Macro Economics Analysis of Relationship between Unemployment and GDP Growth of Bhutan: Application of Okun's Law

Abstracts

This paper examines the relationship between unemployment and the GDP growth rate in Bhutan, focusing on the applicability of Okun's laws from 1991 to 2022. The findings reveal significant short-term and long-term impacts of unemployment on Bhutan's GDP. Both the short run and long run demonstrate the negative effects of unemployment on GDP in Bhutan. The results confirm the validity of Okun's law in the country, showing that a one-unit increase in unemployment leads to a decline of 2 percentage points in GDP. Consequently, this study emphasizes the need for appropriate measures and policies to address the unemployment problem in Bhutan. To tackle this issue, the implementation of hands-on training and workshops on job-related skills during undergraduate studies is recommended. By providing practical training early on, individuals will be better prepared for the job market, enhancing their employability and contributing to the economy more effectively. Furthermore, the government should allocate mandatory internships in various related fields. These internships will provide students with valuable practical experience, bridging the gap between theoretical knowledge and real-world application.

Keywords: Unemployment, GDP, Okun's Law, and ARDL Model

Introduction

The unemployment rate and economic growth have significant implications for Bhutan's overall development and well-being. Bhutan, situated in the eastern Himalayas, has witnessed remarkable economic progress. The unemployment rate in Bhutan reflects the proportion of individuals actively seeking employment but facing difficulties in finding suitable opportunities. Despite Bhutan's unique socio-economic circumstances and relatively small population, the unemployment rate remains comparatively lower than in other nations. However, it continues to be a concern for policymakers as the country endeavors to provide meaningful job prospects for its expanding labor force. Economic growth in Bhutan is measured by the growth of its gross domestic product (GDP) over a specific period (MoLHR, 2022). The Bhutanese government is

actively addressing unemployment challenges and promoting inclusive growth through initiatives such as skill development, fostering employment opportunities in emerging sectors, and encouraging entrepreneurship and innovation. Furthermore, the focus on sustainable development and the preservation of Bhutan's cultural heritage is anticipated to contribute to job creation within the tourism and cultural sectors.

Across different countries, various government policies have been implemented to tackle unemployment and stimulate economic growth. Researchers have conducted studies to examine the relationship between unemployment and GDP. For instance, a study by Okun in the United States discovered that a 1% increase in GDP corresponds to a 0.3% decrease in the unemployment rate. Similar investigations have explored the applicability of Owkun's law in different countries. A study conducted in Saudi Arabia between 1991 and 2017 found a negative and significant impact of the GDP gap on unemployment rates, with a 1% increase in GDP associated with a 0.29% decrease in the unemployment rate (Louail, & Riache, 2019). Another study in Nigeria during 1970-2014 revealed a long-term negative relationship between unemployment and economic growth, as well as a significant positive effect of oil prices on economic growth (Abu, 2017). Other researchers (Knotek, 2007; Okun, 1962; Driouche, 2013; Durech, et al., 2014; Villaverde and Maza, 2009 and Jeke, & Wanjuu, 2021) also examined the relationship between unemployment and GDP growth rate.

In Bhutan, researchers have also explored the relationship between economic growth, inflation, and unemployment. (Tangtipongkul, & Wangmo 2017) concluded that economic growth had no impact on reducing the unemployment rate in Bhutan, and, as economic growth increased, so did the unemployment rate. However, in the short run, inflation had a negative association with the unemployment rate, while in the long run, it had a positive association. These findings suggest that an increase in employment rates leads to short-term inflation, and if inflation is not monitored or controlled, it can negatively impact investment and economic growth, resulting in long-term unemployment. Further studies have been conducted in Bhutan to analyze the relationship between unemployment and GDP growth. (Tenzin, 2019) utilized the ARDL model to investigate the nexus among economic growth, inflation, and unemployment in Bhutan. The findings indicated that economic growth had no impact on the reduction of the unemployment rate in both the short and long run, but inflation had contrasting associations. Additionally, a

study examined the determinants of unemployment and policy responses in Bhutan. The objective of the present paper is to study the macroeconomic analysis of the relationship between unemployment and GDP growth using the ARDL model, aiming to validate the applicability of Owkun's law in Bhutan. The paper is divided into three sections: methodology and data source, results and discussion, and conclusion.

Hypothesis for the above objectives are:

There are two null hypotheses and two alternative hypotheses:

H1: There are no effects of the unemployment on GDP growth rate in Bhutan

H1: Okun law is not applicable in Bhutan.

