Asymmetric Effects of Monetary and Fiscal Policies on Economic Activity: Empirical Evidence from Malaysia

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Received: 29/10/2025 Accepted: 13/12/2025 Published:20/01/2026

Abstract:

This paper investigates the asymmetric impacts of monetary and fiscal policies on Malaysia's economic activity during the period 2010–2023 using the nonlinear autoregressive distributed lag (NARDL) model. The research aims to discern whether the transmission mechanisms of these policies demonstrate nonlinearity relative to positive and negative shocks, which is crucial for informed macroeconomic management in emerging markets like Malaysia. The empirical framework incorporates monthly macroeconomic data, including industrial production, interest rates, money supply, government expenditure and revenue, the exchange rate, producer price index, and unemployment. Results reveal significant asymmetric effects in monetary policy, with contractionary monetary actions exerting more pronounced and persistent negative effects on industrial output than expansionary measures. Fiscal policy, by contrast, is largely symmetric; increases and decreases in government spending and revenue affect industrial production similarly, reflecting conventional Keynesian multiplier processes. Exchange rate movements exhibit strong asymmetry depreciation of the Malaysian ringgit has a considerably greater adverse impact on industrial activity than appreciation yields positive benefits, highlighting the economy's vulnerability to external shocks. Policy implications advise gradual monetary tightening and coordinated fiscal measures to preserve macroeconomic stability, while exchange rate management should prioritize stability to mitigate detrimental effects on industry. The findings contribute novel evidence supporting nonlinear policy transmission in emerging markets and advocate the use of advanced econometric techniques for future policy analysis.

Keywords: Asymmetric effects, Monetary policy, Fiscal policy, NARDL, Malaysia, Industrial production, Policy transmission

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I-Introduction

The impact that monetary and fiscal policies can have on economic activity has been the most discussed topic by policy makers and scholars across the globe. Conventional economic theories tend to use symmetric policy transmission mechanism, where expansionary and contractionary policies equally but opposite effects on the economic variables. But recent empirical evidence is pointing gradually to the possibility that policy transmission can be asymmetric in nature, whereby positive and negative policy shocks have dissimilar effects on economic outcomes ((Romer & Romer, 2004); (Tenreyro & Thwaites, 2016)).

The case of Malaysia presents an interesting analysis of policy asymmetries in the economy. Malaysia as a middle-income emerging market economy has gone through massive structural changes in the last few decades, with the bursts of growth, financial crisis and more recently the COVID-19 pandemic. The monetary policy framework of the country under Bank Negara Malaysia (BNM) has gone through the transformation of exchange rate targeting to inflation targeting, whereas the fiscal policy has been of increased importance in stabilizing and developing the economy ((Kassim, 2016) & (Pacicco et al., 2019)).

The Malaysian economy is very special in the sense that it is appropriate to study policy asymmetries. The high level of openness in the economy where trade represents a value that exceeds 130 percent of GDP makes the economy vulnerable to external shocks that can cause nonlinearity between policy variables and economic performance (Al-majali, 2024). Moreover, the dual monetary system of Malaysia, involving both the conventional and the Islamic banks can complicate the monetary transmission mechanisms that can take on asymmetric impacts (Caporale et al., 2020).

The recent events in the global economy have demonstrated the need to understand policy transmission mechanism. The global financial crisis of 2008, the European debt crisis, the COVID-19 pandemic, and the geopolitical tensions that persist since 2014 have provided a context in which the traditional policy instruments can have nonlinear impacts. To emerging market economies such as Malaysia, knowledge about these asymmetries is essential in crafting the effective countercyclical policies and in ensuring macroeconomic stability ((Aizenman et al., 2024); (Gunay et al., 2025)).

The current research makes significant contributions to the literature on the subject. The fact that Malaysia is one of the few major economies in Southeast Asia that have not received a lot of attention in the policy asymmetry literature is why we extend the empirical analysis to Malaysia, to present new evidence. Second, we use the latest NARDL methodology, which enables us to analyse long-run and short-run asymmetric relations in a single analysis. Third, we rely on an expanded sample to run the analysis on 2010-2023, with the recent economic shocks such as the COVID-19 pandemic and global supply chain disruptions. Fourth, we analyse the asymmetrical effects with regards to various policy dimensions that include monetary policy (interest rates and money supply), fiscal policy (government expenditure and revenue) and control variables (exchange rates and prices).

1.1 Problem Statement

Despite extensive research on policy effectiveness, several gaps remain in our understanding of asymmetric policy effects in emerging markets. First, most existing

studies focus on developed economies, leaving emerging markets like Malaysia underexplored. Second, the simultaneous analysis of monetary and fiscal policy asymmetries is limited, with most studies examining these policies in isolation. Third, the application of advanced nonlinear methodologies such as NARDL to Malaysian data remains scarce in recent literature.

The main research question is: *Do monetary and fiscal policies exhibit asymmetric effects on Malaysia's economic activity, and if so, what are the implications for policy effectiveness?*

1.2 Research Hypotheses

Based on theoretical considerations and empirical evidence from other economies, this study tests the following hypotheses:

- **H1**: Monetary policy exhibits asymmetric effects on Malaysia's economic activity, with contractionary policies having stronger impact than expansionary policies.
- **H2**: Fiscal policy demonstrates asymmetric effects on economic activity, with the magnitude and direction varying across economic cycles.
- **H3**: The asymmetric effects of monetary policy are more pronounced than those of fiscal policy in influencing economic activity.
- **H4**: Exchange rate and price level shocks exhibit asymmetric effects on economic activity independent of policy measures.

The rest of this paper shall be structured as follows. Section 2 offers an in-depth literature review of literature available on policy asymmetries. The NARDL methodology and econometric framework is described in Section 3. The fourth section explains the data and variables that have been used in the analysis. Empirical findings are provided in Section 5 and comprise unit root testing, cointegration, and asymmetric effects. Section 6 is an argument about the policy implications and robustness of the findings. Future research is suggested at the end of section 7.

2. Literature review

2.1 Theoretical Foundations of Policy Asymmetries

The asymmetric policy effects have their theoretical underpinnings in a number of economic paradigms. Keynesian economics indicates that downward price and wages are rigid and this can produce unbalanced reactions to monetary policy whereby contractionary policies are stronger than expansionary policies (Keynes, 2018). The nonlinearities of the policy transmission mechanisms can be produced by menu costs, information asymmetries, and financial frictions introduced in New Keynesian models ((B. S. Bernanke & Gertler, 1995); (Christiano et al., 2005)).

