

# Empirical Analysis of the Relationship between Unemployment and Economic Growth in India: A Study Using Okun's Law

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## Abstract

The study examines the correlation between real GDP and unemployment in India, utilising the Okun's Law structure. Unemployment has been a critical challenge in various developing nations, demanding concerted efforts for mitigation. Okun's Law stands as a pivotal economic principle aimed at comprehending the intricate relationship between unemployment and its consequential impact on a country's Real GDP growth rate. Therefore, this research paper aims to primarily investigate the administration of Okun's Law within the context of India's economy spanning a three-decade period from 1992 to 2022. The central focus revolves around assessing whether Okun's Law remains empirically valid within the Indian economic landscape over this extended timeframe. Additionally, the study aims to look forth and understand the specific periods or instances where deviations from the expected relationship occurred and also seeks to elucidate the underlying factors contributing to these deviations. Utilising empirical data and rigorous statistical analysis, this study undertakes a comprehensive examination of India's economic performance vis-à-vis Okun's Law. The analysis extends to explore the divergence from this economic principle during certain temporal periods, aiming to uncover the nuances and factors behind these deviations.

## Introduction

Unemployment represents a pressing and multifaceted challenge that demands attention in every nation, given its profound ramifications on an array of societal and economic dimensions. The impact of unemployment reverberates significantly, extending its influence across a country's economic landscape, societal fabric, and overall welfare. Economically, elevated unemployment rates precipitate a cascade of adverse effects: curtailed consumer spending due to the limited purchasing power of unemployed individuals, thereby impinging on businesses and catalysing a downturn in economic growth. Moreover, such circumstances strain governmental resources, inducing augmented expenditures on unemployment benefits and social welfare programs, while simultaneously leading to a reduction in government revenue owing to diminished tax collections from a smaller employed cohort. Consequently, these economic implications wield a deep-seated influence on a nation's economic health.

The socio-economic repercussions of unemployment are equally profound, encompassing a spectrum of social challenges. The manifestations include escalated poverty levels, heightened stress, mental health ailments, and societal unrest. Prolonged periods of joblessness engender a loss of skills, thereby diminishing an individual's prospects for reintegration into the workforce, perpetuating cycles of economic

hardship within families, and undermining the efficacy of social safety nets, thereby eroding the cohesion and stability of communities.

Furthermore, the persistent prevalence of unemployment culminates in the attrition of human capital and skilled talent. Skilled individuals, encountering limited opportunities domestically, may seek avenues abroad or forsake endeavours towards meaningful careers, thereby instigating a "brain drain." This exodus of talent undermines a country's competitive edge and potential for innovation, impeding its capacity to flourish within the global economic landscape. Given the above repercussions, mitigating unemployment assumes paramount importance for every nation.

On the other hand, real GDP growth rate quantifies the contraction and expansion of the economic output which has been adjusted for inflation. It serves as a key indicator in assessing the economic well - being of a country. A high growth rate represents a thriving economy which focuses on creating job opportunities for all and fosters higher standards of living. On the other hand, real GDP growth rate quantifies the contraction and expansion of the economic output which has been adjusted for inflation. It serves as a key indicator in assessing the economic well - being of a country. A high growth rate represents a thriving economy which focuses on creating job opportunities for all and fosters higher standards of living.

For a country like India, which encompasses diverse economic and socio-cultural landscapes, this relationship becomes even more intricate. Sectoral and regional disparities, policy interventions pose significant impact in shaping the trajectory of unemployment and real GDP growth rate. In this regard, Okun's Law stands as a pivotal economic concept furnishing policymakers with indispensable insights necessary to devise strategies aimed at alleviating unemployment and fostering sustainable economic growth.

### **Review of Literature**

The first model to be developed where a connection between the differences in the unemployment rate to change in the economic output of a country through GNP was postulated by Arthur Melvin Okun. He conducted his research using quarterly data from 1947 Q2 to 1960 Q4 in the USA. Okun's law refers to the relationship between aforementioned variables. Policymakers since then have used this framework to perform a cost - benefit analysis of varying unemployment rates in an economy with respect to the negative relationship with the economic output of a given country.

