UNEMPLOYMENT AND ITS DETERMINANTS: A TIME SERIES ANALYSIS IN INDIAN CONTEXT

Chetanya Gaur

Shri Ram College of Commerce, University of Delhi, India-110006

ABSTRACT

The paper seeks to examine the relationship between unemployment and macroeconomic variables; GDP, growth rate, inflation, and population growth rate for the Indian economy. To perform an empirical study on the relationship between unemployment and the macroeconomic variables, we used data over 12 years. The least-squares method of estimation has been used for the analysis of the data. We used EViews to perform our study and obtain regression results. Our essential contribution is to detect and validate the correlation between macroeconomic variables and the unemployment rate over time. We construct a methodology for further assessment using additional regressors and extended time.

Keywords: GDP, Inflation, Population Growth Rate, Ordinary Least Square

1. INTRODUCTION

Unemployment is one of the major problems all over the world. It is a common issue in developed as well as underdeveloped countries. Unemployment occurs when people are without jobs. Unemployment is the situation of actively looking for employment but not being currently employed. Based on neoclassical theory in economics, unemployment is due to restrictions imposed on the labour market. But Keynesian economics says that unemployment is due to the inefficiency of markets and ineffective demand for goods and services. Some of the prevalent causes of unemployment in Asian countries, mainly South Asian, are technological changes, economic changes, demographic structures, labour market, population growth rate, inflation rate. Phillip's Curve stated the inverse relationship between the unemployment rate and corresponding rates of rises in wages. This notion was further translated into an inverse relationship between unemployment and inflation by Milton Friedman.

Further on, Okun's Law implies that a one-point increase in the cyclical unemployment rate is associated with two points of negative growth in real GDP. This relationship varies depending on the country and periods. A lot of work has been done on the relationship between unemployment

and other sets of macroeconomic variables, but less attention is paid on the determinants of unemployment. This paper determines the determinants of unemployment i.e., Population growth rate, inflation rate, and Gross Domestic Product growth rate in the context of the Indian economy.

2. LITERATURE REVIEW

Various studies examine the determinants of unemployment. Some favor microeconomic, while others consider macroeconomics factors for analysis.

Different theoretical models study the determinants of unemployment. (Trimurti, 2014).

Muhammad Arslan et al. (Arslan et al., 2014) attempts to study the determinants of unemployment in the economy of Pakistan. The study uses the annual data of foreign direct investment, GDP growth rate, CPI-based inflation rate, and population growth rate for the period 1999 to 2010. Further, it applies the Ordinary Least Squares Model for determining the results. Findings of this paper show that foreign direct investment, gross domestic product rate, and CPI-based inflation rate negatively correlates with unemployment. On the contrary, the population growth rate has a positive relationship with unemployment. The study also confirmed the trade-off between inflation and unemployment. However, more variables like exports, capital stock, etc. could be added to the regression analysis.

Chen Li Xuen et al. (Xuan et al., 2017) studies macroeconomic factors affecting unemployment rate in China using a long-run relationship from 1982 to 2014. Elements used in the analysis include inflation, GDP Growth, Population, and Foreign direct investment. The study was conducted using the Unit Root Test, the Augmented Dickey-Fuller Test, and Autoregressive Distributed Lag approach. Results indicate that GDP growth and Population are significant indicators, whereas Inflation and Foreign Direct Investment show insignificant relationship towards the unemployment rate. Future research can include additional variables and can also be extended to other countries.

Mohammad Chowdhury et al. (Chowdhury et al., 2014) investigates the macroeconomic variables influencing the unemployment rate in the Bangladesh economy from 2000 to 2011. The study uses Simple Single Equation Linear Regression Model (SELRM) to glean insights on the relationship between affecting factors of unemployment. The variables selected for the study are unemployment rate, GDP growth rate, exchange rate, and inflation rate (CPI-based), on an annual basis. The main finding includes that inflation rate stimulates unemployment positively, and GDP growth rate and exchange rate harm unemployment. It also observes the trade-off between inflation and unemployment, but more research is needed to ascertain whether it is a short-run or long-run compromise.

Umair & Ullah (Umair et al., 2013) attempts to study the impact of inflation on GDP and unemployment in Pakistan. It is a longitudinal study for the period in 2000-2010. The study concludes that inflation insignificantly influences GDP and unemployment, and the correlation is negative. The relationship between unemployment and inflation is positive and is insignificant at a 10% level of significance.

