

Trade-off between Inflation and Unemployment in the Short Run: A Case of the Indian Economy

Dr. Vasa. Prabhakar
Department of Commerce and Management,
Government Degree College, Khairatabad, Hyderabad, Telangana. India

Abstract

Unemployment and inflation are issues that are central to economic life of every developing country. This paper estimates the short-run trade-off between inflation and unemployment for the Indian economy over the period 2011-2019, in order to know whether there is a trade-off between inflation and unemployment. In short run there is inverse relationship of inflation with the unemployment, increase in inflation leads to decrease in unemployment and vice versa. This variable is subjected to Bi-variants regression analysis, with unemployment as its dependent variable in the first model, inflation in the second model and real GDP in the third model. The research outcomes proved the effective orientation of unemployment for the inflation and real GDP at statistically non-significance level. The findings proved the negative effect of unemployment for inflation and positive effect on real GDP. The unemployment is a continuously occurring phenomenon in all economies of developing countries where it is affecting highly the level of employment; price level, living standard of people, and real GDP. The findings proved the influential relationship between unemployment and inflation conditions, Unemployment and Real GDP conditions, but in our economic condition it is proved as non-significant. Consequently, the major policy implication of these results is that concerted efforts should be made by policy makers towards restructuring the economy, managing price instability and level of employment.

Keywords: Unemployment, Inflation, Real GDP, Short run Philips curve, Bi-variate regression model

I. INTRODUCTION

Inflation and unemployment economic problems both impact the common man life. High Productivity (Real GDP), price stability and low unemployment are the most desirable macroeconomic goals. In this regard in 1960, the concept of Phillips curve emerged, by A.W. Phillips who is the pioneer of the Phillips curve in UK. This curve suggests negative relationship between the rate of inflation and unemployment. There are two studies which provided explanations of the possible Phillips curve, relationship between the two variables in the short-run and the long run as; first one is, in short run, there is trade-off between inflation and unemployment. Second, in the long run there is no significant trade-off between inflation and unemployment. Therefore economists are in best interest to identify their relationship; there is a short run trade-off between the rate of inflation and unemployment, (McConnell, 16th Ed). In this regard it has been also seen in many studies that there is short run trade-off between Inflation and unemployment in different countries in different time periods. The term inflation refers to increase in overall price level of goods and services in the economy which leads to decrease in the purchasing power of household. Because whenever prices increases, the value of money will depreciate and ultimately the real income of household will decrease. The unemployment is that condition in the economy when supply of labor exceeds the demand of labor in the labor market. Similarly, a person who is willing to do the job but due to shortage

of the jobs he or she could not find the job in the economy is known as unemployment. The inverse relationship between inflation and unemployment rate as represented by Phillips curve is only a short-term relationship i.e., unstable, because it prevails for a limited period of time and there are factors which lead Phillips curve to another situation, and the major factor that leads to instability is unexpected inflation where the real wage for workers is declining, which motivates them to demand higher nominal wage, as a result the business reduces its demand for labor, which increases unemployment. So, unexpected inflation is accompanied by an increase in the unemployment rate. The macroeconomic goals which the government strives to achieve are the maintenance of stable domestic price level and full-employment. Macroeconomic performance is judged by three broad measures—unemployment rate, inflation rate, and the growth rate of output (Ugwuanyi, 2004). The long-run relationship between changes in the rates of GDP growth and unemployment is the rate of growth in potential output. Potential output is an unobservable measure of the capacity of the economy to produce goods and services when available resources, such as labor and capital, are fully utilized. The rate of growth of potential output is a function of the rate of growth in potential productivity and the labour supply when the economy is at full employment. When unemployment rate is high, as it is now, then actual GDP falls short of potential GDP. This is referred to as the output gap. In the absence of productivity growth, as long as each new addition to the labour force is employed, growth in output will be equal to growth in the labour supply. If the rate of GDP growth falls below the rate of labour force growth, there will not be enough new jobs created to accommodate all new job seekers. Unemployment and inflation are issues that are central to both the social and economic life of every country. The existing literature refers to unemployment and inflation as constituting a vicious circle that explains the endemic nature of poverty in developing countries. And it has been argued that continuous improvement in productivity—which brings about the adequate supply of goods and services—is the surest way of breaking the vicious circle. Problem of inflation in Indian economy is that, Inflation erodes the value of money that constrains people and firm to minimize their holding of cash. When price rises, sellers must use resources to change nominal prices. Then society's output of goods and services is reduced by devoting resources to these activities. Problem of unemployment in India is that, Loss of output is the major problem of unemployment because the unemployed labour force does not add to the productivity. And they do not pay taxes, even tax—payers of the society also bear some of the output cost of the unemployed. The main Objectives of this paper is focus on: Firstly: To determine the role of inflation, unemployment and Real GDP in Indian economy, secondly: To examine, is there any trade-off exists between inflation and unemployment in Indian economy during study period and thirdly: To study the impact of Real GDP on unemployment in Indian Economy.

II. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

It illustrates the rate of wage inflation that would result if a particular level of unemployment persisted for some time. After Phillips' work, economists studied the Phillips curve; some validated it while others refuted it. Thus, Friedman (1977) contended that there is no trade-off between inflation and unemployment in the long run, representing a monetarist view of Phillips curve.

A. Theoretical Framework

Phillips Curve was named after the British economist A.W. Phillips, who first examined the relationship between the rate of unemployment and the rate of money wage changes. His analysis was based on data for the United Kingdom from 1861-1957. Phillips derived an empirical result that there was an inverse relationship between the rate of unemployment and the rate of increase in money wages. Phillips found a consistent inverse relationship: when unemployment was high, wages increased slowly; when unemployment was low, wages rose rapidly. The Phillips curve represents the average relationship between unemployment and wage behavior over the business cycle. He argued that, any attempt to hold the unemployment rate at an artificially low level would cause inflation to accelerate indefinitely. He argued that, there is a natural rate of unemployment where the real wage rate is in long run equilibrium for employment rate to be below the natural rate, employers and potential employees must be willing to be hired.

B. Literature Review

Karanassou & Sala (2010) argued there is a trade-off between inflation and unemployment in long run because of money and productivity growth which leads to decrease in unemployment, while supply shock like oil prices which leads to increase in unemployment. In the case of 1970, monetary expansion led to increase in inflation and reduced the unemployment which was very negligible, and slowdown in productivity also led to increase in inflation and unemployment. He argued that increase in productivity growth causes decrease in inflation and also fall in unemployment. Hussein Ali Al-Zeaud (2011) argued that there is no tradeoff between inflation and unemployment in Jordan economy between 1984 and 2011 because foreign labour were not involved in the unemployment rate calculation. He used Granger-Causality test to check relationship between variables and the direction of causation and techniques depends on testing stationary, integration, co-integration as per-requisites. Liu & Jansen (2010) had argued that, the basic concept of traditional Phillips curve model holds that there is a trade-off between inflation and real activity (unemployment), therefore, it is still used to forecast inflation. Berger (2010), they find that increase in cyclical unemployment will lead to decrease in output which ultimately causes to decrease in inflation. Afzal & Awais (2012) argued that there is a trade-off between inflation and unemployment in short run by using latest version of empirical study of Phillips curve for Pakistan. He found that reduced form of Phillips curve structure reveals that the expected inflation is significant for all periods. He said that high economic growth, price stability and low unemployment are the most enviable macroeconomic goals. Inflation is regarded as a problem when the inflation rate is too high and rising. Unemployment results from lack of employment opportunities and is a permanent feature of the economy. Das & Martin (2013) used Phillips curve to estimate the output gaps for Indian Data. And modified Hodrick-Prescott filter with a non-constant smoothing parameter. He allows the smoothing parameter over time and its value reflects the nature and magnitude of supply and demand shock in India. Quin & Wang (2013) he argued that there is a visual relationship between the inflation and unemployment. He used statistical and consistent data for economic condition of china. He also used correlation of co-efficient and causality between inflation rate and unemployment rate for the period of 1978 to 2011. He proved empirical Phillips curve is ineffective to find causal relationship between the inflation rate and unemployment rate in China. Franz (2010) concluded that it is very hard to assess the NAIRU, if the joint relationship of inflation, wage increases and unemployment get worse because

