EXPLORING SRI LANKA'S UNEMPLOYMENT RATE: A TIME SERIES DATA ANALYSIS

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Introduction

Unemployment is a critical economic and social issue that affects countries around the world, including Sri Lanka. Understanding and studying unemployment in Sri Lanka is of utmost importance for several reasons. As an island nation in South Asia with a population of over 21 million people, Sri Lanka faces unique challenges and opportunities in its efforts to combat unemployment and foster economic growth. The importance of studying unemployment in Sri Lanka lies in its impact on various aspects of the nation's development. Unemployment rates directly influence the overall economic stability of a country. High unemployment levels can lead to reduced consumer spending, lower tax revenues, and decreased production output, which may result in economic slowdowns or recessions (Kong, 2011; Leonardi et al., 2018). By studying unemployment, policymakers and economists can design targeted interventions to stabilize and promote economic growth. Unemployment can have severe social consequences, including increased poverty, inequality, and social unrest. Individuals and families facing unemployment often struggle to meet basic needs, leading to hardships and potential long-term negative effects on their well-being. Understanding the underlying causes of unemployment can help devise social welfare programmes and support systems to assist those who are jobless and vulnerable. Unemployment not only affects those without jobs but also impacts the productivity and efficiency of the labour force as a whole. When a significant number of individuals are unemployed, it can lead to a mismatch between available skills and industry demands. This skills mismatch can hinder economic growth and competitiveness (Dissanayake & Weeratunga, 2018). By studying unemployment trends, policymakers can identify skill gaps and implement policies to enhance workforce productivity. Sri Lanka has a sizable youth population, and addressing youth unemployment is crucial for the country's future. High youth unemployment can lead to a generation facing limited opportunities, hampering their ability to contribute effectively to the economy and society. Understanding the unique challenges faced by young job seekers is essential to develop targeted strategies and initiatives to empower and integrate them into the workforce. Data on unemployment rates and trends is essential for designing effective economic policies. By analyzing unemployment patterns, policymakers can identify structural issues in the labour market, address disparities in job opportunities among different regions and demographics, and tailor policy measures to stimulate job creation and reduce unemployment (Rama, 1999). Unemployment is closely linked to the achievement of sustainable development goals.

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By studying unemployment in Sri Lanka, policymakers can align economic growth with social and environmental considerations to ensure a more equitable and sustainable future for the country.

In this context, studying unemployment in Sri Lanka is critical for fostering economic stability, promoting social welfare, enhancing workforce productivity, addressing youth unemployment, formulating effective policies, and advancing sustainable development (Liu & Li, 2022). By understanding the root causes and implications of unemployment, Sri Lanka can strive towards a more prosperous and inclusive society.

Therefore, the objective of the study is to examine unemployment in Sri Lanka comprehensively, recognizing its multifaceted impact on economic stability, social welfare, workforce productivity, and sustainable development. The aim is to understand the root causes and implications of unemployment in order to formulate effective policies and interventions that promote economic growth, reduce inequality, empower the youth, and contribute to a more prosperous and inclusive society.

Data

For this study, data was collected from a variety of reports sourced from the Department of Census and Statistics in Sri Lanka. The data covers a time span from 1991 up to the most recent available records in 2022. The Department of Census and Statistics is a reliable and authoritative government institution responsible for gathering, organizing, and disseminating statistical information in Sri Lanka.

The data collected from these reports serves as a valuable and comprehensive resource for analyzing the trends and dynamics of various economic and social indicators, including the unemployment rate. By using official data from a trusted government source, the study ensures the accuracy and credibility of the information used in the analysis.

Drawing data from a substantial period spanning several decades, from 1991 to 2022, offers us an extensive dataset to examine long-term patterns and changes in the unemployment rate over time. Such historical data can reveal economic fluctuations, the impact of major events or policy changes, and the country's overall economic performance.

By relying on official statistics, the study aims to provide robust and evidence-based findings, making it relevant for policymakers, researchers, and other stakeholders involved in economic analysis and decision-making in Sri Lanka. Moreover, having access to the latest available data in 2022 allows the researchers to offer up-to-date insights into the current state of unemployment in the country and its potential implications for the future.

Overall, using data from the Department of Census and Statistics ensures the study's reliability and enables a comprehensive understanding of the unemployment rate's dynamics in Sri Lanka, facilitating informed discussions and actions for addressing labour market challenges and fostering economic growth

Use of multiple linear regression analysis

The study incorporates five key variables: Unemployment Rate, Labour Force Participation Rate (for individuals aged 15-24 years), Population, Inflation Rate, and Gross Domestic Product (GDP). Among these variables, the Unemployment Rate is considered the dependent variable, while the other four variables function as independent variables.

1. Unemployment Rate: This variable represents the percentage of the labour force that is unemployed and actively seeking employment within a specified period. The Unemployment Rate is the main focus of the study, as it serves as the outcome or response variable that we aim to explain and understand in relation to the other factors.
2. Labour Force Participation Rate (15-24 years of age): This variable measures the proportion of the population between the ages of 15 and 24 who are either employed or actively seeking employment. It is an essential independent variable in the study as it helps to assess the labour market's engagement and potential impact on the Unemployment Rate.
3. Population: The population variable represents the total number of individuals residing in Sri Lanka. It serves as an independent variable in the analysis, as changes in the population may influence the overall labour supply and, subsequently, the Unemployment Rate.
4. Inflation Rate: The Inflation Rate measures the percentage change in the general price level of goods and services over time. It is another independent variable included in the study because inflation can affect economic conditions and, consequently, the labour market and unemployment dynamics.
5. Gross Domestic Product (GDP): GDP is the total value of all goods and services produced within a country's borders over a specific period. It is a critical independent variable as changes in economic growth and output can impact employment opportunities and, in turn, influence the Unemployment Rate.