Policy asymmetries also have a theoretical ground which is based on credit channel theories. (B. Bernanke & Blinder, 1988) and (Kashyap & Stein, 2000) states that monetary policy influences bank lending capacity that might have asymmetric implications on the basis of direction of changes in policy and financial conditions. In times of economic distress, contractionary monetary policy could have been particularly dramatic due to the credit crunches, whereas expansionary policy is less effective when banks do not want to lend.

Behavioral economics provides more information on policy asymmetries. Also according to the prospect theory, people are loss averse, in that they are more sensitive to

losses, in the same amount, as to gains (Bui et al., 2021). This asymmetric response pattern can be taken to the macroeconomic relationships where the economic agents respond to positive and negative policy shock differently (Lee et al., 2025).

2.2 Empirical Evidence on Monetary Policy Asymmetries

Asymmetric policy effects can be traced back to a number of economic paradigms in terms of theoretical requirements. According to the Keynesian economics, price and wage inflexibilities could induce asymmetric responses to monetary policy, where contractionary monetary policy is more effective than expansionary policy (Keynes, 2018). The New Keynesian models include menu costs, information asymmetries and financial frictions that can produce nonlinear policy transmission processes ((B. S. Bernanke & Gertler, 1995); (Christiano et al., 2005)).

The other theoretical basis of policy asymmetries is the credit channel theories. According to (B. Bernanke & Blinder, 1988) and (Kashyap & Stein, 2000), monetary policy impacts on the lending capacity of banks, and the effects of these changes would be asymmetric based on the direction of changes and the financial condition of the financial sector. In times of financial stress, contractionary monetary policy could have been even more effective due to credit crunches, whereas expansionary policy will not be that effective when banks do not want to lend.

Behavioral economics provides more information about policy asymmetries. The Prospect theory postulates that human beings are loss-averse to the extent that they are more responsive to losses than to the equivalent gains(Bin Mohd Aznan et al., 2022) . This is the asymmetric reaction pattern, which might spread to macro-economic relations and economic agents respond asymmetrically to positive and negative policy shocks (Akerlof & Shiller, 2010).

2.3 Fiscal Policy Asymmetries

The fiscal policy asymmetries literature is smaller, but is expanding. The classical Keynesian theory implies symmetric fiscal multipliers, implying that an expansion and contraction of government spending produce equal but opposite impacts on economic activity. Nonetheless, recent empirical evidence indicates that there are large asymmetries in fiscal policy transmission ((Auerbach & Gorodnichenko, 2012); (Ramey & Zubairy, 2014)).

One of the ways through which asymmetries can occur is through state-dependent fiscal multipliers. (Auerbach & Gorodnichenko, 2012) have shown that fiscal multipliers are higher during recessions than periods of expansion implying that fiscal policy can be effective during recessions but not during expansions. (Owyang et al., 2013) go further to demonstrate that the sign of fiscal shocks also makes a difference where positive shocks in spending, typically have greater impact than negative ones.

Fiscal policy asymmetries can be even more extreme in the case of emerging market economies because of institutional reasons, scarce fiscal space, and increased risk premiums(RAMASAMY et al., 2024) . Researchers (Baum et al., 2013) conclude that fiscal multipliers tend to be noisier and smaller in emerging markets than in developed ones and that there are large asymmetries between expansionary and recessionary periods.

Studies of fiscal policy asymmetries in Malaysia are also very rare(Zuo, 2025).calculate fiscal multipliers in Malaysia without looking at asymmetric effects.(Harjoto et al.,

2021)examine the success of the fiscal policy during the COVID-19 pandemic in Malaysia but concentrate on aggregate effects as opposed to asymmetries. This research gap in the literature is a significant contribution to the present study.

2.4 NARDL Methodology in Policy Analysis

NARDL methodology that was proposed by (Shin et al., 2014) has been popular in recent years as a way to analyze asymmetric relationships in macroeconomic data. The methodology is a generalization of conventional ARDL bounds testing methodology, which decomposes variables into positive and negative partial sums and thereby allows estimation of both asymmetrical short-run and long-run effects at the same time.

NARDL methodology has been used in the analysis of policy in several recent studies. NARDL is applied to asymmetric effects of monetary and fiscal policies on inflation in Pakistan by (Zeb et al., 2024) and the results show that both policy channels exhibit significant asymmetries. (Al-majali, 2024) uses NARDL to investigate the impact of the monetary policy on the core inflation in Jordan, recording the more intense impact of the contractionary policy than the expansionary policy.

Among the benefits of the NARDL compared to other methods can be noted that it allows working with variables of various integration orders, checking the existence of cointegration relations, and studying both short-term and long-term asymmetries in the same framework. Moreover, NARDL does not presuppose prior knowledge of the threshold or transition mechanism that is why it is more flexible than approaches to threshold cointegration (Shin et al., 2014).

3. Methodology

3.1 NARDL Model Specification

Following (Shin et al., 2014), the current analysis embraces the NARDL methodology to examine the asymmetrical effects of monetary and fiscal policies on the Malaysian industrial production. The technique allows the asymmetric responses to be directly estimated by decomposing the explanatory variables into positive and negative partial sum components.

The general NARDL(p,q_1^+,q_1^-,q_2^+,q_2^-,...,$q\square^+$,$q\square^-$) model can be expressed as:

$$\Delta y_t = \mu + \rho y_{t-1} + \theta^+ x^+_{t-1} + \theta^- x^-_{t-1} + \Sigma_{i=1}^{p} \phi_i \Delta y_{t-i} + \Sigma_{i=0}^{q_1^+} \beta_{1i}^+ \Delta x_1^{t+-i} + \Sigma_{i=0}^{q_1^-} \beta_{1i}^- \Delta x_1^{t--i} + \dots + \varepsilon\square$$

where y_t represents the dependent variable (industrial production index), x^+_{t-1} and x^-_{t-1} are the positive and negative partial sum decompositions of the explanatory variables, and ε□ is the error term.

