (ECM) is applied to observe the interaction among all variables after the long-run co-integration relationship of the variables is established. granger causality test (Granger, 1988) is operated for discovering causality between inflation and economic growth whether there is bidirectional, unidirectional or not at all in the context of Burkina Faso.

5. EMPIRICAL RESULTS AND DISCUSSION

table 2 shows the results of the descriptive statistics and correlation matrices, is revealed that series of inflation, Economic growth, financial development, and remittance are normally distributed as indicated by Jarque–Bera statistics. the mean and the median of data is represented in the first two rows and indicates minor symmetry as their value are close to each other. on the other hand, Jarque Bera (JB) test for normality is tested for each variable and the results indicate that the null hypothesis of normal distribution cannot be rejected for the all variables since its p-value is reasonably high.

On the other hand, the results of pair-wise correlation describe that there is a positive correlation between inflation, economic growth, and financial development, whereas remittance is negatively associated with inflation and economic growth and financial development. However, the results support the expectation of the hypothesis. In addition, the correlation value of explanatory variables ranges from -0.005 and -0.63 that reveals the good fit of our model.

Table 2: descriptive statistics and correlation matrices

| Variables | LNCPI | LNGDP | LNFD | LNRM |
|--------------|-----------|----------|----------|-----------|
| Mean | 1.785884 | 9.526045 | 1.142781 | 0.521562 |
| Median | 1.849084 | 9.419777 | 1.142611 | 0.540094 |
| Maximum | 2.033945 | 10.10968 | 1.467963 | 0.973611 |
| Minimum | 1.277386 | 8.973115 | 0.831561 | -0.037163 |
| Std. Dev. | 0.208196 | 0.331763 | 0.145491 | 0.291723 |
| Skewness | -0.696668 | 0.411734 | 0.171068 | -0.339062 |
| Kurtosis | 2.680640 | 2.014305 | 3.461172 | 1.940643 |
| Jarque-Bera | 3.661045 | 2.955703 | 0.590778 | 2.834573 |
| Probability | 0.160330 | 0.228127 | 0.744242 | 0.242371 |
| Observations | 43 | 43 | 43 | 43 |
| LNCPI | 1 | | | |
| LNGDP | 0.885 | 1 | | |
| LNFD | 0.250 | 0.583 | 1 | |
| LNRM | -0.7008 | -0.6352 | -0.0052 | 1 |

5.1 Unit root test

For time series analysis, it is crucial to test first if data is stationary to avoid the problem of spurious regression. Therefore, it is necessary to perform Unit Root Test first before estimation to see whether the time series data is stationary or not. Unit Root Test involves testing for the stationarity of the individual variables. In this paper, two methods of unit root tests are adopted the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) to test the property that whether the data is stationary and to find the existence of unit root in each of the time series.

ADF test results showed in table 3 stated that all the variables are not stationary at level this can be determined by comparing ADF test statistics with critical value at pre-determined significance level, results of table 4.1 supported the evidence of non-stationary of all variables at level, furthermore, the results in Table 3 revealed that all the variables are stationary and integrated at first difference, this implies that according to ADF test our data is applicable for performing our objective of to study the short run the long run relationship of economic growth and inflation.

Moreover, The results of the PP unit root test at levels and the first difference are showed in table 3, the results appeared in the table revealed that all the variables are not stationary at level, further, we proceed to perform the test of unit root in the first difference of variables, the results showed in the table demonstrated that all the variable in the study are stationary at their first difference according to PP test results.

Table 3: results of Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP)

| ADF(INTERCEPT) | | | | ADF(INTERCEPT AND TREND) | | | |
|----------------|--------|------------------|-----------------------|--------------------------|------------------|-----------------------|--|
| VARIABLES | Level | First difference | Test critical values. | Level | First difference | Test critical values. | |
| LNCPI | 2.8677 | 6.044*** | 3.596616 (1%) | 2.1775 | 7.4126*** | 4.1985(1%) | |
| LNGDP | 0.4006 | 5.312** | 2.9331(5%) | 1.6766 | 5.2449** | 3.5236 (5%) | |
| LNFD | 0.6557 | 5.391* | 2.6048 (10%) | 1.0124 | 5.5559* | 3.1912(10%) | |
| LNRM | 1.0698 | 5.863*** | 3.59661 (1%) | 0.9154 | 5.8526*** | 4.1923 (1%) | |
| PP(intercept) | | | | Pp(intercept and trend) | | | |
| Varaibels | Level | First Difference | Test critical values. | LEVEL | First difference | Test critical values. | |

| | | | | | | |
|-------|----------|----------|--------------|----------|----------|--------------|
| LNCPI | 2.979633 | 6.291*** | 3.596616(1%) | 2.148141 | 7.224*** | 4.192337(1%) |
| LNGDP | 0.456302 | 5.312** | 2.935001(5%) | 1.924445 | 5.244** | 3.523623(5%) |
| LNFD | 0.956349 | 5.383*** | 3.596616(1%) | 1.204885 | 5.535*** | 4.1985(1%) |
| LNRM | 1.135930 | 5.862** | -2.93315(5%) | 1.091908 | 5.851** | 3.523623(5%) |

