

The Relationship Between Inflation and Unemployment in Namibia Within the Framework of the Phillips Curve

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Abstract: This study intended to empirically validate the applicability of the Phillips Curve in Namibia since independence, using semi-annual time series data, and taking into account the periods of the annus horribilis of the global financial crises and the Coronavirus Disease pandemic. It further sought to examine the nature of the relationship between inflation and unemployment to determine whether it is short-run or long-run and establish the causal relationship between the variables using various econometric analyses. The unit root tests indicate that the variables were stationary in their level forms, implying the absence of the long-run relationship. Hence, the Ordinary Least Square (OLS) model was performed to measure the short-run relationship between the variables. Results from the OLS analysis reveal a bidirectional nexus between inflation and unemployment, validating the presence of the Phillips Curve in the Namibian economy. These results correspond to the findings that incorporated the periods of economic shocks; thus, adjudging the critics of the Philips Curve regarding the consideration of economic shockwaves to be nonsensical in the Namibian economy. Finally, Granger causality test was conducted to establish the causal relationship between the variables, and results found inflation and unemployment to be unrelated. Based on these findings, the study recommends policymakers to adopt a policy mix, skewed to reducing unemployment predominately among the youth since the issues cannot be addressed simultaneously. Lastly, the study suggests future investigations to assess panel analyses on the phenomenon concerning developing countries, particularly those in the same region. It also recommends a significant focus on the determinants of inflation and unemployment since the variables were found to be independent of each other. This will give accurate directives to policymakers in an attempt to address the matter in terms of policy formulation and assimilation when they understand where the issue is deriving from.

Keywords: Phillips Curve, Inflation, Unemployment, Unit Root, OLS, Granger, Namibia.

1. Introduction

The devastating effects of both inflation and unemployment continue to hinder macroeconomic performance for numerous countries. Their effects are mainly aligned with savings, investment, poverty, foreign trade, and economic growth, among others (Behera & Mishra, 2017). Precisely, inflation contributes to macroeconomic instability (Thao & Hua, 2018), where high inflation rate leads to a reduction in social welfare while low inflation declines economic growth and job creation, which gradually result in recession and poverty escalation (Wulandari et al., 2019). More, it also has detrimental effect on the performance of financial markets particularly concerning to financial and employment as key performance indicators of the financial markets (Khan, 2018). Similarly, unemployment reduces economic growth and ultimately inclines the crime rate (Minisi & Badivuku-Pantina, 2017), as well as health related challenges (Godinic et al., 2020). Given these implications of inflation and unemployment on economic activities, it is

crucial for countries to maintain them optimally. However, the desire to reduce both inflation and unemployment simultaneously lies above the possibility frontier curve. This has led to a rise of the concept of a trade-off relationship between inflation and unemployment (Oba & Enoh, 2020), derived from the Phillips Curve that has been a dominant focus between researchers in the field of macroeconomics since the 1950s.

In brief, the Phillips Curve postulates that the relationship between inflation and unemployment rates is negative (Phillips, 1958). However, various macroeconomists led by Friedman (1968) challenged the notion of the Phillips Curve, arguing that it has a potential to shift over time, making it only applicable in the short run, unlike in the long run. This was backed up by Singh and Verma (2016), elucidating that the inverse relationship between inflation and unemployment does not exist in the long run. Further critics of the Phillips Curve argue that the study of Phillips (1958) included the period of 1973-1974 and 1979-1980 when there was an oil crisis that escalated inflation without a reduction in unemployment (International Monetary Fund [IMF], 2010).

However, while the literature presents various studies on the applicability of the Phillips Curve, there are paucity studies that address the matter concerning the critics related to economic shocks. In Namibia, a few studies that have been conducted to validate the notion of the Phillips Curve within the Namibian economy observed mixed results where Ogbokor (2005) concludes the presence of stagflation while Shifotoka (2015) validates the presence of the Phillips Curve in Namibia. In that light, the applicability of the Phillips Curve concerning the Namibian economy remains unclear and continues to invite further debate.

