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THE PUZZLE OF UNEMPLOYMENT AND INFLATION: A CAUSALITY ANALYSIS TO ETHIOPIA

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Abstract:
The puzzle of unemployment and inflation has remained controversial. The choice between the two ends up with cost borne from the other end. Of course, the policy aim is to keep them both to their minimum possible rates. Countries need to examine the dynamics between the two and choose one with lesser harm to the general system. We applied Granger Causality approach to examine the nature of causality between inflation and unemployment to Ethiopia, using a time series running from 1984 to 2018. Accordingly, the-two-way causality between inflation and unemployment (cyclical) variables has been confirmed. Thus, macroeconomic policies need to appreciate this interdependence while designing policy settings.

Keywords:
Granger Causality, Inflation, Phillips Curve, Unemployment

1. Introduction

Of the chief ends with macroeconomists, the two basics are to keep inflation and unemployment minimums. However, these two different ends appear to contradict in practice. Phillips curve is the popular macroeconomic theory to hypothesize an inverse relationship between inflation and unemployment variables. A premise is that, a rise in production and employment is possible only at the cost of rising prices and vice versa. Any policy scheme to boost the aggregate demand is associated with higher output, higher employment and higher price. Owing to more demand (due to additional employment), the price level tends to rise sustainably, which in turn, could result in higher inflation. In contrast, when the aggregate demand falls following the fall in aggregate output, an economy ends up with rising unemployment and but, falling inflation rates (Mankiw, 2008; Snowdon and Vane, 2005)

The1960s US experience showed the validity of the Phillips curve very well. At the time, policymakers tried reducing unemployment only at the cost of higher inflation, which is exactly what was briefed with the Phillips curve (see Pirayoff, 2004; Mankiw, 2010).The fall in tax rate coupled with expansionary monetary policy in 1964, increased the aggregate demand and reduced the rate of unemployment rate below 5 percent. This upward move in aggregate demand has continued, even, during the final years of 1960s following the US government expenditure for financing war against Vietnam. As a result, the US economy was forced to experience lower unemployment and higher than the targeted rate of inflation, towards validating the Phillips curve hypothesis here again. The earlier years of 1970s were harsh to US economy due to inherited inflation from the 1960s. Following the application of tight monetary policy and the US recession due to the Organization of Petroleum Exporting Countries (OPEC) during the late 1970s, the higher unemployment has reduced the inflation rate only slightly; though farther increase in oil prices pushed inflation up (Curtis and Irvine, 2015; Heijdra, 1996).

Our back-look is not just to tell you history alone, but rather, how the two policy variables tend to contradict in practice. All this is to indicate the paradox of unemployment and inflation in policy formulation. A basic concern with regard policy formulation could be determining the optimum level of both variables, and then controlling their normal operation. The original Phillips curve, however, was limited only to wage inflation; but because of its implication with the general price inflation, the Phillips curve has been extended to unemployment-inflation analyses, which we are employing here too.

By far, it is vital to attest how the two macroeconomic variables are acting each other in a particular system. The Phillips curve is, therefore, an instant tool of analysis in that regard. We aimed at verifying the validity of the Phillips Curve in the context of Ethiopian economy. For our purpose, we have extracted a time series of realizations on seven macroeconomic variables and examined the dynamics of each in the very long run. For the causality issues, however, we focused only on the series of the unemployment and inflation variables for periods ranging between 1984 and 2018. In an attempt to appreciating the likely time impact on the nature of causation, we also have considered both the short and long run analyses.

Perhaps for Ethiopia, unemployment and inflation are the two most development disasters at present. Despite the recently appreciable growth records, the country's economy has been unable to satisfy the ever rising employment demands (NBE, 2016; WB, 2015). Besides, the country has registered higher inflation rates for the last three or four consecutive months, compared to the same for the last ten and even more years. According to the government's half- fiscal year performance report, the Consumer Price Index (CPI) measured inflation rate was estimated at 14 percent during June, 2018, average of 12 percent during September to December, 2018, again 12 percent during February, 2019, and mounted to 16 percent in May, 2019 (MoFEC, 2019). When we look at these figures, Ethiopia is hosting the double-digit inflation rate which is in excess of the recommended threshold of 8 percent. Besides, the unemployment rate in the country was registered to be more than an average of 12 percent for the last two years, thereby signifying the severity of both problems in Ethiopia. Surprisingly, both variables tend to move in the same direction because of the country facing many internal and external shocks. Even though it needs a more detailed investigation of a complete system, we focus on only two of the appealing policy challenges: inflation and unemployment. The recent trends in both variables indicate the highest and continuously rising rates through time, and that both variables have been the most development challenges in the country. A wiser approach is to deal with the dynamics of each, and scrutinize which mainly enlightens the other and decide on the appropriate strategic action thereof.

2. Methods and Procedures

2.1. Data Source and Type

The data used were exclusively of secondary types, and obtained from the National Bank of Ethiopia. For the causality tests, we collected a time series data set on the CPI inflation and the cyclical unemployment rates from the time periods between 1984 and 2018.

