

REVISITING THE ECONOMIC GROWTH MODEL: THE ROLES OF EXPORTS, EMPLOYMENT, AND FOREIGN DIRECT INVESTMENT

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Abstract: *The focal point of this study is to examine the relationship between the selected macroeconomic variables namely foreign direct investment, exports, and employment on the gross domestic product. In estimating the model, this study adopts the multiple regression model using ordinary least square approach. The yearly data is utilized spinning from 1991 to 2025. In general, all variables under observation are important in explaining the dependent variable in the long run at 99% confidence level. Specifically, the finding suggests that the exports (X) and employment growth rate (EGr) have a strong positive relationship with gross domestic product (GDP). On the other hand, foreign direct investment (FDI) also has a weak positive relationship with GDP, but it is not significant. The estimated model passed all diagnostic tests, including heteroscedastic, multicollinearity, and autocorrelation. By implication, both exports and the employment growth rate have a significant effect impact on gross domestic product in the long run, thus indicating high reliability on the rate of increase in exports and employment in Malaysia. Simply put, the higher exports and employment growth rate, the higher GDP will be increase in the long run. Therefore, the higher exports and employment growth rate can be a catalyst to increase the gross domestic product in Malaysia in the long term, especially from years 1991 to 2025.*

Keywords: *Gross Domestic Product, Foreign Direct Investment, Employment, Exports.*

Introduction

Gross Domestic Product (GDP) is widely used as a key indicator of economic performance, as it reflects the level of economic activity and production within a country. GDP growth is commonly associated with improvements in income levels, employment opportunities, and overall economic development, making it an important reference point in macroeconomic analysis (Odeh et al., 2021). GDP growth is often associated with improvements in income levels, employment opportunities, and economic stability. For a developing country such as Malaysia, sustaining GDP growth is especially important as it supports national development goals and improves the standard of living. As Malaysia continues its efforts to move towards a high-income economy, identifying the factors that contribute to economic growth remains a key concern for policymakers and researchers.

This study revisits the relationship between selected macroeconomic variables, namely foreign direct investment (FDI), exports, employment growth, and gross domestic product (GDP) in Malaysia. Revisiting these relationships is particularly important as Malaysia faces a rapidly changing global economic environment characterised by greater trade uncertainty, shifting international investment patterns, technological transformation, and evolving labour market conditions. Given Malaysia's strong dependence on international trade and foreign investment as major drivers of economic activity, there is a growing need to reassess whether these traditional determinants continue to contribute effectively to economic growth under current economic conditions. The analysis therefore applies a multiple regression model estimated using the Ordinary Least Squares (OLS) method to determine the individual effects of FDI, exports, and employment growth on GDP. Annual data from 1991 to 2025 are employed to provide an updated and comprehensive assessment of long-run economic trends and structural changes in the Malaysian economy, covering periods of industrial expansion, deeper integration into international markets, financial and economic crises, and significant changes in employment conditions.

The urgency of revisiting these relationships is further reinforced by the need to determine whether Malaysia's traditional growth drivers remain effective in supporting sustainable economic expansion. Exports are expected to contribute positively to GDP by expanding market opportunities for domestic industries, generating foreign exchange earnings, and strengthening production activities; however, increasing exposure to external shocks and global trade uncertainties may alter the strength of this relationship. Employment growth is equally important because the ability of the economy to generate productive employment determines the extent to which economic expansion can be translated into household income, consumption, and sustainable aggregate demand. Although FDI has traditionally been regarded as an important source of capital, technology transfer, productivity improvement, and industrial development, its contribution to economic growth cannot be assumed to be automatically positive, as the benefits depend considerably on domestic absorptive capacity, investment quality, sectoral allocation, and linkages with local industries (Yang, 2024). Therefore, revisiting the effects of exports, employment growth, and FDI using updated data up to 2025 is essential to establish whether these variables continue to function as significant determinants of Malaysia's GDP and to provide policymakers with a stronger empirical basis for designing future trade, investment, and labour market strategies.

To ensure the reliability of the findings, the estimated regression model is subjected to standard diagnostic tests, including tests for heteroscedasticity, multicollinearity, and autocorrelation. Overall, the results of this study indicate that exports and employment growth have a strong association with GDP growth in Malaysia over the long run. These findings suggest that policies aimed at strengthening export

performance and promoting employment creation can play an important role in supporting Malaysia's long-term economic growth, particularly over the period from 1991 to 2025.

Literature Review

This section offers a discussion based on the critical review of previous studies. It identifies the effect of export, employment growth rate and foreign direct investment on gross domestic product in Malaysia. In this section, an analysis of the relationship between each independent variable and the dependent variable will be presented. By integrate the empirical evidence from previous studies, this section contributes more comprehensive understanding on how these economic factors influence on the economic growth of Malaysia.

The Relationship Between Export (X) and Gross Domestic Product (GDP)

Some of the research highlighted that export plays an important role in GDP worldwide. According to Suropto et al. (2025), exports of goods and services have high contribution towards economic growth among ASEAN countries, especially in Thailand, Indonesia and Singapore in short run. It is because exports will enhance the nation's production capacity and foreign exchange reserves to support the GDP growth. Besides, the relationship between export and GDP differs among ASEAN countries due to factors such as level of development, financial systems, open trade systems, and external economic conditions. Therefore, the impact of exports depends on the institutional factors and policy frameworks that are implemented by each country.

Ji et al. (2022) studied the effect of export on economic growth in China. They found that exports of goods and services have a statistically significant relationship to GDP growth from 1986 to 2020 due to capacity utilization and advancements in technology. At the same time, Sein and Sah (2025) found empirical evidence of long-term relationships between export and GDP in Asia-Pacific countries. Overall, the findings suggest that the rapid export growth in manufacturing sectors has greatly contributed to China's GDP growth. Meanwhile, the findings also indicated that Malaysia and South Korea benefit from export-oriented economic structures. Therefore, exports not only improve the efficiency of domestic production but also encourage industrial development among Asia-Pacific countries. Similarly, Pérez-Rodríguez et al. (2025) has pointed out that export have a long-term relationship with GDP growth in 23 OCED countries from 1995 to 2021. The findings illustrate the real exchange rate (REER) increase the export competitiveness and foster the economic growth in these countries. This situation is also aligned with the export-led growth hypothesis (ELGH). A high contribution of export will increase the demand for local products, reduce the production costs and create opportunities to access international markets (Adelakun et al., 2025).

In contrast, some scholars argued that exports have an insignificant relationship with GDP. For instance, Romli et al. (2022) found that export have a negative impact on economic growth in Malaysia. The study revealed Malaysia is experiencing a trade deficit due to excessive imports. Finally, Bazán Navarro et al. (2022) noted that exports have no short-term relationship with GDP. The findings explain that export-related effects do not influence GDP instantaneously in the short run since the changes in exports take time to affect production and investment. Lastly, Enow (2025) explained that exports did not cause any short-term and long-term effects on GDP in Somalia. The findings discovered that Somalia highly concentrated on limited basic products, resulting unstable export revenue. In addition, most of the export income is spent on importing goods and capital equipment that are not produced domestically, instead of investing in local

industries. This will cause capital outflows and limit the reduction in the development of local industries. Thus, exports did not contribute to sustainable economic growth in Somalia.

The Relationship Between Employment Growth Rate and Gross Domestic Product (GDP)

Jafri and Aziz (2021) perform a study on Pakistan's economy from 1994 to 2019. This study indicates a strong positive relationship between GDP and employment. When the employment in Pakistan increase, it shows that the GDP also goes up for the following year. This study also compares Pakistan with neighbouring country such as Bangladesh, India, and Sri Lanka. The comparison shows a similar trend in all these countries, and this also highlight the importance of employment for the economic development.