This paper presents the statistical treatments employed to obtain the expected outputs. One of the key methodologies used is Multiple Linear Regression, aimed at determining the influence of the five given independent variables on the unemployment rate in the country. The model created expresses the unemployment rate as a linear function of the five predictor variables and an error term, represented in a general form as follows:

$$y_i + b_0 + b_1 x_{i1} + b_2 x_{i2} + \cdots + b_k x_{ik} + e_i$$

Where,

y_i *represents the unemployment rate in year i*

b_0 *is the regression coefficent (intercept)of the model*

b_k *denotes the coefficient on the kth predictor variable*

x_{ik} *correseponds to the value of the kth predictor variable in year i*

b_0 *represents the error term or residual in year i, accounting for the*

unexplained variation in the model

*k denotes the total number of predictor variables considered*

Multiple Linear Regression allows us to identify which of the four independent variables have a statistically significant impact on the unemployment rate in the country. The model provides coefficients that indicate the magnitude and direction of the relationship between each predictor variable and the unemployment rate. A positive coefficient suggests a positive association, while a negative coefficient implies a negative association.

By using this regression analysis, we aim to understand the extent to which the selected independent variables contribute to changes in the unemployment rate over time. This analytical approach is valuable in unveiling potential trends, patterns, and causal relationships between the variables, thus assisting in making informed policy decisions and addressing economic challenges effectively.

Trend in Unemployment Rate

Figure 1 displays the unemployment rate for Sri Lanka over a span of 31 years, from 1991 to 2022. The unemployment rate is a key economic indicator that represents the percentage of the labour force that is unemployed and actively seeking employment during a specific period. The data shows that the unemployment rate tends to fluctuate over the years but generally follows an overall trend. In the early 1990s, the unemployment rate was relatively high, with values above 14% in 1991 and 1992. From 1997 to 2000, there was a notable decline in unemployment, with a significant drop to 7.74% in the year 2000. The early 2000s saw some fluctuations in the unemployment rate, reaching a peak of 8.76% in 2002. The years from 2004 to 2007 experienced a downward trend in unemployment, with a low of 5.22% in 2008. The global financial crisis in 2008 resulted in a slight increase in unemployment, reaching 5.85% in 2009. From 2010 onwards, there was a steady decline in unemployment, reaching a low of 3.88% in 2012. In the 2010s, the unemployment rate remained relatively stable, with small fluctuations between 3.88% and 5.395% in 2022. Higher rates in recent years were mainly due to the COVID-19 pandemic and subsequent economic crisis, significantly impacting Sri Lanka's economy.

Figure 1: Unemployment Rate, Sri Lanka, 1991 to 2022
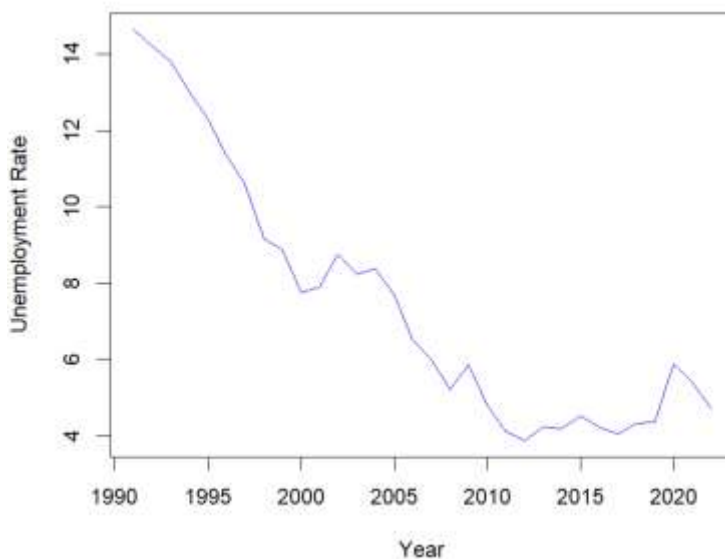
Source: Author's calculations based on data obtained from the Department of Census and Statistics, Sri Lanka

Trend in Youth Labour Force Participation Rate

Figure 2 shows the trend in the labour force participation rate (LFPR) of youth aged 15 to 24 in Sri Lanka from 1991 to 2022. Over the past three decades, there has been a general decline in the LFPR of the youth in Sri Lanka. The LFPR started at 49.963% in 1991 and gradually decreased over the years, reaching 26.763% in 2022. This decline indicates that a smaller proportion of the youth population in this age group has been actively participating in the labour force. While the overall trend shows a decline, there are fluctuations from year to year. Some years witnessed slight increases or temporary stabilizations, but the general trajectory remained downward. The LFPR of youth is influenced by various factors, including the state of the economy, availability of jobs, educational opportunities, and social norms. Economic downturns and job scarcity might lead to a lower LFPR as young people may choose to pursue further education, postpone entering the labour force, or face challenges finding suitable employment. The declining LFPR could also be associated with an increasing emphasis on education and skill development. More young people might be pursuing higher education or vocational training to enhance their employability and job prospects.

This study exclusively examines overall unemployment rates without delving into gender-specific disparities, leaving the exploration of such differences for potential future research.

A declining LFPR among youth may have significant policy implications for a country. Governments may need to address issues related to youth unemployment, skill development, and creating an enabling environment for job creation to ensure that young people can contribute productively to the economy.

