American Journal of Applied Mathematics
2019; 7(1): 5-12
http://www.sciencepublishinggroup.com/j/ajam
doi: 10.11648/j.ajam.20190701.12
ISSN: 2330-0043 (Print); ISSN: 2330-006X (Online)

Effects of Gross Domestic Product and Inflation Rate on Unemployment Rate in Ghana: Comparative Analysis of Multiple Regression and Covariance Matrix Models

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To cite this article:
Brew Lewis, Crankson Monica Veronica, Nyarko Francis, Ampofi Isaac. Effects of Gross Domestic Product and Inflation Rate on Unemployment Rate in Ghana: Comparative Analysis of Multiple Regression and Covariance Matrix Models. *American Journal of Applied Mathematics*. Vol. 7, No. 1, 2019, pp. 5-12. doi: 10.11648/j.ajam.20190701.12

Received: February 4, 2019; **Accepted**: March 11, 2019; **Published**: April 22, 2019

Abstract: This paper analyses the effects of Gross Domestic Product growth (GDP) and Inflation rate (INF) on Unemployment rate (UMP) in Ghana's economy using covariance matrix and multiple regression models. The two models were examined separately on the same data of three variables and the different outputs analysed to determine the effectiveness among the two models. The analyses of the outputs highlight the significance of both predictor variables on unemployment rate in Ghana. Scatterplot and normal probability distribution (pnorm) graphs were used to analyse the normality of the predictor variables. Data on inflation rate and GDP growth spanning from 1991 to 2017 was used. The data was transformed to n *X* m matrix form for covariance –variance matrix analysis. The rows in the n by m data matrix were the multivariate observations on n units. Multiple regression analysis was performed on the data. Both the two methods provided the long-run effects of the two predictor variables on the unemployment rate. However, while multiple regression model could quantify the effect of each predictor variable on the predicted variable, the covariance matrix model only quantifies the relation existing between predictor variables and the predicted variable.

Keywords: Gross Domestic Product Growth Rate, Inflation Rate, Unemployment Rate, Covariance Matrix Model, Multiple Regression Model, Scatterplot Graphs and Normal Probability Distribution (Pnorm)

1. Introduction

Unemployment is a critical issue across various countries including Ghana. It is one of the major economic problems facing not only Ghana but the entire developing countries. Various attempts have been made by successive Governments and other policy makers to address these problems, but the problems continue to increase year after year as a result of the increase of the population size and the number graduates produced from various tertially institutions. This is very worrying and requires proper action, otherwise, the harm today will be felt for decades by the nation at large. To help curb these problems, it very important to first investigate the causes, which of course has led to many research works. More research works to establish the causes and the lasting solution to this eminent problem are still underway. For instance, in one of the researches, it was established that the economic activities such as production of good and services, structuring of good market places etc and political systems which have not been properly managed by the governments and other reliable stakeholders were some of the causes [4]. Indeed, when the causes of unemployment in Iran for the period 1996-2012 was investigated, it was found that improper control of inflation to achieve sustainable economic growth by policy makers and successive governments was one of the causes which led to the fold ups of many employments and thereby increasing unemployment rate during the period [6]. The causes of unemployment are many [9], but since all of them cannot be analysed at the same time in this

