WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Exploring the Drivers of Unemployment and Forecasting the Unemployment Rate: A Time Series and Regression Analysis

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DOI: https://doi.org/10.55248/gengpi.4.823.50845

A B S T R A C T

The unemployment rate is a key macroeconomic indicator that quantifies the proportion of the labor force actively seeking employment but currently without work, serving as a pivotal metric for assessing labor market dynamics and economic health. Forecasting and exploring predictors of unemployment helps inform policymakers, businesses, and stakeholders, assisting in the formulation of effective strategies for mitigating unemployment and fostering economic stability. This study explores the key factors influencing the Unemployment rate in the Philippines from 2000 to 2020 using simple linear regression, multiple linear regression, and time series analysis. The research aims to determine the trend of unemployment over the years, investigate the significant relationships between the Unemployment rate and various macroeconomic variables, and construct time series models to predict the Unemployment rate for 2024. Findings reveal a declining trend in unemployment from 2000 to 2020, with fluctuations in recent years. Labor force participation rate, population growth rate, and inflation rate showed significant linear relationships with unemployment, while Gross Domestic Product (GDP) growth rate did not. The best fit model, a moving average model with an interval of 2, predicts a 2.240% increase in the Unemployment rate for 2024. These results offer valuable insights for policymakers and researchers seeking to address unemployment challenges in the Philippine economy.

Keywords: Philippines, Unemployment Rate, Time Series Analysis, Linear Regression, Mathematical Modelling

1. Introduction

Unemployment remains a pressing and multifaceted issue that profoundly impacts economies and societies worldwide. Its consequences are far-reaching, affecting individuals, families, and communities, while also influencing macroeconomic stability and growth. As such, understanding the determinants of unemployment is of paramount importance for policymakers and economists seeking to formulate effective strategies for reducing unemployment rates and fostering sustainable economic development.

According to Chappelow (2020) it is of utmost importance for us to understand that unemployment is a key economic indicator mainly since it signals the ability (or inability) of workers to readily obtain gainful work to contribute to the productive output of the economy. With more unemployed workers mean less total economic production will take place than might have otherwise.

Considerable research has explored the relationship between unemployment and various economic indicators, such as GDP growth, inflation, and labor force participation. Scholars have identified significant associations between these factors and fluctuations in unemployment rates. Existing studies have often employed simple linear regression to examine these relationships individually, but few have ventured into comprehensive analyses that incorporate multiple predictors and account for the dynamic nature of unemployment over time. In the study of Chen et al. (2017) the common factors which influence greatly towards unemployment rate are inflation (INF), gross domestic product growth (GDP), population (POP) and foreign direct investment (FDI). Moreover, they found that the GDP and POP are significant to interpret the unemployment rate in long-run whereas insignificant long-run relation between unemployment rate with INF and FDI in respective. While Wirawan et al. (2021) found that exchange rate and FDI had a negative and not significant effect on educated unemployment, Inflation and Domestic investment had a positive and not significant effect on educated unemployment in the short- and long-term period, while economic growth has negative and significant on educate unemployment, and the last variable is minimum wage has positive and significant effect on educated unemployment in Indonesia both for short- and long-term period. Shabbir et al. (2021) found a negative and significant relationship at the 5% level of significance among governance, internet users, mobile cellular subscriptions, fixed broadband subscriptions and human capital with an unemployment rate of South Asian economies. On the other hand, financial activity (credit) and population growth have a positive and significant relationship with the unemployment rate. Additionally, Puspadjuita (2018) found that the labor force variable was significant to unemployment level in Indonesia. Here in the Philippines, Urrutia et al. (2017) found that significant factors of unemployment rate are found to be Labor Force Rate and Population.

In the context of the Philippines, despite the considerable amount of global research on factors influencing unemployment rates, a significant dearth of studies specifically focusing on unemployment within the country is apparent, particularly when searching through online engines such as Google Scholar.

This lack of local research highlights a crucial gap in our understanding of the dynamics of unemployment in the Philippines, particularly during the period from 2000 to 2022, which covers the time frame encompassing the pandemic's impact.

To address this knowledge gap, our research endeavors to take a comprehensive approach, combining time series analysis and multiple linear regression techniques. By doing so, we aim to provide a more nuanced and in-depth understanding of the complex drivers of unemployment in the Philippines. Our study takes into account the interplay between unemployment and several key macroeconomic indicators, each of which holds significant importance. Among the macroeconomic indicators considered in this study is the GDP growth rate, a crucial indicator of an economy's expansion or contraction. By analyzing the economic output of the country measured by GDP in consecutive quarters, we can discern the pace of economic growth or decline. Another essential factor we examine is the inflation rate, which measures how quickly a currency loses its value. This percentage indicates the currency's devaluation during a specific period and serves as a measure of the rise in prices for goods and services over time. Moreover, the population growth rate is included in our analysis, providing insight into the annual average rate of change in the country's population size over a defined period. Understanding population trends can help discern their influence on unemployment rates. The study also accounts for net national income, defined as gross national income minus the depreciation of fixed capital. This indicator allows us to evaluate the overall economic well-being of the country and its potential impact on unemployment. Furthermore, the labor force participation rate, which measures the proportion of the population either employed or actively seeking work, is incorporated into our study. This metric plays a vital role in understanding the workforce's engagement and its relation to unemployment rates. This study aimed to analyze various factors that influence unemployment rates in the Philippines. We want to understand how these factors work together and if they can either support or contradict each other. By doing this, we hope to add valuable information to what we already know about unemployment in the country. This research can be beneficial for policymakers and other researchers as well. With a better understanding of the specific causes of unemployment in the Philippines, we can develop targeted strategies and policies to tackle this important economic issue. Specifically, this study aimed to

1. Determine the trend of Unemployment Rate of the Philippines from 2000 to 2020.
2. Find if the Unemployment Rate has a significant linear relationship with (1) Gross Domestic Product Growth Rate, (2) Labor Force Participation Rate, (3) Net National Income (annual % of growth), (4) Population Growth Rate, (5) Inflation Rate, (6) Gross Domestic Product Growth Rate, Labor Force Participation Rate, Net National Income (annual % of growth), Population Growth Rate and Inflation Rate.
3. Construct time series model of the Unemployment Rate using the following models, (1) Exponential, (2) Linear, (3) Logarithmic, (4) Polynomial, (5) Power, (6) Moving Average, (7) Exponential Smoothing, and (8) Autoregression.
4. Determine the best-fit model and predict the Unemployment Rate in the Philippines for 2024.

2. Methodology

The data used in this study was collected from the official website of the World Bank. The World Bank is an important international financial institution that provides detailed information on various economic indicators, like GDP growth rate, inflation rate, population growth rate, net national income, labor force participation rate, and unemployment rate.