H2: There are effects of unemployment rate on GDP growth rate in Bhutan

H2: Okun law is applicable in Bhutan

Data Source and Methodology

1. **Data sources**

The data was collected from secondary sources from World Bank Open Data for the study of this paper. The unemployment rate of Bhutan data was collected from the year 1991 to 2022 and the total annual GDP growth rate of Bhutan was collected from year 1991 to 2022. Thus, results were analyzed using data from the year 1991 to 2022.

2. **Methodology**

Okun’s Model

According to Okun's proposition in 1970, there exist two main model specifications of Okun's law, namely the 'First Difference Model' and the 'Gaps Model'. Okun initially introduced Okun's Law in 1962, which demonstrated a negative correlation between unemployment and output.

This law refers to the empirical regularity that holds when analyzing the relationship between cyclical unemployment and cyclical output.

The 'First Difference Model', as suggested by Okun (1962), allows for the estimation of the empirical relationship between real GDP and unemployment through the use of first differences. The equation representing this model is as follows:

$$(Yt - Yt{-}1\ ) = \beta 0 + \beta 1\ (Ut - Ut{-}1\ ) + \varepsilon t$$

In this equation, ΔUt represents the changes in the unemployment rate between the current and previous periods, ΔYt signifies the growth rate of output (GDP) in percentage between the current and previous periods, εt represents the error term in period t, and β1 denotes the coefficient of Okun. According to Knotek (2007), for Okun's Law to hold, the coefficient β1 should be negative, as a growing economy, in the long run, should result in a decrease in unemployment.

On the other hand, the 'Gaps Model' is described as follows:

$$(Ut - Ut*\ ) = \beta(Yt - Yt*\ ) + \varepsilon t$$

In this model, Ut represents the unemployment rate, Yt represents the actual output, Ut* represents the natural rate of unemployment, Yt* represents the potential output, εt represents the error term in period t, and β represents the coefficient of Okun.

Results and Discussion

This section of the paper will delve into the results and discussion derived from the implementation of the ARDL (Autoregressive Distributed Lag) model. The ARDL model allows for a comprehensive analysis of the relationship between unemployment and GDP growth in Bhutan, considering both short-term and long-term dynamics. By employing the ARDL model, the study aims to capture the intricacies of this relationship and provide valuable insights into the applicability and validity of Okun's law in the Bhutanese context. The model will enable the examination of lagged effects, potential non-linearity, and other relevant factors that may influence the relationship between unemployment and GDP growth. The results generated from the ARDL model will enable the identification of any potential long-term equilibrium

relationship between unemployment and GDP growth, which can further inform policymakers and researchers in understanding the dynamics of Bhutan's economy.

In this paper, the Owkun Gap model has been adopted and the new gap model equation is:

$$Ugapt = \beta 0 + \beta 1 GDP\ gap 1 + \varepsilon$$

ARDL model equation is:

$$\Delta Ugapt = \beta 0 + \beta 1 gapt{-}1 + \beta 2 \mathrm{GDP} gapt{-}1 + \sum \gamma li\ p\ i{=}1\ Ugapt{-}1 + \sum \gamma 2j\ q\ j{=}1\ \Delta \mathrm{GDP} gapt{-}1 + \varepsilon_t$$

1. Unit Root Test

Table 1 presents the results of the unit root tests conducted using the ADF (Augmented Dickey-Fuller) test and PP (Phillips-Perron) test. Initially, when examining the variables at their original level, neither unemployment nor GDP exhibits significance in the ADF test. However, when the variables are transformed into first differences, they become both stationary and significant. Furthermore, the stationary nature of the variables is also confirmed by the results of the Phillips-Perron test. Initially, neither unemployment nor GDP shows stationary at the level. However, once the variables are differenced, they become stationary at the first difference. Based on these findings, it can be concluded that the variables satisfy the stationary requirement when considering their first differences. This suggests that the ARDL (Autoregressive Distributed Lag) model can be appropriately utilized in this context. By transforming the variables into their first differences, any non-stationary issues that may have existed in the original level data are addressed. This ensures the reliability and appropriateness of employing the ARDL model for further analysis.

