

Impact of Unemployment and Inflation on the Economic Growth of India

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Abstract: The effects of unemployment and inflation on the output growth of India over the period 1990 -2021 have been examined in this paper. The method of Panel Unit Root test; Panel Co-integration test; Mean Group and Pooled Mean group test; were applied in this study. The study provides evidence of having up to four co-integrating relationships among the variables applied and has not suffered from serial correlation, heteroscedasticity, and multicollinearity to carry out the stability of the estimated coefficients using the cumovulative sum (CUSUM) of recursive residuals. The logarithm of capital stock and investment in human capital (HUCAP) have a significantly stimulating impact on the logarithm of output in India in the long run. The result shows that a one percent increase in capital stock is liable to increase the real gross domestic by 0.154% in the long run, while a unit increase in human capital investment is susceptible to increasing real GDP by 0.002% in the long run, assuming all other factors are held constant. The inflation rate, however, has a depressing impact on real GDP in India. A 1% increase in inflation is liable to reduce real GDP by 0.004% in the long run. The results have also shown that unemployment (UNEMPL) has no significant impact on the logarithm of real GDP in the long run as it has a greater significance level. The short-run results have shown that if the log real GDP deviates from its long-run, it recovers over 32% in one year. Results indicate that inflation significantly depresses economic performance in India because of uncertainty and reduces investment, employment, and consequently output. Unemployment has not significantly impacted real GDP in India, the reasons being the use of a log of real GDP, the nature of the regression model applied, and controlling for the possible impact of human capital and

physical capital. Investment in physical capital and human capital has significantly promoted economic performance in India because investment in human capital improves the productivity of the labor forces and hence increases output and investment in physical capital increases the amount of capital per unit of labor and these have the potency of increasing productivity per worker. The overall effect is an increase in output and therefore economic performance. Unemployment is caused by various reasons but the main causes are the high growth rate of the population; the lack of job opportunities; and the inefficiencies of the public sector. The Government of India may focus on creating a proper environment for the private sector to create jobs and increase job opportunities; and modernization of the agriculture sector through its strategies and resources that include attracting foreign investors.

Keywords: Unemployment, Inflation, Output Growth, Panel Unit Root test; Panel Co-integration test; Mean Group and Pooled Mean group test;

JEL: C25, E32, E37, E51

1. Introduction

Gross Domestic Product (GDP), Inflation, and Unemployment are at the core of the goals of macroeconomic policies. The sharp or smooth change of these three economic factors directly influences societies and might cause social or economic problems. If economic growth persists too rapidly, inflation might accelerate and if economic growth is lagging, then unemployment may increase – implying thereby that economic growth, inflation, and unemployment significantly impact economic development. High inflation causes a sharp decline in real money holdings leading to a decline in output, real wage, and private consumption; while deflation triggered falling prices, output profit, and employment – as such both high and low inflation hurt the economies. Unemployment affects peoples' living standards – both at present and in the future, and investments made in the skill development/ education of the unemployed are lost as they gradually lose their skill/ education in the long run, and the children of their families suffer deprivation of skill development/ education. Low economic growth leads to social and economic problems in terms of increased poverty, a decline in quality of life, lesser creation of jobs, and ultimately low human development index. With the importance of this background, interrelated studies of these macroeconomic factors are essential. Studies made so far do not lead to a

general conclusion for all the economies and are needed for each economy separately to assist policymakers with specific findings to take appropriate decisions in the interest of the economy at hand.

The negative effect of unemployment in developing countries like India has created the greatest problem for the people and society and adversely affects consumption, purchasing power, and the capability of production for the economy. Reduction of the unemployment rate remained the prime concern for the planners from the beginning of the planning process in India. Research evidence has shown that several labor market barriers exist that prevent people from overcoming unemployment and earning a living – most of which affect mainly the poor and arise from a pool of poverty leading to marginalization, inequality, and further poverty. More importantly, however, is the overall impact of India's unemployment situation on the economy from a macroeconomic perspective which is accentuated by the influence of labor market fluctuations on monetary policy, changes in the gross domestic product (GDP) as accounted for by unemployment, as well as the relationship between unemployment and inflation in India.

There is scant literature on inflation, unemployment, and output growth, which are the three tremendously vital macroeconomic variables in India's economy. The success of the economy is hinged on these variables which are indispensable fundamentals for the economic policies of India. This study is an attempt to add knowledge and provide policy recommendations for the sustainable development of the Indian economy. Such recommendations could be based on sorting out differences in the existing literature on the impact of inflation and unemployment on economic performances in different economies. For instance, Tenzin (2019)(1) has established that unemployment has no impact on output in Bhutan; Muryani and Pamungkas (2018) (2) have demonstrated using the Error Correction Model (ECM) that unemployment has significantly contributed to output growth in Indonesia. While Makaringe and Khobai (2018)(3) have shown using Auto-Regressive Distributed Lag (ARDL) regression that unemployment has a depressing effect on output in South Africa. Banda, Ngirande, and Hogwe (2016)(4) have demonstrated that unemployment promotes output growth in South Africa. In the case of inflation, however, there are more consistent findings that inflation depresses output. For instance, Tenzin (2019)(1), Saidu and Muhammad (2018)(5), Muryani and Pamungkas (2018)(2), and Munyeka (2014)(6), among others have all established that inflation depresses growth in the studies across different economic settings. The differences