Figure 2: Youth (aged15-24) Labour Force Participation Rate
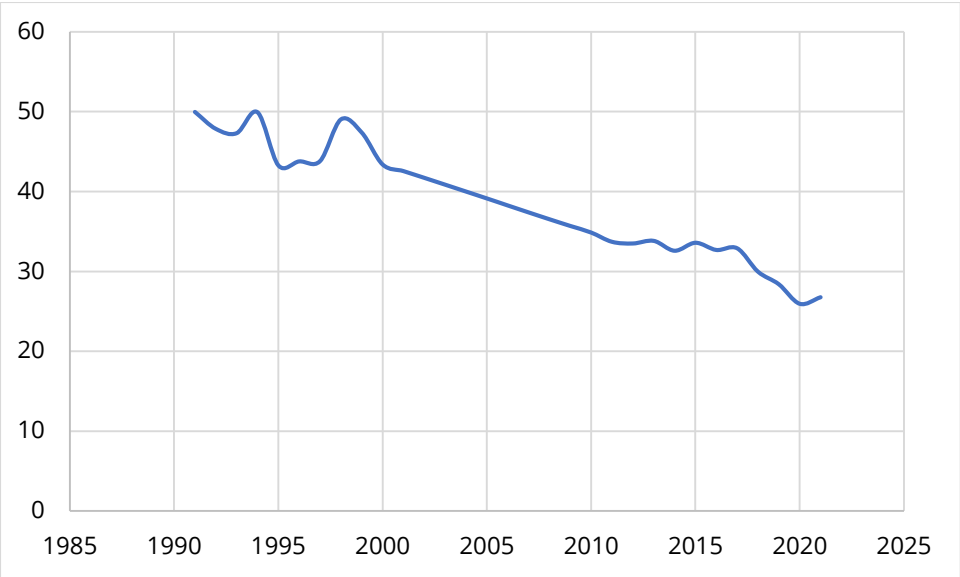
Source: Author's calculations based on data obtained from the Department of Census and Statistics, Sri Lanka

Population trend

Figure 3 represents the population of Sri Lanka from the year 1991 to 2022. From 1991 to 2022, the population of Sri Lanka has consistently increased. The population has gone from 17,416,596 in 1991 to 21,773,441 in 2022. The growth rate of the population appears to be steady and gradual throughout the period. While there are fluctuations in the annual population figures, the overall trend shows a slow and continuous increase in population. There are some variations in population growth from year to year, but these fluctuations seem relatively small. Such fluctuations may be influenced by factors like birth rates, death rates, immigration, and emigration, among others. The growth rate appears to have peaked around the early 2000s, with the highest population increase seen between 2001 and 2012. Afterward, the growth rate seems to have slowed down slightly, but the population continues to increase.

Figure 3: Population trend
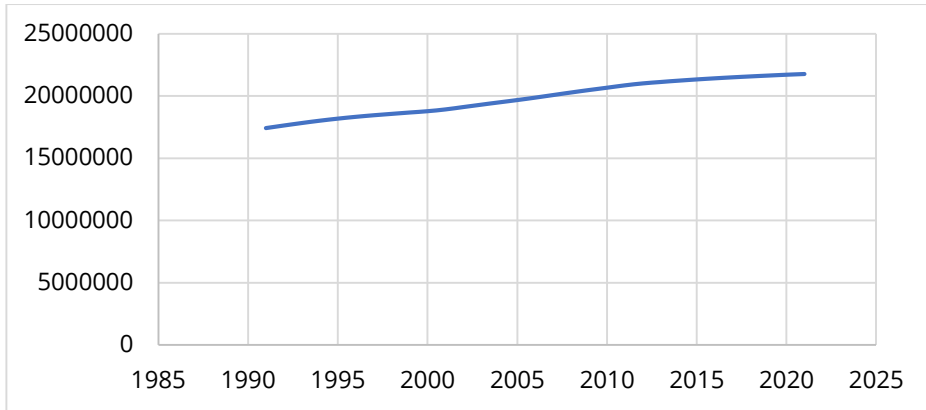
Source: Dissanayake, 2016

Inflation Rate

Figure 4 represents the inflation rate for Sri Lanka from 1991 to 2022. The inflation rate is a percentage change in the general price level of goods and services in an economy over a specific period, usually measured annually. In the early 1990s, Sri Lanka experienced relatively high inflation rates, with values around 11% to 12%. High inflation during this period can be attributed to various factors, such as rapid economic growth, supply-side constraints, and fiscal policies. From 1994 to 1999, the inflation rate began to decline gradually. In 1999, the inflation rate dropped to 4.69%, indicating a period of more stable and controlled inflation. In the early 2000s, there were fluctuations in inflation rates, with some years experiencing higher inflation, such as 15.94% in 1996 and 14.16% in 2001. These fluctuations could have been influenced by external and internal factors affecting the Sri Lankan economy. Between 2003 and 2007, Sri Lanka experienced relatively stable inflation rates, ranging from 6.31% to 15.84%. During this period, the Central Bank of Sri Lanka likely implemented monetary policies to control inflation and stabilize the economy. In 2008, Sri Lanka faced a significant increase in inflation, reaching 22.56%. The global financial crisis of 2008 had an impact on many economies, including Sri Lanka, which could have contributed to this surge in inflation. Throughout the 2010s, Sri Lanka generally experienced moderate inflation rates, with figures varying from 2.13% in 2018 to 7.70% in 2017. This period of moderate inflation indicates that the country's economy was relatively stable during this decade. In 2020 and 2022, the inflation rate increased to 6.15% and 7.01%, respectively. These increases may have been influenced by factors like global economic conditions, fiscal and monetary policies, and supply chain disruptions, particularly caused by COVID 19 pandemic.

