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VECM APPROACH OF MALAYSIA'S OIL PRICE RESILIENCE ON GROWTH

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Abstract: Malaysia, as an oil-dependent economy, is greatly affected by any worldwide fluctuations in oil prices. As such, revenues gained from oil are imperative to maintain Malaysia’s fiscal stability and boost its economic performance. Thus, this article explores the dynamic relationships between oil prices, macroeconomic variables, namely real effective exchange rates (REER) and consumer price index (CPI), and economic growth via Vector Error Correction Model (VECM) approach. Moreover, this study employs monthly time series data from January 2014 until August 2024. The analysis results show the short run and long run effects of the mentioned independent variables on Malaysian economic growth. In the short run, both oil prices and CPI prove to have two-way relationship with economic growth. Meanwhile, REER seem to have one-way relationship with economic growth. In addition, all variables significantly influence Malaysian economic growth. Heavily reliance on oil, Malaysia’s economy is vulnerable to the oil prices fluctuations. Indirectly, this study also offers an insight on energy economics. Hence, necessary economic diversification and actions are needed to reduce Malaysian economic vulnerability.

Keywords: Oil price, economic growth, econometrics, macroeconomics, energy economics

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PENGENALAN

The relationship between oil prices and economic growth remains a central focus in economic research, especially for countries whose economies are significantly shaped by the oil sector. Malaysia, as a major Southeast Asian economy with both oil-exporting and oil-importing characteristics, presents a unique case for examining the effects of global oil price fluctuations on economic growth. Understanding this relationship is essential for policymakers, businesses, and stakeholders, given the critical role of oil revenues in determining Malaysia's fiscal stability, trade balance, and overall economic performance.

Oil prices exhibit inherent volatility due to various global factors, including geopolitical tensions, supply-demand imbalances, and broader macroeconomic trends. Such fluctuations have significant implications for Malaysia's economy, which relies heavily on oil and gas exports for government revenue. Variations in oil prices affect key macroeconomic indicators such as GDP, inflation, exchange rates, and foreign direct investment. A comprehensive understanding of these dynamics is crucial for formulating effective policies that mitigate negative impacts and capitalize on potential opportunities.

This study examines the impact of oil price fluctuations on the Malaysian economy, focusing on macroeconomic variables such as inflation (using Consumer Price Index as its proxy) and the Real Effective Exchange Rate (REER) in relation to economic growth, using Producer Price Index (PPI) as its proxy. The research utilizes the Vector Error Correction Model (VECM) to assess both the short-term and long-term effects of oil price changes and associated macroeconomic variables on economic growth.

LITERATURE REVIEW

Researchers found that oil price, exchange rate and inflation played important roles in economic growth (Usupbeyli & Ucak, 2020; Husaini & Lean, 2021; Ahmad et al., 2022; Sek, 2022; Ding et al., 2023; Fokin et al., 2024; Palupi & Purwono, 2024; Bigerna, 2024).

Husaini and Lean (2021) examined the impact of oil price shocks and exchange rate on prices in ASEAN countries. Both rising oil price and decreasing exchange rate impacted Producer Price Index (PPI) and Consumer Price Index (CPI) to hike in three ASEAN countries, Malaysia, Indonesia and Thailand. In South Asia, Ahmad et al. (2022) discovered that oil price shocks significantly increased inflation; on the other hand, depreciation in exchange rate amplified the pass-through effect, which was in line with Husaini and Lean (2021). Besides, oil price changes would affect PPI more than CPI and that exchange rate was one of the major determinants of domestic inflation instead of oil price shocks (Sek, 2022), consistent with previous studies.

Utilizing Vector Autoregressive (VAR) model, Usupbeyli & Ucak (2020) showed that changes in oil price would lead to rising consumer prices in the short run compared to complex result in exchange rate. In addition, oil-importing nations were vulnerable to any external shocks. Moreover, Ding et al. (2023) uncovered that oil prices and exchange rates were significant factors in influencing inflation through their covariance study between oil prices, exchange rates and inflation. Meanwhile, Fokin et al. (2024) investigated the relationships between oil prices and Real Effective Exchange Rate (REER) using cointegration approach. Interestingly, they found that the relationships between both variables differed in different circumstances. The increase in oil price would appreciate REER and affect imported inflation for oil-exporting nations while depreciate REER and rise domestic inflation for oil-importing nations.