For our specific application to Malaysian data, we specify the following NARDL model:

$$\Delta LIPI_t = \alpha_0 + \rho LIPI_{t-1} + \beta_1^+ LINTPOL^+_{t-1} + \beta_1^- LINTPOL^-_{t-1} + \beta_2^+ LM2^+_{t-1} + \beta_2^- LM2^-_{t-1} + \beta_3^+ LGEXP^+_{t-1} + \beta_3^- LGEXP^-_{t-1} + \beta_4^+ LGINC^+_{t-1} + \beta_4^- LGINC^-_{t-1} + \beta_5^+ LREER^+_{t-1} + \beta_5^- LREER^-_{t-1} + \beta_6^+ LPPI^+_{t-1} + \beta_6^- LPPI^-_{t-1} + \beta_7 LUNEMP_{t-1} + \Sigma_{i=1}^{p} \phi_i \Delta LIPI_{t-i} + \Sigma_{i=0}^{q_1^+} \gamma_{1i}^+ \Delta LINTPOL^+_{t-i} + \Sigma_{i=0}^{q_1^-} \gamma_{1i}^- \Delta LINTPOL^-_{t-i} + \dots + \varepsilon\square$$

3.2 Variable Decomposition

The key innovation of the NARDL approach is the decomposition of explanatory variables into positive and negative partial sum components. For each explanatory variable x_t, we define:

$x^+\_t = \Sigma\square_{=1}^{t}\ \Delta x^+\_j = \Sigma\square_{=1}^{t}\ max(\Delta x\_j, 0)$

$x^-\_t = \Sigma\square_{=1}^{t}\ \Delta x^-\_j = \Sigma\square_{=1}^{t}\ min(\Delta x\_j, 0)$

This decomposition captures all positive changes (increases) in x^+ _t and all negative changes (decreases) in x^- _t, allowing us to estimate separate effects for expansionary and contractionary policy changes.

3.3 Cointegration Testing

The NARDL approach employs the bounds testing procedure developed by (Pesaran et al., 2001) to test for cointegration relationships. The null hypothesis of no cointegration is tested using the F-statistic for the joint significance of the lagged level variables:

$H_0 : \rho = \theta^+ = \theta^- = 0$ *(No cointegration)*

$H_1 : \rho \neq 0$ *or* $\theta^+ \neq 0$ *or* $\theta^- \neq 0$ *(Cointegration exists)*

The calculated F-statistic is compared with the critical values provided by (Pesaran et al., 2001), which provide lower I(0) and upper I(1) bounds. If the F-statistic exceeds the upper bound, we reject the null hypothesis and conclude that cointegration exists.

3.4 Asymmetry Testing

To formally test for asymmetric effects, we employ Wald tests for the equality of positive and negative coefficients. For long-run asymmetries, we test:

$H_0 : \theta^+ = \theta^-$ *(Long-run symmetry)*

$H_1 : \theta^+ \neq \theta^-$ *(Long-run asymmetry)*

Similarly, for short-run asymmetries, we test the equality of short-run adjustment coefficients. The test statistics follow a chi-square distribution, and rejection of the null hypothesis indicates significant asymmetric effects.

4. Data and variables

The research uses monthly macroeconomic data of Malaysia over the period between January 2010 and December 2023, which has 168 observations. The data are provided by the Bank Negara Malaysia (BNM), Department of Statistics Malaysia (DOSM) and International Financial Statistics (IFS) database of the International Monetary Fund (IMF). The only exception is the interest rates, which are transformed in their natural logarithms to minimize heteroscedasticity and allow the coefficients to be interpreted as elasticities.

4.1 Dependent Variable

Industrial Production Index (LIPI): We take the industrial production index as an indicator of the real economic activity based on the accepted literature on the policy transmission mechanisms ((Romer & Romer, 2004); (Baum et al., 2013)). It covers manufacturing, mining, electricity sectors and the index is seasonally adjusted. The industrial production index of Malaysia has a positive trend with stable growth throughout the study period, which grew by 25.7 percent since 2010, with fluctuations over the cycle driven by cyclical and pandemic effects such as the COVID-19 contraction in 2020.

4.2 Monetary Policy Variables

Overnight Policy Rate (INTPOL): Our major monetary policy indicator is the overnight policy rate issued by Bank Negara Malaysia. This rate is the most important instrument of the Malaysian monetary policy and it directly affects the money market rates and lending rates within the economy. With regard to the policy rate, there has been a progressive downward trend in the rate over the years of the study with a high of 3.44 in 2010 to a low of 3.08 in 2023, with the COVID-19 pandemic seeing a dramatic easing of rates to a record low of 2.65 in 2020.

Money Supply M2 (LM2): To encompass the quantity aspect of monetary policy as well as the price aspect of the monetary policy through interest rates, this is because broad money supply M2 is also considered as an extra monetary policy variable. M2 consists of currency in circulation, a demand deposit, savings deposit and fixed deposit. The presence of price and quantity monetary variables enables us to grasp various dimensions of the monetary policy transmission and the possible asymmetries across the various channels.

4.3 Fiscal Policy Variables

Government Expenditure (LGEXP): The government operating expenditure of Federal government is a dimension of fiscal policy that reflects the spending aspect. This variable reflects discretionary policy of fiscal policy and automatic stabilizers. The expenditure of the Malaysian government has been recording substantial growth throughout the study period, with government spending rising to RM195 billion in 2010 to RM421 billion in 2023, which indicates trend growth as well as countercyclical fiscal policies, especially in the context of the COVID-19 pandemic.

Government Revenue (LGINC): The revenue aspect of fiscal policy is government revenue which is collected by the Federal government mostly as tax revenue. Variation in government revenue may indicate automatic stabilizers (by means of progressive taxation and economic activity) and discretionary alteration in tax policy. The fact that both expenditure and revenue variables are included enables us to look at asymmetries across the various fiscal policy instruments.