Figure 4: Inflation Rate (%)
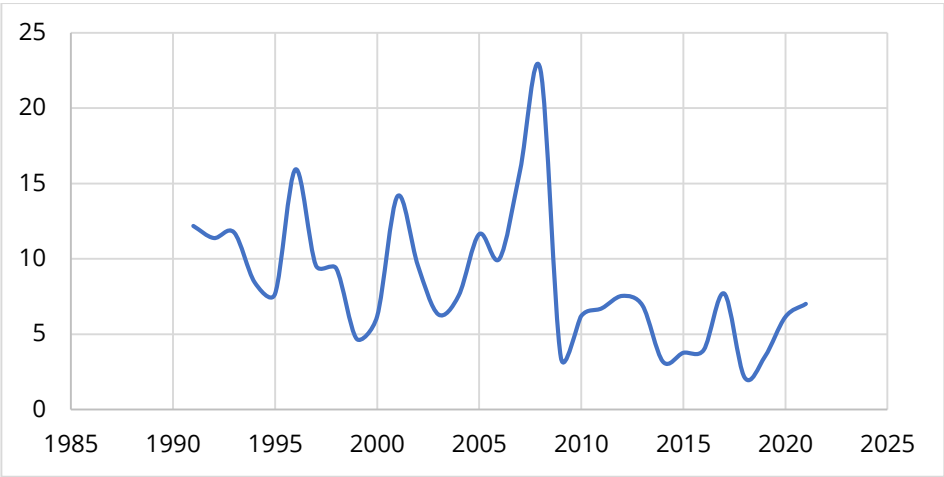

Source: Author's calculations from DCS data

Trend in Gross Domestic Product

Figure 5 shows the Gross Domestic Product (GDP) growth trend of Sri Lanka from 1991 to 2022, measured in billions of US dollars. GDP is a key indicator of the economic performance of a country and reflects the total value of goods and services produced within its borders. From 1991 to 1997, Sri Lanka's GDP showed consistent growth, with the economy expanding from $9.00 billion to $15.09 billion. This period saw an average annual growth rate of around 8%, indicating a relatively healthy economic environment. The economy continued to grow until 1997, but growth slowed down in 1998 due to the Asian Financial Crisis that affected many countries in the region. The growth rate during this time was around 6%, indicating the impact of external economic shocks. The economy experienced moderate growth during this period, hovering around $15-16 billion. The growth rate during these years was relatively stable at around 3-4%, but it didn't reach the higher growth rates seen in the early 1990s. The period from 2001 to 2008 witnessed a mixture of fluctuations and growth spurts. The GDP reached a peak of $40.71 billion in 2008, reflecting a rapid expansion. The growth rate during this period fluctuated between 1% and 8%, with several years experiencing growth above 6%. The global financial crisis of 2008 had a noticeable impact on Sri Lanka's economy, leading to a slower growth rate in 2009. Despite this, the economy continued to grow, albeit at a more subdued pace. The years from 2010 to 2015 marked a significant period of economic growth for Sri Lanka, with the GDP nearly doubling from $58.64 billion in 2010 to $85.14 billion in 2015. This rapid expansion was due to various factors, including post-crisis recovery, increased infrastructure investment, and growth in sectors like tourism and services. Following the rapid growth phase, the economy continued to expand, albeit at a slower pace.

The growth rate varied between 1% and 6% during this period. Despite some fluctuations, the overall trend was positive, with the GDP reaching $88.93 billion in 2022. In summary, the GDP growth trend in Sri Lanka from 1991 to 2022 shows a mixture of periods with rapid growth, moderate expansion, and fluctuations. Various global and domestic factors, including financial crises and policy decisions, influenced the trajectory of the country's economic growth during these years.

Figure 5: GDP growth (Billions of US $)
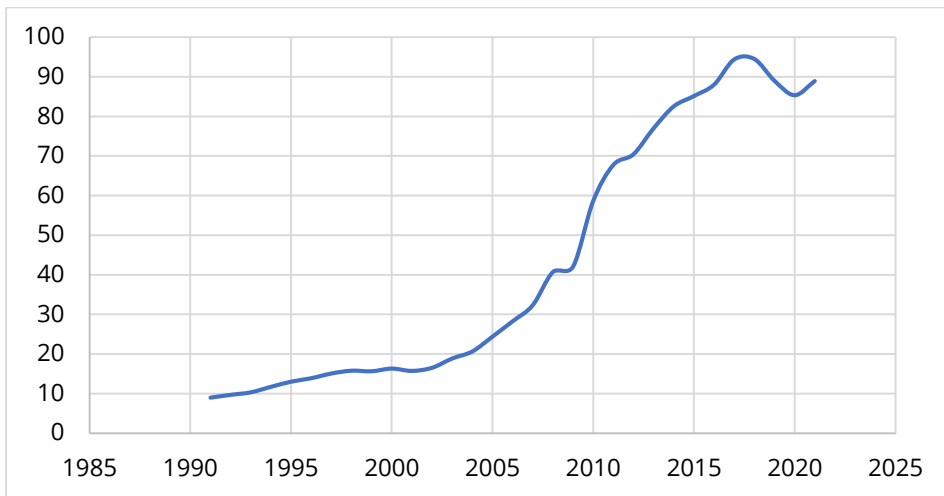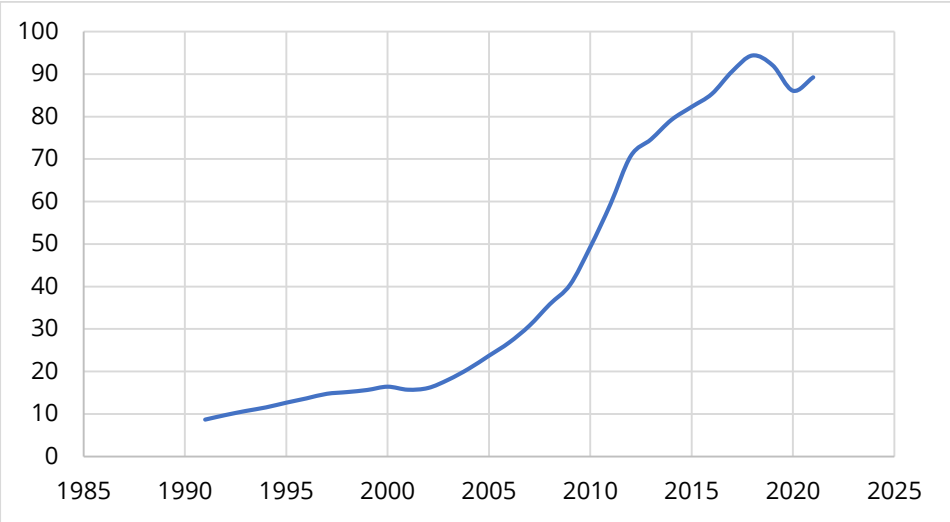