Thirunaukarasu Subramaniam et al. (Subramaniam et al., 2011) examines the determinants of unemployment in the Philippines economy from 1974 to 2003. The study uses the annual data for GDP growth rate, foreign direct investment, government spending, and inflation rate. It uses the error correction version of the Autoregressive Distributed Lag Model. This study reveals that the Philippines labour market may be affected by a structural unemployment problem. Further, political instability may also retard economic growth and aggravate the unemployment problem in the Philippines.

Kaewkwan Tangtipongkul (Wangmo, 2016) studies the determinants of unemployment, its characteristics, and policy responses in Bhutan. It explores the determinants of unemployment by using the secondary cross-sectional data from the labour force survey of Bhutan in 2015. The estimation is done for general, youth, and adult samples. The result estimated shows that variables both from demand and supply have a stronger effect on unemployment. Compared to all other variables, education has the most significant marginal impact with the highest negligible effect for degree and masters. Although the government to reduce the high prevalence of unemployment amongst the youth mediates a lot of policy responses, yet the research suggests particular and specific interventions are required.

Christimulia Purnama Tirmurti et al. (Trimurti et al., 2014) investigates the economic growth, unemployment data, inflation, and the minimum wage for seven provinces in Indonesia between 2004 to 2012. The study examines the empirical relationship using regression analysis with SPSS 18 among the variables. The result of the survey reveals that while economic growth and unemployment variables have insignificant effects on unemployment, the minimum wage and unemployment variables have a negligible impact on the dependent variable. The inflation and unemployment variables have a positive and significant impact on unemployment.

Asif Kamran et al. (Kamran et al., 2014) examine the determinants of unemployment in Pakistan from 1981 to 2010 using the Regressive Model, descriptive stats, and graphs. Population growth, interest rate, foreign direct investment, gross domestic product, and literacy rate in Pakistan are used as explanatory variables. Also, analysed the factors underlying the employment, study the trends of variables involved in the study, and suggest recommendations for reduction in unemployment in Pakistan. The statistical research indicates that the given factors have a significant impact on determining the unemployment rate.

Cheema & Atta (Cheema et al., 2014) examined the Economic Determinants of Unemployment in Pakistan: Co-integration Analysis. This study finds the determinants of unemployment by applying the ARDL approach using time series data from 1973 to 2010. The results conclude that unemployment has statistically significant positive relationships with the output gap, productivity, and economic uncertainty. Further, it has statistically negative relationships with gross fixed investment and openness of trade.

Maqbool (Maqbool et al., 2013) examines the empirical relationship between unemployment, Population, foreign direct investment, gross domestic product, inflation, and external debt in Pakistan. ARDL approach has been applied to test the determinants of unemployment. Empirical results conclude that gross domestic product, Population, inflation, and foreign direct investment are significant determinants of unemployment in Pakistan (Cheema et al., 2014).

3. OBJECTIVE OF THE STUDY

- To study the impact of GDP Growth Rate on Unemployment Rate
- To study the impact of Inflation on Unemployment Rate
- To study the impact of Population Growth Rate on Unemployment Rate

4. VARIABLES DESCRIPTION

The Unemployment Rate is defined as the percentage of unemployed workers in the total labour force. The GDP Growth Rate refers to the rate at which the national income/GDP of an economy grows. The Population Growth Rate is the rate at which the number of individuals in a population increases in a given time, expressed as a fraction of the initial population. Inflation is the rate at which the general level of prices for goods and services is rising and, consequently, the purchasing power of currency is falling.

4.1 Hypothesis

We hypothesize that there is no significant relationship between Unemployment and GDP Growth Rate, no meaningful relationship between Unemployment and Inflation, and no significant relationship between Unemployment and Population Growth Rate as our null hypothesis. We further check for the relevance of the model by finding the R2. As an alternative hypothesis, we hypothesize that there is a significant relationship between Unemployment and GDP Growth Rate, the considerable relationship between Unemployment and Inflation, the substantial relationship between Unemployment and Population Growth Rate.

5. RESEARCH METHODOLOGY

In the study, we examine whether variation in population growth rate, GDP growth rate and inflation rate affect unemployment rate.

5.1. Secondary Data

Secondary data refers to information obtained by individuals, agencies and institutions that has previously been gathered. In this paper the sample consists of 12 years i.e. 2006 to 2017. The annual figures of unemployment rate, inflation rate, population growth rate and GDP growth rate were taken as variables. Data on each variable was taken from World Bank and Reserve Bank of India. EViews was used for this empirical analysis.

5.2 Model Specification

The following simple linear regression model was used in the study:

$$Y = \beta° + \beta X + \mu_i$$

In above equation, Y represents the unemployment rate and it is the dependent variable. β is the coefficient of independent variable. μ is the error term and it is assumed to be zero and independent across time period.