The World Bank's database contains a large amount of historical data from many countries and regions, covering several decades. This extensive data set allowed us to analyze how these economic indicators are related to changes in the unemployment rate. Using data from the World Bank adds credibility to our study, as it is trusted and widely used by researchers, policymakers, and economists worldwide. Having access to such comprehensive data enabled the conduct of the study.

In determining the trend of percentage of Unemployment rate of the Philippines from 2000 to 2020, simple linear regression model was used to establish the trend of FDI net inflows over the study period. The regression analysis provided insights into the direction and magnitude of the trend. The potential linear relationships between the Unemployment rate and several economic variables, including the Gross Domestic Product (GDP) growth rate, Labor force participation rate, Net National Income (annual % of growth), Population Growth rate, and Inflation rate was explored utilizing simple linear regression and multiple linear regression. To forecast the Unemployment rate for future years, we constructed time series models using various techniques, including linear, quadratic, exponential, and polynomial (quadratic, cubic, quartic, quintic, sextic) models, as well as power, moving average, exponential smoothing, and auto-regression models. These models lead us to project the Unemployment rate for the year 2024.

3. Results

Objective 1

Determine the trend of Unemployment Rate of the Philippines from 2000 to 2020.

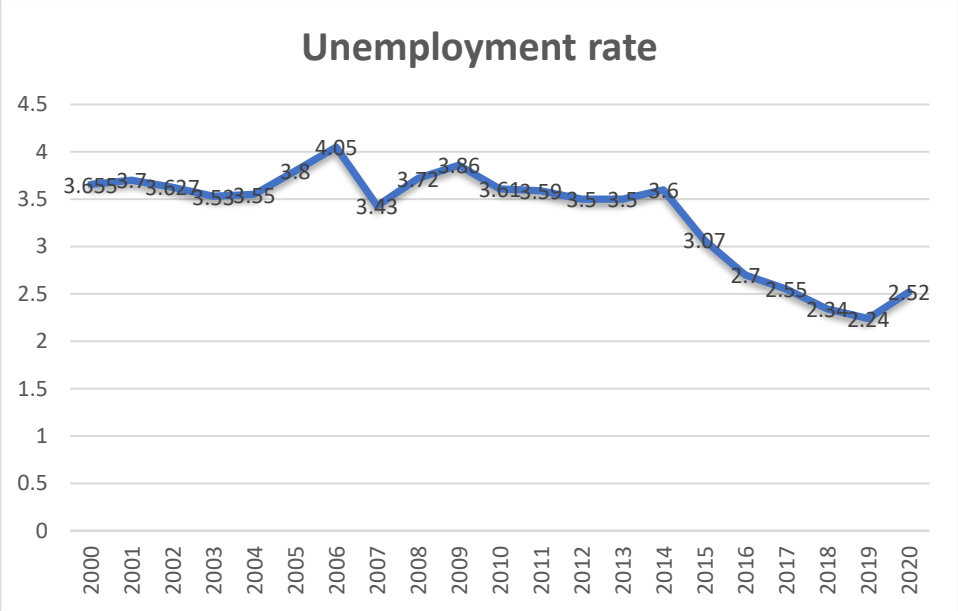

Figure 1. Trend of Unemployment Rate in the Philippines from 2000-2020

The trend in the unemployment rate for the Philippines from 2000 to 2020 displays a generally declining pattern with some fluctuations. Over this period, the unemployment rate experienced variations but demonstrated an overall decreasing trend. From the year 2000 to around 2004, the unemployment rate remained relatively stable, fluctuating between 3.53% and 3.8%. However, starting from approximately 2005, there was a gradual increase in the unemployment rate until it reached a peak of 4.05% in 2006. This period of rising unemployment might have been influenced by various economic factors, both domestically and globally. Following the peak in 2006, the unemployment rate began to decline steadily. From 2007 to 2010, there was a notable decrease in the rate, reaching a low of 3.43% in 2007 and further dropping to 3.61% in 2010. This decline might be attributed to government policies and economic measures implemented during this period. After 2010, the unemployment rate continued to show fluctuations but generally maintained a downward trajectory. It remained below 3.9% from 2011 to 2014, reflecting an overall stable labor market during those years. From 2015 to 2017, there was a significant decline in the unemployment rate, dropping below 3% for the first time in 2015, reaching 2.55% in 2017. This period of low unemployment might have been influenced by favorable economic conditions, increased job opportunities, and robust economic growth in the Philippines. In 2018 and 2019, the unemployment rate further decreased, reaching 2.34% and 2.24%, respectively. These historically low rates suggest a relatively robust labor market during those years. However, in 2020, the unemployment rate saw a slight increase to 2.52%, likely due to the impact of the COVID-19 pandemic, which resulted in economic disruptions and job losses globally.

Objective 2

Find if the Unemployment Rate has a significant linear relationship with (1) Gross Domestic Product Growth Rate, (2) Labor Force Participation Rate, (3) Net National Income (annual % of growth), (4) Population Growth Rate, (5) Inflation Rate, (6) Gross Domestic Product Growth Rate, Labor Force Participation Rate, Net National Income (annual % of growth), Population Growth Rate and Inflation Rate

Gross Domestic Product Growth Rate

Table 1. Significant Linear Relationship between Unemployment Rate and GDP Growth Rate

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3.26	0.20	16.242	0.000
GDP Growth rate	0.02	0.03	0.527	0.604

F (1) =0.278, P-value= 0.604

Table 1 shows F (1) = 0.278 and p-value that is greater than 0.05 which indicates that gross domestic product growth rate has no significant linear relationship with unemployment rate. The table also shows that gross domestic product growth rate is not a significant predictor of unemployment rate (p=0.604).

Labor Force Participation Rate

Table 2. Significant Linear Relationship between Unemployment Rate and Labor Force Participation Rate

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-10.19	4.02	-2.538	0.020
Labor Force Participation Rate	0.22	0.06	3.370	0.003

F (1) =11.357, P-value= 0.003

Table 2 shows F (1) = 11.357 and p-value that is less than 0.05 which indicates that labor force participation rate has a significant linear relationship with unemployment rate. The table also shows that labor force participation rate is a significant predictor of unemployment rate (p=0.003).

Net National Income

Table 3. Significant Linear Relationship between Unemployment Rate and Net National Income

	Coefficients	Standard Error	t Stat	P-value
Intercept	3.21	0.17	19.198	0.000
Net National Income	0.03	0.03	0.919	0.370

F (1) =0.844, P-value= 0.370

Table 3 shows F (1) = 0.844 and p-value that is greater than 0.05 which indicates that net national income has no significant linear relationship with unemployment rate. The table also shows that net national income is not a significant predictor of unemployment rate (p=0.370).

