FACTORS AFFECTING UNEMPLOYMENT RATE IN MALAYSIA

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Abstract

This empirical research examined the factors affecting the unemployment rate in Malaysia. The study applied annual time series data from 1982 to 2013. The data on enrollment to tertiary education, inflation, gross domestic product (GDP) and population were tested for unit root using Augmented Dickey Fuller (ADF) test. The results from the ADF revealed that inflation and GDP were stationary at level while unemployment, enrollment to tertiary education and population are stationary at first difference. The Ordinary Least Squares (OLS) were used in the process of estimate the significance of each variable to unemployment. The main results disclosed that enrollment to tertiary education and inflation have significant effect on unemployment while GDP and population seem insignificant to unemployment. The enrollment to tertiary education, inflation and GDP show negative relationship towards unemployment. Meanwhile, the population impacted positively, thereby increase in population would result in increasing the rate of unemployment. The possible reasons of such outcomes are data constraints and excluding relevant variables. Thus, some recommendations suggested to future researchers or policymakers are to increase the sample size and use panel data analysis so that further judgment can be made on the validity of research towards various countries other than focusing on Malaysia.

Keywords: *Unemployment Rate, Enrollment to Tertiary Education, Inflation, GDP, Population*

INTRODUCTION

Unemployment is an overriding topic for every nation, with a massive population predominantly for developing countries such as Malaysia. High unemployment indicates that there is no practical use of the labor resources. There are critical debates and discussions in Parliament about this issue. One of the ways to overcome this issue is prosperous the economy which may influence the economic development. According to the Department of Statistics Malaysia (2020), Malaysia's unemployment rate had risen from 3.2% in 2007 to 3.7% in 2009. Irpan et al. (2016) added, around 396,300 Malaysians were unemployed in 2012, accounting for 3% unemployment rate.

Furthermore, in 2013, Malaysia was classified as the 20th nation with the world's lowest unemployment rate at 3.1%. It achieved its lowest unemployment level in 2014, approximately 2.85%. However, we are currently in the phase of Industrial Revolution (IR) 4.0 where the machines perform jobs. It requires less unqualified human labor, and highly request value-added skilled labor who may specialize in operating the machines. Absolutely, this may lead to a significant increase in the rate

of unemployment and may affect the economic growth if no appropriate action taken to overcome this issue.

There are voluminous studies have been done to investigate this critical matter. For instance, Biagi and Lucifora (2008) observed that the education level is adversely linked to the unemployment rate since the education level may improve the likelihood of employment. Mpendulo and Mang'unyi (2018) also found similar discovery where the education level favourably and significantly contributed in reducing the unemployment rate. This proves that people who entered and graduated in tertiary educational level have a higher chance in getting the job.

Besides that, inflation rate is another factor that has an immense impact on the unemployment rate. Inflation is an economic term that is used to measure the rate of increase in the average price level of goods and services. Higher inflation rates indicate a decrease in purchasing power. According to the economic theory, the rate of inflation will rise as the unemployment rate drop. The relationship between unemployment and inflation rate has been opened up for research in the past decades such as in Philips (1958) where he discovered an inverse association between inflation and unemployment rate. His finding was supported by Maijama'a et al. (2019) where they found similar relationship in their study. In addition, Tesfaselassie and Wolters (2018) and Donayre and Panovska (2018) emphasized that reducing the unemployment rate against inflation is still a matter of controversy among scholars.

Apart from that, it has been revealed that the population also has a substantial long-term impact on unemployment rate as been discovered by Maqbool et al. (2013). According to their investigation, highly populated country such as Pakistan may cause many socio-economic challenges which may critically increase the unemployment rate. High percentage of unemployment rate due to overpopulation may also lead to society violence such as crimes and thievery in order to fulfil their living necessities.