study, only the few that seriously affects the country's economy leading to increase in the rate of unemployment are considered. The few considered include gross domestic product (GDP) growth and inflation (INF) rates and the question of which of the two methods, thus, covariance-variance matrix and multiple regression show high significant effects is searched for. The long run impact of inflation and unemployment on the economic growth of Pakistan was studied via the Autoregressive Distributed Lag (ADL) model approach [10]. The relationship between unemployment, inflation and economic growth in Nigeria using different statistical analysis techniques was investigated and the results confirmed that high inflation rates contribute to high unemployment rates and consequently, affect the growth of the economy [11]. It was established further that unemployment is an influential phenomenon in the economies that negatively influenced inflation [5]. All these analysis were carried out with different statistical tools. In most of these statistical analysis techniques, the variance and standard deviation were used on few variables. This is because the variance and standard deviation indicate the extent to which the values of the variables are spread or scattered about their expected values. The research works are still on-going, and the question of which "statistical techniques" analyses effectively the effect of some economic variables on unemployment rate continues to remain open. To attempt to answer this question, this paper considers two separates methods covariance-variance matrix and multiple regression methods on some economic variables and compares the strength of the two. Many literatures have shown how the matrix algebra method provides, appropriate way of combining two or more variables in certain groups for effective analysis [2]. Indeed, in the matrix form, covariance method provides one of the appropriate ways of explaining the relationship among all the variables in the group at the same time. Though multiple regression technique also explains the relationship between more variables at the same time, it is the comparison of the two methods that will help to identify the best among the two.

2. Methodology

This study analyses the effects of some economic variables such as gross domestic product (GDP) growth and inflation (INF) on unemployment (UNMP) rate in Ghana's economy using covariance - variance matrix and multiple regression methods. A total of 26 data points spanning from 1992 to 2017 formed the data set. The data was obtained from [3]. Both methods were used to study the data. The covariance techniques were applied in selecting statistical values [8]. Scatterplot and normal probability distribution (pnorm) were used to check the normality of predictor variables. Three variables, gross domestic product (GDP) growth rate, inflation rate and unemployment rate for 26 years were considered for the data set. The unemployment rate was regressed on gross domestic product (GDP) growth rate and inflation rate. Association between the GDP growth rate and inflation rate on unemployment rate was examined using the covariance-variance and multiple regression analysis techniques. The methodological approach of the study includes the following:

1. To examine the distribution of the variables using scatterplot matrix graph and normal probability distribution (pnorm).
2. To analyse the effect of GDP growth and Inflation rate on unemployment rate using covariance-variance matrix and multiple regression method.

3. Prior Work

There are many research works on the effects of more economic variables on unemployment which have shown significant results. Some of the research works found that inflation rate, GDP growth rate and unemployment are positively associated to each other [7]. The association between inflation rates or GDP growth rate was found to have increasingly steady state in relation to unemployment rate. The relationship between unemployment, inflation and economic growth in Nigeria was investigated using different statistical analysis techniques and the results confirmed that high inflation rates contribute to high unemployment rate [11]. The inflation was investigated as the cause of unemployment in Iran for the period 1996-2012, since it was established that improper control of inflation caused increase in unemployment rate [6]. Finally, a research work was carried on inflation and unemployment rate with another statistical techniques [1]. But none of the prior works compared the strength of these two separate methods on the afore mentioned predictor variables on unemployment.

4. Research Design

The study focused on the comparative analysis of the covariance-variance matrix and multiple regression methods on the same data. The data gathered for the study was from the period 1992 to 2017 [3]. The twenty-six years data span was considered to have a proper observation of inflation rates and GDP growth on unemployment rates in Ghana. The research study employed multiple regression analysis, scatterplot graphs, normal probability distribution (pnorm) graphs and covariance-variance analyses. The findings of the research provided statistical facts to analyse the effect of inflation rate and GDP growth on unemployment rates in Ghana. The data is shown in Table 1.

Table 1. *GDP growth rate, Inflation rate and Unemployment rate.*

Year	UMP Rate	GDP Rate	INF rate	Year	UMP Rate	GDP Rate	INF Rate
1992	4.7	3.9	10.06	2005	4.7	5.9	15.12
1993	5.3	3.7	24.96	2006	3.6	6.3	10.92
1994	5.9	3.6	24.87	2007	4.0	4.3	10.73
1995	6.5	4.2	59.46	2008	4.5	9.2	16.52
1996	7.1	4.6	45.56	2009	4.93	4.8	19.25
1997	7.7	4.8	27.89	2010	5.32	7.9	10.71
1998	8.2	4.7	14.62	2011	4.47	14	8.73
1999	10.1	4.4	12.41	2012	3.63	9.3	9.16
2000	10.4	3.7	25.19	2013	2.17	7.3	11.61
2001	8.1	4.2	32.91	2014	2.16	4.0	15.49
2002	8.1	4.5	14.82	2015	2.15	3.8	17.15
2003	7.0	5.2	26.67	2016	2.26	3.7	17.47
2004	5.8	5.6	12.62	2017	2.36	8.4	11.8