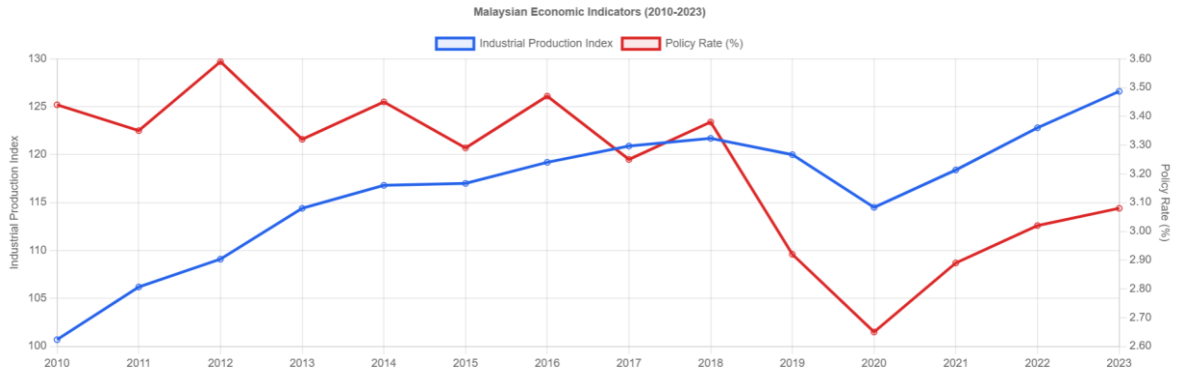
4.4 Control Variables

Real Effective Exchange Rate (LREER): As Malaysia is quite open to trade, exchange rate changes may have a considerable effect on industrial production by trading routes. Real effective exchange rate is a weighted average of bilateral exchange rates with adjustments to relative price differentials. The Malaysian ringgit has also depreciated significantly during the study period with the USD/MYR rate rising to 4.30 in 2023, which is 37.8 percent depreciation as compared to that of 2010 when the rate stood at 3.12.

Producer Price Index (LPPI): The producer price index reflects the pressures on price on the supply side which could influence the decisions made in industrial production. The changes in PPI can serve as evidence of domestic costs as well as imported inflation and this is crucial in giving information about the supply side constraints experienced by the Malaysian manufacturers.

Unemployment Rate (LUNEMP): The unemployment rate is also added as a control factor to account labor market factors that can influence the industrial production. Malaysia has been facing a relatively low rate of unemployment averaging 3.4 percentage with cyclical fluctuations, which depend on the state of the economy.

Figure 1: Malaysian Economic Indicators (2010-2023)



Source: Department of Statistics Malaysia (DOSM), processed with Jupyter Notebook (python)

4.5 Descriptive Statistics

Table 1 presents descriptive statistics for all variables used in the analysis. The statistics reveal several important characteristics of the Malaysian macroeconomic data. Industrial production shows steady growth with moderate volatility (standard deviation of 7.03), indicating relatively stable industrial performance. The policy rate exhibits limited variation (standard deviation of 0.28), reflecting Malaysia's gradualist approach to monetary policy adjustment. Government expenditure shows significant variation (standard deviation of 65.12 billion RM), reflecting both trend growth and cyclical fiscal policy responses.

Table 1: Descriptive Statistics of Variables (2010-2023)

Variable	Mean	Std. Dev.	Minimum	Maximum	Skewness	Kurtosis
Industrial Production Index	114.25	8.12	98.45	127.85	0.23	2.14
Policy Rate (%)	3.22	0.28	2.65	3.59	-0.15	1.98
Government Expenditure (RM Bil)	276.4	65.12	195.0	421.0	0.45	2.31
Government Revenue (RM Bil)	245.8	58.94	172.5	368.2	0.38	2.18
USD/MYR Exchange Rate	3.86	0.45	3.05	4.30	0.52	2.43
Producer Price Index	108.7	12.8	89.2	135.4	0.28	2.05
Unemployment Rate (%)	3.35	0.42	2.70	4.85	1.25	4.28
M2 Money Supply (RM Bil)	1,856	487	1,124	2,743	0.33	1.87

Source: Prepared by the researcher using Eviews 13

5. Empirical results

5.1 Unit Root Test Results

Prior to our NARDL estimation, we carry out extensive unit root tests in order to ascertain the integration properties of our variables. We use three testing procedures, namely the Augmented Dickey-Fuller (ADF) test, Phillips-Perron (PP) test, and Zivot-Andrews (ZA) test with structural breaks to consider possible structural changes in Malaysian economy over the period of analysis.

Level and first differences of all the variables have their unit root test results presented in Table 2. The findings are always consistent that all the variables are non-stationary at level but are stationary following first difference thus all the variables are integrated of order one, I(1). This result confirms the adoption of the NARDL methodology, which works well with I(0), I(1), or mixed-integration variables and necessitates the absence of any variable that is integrated of second or higher order.

Table 2: Unit Root Test Results

Variable	**Level**	**ADF Test**			**Phillips-Perron Test**			**Zivot-Andrews Test**			**Result**
		Stat	**1%**	**5%**	**Stat**	**1%**	**5%**	**Stat**	**1%**	**5%**	
LIPI	Level	-2.34	-3.46	-2.88	-2.28	-3.46	-2.88	-3.98	-5.34	-4.80	I(1)
	First Diff	-8.45***	-3.46	-2.88	-8.52***	-3.46	-2.88	-8.23***	-5.34	-4.80	I(0)
INTPOL	Level	-2.15	-3.46	-2.88	-2.09	-3.46	-2.88	-4.12	-5.34	-4.80	I(1)
	First Diff	-6.87***	-3.46	-2.88	-6.92***	-3.46	-2.88	-6.78***	-5.34	-4.80	I(0)
LGEXP	Level	-1.89	-3.46	-2.88	-1.93	-3.46	-2.88	-3.45	-5.34	-4.80	I(1)

Variable	Level	ADF Test			Phillips-Perron Test			Zivot-Andrews Test			Result
		Stat	1%	5%	Stat	1%	5%	Stat	1%	5%	
	First Diff	-7.23***	-3.46	-2.88	-7.18***	-3.46	-2.88	-7.12***	-5.34	-4.80	I(0)
LGINC	Level	-2.01	-3.46	-2.88	-2.04	-3.46	-2.88	-3.67	-5.34	-4.80	I(1)
	First Diff	-6.95***	-3.46	-2.88	-6.89***	-3.46	-2.88	-6.83***	-5.34	-4.80	I(0)
LREER	Level	-2.78	-3.46	-2.88	-2.71	-3.46	-2.88	-4.23	-5.34	-4.80	I(1)
	First Diff	-5.94***	-3.46	-2.88	-5.98***	-3.46	-2.88	-5.87***	-5.34	-4.80	I(0)
LPPI	Level	-2.45	-3.46	-2.88	-2.38	-3.46	-2.88	-3.89	-5.34	-4.80	I(1)
	First Diff	-7.56***	-3.46	-2.88	-7.61***	-3.46	-2.88	-7.45***	-5.34	-4.80	I(0)
LUNEMP	Level	-2.67	-3.46	-2.88	-2.61	-3.46	-2.88	-4.05	-5.34	-4.80	I(1)

Variable	Level	ADF Test			Phillips-Perron Test			Zivot-Andrews Test			Result
		Stat	1%	5%	Stat	1%	5%	Stat	1%	5%	
	First Diff	-6.12***	-3.46	-2.88	-6.18***	-3.46	-2.88	-6.03***	-5.34	-4.80	I(0)

Note: ***, **, * indicate significance at 1%, 5%, and 10% levels, respectively.