Population Growth Rate

Table 4. Significant Linear Relationship between Unemployment Rate and Population Growth Rate

	Coefficients	Standard Error	t Stat	P-value
Intercept	0.118	1.139	0.104	0.918
Population Growth Rate	1.752	0.617	2.841	0.010

F (1) = 8.071, P-value= 0.010

Table 4 shows F (1) = 8.071 and p-value that is less than 0.05 which indicates that population growth rate has a significant linear relationship with unemployment rate. The table also shows that population growth rate is a significant predictor of unemployment rate (p=0.010).

Inflation Rate

Table 5. Significant Linear Relationship between Unemployment Rate and Inflation Rate

	Coefficients	Standard Error	t Stat	P-value
Intercept	2.826	0.254	11.119	0.000
Inflation Rate	0.136	0.061	2.230	0.038

F (1) = 4.975, P-value= 0.038

Table 5 shows F (1) = 4.975 and p-value that is less than 0.05 which indicates that inflation rate has a significant linear relationship with unemployment rate. The table also shows that inflation rate is a significant predictor of unemployment rate (p=0.038).

Gross Domestic Product Growth Rate, Labor Force Participation Rate, Net National Income, Population Growth Rate, Inflation Rate

Table 6. Significant Linear Relationship between the dependent variable and independent variables

	Coefficients	Standard Error	t Stat	P-value
Intercept	-18.66	3.91	-4.774	0.000
GDP Growth Rate	-0.14	0.04	-3.527	0.003
Inflation Rate	0.07	0.04	2.100	0.053
Population Growth Rate	1.01	0.42	2.407	0.029

Net National Income	0.05	0.04	1.429	0.173
Labor Force Participation Rate	0.33	0.07	4.81	0.000

F (5) = 13.226, P-value= 0.000

Table 6 shows F (5) = 13.226 and p-value that is less than 0.05 which indicates that that there is a significant linear relationship between the dependent and independent variable. The independent variable that shows a significant predictor with unemployment rate are gross domestic product growth rate (p=0.003), population growth rate (p=0.029) and labor force participation rate (p=0.000). On the other hand, inflation rate(p=0.053) and net national income (p=0.173) are not a significant predictor of unemployment rate.

This corroborates with Chand et al. (2017) who also found that GDP growth rate accounts for 48% of cause of change in unemployment rate in India indicating that there is a strong negative correlation between economic growth and unemployment rate. Similarly, study was also conducted by Pambayun (2021) states that the increase in Gross Domestic Product (GDP) means that the level of public welfare improves in direct proportion to the gross domestic product (GDP) which is used as a measuring tool for economic conditions. Hence, based on the findings and the support from the related studies, GDP can predict the unemployment rate. When the economy grows, more goods and services are produced, leading to increased demand for labor. This results in more job opportunities and a decrease in the unemployment rate. Higher GDP growth rates often indicate a healthy and expanding economy.

The findings also supported by Ramli et al. (2018) who found that population growth in Malaysia significantly affect the unemployment rate. Similarly, study was also conducted by Tampubolon et al. (2021) states that population growth rate has a positive and significant effect on the unemployment rate in Europe. Hence, based on the findings and the support from the related studies, population growth rate can predict the unemployment rate. When the population grows, the unemployment rate tends to increase as well. Higher unemployment rates may arise if the economy does not create enough jobs to accommodate the expanding labor force.

The results also supported by Ozerkek (2013) who also found that as unemployment rate increases, there is less chance to find a job. Economic and psychological costs associated with job search are higher when the unemployment rate is high. The findings also complement with Hornstein et al. (2019) who found that there is a positive relationship between labor force participation rate and unemployment rate, they also projected the trend of labor force participation rate for the next 10 years will decline to 61.1% from its 2018 value of 62.7%, and the trend unemployment rate will also decline to 4.3% from its 2018 value of 4.7% in United States. Hence, based on the findings and the support from the related studies, labor force participation rate can predict the unemployment rate. When more individuals actively participate in the labor force, it can lead to increased competition for available job opportunities. If job creation does not keep pace with the growing labor force, the unemployment rate is likely to rise.

This corroborates with Ansari et al. (2022) who also found that inflation rate has no significant effect on the unemployment rate in Brebes Regency. Similarly, study was also conducted by Rizki (2022) states that unemployment has no significant effect on poverty in Indonesia, they also found that unemployment does not increase nor decrease the rate of economic growth or national income. Hence, based on the findings and the support from the related studies, inflation rate and net national income cannot predict the unemployment rate.

Objective 3

Construct time series model of the Unemployment Rate using the following models, (1) Exponential, (2) Linear, (3) Logarithmic, (4) Polynomial, (5) Power, (6) Moving Average, (7) Exponential Smoothing, and (8) Autoregression.

The following graph uses a variety of analytical techniques to show how the unemployment rate has changed throughout time.

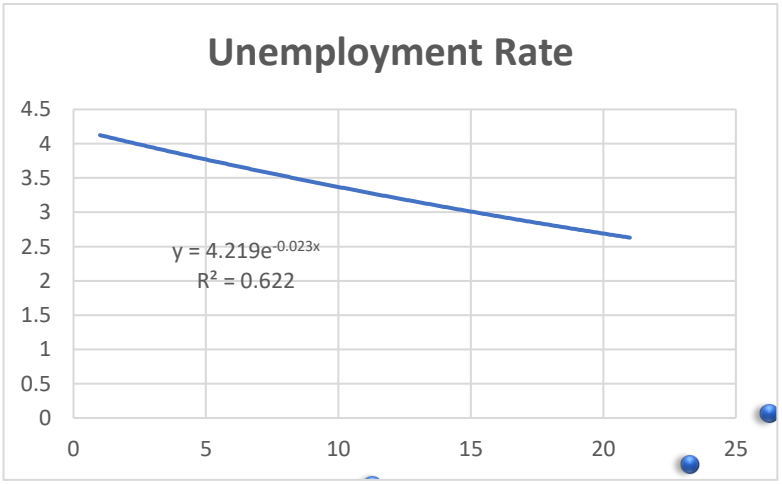

Figure 2. Exponential Trend of Unemployment Rate in the Philippines from 2000-2020

Figure 2 shows the exponential model of Unemployment Rate in the Philippines from year 2000-2020 with, $y = 4.219e^{-0.023x}$ and an R^2 value of 0.5767 which indicates that around 57.67% of the variances in Unemployment Rate can be explained by the exponential growth model.