Arthur Okun quantified this relationship in 1962, highlighting that a 1% decrease in unemployment corresponded to a 3% rise in gross national product, hence termed as "Okun's law" by subsequent observers. There exist two fundamental approaches to Okun's Law: the "gap version" and the "difference version." The former asserts that a 1% increase in unemployment leads to an approximate 2% fall in a country's GDP compared to its potential GDP. Meanwhile, the latter delineates the relationship between quarterly shifts in unemployment and real GDP alterations. However, the accuracy of this law has faced challenges and been subject to disputes over time.

Okun's law, often called "Okun's Rule of Thumb" is primarily a derived real - world observation rather than a theoretical deduction. Its approximation arises due to the influence of factors beyond employment,

such as productivity, on a nation's output. Okun's original assertion indicated that a 3% augment in economic yield corresponded to a 1% reduction in the unemployment rate, alongside a 0.5% boost in participation of the labour force, a similar increase in the number of hours each worker works for, and a 1% rise in labour productivity. The general premise of this states that a 1% escalation in the rate of unemployment is accompanied by a 2% decline in GDP.. Nevertheless, this relationship exhibits variations contingent upon the specific country and time period under scrutiny. (Kabanova & Tregub, 2012).

### ***Relevance of Okun's Law***

Okun's Law holds significant importance in the realm of economics as it provides a framework to understand the correlation between change in rate of unemployment and its effect on a country's Gross Domestic Product (GDP). Multiple reasons underline the significance of the same.

**Policy Guidance.** It offers policymakers and economists a valuable tool for formulating and evaluating economic policies. By recognizing the empirical relationship between unemployment and GDP, policymakers can devise targeted strategies to manage unemployment levels and foster economic growth. It assists in determining the necessary interventions during economic downturns or periods of high unemployment.

**Economic Forecasting.** Understanding Okun's Law enables economists to make informed forecasts about the economy. By analysing historical data and deviations from the expected relationship between unemployment and GDP, forecasts about future economic conditions can be more accurately projected.

**Monitoring Economic Health.** Okun's Law serves as an indicator of an economy's well-being. Changes in unemployment rates and their impact on GDP provide insights into the overall well - being and resilience of a nation. It assists in gauging the effectiveness of economic policies and assessing the economic situation of a country.

**Comparative Analysis.** The law facilitates comparisons between different countries' economic performances. By examining how changes in unemployment affect GDP in various nations, analysts can study and learn from diverse economic scenarios and policy implementations.

**Labour Market Insights.** Okun's Law helps in understanding labour market dynamics. It highlights the relationship between employment levels and economic output, shedding light on the importance of reducing structural unemployment through education, training, and policies aimed at enhancing labour market efficiency.

**Investment and Business Planning.** Businesses and investors can use Okun's Law as part of their decision-making process. Understanding this relationship aids in anticipating economic trends and planning investments accordingly.

### ***Criticisms***

Okun's Law faces several limitations and challenges in real-world economic applications. Here's a revised breakdown of the limitations identified in the provided text:

**Assumption of Symmetry.** It traditionally assumes a symmetric relationship between changes in unemployment and changes in output. However, evidence insinuates that this relationship might not always hold symmetrically. Ignoring this asymmetry can lead to inaccuracies in economic forecasts and policy recommendations. Real-world economic dynamics often exhibit asymmetrical responses between unemployment and output changes during different phases of economic cycles.

**Complexity of Influencing Factors.** Numerous factors contribute to asymmetry the relationship between output and unemployment. The intricate interplay of these factors challenges the simplistic assumption of a linear, symmetric relationship as described by this law.

**Policy Implications.** Asymmetric relationships in the Law have significant policy implications. For instance, if unemployment responds differently to output changes during economic downturns compared to upswings, this can significantly impact the effectiveness of unemployment policies. Additionally, understanding the link between Okun's Law and the Phillips curve can influence inflation management and policy decisions.

**Labour Market Complexity.** The structure of the labour market, including labour market rigidity due to institutional restrictions on hiring or firing, can cause asymmetric responses. For instance, if employers face constraints in dismissing workers but not in hiring, this could result in slower responses in unemployment during economic downturns and faster responses during recoveries.