NAIRU is the point where inflation is constant at consistent rate of unemployment. Apel & Jansson (1999) argued that Phillips curve equation also helps in precision of estimating the potential output and the NAIRU. Sagar Katria et al. (2011) Sukkur Institute of Business Administration, and Sukkur aimed to identify the relationship between inflation and unemployment in SAARC countries from the perspective of Phillips curve. Unbalanced annual panel data of 8 SAARC members (Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka) and 6 expected member of SAARC (Republic of China, Russia, Indonesia, Iran, Myanmar and South Africa) had been used for the period 1980-2010. This paper found significant results; there is a negative relationship between inflation and unemployment rate in the SAARC Countries. Concept of Phillips curve holds true. Still on the relationship between unemployment and inflation, Studies by Aminu & Anono (2012) using the Augmented Dickey-Fuller technique, revealed that there is no causation between unemployment and inflation and that a long-term relationship exist between the two. Also, the study revealed a negative relationship between unemployment and inflation and a minimal applicability of various theories of unemployment and inflation in India

III. METHODOLOGY AND DATA SOURCE

The secondary data are used for this study period from 2009-2015. Therefore, data were sourced from Central Bank of India (CBI) Statistical bulletin which includes; data on real gross domestic production (RGDP), consumer price index proxy for inflation (INF) and Ministry of labour & employment for unemployment rate (UNEMP). The ordinary least square method and Bi-variety regression model of econometric approach was used in estimation.

A. Model Specification

To study empirically on the relationship between unemployment and inflation in Indian economy, a model will be employed. In the first model, inflation, Real GDP will be regressed on unemployment; in order to ascertain the impact of the explanatory variables on the explained variable. In the second model, unemployment, Real GDP will be regressed on Inflation and in the third model, inflation and unemployment will be regressed on Real GDP. The model of the form will be formulated which is adopted by Bello Malam Sa'idu1 (2015) as stated below. From the foregoing analysis, three models can be written in its functional form as follows:

$$UNEMP = f(INF, RGDP)$$

$$INF = f(UNEMP, RGDP)$$

$$RGDP = f(UNEMP, INF)$$

To fully appreciate theories of expectations, it is helpful to review the difference between real and nominal concepts. Anything that is nominal is a stated aspect. In contrast, anything that is real has been adjusted for inflation. To make the distinction clearer, consider this example. Suppose you are opening a savings account at a bank that promises a 5% interest rate. This is the nominal, or stated, interest rate. However, suppose inflation is at 3%. The real interest rate would only be 2% (the nominal 5% minus 3% to adjust for inflation).

The difference between real and nominal extends beyond interest rates. In an earlier atom, the difference between real GDP and nominal GDP was discussed. The distinction also applies to wages, income, and exchange rates, among other values.

Table 1. Inflation rate of India in percentage during 2011-2017

| Years | Inflation Rate (%) |
|-----------|--------------------|
| 2011-2012 | 10.83 |
| 2012-2013 | 12.11 |
| 2013-2014 | 8.94 |
| 2014-2015 | 7.35 |
| 2015-1016 | 5.98 |
| 2016-2017 | 6.37 |

Where, UNEMP = unemployment Rate, INF = Inflation Rate, Real GDP = Real Gross Domestic Product and f = functional relationship Expanding the model into a linear mathematical relationship, we have,

$$\text{UNEMP} = \beta_0 + \beta_1 \text{RGDP} + \beta_2 \text{INF} \quad (1)$$

$$\text{INF} = \beta_0 + \beta_1 \text{UNEMP} + \beta_2 \text{RGDP} \quad (2)$$

$$\text{RGDP} = \beta_0 + \beta_1 \text{UNEMP} + \beta_2 \text{INF} \quad (3)$$

Econometrics model, by including stochastic term (ET), thus our model becomes;

$$\text{UNEMP} = \beta_0 + \beta_1 \text{RGDP} + \beta_2 \text{INF} + \text{et} \quad (4)$$

$$\text{INF} = \beta_0 + \beta_1 \text{UNEMP} + \beta_2 \text{RGDP} + \text{et} \quad (5)$$

$$\text{RGDP} = \beta_0 + \beta_1 \text{UNEMP} + \beta_2 \text{INF} + \text{et} \quad (6)$$

Where, β_0 is intercept depicting unemployment when the explanatory variables are equal to zero in first model, inflation in the second model when the explanatory variables are equal to zero and Real GDP in the third model when the explanatory variables are equal to zero. β_0 and β_1 are the co-efficient or parameters attached to the explanatory variables. The inclusion of the stochastic or error term (et) in the above model is to capture the impact of other variables that are not included in the models. 3.1.1 Inflation Rate