Against this background, this study was conducted to investigate the relationship between inflation and unemployment within the context of the Phillips Curve in Namibia since independence using the data of 1991 to 2019 to validate the applicability of the Phillips Curve. Deliberately, the study excluded the periods of 2007-2008, as well as 2020-2021, although the data were readily available to avoid misleading results based on the influences of the economic annus horribilis of the financial crisis and Coronavirus disease (COVID-19) pandemic where one variable can rise without a reduction in the other. In addition, the study sought to determine whether the relationship between inflation and unemployment is short-run or long-run, and finally establish the causal relationship between the variables using various econometric analyses.

2. Literature Review

2.1. Theoretical Literature

The Phillips Curve emerged in 1958 when Alban William Phillips of the London School of Economics estimated the relationship between unemployment and the rate of change of money wages (inflation) with particular reference to the United Kingdom. Phillips (1958) used the data for almost a century from 1861–1957 to examine the relationship between the variables. His results show an inverse relationship between inflation and unemployment. Therefore, the Phillips Curve depicts that an increase in one variable results from a decrease in the other variable, denoting the impossibility of simultaneously lowering unemployment and inflation rates (Shaari et al., 2018). This was outlandish yet good news to the policymakers, on the other hand, knowing that both inflation and unemployment rates cannot be concurrently high.

In 1960, two American economists, Paul Samuelson and Robert Solow, treated the Phillips Curve as a sort of menu of policy options by fitting the Phillips curve to the economy of the United States using the data of 1935 to 1959. Their results reveal a negative nexus between inflation and unemployment rates. Thus, they presented the Phillips Curve as a stable and exploitable relationship that plays a substantial role in inflationary policy advancement (Forder, 2010). Besides from that, Samuelson and Solow (1960) elucidated that the existing trade-off between the variables is unsustainable since the Phillips Curve has a high probability of shifting. On the other hand, Phelps (1967) observed stagflation, a continual increment in both inflation and unemployment that contradicts the notion of the Phillips Curve. Stagflation insinuates that inflation and unemployment move in the same direction, implying a positive relationship

between the two variables. Similarly, Ogbokor (2005) observed the same situation within the Namibian economy.

In 1968, Friedman (1968) criticized the idea of a perpetual downward sloping of the Phillips Curve. Instead, he underscored the existence of two Phillips Curves, a short-run Phillips Curve, and a long-run Phillips Curve, justifying that the trade-off is temporally in essence that it only exists in the short run and not in the long run. He further accentuated the expectations theory that states that individuals' expectations for economic events influence economic outcomes, giving rise to the Friedman natural rate theory, also known as the Friedman fooling theory. The Friedman natural rate theory insinuates that the economy returns to its natural unemployment in the long run. It had moved away because workers were influenced to think that inflation was lower than in the short-run.

Overall, Phillips (1958) and the Classical economists shared a mutual sentiment that the Phillips Curve exists only in the short-run, unlike in the long run. The short-run Phillips Curve and the long-run Phillips Curve are presented in Figures 2.1a and 2.1b, respectively.