Furthermore, Palupi & Purwono (2024) indicated that changes in world oil price shocks would influence exchange rate both in the short and long run in ASEAN-4 nations. Using analysis of connectedness, Bigerna, S. (2024) stressed that CPI and PPI served as the intermediaries while discovering strong bidirectional relationship between oil prices and REER.

METHODOLOGY

This study utilized monthly time series data to investigate the impact of Oil Price (LOP), Real Effective Exchange Rate (REER) and Consumer Price Index (CPI) against the Producer Price Index (PPI), which is used as a proxy for Gross Domestic Product (GDP), ranging from January 2014 to August 2024.

Hashim et al. (2019, 2024) and Asri et al. (2025) studies served as the foundation for the model used in this study. This specific study examines how oil price, REER, and CPI may affect PPI (economic growth). The following is its model specification:

$$PPI_t = f(REER_t, CPI_t, LOP_t) \quad (1)$$

From equation (1), we can derive;

$$PPI_t = a_0 + a_1 REER_t + a_2 CPI_t + a_3 LOP_t + v_t \quad (2)$$

From equation (2), the equation becomes;

$$PPI_t = a_0 + a_1 REER_t + a_2 CPI_t + a_3 lnLOP_t + v_t \quad (3)$$

Where, PPI_t is Producer Price Index, $REER_t$ is Real Effective Exchange Rate, CPI_t is Consumer Price Index and LOP_t is Oil Price. According to equations (2), the a_0 is Constant while, a_i (i = 1,2,3) are slope coefficients. Lastly, v_t is respectively the error terms for that model.

The flow of the methodology is employed as follows: initially, Dickey and Fuller's (1979) univariate unit root test was applied. Secondly, as suggested by Johansen and Juselius (1990), the cointegration test approach was used to capture the long-term relationship between the variables. Thirdly, in accordance with Sims (1972), this study proceeds with Granger causality tests in VECM. Finally, error correction model (ECM) and Vector Error Correction Model (VECM) are analyzed.

The error correction model (ECM) in this study is as follows:

$$\Delta PPI_t = \eta_1 + \sum_{i=1}^{PPI} a_i \Delta PPI_{t-i} + \sum_{i=1}^{REER} \beta_i \Delta REER_{t-i} + \sum_{i=1}^{CPI} \theta_i \Delta CPI_{t-i} + \sum_{i=1}^{LOP} \delta_i \Delta LOP_{t-i} + \gamma_i ECT_{t-i} \, v_{1t} \quad (4)$$

The Vector Error Correction Model (VECM) considers the dynamic of short run and long run relationships between variables, oil prices, REER, inflation and economic growth.

The Vector Error Correction Model (VECM) equations;

$$\Delta LOP_t = a_1 + \sum_{i=1}^{n} a_i \Delta PPI_{t-i} + \sum_{i=1}^{n} \beta_i \Delta REER_{t-i} + \sum_{i=1}^{n} \theta_i \Delta CPI_{t-i} + \sum_{i=1}^{n} \delta_i \Delta LOP_{t-i} + \gamma_i ECT_{t-i} \, v_2 \quad (5)$$

$$\Delta REER_t = a_2 + \sum_{i=1}^{n} a_i \Delta PPI_{t-i} + \sum_{i=1}^{n} \beta_i \Delta REER_{t-i} + \sum_{i=1}^{n} \theta_i \Delta CPI_{t-i} + \sum_{i=1}^{n} \delta_i \Delta LOP_{t-i} + \gamma_i ECT_{t-i} \, v_3 \quad (6)$$

