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Macroeconomic Determinants of Malaysia's Exchange Rate: A Multiple Linear Regression Analysis

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ABSTRACT

This study uses Multiple Linear Regression (MLR) to examine how important macroeconomic factors affect Malaysia's exchange rate. The analysis covered annual data from 1990 to 2023 and focused on five main indicators—GDP at constant prices, GDP growth rate, interest rate, inflation rate, and unemployment rate. On average, the exchange rate stood at 3.50 MYR/USD, showing moderate fluctuation, while GDP at constant prices recorded an average of 25,144.60 million MYR with wider variation, reflecting the country's economic expansion. The correlation results indicate that the exchange rate moves closely with GDP at constant prices ($r = 0.801$) but inversely with both interest rate ($r = –0.762$) and GDP growth rate ($r = –0.757$). Regression analysis further confirms that GDP at constant prices exerts a strong positive influence on the exchange rate ($\beta = 0.475$, $p < 0.001$), whereas GDP growth rate has a significant negative effect ($\beta = –0.327$, $p = 0.022$). The overall model explains about 76 percent of the variation in the exchange rate (Adjusted $R^2 = 0.757$) and shows no sign of serial correlation (Durbin–Watson = 1.882). These findings underscore the dominant role of structural output and growth dynamics in influencing Malaysia's exchange rate, allowing policymakers to sustain long-term economic stability and manage volatility arising from rapid short-term growth.

1. INTRODUCTION

The exchange rate plays a crucial role in Malaysia's economic performance, as it directly affects international trade, capital flows, inflation, and overall economic stability. As a small open economy, Malaysia is highly exposed to global financial movements, and fluctuations in the Malaysian Ringgit (MYR) against the US Dollar (USD) have significant consequences for businesses, investors, and policymakers. A stable exchange rate is therefore necessary to guarantee balanced growth in trade and investment and to preserve investor confidence.

There were many previous studies that had identified the influence of macroeconomic variables on

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exchange rates like Gross Domestic Product (GDP), interest rate, inflation rate, and unemployment rate. Singh et al. (2021), for instance, found a stronger economic performance that attracts foreign investment often links GDP growth to exchange rate appreciation. Similarly to this, a study done by Hansi (2023) found that interest rates can appreciate domestic currency by encouraging capital inflows, though some evidence suggests mixed or weak effects depending on country-specific conditions. Inflation generally leads to currency depreciation by reducing competitiveness, while unemployment tends to weaken the currency by reflecting underutilization of resources (Ahmad et al., 2023).

Despite these findings, the impact of the GDP growth rate on Malaysia's exchange rate has received relatively little attention, and previous studies often relied on cointegration or time series models rather than multiple linear regression (MLR). Therefore, this study applies MLR to evaluate the influence of five macroeconomic variables (GDP at constant prices, GDP growth rate, interest rate, inflation rate, and unemployment rate) on Malaysia's exchange rate between 1990 and 2023.

2. LITERATURE REVIEW

Exchange rate determination has been widely studied due to its importance in international trade and financial stability. Many studies highlight macroeconomic fundamentals as key drivers of exchange rate movements. GDP constant prices and GDP growth rate are often emphasized, as higher economic output tends to strengthen domestic currency by attracting foreign investment. Singh et al. (2021) found that in ASEAN countries, stronger GDP performance generally correlates with currency appreciation. Similarly, Hasan & Islam (2023) reported that in developing countries, consistent GDP growth supports long-term exchange rate stability by enhancing investor confidence. These findings suggest that GDP measures are crucial indicators of currency strength.

Another variable that is commonly connected to exchange rate behaviour is interest rate. Traditional theory suggests that higher interest rates attract foreign capital, thereby appreciating the domestic currency. However, empirical results are mixed. While some evidence supports the positive relationship, other studies, such as Hansi (2023), show that the effect can be negative or insignificant depending on capital mobility, inflationary pressures, and monetary policies. According to Mohd Ali et al. (2022), interest rate has a negligible effect on the exchange rate in Malaysia as exchange rate movements are more strongly influenced by global financial conditions.

Inflation has consistently been associated with exchange rate depreciation because rising domestic prices reduce export competitiveness. Singh and Saxena (2022) demonstrated that inflation leads to long-term currency weakening in emerging markets. Nonetheless, Mohamed et al. (2022) found that inflation in Malaysia has not significantly influenced the exchange rate, possibly due to effective monetary policies that maintain relatively low inflation levels compared to regional peers. This suggests that while inflation remains theoretically relevant, its practical impact in Malaysia may be limited.