in the findings on the impact of unemployment on output may be explained by the nature of data at the different periods under varying economic situations prevailing thereon. The differences in the impact of unemployment may also be caused by the non-consideration of omitted variables or an incomplete model. This study is designed to avoid the problem of omission of variables by considering the major factors that affect output such as physical and human capital, and the labor force which has been dropped because of its high correlation with physical capital. The opinion of this study is that having included most of the variables that affect output, the finding of the impact of unemployment will likely reflect the true relationship in India in the period under review. The paper has also carried out Karl Person's correlation test (an extensively used mathematical method in which the numerical representation is applied to measure the level of relation between linearly related variables) to establish the nature of the relationship among the variables to see how the variables are statistically related to know the nature of their correlation, apart from the nature of impact one has over the other (their regression coefficients and their t-ratios). Moreover, the knowledge of correlation gives us information about the likely presence of multi-colinearity and how to avoid it. This has the potency of improving the quality of regression outcomes.

2. Unemployment, Inflation, and GDP in India

There appears to be a theoretical relationship between unemployment that is caused by critical manpower shortages and scarcity of productive inputs in the form of modern types of machinery, equipment, and other critical inputs. The result is that domestic production falls short of the required output which has to be met by imported goods and services. The tendency is for the economy to demand more imports than its exports. The consequence is building a trade deficit which in the long run requires devaluation of the rupee and its attendant inflation implications. To control inflation, the Government of India has put in place the Inflation Targeting (IT) framework of 3%-6%. This further affects people who are employed as their real wages are eroded via inflation. The Phillips Curve was developed to explain the trade-off between unemployment and changes in wages (inflation).

Rapid economic growth generally ameliorates unemployment concerns, but the situation in India is different. GDP growth in India resulted in the creation of a limited number of well-paying employment, implying that unemployment will continue to rise even with strong economic improvement. India's macroeconomic

challenges continue to be stagnant economic growth with high unemployment. Employment growth in India slowed from 2012 to 2016 and a survey [Kannan & Raveendran,2019(7)] reported a net decline in employment and an increase in unemployment. Unemployment in India is attributed to negative activities, the substitution of labor for capital, and an increase in workforce supply. The initiative taken by the Government of India to curb the problem of rising unemployment and stagnant growth has lagged and led to more unemployment. Studies mention an unidirectional relationship between unemployment and economic growth in the U.S.A, and the scenario in India needs to be investigated.

3. Theoretical literature review

When it comes to studying the economy, growth and jobs are two primary factors economists must consider. There is a clear relationship between the two, and many economists have framed the discussion by trying to study the relationship between economic growth and unemployment levels. Economist Arthur Okun first started tackling the discussion in the 1960s, known as Okun's law which states that a country's gross domestic product (GDP) must grow at about four times faster in a year to achieve the desired reduction in the rate of unemployment. Okun's law "is intended to tell us how much of a country's gross domestic product (GDP) may be lost when the unemployment rate is above its natural rate." The logic behind Okun's law is simple. Because the output of the economy is dependent on the labor that it has used, it can be understood that a positive relationship exists between output and employment, which further explains the negative relationship between output and unemployment since the unemployed are not participants of the labor force Snowdon and Vane (2005)(8). A positive relationship exists between output and employment because output depends on the amount of labor used in production. Inversely, a negative relationship exists between output and unemployment because unemployment is the labor force minus total employment. According to this principle, a one-percentage-point decline in the rate of unemployment in one year produces a two percent increase in the real GDP growth rate per year. Therefore, if, for instance, the potential rate of GDP growth is 2% per annum, then Okun's Law holds that real GDP should grow at approximately 4% for a year to achieve a two-percentage-point fall in the unemployment rate Fuhrmann (2016) (9). To hold the unemployment rate steady, the growth in GDP rate must usually be twice the growth rate of employment potential.

3.1. Phillips curve and the Augmented Phillips Curve

The effects of any monetary policy can be divided between output growth and prices. With the role of expectations and price-stickiness, elected governments have the incentive to conduct their monetary policy with an inflationary bias. The Phillips curve plots the relationship between the recorded level of unemployment and the rate of change in wages, where the rate of change of money wages is used as a proxy for inflation (Phillips Curve shows the inverse relationship between inflation (money wage rate) and level of unemployment i.e. lower the unemployment in an economy, higher the inflation (money wage rate) and vice – versa.) {Bias,P.V.2011} (10). As unemployment falls the rate of inflation increases. This means that there is no change in real values, as the rate of inflation adjusts to new pressure demands due to wage increases Howells and Bain,(2008) (11).