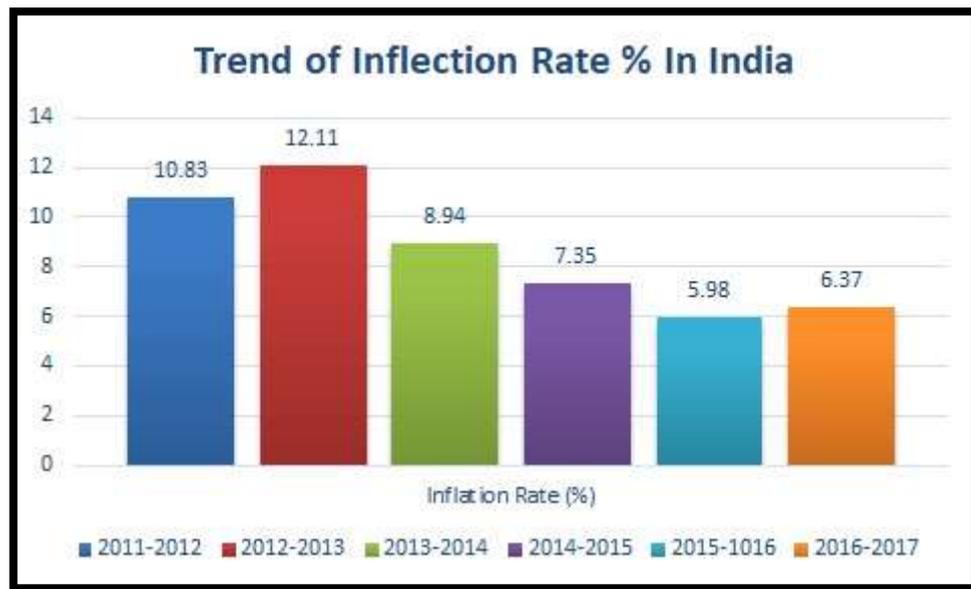


Figure 1: Inflation rate (%) in India

The figure 1 shows average inflation rate (%) in India from the year 2011-2017. In year 2010-2011 inflation rate is increased by 1.28%, but decreased by 3.17 % in 2011-2012. It was decreased continuously and reached to 6.37% in 2014-2015. From the above data we can conclude that situation of inflation in India sometime increased or decreased i.e., fluctuated not linearly changed.

Table 2: Table form year to Unemployment Rate

| Years | Unemployment Rate (%) |
|-----------|-----------------------|
| 2011-2012 | 10.1 |
| 2012-2013 | 10.8 |
| 2013-2014 | 9.8 |
| 2014-2015 | 8.5 |
| 2015-2016 | 8.8 |
| 2016-2017 | 7.4 |

There is no short run tradeoff relationship between inflation and unemployment in India. Null hypothesis (Ho): There is insignificant relationship between inflation and unemployment. Real Gross domestic product (GDP) has no significant impact on unemployment in India. From the regression result, the coefficient of inflation is negative in first model, this is showing that short run tradeoff relationship does not exists between inflation and unemployment. The co-efficient of unemployment is positive in second model. This is showing that inflation has positive effect on unemployment. It has further seen from the analysis that gross domestic product was found to be statistically non-significant in the third model. From the third model, co-efficient of inflation is positive and Statistical significance with Real GDP taken as a dependent variable. This analysis shows non- significant impact of unemployment variable on Real GDP. It has been seen in the study that prices of commodity increases indicates higher rate of inflation in the country while reverse is true for deflation. → The available data of Inflation and unemployment it has been seen in the study that when inflation increases in the year the unemployment rate also increases in different ratio or independent ratio. → The data of inflation and

employment shows inverse relation with each other, this indicates that when inflation increases the unemployment decreases.

IV. RESULTS:

Experiential results as evidence proved the relationship between inflation, GDP and unemployment as influencing each other at insignificant level. The results of the quantitative outcome proved that Unemployment is one of vibrant and influential phenomenon in the economy of India. And the inflation needs to be considered as one of the important factor for the economies to consider it towards strategic economic decisions. The quantitative factors of the economies are mainly to be considered for the strategic decision to lead the rational approaches in the economic decisions for Indian economy