In addition, Taghouti et al. (2024) obtained the empirical finding that supports positive relationship between employment growth and GDP in Morocco. It is because increase of employment will enhance the consumer spending. Individuals have high purchasing power tend to spend more income to buy goods and services. It will also promote productivity because skilled labour will contribute innovation, which improve the efficiency and production process. Consequently, economic growth will be foster because of high quality of goods and services that provide by local labour.

Furthermore, Burggraeve et al. (2015) pointed out how changes in employment will affect the GDP by analysed employment elasticity of GDP. Their study found that increase in employment lead to higher GDP, but this effect differs across the countries. For instance, the elasticity of employment of GDP is higher in United States and Spain, meanwhile Italy and Germany show the lower elasticity. This situation can be explained by differences in labour productivity and industrial structure in each country. Haider et al. (2023) analysed data across 44 nations from 1970 to 2019 and found that the relationship between GDP growth and employment growth depends on the development level of a country. The study's analysis shows this relationship is positive in developed countries, where economic expansion is more effective in creating job opportunities. However, the analysis also indicates a weaker relationship between the two variables in developing countries. This shows that although the economy is growing in developing countries, this growth does not always lead mean to enough job opportunity, highlighting that economic expansion may fail to generate proportional employment opportunities.

According to Bölükbaş (2019), the study analysed economic growth and employment growth across seven Balkan countries. The Wald statistic was used to determine the significance of the relationship between economic growth and employment growth. The result showed significant relationship between GDP growth and employment growth in two countries which is Croatia and Greece, while in Serbia, the employment is driving economic growth. Conversely, there is no significant relationship was found between GDP and employment growth in Albania, Bulgaria, and Romania. Although there is an economic expansion, but it may also fail to generate corresponding job opportunities.

The Relationship Between Foreign Direct Investment (FDI) and Gross Domestic Product (GDP)

Several empirical studies pointed out that FDI has a significant impact on GDP. First and foremost, Aouar and Tahraoui (2023) found that FDI has contributes positively to GDP in Arab Maghreb Union (AMU). As shown in their study, foreign investment in technology transfer and

skill development will increase productivity and help overcome the limitations of local expertise. Consequently, this situation encourages Maghreb countries to attract more FDI in specific sectors, such as Algeria's hydrocarbons sector to support long-term economic growth.

In ASEAN countries such as Indonesia, Sekar and Kaluge (2023) has demonstrated a positive relationship between FDI and GDP. The findings reveal that FDI acts as an important role in enhancing production capacity in primary sectors, particularly in manufacturing sectors such as Central Java and South Sulawesi. The scholars also explained that Jakarta and West Java have better infrastructure and market access will increase FDI rather than the less developed area. Factors such as quality of infrastructure, labour skill, market potential and the framework of investment policies will influence FDI to determine a country's attractiveness and profitability for the foreign investors. Studies by Ma'in and Mat Isa (2024) explained that FDI supports Malaysia's GDP by creating spillover effects. The findings also indicated the endogenous growth theory which is FDI brings technology, capital and innovation to foster the economic growth. Furthermore, Shaari et al. (2012) have highlighted FDI will give positive impact on Malaysia's GDP, particularly in petroleum and plantation industries.

Conversely, other scholars such as Siew (2021) argued that FDI has a significant negative relationship with GDP. This situation is due to the uncertainties of global economic and investment trends, especially during the COVID-19 pandemic. Azman Saini et al. (2010) found that insignificant relationships occur between FDI and GDP. The findings show that FDI alone does not have an impact on the GDP. FDI exerts significant influence on economic growth when the level of economic freedom in the country is high. Economic freedom such as Trade openness and efficient regulatory system will strengthen the ability of a country to attract the FDI. Yeboah et al. (2025) noted that while FDI positively influence to GDP in short-term, but it may give a negative impact in the long run. In facts, FDI promotes the growth of GDP as the European Union (EU) attracts large amount of foreign investment in technology, management and capital. However, excessive FDI may also reduce the domestic investment in the country, which will limit the opportunities for domestic firm to grow and divert resources. Over time, this will reduce the development of domestic industries and affect negatively to the long-term economic growth.

Methodology

Model Specification

The model specification in this study is inspired by the study proposed by Rambeli, Marikan, and Hashim (2016). Following Rambeli et al. (2016), as follows:

$$\ln KDNK_t = \beta_0 + \beta_1 FDI_t + \beta_2 X_t + \beta_3 PER_t + u_t \text{ -----} \textcircled{1}$$

where,

$KDNK_t$	=	Gross domestic product in the year t
FDI_t	=	Foreign direct investment in the year
X_t	=	Export in the year
PER_t	=	Rate of employment growth in the year
u_t	=	The random error in the year
β_0	=	Constant
β_i	=	Coefficient ($i = 1, 2 \text{ \& } 3$)
$\ln$	=	Logarithm

Based on equation (1), the augmented model applied in this study is as follows;

$$\ln GDP_t = \beta_0 + \beta_1 \ln X_t + \beta_2 \ln FDI_t + \beta_3 \ln EGr + \varepsilon_t \text{ -----} \textcircled{2}$$

where,

GDP_t	=	Gross domestic product
X_t	=	Export
EGr_t	=	Rate of employment growth
FDI_t	=	Foreign direct investment
ε_t	=	The random error
β_0	=	Constant
β_i	=	Coefficient (i = 1, 2 & 3)
ln	=	Logarithm

Econometric Approaches

The regression analysis in this study will employs Ordinary Least Squares (OLS) to examine the significance of the relationship between the independent and dependent variables. The OLS estimator is selected because it is the best linear unbiased estimators. The OLS method also aims to minimize the difference between the given values and predicted values by the regression model (Rawal, 2021). This study applies the Pearson correlation test and diagnostic tests for autocorrelation and heteroscedasticity in the regression analysis. Heteroscedasticity test is conducted to examine whether the errors in the regression model have unequal variance across different observation. Park test is conduct in this study to continue the heteroscedasticity test. When the significance level is higher than 0.05, the regression model will pass the heteroscedasticity test, but when is below 0.05, it indicates heteroscedasticity in the regression model (Tarigan & Vanessa, 2024).

Autocorrelation occurs when observations in variables is measured across temporal or geographic space. In linear regression model, this happens when the error at one period is related to the error at a previous period, which violates the classical regression assumption of independent errors (Fitry et al., 2024). The Durbin-Watson test (d-test) is commonly used to check for autocorrelation, and this study applied the test to examine the presence of autocorrelation in the regression model (Norhaliza & Purbowati, 2025). Multicollinearity occurs in a regression analysis where two or more independent variables are strongly correlated with each other. This strong correlation makes it hard to determine the individual effect of each variable on the dependent variable. Two methods were employed in this investigation. The first method is the hypothesis testing approach, while the second method is the variance inflation factor (VIF). If the VIF is greater than 10, it indicates that there is a strong presence of multicollinearity in the model (Azid et al., 2024).