3.2. Growth Theory & Empirical Literature

The classical growth theory asserts wages/inflation is determined at the natural market wage level. Classical economists {Smith (1776) (12); David, R.(1817) (13);Mill (1848) (14) ; Pigou, A.C. (1920) (15)} confess that the economy will decline with the increase in prices. Persistent increases in prices usually erode the value of a currency and lead to a decline in the growth of the economy. This leads to negative growth being experienced.

Tenzin (2019) (1) has investigated the impact of unemployment and inflation on economic growth in Bhutan using data from 1998 to 2016. The study uses the autoregressive distributed lag (ARDL) model to estimate the parameters of the regression model. The results show that unemployment has no impact on economic growth in Bhutan, both in the short run and long-run. Inflation has an impact on economic growth in the long run. The reason given is that inflation causes uncertainty.

Saidu and Muhammad (2018) (5) have studied the interaction between unemployment, inflation, and economic growth in Nigeria. The paper uses Granger causality { Umaru, A. and Zubairu, A. A. (2012). (16) } to investigate the line of causality. Before applying Granger causality, unit root analysis was applied to determine the time-series features of the data to ascertain if the variables applied are stationary. The results show that the data are trending. The results of the Granger causality indicate that inflation affects economic growth, but growth does not cause inflation. There is no relationship between economic growth and unemployment.

Muryani and Pamungkas (2018) (2) have explored the impact of unemployment, inflation, government expenditure, labor force, and gross fixed capital formation on economic growth in Indonesia. The paper estimates the parameters of the population regression using the Error Correction Model (ECM) { Amassona, Ditimi dan Nwosa, Philip I. (2013). (17) }. The results show that unemployment and gross fixed capital formation promote economic growth. Labour force and inflation depress economic growth. Government expenditure does not affect economic growth.

Munyeka (2014) (6) has explored the relationship between inflation and economic growth in South Africa. The study applies quarterly data from 1993 to 2016. The study applies correlation and Ordinary Least Square (OLS) regression methods (Muellhauer, A . J. and Banko, J. 2001 (18)). The results of both analytical methods show that there is a negative and significant relationship between the two variables. Mohseni and Joazaryan (2016) (19) have explored the impact of inflation and unemployment on economic growth in Iran. The paper uses the ARDL regression model to estimate the parameters of the population regression model, using time-series data from 1996 to 2012. The results show that both inflation and unemployment impact negatively economic growth in the long run.

Makarange and Khobai (2018) (3) have investigated the impact of unemployment and economic growth in South Africa using quarterly data from 1994 to 2016. The study applies the ARDL regression model to estimate the coefficients of the regression. The results of the regression show unemployment depresses economic growth in South Africa. Leshoro (2015)(20) explores the relationship between employment and economic growth in South Africa. The study uses the Toda-Yamamoto causality tests (Guru- Gharana, K.K. (2012). (21)) to estimate the relationship. The paper uses quarterly data from 2000Q1 to 2012Q3. The results show that employment does not cause economic growth, but GDP causes employment.

Banda, Ngirande, and Hogwe (2016)(4) have explored the effect of log of output, real effective exchange rates, labor productivity, and budget deficit on unemployment in South Africa. The study uses Error Correction Model (ECM) in estimating the parameters of the regression model (Dhungal, K.R. 2014 (22)). The results show that the log of GDP, labor productivity, and budget deficit increase unemployment. A real effective exchange rate does not affect unemployment. Osinubi (2005) (23) has explored the interaction between economic growth, poverty, unemployment,

inflation, money supply, and saving rates in Nigeria. The paper uses OLS to estimate the relationship. The results show that unemployment significantly promotes growth and saving reduces growth. The results also show that growth has no impact on unemployment.

Aubrey (2015) (24) investigates the effect of inflation on economic growth in South Africa. The paper uses the Error Correction Method to estimate the parameters of the population. The paper establishes that inflation has not impacted the economic growth in South Africa. Madito and Khamalo (2014) (25) have explored the impact of unemployment and inflation on economic growth in South Africa. The paper uses quarterly data from 1967 to 2013. The study uses Johansen co-integration method to establish the existence of long-run relationships among the variables applied in the study. The paper applied the error correction regression model to estimate the coefficients of the regression model. The results show that unemployment has no impact on economic growth. Sinha (2022)(26) investigated the effect of unemployment and inflation on economic growth at the regional level in India and recommended large-scale investments in infrastructure and skill development and carry-on renewal at opportune moments to keep steady the positive trend of economic growth over the years. Feng & Nga (2022)(27) examines the relationship and interaction between youth unemployment, inflation, and economic growth of ASEAN countries from 1996 to 2019 and found that in the long run youth unemployment has a significant negative impact, while inflation has a positive impact on economic growth. Besides, youth unemployment and inflation have a significant interactive effect on economic growth. It recommends taking specific policies that are effective and impact youth unemployment, inflation, and economic growth for the ASEAN countries.