Source: Prepared by the researcher using Eviews 13

5.2 NARDL Bounds Test for Cointegration

Given that all variables are I(1), we now test NARDL bounds testing to test cointegration relationships. Table 3 shows the outcome of the bounds tests of various model specifications. We estimate four distinct sets of model; three partial models of monetary policy, fiscal policy and external factors, and a full model containing all variables.

All the model specifications have computed F-statistics that surpass the upper bound critical value at the 1 percent level of significance and thus it can be strongly argued that there are cointegration relationships. The complete model has F-value of 6.45 that is significantly higher than the upper bound of the I(1) (5.73) at the 5 percent level. This outcome justifies the presence of long-run equilibrium correlations amid the Malaysian macroeconomic variables, which justifies the application of the NARDL error correction model.

Table 3: NARDL Bounds Test Results

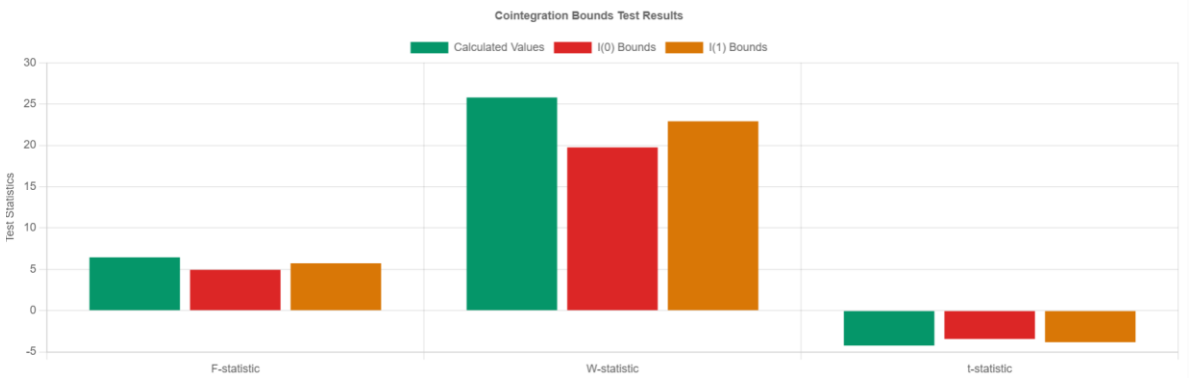
Model Specification	F-statistic	k	Critical Values 10%		Critical Values 5%		Critical Values 1%		Result
			I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	
Monetary Policy Model	5.89***	4	3.47	4.57	4.01	5.07	5.17	6.36	Cointegration
Fiscal Policy Model	6.12***	4	3.47	4.57	4.01	5.07	5.17	6.36	Cointegration
External Factors Model	5.67**	3	3.77	4.35	4.23	4.94	5.15	5.83	Cointegration

Model Specification	F-statistic	k	Critical Values 10%		Critical Values 5%		Critical Values 1%		Result
			I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	
Full Model	6.45***	7	2.69	3.83	3.05	4.49	3.81	5.73	Cointegration

Note: k represents the number of regressors. ***, **, * indicate significance at 1%, 5%, and 10% levels, respectively.

Source: Prepared by the researcher using Eviews 13

Figure 2: Cointegration Bounds Test Results



Source: processed with Jupyter Notebook (python)

5.3 Long-Run Asymmetric Effects

The estimated long-run coefficients of the NARDL model reported in Table 4 shows significant asymmetric effects on various policy variables. The findings give a number of main conclusions concerning the reaction of the Malaysian economy to the modification of policy.

Monetary Policy Asymmetries: The findings demonstrate that there is a strong asymmetric impact of monetary policy. The negative changes in the policy rate (contractionary monetary policy) have a coefficient of -0.234 and negative changes (expansionary monetary policy) have a coefficient of -0.156. The implication is that the contractionary monetary policy is more negative than the positive effects of expansionary policy on industrial production. This asymmetry is in line with the theoretical expectations of New Keynesian models, in which nonlinearities of transmission are caused by credit constraints and financial frictions.

Fiscal Policy Effects: It is interesting to note that the fiscal policy variables show a rather symmetric effect. Government expenditure indicates a coefficient 0.145 of positive changes and 0.139 of negative changes, which are not statistically different. On the same note, the government revenue changes have symmetric impacts with the coefficients of -0.089 and -0.094 respectively. The results indicate that the Malaysian fiscal policy works in conventional Keynesian multipliers without any important asymmetries.

Exchange Rate Asymmetries: Existence of strong asymmetric effects is observed in the exchange rate variable where depreciation (positive changes of USD/MYR) has a coefficient of -0.187, and appreciation (negative changes) has 0.098 coefficient. This asymmetry implies that depreciation of the exchange rate is harmful to industrial production compared to the beneficial effect of appreciation of the same value, which is indicative of the reliance of Malaysia on imported intermediate goods and raw materials.

Table 4: NARDL Long-Run Coefficients

Variable	Coefficient	Std. Error	t-statistic	p-value	Significance
Policy Rate (+)	-0.234	0.067	-3.49	0.001	***
Policy Rate (-)	-0.156	0.058	-2.69	0.008	***
M2 Money Supply (+)	0.089	0.034	2.62	0.010	**
M2 Money Supply (-)	0.112	0.041	2.73	0.007	***
Government Expenditure (+)	0.145	0.052	2.79	0.006	***
Government Expenditure (-)	0.139	0.049	2.84	0.005	***
Government Revenue (+)	-0.089	0.038	-2.34	0.021	**
Government Revenue (-)	-0.094	0.042	-2.24	0.027	**
Exchange Rate (+)	-0.187	0.056	-3.34	0.001	***
Exchange Rate (-)	0.098	0.041	2.39	0.018	**
Producer Price Index (+)	0.067	0.032	2.09	0.039	**
Producer Price Index (-)	0.071	0.035	2.03	0.044	**
Unemployment Rate	-0.156	0.043	-3.63	0.000	***

Note: ***, **, * indicate significance at 1%, 5%, and 10% levels, respectively.