Source: Department of Census and Statistics

Trend in Gross National Income

Figure 6 represents the trend in Gross National Income (GNI) in Sri Lanka from 1991 to 2022, measured in billions of US dollars. GNI is a measure that takes into account the total income earned by a country's residents, both domestically and from abroad. It includes GDP along with net income from abroad, such as remittances and investments. From 1991 to 1997, Sri Lanka's GNI showed consistent growth, with the income expanding from $8.66 billion to $14.73 billion. This period saw an average annual growth rate of around 8%, indicating a robust economic performance. Similar to the GDP trend, the GNI growth also slowed down in 1998 due to the Asian Financial Crisis. However, the impact on GNI was relatively less pronounced than on GDP, reflecting the influence of external economic shocks and global trade on income flows.

The economy experienced moderate growth during this period, with GNI ranging from $15.63 billion to $16.41 billion. The growth rate during these years was relatively stable, indicating steady income growth. Similar to the GDP trend, the years from 2001 to 2008 witnessed fluctuations and growth spurts in GNI. The GNI reached a peak of $35.80 billion in 2008, reflecting a substantial increase in income. The growth rate during this period fluctuated between 2% and 12%.

The global financial crisis of 2008 had an impact on GNI, leading to a slower growth rate in 2009. While the growth rate decreased, the overall trend remained positive, indicating the resilience of the country's income sources. Similar to GDP, the years from 2010 to 2015 marked a period of significant GNI growth for Sri Lanka, with the income nearly doubling from $49.28 billion in 2010 to $82.28 billion in 2015. This rapid expansion was driven by various factors, including economic recovery, increased remittances, and international trade. Following the rapid growth phase, the GNI continued to expand at a slower pace. The growth rate varied between 1% and 6% during this period. Despite fluctuations, the overall trend remained positive, with the GNI reaching $89.24 billion in 2022. In summary, the GNI trend in Sri Lanka from 1991 to 2022 follows a pattern similar to GDP, reflecting a mixture of periods with rapid growth, moderate expansion, and fluctuations. External economic events and trade relationships played a significant role in shaping the income growth trajectory of the country during these years.

Figure 6: GNI (Billions of US $)

Source: Department of Census and Statistics and Annual Reports of the Central Bank of Sri Lanka

Association between Unemployment Rate and five independent variables

Table 1 presents the correlation coefficient (Pearson's r) and p-values between the unemployment rate and five different independent variables in the context of some analysis. The correlation coefficient measures the strength and direction of the linear relationship between two variables, while the p-value helps determine the statistical significance of that relationship. The Pearson correlation coefficient between the youth labour force participation rate and the unemployment rate is 0.864. This positive correlation suggests a strong positive relationship between these two variables.

In other words, as the youth labour force rate increases, the unemployment rate tends to increase as well. The p-value of 0.000 indicates that this correlation is statistically significant, meaning it is highly unlikely to have occurred by chance. The Pearson correlation coefficient between the inflation rate and the unemployment rate is -0.935. This negative correlation indicates a strong negative relationship between these two variables. In this case, as the inflation rate increases, the unemployment rate tends to decrease. The p-value of 0.000 suggests that this correlation is statistically significant. The Pearson correlation coefficient between the GDP and the unemployment rate is -0.822. This negative correlation implies a moderate negative relationship between these two variables.