4. Methodology

The most extensively famous single equation approach to co-integration is the Engle-Granger two-step procedure Engle and Granger (1987)(28). This approach has some limitations. One, it does not indicate which of the variable is a dependent variable and which variable is an independent variable. This issue is important as the determination of the dependent variable can affect the significance of the results. Second, when there are more than two variables, the Engle-Granger model cannot handle this. A more versatile model must be applied because we do not have a unique co-integrating relationship. This second problem explains why this

study applies the autoregressive distributed lag (ARDL) model by Pesaran, Shin, and Smith (1999; 2001)(29,30) in this study. The ARDL model can be presented as follows:

$$Y_t = \sum_{j=1}^p \lambda_j Y_{t-j} + \sum_{j=1}^q \delta_j X_{t-j} + \varepsilon_t \quad (1)$$

Where: X_{t-j} are the $K \times 1$ vector of explanatory variables, and Y_{t-j} are the lagged dependent variable. The above ARDL model can be presented using vector equilibrium or error correction model (VECM) as follows:

$$\Delta Y_t = \theta_j (Y_{t-1} - \beta'_j X_{t-1}) + \sum_{j=1}^p \lambda_j Y_{t-j} + \sum_{j=1}^q \delta_j X_{t-j} + \varepsilon_t \dots \quad (2)$$

In equation (2), the β'_j is the estimated long-run parameters and the θ_j is the equilibrium error corrections parameters. The ARDL model is also called pool mean group (PMG) and it uses a generalized likelihood estimation technique and the lag length is determined by one of the information criteria like the Schwarz Bayesian information criterion (Schwarz, G. 1978) (31).

The relevant data were taken from the various concerned departments of the Government of India from 1990-91 to 2020-21 (31 observations). Table 1 shows the variables that are used in the study.

Table 1: Description of variables

| <i>Acronym of variable</i> | <i>Variable</i> | <i>Measurement of variable</i> |
|----------------------------|-------------------|--|
| INFO | Inflation Rate | Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed as specified. |
| RGDP | Real GDP | The annual percentage growth rate of GDP at market prices is based on constant price. |
| UNEMPL | Unemployment Rate | The unemployment rate refers to the percentage of the labor force that is without work but available for and seeking employment. |
| HUCAP | Human Capital | This is defined as the mean value of secondary enrolment and life expectancy |
| KAPSTC | Capital Stock | KAPSTC is estimated as the gross fixed capital formation of India. |

Source: Researchers' computations (Various Departments of the Government of India, 2020).

5. Results

5.1. Descriptive Statistics of the Variables

Descriptive statistics help to simplify the data sensibly. Summary statistics for the data analyzed are presented in this section using descriptive statistics, Karl person correlation coefficients, unit root test, Johansen co-integration test, and regression model following Pesaran, Shin, and Smith (29,30). Table-2 describes the major descriptive statistics of the variables considered in this study.

Table 2: Descriptive statistics-result

| <i>Description</i> | <i>lnRGDP</i> | <i>lnKAPSTC</i> | <i>UNEMP</i> | <i>INFL</i> | <i>HUCAP</i> |
|--------------------------|---------------|-----------------|--------------|-------------|--------------|
| Mean | 36.52 | 34.77 | 17.90 | 4.83 | 88.80 |
| Median | 36.58 | 34.93 | 18.35 | 6.71 | 89.23 |
| Std. Dev. | 1.22 | 1.37 | 3.93 | 4.35 | 6.13 |
| Skewness | -0.28 | -0.32 | -0.09 | -0.50 | 0.13 |
| Kurtosis | 1.58 | 1.45 | 1.98 | 3.85 | 2.75 |
| Jarque-Bera ² | 2.52 | 3.06 | 1.15 | 1.85 | 0.13 |
| Probability | 0.28 | 0.23 | 0.56 | 0.40 | 0.94 |

Source: 1. Researchers' computations (Various Departments of the Government of India, 2020).

2. Jarque–Bera test is a goodness-of-fit test of whether sample data have the skewness and kurtosis matching a normal distribution.

The variables of real GDP (RGDP) and capital stock (KAPSTC) were measured using natural logarithms. While unemployment (UNEMP) and inflation rates (INF) are measured using percentages and human capital is measured using the mean of secondary schools' enrolment and life expectancy. The mean and median logarithms of RGDP and KAPSTC are about 36 and 35, respectively. The mean and median of inflation rates, unemployment rates, and human capital index are about 5%, 18% units, and 89 units, respectively. The inflation rate of about 5% appears to be on the upper limit of the targeted rate of 6% per annum. The unemployment rate of 18% is very high.

The spread around the mean appears to be below for all the variables as the standard deviation values are low. The low value of the skewness and Kurtosis tend to give evidence in favor of normally distributed variables. While the low values of the Jarque Bera statistic and their associated probabilities tend to show that the distributions are not statistically significant.

5.2. Correlation Analysis

The correlation matrix of the variables under study is presented in Table - 3. The correlation matrix was evaluated by the guide given by Evans (2002)(32) to determine the relationships between the variables.