Unemployment also plays a role in explaining exchange rate dynamics, albeit less prominently than other variables. High unemployment is generally associated with reduced productivity and economic weakness, which can lead to depreciation. Ahmad et al. (2023) noted that unemployment exerts a negative but statistically weak effect on Malaysia's exchange rate. This indicates that, while labour market conditions reflect the broader economy, they are not a primary determinant of the ringgit's performance.

In summary, the literature shows that GDP indicators and inflation are commonly considered major determinants of exchange rates, while interest rates and unemployment display more inconsistent effects. However, few Malaysian studies have examined GDP growth rate together with other variables using multiple linear regression. This study therefore contributes by empirically assessing the combined impact of GDP constant prices, GDP growth rate, interest rate, inflation rate, and unemployment rate on Malaysia's exchange rate.

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3. METHODOLOGY

This study employed a quantitative approach using annual secondary data covering the period 1990 to 2023. The dependent and independent variables used in the analysis, their measurement units, and data sources are summarized in Table 1. These variables were selected based on theoretical relevance and data availability from credible international and national databases to ensure consistency and reliability across the study period.

Table 1. Description of variables

Variable	Type	Unit of Measurement	Source
Exchange Rate (MYR/USD)	Dependent	Malaysian Ringgit per U.S. Dollar (MYR/USD)	Federal Reserve Economic Data (FRED)
GDP Constant Prices	Independent	Million MYR	Department of Statistics Malaysia (DOSM)
GDP Growth Rate	Independent	Percent (%)	World Bank
Interest Rate	Independent	Percent (%)	World Bank
Inflation Rate	Independent	Percent (%)	Federal Reserve Economic Data (FRED)
Unemployment Rate	Independent	Percent (%)	Department of Statistics Malaysia (DOSM)

3.1 Multiple linear regression

The Multiple Linear Regression (MLR) model was adopted because it allows simultaneous assessment of several macroeconomic factors in explaining variations in exchange rate. This method is used to determine the correlation between exchange rate and selected macroeconomic variables and to identify which variables significantly influence Malaysia's exchange rate. Unlike univariate models that assess one variable at a time, MLR is more suitable here as it captures the combined and relative contribution of multiple predictors, providing a clearer understanding of the dynamics that shape the ringgit's performance. The MLR model was specified as:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon \quad (1)$$

Where:

Y_i: Exchange rate

X_1: GDP constant price.

X_2: Interest rate

X_3: Unemployment rate

X_4: Inflation rate

X_5: GDP growth rate

β_0 : Intercept (value of y when all other parameters are set to 0)

$\beta_1, \beta_2, \ldots, \beta_5$ are the regression coefficient

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ε = model error

Before estimation, correlation analysis was performed to examine initial relationships among the variables. This step was essential to identify potential multicollinearity and provide preliminary evidence of associations. Standard diagnostic tests were conducted to confirm the validity of the regression assumptions: independence of errors using the Durbin-Watson statistic, and multicollinearity using the Variance Inflation Factor (VIF). These steps were necessary to ensure that the model results were statistically reliable and unbiased.

The model's effectiveness was evaluated using the coefficient of determination (R^2) to measure explanatory power and mean squared error (MSE) to assess predictive accuracy. By combining correlation analysis, diagnostic testing, and regression modelling, this methodology provides a rigorous and comprehensive framework that directly aligns with the study's objectives of identifying significant macroeconomic determinants of Malaysia's exchange rate.

4. RESULTS AND DISCUSSIONS

4.1 Descriptive statistics

Table 2 shows that the exchange rate averaged 3.50 MYR/USD, with a minimum of 2.51 and a maximum of 4.56 over the study period. This means that the value of Malaysia's currency against the US dollar changed only slightly. The GDP at constant prices averaged 25,144.60 million MYR with a standard deviation of 6,869.83 million MYR, reflecting Malaysia's steadily expanding economic base over more than three decades. This result aligns with Malaysia's long-term economic growth trajectory as reported by the World Bank (2020), which indicated that Malaysia's real GDP rose from approximately US$ 71 billion in 1990 to more than US$ 430 billion in 2023, representing over a six-fold increase in real output. The IMF (2023) likewise highlighted that Malaysia's structural growth, combined with stable inflation averaging 2–3 percent, supported sustained expansion in real output and strengthened overall macroeconomic resilience. The unemployment rate remained low and stable, averaging 3.40 percent, while the interest rate and inflation rate averaged 6.48 percent and 2.56 percent, respectively. The GDP growth rate averaged 6.15 percent, indicating steady, though occasionally variable, economic performance consistent with Malaysia's long-term transition toward a high-income economy.