By adopting the same, the equation so generated for this paper transforms to:

$$UR = \beta° + \beta_1 PGR + \beta_2 GDP + \beta_3 INF + \mu_i$$

where,

UR= Unemployment Rate, PGR= Population Growth Rate, INF= Inflation Rate, GDP= GDP Growth Rate, and μ_i = Error Term

Model is estimated using Ordinary Least Square technique and significance of coefficients have been checked using t-test and model relevance is checked using F-statistic. As the data is time series, unit root test should be checked. But the sample is not large enough so we consider it in potential future study.

6. THEORY

As per economic criteria, the population growth rate should increase the unemployment rate because the labor force rises with an increase in the population. However, it does not imply that there is a corresponding increase in the workforce.

Hence theory suggests a positive relationship between the population growth rate and the unemployment rate. The economic theory of the Philips curve explains a negative correlation between inflation and unemployment. Also, as per the Okun Law, a rise in GDP causes a decline in the unemployment rate; hence, a negative relationship should exist between a GDP growth rate and the unemployment rate.

7. RESULTS

From Table 1, signs of the all the estimated coefficients are as per expectations and conform to the above economic theory. That is, the sign of the coefficients of GDP growth rate and inflation rate are negative and the sign of the coefficient of population growth rate is positive. The t-statistics of population growth rate, GDP growth rate and inflation rate are 14.3340, -3.0281 and -5.5060 respectively, which indicate that all the estimated coefficients are the statistically significant, with very low standard errors. This leads us to rejecting the null hypothesis taken above. Hence unemployment rate is significantly related to the variables GDP growth rate, inflation and population growth rate. If all the other variables remain constant, the estimated regression equation will be as follows:

$$UR=1.5110+2.0963PGR-0.0340GDP-0.0416INF+U_i$$

Table 1: Regression Results I

Variable	Coefficient	Std. Error	t-Statistic	Prob	R^2 =0.9629
C	1.5110	0.1760	8.5860	0.00	Adj R^2=0.950
Population growth rate	2.0963	0.1463	14.334	0.00	Durbin Watson Stat=2.4960
GDP Growth Rate	-0.0340	0.0120	-3.0281	0.16	F-Statistic=69.388
Inflation	-0.0416	0.0075	-5.5060	0.006	Prob(F-Stat)=0.00

The above result has the presence of Auto-Correlation due to its time series nature. Though OLS estimators are linear, unbiased and hence consistent, they are not efficient as they can't produce minimum variance. The current value of d, using Durbin Watson d-test, is 2.4960.

The Breusch-Godfrey Lagrange Multipliers (BG-LM) Test also justifies the same, following are the results:

Table 2: BG-LM Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob	R^2 =0.4291
C	0.0117	0.019	0.6181	0.5592	Adj R^2=0.0464
Population growth rate	0.0335	0.0480	0.6987	0.5109	Durbin Watson Stat=1.8616
GDP Growth Rate	-0.0002	0.0177	-0.0102	0.9921	F-Statistic=0.9022
Inflation	-0.0180	0.0153	-1.1712	0.2859	Prob(F-Stat)= 0.5350

From Table 2, we get d-statistic is $1.8616 < 2$. The null hypothesis would be no positive autocorrelation. For n=12 and k'=3 Durbin –Watson statistic $d_l = 0.658$ and $d_u = 1.864$ at 5% level of significance. Since 1.8616 lies between $d_u = 0.658$ and $4 - d_u = 2.136$, we conclude that there is no auto correlation.

We accept the null hypothesis that there is no autocorrelation in the data. Hence, autocorrelation is present in the data. Therefore, we change the functional form of the data by taking the double log regression equation as follows:

$$LogUR= \beta°+ \beta_1 LogPGR + \beta_2 LogINF + \beta_3 LogGDP + \mu_i$$

Table 3: Regression Results with Log

Variable	Coefficient	Std. Error	t-Statistic	Prob	R^2 =0.9632
C	0.6099	0.0204	29.7904	0.00	Adj R^2=0.9495
Population growth rate	0.7477	0.0516	14.4793	0.00	Durbin Watson Stat=1.8684
GDP Growth Rate	-0.0639	0.0193	-3.3041	0.010	F-Statistic=69.968
Inflation	-0.0881	0.0147	-5.9929	0.000	Prob(F-Stat) = 0.00

Using Table 3, we get R-squared as 0.9632, which indicates very well fit model hence model is relevant. This is corroborated by the fact that 96% of variation in the unemployment rate in India is explained by GDP growth rate, population growth rate and inflation.