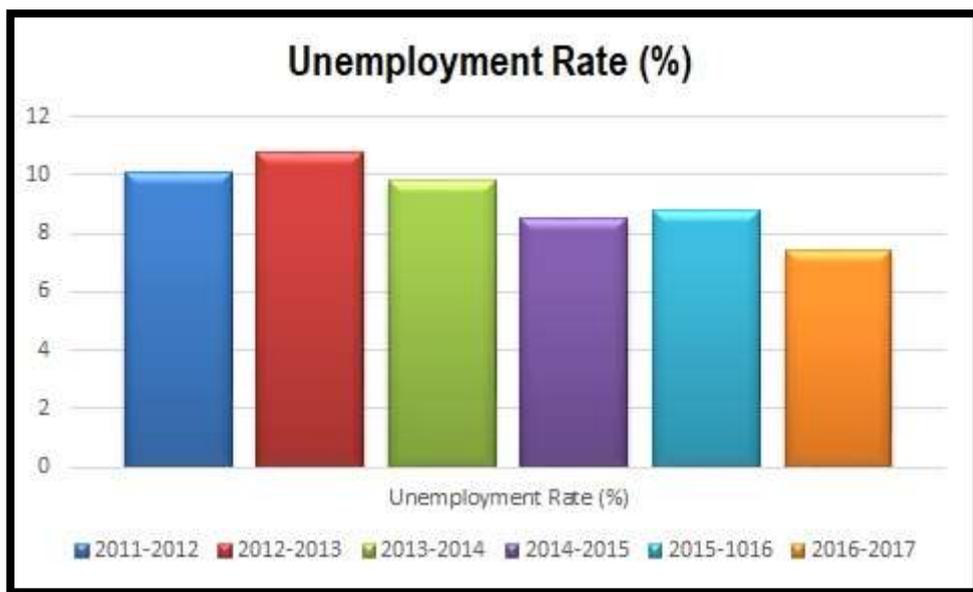


Figure 2: Indian Unemployment rate

It has seen that unemployment rate is increased only by 0.7 % in 2010-2011 but decreased by 1% in year 2011-2012. It decreased continuously reached to 7.3 in year 2014-2015. Unemployment rate sometime increased and decreased as shown in the above graph, so it seen that, there is fluctuation in unemployment rate in Indian economy

Table 3: Regression Model 1

| Regression (model 1) fit between UNEMP = INF, Real GDP (2009-2015) | | | |
|--------------------------------------------------------------------|--------------------|----------|-------------------|
| R ² (r- Square) | Adjusted R-squares | f-test | Significant level |
| 0.763772 | 0.606287 | 4.0635 | 0.1975 |
| Regression (model 2) fit between INF = UNEMP ,RGDP (2009-2015) | | | |
| R ² (r-Square) | Adjusted R-Squares | f- test | Significant level |
| 0.962436 | 0.937394 | 38.43223 | 0.00728 |
| Regression (model 3)fit between Real GDP= UNEMP,INF (2009-2015) | | | |
| R ² (r-square) | Adjusted R-squares | f-test | Significant level |
| 0.951864 | 0.919773 | 29.66177 | 0.010561 |

Unemployment Rate in India decreased by 4.90 percent in 2013 from 5.20 percent in 2012. Unemployment Rate in India averaged 7.32 percent from 1983 until 2013, reached an all-time high of 9.40 percent in 2009 and recorded lowest of 4.90 percent in 2013.

Table 4: Regression results between unemployment First charts

| Regression result between Unemployment = Inflation, Real GDP | | | | | |
|---------------------------------------------------------------------|--------------|------------|----------|----------|-------------------|
| Variables | Co-efficient | Std. Error | t-test | t-prob. | Significant level |
| Constant | 3.323638 | 1.959568 | 1.696107 | 0.188435 | 0.1975 |
| RGDP | 0.516477 | 0.237332 | 2.176178 | 0.117771 | |
| INF | -0.18398 | 0.327438 | -0.56187 | 0.613446 | |
| Regression result between Inflation= Unemployment, RGDP | | | | | |
| Variables | Co-efficient | Std. Error | t-test | t- prob. | Significant level |
| Constant | -6.26727 | 2.070694 | -302665 | 0.056461 | 0.00728 |
| UNEMP | 1.162728 | 0.272325 | 4.269637 | 0.023581 | |
| RGDP | 0.62212 | 0.170106 | 3.657237 | 0.035313 | |
| Regression result Real GDP= Unemployment, INF | | | | | |
| Variables | Co-efficient | Std. error | t-test | t-prob. | Significant level |
| Constant | 8.557254 | 2.726748 | 3.138264 | 0.051733 | 0.010561 |
| UNEMP | -1.72805 | 0.49934 | -3.46066 | 0.040621 | |
| INF | 1.672243 | 0.275061 | 6.079532 | 0.008935 | |