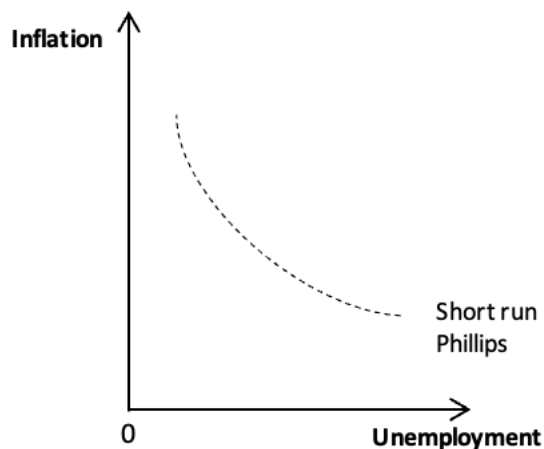


Figure 2.1a: Short-run Phillips Curve

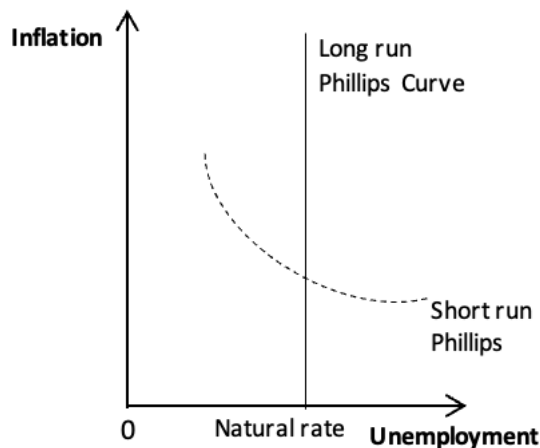


Figure 2.1b: Long-run Phillips Curve

As shown in figure 2.1. the short-run Phillips Curve holds both expected inflation rate and the natural rate of unemployment constant. Thus, a rise in inflation above the anticipated rate will lead to a fall in the unemployment rate below the natural rate and vice-versa. In figure 2.1b, the vertical slope presents the long-run Phillips Curve, implying the absence of a trade-off between inflation and unemployment. Unlike the short-run Phillips Curve, the long-run Phillips Curve holds only the anticipated unemployment rate constant and not for inflation, showing the nexus between the variables when the actual unemployment rate is equivalent to the expected inflation rate.

In short, both Friedman (1968); and Phelps (1967) have individually dared the theoretical underpinnings of the Phillips Curve's admiration as a guide to policy. Furthermore, they argued that, due to rationality between the employers and the employees, the two parties would only be concerned about the purchasing power of money wages that is altered for inflation. Hence, real wages would adjust to equalize the demand and supply of labor, resulting in a natural rate of unemployment. Inclusively, the ideology of all economists covered in the literature presented in this study conclude that the trade-off of the Phillips Curve is only applicable in the short run but not in the long run, and different Phillips Curves vary with the rate of inflation since fluctuations in inflation expectations have the potential to shift the Phillips Curve. Therefore, this study was conducted to validate the applicability of the Phillips Curve based on the arguments of these theories with special reference to the Namibian economy.

2.2. Empirical Literature

The literature presents various studies that investigated the Phillips Curve's relevance in different countries based on macroeconomic variables. From the rest of the world, Wulandari et al. (2019) quantitatively examined the nexus between inflation and unemployment rates in Indonesia using the Vector Error Correction Model (VECM) to determine the causality between the variables. The study used time series secondary data for Indonesia running from 1987 to 2018. Their results show a one-way relationship of inflation on unemployment in the third lag, and no effect of unemployment on inflation in both the short run and long run, leading to a conclusion that high rate of inflation is not associated with unemployment in Indonesia but rather by rising prices of essential goods, services, and fuel.

Shaari et al. (2018) analyzed the existence of the Phillips Curve in ten high-income countries from 1990 through 2014 using panel data analyses, such as panel unit root tests, panel cointegration tests, and panel Granger causality tests. Their results show a negative relationship between inflation and unemployment rates in both the short and long run, validating the notion of the Phillips Curve in high-income countries. Similarly, Kunst (2011) used the Vector Auto Regression (VAR) model to estimate the Phillips Curve for the United States to test for a determining relationship with the Phillips curve variables, using time series quarterly data from 1949 to 2014. The study used a different approach by adding interest rates to the model. The results show an inverse relationship between inflation and unemployment, indicating that the U.S. economy corresponds to the Phillips Curve.

Asides from that, Dritsaki and Dritsaki (2013) investigated the relationship between inflation and unemployment in Greece using annual data from 1980 to 2010 to examine the long-run relation for the case of Greece. Using the cointegration test and Granger causality test, their findings reveal the existence of the Phillips Curve only in the long run, unlike in the short run, implying that it does not hold up the trade-off between inflation and unemployment. This invalidates the notion of the Phillips Curve to the Greek economy. More, Rasna (2010) used Cointegration and Granger causality econometric analysis to determine the applicability of the Phillips Curve to Bangladesh by employing the macroeconomic time series data running from 1995-96 to 2009-2010 to test whether there exists a short-run or a long-run Phillips curve in Bangladesh. Also, the study used the interpolation method to remove the data inconsistency for unemployment between the periods that were not readily available in any data source. The results reveal that Bangladesh's economy does not ease the traditional concept of the Phillips Curve, as the country's economy was found to be simultaneously faced with high rates of both inflation and unemployment. Therefore, the economy of Bangladesh exhibits stagflation.