Table 3: Correlation matrix

| <i>Variable</i> | <i>RGDP</i> | <i>KAPSTC</i> | <i>UNEMPL</i> | <i>INFL</i> |
|-----------------|-------------|---------------|---------------|-------------|
| KAPSTC | 0.95** | - | - | - |
| UNEMP | -0.71** | -0.89** | - | - |
| INFL | -0.30 | -0.29 | 0.04 | - |
| HUCAP | 0.84** | 0.72** | -0.69** | -0.37 |

Note: Correlation range between 0.00-0.19 is very weak, 0.20 -0.39 is weak, 0.40-.59 is moderate, 0.60-0.79 is strong and 0.80-1.0 is very strong. The guide is suggested by Evans (2002) (32).

Note: (*) and (**) indicate significance at 5% and 1% levels respectively.

Based on the correlation range suggested above by Evans (2002)(32), unemployment has a very strong negative relationship with the RGDP, the dependent variable, and KAPSTC. Inflation rates (INFL) are weakly correlated with the dependent variable (RGDP) and capital stock (KAPSTC) and unemployment rates (UNEMP). Human capital (HUCAP) is highly correlated with both the dependent variable and the independent variables, except for inflation rates.

5.3. Unit Root Test

Variables need to be stationary to avoid problems associated with non-stationary time series, such as spurious regression and persistent shocks. The unit root tests used in the study are the Augmented Dickey-Fuller (ADF) and Phillips and Perron (PP) test and the results are summarized in Table 4.

5.4. Unit Root Results

The analysis of the stationary test was carried out with intercepts only. Examining the ADF test results at levels, none of the variables are significant and the null hypothesis is rejected. At first differences between the three variables which are INFL, UEMPL and HUCAP are significant at a 5 percent level of significance and the null hypothesis of no unit root in the variable is not rejected. The null hypothesis of a unit root in the data is rejected in the case of RGDP and KAPSTC. This null

Table 4: Results of Augmented Dickey-Fuller (ADF) and Phillips and Perron (PP) tests

| <i>Variables</i> | <i>Levels</i> | | | <i>First difference</i> | | |
|---------------------|---------------|--------------------------|--------------|-------------------------|--------------------------|--------------|
| | <i>ADF</i> | <i>5% Critical value</i> | <i>Prob.</i> | <i>PP</i> | <i>5% Critical value</i> | <i>Prob.</i> |
| lnRGDP | 0.467 | -3.603 | 0.99 | 0.091 | -3.603 | 0.99 |
| Δ lnRGDP | -3.107 | -3.612 | 0.12 | -3.081 | -3.612 | 0.13 |
| Δ^2 lnRGDP | -5.578 | -3.622 | 0.00 | -9.465 | -3.622 | 0.00 |
| lnKAPSTC | -1.309 | -3.602 | 0.86 | -0.993 | -3.603 | 0.93 |
| Δ lnKAPSTC | -3.104 | -3.612 | 0.12 | -3.105 | -3.612 | 0.12 |
| Δ^2 lnKAPSTC | -6.022 | -3.622 | 0.00 | -6.531 | -3.522 | 0.00 |
| UNEMP | -1.262 | -2.986 | 0.63 | -1.262 | -2.986 | 0.63 |
| Δ UNEMP | -3.673 | -2.992 | 0.01 | -3.633 | -2.992 | 0.01 |
| INFLA | -1.377 | -1.955 | 0.15 | -1.312 | -1.955 | 0.16 |
| Δ INFLA | -5.047 | -2.958 | 0.00 | -6.063 | -1.955 | 0.00 |
| HUCAP | -1.280 | -3.004 | 0.61 | -1.571 | -3.012 | 0.47 |
| Δ HUCAP | -3.090 | -3.012 | 0.04 | -3.043 | -3.3012 | 0.04 |

Source: Researchers' computations.

hypothesis is not rejected after the second difference. Looking at the results for PP at levels, none of the variables are significant and the null hypothesis is rejected. At first difference, like in the case of the ADF test, three variables of UNEMPL, INFL, and HUCAP are significant at a 5 percent level of significance, and the null hypothesis that unit root exists in the variable is rejected. In the remaining two variables which

Table 5: Johansen cointegration test

| <i>Maximum Eigenvalue Statistics (ME Stat.)</i> | | | | <i>Trace statistics (T Stat.)</i> | | | |
|---|--------------|-----------------|--------------------------|-----------------------------------|-----------------|----------------|--------------------------|
| <i>H0</i> | <i>H1</i> | <i>ME Stat.</i> | <i>5% critical value</i> | <i>H0</i> | <i>H1</i> | <i>T Stat.</i> | <i>5% critical value</i> |
| $\Gamma = 0$ | $\Gamma = 1$ | 251.42 | 88.80 | $\Gamma = 0$ | $\Gamma \geq 1$ | 121.87 | 38.33 |
| $\Gamma \leq 1$ | $\Gamma = 2$ | 129.55 | 63.88 | $\Gamma \leq 1$ | $\Gamma \geq 2$ | 55.49 | 32.12 |
| $\Gamma \leq 2$ | $\Gamma = 3$ | 74.06 | 42.92 | $\Gamma \leq 2$ | $\Gamma \geq 3$ | 36.66 | 25.82 |
| $\Gamma \leq 3$ | $\Gamma = 4$ | 37.40 | 25.87 | $\Gamma \leq 3$ | $\Gamma \geq 4$ | 25.04 | 19.39 |
| $\Gamma \leq 4$ | $\Gamma = 5$ | 12.37 | 12.52 | $\Gamma \leq 4$ | $\Gamma \geq 5$ | 12.37 | 12.52 |

Source: Researchers' computations.

are logarithms of RGDP and KAPSTC, the null hypothesis cannot be rejected. After the second differencing the null hypothesis is rejected, and this study has concluded the logarithms RGDP and KAPSTC are stationary after the second differencing. Having established that all the variables are trending at a level, this study has tested the existence of co-integration using the Johansen co-integrating method.

