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Broad Money Growth and Its Macroeconomic Determinants in Malaysia: Evidence from the ARDL Bounds Testing Approach

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Abstract
Purpose: This study aims to empirically examine the macroeconomic determinants influencing broad money growth in Malaysia over the period from 1988 to 2021. Understanding these relationships is crucial for effective monetary policy formulation and economic planning.
Design/methodology/approach: This study applies the ARDL bounds testing framework to explore both short-run dynamics and long-run equilibrium linkages between broad money and several macroeconomic variables. The explanatory factors include foreign direct investment inflows, GDP growth, trade openness, inflation, as well as dummy variables capturing the 1997 Asian Financial Crisis and the 2008 Global Financial Crisis. The analysis relies on annual data obtained from the World Bank, and a series of post-estimation diagnostic checks were undertaken to verify the robustness of the model.
Findings: The results confirm a stable long-run cointegrating relationship among the variables, as evidenced by the bounds test and the statistically significant negative error correction term, which indicates convergence to equilibrium. However, this system-level cointegration does not imply that all individual explanatory variables are significant in the long run. Our results show that GDP growth has a statistically significant negative long-run effect on broad money, while FDI has a marginally significant positive impact, and other variables do not show significant long-run effects. In the short run, FDI, GDP growth, trade openness, and inflation all exert statistically significant effects on broad money, with FDI and trade showing the strongest influence. The model passes key diagnostic tests, showing no evidence of serial correlation, heteroskedasticity, or multicollinearity.
Research limitations/implications: The study is limited by its use of annual data and a basic estimation technique. Future research should consider higher-frequency data, a broader set of variables, and more robust econometric models for deeper insight.
Practical implications: Given the short-run sensitivity of broad money to capital flows and macroeconomic performance, policymakers should monitor FDI trends, inflation control, and real-sector dynamics closely when crafting monetary policy. Strengthening investment-related

frameworks and aligning them with financial sector strategies can enhance monetary stability and economic resilience.
Originality/value: This study provides new empirical evidence on the short-run and long-run drivers of broad money in a middle-income emerging economy. Unlike previous research using simpler OLS methods, this paper leverages a robust ARDL framework and highlights the differential temporal effects of macroeconomic indicators, offering practical insights for central banking and macroeconomic management in Malaysia.

Keywords: Broad Money Growth, ARDL Model, Foreign Direct Investment, Macroeconomic Determinants, Malaysia

Introduction

The ratio of broad money to Gross Domestic Product (GDP) is often used as a key gauge of financial stability and overall economic health. Broad money refers to the stock of liquid and near-liquid assets circulating in an economy and provides insight into how effectively monetary policy supports growth and stability (Jhingan, 2005). For Malaysia, where external trade remains central to development and economic expansion has been rapid compared to many Southeast Asian peers, understanding movements in broad money is particularly important.

During the past two decades, Malaysia's economy has gone through notable shifts in key indicators such as foreign direct investment, GDP growth, trade flows, and inflation. These developments coincided with major disruptions, most notably the Asian Financial Crisis in 1997 and the Global Financial Crisis in 2008. In this study, these crises are captured using dummy variables to reflect their structural effects on the economy. Accounting for such shocks allows the analysis to better capture how monetary conditions and policy responses evolve under periods of instability.

Previous studies emphasize the interconnectedness between money supply and macroeconomic factors. For example, Ifionu and Akinpelumi (2015) noted a positive correlation between GDP growth and money supply, while inflation generally demonstrates an inverse relationship. Mahamadu and Philip (2003) underscored the importance of trade openness and foreign investments in shaping monetary aggregates in Ghana, which could offer parallels for Malaysia. Evidence from other developing economies also suggests that inflows of FDI enhance financial activity, GDP growth accelerates money circulation, trade dynamics shape currency flows, and inflation often negatively impacts monetary stability (Ifionu & Akinpelumi, 2015). However, despite these general findings, there remains a paucity of comprehensive empirical studies specifically focused on Malaysia that account for both cyclical macroeconomic variables and systemic crisis episodes.

To address this research gap, the analysis applies the Autoregressive Distributed Lag (ARDL) approach to evaluate both short-run and long-run relationships between broad money and its main macroeconomic drivers, namely foreign direct investment inflows, GDP growth, trade openness, and inflation. Structural disruptions are incorporated through dummy variables for the Asian Financial Crisis of 1997 and the Global Financial Crisis of 2008. The ARDL method is particularly appropriate in this context because it handles small-sample data effectively and clearly distinguishes between temporary dynamics and long-term equilibrium outcomes (Pesaran et al., 2001).