Time Series Data

This analysis is using annual data from Malaysia, between the year range from 1991 to 2025. The goal of this analysis is to find out how macroeconomic variables include export, employment growth rate, and foreign direct investment will affect the gross domestic product. Data starting from 1991, covering a period of over 35 years, were collected to ensure the estimation model is reliable and provide a more detailed picture. According to Kong et al. (2025) using long time-series data enable clearer and more accurate patterns to be found, leading to a more reliable and precise results. Table 1 presents the reference sources of the time

series data for each economic variable. Data for gross domestic production (GDP), export (E), and foreign direct investment (FDI) are gathered from World Bank's Development Indicators (WDI). Throughout the data cleaning process, data for foreign direct investment (FDI) is converted from United States Dollars to Malaysian Ringgit using exchange rate calculations, which is 1 USD = RM4.17. Data for employment growth rate (EGr) are calculated using labor force and the unemployment rate. Both data are collected from the World Bank's Development Indicators (WDI). The unemployment rate series combines national estimates and International Labor Organization (ILO) estimates due to missing observations in the national unemployment data for certain years. After compiling the data for labor force and unemployment rate, the employment rate for each year is first computed using the formula $100 - \text{unemployment rate}$. Next, total employment (EMP) is calculated by multiplying the employment rate by the labor force. Finally, the employment growth rate is derived using the formula

$$\frac{\text{Employment}_1 - \text{Employment}_0}{\text{Employment}_0} \times 100.$$

Table 1: Link of Data Source

Macroeconomic Variables	Name of Variables in Modelling	Source of Data	Link of Data Source
Gross Domestic Production	GDP	World Bank's Development Indicators	https://databank.worldbank.org/id/c0718538
Export	X	World Bank's Development Indicators	https://databank.worldbank.org/id/953eca8f
Employment Growth Rate	EGr	World Bank's Development Indicators	Labor force: https://data.worldbank.org/indicator/SL.TLF.TOTL.IN?locations=MY Unemployment Rate (National Estimate): https://data.worldbank.org/indicator/SL.UEM.TOTL.NE.ZS?locations=MY Unemployment Rate (ILO Estimate): https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS?locations=MY
Foreign Direct Investment	FDI	World Bank's Development Indicators	https://databank.worldbank.org/id/3083aef4

Table 2 presents the real data for both dependent and independent variables and independent variable used in this study. The data were collected from World Bank's Development Indicators and subsequently calculated and converted to ensure accuracy and suitability for this study's econometric analysis.

Table 2: Real Data for GDP, X, EGr, and FDI

Year	GDP (RM)	X (RM)	EMP (People)	EGr (%)	FDI (RM) (1 USD = 4.17 MYR)
1991	74627553679.51	41775882054.87	6692533.04	-	-9726338555.38
1992	81751102498.17	48364081445.27	6973436.04	4.20	-16673530338.66
1993	89014784403.71	54455921350.79	7196904.29	3.20	-21614603220.29
1994	97822746879.14	60741515669.98	7385879.31	2.63	-20873530308.70
1995	106834219205.05	74047992161.81	7644603.04	3.50	-18105309821.05

1996	117335045630.59	88090844308.04	7912390.28	3.50	-17423258027.12
1997	129071719045.02	96219827786.19	8200939.76	3.65	-21176990332.66
1998	138523307832.51	101502912205.22	8454373.65	3.09	-21419265780.54
1999	128328802476.72	102001447473.74	8664429.58	2.48	-9021385570.97
2000	136205126470.56	115428201758.86	8906192.39	2.79	-10311971052.62
2001	148271359064.95	133972584364.49	9210144.18	3.41	-7345784210.53
2002	149038923296.26	124822038774.10	9436723.38	2.46	-1197228947.38
2003	157073594223.93	131596548631.24	9717015.87	2.97	-5415513157.91
2004	166165798103.90	138352547206.58	9986328.83	2.77	-4602363157.91
2005	177437551536.37	160569563645.47	10285877.06	3.00	-10687271052.62
2006	186898768708.90	173899899014.06	10596006.26	3.02	-4143657943.03
2007	197336779111.68	185520164260.91	10941734.83	3.26	-221591885.64
2008	209766600383.97	193736072466.12	11286388.64	3.15	11443277401.87
2009	219902039818.78	196783701549.66	11626290.14	3.01	32640676568.13
2010	216573759299.08	175376749036.10	11957788.24	2.85	27630957311.55
2011	232654030399.23	193649374880.62	12342514.89	3.22	18613260702.64
2012	244970531973.68	201742743145.94	12710205.11	2.98	12463958155.30
2013	258378881826.47	198228674451.94	13211805.31	3.95	33364601705.13
2014	270506469604.10	198742577840.35	13723292.27	3.87	8806757365.03
2015	286755041078.03	208759761761.25	14295177.29	4.17	22686646511.78
2016	301355266964.95	209287287856.54	14632162.60	2.36	2855652502.05
2017	314764917575.09	212048789474.52	14882045.43	1.71	-14064459755.00
2018	333061328477.27	230460985473.29	15238228.68	2.39	-15679569587.27
2019	349191778300.01	234915774291.29	15669593.15	2.83	-10588237774.83
2020	364602265936.14	232461507302.28	16091053.45	2.69	-6784467797.23
2021	344706479641.24	212561272146.37	16109127.97	0.11	-3180784457.57
2022	356134704342.14	251976934800.05	16443413.04	2.08	-31108955744.82
2023	387694727478.78	288535388352.92	16892300.32	2.73	-13413466439.98
2024	401479163711.43	265237250140.44	17229720.63	2.00	195412194.88
2025	422011432356.57	287769744109.20	17565219.36	1.95	-10653189140.35

Empirical Findings

Regression Model From SPSS

The following equation simplifies the results of the multiple linear regression model obtained from the output of the SPSS software. The estimated regression model for this study is presented as follows:

$\ln GDP$	$= \beta_0 + \beta_1 \ln X_t + \beta_2 \ln FDI + \beta_3 \ln EGr + \epsilon_t$	-----②
$\widehat{\ln GDP}$	$= 0.932 + 0.914\widehat{\ln X} + 0.025\widehat{\ln FDI} - 0.033\widehat{\ln EGr}$	-----③
<i>Se</i>	(0.622) (0.050) (0.019) (0.014)	
<i>t</i>	(1.499) (18.323)*** (1.295) (-2.441)**	
<i>F Test</i>	145.867	
R^2	0.936	
<i>DW</i>	0.334	

Coefficients ^a								
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.932	.622		1.499	.144		
	EXPORT	.914	.050	.926	18.323	.000	.838	1.194
	FOREIGN DIRECT INVESTMENT	.025	.019	.064	1.295	.205	.889	1.125
	EMPLOYMENT GROWTH RATE	-.033	.014	-.126	-2.441	.021	.798	1.254

a. Dependent Variable: GROSS DOMESTIC PRODUCT

Figure 1: SPSS output

The regression results indicate that export (X), employment growth (EGr), and foreign direct investment (FDI) collectively explain variations in gross domestic product (GDP). The estimated coefficient of export is positive at 0.914, indicating that an increase in exports is associated with an increase in GDP, holding other factors constant. Export is also highly statistically significant, with a t-statistic of 18.323, suggesting that it is an important determinant of GDP in the estimated model. Employment growth records a positive coefficient of 0.025, implying that higher employment growth is associated with an increase in GDP. However, its t-statistic of 1.295 indicates that the effect of employment growth is not statistically significant at conventional significance levels. In contrast, FDI has a negative coefficient of -0.033 and is statistically significant, with a t-statistic of -2.441, indicating a significant negative association between FDI and GDP during the study period. The estimated constant term is 0.932 with a t-statistic of 1.499, suggesting that it is not statistically significant at conventional levels. The model records an R^2 value of 0.936, indicating that approximately 93.6% of the variation in GDP is explained by export, employment growth, and FDI. Furthermore, the F-statistic of 145.867 indicates strong overall explanatory power of the regression model and suggests that the explanatory variables are jointly important in explaining GDP. Nevertheless, the Durbin–Watson statistic of 0.334 indicates a potential problem of strong

positive autocorrelation in the residuals, suggesting that further diagnostic testing and appropriate correction for serial correlation should be considered.

Table of t-Test Hypothesis

The t-test is employed to examine the statistical significance of each independent variable individually in relation to the dependent variable. This test determines whether each explanatory variable has a meaningful impact on the dependent variable when considered separately. The results of the hypothesis testing based on the t-test are presented in Table 4.