In addition, Mandel and Liebens (2019) emphasized that the most prominent issue in a country is the decline in discretionary consumption. If consumer spending remains low and high unemployment rate persists, this may lead to a recession which may lead to a worst-case situation. They also found that the reduction in the GDP rate can be one of the main causing factors of the rise in the unemployment rate. Based on the previous studies, we can conclude that there are many factors lead to a high unemployment rate. This issue has been a delicate matter in many countries to be solved since it involves uncontrolled variables. Malaysia is not exceptable in this issue.

Thus, the main aim of this paper is to investigate the significant factors of the unemployment rate in Malaysia.

METHODOLOGY

Augmented Dickey Fuller Test

Before analysing the data, we test the stationarity of a time series using Augmented Dickey Fuller Test (ADF). The series of data is said to be non-stationary if unit root exists and vice versa. The existence of unit root in a series might lead to a spurious regression. The hypothesis for the ADF test is as follows:

H_o: Unit root present
H_a: No unit root

The null hypothesis will be rejected if the ADF value is less than the critical value which implies that the series is stationary.

Regression Analysis

We use Ordinary Least Square (OLS) method to estimate the parameters in a linear regression model. This method is frequently used to minimize the sum of the squares of the differences between the observed dependent variable and the estimated values of the independent variables. We suggest the following equation to examine the significant determinants of unemployment rate in Malaysia:

$$y = \beta_0 + \beta_1 log x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \varepsilon \quad (3.1)$$

y = unemployment rate
x_1= log enrolment to tertiary education
x_2= inflation rate
x_3= population rate
x_4= GDP
β_0= intercept
ε = error term
β_i= estimated coefficient of respective independent variables, where $i = 1, 2, 3, 4$.

The t-test is used to verify the significance of each variables with the following hypothesis:

H_o: β_i is not significantly different than 0
H_a: β_i is significantly different than 0

where $i = 1, 2, 3, 4$. If the $p-$value of respective individual variable is less than the significant level, $\alpha = 0.05$, then the null hypothesis will be rejected. Apart from that,

we use F-test to identify if the suggested model can best fit the data with the following hypothesis:

$$H_o: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$$
$$H_a: \text{at least one of } \beta_i \neq 0$$

We reject the null hypothesis is the $p-$value of the F-test is less than the significance level, $\alpha = 0.05$.

Autocorrelation Function (ACF)

The next method applied in our study is autocorrelation (ACF) where it is used to analyze the linear relationship of a variable with its own previous values. The ACF at lag k of the Υ sequence is calculated by:

$$\tau_k = \frac{\sum_{t=k+1}^{T}(Y_t - \bar{Y})(Y_{t-k} - \bar{Y})}{\sum_{t=1}^{T}(Y_t - \bar{Y})^2} \tag{3.2}$$

where $\bar{Y}$ is the sample mean of Y. If τ_1 is nonzero, it means that the series is first order serially correlated. If τ_k dies off more or less geometrically with increasing lag k, it is a sign that the series obey a low-order auto-regressive (AR) process. If τ_k drops to zero after a small number of lags, it is a sign that the series obeys a low-order moving-average (MA) process.

Partial Autocorrelations Function (PACF)

In order to determine the significant previous values, we use partial autocorrelation function (PACF). The PACF at lag k is the coefficient of regression on Y_{t-k} if Y_t is regressed at a constant, $Y_{t-1,} \ldots, Y_{t-k}$. This is a partial correlation since, after extracting the correlation from the intervening lags, it calculates the correlation of Y values, which are k cycles apart. The k lag is close to zero. The PAC of an order p, AR(p) pure autoregressive process cuts off at lag p, while the PAC of a process of the pure moving average (MA) steadily asymptotes to zero. The partial autocorrelation at lag k can be estimated using EViews recursively by:

$$\phi_k = \begin{cases} \tau_1 & for\ k = 1 \\ \dfrac{\tau_k - \sum_{j=1}^{k-1} \phi_{k-1,j} \tau_{k-j}}{1 - \sum_{j=1}^{k-1} \phi_{k-1,j} \tau_{k-j}} & for\ k > 1 \end{cases} \tag{3.3}$$

where τ_k is the evaluated autocorrelation at lag k. The estimates of the PACF is given by

$$\phi_{k,j} = \phi_{k-1,j} - \phi_k \phi_{k-1,k-j} \tag{3.4}$$

Table 2.1: The behavior of ACF and PACF

Model	AR(p)	MA(q)	ARMA(p,q)
ACF	Dies down	Cut off after certain lag q	Dies down
PACF	Cut off after certain lag p	Dies down	Dies down