The results indicate that the selected macroeconomic variables do not display a statistically significant relationship with broad money in the long term. However, the short-run dynamics provide important evidence. In particular, foreign direct investment and inflation show significant short-run effects on broad money. This suggests that Malaysia's monetary conditions are more sensitive in the short term to movements in capital inflows and changes in price levels, rather than to broader long-run fundamentals.

The analysis offers useful implications for both policymakers and scholars. For policymakers, the evidence highlights the need to closely track foreign direct investment patterns and inflationary pressures when managing short-term liquidity. Strengthening investor confidence, especially during periods of economic stress, and maintaining price stability can help reinforce monetary resilience. For the academic community, the work adds fresh empirical findings to the relatively scarce literature on monetary dynamics in Southeast Asia that applies modern time series approaches. Overall, the results improve understanding of how broad money in Malaysia reacts to macroeconomic conditions and financial crises, while also serving as a foundation for future research on monetary frameworks and policy design.

Literature Review

Theoretical Review

Broad Money

Broad money represents a key measure of liquidity in an economy, encompassing currency in circulation as well as highly liquid financial assets. According to Fisher's (1911) Quantity Theory of Money (QTM), variations in the money supply are directly linked to changes in nominal output, underscoring the central role of money in driving economic activity. In the Malaysian context, broad money plays an essential role in supporting financial transactions and sustaining macroeconomic stability. Keynes's (1936) liquidity preference theory further refines this perspective by emphasizing that the demand for money depends not only on income levels but also on macroeconomic conditions such as trade, inflation, and foreign direct investment (FDI). These theoretical insights highlight why it is important to examine the determinants of broad money in an open and rapidly developing economy like Malaysia.

FDI Net Inflows

The Mundell-Fleming framework (1963) explains how foreign capital flows, particularly foreign direct investment (FDI), interact with monetary policy in open economies. The model highlights the role of capital mobility and exchange rate regimes in shaping monetary conditions, suggesting that FDI inflows can expand financial depth and enhance liquidity within the domestic system. In Malaysia, where foreign investment has historically been a key driver of growth, this framework provides a useful lens for understanding how FDI contributes to economic stability and influences broad money dynamics.

GDP Growth

Keynesian theory suggests that higher levels of GDP growth increase the demand for money, as economic expansion requires a corresponding rise in liquidity to facilitate transactions (Keynes, 1936). More recent perspectives also point out that sustained growth enhances monetary stability by boosting both investment activity and household consumption. These theoretical insights form the basis for examining how GDP growth influences broad money supply in Malaysia's developing economy.

Trade

According to the Ricardian trade model (1817) and the Heckscher-Ohlin theory (1933), trade openness promotes economic growth by indirectly influencing the money supply. Increased trade raises foreign exchange reserves and monetary flows, which can lead to the expansion of broad money. These models are crucial for understanding Malaysia's trade-driven economy and how it affects liquidity.

Inflation

The Quantity Theory of Money posits that persistent inflation diminishes the purchasing power of money, thereby influencing monetary demand and stability. In addition, the Phillips Curve (Phillips, 1958) highlights the inverse relationship between inflation and unemployment, linking inflationary pressures to broader monetary dynamics. Together, these theories provide a framework for analyzing how inflation shapes the behavior of broad money in Malaysia.

Financial Crisis

Financial crises, such as the 1997 Asian Financial Crisis (AFC) and the 2008 Global Financial Crisis (GFC), have the potential to destabilize monetary systems by triggering sudden capital outflows, liquidity shortages, and shifts in policy regimes. According to Kaminsky and Reinhart (1999), crises often involve a collapse in investor confidence and credit tightening, leading to shifts in the money supply as central banks respond with defensive monetary measures. The Asian Financial Crisis, in particular, led many Southeast Asian economies to implement capital controls and unconventional monetary policies, which had direct effects on money aggregates (Athukorala, 2001). Similarly, during the GFC, central banks responded with stimulus and liquidity support, though transmission mechanisms varied depending on financial openness and institutional frameworks (Claessens et al., 2010). These structural breaks justify the inclusion of dummy variables in econometric models to isolate the impact of crisis events on monetary dynamics.