Table 3: The Individual Hypothesis Test (t-test)

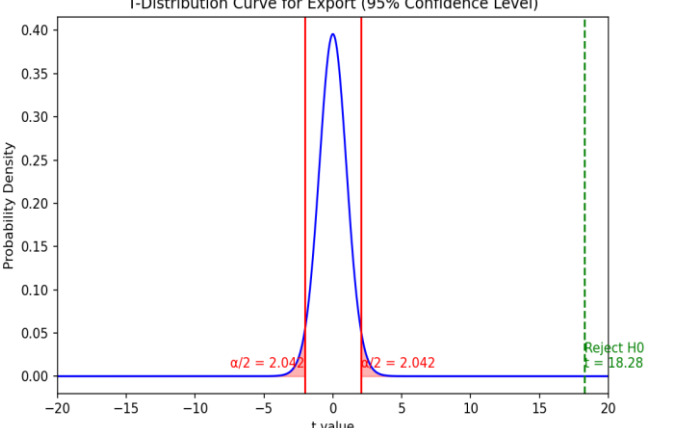
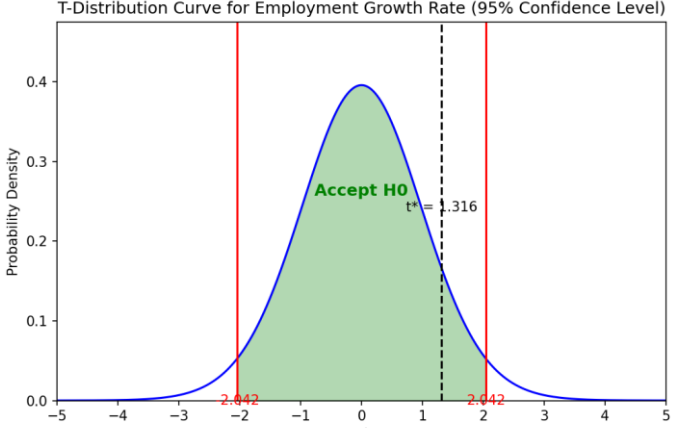
Independent Variable	Hypothesis	Statistical Test	Critical Value	Conclusion
Export (X)	H ₀ : $\beta_1=0$ H ₁ : $\beta_1 \neq 0$	$t^* = \frac{\hat{\beta} - \beta_1}{SE(\hat{\beta}_1)}$ $t^* = \frac{0.914}{0.050}$ $t^* = 18.28$	$t = (\alpha/2, N - k)$ $t = (\frac{0.05}{2}, 35 - 4)$ $t = 2.042$	$t^* > t$, $18.28 > 2.042$ At the 5% significance level, the result suggests rejecting H ₀ . Therefore, X is statistically significant and important in explaining GDP at the 95% confidence level.
Foreign Direct Investment (FDI)	H ₀ : $\beta_2=0$ H ₁ : $\beta_2 \neq 0$	$t^* = \frac{\hat{\beta} - \beta_1}{SE(\hat{\beta}_1)}$ $t^* = \frac{0.025}{0.019}$ $t^* = 1.316$	$t = (\alpha/2, N - k)$ $t = (\frac{0.05}{2}, 35 - 4)$ $t = 2.042$	$t^* < t$, $1.316 < 2.042$ At a 5% significance level, the result suggests accepting H ₀ . Therefore, FDI is not statistically significant and not important in explaining GDP at 95% significance level.
Employment Growth Rate (EGr)	H ₀ : $\beta_3=0$ H ₁ : $\beta_3 \neq 0$	$t^* = \frac{\hat{\beta} - \beta_1}{SE(\hat{\beta}_1)}$ $t^* = \frac{-0.33}{0.014}$ $t^* = -2.357$	$t = (\alpha/2, N - k)$ $t = (\frac{0.05}{2}, 35 - 4)$ $t = 2.042$	$t^* > t$, $2.357 > 2.042$ At the 5% significance level, the result suggests rejecting H ₀ . Therefore, EGr is statistically significant and important in explaining GDP at the 95% confidence level.

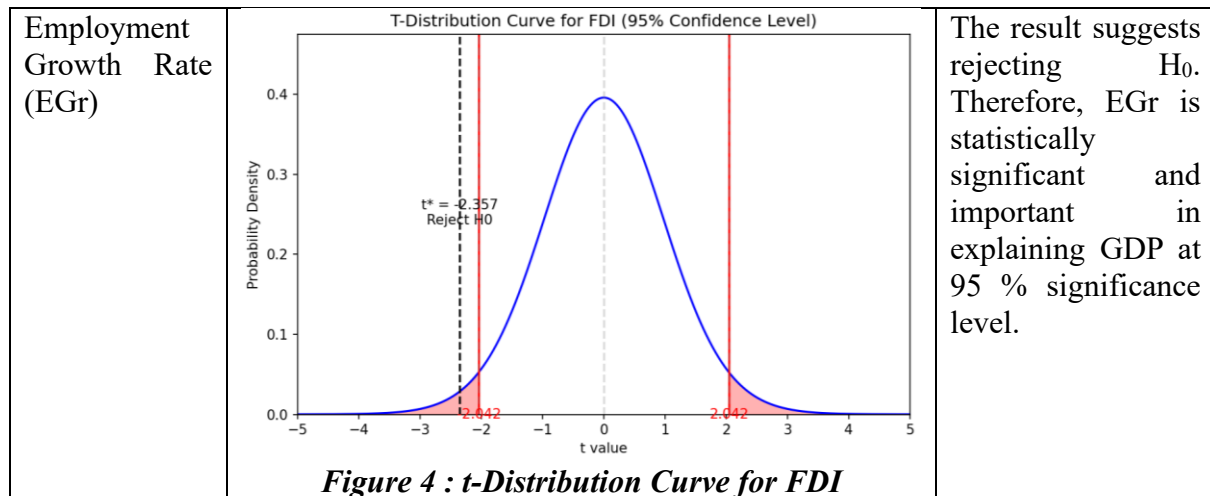
Table 3 shows the results of the t-test, which is whether to reject or accept H₀. Based on the results, the individual t-test for Export (X) shows that the calculated t-statistic (t*) is 18.28,

which is greater than the critical value of ± 2.042 at the 5% significance level ($t^* > t_{\alpha}(\alpha/2, N - k)$). Therefore, the hypothesis is rejected. This indicates that export is statistically significant and important in explaining GDP at the 95% confidence level. Next, the individual t-test conducted for the FDI shows that the calculated t-statistic t^* is 1.316, which is smaller than the critical value of ± 2.042 ($t^* < t_{\alpha}(\alpha/2, N - k)$). Hence, the hypothesis fails to be rejected. This implies that Employment Growth Rate is not statistically significant and not important in explaining GDP at the 95% confidence level. Furthermore, the individual t-test for EGr reveals that the calculated t-statistic (t^*) is -2.357 . In absolute terms, which is greater than the critical value of ± 2.042 ($t^* < t_{\alpha}(\alpha/2, N - k)$). Therefore, the hypothesis is rejected. This result indicates that FDI is statistically significant and important in explaining GDP at the 95% confidence level, although the relationship is negative. Table 4, presenting the curve of t-distribution for export, foreign direct investment and unemployment growth, using python code in Figure 5.

Table 4: t-Distribution Curve

Table of t-Distribution Curve

Export (X)	 Figure 2 : t-Distribution Curve for X	The result suggests rejecting H_0 . Therefore, X is statistically significant and important in explaining GDP at 95 % significance level.
Foreign Direct Investment (FDI)	 Figure 3 : t-Distribution Curve for EGr	The result suggests accepting H_0 . Therefore, FDI is not statistically significant and not important in explaining GDP at 95 % significance level.