$$\Delta CPI_t = a_3 + \sum_{i=1}^{n} a_i \Delta PPI_{t-i} + \sum_{i=1}^{n} \beta_i \Delta REER_{t-i} + \sum_{i=1}^{n} \theta_i \Delta CPI_{t-i} + \sum_{i=1}^{n} \delta_i \Delta LOP_{t-i} + \gamma_i ECT_{t-i}\, v_4 \quad (7)$$

$$\Delta PPI_t = a_4 + \sum_{i=1}^{n} a_i \Delta PPI_{t-i} + \sum_{i=1}^{n} \beta_i \Delta REER_{t-i} + \sum_{i=1}^{n} \theta_i \Delta CPI_{t-i} + \sum_{i=1}^{n} \delta_i \Delta LOP_{t-i} + \gamma_i ECT_{t-i}\, v_5 \quad (8)$$

The notation $\sum$ represents the optimal lag choice, which is utilized from The vector autoregression (VAR) and Akaike Information Criterion (AIC), for each variable (equations 5-8) in this dynamic modelling. Constants are denoted by a_1 - a_4. The symbol v_t represents each dynamic system's white noise.

EMPIRICAL FINDINGS

Accordingly, Augmented Dickey Fuller (ADF) unit root test and Johansen Juselius (JJ) Cointegration Test are conducted. Using ADF test, all variables are stationary at first difference at 0.1 significance level. Based on JJ test, the series in the system are moving together but cannot be separated far from each other towards the long-term equilibrium. The long-run relationship between independent variables and economic growth exists.

Table 1: Summarize of Overall Temporal Granger Causality Test

Number of Directions	Direct of Causality	Wald-test	p-value
1	REER does not Granger Cause PPI	[7.24648]	(0.0011)***
	PPI does not Granger Cause REER	[0.68920]	(0.5039)
2	CPI does not Granger Cause PPI	[2.46527]	(0.0892)*
	PPI does not Granger Cause CPI	[8.79825]	(0.0003)***
3	LOP does not Granger Cause PPI	[7.58551]	(0.0008)***
	PPI does not Granger Cause LOP	[2.48344]	(0.0877)*
4	CPI does not Granger Cause REER	[2.65633]	(0.0743)*
	REER does not Granger Cause CPI	[4.32582]	(0.0153)***
5	LOP does not Granger Cause REER	[2.48470]	(0.0876)*
	REER does not Granger Cause LOP	[0.82220]	(0.4419)
6	LOP does not Granger Cause CPI	[22.5565]	(5.E-09)***
	CPI does not Granger Cause LOP	[2.20938]	(0.1142)

Note: Asterisks (***), (**) and (*) indicates statistically significant at 1%, 5% and 10% level, respectively.

From Table 1, the result suggests bidirectional causality, between PPI and CPI, PPI and LOP, CPI and REER, and vice versa. The result also demonstrates unidirectional relationship between REER and PPI, LOP and REER, and LOP and CPI. Thus, both oil prices and REER are dominant variables that strongly influence inflation and economic growth.

Error Correction Term

Table 2: Summarize of Overall Temporal Granger Causality Test

Cointegrating Equation	Coint EQ1
PPI(-1)	1.000000
REER(-1)	0.801053 (0.03162) [25.3298]
CPI(-1)	-0.187592 (0.03677) [-5.10222]
LOP(-1)	-0.119627 (0.00438) [-27.3156]
C	-3.211258

ECT1(-1) = -3.211258 + 1.000000*PPI(-1) + 0.801053*REER(-1) - 0.187592*CPI(-1) - 0.119627*LOP(-1)

Table 2 exemplifies cointegrating equation of the long run relationships between LOP, REER and CPI and the dependent variable, PPI. To ensure stability over time, Cointegrating Equation is used to correct deviations from long run equilibrium. All variables, LOP, REER and CPI affect PPI in the long run, though in opposite direction. REER strongly and positively influences PPI in the long run, while LOP and CPI negatively affect PPI in the long run.