From the continental perspective, Oba and Enoch (2020) conducted a study to validate the Phillips Curve in Nigeria using time series quarterly data for inflation and unemployment from 2010 to 2018, employing the Generalized Methods of Moments and Canonical Cointegration Regression methods. Their results show a significant trade-off relationship between the variables, validating the existence of the Phillips Curve in the economy. In the same view, Touny (2013) examined the applicability of the Phillips Curve to Egypt in the long run for the period 1974 to 2011 using Johansen-Juselius cointegration tests and VECM. The results indicate a positive relationship between the variables in the long run, hence the Phillips Curve's absence. Furthermore, the study justified that the Egyptian stagflation was due to increased foreign

workers entering the country's labor market. Consequently, unemployment continues to escalate with high inflation.

From the national perspective, the literature presents a paucity of studies that addressed the nexus between inflation and unemployment in Namibia. Nevertheless, Ogbokor (2005) applied the Ordinal Least Square (OLS) model to investigate the applicability of the short-run Phillips Curve in Namibia, employing time series data from various publications covering the period 1991 to 2005. He also used interpolation and extrapolation techniques to stimulate missing data that were not readily available for the years. His results invalidated the Phillips curve notion by showing a direct relationship between inflation and unemployment in the short run that reflects the presence of stagflation. On the other hand, Shifotoka (2015) used the Vector Autoregressive model to assess the relationship between inflation, unemployment, and bank rates to the Namibian economy using time series data from 1961 to 2012. The results reveal a trade-off between the variables, confirming the existence of the Phillips Curve in Namibia. In a nutshell, the relationship between inflation and unemployment is inconclusive for the Namibian economy. From the empirical literature presented in this study, various researchers applied different methodologies and techniques in their studies regarding the notion of the Phillips curve for other countries across the world. Studies that utilized data of the years before 1980 bore semblance to the short-run Phillips Curve, while those that employed the data of recent years revealed stagflation where inflation and unemployment tend to move in the same direction. In the case of Namibia, there is a dearth of empirical investigation of the Phillips Curve within the Namibian economy. Yet, they show contradicting results, given the results of Ogbokor (2005) that bore no correspondence to the Phillips Curve whereas those of Shifotoka (2015) conforms to the notion of the Phillips Curve.

This study differs from that of Ogbokor (2005); and Shifotoka (2015) in such a manner that it excluded the periods of the crises, specifically the 1973-74 and 1979-1980 of the oil shockwaves, and 2007-2008 of the financial crises, which were not considered in the study of Shifotoka (2015), as well as 2020-2021 of the COVID-19 pandemic. Even though the study of Ogbokor (2005) did also not encompass the period of the crises, it used a shorter period compared to the period of this study. Lastly, this study expanded the analysis by including the Granger causality test to determine the causal relationship between the variables, which was not covered in any of these early studies.

3. Methodology

This is a quantitative study that relied on semi-annual time series secondary data running from 1990 to 2019 collected from the World Bank database to examine the validity of the Phillips Curve in Namibia, excluded the periods of 2007-2008 of the global financial shock, as well as 2020-2021 of COVID-19 pandemic. The study employed various econometrics analyses, encompassing unit root tests, Ordinary Least Squares (OLS), and Granger causality test. The unit root test was applied for stationarity testing of the data, while the OLS model was used to analyze the relationship between inflation and unemployment for the Namibian economy. Lastly, Granger causality test was employed to determine the causal relationship between the variables. In this light, the variables were defined in the following manner:

Let Inf_t = annual rate of inflation (%), and

$Unemp_t$ = annual rate of unemployment (%)

Thus, the general functional model was specified as:

$$Inf_t = f(Unemp)$$

$$\therefore Unemp_t = f(Inf)$$

Where Inf represents inflation, $Unemp$ is unemployment, and t is time period. More, the linear regression equations were specified as follow:

1. $Inf = \alpha_0 + \alpha_1 Unemp$

2. $Unemp = \alpha_0 + \alpha_1 Inf$, where α_0 is the constant while α_1 is the represents the coefficient of the variables.