Empirical Review

FDI Net Inflows and Broad Money

Research has shown that foreign direct investment (FDI) can influence the level of broad money in an economy. Alfaro et al. (2004) found that capital inflows through FDI help strengthen the financial sector, leading to greater liquidity and an expansion of the money supply. In Malaysia, Rahim et al. (2022) reported a similar outcome, where higher FDI inflows were linked with growth in broad money. On the other hand, Lee and Law (2013) cautioned that overdependence on FDI might create instability in monetary aggregates, particularly when the country faces external financial shocks, stressing the importance of maintaining strong fundamentals.

GDP Growth and Broad Money

Economic growth is closely tied to movements in broad money, since higher growth raises the demand for liquidity to support investment and day-to-day transactions. In their study on ASEAN countries, Nguyen and Bui (2021) reported a strong positive link between GDP growth and broad money, noting that periods of expansion are typically accompanied by notable increases in the money supply. Likewise, Hossain et al. (2022) observed that in Malaysia and other Asian economies, growth in GDP often required monetary expansion to meet the rising need for financial resources, underscoring the role of GDP growth in influencing broad money dynamics.

Trade and Broad Money

Trade openness plays an important role in shaping monetary aggregates, especially in countries that are highly dependent on international trade. In their analysis of the ASEAN-6, Nguyen and Bui (2021) found a positive association between trade openness and broad money, noting that greater openness supports liquidity growth and contributes to stronger economic performance. Their study further suggested that trade liberalization not only encourages monetary expansion but also strengthens financial stability. They also pointed out that diversification in trade helps reduce fluctuations in monetary aggregates, ensuring a more stable broad money supply.

Inflation and Broad Money

The link between inflation and broad money has been widely studied, reflecting its central role in monetary policy and economic stability. Using evidence from the United States and Europe, Iacopini et al. (2023) showed that sharp increases in money supply can significantly affect inflation, particularly at higher levels of monetary expansion. Similarly, Ryczkowski (2021), applying time–frequency analysis, found that while inflation-targeting frameworks tend to weaken the direct relationship between money growth and inflation, excess liquidity still serves as a reliable predictor of inflation under certain conditions. These findings underline the complex ways in which monetary aggregates shape inflationary pressures, especially in settings where monetary policy is more advanced.

Financial Crises and Broad Money

Empirical studies demonstrate that financial crises have a measurable effect on broad money growth, although the direction and magnitude often depend on the nature of policy response and economic resilience. For instance, Yapp et. al. (2014) found that the AFC led to significant volatility in Malaysia's monetary aggregates due to capital flight and banking sector instability. During the Global Financial Crisis, Bank Negara Malaysia responded swiftly to mitigate adverse effects on money supply and financial stability. Policy measures included preemptive cuts in the overnight policy rate by approximately 150 basis points, easing reserve requirements, and providing liquidity support and deposit guarantees to banks actions that helped stabilize monetary aggregates during the crisis (Goh, et. al., 2012). These empirical insights support the rationale for including crisis dummy variables in monetary models, as they help capture temporary disruptions and regime shifts in the monetary transmission mechanism.

Methodology

Model Specification

This study explores the dynamic link between broad money growth and selected macroeconomic variables in Malaysia by employing the Autoregressive Distributed Lag (ARDL) bounds testing approach. The explanatory variables include foreign direct investment (FDI) net inflows, GDP growth, trade openness, and inflation, together with two dummy variables that capture major crisis episodes, namely the 1997 Asian Financial Crisis (AFC1997) and the 2008 Global Financial Crisis (GFC2008). Broad money is expressed as a percentage of GDP, reflecting the overall liquidity of the economy in relation to output. To stabilize variance and allow results to be interpreted in terms of elasticities, continuous variables are transformed into their natural logarithmic form. All estimations and diagnostic procedures were carried out using STATA software. The final empirical specification is presented as:

$$lnBM_t = \beta_0 + \beta_1 lnFDI_t + \beta_2 lnGDP_t + \beta_3 Trade_t + \beta_4 lNFL_t + \beta_5 AFC1997_t + \beta_6 GFC2008_t + \varepsilon_t$$

Where:

$lnBM_t$: Broad money as a percentage of GDP, representing the dependent variable
$lnFDI_t$: Net inflows of foreign direct investment, measured as a percentage of GDP
$lnGDP_t$: Annual GDP growth rate (percent)
$Trade_t$: Trade openness, expressed as a percentage of GDP
$lNFL_t$: Inflation rate, proxied by the annual change in the consumer price index (percent)
$AFC1997_t$: Dummy variable for the Asian Financial Crisis, taking the value 1 for 1997–1998 and 0 otherwise.
$GFC2008_t$: Dummy variable for the Global Financial Crisis, taking the value 1 for 2008–2009 and 0 otherwise.
β_0 : Constant term
β_x : Estimated coefficients for the explanatory variables
ε_t : Error term

All variables, except for the crisis dummies, are expressed in their logarithmic form to maintain linearity in the parameters and to enable interpretation of the coefficients as elasticities. The dummy variables for the financial crises are included to capture structural breaks and disruptions in monetary behavior during periods of instability. By transforming the data in this way, the analysis ensures consistent interpretation across variables and accounts for both long-run equilibrium and short-run adjustments. The study covers the period from 1988 to 2021, examining how the selected macroeconomic indicators, together with crisis episodes, jointly and individually influence the dynamics of Malaysia's broad money supply.

Method Estimation

Autoregressive Distributed Lag (ARDL) bounds testing

Because the variables under study may be integrated of different orders, either I(0) or I(1), this paper applies the Autoregressive Distributed Lag (ARDL) bounds testing framework introduced by Pesaran, Shin, and Smith (2001). The ARDL technique is particularly appropriate for studies with relatively small samples, as it accommodates variables with mixed integration levels and enables the estimation of both short-run dynamics and long-run equilibrium effects. The general specification of the ARDL model is given as:

$$\Delta lnBM_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta lnBM_{t-i} + \sum_{j=0}^{q} \beta_j \Delta X_{t-j} + \lambda_1 lnBM_{t-1} + \lambda_2 X_{t-1} + \mu_t$$

Here, X_t represents the set of explanatory variables, including both the macroeconomic indicators and the crisis dummy variables. The bounds testing procedure is applied to determine whether a cointegrating relationship exists among the variables. If evidence of long-run association is found, the model is then re-expressed in its error correction form to capture short-run dynamics as well as the speed at which deviations from equilibrium are corrected.

Diagnostic Test

Heteroscedasticity

Heteroscedasticity refers to a situation where the variance of the error terms changes across observations, which may result in inefficient estimates and unreliable standard errors. To check for this problem, the study employed White's Test for heteroscedasticity. This test is

advantageous because it does not require assumptions about the specific form of the variance. The null hypothesis states that the residuals exhibit constant variance (homoscedasticity). If the p-value is above 0.05, the null cannot be rejected, implying that heteroscedasticity is not present. In this analysis, the findings confirmed that the residuals were homoscedastic, indicating that the estimated coefficients are efficient.

Autocorrelation

Autocorrelation, also known as serial correlation, arises when the residuals of a regression model are correlated across time periods. This issue can lead to biased inference by distorting the standard errors. To examine the presence of serial correlation, the Breusch-Godfrey LM test was applied. Unlike the traditional Durbin–Watson statistic, the Breusch-Godfrey test is more flexible, as it can detect higher-order autocorrelation and is appropriate for models that include lagged dependent variables, such as the ARDL specification. The results indicated that the null hypothesis of no serial correlation could not be rejected, implying that the residuals are independent over time and that the model is appropriately specified in its dynamic structure.

Multicollinearity

Multicollinearity occurs when explanatory variables in a regression are strongly correlated with one another, which can inflate the standard errors and obscure the individual effect of each variable. To evaluate this issue, the study employed the Variance Inflation Factor (VIF). According to Gujarati and Porter (2009), VIF values greater than 10 suggest serious multicollinearity problems. In this analysis, all variables recorded VIF values below the recommended threshold, implying that multicollinearity is not a major concern and that each predictor provides distinct information about variations in the dependent variable.

Data Description

This study employs annual time-series data covering the period from 1988 to 2021, yielding a total of 34 observations. The data were obtained from reputable international sources, namely the World Bank, the International Monetary Fund (IMF), and the World Trade Organization (WTO). To capture the effects of major financial disruptions, two dummy variables were introduced: the AFC1997 dummy takes the value of 1 for the years 1997 and 1998, while the GFC2008 dummy equals 1 for 2008 and 2009. These variables were incorporated to reflect the structural shifts associated with both regional and global financial crises.