Wald Test in Vector Error Correction Model (VECM) Framework

Table 3: VECM Before Parsimonious

Dependent Variables	Independent Variable					Diagnostic Tests			
						Lm Test		Arch Test	
	PPI	REER	CPI	LOP	ECT1	F-Statistic	F-Stat (Prob)	F-Statistic	F-Stat (Prob)
Ppi		5.814265 [0.0032] ***	5.313870 [0.0046] ***	6.818917 [0.0016] ***	-4.537718 [0.0006] ***	4.734568	0.190784 [0.8300]	1.447607	1.439733 [0.2330]

Reer	1.518966 [0.2501]		1.289569 [0.3490]	1.29104 [0.3467]	-3.608042 [0.1865]	48.88189	3.547428 [0.0789]	1.505541	1.498207 [0.2238]
Cpi	1.089996 [0.4656]	1.166127 [0.4175]		1.413056 [0.2916]	-0.355682 [0.6854]	23.15882	1.145892 [0.3651]	4.099549	4.186578 [0.0433]
Lop	0.780412 [0.7031]	0.461682 [0.9392]	0.794190 [0.6915]		-4.041675 [0.9179]	4.948544	0.199837 [0.8228]	1.005959	0.996155 [0.3206]

Note: All variables in each data set are in the first difference (denoted Δ) except for the lagged error correction term (ECT_{t-1}). All equations for all data set passed the diagnostic tests. The brackets [ ] specify for probabilities and error correction term coefficients. The superscript '***', '**', and '*' specify their significance at 99%, 95% and 90% confidence levels.

Table 4: VECM After Parsimonious (Removed prob exceed 0.2)

Dependent Variables	Independent Variable					Diagnostic Tests			
						Lm Test		Arch Test	
	PPI	REER	CPI	LOP	ECT1	F-Stat	F-Stat (Prob)	F-Stat	F-Stat (Prob)
Ppi		5.773158 [0.0000] ***	2.569616 [0.0600] *	3.352013 [0.0023] ***	-0.599776 [0.0000] ***	2.068572	0.761571 [0.4704]	0.996240	0.986807 [0.3228]

Reer	4.752641 [0.0040] ***		2.509839 [0.0637] *	3.778943 [0.0132] **	-0.165826 [0.0028] ***	2.879954	1.253144 [0.2907]	3.741026	3.806645 [0.0538]
Cpi	4.113435 [0.0087] ***	7.099054 [0.0002] ***		11.61819 [0.0000] ***	-0.126927 [0.0000] ***	3.117748	1.348530 [0.2649]	6.148682	6.406736 [0.0129]
Lop	5.921066 [0.0038] ***	0.919673 [0.4022]	2.964564 [0.0564] *		-0.691753 [0.3219]	6.728647	3.183859 [0.0460]	0.201969	0.198470 [0.6569]

Note: All variables in each data set are in the first difference (denoted Δ) except for the lagged error correction term (ECT_{t-1}). All equations for all data set passed the diagnostic tests. The brackets [ ] specify for probabilities and error correction term coefficients. The superscript '***', '**', and '*' specify their significance at 99%, 95% and 90% confidence levels.

Table 3 and 4 illustrate statistical relationships between variables, ECT and diagnostic tests before and after parsimonious, respectively. LM test and ARCH test with probabilities more than 0.05 indicate that there are no problems of autocorrelation and heteroscedasticity in both models. Adjusting the model using stricter parsimonious criterion of 0.2, the model becomes more robust and stable by removing many insignificant short run variables and remaining strongest predictors. All independent variables, LOP and REER and CPI remain significant in influencing PPI.

This study shows that oil price changes are key factors that determine Malaysia's economic performance (PPI), as well as two macroeconomics measures such as REER and inflation (CPI). The results indicate strong correlations between these variables in the short run and the long run, thus underlining the importance of oil prices on Malaysia's economic performance.

CONCLUSION

In conclusion, all variables, oil price shocks, real effective exchange rate and inflation affect economic growth and are significant in the long run. Though Malaysia is quite reliant on its oil revenues, Malaysian economy proves to be resilient and has the capability to adapt to shocks from its external environment. Therefore, it is stable over time in the long run. Nonetheless, appropriate policies and avenues for change are needed in sustaining the economy, enhancing its resistance to shocks and ensuring its sustainable development in the current and future global settings.