Source: [3]: *https://knoema.com/atlas/Ghana/Unemployment-rate.*

5. Data Analysis

5.1. Graph Matrix Analysis

A scatterplot matrix of unemployment against inflation rate and GDP growth rate is plotted to identify non-linearities and outliers' problems in the data as shown in Figure 1.

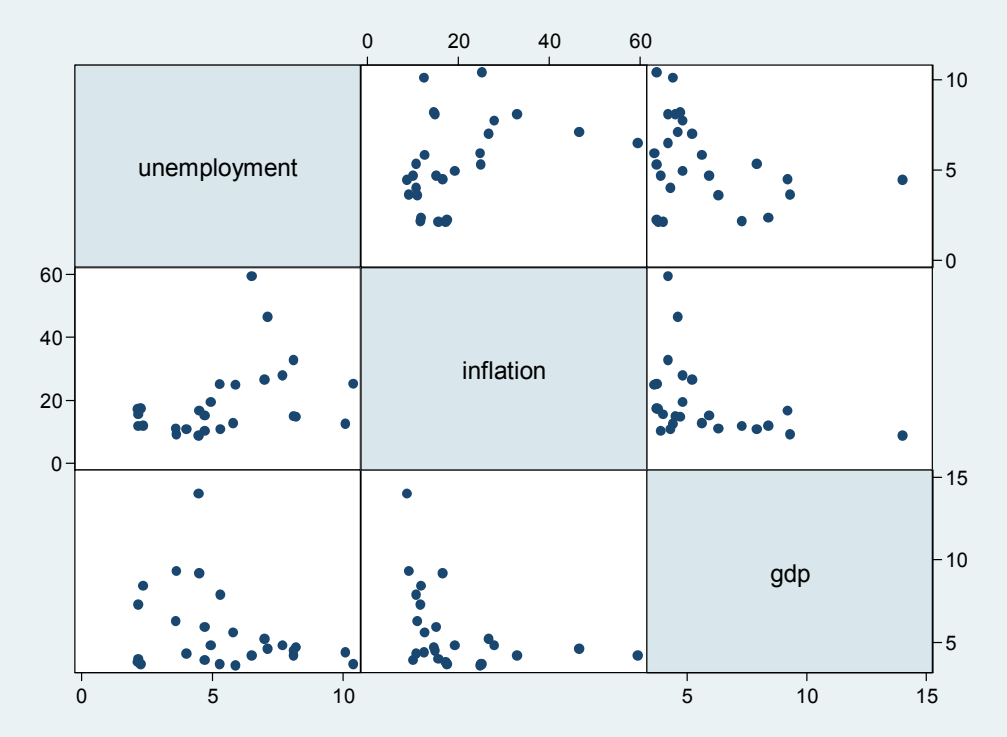

Figure 1. *Graph matrix of unemployment, inflation and GDP.*

Figure 1 shows the problems identified in the data. Thus, while some of the data points are clustered at certain points, others are far away when the unemployment rate is regressed on inflation rate and GDP growth. The inflation variable has more scattered points or outliers than GDP growth rate variable and the two show different trend patterns as shown in Figure 1. Thus, the points of inflation variable show upward trend while that of GDP variable show downward trend. These scattered points confirm the non-linearity of both predictor variables. Hence, to check their linearity, the normal probability distribution plot (pnorm) is employed and the result is as shown in Figure 2 and Figure 3 respectively. The different trends suggest the variation in the effects of inflation rate and GDP growth on unemployment rate.