Table 5 shows that the maximum Eigen-value statistics (ME Stat.) test of cointegration rejects the null hypotheses (H_0) of no co-integration from having zero co-integration (to having less than or equal to 3 cointegrating relationships

The null hypothesis of having less than or equal to 4 cointegrating equations (could not be rejected. The rationale for rejecting the null hypothesis is that the computed maximum Eigen-value statistics are greater than their 5% critical values; while the reason for accepting the null hypothesis that is that the computed 5% critical value is lesser than their 5% critical value. This means that there are one, two, three, and four co-integrating equation relationships in the model. Based on the trace statistics, Table 5 also shows that the null hypotheses of having zero co-integrating relationships (to having less than 3 co-integrating relationships) could not be accepted. This implies that the alternative trace hypothesis (H_1) that there is 1 co-integrating relation greater than or equal to 4 co-integrating relationships could not be rejected. Thus, under both methods, there is evidence of having up to four co-integrating relationships among the variables applied in this study. The reason is that the computed trace statistics are greater than their 5% critical values. Thus, this study applies the autoregressive distributed lagged (ARDL) or pooled mean group (PMG) model developed by Pesaran, Shin, and Smith (1999) (29) to estimate both the short-run and the long-run relationship among the variables in Table 6.

5.5. Diagnostic Tests

Table 6 has shown that the estimated VAR model has a good fit of over 99%. Overall, its explanatory power is high. The high F- statistic with a low probability value shows that the overall model is significant. The low values of Ljung-Box (1979)(33) Q-statistics and its high probability values of more than 5% indicate the absence of autoregressive conditional heteroscedasticity (ARCH) in the residuals of the estimated ARDL regression. The Breusch and Godfrey (B-G) Lagrange multiplier (LM) test (*Asteriou, Dimitrios; Hall, Stephen G. (2011). (34)*) for serial correlation is based on the F-statistic test along with its associated probability value could not

Table 6: ARDL Regression model (lnRGDP is the dependent variable)

| Variable | Long-run relationship | | Short-run relationship | | | |
|---|-----------------------|---------|------------------------|--------|---------|-------|
| | Coef. | t-Stat. | Prob. | Coef. | t-Stat. | Prob. |
| ECM | - | - | - | -0.328 | -6.780 | 0.000 |
| Constant | 4.600 | 1.071 | 0.30 | - | - | - |
| lnRGDP | -0.328 | -1.548 | 0.14 | - | - | - |
| lnKAPSTC | 0.154 | 2.362 | 0.03 | 0.471 | 2.714 | 0.01 |
| UNEMP | 0.003 | 1.601 | 0.13 | 0.009 | 1.130 | 0.27 |
| INFLA | -0.004 | -2.753 | 0.01 | -0.011 | -1.23 | 0.23 |
| HUCAP | 0.002 | 2.342 | 0.03 | 0.007 | 1.350 | 0.19 |
| Adjusted R ² | 0.99 | | | | | |
| F – Statistics/Probability | | | 1591/0.00 | | | |
| ARCH test: Q - stat. lags 1 to 5 | | | 0.939to 9.037 | | | |
| ARCH test Q-stat. prob. Lags 1 to 5 | | | 0.33 to 0.11 | | | |
| B-G Serial Cor. LM test – F- Stat/Prob. | | | 2.218/0.13 | | | |
| B-P-G Heteroske. Test: F-Stat./Prob. | | | 0.556/0.78 | | | |
| Residual normality test: Jarque. Bera/ Prob. | | | 1.601/0.45 | | | |
| A residual Normality test: Skewness/Kurtosis | | | -0.608/3.24 | | | |
| 2 highest variance decomposition proportion of the first column | | | 0.512 and 0.146 | | | |

Source: Researchers' computations.

reject the null hypothesis of no serial correlation in the residuals. The reason for accepting the null hypothesis is predicated on the low F-statistic and its associated high probability values which are consistent with the null hypothesis. Similarly, the estimated F-statistic of the Breusch-Pagan-Godfrey (B-P-G) test along with its associated probability values have confirmed the null hypothesis that the variances of the ARDL regression model are homoscedastic. The reason for accepting the null hypothesis is that the computed F-statistic value is low giving credence to the null hypothesis. In the same way, the computed probability value is high. Again, this supports the null hypothesis of homoscedasticity of residuals. The estimated correlations of the explanatory variables are not too high as evidenced by the highest two variance decompositions of the first column which are 0.512 and 0.146. This is an indication of a lack of severe multicollinearity. Thus, this evidence has shown that the estimated ARDL model has not suffered from serial correlation,

heteroscedasticity, and multicollinearity. It is important to carry out the stability of the estimated coefficients using the cumulative sum (CUSUM) of recursive residuals as recommended by Brown, Durbin, and Evans (1975) (34) in figure 1 below.