Table 5: F-Statistics for Model 2

For the first model, The R-square of 0.76 illustrates that 76% variation in unemployment is explained by Real GDP and Inflation in first model. The R-square of 0.76 illustrates that 76% variation in Unemployment is explained by Inflation and Real GDP in the first model. Also, the adjusted R-square with a value of 0.60 which shows 60% variation in dependent variable is explained by independent variable when the degree of freedom is taken care off. The F-statistics values for unemployment and Inflation is greater than 2 which indicate the rejection of the hypothesis that there is causation between inflation and unemployment. This confirms that unemployment substantially affect inflation while Real GDP has little substantial effect. For Second model, the R-square of 0.96 illustrates that 96% variation in Inflation rate is explained by Unemployment and Real GDP in the third model. Also, the adjusted R-square with a value of 0.93 which shows 93% variation in dependent variable is explained by the independent variable when degree of freedom is taken care off. The F-Statistics values for Inflation and unemployment is 2 which rejects the hypothesis that there is no relationship between inflation- unemployment. This confirms that Inflation substantially affect unemployment while Real GDP has little substantial effect. For Third model, The R-square of 0.95 illustrates that 95% variation in Real GDP growth is explained by unemployment and Inflation in the second model. Also, the adjusted R-square with a value of 0.91 which shows 91% variation in dependent variable is explained by the independent variable when the degree of freedom is taken care off.

| F-statistics For Model (UNEMP = $\beta_0 + \beta_1$ RGDP + β_2 INF + et) | | |
|--------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------|
| Fcal | Ftab at 0.05 significant level | Decision |
| 4.0635 | 0.1975 | H ₀ reject and H ₁ accept |
| F- statistics For model (INF = $\beta_0 + \beta_1$ UNEMP + β_2 RGDP + et) | | |
| Fcal | Ftab at 0.05 significant level | Decision |
| 38.43223 | 0.00728 | H ₀ reject and H ₁ accept |
| F- statistics For model (RGDP = $\beta_0 + \beta_1$ UNEMP+ β_3 INF+ et) | | |
| Fcal | Ftab at 0.05 significant level | Decision |
| 29.6617 | 0.010561 | H ₀ reject and H ₁ accept |

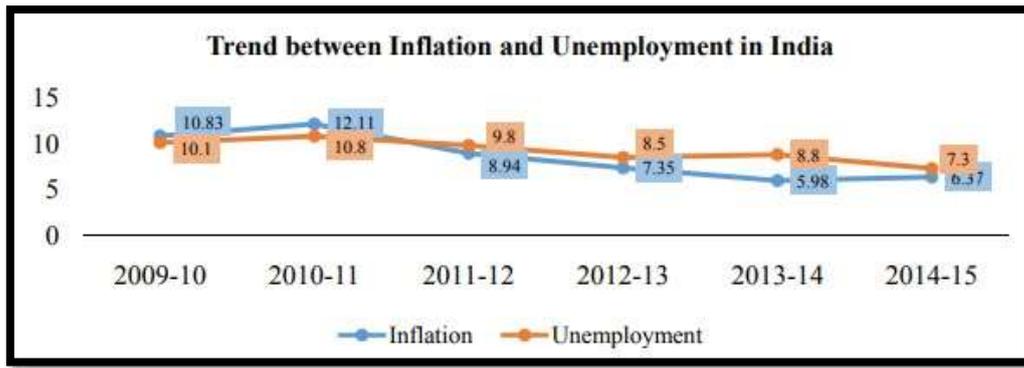


Figure 3: Trend between Inflation and Unemployment in India

It has seen that whether Phillips curve situation exist in our Indian economy during study period .Phillips curve means inverse relationship between inflation and unemployment in the short run period. The following table showing the fluctuation situation of inflation—unemployment over preceding year.