Table 2. Descriptive statistics

Variable	Mean	SD	Kurtosis	Skewness	Min	Max
Exchange Rate	3.50	0.61	-1.13	-0.26	2.51	4.56
GDP Constant Price	25144.60	6869.83	1.04	0.24	13722.75	37658.93
Unemployment Rate	3.40	0.38	0.63	-0.35	2.45	4.11
Interest Rate	6.48	2.29	-0.55	0.72	3.44	12.13
Inflation Rate	2.56	1.40	0.44	-0.12	-1.14	5.44
GDP Growth Rate	6.15	1.68	-0.96	0.59	2.10	7.50

4.2 Correlation analysis

As shown in Table 3, the exchange rate is strong and positively correlated with GDP at constant prices (r = 0.801), suggesting that as the economy grows, the exchange rate tends to strengthen. This results consistent with findings by Shukri and Aziz (2021), who identified GDP as a key determinant of Malaysia's exchange rate. A moderate positive relationship is also found with unemployment (r = 0.491), implying that exchange rate fluctuations may be associated with labour market conditions. Conversely, the exchange

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rate shows a strong negative correlation with both interest rate (r = -0.762) and GDP growth rate (r = -0.757). This suggests that higher interest rates and stronger economic growth are associated with a more stable or appreciating exchange rate. Inflation, however, demonstrates only a weak negative correlation with exchange rate (r = -0.343), indicating limited direct association. This observation supports findings by Mohamed et al. (2022), who noted that Malaysia's inflation has had only a minor influence on exchange rate variations due to effective monetary management. Interestingly, GDP growth is positively correlated with interest rate (r = 0.748), consistent with monetary policy responses to overheating economies. Inflation also correlates moderately with interest rate (r = 0.443), reflecting the typical monetary increase during inflationary periods.

Table 3. Correlation matrix

	Exchange Rate	GDPConstant Price	Unemployment Rate	Interest Rate	Inflation Rate	GDPGrowthRate
ExchangeRate	1					
GDPConstant Price	0.801	1				
Unemployment Rate	0.491	0.366	1			
InterestRate	-0.762	-0.685	-0.399	1		
InflationRate	-0.343	-0.328	-0.236	0.443	1	
GDPGrowth Rate	-0.757	-0.565	-0.468	0.748	0.345	1

4.3 Regression analysis

This study considers the exchange rate as the dependent variable and GDP growth rate, unemployment rate, inflation rate, GDP constant price, and interest rate as independent variables. Table 4 presents the summary statistics of the regression analysis. The correlation coefficient (R = 0.891) indicates a strong positive relationship between the independent variables and the exchange rate, consistent with findings by Shukri and Aziz (2021), who also reported robust correlations between Malaysia's macroeconomic fundamentals and exchange rate movements. The model demonstrates high explanatory power with R^2 = 0.794 and adjusted R^2 = 0.757, suggesting that approximately 76% of the variation in the exchange rate is explained by the selected variables like the explanatory strength reported in Butt et al. (2023). The Durbin–Watson statistic (1.882) is close to the ideal value of 2.0, indicating no significant autocorrelation problem and confirming that the residuals are independent, as supported by Ismail and Sek (2021) who found similar diagnostic results in Malaysian macroeconomic models.

Table 4. Summary statistics of regression analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin- Watson
1	.891[a]	.794	.757	.30195	1.882

a.Predictors: (Constant), GDPGrowthRate, UnemploymentRate, InflationRate, GDPConstantPrice, InterestRate
b.Dependent Variable: ExchangeRate

Table 5 shows the results of analysis of variance (ANOVA) that confirm the model's overall significance (F = 21.579, p < 0.001). Therefore, the relationship between independent and dependent variables, as modelled in this study, is statistically significant.