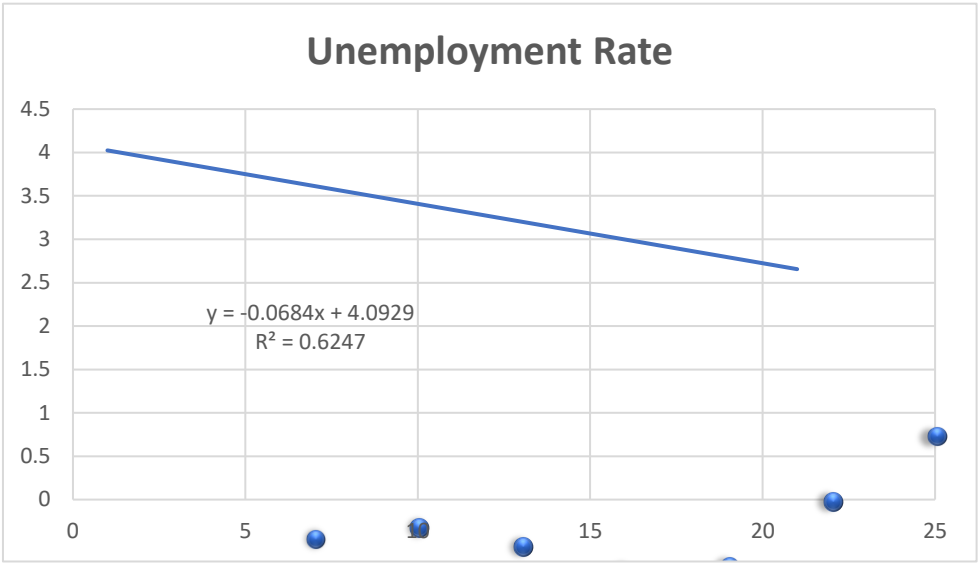

Figure 3. Linear Trend of Unemployment Rate in the Philippines from 2000-2020

Figure 3 shows the linear model of Unemployment Rate in the Philippines from year 2000-2020 with, y = -0.0684x + 4.0929 and an R^2 value of 0.6247 which indicates that around 62.47% of the variances in Unemployment Rate can be explained by the linear growth model.

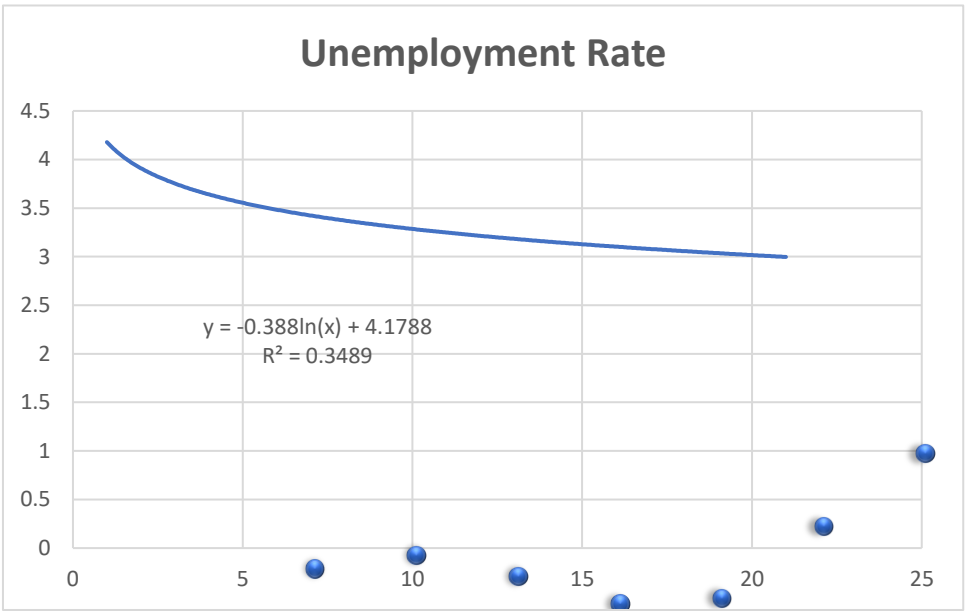

Figure 4. Logarithmic Trend of Unemployment Rate in the Philippines from 2000-2020

Figure 4 shows the logarithmic model of Unemployment Rate in the Philippines from year 2000-2020 with, y = -0.388ln(x) + 4.1788 and an R^2 value of 0.3489 which indicates that around 34.89% of the variances in Unemployment Rate can be explained by the logarithmic growth model.

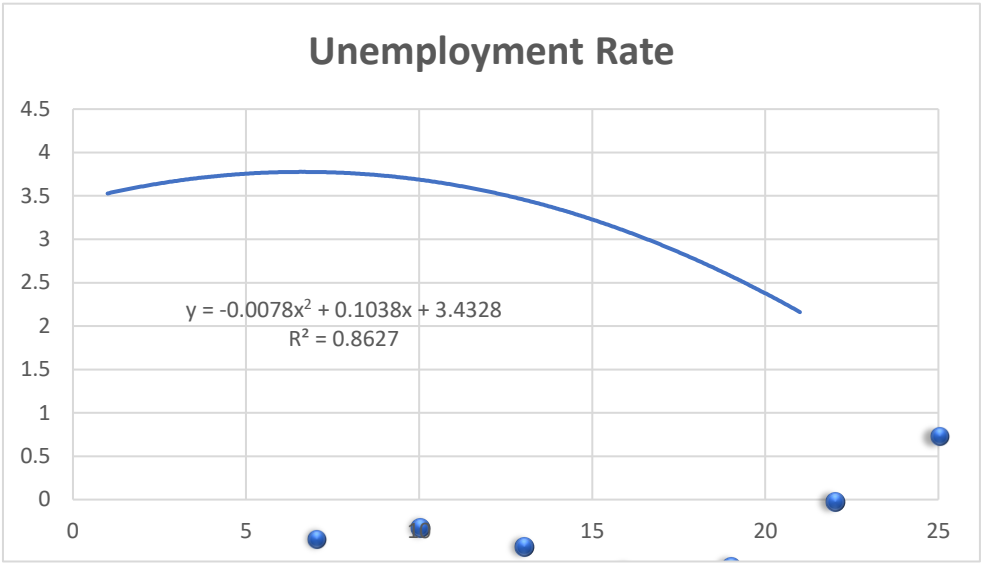

Figure 5. Quadratic Trend of Unemployment Rate in the Philippines from 2000-2020

Figure 5 shows the quadratic model of Unemployment Rate in the Philippines from year 2000-2020 with, $y = -0.0078x^2 + 0.1038x + 3.4328$ and an R^2 value of 0.8627 which indicates that around 86.27% of the variances in Unemployment Rate can be explained by the quadratic growth model.