5.2 Cointegration test

after performing unit root test and our empirical revealed that our data is stationary at first difference, the next process would be to do co-integration test and VECM, but before proceeding that process, to avoid autocorrelation problem we adopted VAR model, and is crucial for the time series data specification.

this study performed the Vector Autoregression (VAR) Lag Order Selection criteria to identify the lag to use for co-integration test The Lag Length selection test is shown in table 4 Based on all criterion, long-run test statistics we employed a lag length of k = 1 in determining co-integrating vector among the variables.

Table 4: Vector Auto regression (VAR) Model estimates

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|-----|----------|-----------|-----------|------------|------------|------------|
| 0 | 91.94377 | NA | 1.45e-07 | -4.397188 | -4.228300 | -4.336124 |
| 1 | 273.2826 | 317.3430* | 3.74e-11* | -12.66413* | -11.81969* | -12.35881* |
| 2 | 281.3116 | 12.44493 | 5.71e-11 | -12.26558 | -10.74559 | -11.71600 |
| 3 | 297.6273 | 22.02617 | 6.01e-11 | -12.28136 | -10.08582 | -11.48753 |

Note: * indicates lag order selected by the criterion, LR: sequential modified LR test statistic, FPE: Final prediction error , AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.(each test at 5% level)

5.2.1 Johansen Cointegration Test

After obtaining the results of non-stationary at the level and stationary at their first difference, we can proceed to perform the Johansen co-integration test to examine the long-run relationship among the variables in the regression.

The results of the Johanssen co-integration test is presented in Table 5 (Trace Statistics) and (Maximum Eigenvalue) that reveals the existence of a long run linear relation, the empirical results shows that all the variables in the model are co-integrated and it can be rejected the null hypothesis of no co-integration under 5% level of significance .specifically, the computed maximum Eigenvalue ,the trace test statistics and their corresponding critical values shows that it can be rejected the null hypothesis of no co-integration at 5-percent levels of significance of both test. maximum Eigenvalue and the trace test statistics provide co-integration value of all four variables in the model, this implies there is long run co-integration in our model and this method proposed by Johansen and Juselius (1990), we can conclude that there is long-run relationship between inflation, economic growth, financial development and remittance in Burkina Faso.

Table 5: Johansen Cointegration Test results

| Unrestricted Cointegration Rank Test (Trace) | | | | |
|---|------------|----------------------|---------------------|-------------|
| Hypothesized No. of CE(s) | Eigenvalue | Trace statistics | 0.05 critical value | probability |
| None * | 0.554705 | 59.80757 | 47.85613 | 0.0026 |
| At most 1 | 0.326053 | 26.63787 | 29.79707 | 0.1108 |
| At most 2 | 0.169395 | 10.45911 | 15.49471 | 0.2471 |
| At most 3 | 0.067139 | 2.849462 | 3.841466 | 0.0914 |
| Unrestricted Cointegration Rank Test (Maximum Eigenvalue) | | | | |
| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen statistics | 0.05 critical value | probability |
| None * | 0.554705 | 33.16971 | 27.58434 | 0.0086 |
| At most 1 | 0.326053 | 16.17876 | 21.13162 | 0.2146 |
| At most 2 | 0.169395 | 7.609647 | 14.26460 | 0.4198 |
| At most 3 | 0.067139 | 2.849462 | 3.841466 | 0.0914 |

Note: Max-eigenvalue and Trace tests indicate 1 cointegrating eqn(s) at the 0.05 level, * denotes rejection of the hypothesis at the 0.05 level,**MacKinnon-Haug-Michelis (1999) p-values.