Granger Causality Test

In any substantive context of the term, association does not inherently indicate causation. There are magnificent associations in the econometric cemetery, which are actually spurious or insignificant. In this study, the granger causality test investigates causality between two variables in a time series. Causality is closely related to the idea of cause-and-effect. A variable X is a causal to variable Y if X is the cause of Y. Before running a granger causality test, we need to ensure that all the variables in this series are stationary. EViews runs the form's bivariate regressions:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \cdots + \alpha_1 y_{t-1} + \beta_1 x_{t-1} + \cdots + \beta_1 x_{-1} + \epsilon_t \quad (3.5)$$
$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \cdots + \alpha_1 x_{t-1} + \beta_1 y_{t-1} + \cdots + \beta_1 y_{-1} + u_t \quad (3.6)$$

for all of the potential (x, y) series pairs in the group. For the joint hypothesis, the recorded F-statistics are the Wald statistics:

$$\beta_1 = \beta_2 = \cdots = \beta_1 = 0$$

for each equation. The null hypothesis is that x is the first regression does not Granger-cause y and that y in the second regression does not Granger-cause x.

RESULTS AND DISCUSSION

Descriptive Analysis

Table 3.1: Descriptive Statistics of Variables

	Unemployment	**Log Enrolment to Tertiary Education**	**Inflation**	**GDP**	**Population**
Mean	4.058750	1.172382	2.726783	5.862500	2.296085
Median	3.530000	1.347673	2.703538	6.194921	2.409780
Maximum	8.290000	1.585831	5.818900	10.00270	2.984112
Minimum	2.450000	0.607453	0.290008	-7.359415	1.369114
Std. Dev.	1.487947	0.348051	1.482650	3.888557	0.440321
Skewness	1.604650	-0.274607	0.245136	-1.564741	-0.402448
Kurtosis	4.376732	1.435318	2.346236	5.655168	2.292042

There are various information reported in Table 3.1. Noteworthy to mention that the excess kurtosis for unemployment and GDP are both greater than 3. This means that the datasets have a heavier tail than normal distribution. In contrast, the value of kurtosis for the log enrolment to tertiary education, inflation, and the population is less than 3. It indicates that these datasets have a lighter tail than a normal distribution. Meanwhile, in terms of skewness, the unemployment and inflation are positively skewed.

Unit Root Test

Table 3.2: Unit root test for Inflation rate and GDP

	Inflation I(0)	**GDP I(0)**	**Tertiary Education I(1)**	**Population I(1)**	**Unemployment I(1)**
ADF value	-4.440546	-4.459090	-4.495806	-3.203914	-3.413497
t-test (at 5%)	-2.960411	-2.960411	-2.963972	-2.998064	-2.963972
p-value	0.0014	0.0013	0.0012	0.0328	0.0184

Table 3.2 shows the result of the unit root test for all variables. Based on the results obtained, the ADF value for both inflation and GDP are -4.440546 and -4.459090 respectively, where the values are lower than the critical value at 5% level of significance. Their p-value are 0.0014 and 0.0013 individually. It means that both inflation and GDP are stationary at the level of 5%. Thus, we may reject the null hypothesis that both variables do not have a unit root and stationary at the level at 5% level. Meanwhile, for log enrolment to tertiary education, population and unemployment rate, they are all stationary at the first difference with p-values 0.0012, 0.0328 and 0.0184 individually.

