

The Validity of the Short Run and the Long Run Phillips Curve in Kenya



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ABSTRACT: Levels of unemployment is of great concern to policy makers in most world economies. Many models have been developed to address the problem but no clear solution has been found. Closely related to unemployment is the problem of inflation. Stagflation, a condition where both unemployment and inflation are high at the same time has resulted to ineffectiveness of policies issued by monetary authorities in Kenya. Solutions to unemployment and inflation are challenges experienced by policy makers in many economies. The purpose of this study was to empirically analyze the validity of Philips curve in the Kenyan economy. The study was informed by the ever increasing unemployment rates, cost of living and the inadequate attention inform of policies made by the policy makers to alleviate the economy from this problem. The study adopted an explanatory research design and employed an Auto-Regressive Distributed Lag (ARDL) and Error Correction Model (ECM) to analyze both the short run and the long run results. The study sample entailed of annual secondary time series data set for a period of 30 years from 1991 to 2020, sourced from KNBS, Central Bank of Kenya, and World Bank. The findings of the study concluded that the relationship between unemployment and inflation was positive and insignificant both in the short run and in the long run. The Non-Accelerating Inflation Rate of Unemployment (NAIRU) was estimated to be 6.26 percent but insignificant. The findings of the study also showed that money supply and government expenditure had a negative and positive but insignificant relationship with unemployment in the short run. The study recommends that the government should not employ Phillips curve as an instrument for policy implementation in Kenya. This is because both unemployment and inflation are positively related. Finally, the government should come up with a supplementary policy of cushioning the economy against the harsh effects of structural breaks on unemployment in the economy.

KEYWORDS: Unemployment, Inflation, NAIRU, Stagflation.

INTRODUCTION

Inflation and unemployment are important economic indicators of the state and performance of any economy. An economy with sustainable growth patterns will be characterized by low unemployment and inflation levels. According to Vermeulen (2017), in macroeconomics, unemployment and inflation are key concerns. Some governments are focused on reducing unemployment, while others are focused on getting inflation under control. In economics, unemployment and inflation are two concerns that need to be addressed. The objective of any government is to ensure that her economy is growing at sustainable rates and all the stakeholders are able to benefit from the continuous expansion of the economy through equitable distribution of resources and wealth.

A key problem that is detrimental to the financial health of economies around the world is stagflation (Bruno & Sachs 2013). Stagflation is characterized by high unemployment and inflation levels in the economy. According to Fomenko (2020), global youth unemployment stood at around 13 percent which was almost thrice the rate of adult unemployment in 2020 although the global inflation rate was low due to decreased demand caused by the outbreak of Covid 19 pandemic. According to Bruno & Sachs (2013), an economy characterized by high levels of unemployment and inflation would experience stagflation, a condition where both inflation and unemployment are rising. Stagflation condition goes against the proposition of Phillips (1958) of an inverse relationship between unemployment and inflation. According to Heise *et. al* (2020), high Inflation is detrimental to the stability of any economy because it results to price increase which in turn causes workers to re-negotiate their wages upward. Producers on the other hand are forced to increase prices further due to increased cost of production. The end results of high inflation would cause a rise in unemployment due to increased cost of production and the need by producers to maintain their

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profit margins. Study done by Ciccarelli & Mojon (2010) showed that the global inflation rate has been fluctuating and stagflation causes lack of confidence in an economy which leads to a slow recovery process.

The actual situation in the Kenyan economy has been high unemployment coupled with high inflation in the backdrop of high economic growth. The high rate of inflation and unemployment in Kenya over a number of years makes it unclear whether Phillips curve assertion is present in Kenya and whether inflation expectations plays a crucial role in determining the short and long run Phillips curve in the economy. This study examines the validity of the short run and long run Phillips curve as suggested by Phillips (1958) the implications it has on policies made by the government.

LITERATURE REVIEW

Phillips (1958) conducted a study to investigate the relationship between the wage level and unemployment macroeconomic variables. His study employed inflation and unemployment data and was based in the Great United Kingdom economy from the year 1861 to 1957. Phillips (1958) was able to find out that there is a negative relationship between inflation and unemployment. That is, if unemployment increases then the rate of inflation or wage rate decreases and vice-versa. This relationship is what is called the short run Philips curve. According to Philips (1958), policy makers can exploit this relationship in policy making. They could reduce unemployment in the economy by allowing some level of inflation.