2.2. Stationarity Tests

The Granger causality assumes that the variables under consideration are all stationary (Maddala, 1992). To examine the unit root properties both variables were subjected to the augmented Dickey-Fuller unit root examination approach. Accordingly, both variables were suggested to be integrated of order one. Besides the stationarity tests, we have examined all of the necessary pre and post estimation tests and in none of them is invalidity suggested.

2.3. The Model

The Granger causality test approach has been employed to address our objective thereof. This method is the popular approach in most empirical analyses that are looking at the endogeneity of different variables of interest in their model adapted for empirical analysis. The Granger causality necessitates stationarity among all the series of interest. Besides the variable being stationary, the test also requires that the error terms involved shouldn't be correlated. We actually confirmed both necessities as parts of our methodological procedure. From Maddala (1998; Wooldridge, 2013), Granger causality test is based on the following regressions;

$$\Delta lnUEMT_t = \sum_{i=1}^{n} \theta_i \Delta lnCPI_{t-i} + \sum_{i=1}^{n} \gamma_i \Delta lnUEMT_{t-i} + u_{1t} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1.1)$$

$$\Delta lnCPI_t = \sum_{i=1}^{n} \pi_i \Delta lnUEMT_{t-i} + \sum_{i=1}^{n} \beta_i \Delta lnCPI_{t-i} + u_{2t} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1.2)$$

Where, Δ represents the first difference; $i = 3$ is the suggested lag length to minimize *AIC*; *UEMT* and *CPI*, respectively, are the unemployment and inflation rates. *CPI* is the consumer price index used as proxy to inflation;

and *ln* is the natural logarithmic operator of corresponding variables; and *t* is the time trend. The Granger causality test is based on the *F*-statistics obtained from regression of equations (1.1) and (1.2) above. For instance, from (1.1) we first regress the current unemployment on its current as well as all of its lagged values and current inflation only to obtain the Restricted Residual sum of Squares (RSS_R). Next, we run the same regression including all of the lagged terms of the inflation variable to obtain the unrestricted residual sum of squares (RSS_{UR}). Then the F-statistic is given by the formula (Gujarati, 2004):

$$F = \frac{(RSS_R - RSS_{UR})/_h}{(RSS_{UR})/_{n-k}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1.3)$$

Where, h represents the number of *UEMT* lagged terms, and *k* is the number of parameters estimated in the unrestricted regression, which follows *F*-distribution with *n–k* degrees of freedom. A null hypothesis is, then, H_0: $\sum \gamma_i = 0$ implying that, the lagged *UEMT* do not belong in the equation. If the calculated *F* exceeds the critical at chosen level of significance, we reject the null hypothesis, and say the lagged *UEMT* terms belong in the regression: which is to mean *CPI* causes *UEMT*. Exactly similar procedure is followed to test whether the influence runs the other way.

3. Results and Discussion

Below we present the short run and long run causality analyses results, respectively.

Table 1.1: Short-run Granger Causality Wald test Results

Null hypothesis (H_0):	*F-Stat*	*Prob.*
Unemployment does not Granger cause Inflation	2.124081	0.1459
Inflation does not Granger cause Unemployment	3.312775	0.0444

Source: (Own analysis based on NBE, 2018)

Evident from table (1.1) is only unidirectional causality between inflation and the unemployment variables. Specifically, we confirmed the flow of influence from inflation to unemployment owing to the significant probability value of the computed F-statistics thereof; and nothing in reverse. Hence, we partly guarantee the Phillips curve in the short run in reference to Ethiopia.

Table 1.2: Long-run causality Analysis Results

Null hypothesis (H_0):	*a*	*Prob.*
Unemployment does not cause Inflation	-1.304447	0.0000
Inflation does not cause Unemployment	-7.775125	0.0000

Source: (Own analysis based on NBE, 2018)

Where *a* is the corresponding cointegrating parameter, or the coefficient of error correction term (ECM); and *prob.* represents the probability of each computed *t-statistics* of the corresponding cointegrating parameters. The long-run causality between the two variables behaves differently while the short-run situation is noted. As we can verify very easily from table (1.2), the computed cointegrating coefficients are negative in sign as well as strongly significant in magnitude, whereby implying for the existence of bidirectional causality between inflation and unemployment in the long run. It means that, inflation causes unemployment and unemployment in turn causes inflation in the long run. The transmission is not in a single path, unlike the case in the short-run. We thus confirm that, the Phillips curve is operational with reference to the long run macroeconomic dynamics of Ethiopia.

4. Concluding Remarks

In reference to the Ethiopian economy, Inflation causes inflation causes unemployment in the short run, though short run causality the other way is not suggested. In the long run, both variables are significantly dependent one another. Hence, macroeconomic policy makers need to consider the interdependence between inflation and unemployment while framing the national policies regarding them both.

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