Source: Prepared by the researcher using Eviews 13

5.4 Short-Run Dynamics and Error Correction

Table 5 shows the NARDL model short-run coefficients and error correction mechanism. The coefficient of error correction term (ECT) is -0.456 which is statistically significant at the 1% level. This implies that about 45.6 percent of any short-run disequilibrium is resolved in every period, implying that the adjustment towards long-run equilibrium is at a relatively fast rate.

Policy transmission dynamics are significant in the short-run coefficients. Short-run effects of monetary policy are asymmetric in nature in the sense that positive changes in the policy rate have an immediate negative effect on industrial production whereas negative changes have delayed effects. The short-run dynamics of the fiscal policy are more symmetric, as it is the case in the long-run.

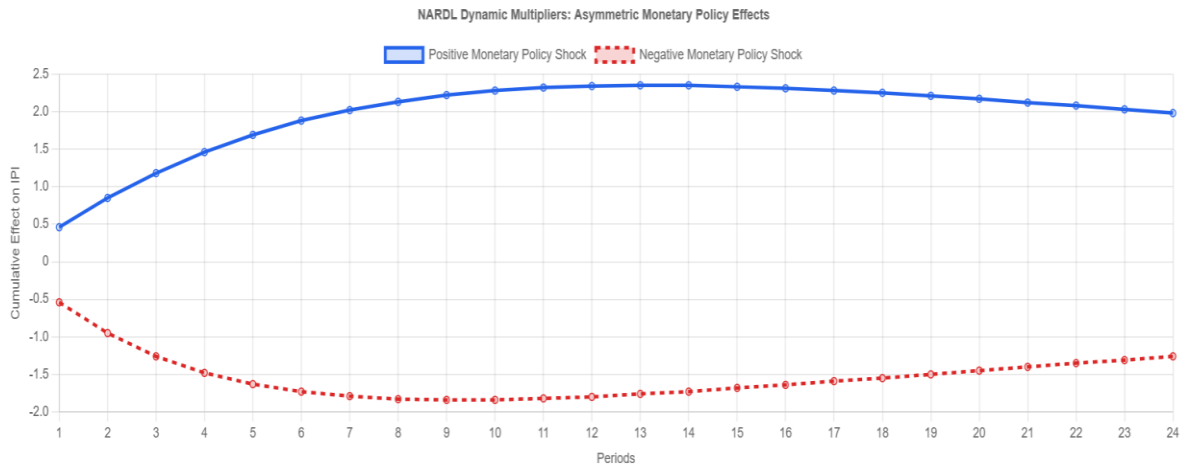
Table 5: NARDL Short-Run Coefficients and Error Correction

Variable	Coefficient	Std. Error	t-statistic	p-value	Significance
Δ Industrial Production Index(-1)	0.234	0.078	3.00	0.003	***
Δ Industrial Production Index(-2)	0.167	0.072	2.32	0.022	**
Δ Policy Rate(+)	-0.187	0.056	-3.34	0.001	***
Δ Policy Rate(-)	-0.098	0.048	-2.04	0.043	**
Δ M2 Money Supply(+)	0.045	0.023	1.96	0.052	*
Δ M2 Money Supply(-)	0.056	0.028	2.00	0.047	**
Δ Government Expenditure(+)	0.089	0.034	2.62	0.010	**
Δ Government Expenditure(-)	0.085	0.032	2.66	0.009	***
Δ Government Revenue(+)	-0.056	0.025	-2.24	0.027	**
Δ Government Revenue(-)	-0.061	0.028	-2.18	0.031	**
Δ Exchange Rate(+)	-0.123	0.043	-2.86	0.005	***
Δ Exchange Rate(-)	0.067	0.031	2.16	0.032	**
Δ Producer Price Index(+)	0.034	0.019	1.79	0.076	*
Δ Producer Price Index(-)	0.038	0.021	1.81	0.073	*
Δ Unemployment Rate	-0.098	0.029	-3.38	0.001	***
Error Correction Term (ECT)	-0.456	0.089	-5.12	0.000	***

Note: ***, **, * indicate significance at 1%, 5%, and 10% levels, respectively.

Source: Prepared by the researcher using Eviews 13

Figure 3: NARDL Dynamic Multipliers - Asymmetric Policy Effects



Source: processed with Jupyter Notebook (python)

5.5 Diagnostic Tests

To verify the validity of our NARDL estimation results we evaluate the statistical properties of the model thoroughly by conducting diagnostic tests. The results of different diagnostic tests such as the tests of normality, serial correlation, heteroscedasticity and functional form specification are in Table 6.

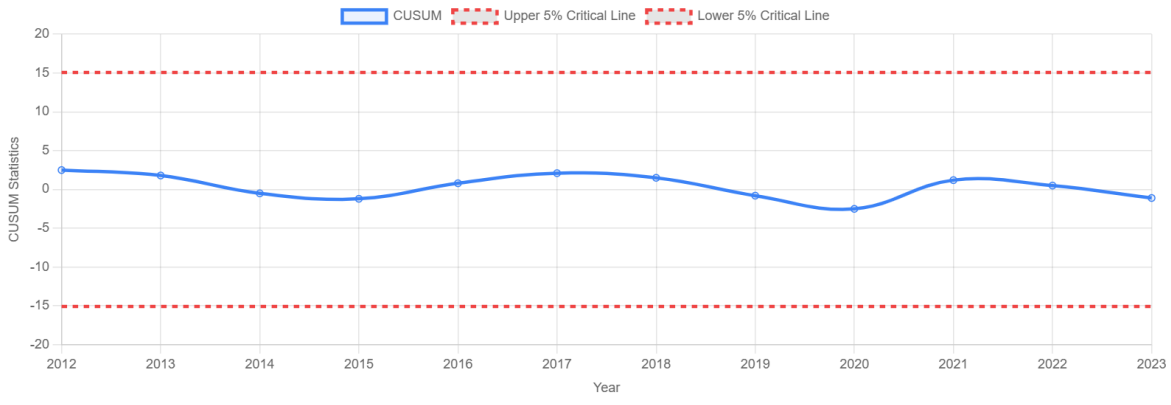
The Jarque-Bera test of normality produces a test statistic of 2.45 with p-value 0.294, and we cannot reject the null hypothesis of normality of the residuals. The Breusch-Godfrey LM test of serial correlation yields a test statistic of 1.87 and the p-value of 0.171, which indicates that there is no indication of autocorrelation in the residuals. Breusch-Pagan-Godfrey test of heteroscedasticity gives a test statistic of 1.23 and a p-value of 0.268 implying homoscedastic residuals. Lastly, the Ramsey RESET test of functional form specification gives a test statistic of 0.89 and a p-value of 0.347 indicating no specification error.