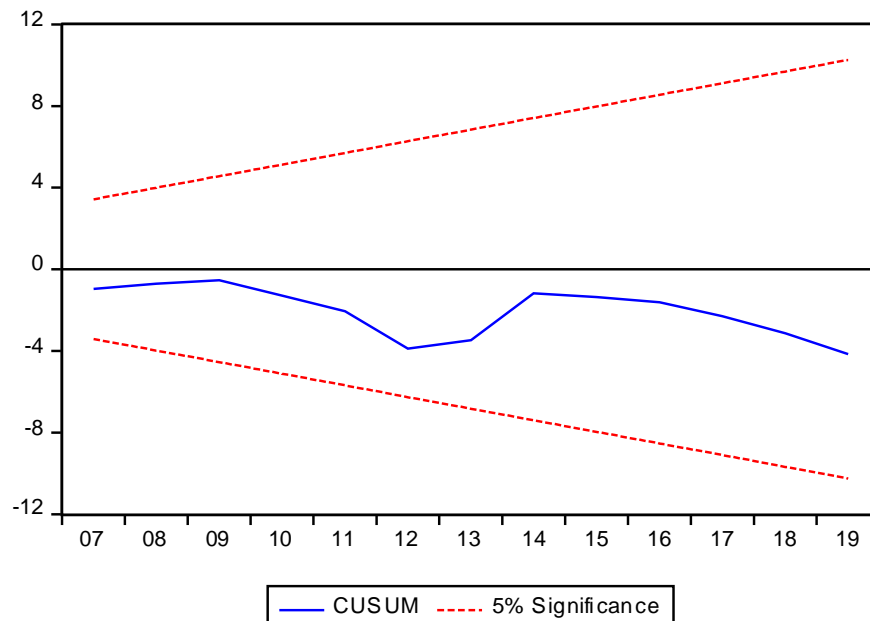


Figure 1: Stability of the estimated coefficients using cumulative sum (COSUM) of recursive residuals

Figure 1 has shown that the estimated parameters are stable as they have not gone outside the critical lines. Thus, the estimated regression coefficients are stable. Based on all these diagnostic tests, this study uses the estimated ARDL regression model results as demonstrated below as the research findings of this study.

5.6. Research Findings

Results indicated in Table-6 have shown that the logarithm of capital stock and investment in human capital (HUCAP) have a significantly stimulating impact on the logarithm of output in India in the long run. The result shows that a one percent increase in capital stock is liable to increase the real gross domestic by 0.154% in the long run, holding all other factors constant. A unit increase in human capital investment is susceptible to increasing real GDP by 0.002% in the log-run, assuming all other factors are held constant. The inflation rate, however, has a depressing impact on real GDP in India in the long run. A 1% increase in inflation is liable to

reduce real GDP by 0.004% in the long run, holding other factors constant. The results have also shown that unemployment (UNEMPL) has no significant impact on the logarithm of real GDP in the long run as it has a greater significance level.

The short-run results have shown that if the log real GDP deviates from its long-run, it recovers over 32% in one year. It would likely take about three years for the economy to recover from the shock in the system. The results of short-run regression coefficients have also shown that only the logarithm of capital stock (lnKAPSTC) has an impact on the logarithm of real GDP (ln GDP).

5.7. Discussion of Findings

This study has investigated the impact of unemployment and inflation on economic performances in India while using the logarithm of capital stock and human capital as control variables. The essence of the study is to find out if after controlling for the above variables, inflation rates and unemployment rates would still impact the logarithm of real GDP in India. For instance, Tenzin (2019) (1) Saidu and Muhammad (2018) (5), Muryani and Pamungkas (2018) (2), and Muryani (2014) (6), to name but a few extant literature, have found that inflation depressed real GDP. Muryani and Pamungkas (2018) (2) have established that unemployment stimulates real GDP. Makaringe and Khobai (2018) (3) and Mohseni and Jouzaryan (2016) (19) have shown that unemployment depresses real GDP.

This study has established that inflation significantly depresses economic performance in India. This finding agrees with extant findings in this area such as the finding of Muryani (2014) (6) in his study of the impact of inflation on economic growth in South Africa; Tenzin (2019) (1) study of the impact of inflation in Bhutan using ARDL; Muryani and Pamungkas (2018) (2) from their study of Indonesia using ECM; among other studies. The reason advanced for inflation impacting negatively on growth in most studies is that inflation causes uncertainty and reduces investment, employment, and consequently output (Tenzin, 2019) (1).