Below is the python code used to generate t-Distribution Curve for Export, Employment Growth and Foreign Direct Investment, accordingly;
Code :-

```
import numpy as np
import matplotlib.pyplot as plt
from scipy.stats import t

df = 31
alpha = 0.05
t_critical = 2.042
t_calculated = 18.28

x = np.linspace(-20, 20, 1000)
y = t.pdf(x, df)

plt.figure(figsize=(8,5))
plt.plot(x, y, color='blue')

plt.axvline(-t_critical, color='red', linestyle='--')
plt.axvline(t_critical, color='red', linestyle='--')

plt.fill_between(x, y, where=(x <= -t_critical), color='red', alpha=0.3)
plt.fill_between(x, y, where=(x >= t_critical), color='red', alpha=0.3)

plt.text(-t_critical, 0.01, f' $\alpha/2 = \{t\_critical\}$ ', color='red', ha='right')
plt.text(t_critical, 0.01, f' $\alpha/2 = \{t\_critical\}$ ', color='red', ha='left')

plt.axvline(t_calculated, linestyle='--', color='green')
plt.text(t_calculated, 0.01, f'Reject H0\nt = {t_calculated}', color='green')

plt.title("T-Distribution Curve for Export (95% Confidence Level)")
plt.xlabel("t value")
plt.ylabel("Probability Density")
plt.xlim(-20, 20)

plt.show()
```

Figure 5: Coding of Export (T-distribution Curve)

Goodness of Fitted Model Analysis (F-test)

Meanwhile, the F-test (Wald-test) is used to evaluate the joint significance of all independent variables included in the model. This test assesses whether the independent variables, when considered collectively, significantly explain the variation in the dependent variable. The

outcomes of the F-test (Wald-test) are reported in Table 6 and Table 7, which provide evidence on the overall validity and explanatory power of the regression models.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.967 ^a	.936	.929	.05457	.334

a. Predictors: (Constant), EMPLOYMENT GROWTH RATE, FOREIGN DIRECT INVESTMENT, EXPORT

b. Dependent Variable: GROSS DOMESTIC PRODUCT

Figure 6: Model Summary Table

ANOVA^a

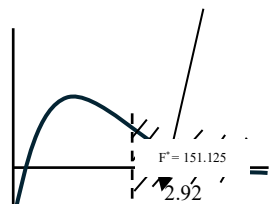
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.303	3	.434	145.867	.000 ^b
	Residual	.089	30	.003		
	Total	1.393	33			

a. Dependent Variable: GROSS DOMESTIC PRODUCT

b. Predictors: (Constant), EMPLOYMENT GROWTH RATE, FOREIGN DIRECT INVESTMENT, EXPORT

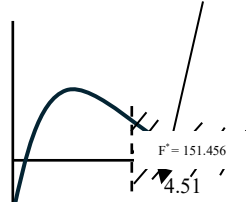
Figure 7: ANOVA Table

Table 5: The Wald Hypothesis Test (F-test) at 5% significant value

Model	Hypothesis	Statistical Test	Critical Value	Conclusion
Estimation Model	$H_0: \beta_1 = \beta_2 = \beta_3 = 0$ $H_1: \beta_1 \neq 0$	$F^* = \frac{R^2/K - 1}{(1 - R^2)/N - k}$ $F^* = \frac{0.936/3}{(1 - 0.936)/35 - 4}$ $F^* = \frac{2.064516 \times 10^{-3}}{0.312}$ $F^* = 151.125$	$= F_{\alpha, K-1, N-k}$ $= F_{0.05, 3, 31}$ $F = 2.92$	Reject H_0 $\alpha = 0.05, F^* = 151.125$  $F^* > F, 151.125 > 2.92$ Hence, H_0 is rejected and the model is significant at the 5% significant level.

The Wald hypothesis test results are presented in Table 5. The F-statistic is used to examine the overall goodness of fit of the regression model. Based on the results, the calculated F-statistic (151.125) is greater than the critical F-value at the 5% significance level (≈ 2.92). Therefore, the hypothesis is rejected at the 95% confidence level. This indicates that the independent variables, namely Export (X), Employment Growth Rate (EGr) and Foreign Direct Investment (FDI) are jointly significant and provide a good explanation of Gross Domestic Product (GDP) in the long run.

Table 6: The Wald Hypothesis Test (F-test) at 1% significant value

Model	Hypothesis	Statistical Test	Critical Value	Conclusion
Estimation Model	$H_0: \beta_1 = \beta_2 = \beta_3 = 0$ $H_1: \beta_1 \neq 0$	$F^* = \frac{R^2/K - 1}{(1 - R^2)/N - k}$ $F^* = \frac{0.936/3}{(1 - 0.936)/35 - 4}$ $F^* = \frac{0.312}{0.00206}$ $F^* = 151.456$	$= F_{\alpha, K-1, N-k}$ $= F_{0.01, 3, 31}$ $F = 4.51$	Reject H_0 $\alpha = 0.01, F^* = 151.456$  $F^* > F, 151.456 > 4.51$ Hence, H_0 is rejected and the model is significant at the 1% significant level.

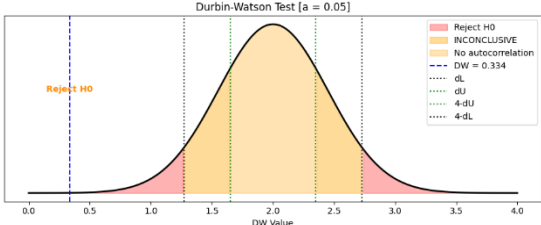
The Wald hypothesis test results are presented in Table 6. The F-statistic is used to examine the overall goodness of fit of the regression model. Based on the results, the calculated F-statistic (151.456) is greater than the critical F-value at the 1% significance level (≈ 4.51). Therefore, the hypothesis is rejected at the 99% confidence level. This indicates that the independent variables, namely Export (X), Employment Growth Rate (EGr) and Foreign Direct Investment (FDI) are jointly significant and provide a good explanation of Gross Domestic Product (GDP) in the long run.

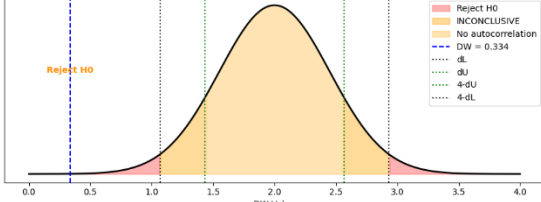
Diagnostic Tests Analysis

In this section, there will be three types of diagnostic tests, namely Autocorrelation, Heteroscedasticity and Multicollinearity. The graphs of each analysis is conducted using python code.

Autocorrelation (Durbin-Watson Test)

Table 7: The Durbin Watson (DW) Test Results

Level of Significance	DW	N	K	K*	Result
5%	0.334	34	4	3	 Positive autocorrelation problem exists in the main estimated model.
	dL	du	4 - du	4 - dL	
	1.271	1.652	4-1.652 = 2.348	4-1.271 = 2.729	

Level of Significance	DW	N	K	K*	Result
1%	0.334	34	4	3	 Positive autocorrelation problem exists in the main estimated model.
	dL	du	4 - du	4 - dL	
	1.070	1.435	4-1.435 = 2.565	4-1.070 = 2.930	

The Durbin Watson (DW) test was conducted to detect the presence of autocorrelation in the residuals of the estimated regression model. According to the result in Table 8, the DW statistic is 0.334 with 34 observations ($N = 34$) and 3 independent variables ($K^* = 3$). The lower critical (d_L) and upper critical (d_U) values at 5% significance level are 1.271 and 1.652 respectively, while the corresponding critical values for testing negative autocorrelation, $4-d_L$ and $4-d_U$, are 2.348 and 2.729 respectively. The DW test indicates the presence of positive autocorrelation because the DW value is 0.334, which is smaller than d_L . At 1% significance level, the d_L is 1.070 and d_U is 1.435, while the negative autocorrelation, $4-d_L$ and $4-d_U$, are 2.565 and 2.930 respectively. The DW statistic also lies below d_L that shows a positive autocorrelation in the residuals. Therefore, the null hypothesis (H_0) of no autocorrelation is rejected and no negative autocorrelation is found in the model.