Finally, Granger causality analysis was expected to follow one of the four possible outcomes of the Granger causality test, constituting:

1. Inflation granger causes unemployment,
2. Unemployment granger causes inflation,
3. Each variable is independent of the other, and
4. Two-way causality between inflation and unemployment

4. Findings and Result Discussion

4.1. Stationarity Test

The unit root test was performed to determine whether the data were stationary or non-stationary, using the Augmented Dickey Fuller test (ADF) and Phillips-Perron (P.P.) test of a unit root. The results show that all the variables were stationary at level forms, implying the absence of the long-run relationship between the variables. Thus, the Ordinary Least Square (OLS) regression analysis was performed for the short-run relationship between inflation and unemployment.

4.2. Ordinary Least Square (OLS) Regression

The Ordinary Least Square (OLS) regression was performed to measure the short-run relationship between inflation and unemployment. In the model, R^2 is the coefficient of determination determining the degree to which the predictor variable(s) can account for a systematic variation in the regressand variable. It also estimates the goodness fit of the model. Moreover, the Durbin-Watson (D.W.) measures the correlation between the residuals and estimates whether autocorrelation exists in the model. Lastly, the t-statistic tests the null hypothesis where the coefficient of zero for the regressor implies that it has no effect on the regressand. The results of the OLS regression analysis are presented as follows:

1. $\text{Inf} = 0.077521 - 0.141501(\text{Unemp})$
t-stats = (0.225909) (-2.477523)
 $R^2 = 0.102067 < D-W = 1.541397$
2. $\text{Unemp} = 0.003408 - 0.082213(\text{Inf})$
t-stats = (0.038575) (-2.477523)
 $R^2 = 0.102067 < D-W = 1.518413$

From the results, the coefficients of the explanatory variables constituted in equations 1 and 2 are negative and statistically significant at a 5% level of significance. This implies an inverse relationship between inflation and unemployment. Precisely, a unit increment in the inflation rate is associated with a reduction of 14% in the unemployment rate. Similarly, a unit increment in the unemployment rate is interlinked with a decrease of about 8% in the inflation rate. More, approximately 10.21% of the systematic variation in the regressand is accounted for by the predictors. In addition, the coefficient of determination in both equations is less than the Durbin-Watson statistic, indicating a good fit of the model and the absence of serial correlation. This was confirmed with reliability and stability tests using the Breusch-Godfrey Serial Correlation L.M. test and CUSUM tests.

Overall, evidence from the analyses conforms to the trade-off between inflation and unemployment postulation of the Phillips Curve (1958) with respect to the Namibian economy. These results correspond to the findings of Shifotoka (2015) who observed an inverse relationship between inflation and unemployment, yet against those of Ogbokor (2005), who found the Namibian economy exhibiting stagflation. Ogbokor (2005) related his findings to the actual situation when inflation and unemployment were instantaneously increasing. In the current era, the real situation differs as the Namibian economy has been faced with unceasing increment in the unemployment rate over the years but not necessarily in inflation.

4.3. Granger Causality Test

A pairwise Granger causality test was used to establish the causal relationship between inflation and unemployment. As displayed in table 4.3, the study found probability values for both variables to be greater than the significant level (0.05). In this regard, the study failed to reject the null hypotheses to imply that unemployment does not granger cause inflation and inflation does not granger cause unemployment. This led to the conclusion that there is no causal relationship between the variables, implying that they are independent.