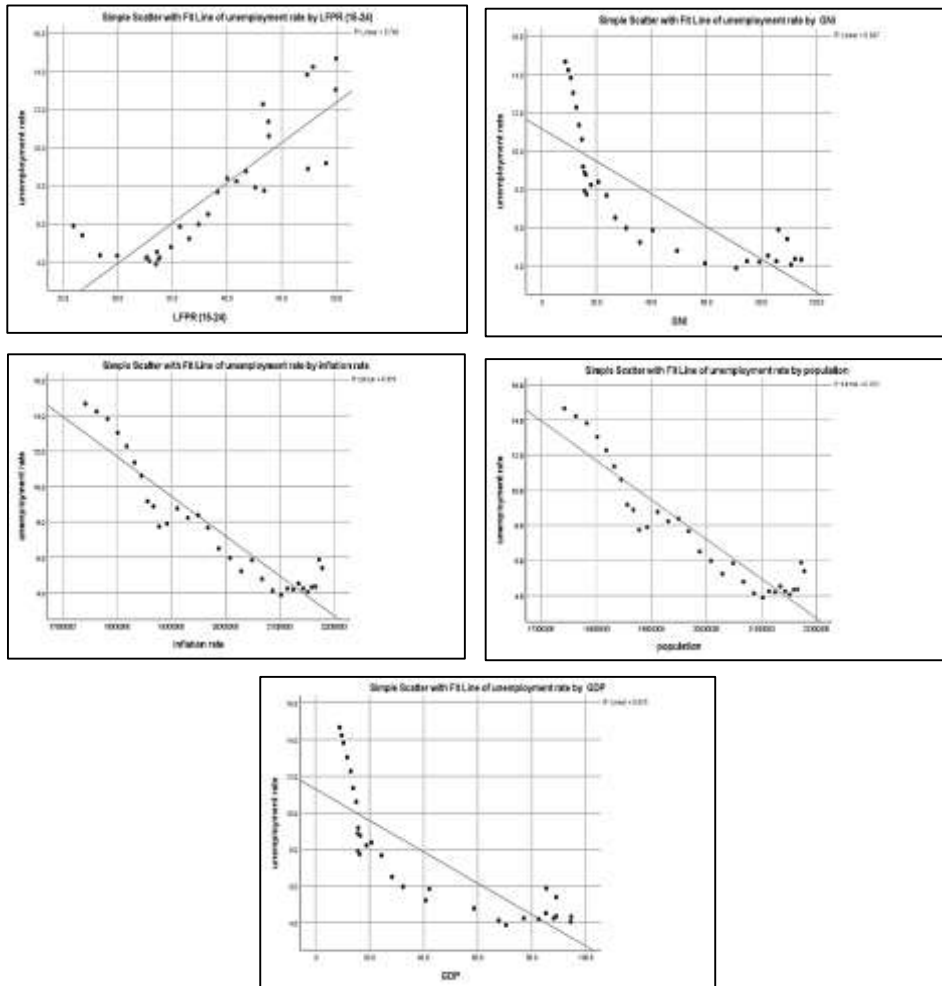Table 1: Relationship between Unemployment Rate and five independent variables

Independent Variable	Pearson r	p-value
Youth Labour Force Participation Rate	0.864	.000
Inflation Rate	-0.935	.000
GDP	-0.822	.000
GNI	-0.804	.000
Population	-0.935	.000

Furthermore, as the GDP (economic output) increases, the unemployment rate generally decreases. The p-value of 0.000 indicates that this correlation is statistically significant. The Pearson correlation coefficient between the GNI and the unemployment rate is -0.804. This negative correlation suggests a moderate negative relationship between these two variables. As the GNI (Gross National Income) increases, the unemployment rate tends to decrease. The p-value of 0.000 indicates that this correlation is statistically significant. In a similar vein, it's essential to delve deeper into the pronounced negative correlation observed between population and the unemployment rate, as indicated by the robust Pearson correlation coefficient of -0.935. This significant statistical finding underscores the noteworthy relationship between these two variables. What it essentially conveys is that when a nation's population experiences growth, the corresponding impact on the unemployment rate is decidedly inverse. In other words, as the population expands and more individuals enter the labour force, there is a concurrent tendency for the unemployment rate to decrease. This correlation's strength lies in its consistency and predictability, making it a vital consideration for policymakers and labour market analysts. Furthermore, the p-value of 0.000 firmly reinforces the statistical significance of this relationship, leaving no room for doubt that the observed negative correlation between population and unemployment is a genuine and noteworthy phenomenon.

This insight holds crucial implications for labour market planning and policies, suggesting that as the population grows, strategic efforts should be made to leverage this potential labour force to mitigate unemployment and foster economic stability.

Figure 7 indicates a positive relationship between the unemployment rate and the youth labour force participation rate in Sri Lanka. This means that when the youth labour force participation rate increases, the unemployment rate tends to increase as well. In practical terms, a higher youth labour force participation rate might lead to a greater number of young people entering the job market, potentially contributing to higher unemployment rates. This relationship could be influenced by factors such as education, skills development, and job availability for the youth population. The figure also suggests a negative relationship between the unemployment rate and the population in Sri Lanka. As the population increases, the unemployment rate tends to rise as well. This connection might be due to increased competition for jobs when the population grows. However, it's important to consider the quality of job opportunities, job matching, and demographic factors that might impact the unemployment rate alongside population growth. The negative relationship observed between the unemployment rate and GNI in Figure 7 implies that as the Gross National Income of Sri Lanka increases, the unemployment rate tends to decrease. This association suggests that a stronger economy, as reflected in higher GNI, can lead to improved employment opportunities, potentially lowering the unemployment rate. Economic growth can create more jobs and reduce the need for unemployment. Similarly, the negative relationship between the unemployment rate and GDP indicates that as Sri Lanka's economic output (GDP) rises, the unemployment rate generally decreases. This connection underscores the role of economic expansion in generating job opportunities and reducing unemployment. A growing GDP can lead to increased demand for labour across various sectors. Figure 7 further demonstrates a negative relationship between the unemployment rate and the inflation rate in Sri Lanka. When the inflation rate increases, the unemployment rate tends to decrease. This inverse relationship suggests that periods of higher inflation might coincide with lower unemployment, possibly because increased economic activity during inflationary periods leads to more job opportunities.

Figure 7: Scatterplot diagram showing the relationship between Unemployment Rate and other five independent variables

The positive association between the unemployment rate and youth labour force participation rate, suggest the potential challenges in managing unemployment in a growing labour force. Conversely, the negative relationships between the unemployment rate and GNI, GDP, Population and inflation rate emphasize the importance of economic growth and stability in reducing unemployment rates. It is worth noting that these relationships can be complex and influenced by a multitude of factors within the country's economic, social, and policy contexts.

Factors influencing Unemployment Rate

Table 2 presents the outcomes of the regression analysis conducted within this study, aiming to identify the variable from the five considered factors that influences the unemployment rate in Sri Lanka.