Below is the python code used to generate DW Test Curve at 5% level of significance:
Code :-

```
import numpy as np
import matplotlib.pyplot as plt
from scipy.stats import norm
mu = 2.0
sigma = 0.45
x = np.linspace(0, 4, 400)
y = norm.pdf(x, loc=mu, scale=sigma)
dw = 0.334
dL_01 = 1.271
dU_01 = 1.652
four_dU_01 = 2.348
four_dL_01 = 2.729
plt.figure(figsize=(9,4))
<Figure size 900x400 with 0 Axes>
plt.plot(x, y, color='black', lw=2)
[<matplotlib.lines.Line2D object at 0x0000020FAACDB4D0>]
plt.fill_between(x, y, where=(x <= dL_01), color='red', alpha=0.3, label='Reject H0')
<matplotlib.collections.FillBetweenPolyCollection object at 0x0000020FAACDB230>
plt.fill_between(x, y, where=(x >= four_dL_01), color='red', alpha=0.3)
<matplotlib.collections.FillBetweenPolyCollection object at 0x0000020FAACDC910>
plt.fill_between(x, y, where=( (x > dL_01) & (x < dU_01) ), color='orange', alpha=0.4, label="INCONCLUSIVE")
<matplotlib.collections.FillBetweenPolyCollection object at 0x0000020FAAD38050>
plt.fill_between(x, y, where=(x > four_dU_01) & (x < four_dL_01), color='orange', alpha=0.4)
<matplotlib.collections.FillBetweenPolyCollection object at 0x0000020FAAD38410>
plt.fill_between(x, y, where=(x >= dU_01) & (x <= four_dU_01), color='orange', alpha=0.3, label='No autocorrelation')
<matplotlib.collections.FillBetweenPolyCollection object at 0x0000020FAAD38550>
plt.axvline(dw, color='blue', linestyle='--', label='DW = 0.334')
<matplotlib.lines.Line2D object at 0x0000020FAACDB770>
plt.axvline(dL_01, linestyle=':', color='black', label='dL')
<matplotlib.lines.Line2D object at 0x0000020FAACDBA10>
plt.axvline(dU_01, linestyle=':', color='green', label='dU')
<matplotlib.lines.Line2D object at 0x0000020FAACDBB60>
plt.axvline(four_dU_01, linestyle=':', color='green', label='4-dU')
<matplotlib.lines.Line2D object at 0x0000020FAACDBC0>
plt.axvline(four_dL_01, linestyle=':', color='black', label='4-dL')
<matplotlib.lines.Line2D object at 0x0000020FAACDBE00>
plt.text(dw, max(y)*0.6, 'Reject H0', color='darkorange', ha='center', fontweight='bold')
Text(0.334, 0.5318900420117617, 'Reject H0')
plt.title('Durbin-Watson Test [a = 0.05]')
Text(0.5, 1.0, 'Durbin-Watson Test [a = 0.05]')
plt.xlabel('DW Value')
Text(0.5, 0, 'DW Value')
plt.yticks([])
([], [])
plt.legend()
<matplotlib.legend.Legend object at 0x0000020FAAD541A0>
plt.tight_layout()
plt.show()
```

Figure 8: Coding for Durbin Watson Statistic Test Curve at 5% Level of Significance

Below is the python code used to generate DW Test Curve at 1% level of significance:
Code :-

```
import numpy as np
import matplotlib.pyplot as plt
from scipy.stats import norm
mu = 2.0
sigma = 0.45
x = np.linspace(0, 4, 400)
y = norm.pdf(x, loc=mu, scale=sigma)
dw = 0.334
dL_01 = 1.070
dU_01 = 1.435
four_dU_01 = 2.565
four_dL_01 = 2.930
plt.figure(figsize=(9,4))
<Figure size 900x400 with 0 Axes>
plt.plot(x, y, color='black', lw=2)
[<matplotlib.lines.Line2D object at 0x000001DEE251B4D0>]
plt.fill_between(x, y, where=(x <= dL_01), color='red', alpha=0.3, label='Reject H0')
<matplotlib.collections.FillBetweenPolyCollection object at 0x000001DEE251B230>
plt.fill_between(x, y, where=(x >= four_dL_01), color='red', alpha=0.3)
<matplotlib.collections.FillBetweenPolyCollection object at 0x000001DEE251C910>
plt.fill_between(x, y, where=( (x > dL_01) & (x < dU_01) ), color='orange', alpha=0.4, label='INCONCLUSIVE')
<matplotlib.collections.FillBetweenPolyCollection object at 0x000001DEE2578050>
plt.fill_between(x, y, where=(x > four_dU_01) & (x < four_dL_01), color='orange', alpha=0.4)
<matplotlib.collections.FillBetweenPolyCollection object at 0x000001DEE2578410>
plt.fill_between(x, y, where=(x >= dU_01) & (x <= four_dU_01), color='orange', alpha=0.3, label='No autocorrelation')
<matplotlib.collections.FillBetweenPolyCollection object at 0x000001DEE2578550>
plt.axvline(dw, color='blue', linestyle='--', label='DW = 0.334')
<matplotlib.lines.Line2D object at 0x000001DEE251B770>
plt.axvline(dL_01, linestyle=':', color='black', label='dL')
<matplotlib.lines.Line2D object at 0x000001DEE251BA10>
plt.axvline(dU_01, linestyle=':', color='green', label='dU')
<matplotlib.lines.Line2D object at 0x000001DEE251BB60>
plt.axvline(four_dU_01, linestyle=':', color='green', label='4-dU')
<matplotlib.lines.Line2D object at 0x000001DEE251BCB0>
plt.axvline(four_dL_01, linestyle=':', color='black', label='4-dL')
<matplotlib.lines.Line2D object at 0x000001DEE251BE00>
plt.text(dw, max(y)*0.6, 'Reject H0', color='darkorange', ha='center', fontweight='bold')
Text(0.334, 0.5318900420117617, 'Reject H0')
plt.title('Durbin-Watson Test [a = 0.01]')
Text(0.5, 1.0, 'Durbin-Watson Test [a = 0.01]')
plt.xlabel('DW Value')
Text(0.5, 0, 'DW Value')
plt.yticks([])
([], [])
plt.legend()
<matplotlib.legend.Legend object at 0x000001DEE25941A0>
plt.tight_layout()
plt.show()
```

Figure 9: Coding for Durbin Watson Statistic Test Curve at 1% Level of Significance

Heteroscedasticity

Heteroscedasticity test is conducted to examine whether the errors in the regression model have unequal variance across different observation. Park test is conduct in this study to continue the heteroscedasticity test. When the significance level is higher than 0.05, the regression model

will pass the heteroscedasticity test, but when is below 0.05, it indicates heteroscedasticity in the regression model (Tarigan & Vanessa, 2024).

Initial Estimated Model

<i>GDP</i>	$= \beta_0 + \beta_1 X + \beta_2 EGr + \beta_3 FDI + \varepsilon t$	----- ②
$\widehat{GDP}$	$= 0.932 + 0.914\widehat{X} + 0.025\widehat{EGr} - 0.033\widehat{FDI}$	----- ③
<i>Se</i>	(0.622) (0.050) (0.019) (0.010)	
<i>t</i>	(1.499) (18.323) (1.295) (-2.441)	
<i>F</i>	145.867	
<i>R</i> ²	0.936	
<i>DW</i>	0.334	

New Model (Glejser):

Glejser Test is a well-known test for heteroscedasticity which is based on weak assumptions and is very important (Furno, 2005) in a regression model. It examines whether the absolute values of the residuals are significantly related to the independent variables. If a significant relationship is found, it indicates the presence of heteroscedasticity which means the variance of the error terms is not constant.