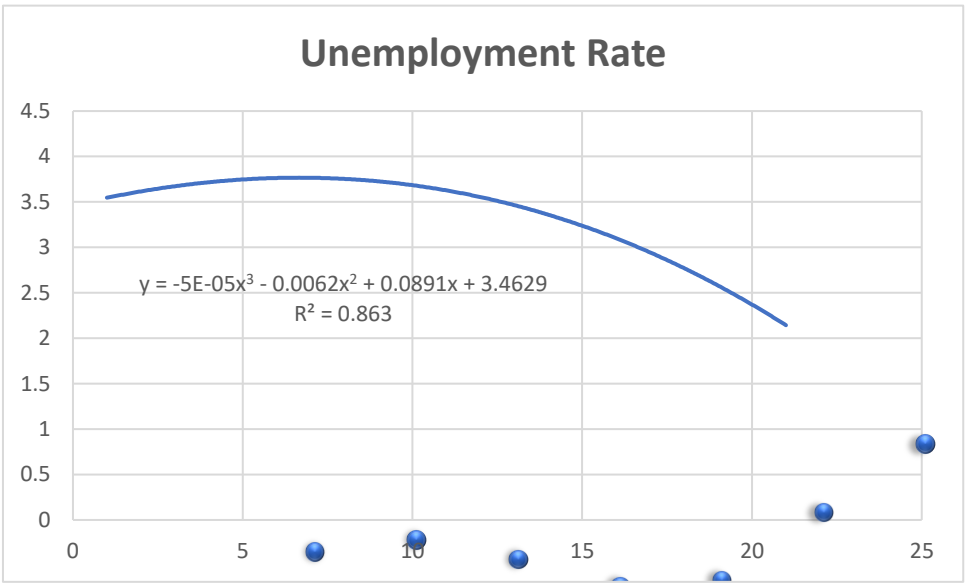

Figure 6. Cubic Trend of Unemployment Rate in the Philippines from 2000-2020

Figure 6 shows the cubic model of Unemployment Rate in the Philippines from year 2000-2020 with, $y = -5E\text{-}05x^3 - 0.0062x^2 + 0.0891x + 3.4629$ and an R^2 value of 0.863 which indicates that around 86.3% of the variances in Unemployment Rate can be explained by the cubic growth model.

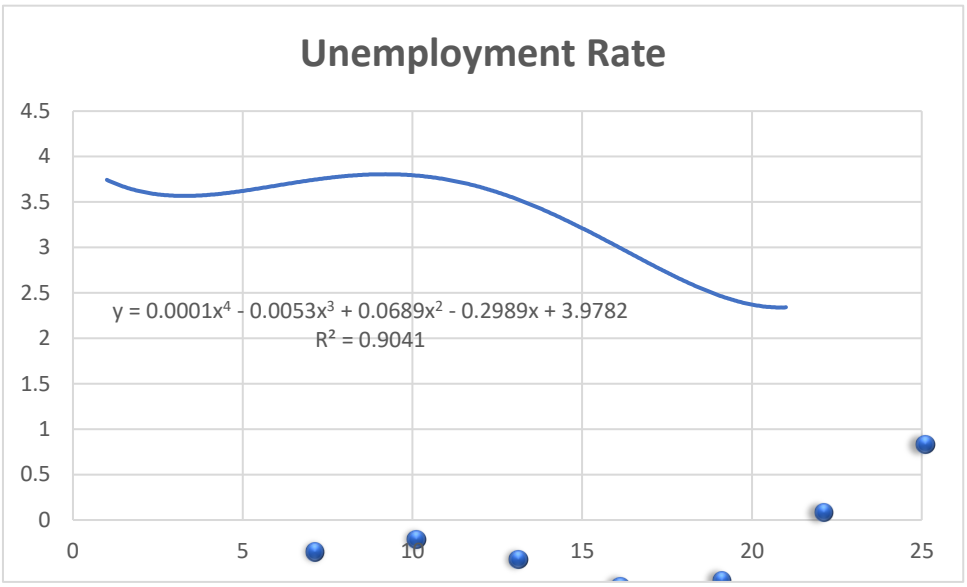

Figure 7. Quartic Trend of Unemployment Rate in the Philippines from 2000-2020

Figure 7 shows the quartic model of Unemployment Rate in the Philippines from year 2000-2020 with, $y = 0.0001x^4 - 0.0053x^3 + 0.0689x^2 - 0.2989x + 3.9782$and an R^2 value of 0.9041 which indicates that around 90.41% of the variances in Unemployment Rate can be explained by the quartic growth model.

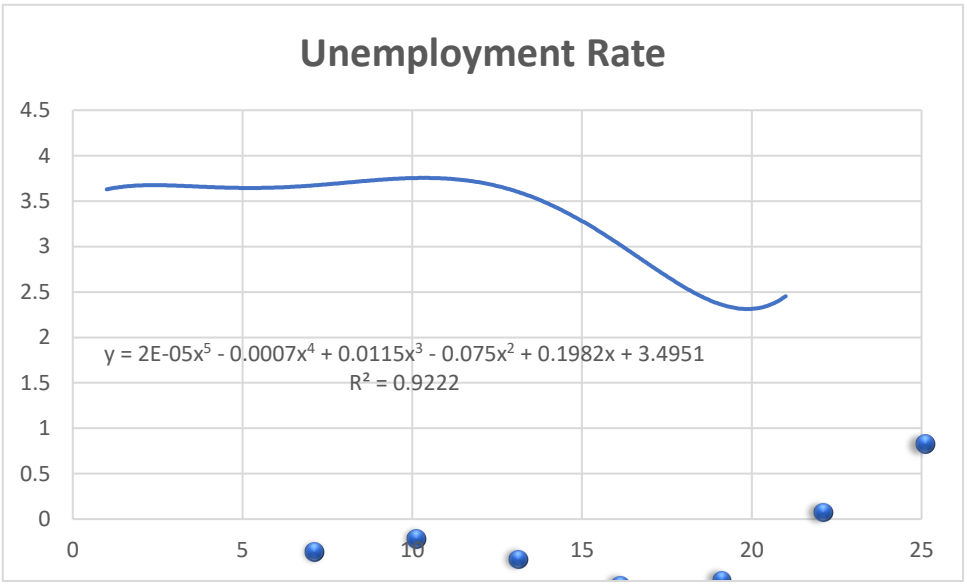

Figure 8. Quintic Trend of Unemployment Rate in the Philippines from 2000-2020

Figure 8 shows the quintic model of Unemployment Rate in the Philippines from year 2000-2020 with, $y = 2E\text{-}05x^5 - 0.0007x^4 + 0.0115x^3 - 0.075x^2 + 0.1982x + 3.4951$ and an R^2 value of 0.9222 which indicates that around 92.22% of the variances in Unemployment Rate can be explained by the quintic growth model.