Multiple Regression

Table 3.3: Result of Multiple Regression

Variable	**Coefficient**	**t-value**	**p-value**	**SE**
Log Enrolment to Tertiary Education	-2.559490	-3.353663	0.0024	0.763192
Inflation	-0.484612	-4.271560	0.0002	0.113451
GDP	-0.075080	-1.733199	0.0945	0.043319
Population	0.697008	1.183588	0.2469	0.588894
Constant	7.220652	3.271043	0.0029	2.207447
R-squared	0.681383			
F-statistic	14.43529			

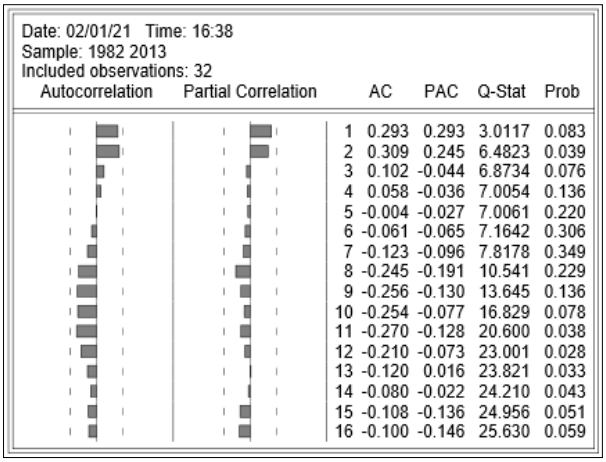
Referring to Table 3.3, we can see that the p-value for log enrolment variable to tertiary education and inflation are 0.0024 and 0.0002, respectively. Since the values are less than 0.05, both log enrolment to tertiary education and inflation are significant to Malaysian unemployment rate. While for the GDP and Population, the values are 0.0945 and 0.2469, respectively, where they are exceed the significance value 0.05. Thus, we can conclude that both variables are not significantly affect the unemployment rate.

Moreover, the estimated coefficient of the log enrollment to tertiary education, INF, and GDP are -2.559490, -0.484612, and -0.075080. These values imply that they have a negative relationship with unemployment rate. This means that any increase in the log to enrolment to tertiary education, inflation and GDP units supposed to be followed by a decrease in unemployment rate. In contrast, the estimated coefficient of the population is 0.697008. This indicates a positive relationship between population and unemployment rate.

Last but not least, the R-Squared value of 0.681383 implies that the independent variable's variance explains 68.14% of the variance of the dependent variable being analyzed. Since the value is relatively high, we can conclude that the suggested independent variables explain the dependent variable rather well.

Autocorrelation Test

The autocorrelation test was carried out using the error term, ϵ, after deducting all trend and seasonality in the datasets. The following figure shows its result.


Date: 02/01/21 Time: 16:38
Sample: 1982 2013
Included observations: 32

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.293	0.293	3.0117	0.083
		2	0.309	0.245	6.4823	0.039
		3	0.102	-0.044	6.8734	0.076
		4	0.058	-0.036	7.0054	0.136
		5	-0.004	-0.027	7.0061	0.220
		6	-0.061	-0.065	7.1642	0.306
		7	-0.123	-0.096	7.8178	0.349
		8	-0.245	-0.191	10.541	0.229
		9	-0.256	-0.130	13.645	0.136
		10	-0.254	-0.077	16.829	0.078
		11	-0.270	-0.128	20.600	0.038
		12	-0.210	-0.073	23.001	0.028
		13	-0.120	0.016	23.821	0.033
		14	-0.080	-0.022	24.210	0.043
		15	-0.108	-0.136	24.956	0.051
		16	-0.100	-0.146	25.630	0.059

Figure 3.1: ACF and PACF of the series

Based on the Figure 3.1, we can see that the values of ACF and PACF are lying within the confidence band. This indicates that there is no significant lags which can

explain the correlation with the previous values of the error terms. It means that we have obtained a white noise of error series.

Fitted Plot

Figure 3.2 shows the graph of the estimated value and the actual value. The purpose of fitting the data is to see how well the predicted regression function matches with the real data. Based on the plot, we can say that the estimated data fit the actual data rather well. However, the plot is rather rough which highly due to lack of the data.