The F value is 69.968 while the critical value is 4.07 at 5% level of significance and 7.59 at 1% level of significance, indicating that the value of R-squared is statistically significant. P=0.00 signifying that the impact of all independent variables on dependent is significant. Hence, pointing towards overall stability of the model.

8. ANALYSIS

The signs of all the estimated coefficients are as per expectations and conform to the above economic theory. That is, the sign of the factors of GDP growth rate and inflation rate and the sign of the coefficient of population growth rate is positive.

The t-statistics of all the estimated coefficients are statistically significant, with slight standard errors. It leads us to reject the null hypothesis taken above. Hence the unemployment rate is significantly related to the variables GDP growth rate, inflation, and population growth rate.

The F-statistic of the model is very high, implying that the model is relevant. According to the results, the model is a good fit. The R-squared is very high, suggesting that the explanatory variables are strong determinants of unemployment.

9. CONCLUSION

Based on the above results, GDP growth rate, inflation, population growth are essential determinants explaining unemployment in the economy. Hence, the policy that aims to reduce the current levels of unemployment in the Indian economy should focus on increasing the rate of growth of national income. Moreover, make efforts to keep levels inflation within desirable limits and curtail the population growth rate in the economy over the longer run. Some policy recommendations could include improvement of income distribution to have more impact on growth rate and hence, unemployment. The government can promote more skill enhancement schemes and utilize the booming youth population that India entails. The shift from the unskilled labour force to skilled would impact unemployment tremendously. Creation of jobs is the foremost challenge every developing economy faces, which needs to be dealt with appropriate public policies.

As future work, we point that more variables like government expenditure, private investments could also be added to the model to assess their impact on the unemployment rate. Further, the model can be extended over a more extended time frame.

REFERENCES

[Journal] / auth. Umair Muhammad and Ullah Raza // Impact of GDP and Inflation on Unemployment Rate: A Study of Pakistan Economy in 2000-2010. International Review of Management and Business Research, 2(2), p.388.. - 2013.

A Study on Determinants of Unemployment in Pakistan [Journal] / auth. Kamran Asif [et al.] // In Proceedings of the Seventh International Conference on Management Science

and Engineering Management 2014 (pp. 1337-1348). Springer, Berlin, Heidelberg. - [s.l.] : Springer, Berlin, Heidelberg, 2014.

Determinants of Unemployment in Bangladesh: A Case Study [Journal] / auth. Chowdhury Mohammad and Hossain Md. Tanjil // Developing Country Studies. - 2014. - 3 : Vol. 4. - p. 5.

Determinants of Unemployment in the Philippines [Journal] / auth. Subramaniam Thirunaukarasu and Baharumshah Ahmad Zubaidi // The Empirical Economics Letters. - 2011. - 12 : Vol. 10.

Determinants of Unemployment: Empirical Evidences from 7 Province in Indonesia [Journal] / auth. Trimurti Christimulia Purnama and Komalasari Yeyen // Scientific Research Journal (SCIRJ), Volume II, Issue VIII, August 2014 5 ISSN 2201-2796 www.scirj.org. - [s.l.] : Scientific Research Journal (SCIRJ), 2014. - pp. 5-9.

Determinants of Unemployment: Empirical Evidences from 7 Province in Indonesia. [Journal] / auth. Trimurti C.P and Komalasari, Y., 2014 // Scientific Research Journal (SCIRJ), 2(8), pp.5-9. - 2014. - pp. 5-9.

DETERMINANTS OF UNEMPLOYMENT: Empirical Evidences from Pakistan [Journal] / auth. Maqbool Muhammad Shahid [et al.] // Pakistan Economic and Social Review Vol. 51, No. 2 (Winter 2013), pp. 191-208. - 2013.

Determinants of Unemploymnet: Characteristics and Policy Responses in Bhutan [Journal] / auth. Wangmo Deki. - [s.l.] : Thammasat University, 2016.

Economic determinants of unemployment in Pakistan:Co-integration analysis [Journal] / auth. Cheema Ahmed Raza and Atta Ambreen // International Journal of Business and Social Science, 5(3).. - 2014.

Macroeconomic Factors Affecting Unemployment Rate in China [Journal] / auth. Xuan Chen Li [et al.]. - 2017. - p. 64.

Unemployment and its Determinants: A Study of Pakistan Economy (1999-2010) [Journal] / auth. Arslan Muhammad and Zaman Rashid // Journal of Economics and Sustainable Development. - 2014. - 13 : Vol. 5. - p. 6.