Table 2: Regression Analysis

Independent variable	p-value
GNI	.112
LFPR (15-24)	.005
Population	.000
GDP	.517
Inflation Rate	.939

The p-value for GNI is 0.112, which is greater than the commonly used significance level of 0.05. This suggests that the relationship between GNI and the unemployment rate in Sri Lanka may not be statistically significant at the 0.05 significance level. In other words, GNI might not have a strong impact on explaining changes in the unemployment rate in this context. The p-value for LFPR (15-24) is 0.005, which is less than 0.05. This suggests that the LFPR for the age group 15-24 is likely to be statistically significant in explaining variations in the unemployment rate in Sri Lanka. A lower p-value indicates a stronger likelihood that changes in LFPR for this age group are associated with changes in the unemployment rate. he p-value for Population is 0.000, which is much less than 0.05. This indicates strong evidence that the population variable is statistically significant in explaining changes in the unemployment rate in Sri Lanka. The very low p-value suggests that changes in population are highly likely to be associated with changes in the unemployment rate. p-value for GDP is 0.517, which is much higher than 0.05. This indicates that the relationship between GDP and the unemployment rate may not be statistically significant at the 0.05 significance level. In other words, GDP might not have a strong impact on explaining changes in the unemployment rate in this context. The p-value for Inflation Rate is 0.939, which is much greater than 0.05. This suggests that the relationship between the inflation rate and the unemployment rate in Sri Lanka may not be statistically significant at the 0.05 significance level. The inflation rate might not have a strong impact on explaining changes in the unemployment rate in this context.

Additionally, the overall goodness-of-fit of the regression model can be assessed using the R-squared value, which is 0.950 in this case. This indicates that approximately 95% of the variation in the unemployment rate can be explained by the independent variables included in the model. A high R-squared value generally suggests a strong relationship between the independent variables and the dependent variable (unemployment rate).

Furthermore, the Durbin-Watson statistic of 1.087, which is a value that is close to 2, reinforcing the idea that autocorrelation is not a major concern in the residuals in our regression analysis. This is generally a positive outcome, as it implies that the estimated coefficients and the significance tests based on them are more likely to be reliable.

Forecasting Unemployment Rate

Use of seasonal autoregressive integrated moving average (SARIMA) model

We employed the Seasonal Autoregressive Integrated Moving Average (SARIMA) model to forecast the Unemployment Rate over the upcoming five years, spanning from 2022 to 2026. SARIMA is specifically employed when there is a presence of seasonal patterns within the time series data. This model combines both nonseasonal and seasonal factors in a multiplicative framework (Brownlee, 2018; Urrutia et al., 2017).

A concise notation for this model is ARIMA(p, d, q)(P, D, Q)_s, where:

- p represents the non-seasonal autoregressive (AR) terms,
- d stands for the nonseasonal differencing,
- q denotes the non-seasonal moving average (MA) terms,
- P corresponds to the seasonal AR terms,
- D indicates the seasonal differencing,
- Q represents the seasonal MA terms, and
- s signifies the time span of the repeating seasonal pattern.

The formal representation of the SARIMA model is as follows:

$$\Phi(B^s)\varphi(B)\, x_t - \mu) = \Theta(B^s)\,\theta(B)\, w_t$$

where $\varphi(B)$ is the non-seasonal autoregressive terms, $\theta(B)$ is the non-seasonal moving average terms, $\Phi(B^s)$ is the seasonal AR terms, $\Theta(B^s)$ is the seasonal MA terms and w_t is the white noise error term at time t.

After analyzing the correlogram of the unemployment rate, we have identified clear evidence of seasonality within the time series. Concurrently, we have also observed that the time series exhibits a certain degree of non-stationarity. To address this non-stationarity and conform to the assumptions of time series analysis, which necessitate stationary data, we applied regular differencing techniques. The SARIMA model extends the basic ARIMA model by incorporating additional parameters to account for seasonality in the data.

The SARIMA model extends the basic ARIMA model by incorporating additional parameters to account for seasonality in the data. The SARIMA model can provide more accurate and reliable forecasts for seasonal data. By considering seasonal differences, it can better model the data's behavior, leading to improved predictions. SARIMA models allow for the inclusion of seasonal autoregressive (SAR) and seasonal moving average (SMA) terms, enabling greater flexibility in modeling seasonal dynamics. Furthermore, by including seasonal components, SARIMA models can produce more accurate parameter estimates, better fit the data, and provide more meaningful diagnostics for model validation.

The initial differencing process, specifically implementing a first-order difference, has effectively transformed the data into a stationary form. This crucial achievement signifies the elimination of significant trends or seasonality in the dataset, fulfilling the fundamental requirement for conducting time series analysis. Employing the Box-Jenkins methodology, we performed a comprehensive analysis to determine the appropriate model order (p, d, q) required to capture the key dynamic features within the data. Subsequently, we subjected the model's residuals to rigorous diagnostic tests. Leveraging the SARIMA (6, 2, 4), x(0, 1, 1)1 model, we conducted annual forecasts for the unemployment rate spanning from 2023 to 2027.

The forecasted outcomes indicate a relatively stable unemployment rate over the forthcoming five years, with values consistently hovering between 4 and 6 percent. This observation implies that, as per the model, the country's unemployment rate is anticipated to remain relatively constant around 4 during this period.

Furthermore, the forecasted unemployment rates from 2023 to 2027, along with their prediction intervals, provide estimates and confidence levels (Table 3 and Figure 8). For instance, the 2023 forecast is 4.31, with an 80% prediction interval of 3.45 to 5.17 and a 95% interval of 2.99 to 5.63. These intervals represent the range within which the actual rates are likely to fall, offering varying levels of confidence. The 80% interval is narrower but less certain, while the 95% interval is wider but more confident. These forecasts are valuable for planning and decision-making, with the choice of interval balancing risk and certainty as we move into the future. These forecasted values are given in Table 3. The forecasted values suggest a general upward trend in the unemployment rate over the forecast horizon, reflecting potential changes in the labour market and economic conditions. These forecasts can be valuable for planning and policy-making but should be used in conjunction with an understanding of the associated uncertainties. Regular monitoring and updates based on actual data are important for refining and validating the forecasts.