<i>GDP</i>	$= \beta_0 + \beta_1 X + \beta_2 EGr + \beta_3 FDI + \varepsilon t$	----- ②
$\widehat{GDP}$	$= -1.800 + 0.000\widehat{X} - 0.119\widehat{EGr} + 0.137\widehat{FDI}$	----- ④
<i>Se</i>	(1.373) (0.110) (0.030) (0.042)	
<i>t</i>	(-1.311) (-0.004) (-3.953) (3.247)	
<i>F</i>	7.309	
<i>R</i> ²	0.422	
<i>DW</i>	0.373	

Coefficients ^a								
		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-1.800	1.373		-1.311	.200		
	EXPORT	.000	.110	-.001	-.004	.997	.838	1.194
	EMPLOYMENT GROWTH RATE	-.119	.030	-.614	-3.953	<.001	.798	1.254
	FOREIGN DIRECT INVENSTMENT	.137	.042	.478	3.247	.003	.889	1.125

a. Dependent Variable: IN ERROR SQUARE

Figure 10: Coefficient Table (Glejser Test)

Table 8: Glejser Test (t-test) at 5% significance level

Independent Variable	Hypothesis	Statistical Test	Critical Value	Conclusion
Export (X)	H ₀ : Homoscedasticity H ₁ : Heteroscedasticity	$t^* = \frac{\hat{\beta} - \beta_1}{SE(\hat{\beta}_1)}$ $t^* = \frac{0.000}{0.110}$ $t^* = 0$	$t = (\alpha/2, N - k)$ $t = (\frac{0.05}{2}, 35 - 4)$ $t = 2.042$	$t^* < t, 0 < 2.042$ The results suggest accepting H ₀ . Therefore, Export does not cause heteroscedasticity, indicating that the model exhibits homoscedasticity at the 95% confidence level.
Employment Growth Rate (EGr)	H ₀ : Homoscedasticity H ₁ : Heteroscedasticity	$t^* = \frac{\hat{\beta} - \beta_1}{SE(\hat{\beta}_1)}$ $t^* = \frac{-0.119}{0.030}$ $t^* = -3.97$	$t = (\alpha/2, N - k)$ $t = (\frac{0.05}{2}, 35 - 4)$ $t = 2.042$	$t^* > t, 3.97 > 2.042$ The results suggest rejecting H ₀ . Therefore, Economic Growth Rate causes heteroscedasticity, indicating that the model suffers from a heteroscedasticity problem at the 95% confidence level.
Foreign Direct Investment (FDI)	H ₀ : Homoscedasticity H ₁ : Heteroscedasticity	$t^* = \frac{\hat{\beta} - \beta_1}{SE(\hat{\beta}_1)}$ $t^* = \frac{0.137}{0.042}$ $t^* = 3.26$	$t = (\alpha/2, N - k)$ $t = (\frac{0.05}{2}, 35 - 4)$ $t = 2.042$	$t^* > t, 3.26 > 2.042$ The results suggest rejecting H ₀ . Therefore, Foreign Direct Investment causes heteroscedasticity, indicating that the model suffers from a heteroscedasticity problem at the 95% confidence level.

Glejser's test through the individual significance test approach (t-test) was carried out to highlight the problem of heteroscedasticity. The purpose of this test is to identify whether there is a heteroscedasticity problem in the regression model. Based on the SPSS results, the t^* value of the statistical test for the Export variable is -0.004 , which is within the critical value parameter t_{α} , which is ± 2.042 . Hence, the result is accepted H₀. Therefore, there is no

heteroscedasticity problem (homoscedasticity) associated with the Export variable at the 95% confidence level. Next, the table shows the t^* value of the statistical test for the Economic Growth Rate (EGr) variable, which is -3.953 , exceeding the critical value parameter t_{α} . Thus, the result is rejected H_0 . Therefore, heteroscedasticity exists in the model with respect to the Economic Growth Rate variable at the 95% confidence level.

As for the Foreign Direct Investment (FDI) variable, the t^* value of the statistical test is 3.247 , which also exceeds the critical value parameter t_{α} . Hence, the result is rejected H_0 . Therefore, the model suffers from a heteroscedasticity problem associated with the Foreign Direct Investment variable at the 95% confidence level.

Table 9: Glejser Test (t-test) at 1% significance level

Independent Variable	Hypothesis	Statistical Test	Critical Value	Conclusion
Export (X)	H_0 : Homoscedasticity H_1 : Heteroscedasticity	$t^* = \frac{\hat{\beta} - \beta_1}{SE(\hat{\beta}_1)}$ $t^* = \frac{0.000}{0.110}$ $t^* = 0$	$t = (\alpha/2, N - k)$ $t = (\frac{0.01}{2}, 35 - 4)$ $t = 2.750$	$t^* < t$, $0 < 2.750$ The results suggest accepting H_0 . Therefore, there is no heteroscedasticity problem (homoscedasticity) associated with the Export variable at the 99% confidence level.
Employment Growth Rate (EGr)	H_0 : Homoscedasticity H_1 : Heteroscedasticity	$t^* = \frac{\hat{\beta} - \beta_1}{SE(\hat{\beta}_1)}$ $t^* = \frac{-0.119}{0.030}$ $t^* = -3.97$	$t = (\alpha/2, N - k)$ $t = (\frac{0.01}{2}, 35 - 4)$ $t = 2.750$	$t^* > t$, $3.97 > 2.750$ The results suggest rejecting H_0 . Therefore, heteroscedasticity exists in the model with respect to the Economic Growth Rate variable at the 99% confidence level.
Foreign Direct Investment (FDI)	H_0 : Homoscedasticity H_1 : Heteroscedasticity	$t^* = \frac{\hat{\beta} - \beta_1}{SE(\hat{\beta}_1)}$ $t^* = \frac{0.137}{0.042}$ $t^* = 3.26$	$t = (\alpha/2, N - k)$ $t = (\frac{0.01}{2}, 35 - 4)$ $t = 2.750$	$t^* > t$, $3.26 > 2.750$ The results suggest rejecting H_0 . Therefore, the model suffers from a heteroscedasticity problem associated with the Foreign Direct Investment variable at the 99% confidence level.

Tables 8 and 9, presents the results of Glejser's test conducted using the individual significance test (t-test) to detect the presence of heteroscedasticity. Based on the SPSS output, the t^* value for the Export variable is -0.004, which lies within the critical value range α . Hence, the hypothesis (H_0) is accepted, indicating that there is no heteroscedasticity problem (homoscedasticity) associated with the Export variable at the 99% confidence level. In contrast, the t^* value for the Economic Growth Rate (EGR) variable is 3.953, which exceeds the critical value of ± 2.750 . Therefore, the hypothesis is rejected, suggesting the presence of heteroscedasticity in the model with respect to the Economic Growth Rate variable at the 99% confidence level. Similarly, the t^* value for the Foreign Direct Investment (FDI) variable is 3.247, which also surpasses the critical value threshold. As a result, the hypothesis is rejected, indicating that the model suffers from heteroscedasticity associated with the Foreign Direct Investment variable at the 99% confidence level. In conclusion, at the 1% significance level, heteroscedasticity is present in the regression model due to the Economic Growth Rate and Foreign Direct Investment variables, while the Export variable does not contribute to heteroscedasticity.

Table 10: Glejser Test (F-test) at 5% significance level

Model	Hypothesis	Statistical Test	Critical Value	Conclusion
Estimation Model	H_0 : Homoscedasticity H_1 : Heteroscedasticity	$F^* = \frac{R^2/K - 1}{(1 - R^2)/N - k}$ $F^* = \frac{0.422/3}{(1 - 0.422)/35 - 4}$ $F^* = \frac{0.1407}{0.01865}$ $F^* = 7.5442$	$= F_{\alpha, K-1, N-k}$ $= F_{0.05, 3, 31}$ $F = 2.92$	$F^* > F, 7.5442 > 2.92$ The results suggest rejecting H_0 . Therefore, a heteroscedasticity problem exists in the model at the 95% significance level.

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.650 ^a	.422	.365	.1205328	.373

a. Predictors: (Constant), Foreign Direct Investment, Export, Economic Growth

b. Dependent Variable: Log Error Square

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.319	3	.106	7.309	.001 ^b
	Residual	.436	30	.015		
	Total	.754	33			

a. Dependent Variable: Log Error Square

b. Predictors: (Constant), Foreign Direct Investment, Export, Economic Growth

Figure 11: ANOVA Table

In the search for the problem of heteroscedasticity, the goodness-of-fit test approach (F-test) is also employed. SPSS reports were used to conduct the above hypothesis test. The results of the statistical test on the estimated model show that the calculated F^* value is 7.5442, while the critical value F_{α} is 2.92. Since the value of F^* is greater than the value of F_{α} , that is, $F^* > F$, $7.5442 > 2.92$. Hence, the Glejser model does not satisfy the homoscedasticity assumption at the 95% confidence level.