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REFERENCES

Ahmad, I., Iqbal, S., Khan, S., Han, H., Vega-Muñoz, A. & Ariza-Montes, A. (2022). Macroeconomic effects of crude oil shocks: Evidence from South Asian countries. *Frontiers in Psychology*, 13:967643. https://doi.org/10.3389/fpsyg.2022.967643

Asri, N. S. M., Jalil, N. A. & Rambeli, N. (2025). Analysing short run and long run relationship between industrial production level and selected macroeconomic variables in Malaysia through ARDL approach. *QALAM International Journal of Islamic and Humanities Research*, 5(1), 59-68. https://jurnal.nun-g.com/index.php/qalam/article/view/532

Bigerna, S. (2024). Connectedness analysis of oil price shocks, inflation, and exchange rate for the MENA region countries. *Resources Policy*, 88, 104344. https://doi.org/10.1016/j.resourpol.2023.104344

Ding, S., Zheng, D., Cui, T. & Du, M. (2023). The oil price-inflation nexus: The exchange rate pass-through effect. *Energy Economics*, 125(2023), 106828. https://doi.org/10.1016/j.eneco.2023.106828

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association*, *74*(366), 427–431. https://doi.org/10.2307/2286348

Engle, R. F. & Granger, C. W. J. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, 55(2), 251-276. https://doi.org/10.2307/1913236

Fokin, N. D., Malikova, E. V. & Polbin, A. V. (2024). Time-varying parameters error correction model for real ruble exchange rate and oil prices: What has changed due to capital control and sanctions? *Russian Journal of Economics*, 10(1), 20-33. https://doi.org/10.32609/j.ruje.10.111503

Hashim, A., Nur Afifah Irdina Shahlan, & Norimah Rambeli@ Ramli. (2024). Trade Openness and Other Selected Macroeconomic Effects on Economic Growth in Malaysia. *International Business Education Journal*, 17(1), 38–48. https://doi.org/10.37134/ibej.Vol17.1.4.2024

Hashim, E., Rambeli, N., Hashim, A., Jalil, N.A., Aziz, S.N.A. & Karim, A.H.A. (2019). Dynamic relationship between real export, real import, real exchange rate, labor force and real gross domestic product in Malaysia. *Research in World Economy*, 10(5), 20-29. https://doi.org/10.5430/rwe.v10n5p20

Husaini, D. H. & Lean, H. H. (2021). Asymmetric impact of oil price and exchange rate on disaggregation price inflation. *Resources Policy*, 73, 2021, 102175. https://doi.org/10.1016/j.resourpol.2021.102175

Johansen, S. and Juselius, K. (1990) Maximum Likelihood Estimation and Inference on Cointegration—With Applications to the Demand for Money. Oxford Bulletin of Economics and Statistics, 52, 169-210. http://dx.doi.org/10.1111/j.1468-0084.1990.mp52002003.x

Palupi, D. A., & Purwono, R. (2024). The impact of changes in world oil prices, interest rates, and net exports on the exchange rate of ASEAN-4 countries. *Jurnal Ilmu Ekonomi Terapan*, 9(2), 281-294. https://doi.org/10.20473/jiet.v9i2.59936

Sek, S. K. (2022). A new look at asymmetric effect of oil price changes on inflation: Evidence from Malaysia. *Energy & Environment*, 34(5), 1524-1547. https://doi.org/10.1177/0958305X221077336

Sims, C. A. (1972). Money, Income, and Causality. *The American Economic Review*, 62(4), 540-552. http://links.jstor.org/sici?sici=0002-8282%28197209%2962%3A4%3C540%3AMIAC%3E2.0.CO%3B2-%23

Usupbeyli, A., & Ucak, S. (2020). The effects of exchange rates on CPI and PPI. *Business and Economics Research Journal*, 11(2), 323-334. https://doi.org/10.20409/berj.2020.252