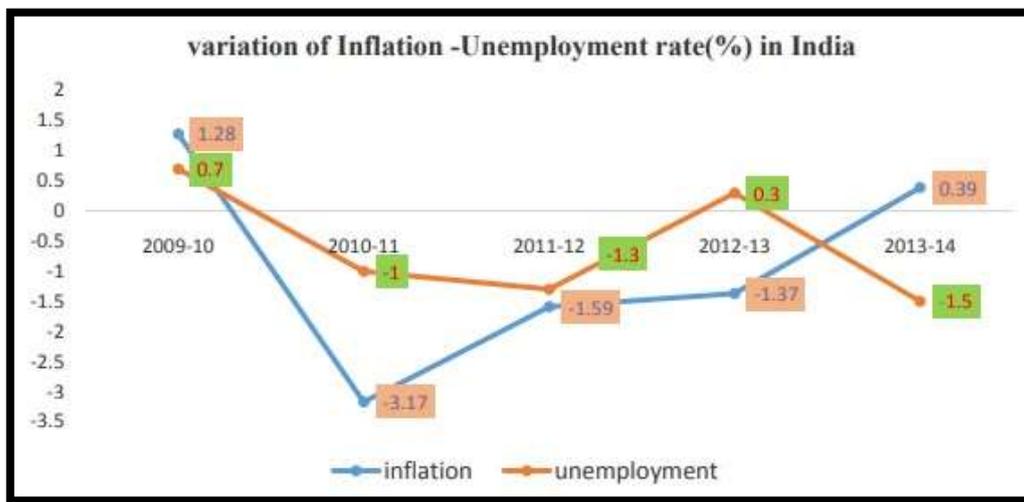


Figure 4: Variation of Inflation

Now assume that the government wants to lower the unemployment rate. To do so, it engages in expansionary economic activities and increases aggregate demand. As aggregate demand increases, inflation increases.



Figure 5: Trend rate of real GDP%

However, workers eventually realize that inflation has grown faster than expected, their nominal wages have not kept pace, and their real wages have been diminished. They demand a 4% increase in wages to increase their real purchasing power to previous levels, which raises labor costs for employers. As labor costs increase, profits decrease, and some workers are let go, increasing the unemployment rate. Graphically, the economy moves from point B to point C.

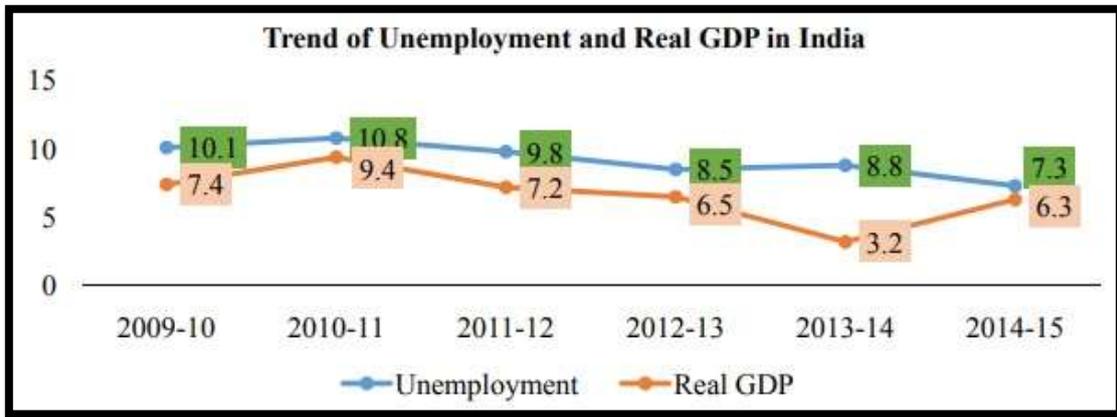


Figure 6: Trend of Unemployment and Real GDP in India

This example highlights how the theory of adaptive expectations predicts that there are no long-run trade-offs between unemployment and inflation. In the short run, it is possible to lower unemployment at the cost of higher inflation, but, eventually, worker expectations will catch up, and the economy will correct itself to the natural rate of unemployment with higher inflation.