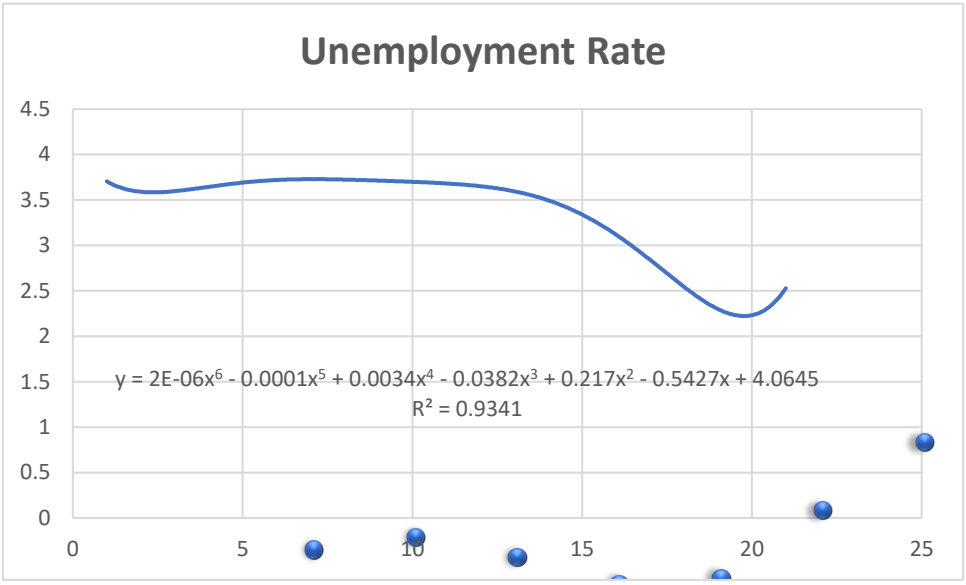

Figure 9. Sextic Trend of Unemployment Rate in the Philippines from 2000-2020

Figure 9 shows the sextic model of Unemployment Rate in the Philippines from year 2000-2020 with, $y = 2E\text{-}06x^6 - 0.0001x^5 + 0.0034x^4 - 0.0382x^3 + 0.217x^2 - 0.5427x + 4.0645$and an R^2 value of 0.9341 which indicates that around 93.41% of the variances in Unemployment Rate can be explained by the sextic growth model.

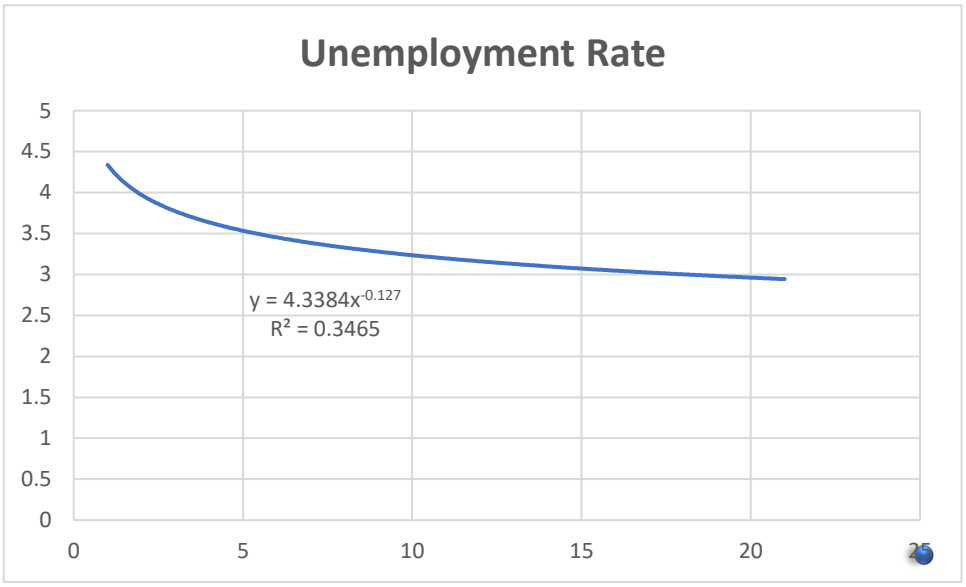

Figure 10. Power Trend of Unemployment Rate in the Philippines from 2000-2020

Figure 10 shows the power model of Unemployment Rate in the Philippines from year 2000-2020 with, $y = 4.3384x^{-0.127}$ and an R^2 value of 0.3109 which indicates that around 31.09% of the variances in Unemployment Rate can be explained by the power growth model.

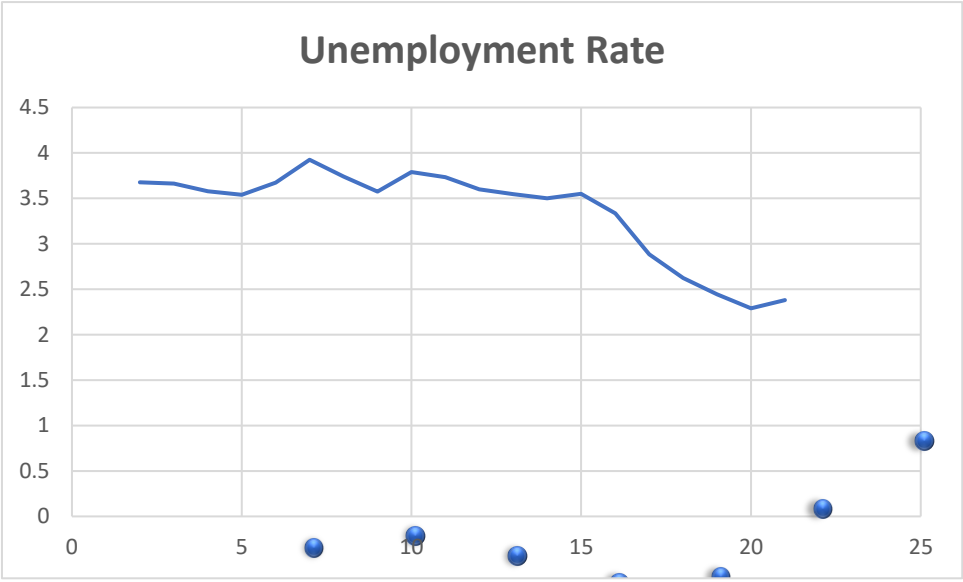

Figure 11. Moving Average Trend of Unemployment Rate in the Philippines from 2000-2020

Figure 11 shows the moving average model at interval 2 of Unemployment Rate in the Philippines from year 2000-2020.