Samuelson and Solow (1960) conducted the same investigation of the relationship between unemployment and inflation using data from the United States. It was found that there exists an inverse negative relationship between unemployment and inflation rate as earlier reported by Phillips (1958), Solow and Gordon (1971) employed data before and after the 1970s of these two macroeconomic variables in the united states to conduct the same investigation and came up with the same results of a negative tradeoff between inflation rate and unemployment. This investigation by Solow and Gordon was termed as the Solow-Gordon affirmation of the Phillips curve because their finding was similar to that of Phillips (1958).

Friedman (1976) conducted research on the same area of study of investigating the relationship between inflation rate and unemployment rate. His findings were that there existed a positive relationship between inflation and unemployment. This means that as unemployment increased, inflation rate also increased. This is a condition referred to as stagflation. Friedman (1976) study therefore refuted the Phillips (1958) study that there is a negative relationship between inflation and unemployment. Unemployment rates were found to exist independently from inflation. According to Friedman (1976) the negative relationship between inflation and unemployment only exists in the short run. In the long run this negative relationship ceases to exist, and a long-run Phillips curve develops. Friedman (1976) findings were backed up by dramatic increase in inflation rate from 2.5 percent to 7.0 percent while unemployment also rose from about 4% to 6%. Both inflation and unemployment were increasing contrary to the Phillips (1956) and Solow and Gordon (1970) findings.

Reichel (2004) provides convincing evidence that Phillips curve is dead in the United States through an analysis of data from the period 1960-2001. He extends his study to other industrial economies such as the United Kingdom, Belgium, Austria, Spain, Germany and Japan among other economies where he establishes the same findings. He employs a Niskanen model to model employment and the inflation variable. The study showed that there is a negative relationship between unemployment and inflation in the short run. However, the long run relationship between unemployment and inflation is positive. Despite this findings, the coefficients of the models were insignificant indicating the non-existence of the Phillips curve. The study also showed that the Non-Accelerating Inflation Rate of Unemployment (NAIRU) was low at 3.7 percent which proportional to the zero inflation rate. This study employment the Co-integration technique and the Autoregressive Distributed Lag (ADRL) to establish the short run and the long run relationship.

Another study from Africa by El Alaoui, *et. al* (2013) did an investigation of the validity of Phillips curve in Morocco and also estimated the NAIRU. This study employed data from the 1998 to 2012 and a triangular model approach was employed to determine the Phillips curve and the Kalman filter model. The structural method (traditional) was used to estimate the NAIRU in the Morocco economy. It was found that the NAIRU estimates for the Morocco economy using the filter model at the end of the sample period ranged from about 9 percent to 8.7 percent. The short-run and the long-run relationship between inflation and unemployment was also examined using the co-integration test. It was concluded from that test that there is no relationship between unemployment and inflation rate in the morocco economy in the long run. A short-run relationship was however found from the test.

Haldane and Quah (1999) concluded that the Phillips curve in the US and the UK differed. They found out that the Phillips curve as a long-run relation in the US broke down due the high inflation of the 1970s. on the other hand, the Phillips curve in the UK has overtime disappeared and the re-emerged. Their conclusion on the behavior of the Phillips curve in the UK over a period of 140 years was because of the interaction between the evolving policy maker's beliefs and attitudes and the private sector

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response towards those beliefs and attitudes. Their standard model of optimal monetary policy however was not able to clearly explain the 1960s and 1970s run-away inflation in the UK.

RESEARCH METHODOLOGY

Research Design

The research design of this study is an explanatory research design that seeks to identify the cause and effect among variables under study and also the extent and nature of the relationship among these variables. This study seeks to identify the causal relationship between unemployment, inflation, government expenditure and money supply in Kenya and the nature of their relationship.

Data Type and Source

A secondary type of data was used in this research study. This data entailed inflation rate, unemployment rate, government expenditure, and money supply. The data was collected from the Kenya National Bureau of Statistics (KNBS), The World Bank and The Central Bank of Kenya. The study period ran from 1992 to 2020 and a time series approach was being employed.

Data Analysis Method

The data collected was used to develop and construct the models that was be used for analysis. Stata statistical application package was employed as the instrument for data analysis and model creation, testing and presentation. Various diagnostic test that were carried out include normality test, heteroscedasticity test, multi-collinearity test, unit root test, co-integration test, autocorrelation test, and lag selection criteria test.