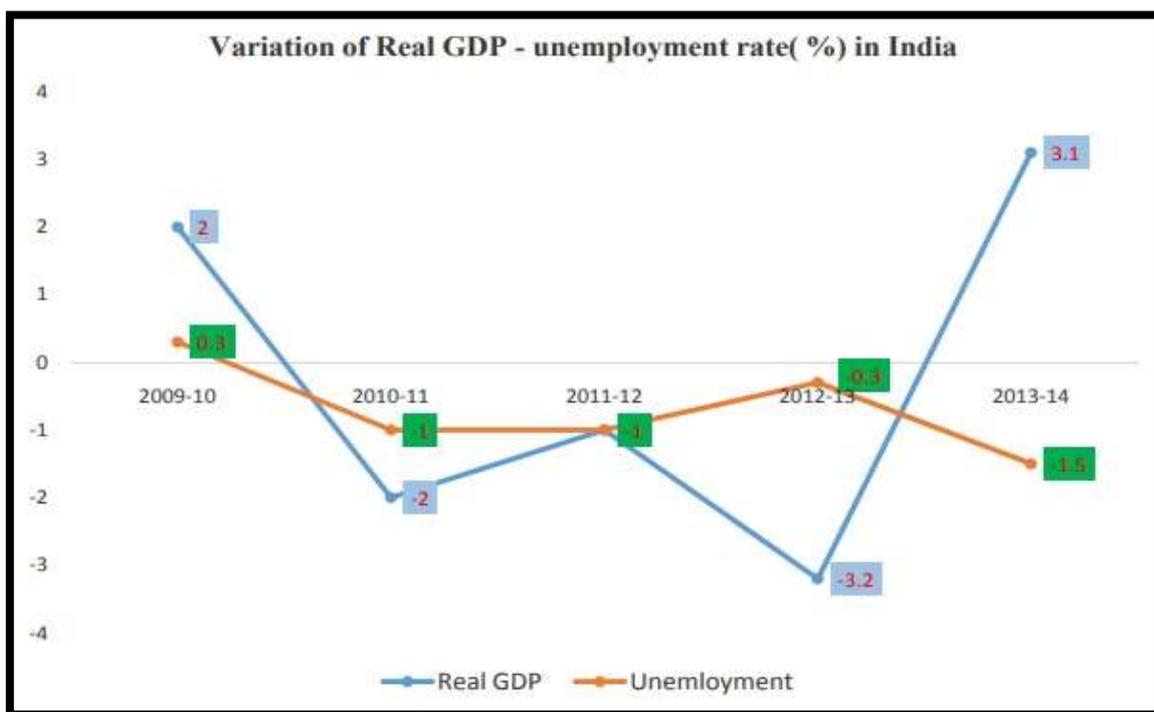


Figure 7: Final Variation graphical representation

Because of the higher inflation, the real wages workers receive have decreased. For example, assume each worker receives \$100, plus the 2% inflation adjustment. Each worker will make \$102 in nominal wages, but \$100 in real wages. Now, if the inflation level has risen to 6%. Workers will make \$102 in nominal wages, but this is only \$96.23 in real wages.

Although the workers' real purchasing power declines, employers are now able to hire labor for a cheaper real cost. Consequently, employers hire more workers to produce more output, lowering the unemployment rate and increasing real GDP. On, the economy moves from point A to point B.

V. CONCLUSION AND POLICY IMPLICATIONS

The findings revealed that the coefficient of Unemployment is positive and statistically significant, while Inflation is negative but unemployment has no significant effect on real GDP. Thus, unemployment substantially affects Inflation, while unemployment has little substantial effect on Real GDP

Unemployment and inflation poses a serious problem in any economy. Studies carried out by most economists revealed that in the quest to reduce unemployment, rising inflation may be risked. A. W. Phillips research work (1958) attested to this fact of trade-off relationship. However, some other economists led by Milton Friedman challenged the trade-off relationship thesis, saying that it exists only in the short-run, that in the long run, the Phillips curve is vertical without any sign of trade-off relationship. Friedman used the term natural rate of unemployment in his analysis denotes the rate at which the actual rate of inflation equals the expected rate of inflation. The researcher in other to validate the existence of a Phillips curve carried out various tests, using the Indian economy as a case study. The result of the test revealed that unemployment and inflation are inversely related, thus confirming the existence of the Phillips curve in India, with inflation having a significant impact on unemployment in India. Thus, there is a need for strong institutional collaboration and link among ministries for dealing with these triplet macroeconomic variables; unemployment, inflation and real GDP in the country. Consequently, this paper suggests some policy options for the government as follows: (1) Restructuring the economy through inward growth not along foreign borrowed ideology; (2) Efficient modern technology to create more sustainable jobs and enhance the real wage of workers; (3) Ensure macroeconomic management of price instability; (4) Improving infrastructure particularly electricity which in turn may generate employment.

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