5.2.2 Normalised Cointegration Coefficients

The normalized cointegration equation is reported in table 6 which showed two different economic model, first model, study choose inflation as dependent variable whereas second model economic growth assigned as dependent variables, the equations of two models can be re-written as follows (due to the normalization Process, signs are reversed)

model 1: $LNCPI=0.48LNGDP-0.4.3LNFD-0.076LNRM$

Model 2: $LNGDP=2.08LNCPI+0.89LNFD+0.15LNRM$

Results in model 1 indicate that economic growth has a positive effect on inflation, one percent increase in real GDP leads 0.478997% increase on inflation, assuming other variables constant and statistically significant at 5% level. On the other hand, financial development and remittance have a negative effect on inflation, a ceteris paribus increase on financial development will lead 0.427668% decrease on inflation, whereas on an average ceteris paribus increase on remittance will bring 0.076086% decrease on inflation, financial development is statistically significance where remittance insignificance.

the second model indicates that long-run estimate for LNCPI, LNFD and LNRM are positive, in other words, inflation, financial development, and remittance has positive effect on economic growth in the context of Burkina Faso, the t-ratio of inflation and financial development are significant at least at the 5 percent level, whereas remittance is insignificant.

Table 6: Normalized cointegrating coefficients

| Model 1: dependent variable D(LNCPI) | | | |
|--|--|--|--------------------------------------|
| LNCPI | LNGDP | LNFD | LNRM |
| 1.000000 | -0.478997** (0.07254) [-6.60308] | 0.427668** (0.12658) [3.37865] | 0.076086 (0.06564) [1.15908] |
| Model 2: dependent variable D(LNGDP) | | | |
| LNGDP | LNCPI | LNFD | LNRM |
| 1.000000 | -2.087696** (0.18680) [-11.1761] | -0.892840** (0.19254) [-4.63710] | -0.158844 (0.12340) [-1.28720] |
| Standard errors in () & t-statistics in [] | | | |

5.2.3 Vector Error Correction Model (VECM)

the VECM shows both the short-run and long-run effects assuming that the variables are co-integrated, table 4.8 presents the estimation coefficients of vector error correction term (long-run effects) and the lagged values of the two series (short-run effects).

after obtaining the long run relationship between variables, now VECM technique is employed to test for the short run relationship .in the sense of VECM, co-integrating coefficients equation 1 should be negative in between (0,-1) and statistically significant, this estimation assumes inflation converges to the equilibrium of the long run relationship, if inflation is below its long term value (error correction term is less than 0) then inflation would increase for convergence to the long run relationship. On the other hand, inflation would decline if it is above its long-term value (Error correction term is greater than 0),.

taking inflation as dependent variables in model 1 from table 7, The coefficient of error correction term for LNCPI is significant at 5 percent, the value of error correction term (ECT) which is negative and less than 1 implies that the past error of disequilibrium plays an important role in identifying the current conditions of LNCPI in Burkina Faso. The result shows that ECT for the LNCPI is -0.270 which means inflation can be adjusted 27 percent of short-run deviations towards the long-run equilibrium on a yearly basis, The error correction term confirm the long run causality among the variables when LNCPI has taken as a dependent variable ,However, in model 2 no single variables is significant though ECM of LNGDP is negative but failed the assumption that's said should be negative in between (0,-1) and statistically significant.

Table 7: Vector Error Correction Estimates

| Model 1 | | | | Model 2 | | | |
|-----------------------------|-------------|------------|-------------|-----------------------------|-------------|------------|-------------|
| Dependent variable D(LNCPI) | | | | Dependent variable D(LNGDP) | | | |
| Variables | Coefficient | Std. Error | t-Statistic | Variables | Coefficient | Std. Error | t-Statistic |
| ECT(-1) | -0.270*** | 0.043381 | -6.237194 | ECT(-1) | -0.046964 | 0.059926 | -0.78370 |
| D(LNCPI(-1)) | -0.039256 | 0.114659 | -0.342372 | D(LNCPI(-1)) | 0.434538 | 0.330662 | 1.314146 |
| D(LNGDP(-1)) | -0.100248 | 0.059680 | -1.679748 | D(LNGDP(-1)) | 0.163143 | 0.172111 | 0.947891 |
| D(LNFD(-1)) | 0.061062 | 0.051183 | 1.193022 | D(LNFD(-1)) | 0.059654 | 0.103812 | 0.574639 |
| D(LNRM(-1)) | -0.028710 | 0.035997 | -0.797547 | D(LNRM(-1)) | 0.210673 | 0.147606 | 1.427266 |
| constant | 0.021056 | 0.004007 | 5.254939 | constant | 0.013495 | 0.011556 | 1.167805 |

5.3 Pairwise Granger Causality

Table 8 presents the results of Granger causality and it comprises three section null hypothesis F-statistics and probability value. refereeing the table 4.7 Economic growth is found does not have Granger cause to inflation in Burkina Faso. The result of the Pairwise Granger Causality Test confirms finding p-value is greater than our pre-determined 5% significance level and we failed to reject the null hypothesis.