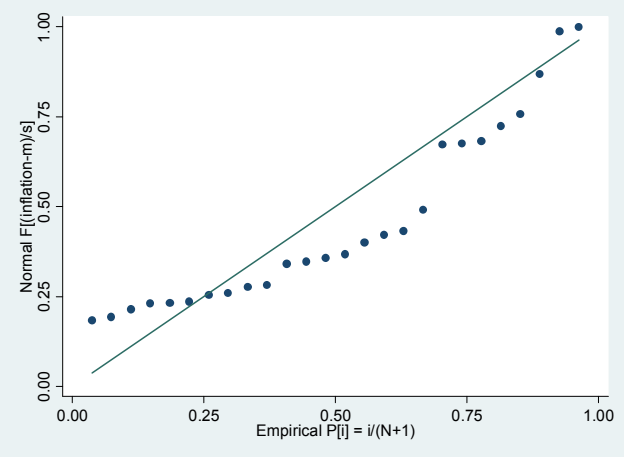

Figure 2. *Pnorm graph of Inflation rate.*

Figures 2 and 3, further confirmed that both inflation rate and GDP growth rate variables are not normally distributed. These problems are observed by the deviations near the centre of the distribution of their plots. The deviations at the centre of their distributions provide unusual values for unemployment rate, confirming that the effect of inflation rate and GDP growth on employment differs. The normality of the variables is only checked but it is not required that the predictor variables should be normally distributed. Indeed, it is rather, the residuals that are expected to be identically and independently distributed in the regression analysis. All these techniques were employed to determine how fit are the data for analyses. Since the linearity in their relationship is not perfect and differs, their beta coefficients are compared to assess their strength within the model. The results of the beta coefficients of the regression of unemployment rate on inflation rate and GDP growth are shown in Table 2.

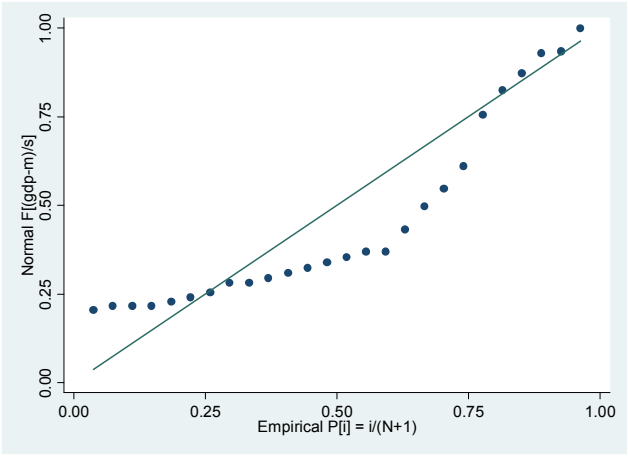

Figure 3. *Pnorm graph of GDP growth rate.*

Table 2. *Beta coefficients of regression of unemployment on inflation and GDP.*

Source	SS	Df	Ms	Number of obs	26
				F(2, 23)	2.36
Model	24.3432003	2	12.1716002	Prob > F	0.1182
Residual	119.324467	23	5.1880203	R-Squared	0.1694
				Adj R-Squared	0.0972
Total	143.667667	25	5.74670669	Root MSE	2.2777

Unemployment	Coef	Std. Err	T	P > t	Beta
Inflation	.0614015	.04135	1.48	0.151	0.3065
GDP	-.1768453	.2028051	-0.87	0.392	-0.1799
Cons	5.222919	1.693102	3.08	0.005	

Table 2 shows the Beta coefficients of the multiple regression of unemployment rate on GDP growth and inflation rate. The Beta coefficients assesses the relative strength of inflation rate and GDP growth rate. The positive and negative beta coefficients of inflation rate and GDP growth rate show the different direction of the trends and this confirms that the two predictor variables cannot be considered at the same time. In this regard, the multiple regression technique employed in this study considers only one predictor variable while the other is kept constant. For instance, from Table 2, the inflation beta coefficient is (0.3065) and that of GDP growth is (-0.1799). This shows that each standard deviation increase in inflation rate leads to a rise of 0.3065 (30.65%) standard deviation of unemployment rate when the GDP growth rate is held constant. Similarly, when the inflation rate is maintained constant, for every increase in GDP growth rate, there is a reduction of 0.1799 (17.99%) in unemployment rate.