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Table 5. Result of analysis of variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.837	5	1.967	21.579	.000[b]
	Residual	2.553	28	.091		
	Total	12.390	33			

a.Dependent Variable: ExchangeRate

b.Predictors: (Constant), GDPGrowthRate, UnemploymentRate, InflationRate, GDPConstantPrice, InterestRate

As shown in Table 6, GDP at constant prices is positive and highly significant ($\beta = 0.475$, $p < 0.001$), reinforcing the earlier correlation finding that the overall size of the Malaysian economy supports Ringgit appreciation. This result aligns with Shukri and Aziz (2021) and Butt et al. (2023), who also found that long-term output expansion leads to exchange rate strengthening through enhanced productivity and export competitiveness. Conversely, the GDP growth rate has a significant negative effect ($\beta = -0.327$, $p = 0.022$), indicating that short-term growth surges may weaken the exchange rate due to higher import demand and capital outflows accompanying rapid economic expansion, consistent with findings by Ismail and Sek (2021) and Wong (2013), who observed similar short-run trade and investment adjustments in Malaysia.

Other predictors, including unemployment, interest rate, and inflation, show statistically insignificant effects ($p > 0.05$), though their coefficients follow expected economic signs. For instance, the interest rate has a negative sign, suggesting that higher rates may stabilize or strengthen the currency by attracting capital inflows, although the effect is not statistically robust in this dataset. This pattern is in line with Mohamed et al. (2022), who reported that Malaysia's monetary policy often moderates exchange rate fluctuations rather than driving them directly. The insignificance of inflation and unemployment may reflect Malaysia's macroeconomic stability during the study period, where both variables remained within narrow ranges due to sound policy interventions (IMF, 2023).

Table 6. Coefficients of the variables

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	2.772	0.727		3.815	0.001		
	GDPConstant Price	0.000039	.000	0.475	3.985	0.000	0.517	.933
	Unemployment Rate	0.174	0.161	0.106	1.078	0.290	0.763	.311
	InterestRate	-0.047	0.045	-0.159	-1.049	0.303	0.319	.137
	InflationRate	0.010	0.042	0.022	0.227	0.822	0.799	.252
	GDPGrowthRate	-0.093	0.039	-0.327	-2.425	0.022	0.404	.472

a.Dependent Variable: ExchangeRate

5. CONCLUSION AND RECOMMENDATIONS

This study shows that exchange rate dynamics are primarily driven by structural economic performance, with GDP at constant prices emerging as the most significant determinant ($\beta = 0.475$, $p < 0.001$). In contrast, the GDP growth rate shows a negative and significant effect ($\beta = -0.327$, $p = 0.022$), indicating that rapid short-term growth may put downward pressure on the currency. Other variables such as inflation, unemployment, and interest rate showed no statistically significant impact, highlighting their relatively

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weaker role compared to structural economic fundamentals. These results suggest that exchange rate stability relies less on short-term fluctuations and more on sustained long-term economic performance. Based on these results, policymakers are advised to provide top priority to measures that increase GDP at constant prices by boosting infrastructure, diversifying economic activity, and increasing productivity. Simultaneously, policymakers must carefully manage rapid growth strategies to avoid trade imbalances or capital outflows that could potentially weaken the exchange rate. Although inflation and unemployment were not significant in this model, maintaining them at stable levels remains essential for overall macroeconomic health and investor confidence. To guarantee sustained growth, financial stability, and resistance to external shocks, exchange rate management should be incorporated into larger fiscal and monetary frameworks.

Future research should therefore expand the model by incorporating external sector variables, structural breaks, and policy-driven shocks. Employing advanced econometric or machine-learning approaches, such as ARDL, VECM, or nonlinear cointegration techniques, may provide deeper insights into dynamic interactions. Comparative studies across ASEAN countries could also help evaluate Malaysia's exchange rate resilience within regional contexts.

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7. CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

8. AUTHORS' CONTRIBUTIONS

Nur Alia Safrina Basri: Conceptualisation, methodology, formal analysis, investigation, and writing-original draft; **Nur 'Ainina Awang**: Conceptualisation, methodology, and formal analysis; **Nur Syamimi Haji Abu Bakar**: Conceptualisation, formal analysis, and conducting validation; **Siti Nur Zahrah Amin Burhanuddin**: Reviewing and editing the original draft, handling data analysis; **Zuraidah Derasit**: Reviewing and editing the original draft and formal analysis.