Furthermore, based on the result in the Granger causality present below, inflation also does not Granger cause to economic growth, the P-value that ranges 0.30-0.59 at different lag orders that clearly made insignificantly hence causes failure to reject the null hypothesis. Thus, a conclusion can be drawn that, inflation does not cause economic growth in the short run in the context of Burkina Faso. In addition, Economic growth does not Granger cause inflation, the P-values of different lags is insignificant hence cause failure to reject the null-hypothesis, we can also conclude that economic growth does not Granger cause inflation in short run in Burkina Faso.

Table 8: Pairwise Granger Causality Tests

| Null Hypothesis: | lags | F-Statistic | Prob. |
|------------------------------------|------|-------------|--------|
| LNGDP does not Granger Cause LNCPI | 1 | 0.29273 | 0.5916 |
| LNCPI does not Granger Cause LNGDP | | 0.74315 | 0.3939 |
| LNGDP does not Granger Cause LNCPI | 2 | 0.52519 | 0.5959 |
| LNCPI does not Granger Cause LNGDP | | 0.74008 | 0.4842 |
| LNGDP does not Granger Cause LNCPI | 3 | 1.30714 | 0.2885 |
| LNCPI does not Granger Cause LNGDP | | 1.20184 | 0.3243 |
| LNGDP does not Granger Cause LNCPI | 4 | 1.23159 | 0.3185 |
| LNCPI does not Granger Cause LNGDP | | 1.27930 | 0.3001 |

6. CONCLUSION

The main objective of this study was to explore the long-run equilibrium relationship between inflation and economic growth, secondly, this study attempted to know short-run causality between inflation and economic growth, to achieve the objectives of the study, The study used annual data covering from 1962 up to 2017 of real GDP as an indicator of economic growth and GDP deflator as proxy of inflation, we have also utilized other control variables in the model such as financial development and personal remittance received in the context of Burkina Faso. all the data theses variables are obtained from the world development indicators (WDI) database of the world bank.

The Findings of Johanssen co-integration test revealed the existence of a long-run linear relation, the empirical results showed that all the variables in the model are co-integrated and it can be rejected the null hypothesis of no co-integration under 5% level of significance, this implies that inflations and economic growth have a positive long-run relationship in Burkina Faso.

In addition, the VECM results demonstrated the presence of long run relationship between inflation and economic growth and the coefficient of error correction term of the model is statistically significant at 5 percentage level. Furthermore, the

diagnostic test of normality (JB) test, serial correlation test, heteroscedasticity (ARCH) test have been performed, all the tests showed that the model is free from diagnostic problem. Finally. The result of Pairwise Granger Causality Test confirms that inflation also does not Granger cause to economic growth, in Burkina Faso, the p-value is greater than 5 percent, that causes to fail the rejection of the null hypothesis, on the other hand, the results showed Economic growth does not granger Cause inflation.

REFERENCES

- [1] Ahmed, S., & Mortaza, G. (2005). Inflation and economic growth in Bangladesh. Policy Analysis Unit Working Paper Series: WP, 604.
- [2] Antwi, S., Mills, A., Mills, G. A., & Zhao, X. (2013). Impact of foreign direct investment on economic growth: Empirical evidence from Ghana. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 3(1), 18-25.
- [3] Baharumshah, A. Z., Slesman, L., & Wohar, M. E. (2016). Inflation, inflation uncertainty, and economic growth in emerging and developing countries: Panel data evidence. *Economic Systems*, 40(4), 638-657.
- [4] Bruno, M., Easterly, W. (1998). Inflation crisis and long-run growth. *Journal of Monetary Economics* 41, 3–26
- [5] Barro, R. J. (1995). Inflation and economic growth (No. w5326). National bureau of economic research.
- [6] Barro, R. J. (1996). Inflation and Growth. *Federal Reserve Bank of St. Louis Review*, 78.
- [7] Burdekin, R. C., Denzau, A. T., Keil, M. W., Sithiyot, T., & Willett, T. D. (2004). When does inflation hurt economic growth? Different nonlinearities for different economies. *Journal of Macroeconomics*, 26(3), 519-532.
- [8] Danladi, J. D. (2013). Inflation and sustainable output performance in the West African sub-region: The threshold effect. *American Journal of Economics*, 3(6), 252-259.
- [9] Eggoh, J. C., & Khan, M. (2014). On the nonlinear relationship between inflation and economic growth. *Research in Economics*, 68(2), 133-143.
- [10] Erbaykal, E., & Okuyan, H. A. (2008). Does inflation depress economic growth? Evidence from Turkey. *International Journal of Finance and Economics*, 13(17).
- [11] Gokal, V., & Hanif, S. (2004). Relationship Between Inflation and Economic Growth, Economics Department, Reserve Bank of Fiji, Suva (No. 002). Fiji, Working Paper.
- [12] Granger, C. W. (1988). Some recent development in a concept of causality. *Journal of econometrics*, 39(1-2), 199-211.
- [13] Doguwa, S. I. (2012). Inflation and economic growth in Nigeria: Detecting the threshold level. *CBN journal of Applied Statistics*, 3(2), 99-124.
- [14] Eggoh, J. C., & Khan, M. (2014). On the nonlinear relationship between inflation and economic growth. *Research in Economics*, 68(2), 133-143.
- [15] Faria, J. R., & Carneiro, F. G. (2001). Does high inflation affect growth in the long and short run?. *Journal of applied economics*, 4(1), 89-105.
- [16] Fisher, S., 1993. The role of macroeconomic factors in growth. *Journal of Monetary Economics* 32, 485–512.
- [17] Johansen, S., Mosconi, R., & Nielsen, B. (2000). Cointegration analysis in the presence of structural breaks in the deterministic trend. *The Econometrics Journal*, 3(2), 216-249.
- [18] Kasidi, F., & Mwaknemela, K. (2013). Impact of inflation on economic growth: A case study of Tanzania.
- [19] Kremer, S., Bick, A., & Nautz, D. (2013). Inflation and growth: new evidence from a dynamic panel threshold analysis. *Empirical Economics*, 44(2), 861-878.