Table 3: Forecasted values: Unemployment Rate, 2023-2027

Year	Forecast	Lo 80	Hi 80	Lo 95	Hi 95
2023	4.31	3.45	5.17	2.99	5.63
2024	3.88	2.71	5.06	2.08	5.68
2025	4.47	3.02	5.92	2.25	6.68
2026	4.92	3.31	6.52	2.46	7.34
2027	5.39	3.71	7.06	2.83	7.95

Figure 8: Actual and forecasted values of Unemployment Rate, Sri Lanka
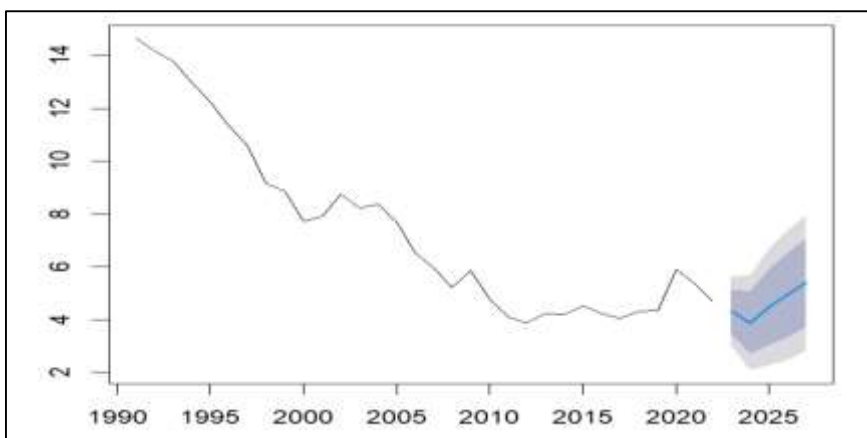
The Box-Ljung test, conducted on the residuals of the SARIMA model, examines whether there is significant autocorrelation in the residuals. With a test statistic (X-squared) of 5.7323 and 10 degrees of freedom, the test returns a p-value of 0.8372. This p-value is notably greater than the typical significance level of 0.05, indicating that there is insufficient evidence to support the presence of significant autocorrelation in the residuals. Consequently, it suggests that the SARIMA model effectively captures the temporal patterns in the data, leaving only random fluctuations in the residuals.

The paired t-test compares the observed unemployment rate values with the SARIMA model's fitted values. The test results show a t-statistic of 0.91817 with 31 degrees of freedom and a p-value of 0.3656. The higher p-value suggests that there is no strong evidence to reject the null hypothesis, indicating that the observed and fitted values do not significantly differ in their means. The 95 percent confidence interval also includes zero, further supporting this conclusion. The sample estimate of the mean difference is 0.0804, which is close to zero. In summary, the test suggests that the SARIMA model provides a reasonable fit to the data, as there is no significant difference between the observed and fitted values.

Conclusion

This paper seeks to predict Sri Lanka's unemployment rate by employing a time series model. The model selected for the estimation and forecasting of the unemployment rate in Sri Lanka is denoted as SARIMA (6, 2, 4) x (0, 1, 1)1, resulting in forecasted values falling within the 4 to 6 percent range. This study offers valuable insights into the factors that influence unemployment rates in Sri Lanka. Notably, we observe positive associations between the unemployment rate and youth labour force participation, signifying the unique challenges of managing unemployment in the context of a growing labour force. Conversely, the negative correlations between the unemployment rate and GNI, GDP, population, and inflation rate underscore the paramount role of fostering economic growth and stability as a means of reducing unemployment.

To translate these findings into actionable recommendations, we suggest the following:

1. *Youth employment initiatives:* Given the significant impact of youth labour force participation on unemployment rates, policymakers should prioritize initiatives aimed at providing employment opportunities and skills development for the younger population. Programmes that facilitate the transition from education to the labour market, such as vocational training and apprenticeships, can be instrumental in reducing youth unemployment.
2. *Economic diversification:* To combat unemployment effectively, Sri Lanka should place a strong emphasis on diversifying its economy. By fostering growth in various industries, including technology, manufacturing, and services, the country can create a more resilient job market. Encouraging entrepreneurship and supporting small and medium-sized enterprises (SMEs) can be pivotal in this regard.
3. *Labour market reforms:* Reforming labour market policies and regulations can enhance flexibility and encourage job creation. Removing barriers that may deter businesses from hiring, such as cumbersome labour laws, can stimulate job growth and reduce unemployment.
4. *Education and training:* Initiatives to equip the workforce with relevant skills and knowledge are essential. Investment in education and vocational training programmes should be a top priority, ensuring that the labour force remains adaptable and competitive in the evolving job market.
5. *Inflation control:* Although the inflation rate did not show a significant impact in the current analysis, it remains a factor to watch. Keeping inflation in check through sound monetary policies is essential to maintain economic stability and, indirectly, mitigate unemployment.

By following these suggested measures, Sri Lanka has the potential to make significant strides in addressing the challenge of high unemployment rates. This concerted effort can lead to the creation of a more robust, thriving job market that benefits its citizens and the nation as a whole. It is essential to recognize that the issue of unemployment is not isolated but intertwined with a web of interconnected factors, spanning economic, social, and policy realms. Consequently, it demands a holistic and multifaceted approach that takes into account these intricate dynamics. Such an approach is vital to effectively tackle this multifaceted issue and create a more prosperous and stable environment for the country's workforce.

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