Table 11: Glejser Test (F-test) at 1% significance level

Model	Hypothesis	Statistical Test	Critical Value	Conclusion
Estimation Model	Ho: Homoscedasticity H ₁ : Heteroscedasticity	$F^* = \frac{R^2/K - 1}{(1 - R^2)/N - k}$ $F^* = \frac{0.422/3}{(1 - 0.422)/35 - 4}$ $F^* = \frac{0.1407}{0.01865}$ $F^* = 7.5442$	$= F_{\alpha, K-1, N-k}$ $= F_{0.01, 3, 31}$ $F = 4.51$	$F^* > F, 7.5442 > 4.51$ The results suggest rejecting Ho. Therefore, a heteroscedasticity problem exists in the model at the 99% confidence level.

In the investigation of heteroscedasticity, both the goodness-of-fit test approach (F-test) and the individual significance test (t-test) were employed. The analysis conducted using SPSS shows that the calculated F^* value for the estimated model is 7.5442, while the critical F value at the 1% significance level is 4.51. Since the calculated F^* value is greater than the critical F value ($F^* > F, 7.5442 > 4.51$), the hypothesis (Ho) is rejected. Therefore, the results indicate the presence of heteroscedasticity in the Glejser model at the 99% significant level.

Residual Scatter Plot

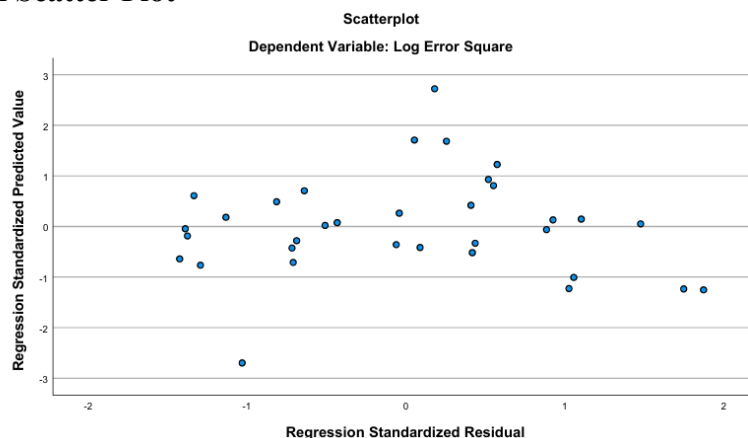


Figure 12: Scatterplot

Based on the scatterplot of the residuals against the predicted values, the residuals appear to be randomly scattered with a relatively constant variance across all levels of the predicted values. Therefore, there is no clear evidence of heteroscedasticity in the model.

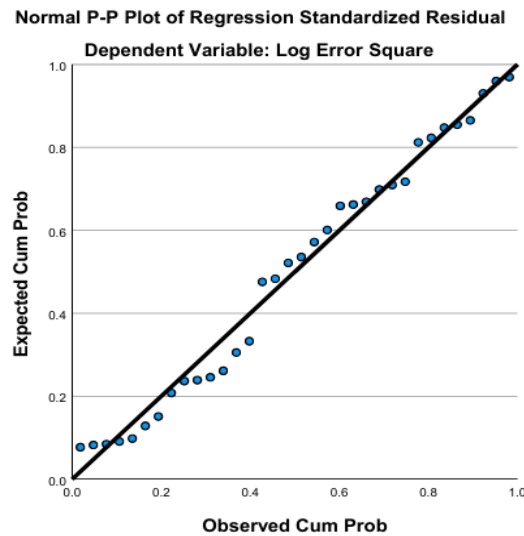


Figure 13: Normal P-P Plot

Based on the Normal P-P Plot of the regression standardized residuals, the plotted points lie approximately along the diagonal line. This indicates that the residuals are approximately normally distributed.

Multicollinearity

Correlations

		EXPORT	EMPLOYMENT GROWTH RATE	FOREIGN DIRECT INVESTMENT
EXPORT	Pearson Correlation	1	-.387 [*]	-.211
	Sig. (2-tailed)		.024	.225
	N	35	34	35
EMPLOYMENT GROWTH RATE	Pearson Correlation	-.387 [*]	1	.312
	Sig. (2-tailed)	.024		.072
	N	34	34	34
FOREIGN DIRECT INVESTMENT	Pearson Correlation	-.211	.312	1
	Sig. (2-tailed)	.225	.072	
	N	35	34	35

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 14: The Coefficient Table

Approach 1: Variance Inflation Factor (VIF) approach

Table 12: Independent Variable

Independent Variable	Statistic VIF	Rule of thumbs	Conclusion
Export (X)	1.194	Less than 5	Therefore, the VIF is 1.194, indicating a low-level multicollinearity because the VIF is less than 5.

Employment Growth Rate (EGr)	1.254	Less than 5	Therefore, the VIF for is 1.254, indicating a low-level multicollinearity because the VIF is less than 5.
Foreign Direct Investment (FDI)	1.125	Less than 5	Therefore, the VIF for is 1.125, indicating a low-level multicollinearity because the VIF is less than 5.

Approach 2: Correlation VS R-square

Table 13: Correlation VS R-square

Correlation Variables Combination	Pearson-Correlation Results	Sign notation (< or >)	R square value from multiple regression results	Conclusion
Corr (X, EGr)	-0.387	<	0.991	Multicollinearity exist but not serious.
Corr (X, FDI)	-0.211	<	0.991	Multicollinearity exist but not serious.
Corr (EGr, FDI)	0.312	>	0.991	Multicollinearity exist but not serious.

The following table simplifies the Pearson correlation findings from the SPSS output. The results suggest that the correlation values among the independent variables, namely Export (X), Employment Growth Rate (EGr), and Foreign Direct Investment (FDI), do not indicate serious multicollinearity issues. Although some degree of correlation exists between Export and Employment Growth Rate ($r = -0.387$), Export and FDI ($r = -0.211$), as well as Employment Growth Rate and FDI ($r = 0.312$), all correlation coefficients remain below the critical threshold, indicating that multicollinearity is not severe. This finding is further supported by the multiple regression results, where the R^2 value (0.991) is greater than the pairwise correlation coefficients among the independent variables, namely $R^2 > \text{corr}(X, \text{EGr})$, $R^2 > \text{corr}(X, \text{FDI})$, and $R^2 > \text{corr}(\text{EGr}, \text{FDI})$. Therefore, the regression model does not suffer from serious multicollinearity problems and is considered statistically reliable for further analysis.

Conclusion

To sum up, the objective of this study is to indicates the relationship between export, employment growth rate and foreign direct investment with GDP in Malaysia from 1991 to 2025. In the study, Ordinary Least Squares (OLS) used to identify the significance of the relationship among these variables. This study provides empirical evidence to show the key driver of economic growth in Malaysia to support the policy-making decisions.

The results indicate that export (X) and employment growth rate has positive significant relationship with gross domestic product (GDP) in Malaysia. Specifically, an increase in

exports contributes to GDP by expanding global market opportunities. Meanwhile, a higher employment growth rate will increase household income and purchasing power, thereby stimulating domestic consumption and strengthening the local industries. Conversely, foreign direct investment (FDI) has a weak positive relationship but is insignificant on GDP in this study. This may be caused by FDI concentrated in the sectors with limited linkage to the domestic economy. In conclusion, this study successfully prove that export and employment growth rate have greater impact on GDP in Malaysia. To further foster the economic growth in Malaysia, strategies to attract FDI such as offering tax incentives, promoting sustainable development and facilitating technology transfer should be prioritized. With the implementation of these strategies, FDI will directly contribute to domestic industrial development in the future.

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