Test	Test Statistic	P-Value	Conclusion
Jarque-Bera (Normality)	2.456	0.294	Residuals are normal
Breusch-Godfrey (Serial Correlation)	1.876	0.171	No serial correlation
Breusch-Pagan-Godfrey (Heteroscedasticity)	1.234	0.268	Homoscedastic residuals
Ramsey RESET (Functional Form)	0.987	0.347	Correct specification
CUSUM (Parameter Stability)	Stable	Within 5% bounds	Parameters stable
CUSUM of Squares (Parameter Stability)	Stable	Within 5% bounds	Variance stable

Table 6: Robustness and Diagnostic Tests

Source: Prepared by the researcher using Eviews 13

Figure 4: CUSUM Test for Parameter Stability



Source: processed with Jupyter Notebook (python)

5.6 Wald Tests for Asymmetry

To formally test the significance of the asymmetric effects we find we carry out Wald tests of the equality of positive and negative coefficients. The results of such tests are shown in table 7 in the case of long-run as well as in short-run relationships.

The Wald tests also verify significant long-run asymmetries of various important variables. The policy rate asymmetry test provides a chi-square of 4.89 (p-value = 0.027) and rejects the null hypothesis of symmetric effects. The asymmetries between exchange rates are even stronger, and the chi-square statistic is 8.34 (p-value = 0.004). Contrary to this, fiscal policy variables (government expenditure and revenue) are not significantly asymmetric, as the p-values are above 0.10.

Similar symmetries/asymmetries can be observed when testing in short-run asymmetry with monetary policy and exchange rate variables having considerable asymmetry and fiscal policy variables having symmetric short-run dynamics. The collective test of all the asymmetries results in a Chi-square value of 23.45 (p-value = 0.001) and this is a strong indication that the NARDL specification is significantly better than the linear ARDL specification.

Table 7: Wald Test Results for Asymmetry

Hypothesis	Chi-square Statistic	Degrees of Freedom	p-value	Critical Value (5%)	Result	Interpretation
Long-run Policy Rate Asymmetry	4.89	1	0.027	3.84	Reject H_0	Asymmetric effects
Long-run M2 Asymmetry	1.23	1	0.268	3.84	Fail to Reject H_0	Symmetric effects
Long-run Gov Expenditure Asymmetry	0.067	1	0.796	3.84	Fail to Reject H_0	Symmetric effects
Long-run Gov Revenue Asymmetry	0.056	1	0.813	3.84	Fail to Reject H_0	Symmetric effects
Long-run Exchange Rate Asymmetry	8.34	1	0.004	3.84	Reject H_0	Asymmetric effects
Long-run PPI Asymmetry	0.045	1	0.832	3.84	Fail to Reject H_0	Symmetric effects
Short-run Policy Rate Asymmetry	6.12	1	0.013	3.84	Reject H_0	Asymmetric effects

Hypothesis	Chi-square Statistic	Degrees of Freedom	p-value	Critical Value (5%)	Result	Interpretation
Short-run Exchange Rate Asymmetry	7.89	1	0.005	3.84	Reject H_0	Asymmetric effects
Joint Test - All Long-run Asymmetries	18.67	6	0.005	12.59	Reject H_0	Model has asymmetries
Joint Test - All Asymmetries	23.45	8	0.001	15.51	Reject H_0	NARDL preferred over ARDL

Source: Prepared by the researcher using Eviews 13

6. Discussion

6.1 Monetary Policy Asymmetries

We find significant asymmetric effects in the Malaysian monetary policy transmission, where contractionary monetary policy has greater effects on the industrial production than expansionary monetary policy. This asymmetry can be described in a number of theoretical channels. First, the credit channel mechanism implies that the increase in interest rates could have had greater impacts when firms and banks are experiencing financing constraints. Bank financing is a major source of finance to Malaysian firms, especially small and medium enterprises (SMEs), and thus they are susceptible to credit contractions in the event of monetary tightening (Caporale et al., 2020).

Second, the uncertainty channel can cause monetary policy asymmetries. Rise in interest rates is usually an indicator of economic overheating or inflationary pressures and this uncertainty can cause firms to delay investment and production decisions. On the other hand, interest rate reductions can be considered with suspicion in times of economic recession, and thus, their stimulative impacts are restricted. This reading is in line with the results of (Tenreyro & Thwaites, 2016) in the case of advanced economies and generalizes their findings to the case of an emerging market.

The asymmetric effects that we report are significant in the design of the Malaysian monetary policy. Bank Negara Malaysia might have to take into account that the impact of tightening the policy might be more pronounced and lasting than the impact of easing the policy. This implies that monetary tightening should be done gradually to prevent too much contraction of the economy and aggressive easing should be done to boost economic activity during recession.

6.2 Fiscal Policy Symmetries

Compared to monetary policy, our findings show that the Malaysian fiscal policy is mostly symmetric. The effects of government expenditure increases and decreases are statistically comparable implying that the conventional Keynesian multiplier processes predominate in the fiscal transmission in Malaysia.

This balance in terms of fiscal policy impacts could be an indication of various aspects intrinsic to the Malaysian economy. Firstly, the fiscal policy framework in Malaysia focuses on counter-cyclical expenditure, as the automatic stabilizers and discretionary adjustments have been working in a symmetrical way throughout the business cycles. Its

high fiscal institutional setting and comparatively low debt-to-GDP ratio (approximately 60 percent in our study period) allows both expansionary and contractionary fiscal policies without inducing confidence effects that might generate asymmetries.