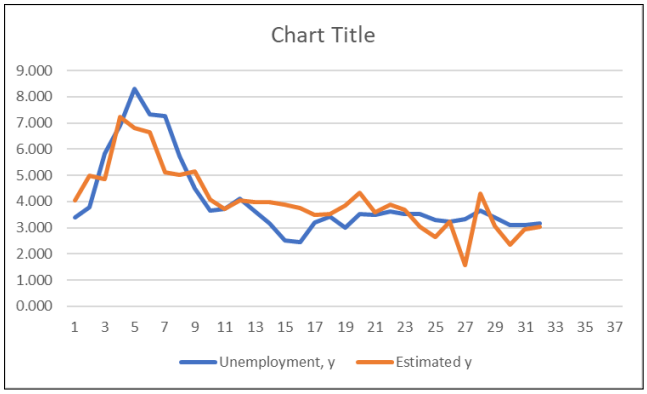


Figure 3.2: The Fitted Plot of Estimated Value

Granger Causality Tests

To accomplish the third objective of this research, we regress all the dependent and independent variables by using the Granger Causality tests. As aforementioned, all variables should be stationary before proceeding with this analysis, which has been performed in Unit Root Test. The Granger causality tests indicate pair-related relationships, which can be a one-way or two-way relationship or no relationship. The findings of the Granger causality test are summarised in the following table:

Table 3.4: Granger Causality test

	Null Hypothesis	**F-Stat**	**P-value**	**Explanations**
1	D(TER) does not Granger Cause D(UR) D(UR) does not Granger Cause D(TER)	0.58139 0.00674	0.5668 0.9933	We fail to reject both null hypotheses. This implies that there is no granger causality relationship between these variables.
2	INF does not Granger Cause D(UR) D(UR) does not Granger Cause INF	1.16159 8.64096	0.3300 0.0015	We fail to reject the hypothesis that INF does not Granger cause D(UR), but we manage to reject the hypothesis that D(UR) does not Granger cause INF. There

				is a one-sided causal relationship between D(UR) to INF.
3	GDP does not Granger Cause D(UR) D(UR) does not Granger Cause GDP	2.15292 2.49524	0.1380 0.1036	We do not reject both hypotheses that GDP does not Granger Cause D(UR), and D(UR) does not Granger Cause GDP. There is no causal relationship between GDP and D(UR).
4	D(POP) does not Granger Cause D(UR) D(UR) does not Granger Cause D(POP)	1.80111 0.20040	0.1867 0.8198	We fail to reject both null hypotheses. This shows that there is no causality relationship between D(POP) and D(UR).

Based on the table above, we can conclude that there is no causal relationship between unemployment rate and tertiary education, DGP as well as population. However, there is a one-sided causal relationship between unemployment and inflation.

CONCLUSION

This research aims to investigate the determinants that give impacts towards the unemployment rate in Malaysia. Notably, we discuss macroeconomics factors and figured out the significant variables such as enrollment to tertiary education, inflation, GDP growth, and population-related. By using multiple regression analysis to estimate the significance chosen variables, we discovered that the enrollment to tertiary education and inflation are significant towards Malaysian unemployment rate.

Meanwhile, GDP and population are not significantly affect the unemployment rate. The fitted plot of the observed and estimated data shown that our proposed model can fit rather well, despite of rough pattern. Besides that, we also found that only inflation has a one-sided causal relationship with the unemployment rate, while the other variables shown no causal relationship with our dependent variable. Throughout this study, there are some limitations. First limitation is lack of data. We believe that the suggested model can fit the observed data much better if we can get access to huge number of data.

Apart from that, we only considered four macroeconomic factors in this study. Inevitably, there are some more factors that are crucial in determining the

unemployment rate. Thus, for the future study, we suggest to include other macroeconomic indicators such as exchange rate, interest rate, export, import in longer time length which might improve the results.

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