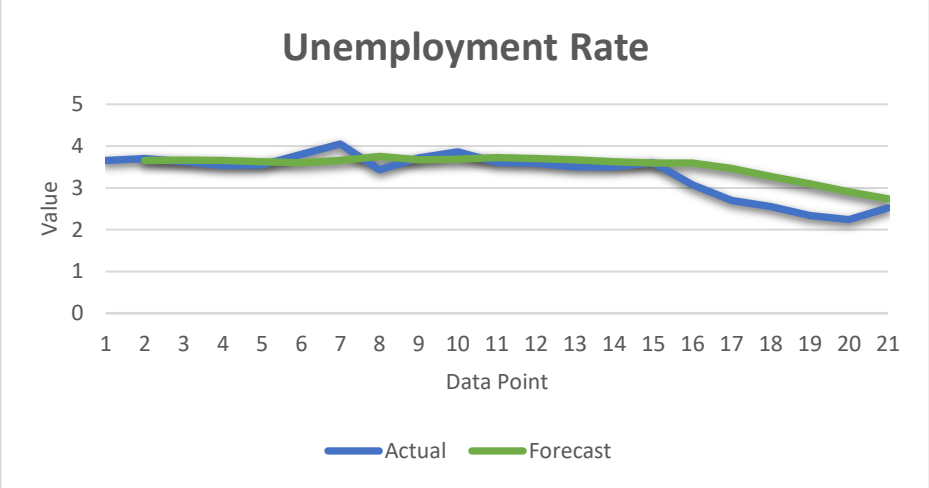

Figure 12. Exponential Smoothing of Unemployment Rate in the Philippines from 2000-2020

Figure 12 shows the exponential smoothing model of Unemployment Rate in the Philippines from year 2000-2020.

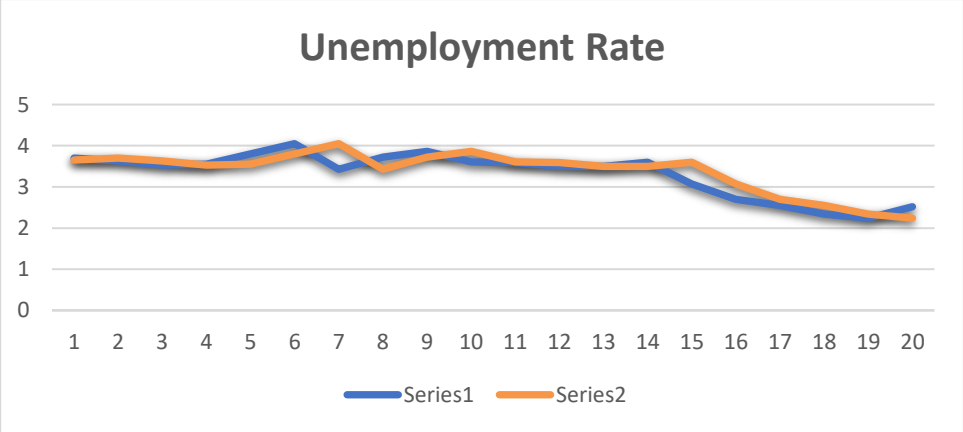

Figure 13. 1st Autoregression Model of Unemployment Rate in the Philippines from 2000-2020

Figure 13 shows the 1st autoregression model of Unemployment Rate in the Philippines from year 2000-2020 with y=0.149+0.94x and an R^2=0.7890 which indicates that around 78.90% of the variances in Unemployment Rate can be explained by the 1st autoregression model.

Objective 4

Determine the best-fit model and predict the Unemployment Rate in the Philippines for 2024.

Table 7. Best Fit Model and Prediction

Model	**Equation**	**R^2**	**SE**	**2024 Predicted Unemployment Rate**
Linear	$y = -0.0684x + 4.0929$	0.625	0.338	2.383
Exponential	$y = 4.219e^{-0.023x}$	0.577	0.359	2.374
Logarithmic	$y = -0.388\ln(x) + 4.1788$	0.349	0.445	2.930
Quadratic	$y = -0.0078x^2 + 0.1038x + 3.4328$	0.863	0.338	1.153
Cubic	$y = -5E\text{-}05x^3 - 0.0062x^2 + 0.0891x + 3.4629$	0.863	0.339	1.034
Quartic	$y = 0.0001x^4 - 0.0053x^3 + 0.0689x^2 – 0.2989x + 3.9782$	0.904	0.339	4.182
Quintic	$y = 2E\text{-}05x^5 - 0.0007x^4 + 0.0115x^3 - 0.075x^2 + 1982x + 3.4951$	0.922	0.340	49608.183
Sextic	$y = 2E\text{-}06x^6 - 0.0001x^5 + 0.0034x^4 – 0.0382x^3 + 0.217x^2 – 0.5427x + 4.0645$	0.934	0.340	369.091
Power	$y = 4.3384x^{-0.127}$	0.311	0.458	2.883
Moving Average Interval=2	-	-	0.105	2.240
1st Autoregression	y=0.149+0.94x	0.789	2.399	23.649
Exponential Smoothing Damping Factor=0.75	-	-	0.258	0.126

Table 7 shows that the moving average model with an interval of 2 is the best fit model as evidenced by its lowest standard error of 0.105. The lower standard error suggests that the predictions made by this model are closer to the actual observed values, signifying its greater reliability and precision in forecasting the unemployment rate compared to the alternative models. The results also show that the quadratic, cubic, quartic, quintic, and sextic models had relatively high R-squared values, indicating a strong goodness-of-fit to the data. However, the moving average model still excelled in terms of accuracy, despite having a simpler structure compared to these polynomial models. Interestingly, the exponential and logarithmic models had lower R-squared values, suggesting weaker fits to the data. Moreover, the power model exhibited the weakest performance among all models, with both the lowest R-squared value (0.311) and the highest standard error (0.458). The time series analysis demonstrated the superiority of the moving average model with an interval of 2 in predicting the unemployment rate. Its ability to capture underlying patterns and trends, combined with its capability to smooth out short-term fluctuations, contributes to its outstanding performance.

4. Summary of Findings

1. The trend in the unemployment rate from 2000 to 2020 shows a general decline with periods of stability and fluctuations. The decreasing trend indicates an improvement in the labor market conditions in the Philippines over this period, but the recent increase in 2020 emphasizes the importance of monitoring economic conditions and implementing policies to address challenges in times of economic uncertainties.
2. The labor force participation rate, population growth rate, and inflation rate all showed a significant linear relationship with the unemployment rate while gross domestic product (GDP) growth rate and net national income did not have a significant linear relationship with the unemployment rate. However, analysis revealed that when the variables were combined in multiple linear regression GDP growth rate, population growth rate, and labor force participation rate had a significant linear relationship with unemployment rate indicating that these three are significant predictors of unemployment rate.