Analysis and Discussion

Table 1. Shapiro Wilk Normality Test

Variable	Observation	W	V	z	Prob>z
Inflation	30	0.75731	7.714	4.224	0.00001
Money supply	30	0.96398	1.145	0.280	0.38988
Government expenditure	30	0.76695	7.408	4.141	0.00002
Unemployment	30	0.66752	10.568	4.875	0.00000
Residuals	30	0.92920	2.251	1.677	0.04675

Source: Author, 2022

Table 2 suggests that Inflation, government expenditure, unemployment and the residuals are not normally distributed because their p values are 0.00001, 0.00002, 0.00000, 0.04675 respectively which are below 5 percent level of significance. Money supply on the other hand is normally distributed as shown by p value of 0.38988 which is greater than 5 percent level of significance.

Table 2. Selection Lag Order Criteria-Inflation

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-77.4894				24.5278*	6.03765*	6.05158*	6.08604*
1	-77.3819	.21505	1	0.643	26.2778	6.1063	6.13417	6.20308
2	-76.8933	.97726	1	0.323	27.352	6.14563	6.18744	6.2908
3	-75.9888	1.8089	1	0.179	27.5933	6.15299	6.20872	6.34654
4	-75.8677	.24224	1	0.623	29.5938	6.22059	6.29026	6.46253

(*) Indicates that the selected lag order

Source: Author, 2022

All the criteria in table 3 suggest that inflation should have zero lag.

Table 3. Selection Lag Order Criteria-Unemployment

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-27.8355				.538092	2.21811	2.23205	2.2665
1	-27.2572	1.1565	1	0.282	.555984	2.25056	2.27842	2.34733
2	-24.3212	5.872*	1	0.015	.479404*	2.10163*	2.14343*	2.2468*
3	-23.9792	.68411	1	0.408	.505013	2.15224	2.20798	2.3458
4	-23.2675	1.4233	1	0.233	.517573	2.17442	2.24409	2.41636

(*) Indicates that the selected lag order

Source: Author, 2022

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All the criteria in table 4 suggest that unemployment should have two lags.

Table 4. Selection Lag Order Criteria- Government Expenditure

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-94.5806				91.3336*	7.35236*	7.36629*	7.40075*
1	-94.4112	.3389	1	0.560	97.3851	7.41625	7.44411	7.51302
2	-94.0369	.74858	1	0.387	102.261	7.46438	7.50618	7.60954
3	-93.691	.69191	1	0.406	107.692	7.51469	7.57043	7.70824
4	-93.118	1.1459	1	0.284	111.554	7.54754	7.61721	7.78948

(*) Indicates that the selected lag order

Source: Author, 2022

All the criteria in table 5 suggest that government expenditure should have zero lag.

Table 5. Selection Order Criteria- Money Supply

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-87.6097				53.4259	6.81613	6.83007	6.86452
1	-81.7664	11.687*	1	0.001	36.8185*	6.44357*	6.47144*	6.54035*
2	-81.6343	.26429	1	0.607	39.389	6.51033	6.55213	6.6555
3	-80.4509	2.3668	1	0.124	38.8928	6.49622	6.55196	6.68978
4	-79.3497	2.2023	1	0.138	38.6835	6.48844	6.55811	6.73038

(*) Indicates that the selected lag order

Source: Author, 2022

All the criteria in table 6 suggest that money supply should have one lag in the model.

Table 7. Augmented Dickey Fuller Stationarity Test

Variable	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Inflation	-3.314	-4.343	-3.584	-3.230
Unemployment	-3.402	-4.362	-3.592	-3.235
Money Supply	-2.813	-4.352	-3.588	-3.233
Government Expenditure	-4.896	-4.343	-3.584	-3.230

Source: Author, 2022

The results in table 7 suggests that inflation, unemployment, money supply and government expenditure have a unit root which mean they are non-stationary and therefore a necessity of performing the ARDL bounds test to check for level relationship.

Table 6. Pesaran/Shin/Smith ARDL Bounds Co-integration

K-2	(I_0)	(I_1)	(I_0)	(L_1)	(I_0)	(I_1)	
	(L_1)	(L_1)	(L_05)	(L_05)	(L_01)	(L_01)	
F-Statistic Case	(9.177*)	3.17	4.14	3.79	4.85	5.15	6.36
t-statistics	(-5.240*)	-2.57	-3.21	-2.86	-3.53	-3.43	-4.10

Source: Author, 2022

This results in table 8 suggest that there was level relationship among variables and therefore a long run relationship existed. This is because the F statistics of 9.177 was greater than the 5 percent critical value of the upper bound (I_1) of 4.85.