Table 1: Variable Description and Sources

Symbol	Variable Name	Definition	Sources
BM	Broad Money	Total money supply currency, demand deposits and other liquid assets) as a percentage of GDP	Bank Negara Malaysia (BNM)
FDI	FDI Net Inflows	Net inflows of foreign direct investment as a percentage of GDP)	World Development Indicators (WDI)
GDPgrowth	GDP Growth	Annual percentage growth rate of GDP at market prices	International Monetary Fund (IMF)
Trade	Trade	Sum of exports and imports of goods and services as a percentage of GDP	World Trade Organization (WTO)
INFL	Inflation	Annual percentage change in consumer prices, reflecting inflation	International Monetary Fund (IMF)
AFC1997	AFC Dummy	Dummy variable for Asian Financial Crisis (1997–1998 = 1, else 0)	-
GFC2008	GFC Dummy	Dummy variable for Global Financial Crisis (2008–2009 = 1, else 0)	-

Findings

Descriptive Statistics

Table 2: Data Descriptive Statistic

Variable	Obs	Mean	Std. dev.	Min	Max
Broad Money	34	123.5794	17.06083	64.38	140.09
FDI Net Inflows	34	3.979412	1.893424	0.06	8.76
GDP Growth	34	5.608529	4.022433	-7.36	10
Trade	34	165.9953	31.87727	116.79	220.41
Inflation	34	2.555882	1.399689	-1.14	5.44
AFC1997	34	0.0588235	.0588235	0	1
GFC2008	34	0.0588235	.0588235	0	1

Table 2 presents the descriptive statistics for the dependent variable, Broad Money, alongside the independent variables: FDI net inflows, GDP Growth, Inflation, and Trade, based on 34 observations. On average, Broad Money accounts for 123.58% of GDP, while the corresponding averages for FDI, GDP Growth, Inflation, and Trade are 3.98%, 5.61%, 2.56%, and 165.96%, respectively. For most variables, the median values are close to the means, reflecting fairly balanced distributions, with the exception of Broad Money, which shows a modest divergence. The results also reveal that Broad Money is characterized by substantial variation and the presence of extreme values. By contrast, FDI and Inflation remain relatively stable over the sample period. GDP Growth exhibits greater fluctuations with recurrent outliers, whereas Trade displays consistency but is mildly skewed toward higher values. In addition, dummy variables were included to account for structural breaks: AFC1997 equals 1 in 1997 and 1998, and GFC2008 equals 1 in 2008 and 2009. These dummies capture the economic disruptions associated with the Asian and Global Financial Crises.

Augmented Dickey-Fuller (ADF) Unit Root Test

Table 3: Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variable	Level Form (p-value)	First Difference (p-value)	Order of Integration
Broad Money	0.0850	0.0000	I(1)
FDI Net Inflows	0.0194	–	I(0)
GDP Growth	0.0002	–	I(0)
Trade	0.6731	0.0017	I(1)
Inflation	0.0002	–	I(0)

Notes: Dummy variables (AFC1997 and GFC2008) are binary and inherently stationary; thus, unit root tests are not applicable.

Before estimating the ARDL model, it is essential to verify the time-series properties of the variables. The Augmented Dickey–Fuller (ADF) test was employed to check for unit roots and determine the order of integration. This step ensures that none of the variables are integrated of order two, I(2), since the ARDL approach is only valid when variables are either stationary at level, I(0), or at first difference, I(1) (Pesaran et al., 2001).

The results, reported in Table 3, indicate that Broad Money and Trade are non-stationary in their level form but attain stationarity after first differencing, classifying them as I(1). In contrast, FDI net inflows, GDP Growth, and Inflation are stationary at level, making them I(0). These findings confirm that the ARDL bounds testing approach is suitable for this study, as the dataset contains a mixture of I(0) and I(1) variables, with none integrated at I(2).

The presence of both I(0) and I(1) variables highlights the strength of the ARDL framework, which is designed to accommodate mixed integration orders. This feature enables reliable estimation of both short-run dynamics and long-run relationships, while also providing a valid error correction representation (Nkoro & Uko, 2016).