This study has also established that unemployment has not significantly impacted real GDP in India. This finding has disagreed with the finding of Makaringe and Khobai (2018) (3) who uses the ARDL regression model to demonstrate that unemployment has reduced economic performance in India. The finding of this study has also contradicted the findings of Babda, Nirande, and Hogwe (2016) who established that unemployment promotes economic growth in South Africa; Saidu and Muhammad (2015) (5) who have also established that unemployment promoted

economic performance in Nigeria. The findings of this study are consistent with the finding of Lesharo (2013) (20) in his study of South Africa that unemployment has no impact on economic growth; Tenzin (2019) (1) who has studied the impact of unemployment in Bhutan and find no impact of unemployment on real GDP; Saidu and Muhammad (2015) (5) who have also established from their study that unemployment has no significant impact on economic growth in Nigeria. The possible reasons for unemployment not affecting growth might be attributed to, the use of a log of real GDP, the nature of the regression model applied, and controlling for the possible impact of human capital and physical capital. It is important to note that two of the extant kinds of literature cited above, Leshoro (2013) (20) and Saidu and Muhhamad (2018) (5) both use causality models while Tenzin (2019) applies the ARDL model with the log of real GDP. There is no definitive conclusion predicated on the reasons presented above.

The study has established that investment in physical capital and human capital has significantly promoted economic performance in India. The possible reasons are an investment in human capital improves the productivity of the labor forces and hence increases output; investment in physical capital increases the amount of capital per unit of labor and this has the potency of increasing productivity per worker. The overall effect is an increase in output and therefore economic performance.

6. Conclusion

The study provides useful insight into the effects of unemployment and inflation on output growth based on time series data of India over the period 1990 – 2021. It shows that unemployment and inflation rates are negatively correlated with real GDP. While unemployment is significantly correlated, the inflation rates are insignificantly correlated with real GDP. Thus inflation poses a role that is influential for GDP and unemployment with significant levels in macro-economic factors in India. Inflation is a serious problem for fixed-income investors. Unemployment is caused by rapid technological change, business change in tastes, and climate condition which affects demand for certain products and services, individual perception, and willingness to work and search for a job. The results are in line with *a priori* expectation as an increase in GDP leads to the creation of jobs which lowers unemployment. The study has also demonstrated that both physical and human investments have significantly promoted the log of real GDP in India. Inflation rates have a depressing

impact on the log of real GDP. The unemployment problem has no direct effect on the real GDP in India. To tame the problem of unemployment in India requires rather control variables that have a direct impact on the real GDP. In this study, two such variables have been identified that stimulate the real GDP which is an investment in physical and human capital. Investment in human capital can enable India to overcome the problem of shortage of critical skills alluded to as the major cause of unemployment in India. Availability of physical capital is liable to increase the productivity of the workforce and is susceptible to increase not only labor productivity but increases employment which might likely reduce unemployment. The physical capital expansion along with human capital development in terms of skill development appears to be the major determinant of boosting potential productivity and affecting positively economic growth. The results indicated that there are significant and certain benefits from the increased supply and improvement in the quality of physical capital which increases labor productivity as well as investment in human capital. Thus, it is recommended that India makes large-scale investments in infrastructure and skill development and carries on renewal at opportune moments to keep steady the positive trend of economic growth over the years. The investment may be in terms of mechanized technologies, supporting and appropriating knowledge relating to their management, and adopting new technologies and practices involving better innovations in infrastructure and manufacturing process and skill development to sustain the growth of value addition.

The paper has established that inflation rates have a depressing impact on the log real GDP in India. The possible reason advanced for this finding is that inflation creates uncertainty, and this reduces economic growth. The implication is that reducing inflation in India can help engender economic growth and reduce unemployment. The reasoning here is that there may be no direct effect of unemployment on real GDP but there is an indirect impact. Any factor that affects GDP is liable to reduce unemployment. Therefore, monetary policies that reduce inflation are liable to affect real GDP and hence reduce unemployment rates.

Conclusively, this research is essential for policymaking in India. For instance, the Sustainable Development Goal number 8 (SDG8) is designed “To promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all”. The results of this paper have shown that to achieve this objective, it is necessary to increase investment in both physical and human capital and to reduce the inflationary tendency in India’s economy. India needs an

establishment of a valid monetary policy to control inflation through short-term interest rates.

7. Recommendations

Economists study unemployment to investigate its causes and how to reduce this phenomenon. Unemployment is caused by various reasons but the main causes are the high growth rate of the population; the lack of job opportunities; and the inefficiencies of the public sector. The present study indicates that economic growth has a negative and significant effect on the unemployment rate in India as such it could be used as an important tool in decreasing the unemployment rate to the desired level. The Government of India may focus on creating a proper environment for the private sector to create jobs and increase job opportunities; and modernization of the agriculture sector, which is the utmost sector providing more than 42 percent of livelihood but is contributing merely 13 percent towards the Gross Domestic Product through its strategies and resources that include attracting foreign investors. Inflation does not have an impact on unemployment and vice-versa in India. GDP has a unidirectional relationship with inflation, meaning that with an increase in the GDP, inflation also goes up. GDP is the main driving factor influencing inflation and unemployment, so the Government of India should balance them with effective investigation and monitoring.

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