5.2. Multiple Regression Analysis

The hypothesis test is further carried on multiple regression analysis to test the significance of the effect of GDP growth rate and inflation rate on unemployment rate at the same time in Ghana. Indeed, if the GDP growth rate and inflation rate have effects on the unemployment rate in Ghana, then the general multiple regression model explaining the unemployment rate is

$$\text{Unemployment rate} = f(\text{GDP rate and Inflation}) \quad (1)$$

From Table 2 the F-test has P-value of 0.118 which is greater than the value of the level of significance (5%). This means that the model is not significant; hence the effect of both GDP growth and inflation rate on unemployment rate at the same time is not significant under multiple regression analysis. This is further confirmed by their P-values. Thus, the two predictor variables inflation and GDP have P-values

greater than 0.05. Though the coefficient of GDP is not statistically significant, its negative value -0.1768453 indicates that high GDP growth is related lower unemployment rate which is true. The coefficient of inflation 0.0614015 is not significant but seems to be related to unemployment rate. Thus, for each percentage rise in inflation, the unemployment rate increases by 0.06 (6%). Table 2 confirmed that both two predictor variables cannot be considered at the same time under multiple regression analysis. Thus, at each instant only one predictor variable is considered while the other is kept constant. Subjecting this statement further to the following hypothesis test, we have:

H_0: The effects of both GDP rate and inflation rate on unemployment rate can be considered at the same time under multiple regression analysis

H_1: The effect of both GDP rate and inflation rate on unemployment rate cannot be considered at the same time under multiple regression analysis

From Table 2 the P-value (0.118) of F-test is greater than the value of the level of significance (5%), which indicates that the null hypothesis is not rejected, thereby, confirming that the effects of both GDP rate and inflation rate on unemployment rate at the same time under multiple regression analysis is not significant. An indication that in multiple regression only one predictor variable is considered at each instant while the other is kept constant. This is shown in Tables 3 and 4 when the predicted variable is regressed on each separate predictor variable.

Table 3. *Regression of unemployment on inflation.*

Source	Ss	Df	Ms	Number of obs	26
				F(1, 24)	3.97
Model	20.3983448	1	20.398345	Prob > F	0.0478
Residual	123.269322	24	5.1362218	R-Squared	0.1420
				Adj R-Squared	0.1062
Total	143.667667	25		Root MSE	2.2663

Unemployment	Coef	Std. Err	T	P > t	[95% Conf. Int]
Inflation	0.075483	0.0378763	1.9	0.058	-.0026909.1536549
Cons	3.954915	0.862883	4.58	0.000	2.174012 5.735818

The F-test in Table 3 seems statistically significant, which means the model is statistically significant for the regression of unemployment on inflation. The P-value for inflation equals 0.048 which seems statistically significant.

Table 4. *Regression of unemployment on GDP.*

Source	Ss	Df	Ms	Number of obs	26
				F(1, 24)	2.37
Model	12.9036697	1	12.9036697	Prob > F	0.0369
Residual	130.763997	24	5.4484999	R-Squared	0.0898
				Adj R-Squared	0.519
Total	143.667667	25	5.74670669	Root MSE	2.3342

Unemployment	Coef	Std. Err	T	P > t	[95% Conf. Int]
GDP	-.2944461	.191332	-1.54	0.137	-.6893359.1004438
Cons	7.082274	1.167861	6.06	0.000	4.671928 9.492621

In Table 4, the F-test is 0.0369 meaning the regression of unemployment rate on GDP rate is significant. Though the model is not significant when the predicted variable is regressed on the two predictor variables, the result was different when it was regressed with individual predictor variables. The study continues with the analysis of the variables using covariance-variance matrix method.