Table 1: Results of Unit Root Test

Unit Root Test					
		Augmented Dickey-fuller Test		***Phillips-Perron***	
SL.NO	**Variable**	**Level**	**First Difference**	**Level**	**First Difference**
1	LNU_GAP		0.0367		-7.4656
2	LNGDP_GAP	0.0104	0.0011	0.0019	-18.4469

2. Bound Test/Co-integration Test

Table 2 presents the results of the bound test, which assesses the cointegration between the dependent variable (GDP growth rate) and the independent variable (Unemployment). The test involves comparing the F-statistic with the upper and lower bound values. In this case, the F-statistic has a value of 9.7, which is greater than both the lower bound (3.62) and the upper bound (4.16) at a 5 percent significance level. This suggests that the model is statistically significant since the F-statistic exceeds the upper bound. Consequently, it indicates the presence of a long-run and short-run relationship between GDP growth rate and Unemployment.

Table 2: Results of the cointegration Test

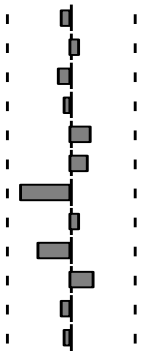
F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	9.704188	10%	3.02	3.51
k	1	5%	3.62	4.16
		2.5%	4.18	4.79
		1%	4.94	5.58
Actual Sample Size	25	Finite Sample: n=30		
		10%	3.303	3.797
		5%	4.09	4.663
		1%	6.027	6.76

3. Diagnostic Test

The ARDL model (Autoregressive Distributed Lag model) is a statistical model used to analyze the long-run relationship between variables. It takes into account both autoregressive and moving average components. Autocorrelation refers to the correlation between a variable and its lagged values. Partial correlation, on the other hand, measures the correlation between two variables while controlling for the influence of other variables. Table 3, presents the results of autocorrelation and partial correlation tests for the variables in the ARDL model. The probability values (p-values) for these tests are reported, and they are all greater than 0.05. A significance level of 0.05 is commonly used to determine statistical significance. If the p-value is less than

0.05, it indicates that there is evidence of autocorrelation or partial correlation. Conversely, if the p-value is greater than 0.05, it suggests that there is no significant autocorrelation or partial correlation. Therefore, based on the given information, the statement concludes that there is no problem with autocorrelation and partial correlation in the ARDL model because the reported probability values are greater than 0.05.

Table 3: Results of the Correlation Test/Diagnostic Test

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
		1	-0.055	-0.055	0.0843	0.772
		2	0.041	0.038	0.1343	0.935
		3	-0.068	-0.064	0.2777	0.964
		4	-0.033	-0.042	0.3132	0.989
		5	0.116	0.118	0.7636	0.979
		6	0.106	0.119	1.1643	0.979
		7	-0.300	-0.314	4.5360	0.716
		8	0.044	0.026	4.6145	0.798
		9	-0.191	-0.143	6.1599	0.724
		10	0.141	0.094	7.0542	0.720
		11	-0.065	-0.108	7.2575	0.778
		12	-0.043	-0.005	7.3537	0.833

4. ARDL MODEL (2, 4)

Table 4 presents the comprehensive results of an ARDL model. In this model, the dependent variable is GDP, and it is fitted with 2 lags. The independent variable, Unemployment, is fitted with 4 lags. The Durbin-Watson statistic is used to test for the presence of autocorrelation in the model. The reported value of 1.95 is compared to the critical value of 1.73. Since 1.95 is greater than 1.73, it suggests that there are long-run effects present in the model and no problem of correlation. This means that the past values of the variables have a lasting impact on the current values, indicating a significant relationship between GDP and Unemployment. Furthermore, the F-statistic, which measures the overall significance of the model, is reported as 2.3. Since this value is significant, it indicates that the ARDL model as a whole is statistically significant. This means that the variables included in the model jointly have a meaningful impact on explaining the changes in GDP.

Table 4: Results for the Overall ADRL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNGDP_GAP(-1)	-0.112677	0.196622	-0.573064	0.5741
LNGDP_GAP(-2)	-0.244088	0.184551	-1.322611	0.2035
LNU_GAP	-0.350779	0.514897	-0.681261	0.5049
LNU_GAP(-1)	0.925877	0.642900	1.440158	0.1680
LNU_GAP(-2)	0.522869	0.715569	0.730704	0.4749
LNU_GAP(-3)	0.519995	0.684154	0.760055	0.4576
LNU_GAP(-4)	-1.647762	0.549975	-2.996069	0.0081
C	2.440835	0.474482	5.144206	0.0001

R-squared	0.489014	Mean dependent var	1.847918
Adjusted R-squared	0.278608	S.D. dependent var	0.437668
S.E. of regression	0.371732	Akaike info criterion	1.113051
Sum squared resid	2.349141	Schwarz criterion	1.503091
Log likelihood	-5.913138	Hannan-Quinn criter.	1.221232
F-statistic	2.324146	Durbin-Watson stat	1.952747
Prob(F-statistic)	0.073723		

*Note: p-values and any subsequent tests do not account for model selection.