**Model Complexity.** Attempts to shed light on imbalances in Okun's Law often involve complex models considering factors such as bottlenecks, costly adjustments etc. These models add complexity, making it challenging to accurately capture and predict the dynamics between unemployment and output. In summary, the Law encounters limitations due to its assumption of symmetry, the complexity of real-world economic factors influencing unemployment, its link to inflation via the Phillips Curve, and the need for more sophisticated models to explain the asymmetric relationships between the variables (Silvapulle & Moosa, 2004).

### ***Supporting Studies***

The Okun's Law has prior been researched upon and has also been examined by various researchers in context to their country. Some of these countries do support the assumption of it while others do not.

One such research in the country of Curacao tried to test this to validate Okun's Law with respect to their economy. By using the difference method given by Okun, the coefficient was found to be -2.3% (for long term) and -1.9% (for short term). Moreover, other researchers also tried to understand the same and found significantly similar results. (Hek & Dare, 2015).

Examination of the same was also done for 4 Mediterranean countries (Italy, Greece, Portugal and Spain). This study showed that Italy's higher coefficient (-0.024) than that of Greece (-0.007) was attributed to different levels of industrialization in the countries, with Italy showing higher levels. Notably, all three countries postulated an inverse relationship holding the assumption correct. (Dritsaki & Dritsakis, 2009).

Okun's Law was also utilised in Trinidad and Tobago and discovered a tenuous relationship. Their beliefs and results also aligned with previous studies of the Okun's relationship as well. However, the authors acknowledged the limitation of underestimation of employment figures in their country which might pose an influence on the results obtained (Mercer-Blackman & Salazni, 2014).

When the Okun-type link was investigated in the Baltic states, (Rubova, 2010) found no evidence to support the correlation. In some of the states, a little negative association was seen despite non-robust estimation results. The paper goes on to say that "Inflexible labour market structures and inelastic responses of the unemployment rate with respect to output may provide a lack of data supporting the OL thesis" as possible explanations for the relationship's nonexistence.

An integrative technique was employed in another study to look for signs of Okun-type interactions in Asian nations. The findings of its test, which used Fully Modified Ordinary Least Square (FMOLS), failed to meet the law's premise. Although several countries had -ve coefficients, they were still very small. The authors came to the conclusion that because of asymmetry, their results failed to conform to the applicability of Okun's Law in some developing countries (Lal. Sulaiman, Jalil, & Hussain, 2010).

The USA, Japan, and France also conducted tests on Okun's claims. Their findings in France and Japan, in contrast to the law, indicated that the variables had no discernible effects on one another. Nonetheless, Okun's Law's demonstration of an inverse correlation between GDP and unemployment applies to the United States of America (White & CHU, 2013).

Noor, Nor et al. in the year 2007 investigated if there is an Okun-type association in severance & affair in Malaysia. The results displayed an inverse relationship for the same. A closer look at Okun's law was conducted by Hassan and Hossain (2013). They investigated whether severance and GDP (real) in Bangladesh had an Okun-type relationship. The empirical results showed a negative relationship between severance and affair. Similarly, they stated that profitable expansion and severance did not correlate over an extended time frame.

Arshad & Erixon(2010) studied the relationship between GDP & severance in context of Swedish frugal living. The study found that from quarter one in 1993 to quarter two in 2009, the Swedish frugality was in compliance with Okun's law. In 2010, Muhammad, Lad and others computed the Okun's measure and looked at how Okun's law related to various Asian countries between 1980 and 2006. The short run dynamic was ascertained using the error correction medium, and the long term dynamic was ascertained using Engle Granger's (1987) co-integration approach. The empirical substantiation indicates that Okun's law did not apply to Sweden. (Stungwa & Tozamide, 2021).

## Objective

The aim of the research paper is to empirically investigate the relationship between economic growth and unemployment in the context of India using the framework of Okun's Law. The primary goal is to analyse and assess the validity and applicability of the same within our Indian economy over a substantial period spanning three decades from 1992 to 2022.

### ***Rationale and Significance***

Unemployment poses a critical challenge in many developing nations, including India, necessitating focused efforts for mitigation. Okun's Law stands as a fundamental economic principle aimed at understanding the intricate relationship between unemployment and its consequential impact on a country's Gross Domestic Product (GDP). This research is motivated by the importance of comprehending this relationship within the Indian economic landscape.