5.3. Covariance Matrix Concept

Variance and standard deviation mostly operate on one-dimension data. It is however prudent to have some statistical tools suitable to operate on two or more-dimensional data and covariance is such a measure or one of that required statistical tools. Covariance is always measured between 2 dimensions. Let n denotes the observations of each variable such that y is $n\times 1$ vector observations of unemployment rate variable (predicted variable). If $k=2$ is the number of the predictor variables, then x is $n\times(k+1)$ vector of observations of the predictor variables (inflation rate and GDP growth rate). For each year t, the observations of the inflation rate and GDP growth rate are denoted as $x=\left(1,\ x_{t1},\ x_{t2}\ldots x_{tj}\right)$ where j = 1, 2 denotes the variable observed at year t. Assuming $\alpha=\begin{pmatrix}\alpha_0\\ \alpha_1\\ \alpha_2\\ .\\ .\\ \alpha_t\end{pmatrix}$ and $\varepsilon=\begin{pmatrix}\varepsilon_1\\ \varepsilon_2\\ \varepsilon_3\\ .\\ .\\ \varepsilon_t\end{pmatrix}$ are the $(t+1)\times 1$ vector of the parameters and $t\times 1$ vector of errors respectively for the model, then the multiple regression model $y=\alpha x+\varepsilon$

fitting the data takes the matrix form as shown in Equation (2)

$$\begin{bmatrix} y_{11} \\ y_{21} \\ y_{31} \\ . \\ . \\ . \\ . \\ y_{n1} \end{bmatrix} = \begin{bmatrix} 1 & x_{11} & x_{12} & x_{13}...x_{1t} \\ 1 & x_{21} & x_{22} & x_{23}...x_{2t} \\ 1 & x_{31} & x_{32} & x_{33}...x_{3t} \\ . & & & \\ . & & & \\ . & & & \\ . & & & \\ 1 & x_{t1} & x_{t2} & x_{t3}...x_{tt} \end{bmatrix} \begin{bmatrix} \alpha_0 \\ \alpha_1 \\ \alpha_2 \\ . \\ . \\ . \\ . \\ \alpha_t \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ . \\ . \\ . \\ . \\ \varepsilon_t \end{bmatrix} \quad (2)$$

where ε represent the random error at time *t*. Since *x* is $n \times (k+1)$ vector of observations on the predictor variables, *x* is written in the form

$$x = \begin{bmatrix} 1 & x_{11} & x_{12} & s_{1t} \\ 1 & x_{21} & x_{22} & x_{2t} \\ . & & & \\ . & & & \\ . & & & \\ 1 & x_{t1} & x_{t2} & x_{tt} \end{bmatrix} \quad (3)$$

The covariance which measures the association between the measurements of variables is given as

$$S_{jk} = \frac{1}{n}\sum_{t=1}^{n}\left(x_{tj} - \overline{x_j}\right)\left(x_{tk} - \overline{x_k}\right) \quad (4)$$

where S_{jk} denotes the association between *j-th* and *k-th* variables for $j \geq 1$ and $k \geq 1$. The covariance matrix is therefore given as

$$\text{Covariance} = S_{jk} = \begin{bmatrix} s_{11} & s_{12} & s_{1k} \\ s_{21} & s_{22} & s_{2k} \\ . & & \\ . & & \\ s_{i1} & s_{i2} & s_{ik} \end{bmatrix}$$

6. Covariance-Variance Matrix Analysis

The measurements of both the predicted and predictor variables are arranged in a matrix form. The value of each distinct item recorded is denoted by x_{tj} where *j* indicates the variable observed at the time *t*. The correlation and covariance values of the *26* individual observations of the *3* variables from Table 1 provides the results as shown in Table 5. Therefore, in the covariance matrix form, Table 6 displays the final results.