9. REFERENCES

Ahmad, Z., Syed Zainul Abidin, S. H., Mohamed Yousop, N. L., Mohd Hasan Abdullah, N., Roslan, S., & Sipon, Z. (2023). Era outbreak in Malaysia: Macroeconomic factors and variability in exchange rates. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, *13*(1), 543–553. http://dx.doi.org/10.6007/IJARAFMS/v13-i1/15042

Butt, S., Ramzan, M., Wong, W., Chohan, M. A., & Ramakrishnan, S. (2023). Unlocking the secrets of exchange rate determination in Malaysia: A game-changing hybrid model. *Heliyon*, *9*(8), e19140. https://doi.org/10.1016/j.heliyon.2023.e19140

https://doi.org/10.24191/jcrinn.v11i1.615

Hansi, M. K. T. N. (2023). The impact of interest rate and inflation rate towards exchange rate: A case of Sri Lanka. *International Journal of Economic Behaviour and Organization*, *11*(3), 107–124. https://doi.org/10.11648/j.ijebo.20231103.11

Hasan, S. M., & Islam R. (2023). Influence of macroeconomic variables on exchange rate: A study on Bangladesh. *International Journal of Accounting & Finance Review*, *14*(1)1–10. https://doi.org/10.46281/ijafr.v14i1.1923

International Monetary Fund (IMF). (2023). *Malaysia: 2023 Article IV Consultation—Press Release; Staff Report (IMF Country Report No. 23/185).* https://www.imf.org/en/Publications/CR/Issues/2023/05/31/Malaysia-2023-Article-IV-Consultation-Press-Release-and-Staff-Report-533968

Ismail, S. F., & Sek, S. K. (2021). Investigating the effects of monetary versus fiscal policies on GDP growth in Malaysia: Smooth transition autoregressive (STAR) approach. *AIP Conference Proceedings*, *2423*, 070010. https://doi.org/10.1063/5.0075334

Mohamed, S., Abdullah, M., Hassan, S. S., Ibrahim, W. M. F. W., Isa, M. A. M., Nasrul, F., & Noh, M. K. A. (2022). Study on the effect of economic factors on the Malaysian exchange rate. *Current Aspects in Business, Economics and Finance*, *1*, 42–52. https://doi.org/10.9734/bpi/cabef/v1/3054B

Mohd Ali, M. F., Syed Mohamad, S. F., Mohammad Yusof, A. S., Ismail, S., & Ibrahim, N. A. (2022). A GARCH study on exchange rate determinants: A Case of Malaysia. *Journal of Statistical Modeling and Analytics (JOSMA)*, *4*(1), 72–84. https://doi.org/10.22452/josma.vol4no1.6

Shukri, J. M., & Aziz, M. R. (2021). The macroeconomic fundamentals of the real exchange rate in Malaysia: Some empirical evidence. *Journal of Economic Modelling, 55*(2), 81–89. http://dx.doi.org/10.17576/JEM-2021-5502-7

Singh, V., & Saxena, S. P. (2022). Causal analysis of the relationship among inflation, interest rate and exchange rate: Evidence from India. *International Journal of Foreign Trade and International Business*, *4*(2), 45–51. https://doi.org/10.33545/26633140.2022.v4.i2a.76

Singh, G., Sharma, D., & Jain, C. (2021). Impact of inflation and GDP of India and the United States on its current foreign exchange currency market rate. *International Journal of Scientific and Research Publications (IJSRP)*, *11*(2), 474–485. http://dx.doi.org/10.29322/IJSRP.11.02.2021.p11057

Wong, H. T (2013). Real exchange rate misalignment and economic growth in Malaysia. *Journal of Economic Studies* (Emerald), *40*(3), 298–313. https://doi.org/10.1108/01443581311283934

World Bank. (2020). *Malaysia's economic growth and transition to high income.* https://openknowledge.worldbank.org/bitstreams/a689762d-7e19-551d-8c32-56866ca566f3/download

World Bank. (2024). *GDP (constant 2015 US$) – Malaysia.* World Development Indicators. https://data.worldbank.org/indicator/NY.GDP.MKTP.KD?locations=MY

https://doi.org/10.24191/jcrinn.v11i1.615