### ***Specific Objectives***

1. To empirically examine and ascertain the validity of Okun's Law within India's economy over a three-decade period.
2. To identify specific periods or instances where deviations from the expected relationship between unemployment and economic growth occurred.
3. To elucidate the underlying factors contributing to these observed deviations.
4. To conduct rigorous statistical analysis utilising empirical data to comprehensively evaluate India's economic performance in light of Okun's Law.
5. To delve deeper into the temporal deviations from this economic principle, aiming to uncover the nuanced factors driving these deviations.

### **Methodology**

Data used for the study is secondary data and was sourced from the World Development Indicators database, focusing on the aforementioned macroeconomic indicators. The study's sample comprises annual data points spanning the last three decades : 1992 - 2022, creating a time series data capturing a comprehensive representation of economic conditions in India. This period of 30 years facilitates nuanced examination of Okun's Law over multiple economic cycles and events.

Measures of central tendency such as mean, standard deviation and correlation are used to draw potential insights from the available dataset. Furthermore, a linear regression analysis is conducted using the equation  $y = mx + c$  to assess this relationship mentioned above (real GDP growth & unemployment) where,

- x is the Real GDP Growth Rate
- y is the change in unemployment rate
- m is the slope coefficient
- c is the intercept

Statistical software, namely, Microsoft Excel has been used for computation of required values and equations for assessing its significance. However, it is crucial to note that the study relies on publicly available information from the World Development Indicators Database. No identifiable information is used in the analysis.

### **Result**

In this section, the outcomes of the analysis focusing on the relationship between change in unemployment and real GDP growth rate in India over the three decade period from 1992-2022 are presented. A linear regression model expressed as  $y = -20.602x + 1.288$  is employed where y represents the real GDP growth rate and x represents the change in unemployment. The robustness of the model is determined through the



coefficient of determination  $R^2$ . Additionally, descriptive statistics tools are used to provide a comprehensive overview of central tendencies and variabilities of the variables.

Year	Change in Unemployment ( $u_t - u_{t-1}$ )	Real GDP Growth Rate (constant 2015 US\$) ( $GDP_t - GDP_{t-1}$ )/ $GDP_{t-1}$
1992	-	-
1993	-0.017	0.047507762
1994	0.032	0.066589241
1995	0.184	0.075744918
1996	0.167	0.075495222
1997	0.098	0.040498208
1998	0.208	0.061844158
1999	0.222	0.088457556
2000	0.061	0.038409912
2001	0.187	0.048239663
2002	0.145	0.038039753
2003	0.258	0.078603815
2004	0.171	0.079229366
2005	0.169	0.079234306
2006	-0.075	0.080607326
2007	-0.089	0.076608151
2008	-0.182	0.030866981
2009	0.03	0.078618888
2010	-0.065	0.084975847
2011	-0.151	0.05241315
2012	-0.073	0.054563888
2013	-0.058	0.063861064
2014	-0.056	0.074102276
2015	-0.066	0.079962538
2016	-0.073	0.082563055
2017	-0.109	0.067953834
2018	-0.083	0.064538513
2019	-1.14	0.038714369
2020	3.685	-0.058310532
2021	-2.482	0.090502779
2022	-0.383	0.070029515