Table 5. *Correlations.*

	Unemployment	Inflation	GDP
Unemployment Pearson Correlation	1	0.377	0.300
Covariance	5.747	10.810	-1.753
N	26	26	26
Inflation Pearson Correlation	0.377	1	-0.391
Covariance	10.810	143.208	-11.402
N	26	26	26
GD Pearson Correlation	0.300	0.391	1
Covariance	-1.753	-11.402	5.953
N	26	26	26

Correalation is significant at the 0.05 level (2-tailed)

Table 6. *Covariance-variance matrix Analysis.*

	Unemployment	Inflation rate	GDP growth rate
Unemployment	5.74	10.810	-1.753
Inflation rate	10.810	143.203	-11.402
GDP growth rate	-1.753	-11.402	5.954

From Table 6, the diagonal values of the covariance matrix denote the variances of the variables. Thus, the variance of unemployment rate, inflation rate and GDP growth rate are 5.747, 143.203 and 5.954 respectively. Admittedly, the inflation rate has the highest variance than the other corresponding variables. This is an indication that inflation has strong effect on the rate of unemployment than the other corresponding variable. The positive covariance value 10.810 shows the relationship of the two variables concerned in the same direction; hence an increase in the inflation rate increases the rate of unemployment. This therefore suggests that the covariance matrix method establishes the relation

between the variables. The covariance value of the two predictor variables inflation rate and the GDP growth rate is negative (-11.406), meaning that they have direct opposite relationship, and their effects on unemployment rates differs. This is confirmed by their respective values -1.753 and 10.810, which in any case, shows that one variable performs better in relation to unemployment rate, than the other. The negative value (-1.753) of GDP growth rate is an indication that as the GDP growth rate increases inflation rate decreases. Indeed, GDP in simple terms is what a country produces over a year and it includes both services and products, therefore as the GDP growth rate increases the rate of unemployment is reduced since more people are employed. More goods and services are produced within the country and less importation of goods and services from the developed countries are experienced leading to low inflation. Therefore high GDP growth result in low inflation rate. Similarly, we would experience high unemployment rates from high inflation rate since the covariance between inflation rate and unemployment is positive 10.810. This is the case in Ghana since Ghana has not increased its productivity and services since 2002 as a result of inadequate employment sectors. This has resulted in more importation of goods and services from the developed countries, thereby increasing inflation. One probable cause of high inflation rate in Ghana is the low productivity due to high unemployment rate and high importation of goods from the developed and other nearby countries. Indeed, it is imperative to know that the causes of high inflation and GDP growth rates differ from country to country and therefore its effects on unemployment rate also differ. In Ghana, no matter the level of inflation rates, that is whether high or low, the unemployment rate still remains high.

7. Conclusion

In Table 2, the multiple regression analysis showed that the effect of the two predictor variables on unemployment rate is not significant at the same time. The predictor variables appear to be significant when they are regressed separately with the predicted variable as shown in Table 3 and 4 respectively. In Tables 2, 3 and 4, the multiple regression models quantify exactly the values of unemployment rates when inflation rate or GDP growth rate increases or decreases. Thus, for every rise in inflation, the unemployment rate increases by 0.075 in value as shown in Table 3. However, in Table 4 for every rise in GDP rate the unemployment rate decreases. Table 6 could not provide the exact value of unemployment rate but rather determines the type of relation existing between variables. The positive and negative covariance values show the relation between the variables in same direction and opposite direction respectively. The covariance value of 10.810 confirms that as inflation rate increases, unemployment rate increases. Similarly, the value -1.753 also shows that as GDP rate increases, unemployment rate decreases. The non-normalities of the inflation rate and GDP growth rate variables were confirmed by the scatterplot matrix graph and normal probability distribution (pnorm) graphs in Figures 2 and 3 respectively. Both graphs showed the non-normalities of the variables. While the scatterplot plot graph showed how far the data points are from the others, the pnorm graph showed the deviations near the centre of the distributions. From the multiple regression analyses it was found that the inflation rate appears more significant in the model than GDP growth rate. However, it was difficult to establish which variable appear significant in covariance matrix model. The beta coefficients showed that each standard deviation increase in inflation rate leads to a rise of 0.3065 (30.65%) standard deviation of unemployment rate while for every increase in GDP growth rate, the beta coefficients showed a reduction of 0.1799 (17.99%) in unemployment rate. The covariance matrix model also revealed how one of predictor variables that is, inflation rate or GDP growth rate affects unemployment rate. Both methods showed that high inflation rates result in high unemployment rates and high GDP growth rate reduces unemployment rate in Ghana. The outcome of study showed the significant relationship between unemployment rate and the two predictor variables for the two methods. But while multiple regression model could predict the approximate value for the total unemployment rate, the covariance matrix model could not. Therefore, to the best of our knowledge multiple regression model or method is better than the covariance matrix model.