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Table 7. Breusch Godfrey LM Test for Serial Correlation

source	chi2	df	Prob>chi2
Breusch Godfrey LM test for Autocorrelation(lags(1))	0.844	1	0.3470
Durbin Watsin Test d statistic			2.299125

Source: Author, 2022

The p value that corresponds to chi-square in the above table 9 is 0.3470 which is greater than the 5 percent level of significance (0.05), the null hypothesis of no serial correlation is therefore accepted. The null hypothesis of no serial correlation is further supported by the Durbin Watson test statistic of 2.299125. The general rule of thumb is that when the test statistic values range between 1.5 and 2.5 there is no serial correlation.

Table 8. LM Test for Heteroscedasticity

source	chi2	df	Prob>chi2
Heteroscedasticity	8.19	13	0.8312

Source: Author, 2022

The results for this test shown in the Table 10 above indicates that the residuals of the model are homoscedastic. This supported by the p values corresponding to chi-square test statistics of 0.8312 than is greater than 5 percent level of significance (0.05). This therefore means that the residuals of the model have a constant variance.

Table 9. VIF Multi-Collinearity Test

Variable	VIF	1/VIF
Government expenditure	1.14	0.875756
Money supply	1.43	0.700689
Dummy	1.19	0.843225
Inflation	1.50	0.667955
Mean VIF	1.31	

Source: Author, 2022

Table 11 above shows the results of multicollinearity. The VIF is the table above is 1.31 which is less than generally accepted rule of thumb of 10 indicating that there is no multicollinearity among the independent variables.

Table 10. Gregory-Hansen Test with break in level (Break in the constant)

	Test Statistic	Breakpoint	Date	5% Asymptotic Critical Value
ADF	-6.32	19	2009	-5.28
zt	-6.43	19	2009	-5.28

Source: Author, 2022

Table 12 shows the results for Gregory Hansen test for structural breaks in the constant

Table 11: Gregory-Hansen Test with break in Level and Trend

	Test Statistic	Breakpoint	Date	5% Asymptotic Critical Value
ADF	-7.52	15	2005	-5.57
zt	-7.86	26	2016	-5.57

Source: Author, 2022

Table 13 above shows the results for the Gregory Hansen test for break in the level and constant

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Table 12. Gregory-Hansen Test for Break in the constant and slope

	Test Statistic	Breakpoint	Date	5% Critical Value
ADF	-6.88	22	2012	-6.00
zt	-7.00	22	2012	-6.00

Source: Author, 2022

Table 14 above shows the results for the Gregory Hansen test for break in the slope and constant.

Table 13: Correlation Analysis

Variable	Inflation	Unemployment	Money Supply	Government Expenditure
Inflation	1.0000			
Unemployment	-0.3689*	1.0000		
	0.0449			
Money supply	0.4883*	-0.3443	1.0000	
	0.0062	0.0624		
Government expenditure	0.1915	-0.1465	0.3249	1.0000
	0.3108	0.4397	0.0798	

Source: Author, 2022

The output in table 15 shows that there was a negative correlation of -0.3689 between unemployment and inflation and which was significant at 5 percent level of significance

Table 14: Short Run Results

Variables	Coefficient	Std. Error	t value	P > t
unemployment L1.	-0.1556	0.2223	-0.70	0.492
unemployment L2.	0.2815	0.5675	0.50	0.625
Inflation	0.0006	0.0185	0.03	0.974
Money supply	-0.0160	0.0231	-0.69	0.498
Money supply L1.	-0.0072	0.0280	-0.26	0.801
Government expenditure	-0.0023	0.0181	0.13	0.900
Dummy	0.7662	0.4295	1.78	0.090
Constant	6.2622	3.9834	1.57	0.132

Source: Author, 2022

Table 15: Long Run Results

Variables	Coefficient	Std. Error	t value	P > t
ADJ unemployment L1	-0.8740	0.5743	-1.52	0.144
Inflation	0.0007	0.0212	0.03	0.974
Money Supply	-0.0264	0.0289	-0.91	0.371
Government Expenditure	0.0026	0.0205	-0.13	0.899
Dummy(z)	0.8766*	0.3765	2.33	0.031
Intercept	6.2622	3.9834	1.57	0.132