**Table 1: Change in Unemployment and Real GDP Growth Rate from 1992 - 2022**

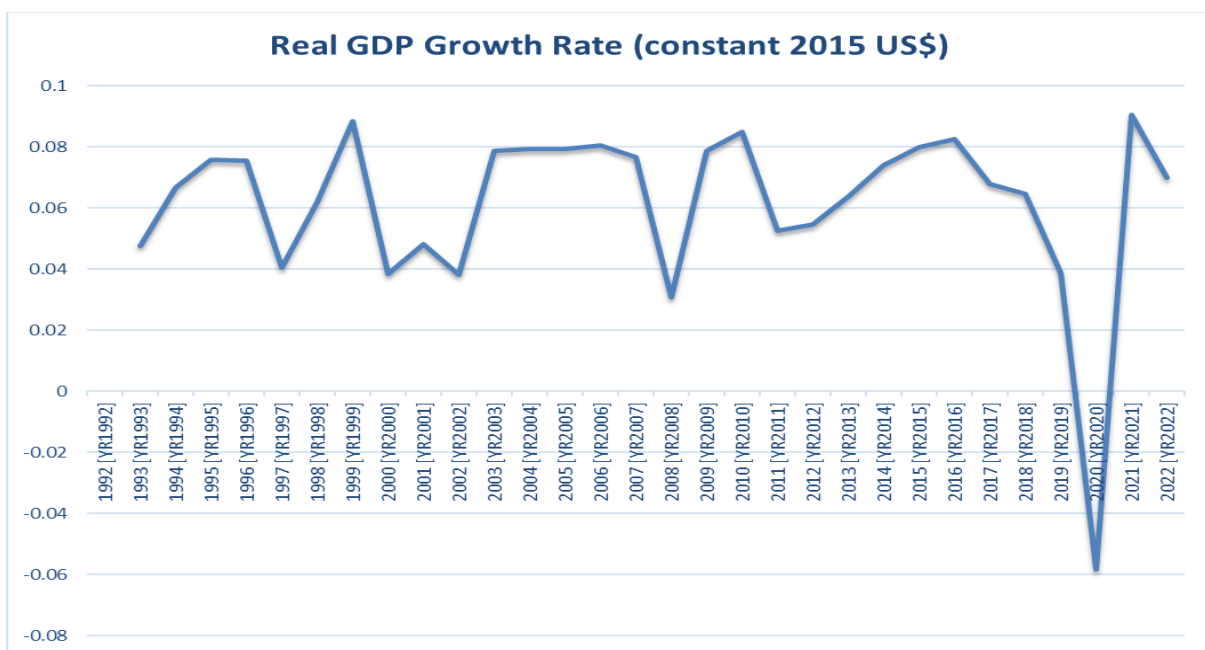
**Descriptive Statistics**

The mean *change in unemployment* over the three decade period was 0.017, which indicates a slight

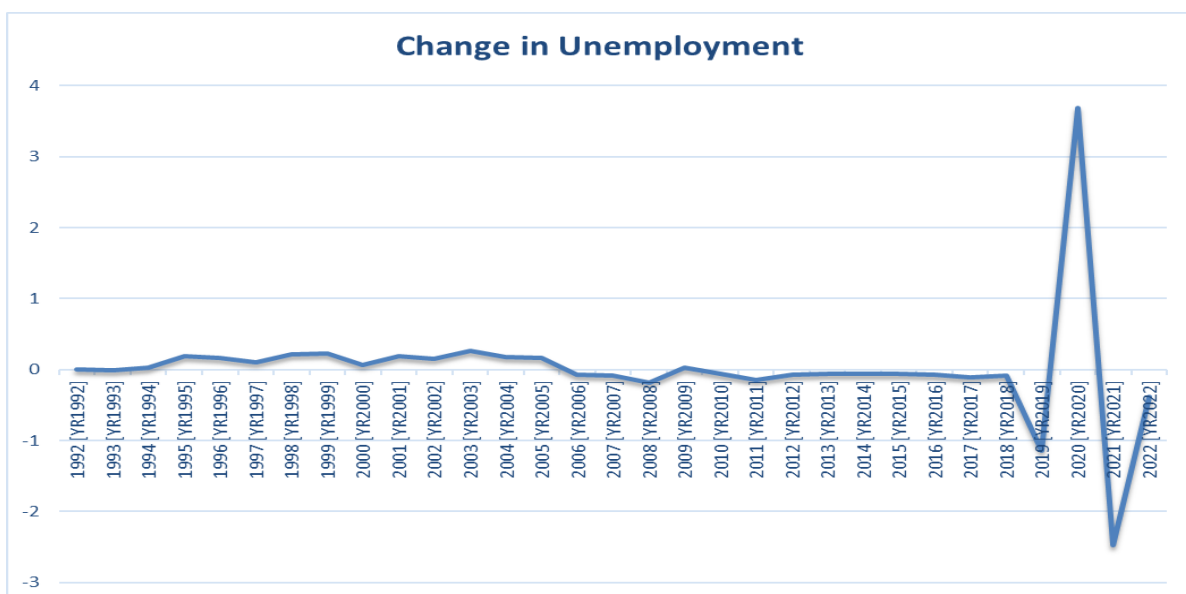
positive change on average. Whereas, the standard deviation was 0.86 suggesting high degrees of variability. This implies significant fluctuations in the annual changes in unemployment over the period.