Table 4.3: Granger causality test

Pairwise Granger Causality Tests			
Null Hypothesis:	Obs	F-Statistic	Prob.
UNEMP does not Granger Cause INF	53	0.18716	0.8439
INF does not Granger Cause UNEMP		0.35041	0.2336

5 Conclusion and Recommendation

This study aimed to investigate the relationship between inflation and unemployment and determine the applicability of the Phillips Curve to the Namibian economy. The unit root test results indicate that inflation and unemployment were stationary in their level forms, implying the absence of the long-run relationship. Hence, the Ordinary Least Square (OLS) regression analysis was performed to measure the short-run variables' nexus. The OLS results reveal a bidirectional relationship between inflation and unemployment, validating the presence of the Phillips Curve in the Namibian economy. The results correspond to the findings of Shifotoka (2015) that incorporated the periods of economic shocks, signifying that the critics of the Philips Curve with respect to the consideration of economic crises is nonsensical to the Namibian economy. In a nutshell, it is evident from this study that Namibia can only address one of these macroeconomic issues, and not both of them simultaneously. Therefore, the study calls upon policymakers to adopt a policy mix that can be favorably disposed towards addressing the devastating issue of unemployment, predominantly among the youth, to mitigate the adverse effects of these macroeconomic challenges. Furthermore, the variables were also found to be independent of each other. Thus, the study recommends further investigations to delve deeper into the determinants of inflation and unemployment in Namibia. This will give proper guidelines to policymakers in formulating and assimilating policies intended to tackle inflation and unemployment when they know where the issue is deriving from. Lastly, it is also crucial for future studies to consider panel studies for low-income countries, particularly those in the same region, such as a panel investigation on the phenomenon for member states of the Southern Africa Customs Union (SACU).

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Appendices

Appendix 1: Unit Root Test

UNIT ROOT TEST TABLE (P.P.)			
		At Level	
		INF	UNEMP
With Constant	t-Statistic	-2.6012	-2.4264
	Prob.	0.0988*	0.1393
With Constant & Trend	t-Statistic	-3.2124	-2.4607
	Prob.	0.0925*	0.3458
Without Constant & Trend	t-Statistic	-1.0402	-0.1007
	Prob.	0.2654	0.6446

UNIT ROOT TEST TABLE (ADF)			
		At Level	
		INF	UNEMP

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With Constant	t-Statistic	-2.3277	-3.6589
	Prob.	0.1679	0.0075***
With Constant & Trend	t-Statistic	-4.375	-4.0452
	Prob.	0.0052***	0.0131**
Without Constant & Trend	t-Statistic	-2.507	-0.2729
	Prob.	0.0133**	0.5823

Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%. and (no) Not Significant

Appendix 2: OLS Regression Analysis

Dependent Variable: D(INF)

Method: Least Squares

Sample (adjusted): 1991S2 2019S1

Included observations: 56 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.077521	0.343149	0.225909	0.8221
D(UNEMP)	-0.141501	0.501106	-2.477523	0.0164
R-squared	0.102067	Mean dependent var	-0.091044	
Adjusted R-squared	0.085439	S.D. dependent var	2.684823	
S.E. of regression	2.567569	Akaike info criterion	4.758857	
Sum squared resid	355.9902	Schwarz criterion	4.831191	
Log likelihood	-131.2480	Hannan-Quinn criter.	4.786901	
F-statistic	6.138118	Durbin-Watson stat	1.541397	
Prob(F-statistic)	0.016390			

Dependent Variable: D(UNEMP)

Method: Least Squares

Sample (adjusted): 1991S2 2019S1

Included observations: 56 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003408	0.088344	0.038575	0.9694
D(INF)	-0.082213	0.033183	-2.477523	0.0164
R-squared	0.102067	Mean dependent var	0.010893	
Adjusted R-squared	0.085439	S.D. dependent var	0.690894	
S.E. of regression	0.660720	Akaike info criterion	2.044089	
Sum squared resid	23.57377	Schwarz criterion	2.116423	
Log likelihood	-55.23448	Hannan-Quinn criter.	2.072132	
F-statistic	6.138118	Durbin-Watson stat	1.518413	
Prob(F-statistic)	0.016390			

Appendix 3: CUSUM test

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