Source: Author, 2022

DISCUSSION OF THE FINDINGS

According to the Augmented Dickey-Fuller (ADF) test results, the variables used in the study were not stationary. In order to determine if the variables were co-integrated in the long run, the co-integration test had to be used. As the ARDL bound test revealed, there was a long-term link between the variables, indicating that they were co-integrated. This necessitated the use of the ARDL Error Correction model to simulate the long-term relationship between the co-integrated variables. As evidenced by results of the Breusch-Godfrey LM test and the Durbin-Watson (DW) test, it was clear that the model did not exhibit serial correlation. The Breusch Pagan test results showed that the model did not have heteroscedasticity. Multi-collinearity was not

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found in the model's Variance Inflation Factor (VIF) test findings. Gregory Hansen structural break test findings showed that the model had a break in slope and constant since 2009 due to external economic shocks. Gregory Hansen structural break test results. The short run results in table 16 indicated that the coefficient (0.0006) of the inflation meant that a one-unit increase in the inflation leads to 0.0006-unit increase in unemployment in the short run at 5 percent level of significance other things held constant. This means that inflation has a positive but insignificant impact on unemployment in the short run.

The long run results in table 17 showed that the coefficient (0.0007) of the inflation meant that a one-unit increase in the inflation leads to 0.0007-unit increase in unemployment in the long run at 5 percent level of significance other things held constant. This means that inflation has a positive but insignificant impact on unemployment in the long run.

The Non-Accelerating Inflation Rate of Unemployment (NAIRU) was found to be both in the short run and in the long run but statistically insignificant. This is also called the natural rate of unemployment. This suggests that any policy that tries to drive unemployment below 6.2622 percent would end up driving inflation upwards without a long run positive change in unemployment levels in the economy. These findings were similar to those of Elalaoui *et al.* 2013 that found out that NAIRU in the Morocco economy was ranging from about 8.7 percent to 9 percent.

According to the results of the ARDL regression model, the Phillips curve does not apply to the Kenyan economy. Since unemployment and inflation have been found to have a positive but insignificant long-term link, this is why. This is in direct conflict with Phillips' (1958) assertion that unemployment and inflation have a negative and significant relationship. Because of this, it is unable to employ the Phillips curve effectively in the Kenyan economy to achieve policy changes. Stagflation would ensue if unemployment and inflation had a positive correlation. There was no substantial negative correlation between unemployment and inflation in the Kenyan economy, according to Masese (2017). While Dritsaki (2013) found that there was a long-term meaningful association between unemployment and inflation in the Greek economy, this study found that there was not. As a result, it was discovered that the current period's predicted unemployment level is adversely correlated both short-term and long-term with the preceding period's expected level of unemployment. These findings confirm Lucas's (1976) assertion that macroeconomic models must incorporate expectations modeling. It was decided to employ Akaike (AIC) and Schwartz (SIC) Lag selection as a model for modeling the adaptive expectations. According to the AIC and SIC, unemployment has a two-lag relationship, inflation has a zero-lag relationship, money supply has a one-lag relationship, and government expenditure has a zero-lag relationship.

It was determined that the Non-Accelerating Inflation Rate of Unemployment (NAIRU) was statistically insignificant, both in the short and long terms. The term "natural unemployment rate" refers to this. Thus, policies aimed at lowering the unemployment rate to below 6.2622 percent are likely to raise inflation rather than reduce it over the long term. Elalaoui *et al.* (2013) reported that NAIRU in Morocco's economy ranged from 8.7% to 9%. These findings are similar.

CONCLUSION

Unemployment and inflation have a little but positive correlation, and monetary and fiscal policies have a small but negative correlation, according to the findings of this research. The conclusions of this study have several policy implications for Kenya's economy. To begin, the government of Kenya should refrain from using the Phillips curve as a tool for policy implementation in Kenya. Due to the fact that both unemployment and inflation are rising in Kenya, the country's economy is seeing a positive correlation. The government should adopt monetary policy initiatives that aim to maintain a sustainable level of inflation in the economy, rather than focusing on the level of unemployment in the economy. To put it another way, lowering unemployment below the natural rate of unemployment would increase inflationary pressures in the economy. As a second option, the government can alter its policies from demand-side to supply-side economics in an effort to minimize unemployment. This is because supply-side measures strengthen the operating mechanism of the labor markets. As a result, the Kenyan government can lower unemployment rates by lowering marginal tax rates, implementing privatization, and liberalizing wage policies. Economic agents would have an incentive to labor as a result, and policy would not have to exert upward pressure on prices. Finally, the government should devise a policy to protect the economy from the unpleasant consequences of structural breaks in the economy. As long as unemployment and inflation are kept within manageable ranges, the recovery process will be able to keep its steady course.

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