The mean *real GDP growth rate* for the same time period was 0.06 and the standard deviation was 0.028 indicating a low level of variability, therefore, a relatively stable model. While the graph may look dynamic, it is crucial to note that the real GDP growth rate ranged between -0.06 to 0.09 in the three decades.

Moreover, the correlation rate between the variables came out to be -0.67 which indicates that when there is an increase in the unemployment rate, there is a strong tendency for the real GDP growth rate to fall.



**Figure 1: Real GDP Growth Rate (constant 2015 US\$) from 1992 - 2022**



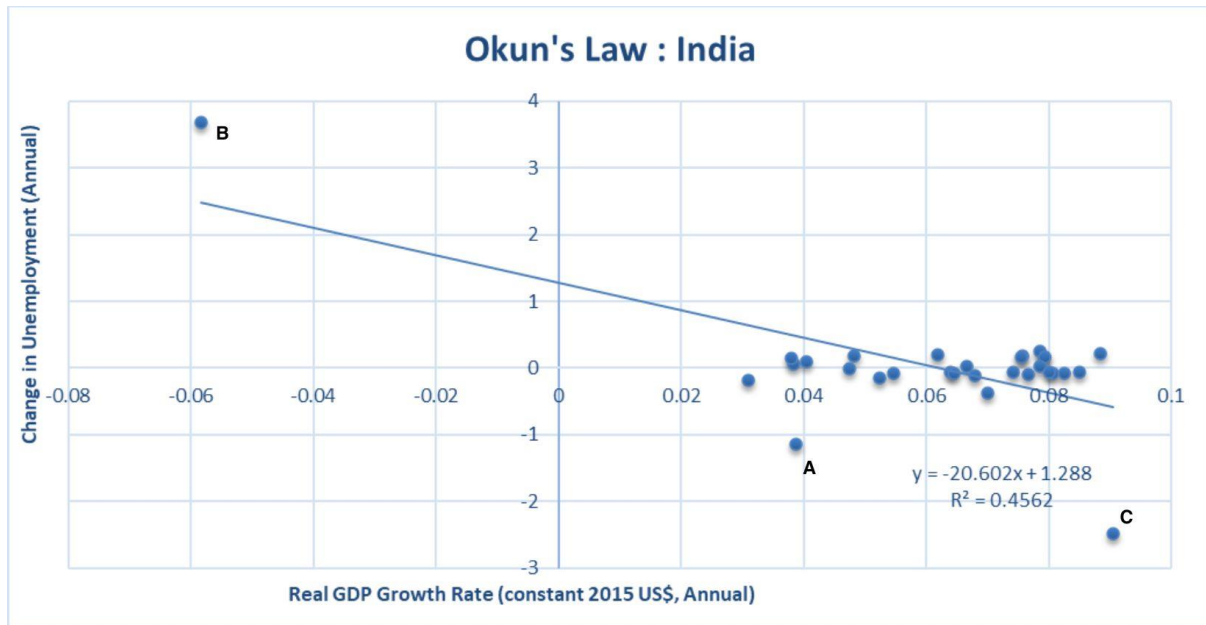
**Figure 2: Change in Unemployment Rate from 1992 - 2022**



**Linear Regression Analysis**

The linear regression model  $y = -20.602x + 1.288$  was employed to ascertain the correlation between the two variables. The coefficient for real GDP growth rate (x) is -20.602, implying an inverse/negative relationship with the unemployment rate. The intercept 1.288 is the estimated GDP growth rate when there is no change in unemployment.

The coefficient of determination ( $R^2$ ) for the model is 0.4562 indicating 45.62% variation in the real GDP can be attributed to the change in unemployment. This mid value suggests a reasonably good fit to the data.