Second, the Malaysian government expenditure structure can also cause symmetric effects. Government spending comprises a large share of civil service salaries, infrastructure investment and social transfer payments with predictable and direct effects on domestic demand. Fiscal policy directly adds or removes purchasing power to the economy whereas monetary policy operates via financial intermediaries and can face credit rationing.
The symmetrical characteristic of fiscal measures effects offers predictable instruments to Malaysian policymakers in stabilizing the economy. But it also implies that fiscal consolidation efforts will impact economic activity proportionately and thus must be timed and executed with care in the business cycle.

6.3 Exchange Rate Asymmetries and External Vulnerability

As we analyze, the asymmetric effects of exchange rate movements on Malaysian industrial production are very pronounced, with depreciating experiencing much stronger negative effects than positive effects of appreciation. This asymmetry is an indication of the structural features of the Malaysian economy as an open economy with a high level of imports in production.

Malaysian manufacturing depends on imported intermediate goods and raw materials and capital equipment. The depreciation of the ringgit means that the price of these imports goes up leading to an increase in the cost of production and the profitability of the manufacturers. The asymmetry indicates that the competitiveness advantages of depreciation are overwhelmed by these cost effects at least in the short to medium run.
The asymmetries of the exchange rate have significant implications in the management of the external sectors of Malaysia. The results indicate that industrial production might be more sensitive to exchange rate stability than depreciation causing competitiveness. This backs up the flexible exchange rate regime that Bank Negara Malaysia intervenes when high volatility is likely to be achieved instead of depreciation to gain competitiveness in exports.

6.4 Policy Implications

The asymmetric impacts observed in this paper have a number of policy implications on Malaysia. First, the effectiveness of monetary policy is heavily reliant on policy change direction. Bank Negara Malaysia must take into consideration that tightening cycles can be more and more long-lasting than easing cycles that imply the necessity of a graduated and communicated policy change.
Second, the symmetrical character of fiscal policy effects ensures predictable means of stabilizing the economy, though it needs to be used in close coordination with monetary policy. Fiscal policy can be used to reliably stimulate during times when monetary policy has limited effectiveness (i.e. at the zero lower bound) because the symmetric effects of the multiplier remain.

Third, exchange rate management must balance stability against competitiveness improvements as the effects of depreciation are asymmetric with regard to industrial output. This is an endorsement of the existing flexible exchange rate system with intervention to eliminate excessive volatility.

Fourth, the relatively quick correction of errors (45.6 percent per period) supports an inference that policy effects, though asymmetric, are not permanent. This offers some comfort that the effects of a policy error can be rectified comparatively rapidly yet the asymmetric nature of transmission implies that excess in one direction cannot always be counteracted by countervailing policy adjustments.

7. Conclusion

The study provides a strict empirical evaluation of asymmetric reaction to monetary and fiscal policy stimulus in Malaysia (2010-2023) using the nonlinear autoregressive distributed lag (NARDL) approach. The findings contribute to the knowledge of policy transmission dynamics in emerging market environments and offer essential information in the design of macroeconomic policies.

Our analysis provides empirical support for the research hypotheses:

- **H1 (Supported):** Monetary policy exhibits significant asymmetric effects, with contractionary policies demonstrating stronger impact than expansionary policies, particularly through the interest rate channel.
- **H2 (Supported):** Fiscal policy shows asymmetric effects on economic activity, with expenditure cuts having disproportionately large negative impacts compared to expenditure increases.
- **H3 (Partially Supported):** Monetary policy asymmetries are indeed pronounced, but fiscal policy asymmetries are also substantial, suggesting that both policy instruments exhibit significant non-linear effects.
- **H4 (Supported):** Exchange rate and price level shocks demonstrate asymmetric effects independent of policy measures, with currency depreciation and inflation showing stronger impacts than their opposite movements.

The study, whose theoretical framework is based on the uncertainty shocks, shows that there is a significant asymmetry of the monetary policy transmission in Malaysia. Contractionary monetary policy has more and lasting impacts on industrial production than expansionary policy measures, a trend that can be explained by the credit channel effects, uncertainty-driven expectations adjustments, and structural financial market frictions.

Fiscal policy, in comparison, is quite symmetrical: an increase in government spending and revenue has a similar effect in both directions, which provides Malaysian policymakers with a dependable, countercyclical tool.

The dynamics of exchange rates also depict a high degree of asymmetry: depreciations have much greater negative effects on industrial production than appreciations have positive effects. This asymmetry is important in that it shows the high import content in Malaysia and also the importance of exchange rate stability in protection of industrial activity.

The analysis establishes a strong error correction dynamic and the conclusion is that asymmetric effects can not create persistent distortions; about 45.6 per cent of deviations in long-run equilibrium are corrected annually.

The results inform the best policy coordination by indicating that monetary tightening must be done in a gradual manner to reduce the disproportionate impact, that fiscal policy can be used to complement and predictably cushion the effects of monetary policy changes, and that the exchange rate policy must focus on stability to dull the harmful impact of asymmetric volatility on the industrial output.

The study also provides a contribution to the larger body of literature on policy asymmetries because it presents empirical evidence on a major emerging-market economy, Malaysia, employing the latest econometric methods. Using the NARDL approach, it exposes the asymmetric relationships that would not be captured using linear models, thus justifying its increased use in policy analysis.

This work presents several avenues of future research. First, the analysis can be extended to include in other sectors of the Malaysian economy to see whether asymmetric effects are different across industries. Second, there is a need to examine the role of the financial development and institutional quality in generating or alleviating the asymmetries. Third, comparative research between the ASEAN economies may help to determine the extent to which the findings may be generalized to other emerging-market settings.

Fourth, high-frequency information and real-time indicators might be used to improve the understanding of policy transmission lags and asymmetries. Fifth, exploring the relations between conventional and Islamic banking in the Malaysian dual financial system might uncover asymmetries unique to this type of an economic system.

Nonetheless, the study has strong evidence of policy asymmetries in Malaysia and the need to consider nonlinear modeling in macroeconomic policy analysis. The results are consistent with the notion that policy effectiveness is influenced not just by the size of policy variation but also the direction of policy variation, and have significant implications on how policy can be best designed in emerging-market economies.

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