International Journal of Novel Research in Humanity and Social Sciences

Vol. 6, Issue 6, pp: (56-66), Month: November - December 2019, Available at: www.noveltyjournals.com

- [20] Kremer, S., Bick, A. and Nautz, D., 2013. Inflation and growth: new evidence from a dynamic panel threshold analysis. *Empirical Economics*, 44(2), pp.861-878.
- [21] López-Villavicencio, A., & Mignon, V. (2011). On the impact of inflation on output growth: Does the level of inflation matter?. *Journal of macroeconomics*, 33(3), 455-464.
- [22] Lucas, R. E. (1973). Some international evidence on output-inflation trade-offs. *The American Economic Review*, 63(3), 326-334.
- [23] Muzaffar, A. T., & Junankar, P. N. (2014). Inflation–growth relationship in selected Asian developing countries: evidence from panel data. *Journal of the Asia Pacific Economy*, 19(4), 604-628.
- [24] Manamperi, N. (2014). The short and long-run dynamics between inflation and economic growth in BRICS. *Applied Economics Letters*, 21(2), 140-145.
- [25] Madurapperuma, M. W. (2016). Impact of inflation on economic growth in Sri Lanka. *Journal of World Economic Research*, 5(1), 1-7.
- [26] Mubarik, Y.A. (2005), “Inflation and Growth: An Estimate of the Threshold Level of Inflation in Pakistan”, *SBP-Research Bulletin*, 1(1): 35-44.
- [27] Ndoricimpa, Arcade. (2017), *Threshold Effects of Inflation on Economic Growth in Africa: Evidence from a Dynamic Panel Threshold Regression Approach*, Working Paper Series N° 249, African Development Bank, Abidjan, Côte d’Ivoire.
- [28] Osuala, A. E., Osuala, K. I., & Onyeike, S. C. (2013). Impact of inflation on economic growth in Nigeria—A causality test. *Journal of Research in National Development*, 11(1), 206-216.
- [29] Singh, S., & Singh, A. (2015). Causal Nexus between Inflation and Economic Growth of Japan. *Iranian Economic Review*, 19(3), 265-278.
- [30] Saaed, A. A. (2007). Inflation and Economic Growth in Kuwait: 1985-2005-Evidence from Co-Integration and Error Correction Model. *Applied Econometrics and International Development*, 7(1).
- [31] Singh, S., & Singh, A. (2015). Causal Nexus between Inflation and Economic Growth of Japan. *Iranian Economic Review*, 19(3), 265-278.
- [32] Sweidan, O. D. (2004). Does inflation harm economic growth in Jordan? An econometric analysis for the period 1970-2000. *International Journal of Applied Econometrics and Quantitative Studies*, 1(2), 41-66.
- [33] Veni, L. K., & Choudhury, P. K. (2007). Inflation and Growth Dilemma: An Econometric Analysis of the Indian Economy. *The IUP Journal of Financial Economics*, 5(1), 79-87.
- [34] Xiao, J. (2009). The relationship between inflation and economic growth of China: empirical study from 1978 to 2007.