5. Short Run Relationship between Ut and Yt

Table 5: Results for the short-run relationship between unemployment and GDP

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.440835	0.474482	5.144206	0.0001
LNGDP_GAP(-1)*	-1.356766	0.261396	-5.190468	0.0001
LNU_GAP(-1)	-0.029800	0.245622	-0.121325	0.9049
D(LNGDP_GAP(-1))	0.244088	0.184551	1.322611	0.2035
D(LNU_GAP)	-0.350779	0.514897	-0.681261	0.5049
D(LNU_GAP(-1))	0.604898	0.516843	1.170370	0.2580
D(LNU_GAP(-2))	1.127767	0.546397	2.064008	0.0546
D(LNU_GAP(-3))	1.647762	0.549975	2.996069	0.0081

* p-value incompatible with t-Bounds distribution.

6. Long Run

Table 6 provides insights into the long-run relationship between unemployment and GDP growth rate. The analysis reveals a significant relationship between these variables. The probability value for unemployment (Ut) is reported as 0.9, which indicates a significance level of less than 10 percent. Examining the coefficient for the long-run variable, we observe a negative value of -0.02. This negative coefficient suggests a negative impact of unemployment on the GDP growth

rate in the long run. Specifically, a one-unit increase in unemployment is associated with a decline in the GDP growth rate by 0.90 units. This highlights the adverse effects of unemployment on the economic growth of Bhutan in the long run. The results underscore the significance of unemployment as a determinant of the GDP growth rate in Bhutan. Policymakers and stakeholders should recognize the importance of addressing unemployment concerns to foster sustained economic growth. Implementing effective labor market policies, such as job creation programs, skills training initiatives, and promoting entrepreneurship, can help mitigate the negative impacts of unemployment on the GDP growth rate.

Table 6: Results for the long-run relationship between unemployment and GDP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNU_GAP	-0.021964	0.182089	-0.120624	0.9054
C	1.799010	0.159332	11.29098	0.0000

EC = LNGDP_GAP - (-0.0220*LNU_GAP + 1.7990)

Application of Okun's Law in Bhutan from the Results

The findings from the short and long-run analysis using the ARDL model indicate that there are negative impacts of unemployment on GDP in Bhutan. Specifically, the Owkun results suggest that a one percent increase in unemployment leads to a decline in GDP by 2 percent according to the "Okun law." Furthermore, the results of the ARDL model reveal that in the short run, a one-unit increase in unemployment leads to a decline in GDP by 0.0001 in Bhutan. This implies that higher levels of unemployment have a detrimental effect on the short-term economic growth of the country. Similarly, in the long run, the analysis indicates that a one-unit increase in unemployment leads to a decline in GDP by 0.9 in Bhutan. This signifies a substantial negative relationship between unemployment and long-term GDP growth. Therefore, based on the results obtained from the ARDL model, it can be concluded that there are both short-run and long-run negative impacts of unemployment on GDP in Bhutan. These findings align with the hypothetical "okun law" and suggest its applicability in the context of Bhutan from the years 1991 to 2022. It is important to note that economic relationships and their dynamics can be

influenced by various factors, including policy interventions, institutional frameworks, and specific economic conditions. Hence, caution should be exercised when generalizing these results to other contexts or periods.

Conclusion

In conclusion, this paper has examined the relationship between unemployment and the GDP growth rate in Bhutan, as well as the applicability of Okun's laws in the context of Bhutan from the period 1991 to 2022. The findings of this study reveal both short-term and long-term impacts of unemployment on the GDP of Bhutan, with both showing negative effects. The results strongly suggest that Owkun's law holds in Bhutan, indicating that a one-unit increase in unemployment leads to a decline of 2 percentage points in GDP. This highlights the importance of addressing the issue of unemployment to promote economic growth and development in the country. Based on these findings, it is recommended that appropriate measures and policies be implemented to mitigate the unemployment problem in Bhutan. One crucial step is to provide hands-on training and workshops on job-related skills during undergraduate studies. By incorporating such training early on, individuals will be better equipped to enter the job market and contribute effectively to the economy. Additionally, the government should allocate mandatory internships in each relevant field. These internships will provide students with practical experience, enhance their employability, and bridge the gap between theoretical knowledge and real-world application.

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