8. Recommendations

Potential economic factors leading to high unemployment rate in Ghana has been identified by this study as high inflation rates and low GDP growth rates. The study therefore recommends that the government and the other policy makers would looked at the root cause of this peculiar problem in Ghana and confront it head on. The paper also recommends multiple regression model as one of the appropriate techniques for studying the effect of one or more variable(s) on another. This study is of the opinion that some strategic policies such as creation of more job opportunities and activities to actively involve the working age youths should be put in place. The creation of jobs must not be sited only in the capital cities. The spread of the jobs in various towns and communities would have been better, but they must be sited in such a way that they are closer to towns and communities abound with raw materials to reduce the cost of transportation of raw materials and prevent the destruction roads by heavy cargo trucks. If this is done more people will be drifted to where the jobs are sited to seek for employment. In so doing the cities and towns will be decongested. Ghanaians also should patronize locally manufactured goods to prevent exerting excessive pressure on the Ghanaian currency, which virtually leads to high inflation rates. Thus, the level of importation of goods should be minimised. The local production must be improved by adding value to the raw materials produced in the country and reduce the level of exportation of raw materials to other countries.

References

[1] Chang-Shuai, L and Zi-juan, L. (2012), Study on the Relationship among Chinese Unemployment Rate, Economic Growth and Inflation, Advances in Applied Economics and Finance, Vol. 1, pp. 1- 6.

[2] Friedman, M. (1976), Inflation and Unemployment. *Chicago Journals - Journal of Political Economy*, pp. 451 - 472.

[3] Knoema, Y. (2017), rate of Unemployment, GDP and Inflation in Ghana, *https://knoema.com/atlas/Ghana/Unemployment-rate*. Accessed: August 20, 2018.

[4] Muhammad, U. and Raza, M. U. (2013). Impact of GDP and Inflation on Unemployment Rate: A. *International Review of Management and Business Research*, Vol. 2, Issue 2. pp. 388-400.

[5] Metin, K. (1998). The Relationship between Inflation and the Budget Deficit in Turkey. *Journal of Business & Economic Statistics*, Vol. 16, No. 4, pp. 412-422.

[6] Mohsenia, M. and Jouzaryan, F. (2016), Examining the Effects of Inflation and Unemployment on Economic Growth in Iran. *Procedia Economics and Finance,* Vol. 36, pp. 381-389.

[7] Mocan, H. N (1995). Income Inequality, Poverty, and Macroeconomic Conditions. *paper presented at the American Economic Association Meetings,* Washington, D. C.

[8] Newey, W K. and West, KD., 1994. Automatic Lag Selection in Covariance Matrix Estimation. Review of Economic Studies, 61 (4), pp. 631–654.

[9] Raza, M. U. (2013). Impact of GDP and Inflation on Unemployment Rate: A. *International Review of Management and Business Research*, pp. 388-400.

[10] Shahid, M. (2014), 'Effects of inflation and unemployment on economic growth in Pakistan', *Journal of economics and sustainable development*, Vol. 5, pp. 13-15.

[11] Yelwa, M., David, K. and Awe, E. O. (2015), Analysis of the Relationship between Inflation, Unemployment and Economic Growth in Nigeria: *http://www.imf.org/external/pubs/ft/weo/2016/02/weodata/weoselgr.aspx*