3. The time series models using the 2000-2020 unemployment rate in the Philippines are, $y = -0.0684x + 4.0929$ for linear, $y= 4.219e^{-0.023x}$ for exponential, $y= -0.388\ln(x) + 4.1788$ for logarithmic, $y = -0.0078x^2 + 0.1038x – 3.4328$ for quadratic, $y= -5E\text{-}05x^3 - 0.0062x^2 + 0.0891x + 3.4629$ for cubic , $y = 0.0001x^4 - 0.0053x^3 + 0.0689x^2 – 0.2989x + 3.9782$ for quartic, $y = 2E\text{-}05x^5 - 0.0007x^4 + 0.0115x^3 - 0.075x^2 + 1982x + 3.4951$ for quintic, $y = 2E\text{-}06x^6 - 0.0001x^5 + 0.0034x^4 – 0.0382x^3 + 0.217x^2 – 0.5427x + 4.0645$ for sextic , $y = 4.3384x^{-0.127}$ for power, moving average model with an interval of 2, the exponential smoothing model with a damping factor of 0.25 and the first autoregression model.
4. The best fit model is the moving average model at interval 2. Using this model, the Unemployment rate of the Philippines for the year 2024 will increase to 2.240%. The data used in this study was collected from the official website of the World Bank. The World Bank is an important international financial institution that provides detailed information on various economic indicators, like GDP growth rate, inflation rate, population growth rate, net national income, labor force participation rate, and unemployment rate.

5. Conclusion

The findings of this study provide valuable insights into the unemployment trends and predictors in the Philippines from 2000 to 2020. The observed general decline in the unemployment rate indicates an overall improvement in the labor market conditions over the years. However, the recent increase in 2020, likely attributed to the COVID-19 pandemic, highlights the importance of vigilance and policy measures during economic uncertainties to address potential challenges and mitigate adverse effects on the workforce. The study revealed that the labor force participation rate, population growth rate, and inflation rate demonstrated significant linear relationships with the unemployment rate, making them significant predictors of unemployment rate. These variables serve as important indicators of the labor market dynamics, and policymakers should consider them when formulating strategies to address unemployment-related issues. Interestingly, while the Gross Domestic Product (GDP) growth rate did not show a significant linear relationship with the unemployment rate individually, its significance emerged when combined with other variables in the multiple linear regression analysis. This highlights the interconnectedness of economic factors and underscores the need for a holistic approach in understanding and addressing unemployment trends.

The time series analysis explored various models for predicting the unemployment rate in the Philippines. Among them, the moving average model with an interval of 2 emerged as the most accurate and reliable model for forecasting unemployment rates. Its low standard error and superior performance suggest that it can be a valuable tool for policymakers and businesses in anticipating future labor market conditions. The study's implications highlight the importance of continuously monitoring the labor market, considering multiple economic indicators, and using reliable forecasting models to inform policymaking. By leveraging these insights, policymakers can develop targeted strategies to promote sustainable economic growth, reduce unemployment, and enhance the overall well-being of the Filipino workforce and economy.

Recommendations

Based on the findings of this study, policymakers and relevant authorities in the Philippines should consider the following recommendations: Policymakers should focus on policies that encourage higher labor force participation to potentially reduce the unemployment rate. Efforts should be made to monitor and manage population growth to ensure it aligns with employment opportunities, as high population growth may lead to higher unemployment rates. Effective measures to address inflationary pressures are crucial, as it has been identified as a significant predictor of unemployment. Policies impacting GDP growth and net national income should be evaluated and reevaluated to assess their influence on unemployment rates, even though they did not show a significant linear relationship in this study. Emphasis should be placed on utilizing the moving average model with an interval of 2 for future unemployment rate predictions due to its superior accuracy and reliability.

Acknowledgements

This research would not have been possible without the invaluable support and resources provided by the Department of Science and Technology in my academic aspirations.

References

Ansari, A., Riono, S. B., & Indriyani, A. (2022, November). Analysis of Economic Growth, Regional Minimum Wage, and Inflation on the Unemployment Rate in Brebes Regency. In Tegal International Conference on Applied Social Science & Humanities (TICASSH 2022) (pp. 393-402). Atlantis Press.

Bakhshi, Z., & Ebrahimi, M. (2016). The effect of real exchange rate on unemployment. Marketing and Branding Research, 3, 4-13.

Chand, K., Tiwari, R., & Phuyal, M. (2017). Economic growth and unemployment rate: An empirical study of Indian economy. Pragati: Journal of Indian Economy, 4(2), 130-137.

Dalmar, M. S., Ali, A. Y. S., & Ali, A. A. (2017). Factors affecting unemployment in Somalia. Journal of Economics and Sustainable Development, 8(22), 200-210.

Hornstein, A., & Kudlyak, M. (2019). Aggregate labor force participation and unemployment and demographic trends. Available at SSRN 3347310.

Kurnia, R. E., & Septiani, Y. (2021). Social and economic factors determining the Unemployment rate in the Bregasmalang region 2010-2020. Eko-Regional: Jurnal Pembangunan Ekonomi Wilayah, 16(1).

Ozerkek, Y. (2013). Unemployment and labor force participation: A panel cointegration analysis for European countries. Applied Econometrics and International Development, 13(1), 67-76.

Pambayun, D. (2021). Indicators of the association of Unemployment in Indonesia with the Level of Employment Opportunity, GDP, and SER. Research Horizon, 1(5), 189-206.

Puspadjuita, E. A. (2018). Factors that influence the rate of unemployment in Indonesia. International Journal of Economics and Finance, 10(1), 140-147.

Ramli, S. F., Firdaus, M., Uzair, H., Khairi, M., & Zharif, A. (2018). Prediction of the unemployment rate in Malaysia. Int. J. Mod. Trends Soc. Sci, 1(4), 38-44.

Rizki, M., & Solihati, K. D. (2022). The impact of corruption, inflation and unemployment towards poverty in Indonesia. Journal of Business Administration Economics & Entrepreneurship, 47-56.

Shabbir, A., Kousar, S., & Zubair Alam, M. (2021). Factors affecting level of unemployment in South Asia. Journal of Economic and Administrative Sciences, 37(1), 1-25.

Tampubolon, H., & Muda, I. (2021). The effect of total population, median income, and unemployment rate on poverty risk in Europe. International Journal of Multidisciplinary Research and Growth Evaluation, 2(1), 430-434.

Wirawan, I., & Sentosa, S. U. (2021, November). Analysis of factors affecting the unemployment rate of educational labor in Indonesia. In Seventh Padang International Conference On Economics Education, Economics, Business and Management, Accounting and Entrepreneurship (PICEEBA 2021) (pp. 93-97). Atlantis Press.