**Figure 3: Line of Best Fit**

**Statistical Significance**

The coefficients in the regression model were found to be statistically significant. The negative coefficient for change in employment implies an inverse relationship between the variables, i.e., an increase in employment will lead to a decrease in the real GDP of the country. This adds confidence to the reliability of the observed relationship.

**Discussion**

The outcome of the linear regression reveals an inverse relationship between the unemployment rate and real GDP growth rate as exhibited by Okun’s Law as well. This is also substantiated by the line of best fit in figure 3, i.e., the downward sloping curve indicates that an increase in unemployment is accompanied with a decrease in real GDP growth rate and vice - versa. The magnitude of the slope (-20.602) implies a high degree of sensitivity of the real GDP growth rate to changes in unemployment. During periods of economic expansion or contraction, the model suggests that a small increase in unemployment is associated with a significant decrease in the real GDP growth rate. The negative relationship underscores the responsiveness of the labour market to fluctuations in economic growth, as indicated by the model.

Additionally, the calculation of the required real GDP growth to maintain a constant unemployment rate turns out to be 0.062%. This value can be used by policymakers as a baseline while formulating economic

policies as it provides a quantitative benchmark for setting goals related to real GDP growth rate that aim to prevent a rise in unemployment. It also serves as an indicator of the level of economic growth required to generate sufficient job opportunities and absorb the new entrants in the labour market.

The value of coefficient of determination which is 0.4562 indicates that there 45.62% variation in real GDP growth rate is due to change in labour market and thereby unemployment rate. This also implies that 54.38% changes in real GDP growth rate is attributed to factors other than unemployment indicating an intricate tapestry of all the factors such as economic events, policy changes etc. that have an effect on the real GDP growth rate. One such event is the onset of Covid - 19 during 2020 which had a significant impact on the unemployment and real GDP levels as shown by the point in the second quadrant of Figure 3.

In figure 3, Point A, representing the situation in 2019 marks the onset of shifting of the economic landscape of India. As the pandemic unfolded, India, like many other countries in the world, started grappling with economic stress. The year 2020, represented by point B, witnesses an unprecedented downfall for the Indian economy leading to a surge in unemployment due to disruptions caused by lockdown across various sectors such as tourism, hospitality etc. Real GDP growth rate plummeted significantly as well owing to the lockdown imposed by the Government. Point C, representing the year 2021, indicates relative stabilisation. Efforts to adapt to the new normal and improved and subsidised access to Covid-19 vaccines such as Covishield resulted in gradual improvement. While challenges persisted, there were signs of recovery in both labour market and economic output.

While the model discusses a correlation between the variables, it is crucial to note that analysis establishes a correlation, not a causation. For instance, while the calculated value of 0.062 provides a baseline, it is essential to keep structural factors such as skill mismatches, demographic trends etc. while policy formulation. Lastly, it is essential to note that the model relies on the linearity assumption as provided by Okun's law which may oversimplify the complex dynamics between the variables.

## Conclusion

By providing empirical evidence and analysis, this research aims to contribute to the existing studies on the dynamics of unemployment and economic growth in India. The findings are expected to shed light on the applicability of Okun's Law in the Indian scenario, identify deviations from this principle, and offer insights into the factors driving these deviations, thereby assisting policymakers and economists in formulating more effective strategies to address unemployment challenges in the country.

The descriptive statistics illuminated the stability of both unemployment and real GDP growth rate. The calculated correlation of -0.67 indicates a strong tendency for real GDP growth rate to fall when there is an increase in unemployment. The linear regression analysis with a coefficient of determination ( $R_2$ ) of 45.62% reaffirms the same. Additionally, the derived value 0.062% for the required real GDP growth rate to maintain a constant unemployment rate serves as a quantitative benchmark and guide for policy formulation.

However, it is crucial to recognize the limitations of the model and the law. While the study establishes a correlation, it does not imply causation. In reality, the unemployment rate and real GDP growth rate are influenced by multiple factors. Moreover, the model relying on the linear assumption of Okun's law oversimplifies the complex dynamics of an economy.

In conclusion, while Okun's law serves as a valuable framework for understanding the relationship between unemployment and real GDP growth rate and holds true for the Indian economy, its application requires careful consideration of the unique social, political, and economic aspects of every country.

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