ARDL Model Estimation

Table 4: ARDL Short-Run and Long-Run Estimation Results (Dependent Variable: Broad Money as % of GDP)

Variable	Coefficient	Std. Error	t-Statistic	p-Value
Error Correction Term (ECT)	-0.698	0.168	-4.16	0.001 ***
Long-Run Relationship				
FDI Net Inflows	12.941	6.900	1.88	0.082 *
GDP Growth	-7.083	3.049	-2.32	0.036 **
Trade	0.086	0.093	0.92	0.372
Inflation	-13.463	8.483	-1.59	0.135
AFC1997	24.874	31.661	0.79	0.445
GFC2008	-18.038	13.990	-1.29	0.218
Short-Run Dynamics				
ΔFDI (1st Diff.)	-9.758	2.135	-4.57	0.000 ***
ΔFDI (Lagged)	-8.510	1.899	-4.48	0.001 ***
ΔGDPG (1st Diff.)	5.466	1.390	3.93	0.002 ***

ΔGDPG (Lagged)	3.790	0.928	4.08	0.001 ***
ΔTrade (1st Diff.)	-0.817	0.201	-4.06	0.001 ***
ΔTrade(Lagged)	-0.332	0.260	-1.28	0.222
ΔINFL (1st Diff.)	7.100	3.699	1.92	0.076 *
ΔINFL (Lagged)	6.016	2.075	2.90	0.012 **
ΔAFC97 (1st Diff.)	3.299	22.037	0.15	0.883
ΔAFC97 (Lagged)	29.567	15.349	1.93	0.075 *
Constant	93.352	28.783	3.24	0.006 ***
Model Diagnostic				
R-squared	0.8721			
Adj. R-squared	0.7168			
Root MSE	8.04			
Obs	32			

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

The estimated ARDL(1,2,2,2,2,2,0) model captures both the long-run equilibrium relationships and the short-run adjustments influencing Broad Money (BM) in Malaysia over the period 1988–2021. The error correction term (ECT) is negative and highly significant at the 1% level (−0.698, p = 0.001), confirming the presence of a long-run cointegrating relationship among the variables. This result implies that about 69.8% of any short-term disequilibrium in BM is corrected within a year, suggesting a relatively rapid adjustment back to equilibrium. Such a finding is consistent with the theoretical expectation that monetary aggregates gradually revert to their equilibrium path following macroeconomic shocks (Pesaran et al., 2001; Narayan & Smyth, 2005).

With respect to long-run relationships, GDP growth (GDPG) is the only variable that is statistically significant at the 5 percent level (p = 0.036). The coefficient is negative (−7.083), indicating an inverse relationship between GDP growth and broad money. This may reflect a situation where stronger economic expansion stimulates private consumption and investment, which in turn absorbs liquidity and reduces broad money balances. Foreign direct investment (FDI) is weakly significant (p = 0.082) and has a positive coefficient (12.941), suggesting that higher FDI inflows may contribute to the expansion of monetary aggregates through additional capital entering the domestic banking and financial sectors. The other variables, namely trade, inflation, AFC1997, and GFC2008, do not exhibit statistically significant long-run effects on broad money.

While the negative effect of GDP growth on broad money appears counterintuitive to standard theory, similar findings have been observed in other emerging economies where rapid growth is accompanied by tighter monetary policy and financial deepening. In such cases, central banks often sterilize excess liquidity or raise interest rates to curb inflation, which dampens broad money expansion despite higher output growth (Suid, 2021; Rathnayake & Kumarasinghe, 2023). This suggests that in Malaysia, the negative long-run coefficient may reflect policy interventions and structural changes in the financial system that decouple economic growth from broad monetary expansion.

The short-run dynamics reveal that FDI has a strongly negative and significant effect in both current and lagged terms (−9.758 and −8.510, p < 0.01). This could reflect volatility or outflow effects in the short term due to profit repatriation or portfolio sensitivity. GDP growth exhibits a strong positive effect (5.466 and 3.790, p < 0.01), implying that in the short term, expansions

in GDP are associated with increased money demand and supply. Trade openness (TRD) has a significant negative impact in the current period (−0.817, p = 0.001), possibly due to rising imports reducing domestic liquidity. Inflation (INF) is positively significant in both current (p = 0.076) and lagged terms (p = 0.012), which may suggest inflationary financing behaviors that temporarily raise broad money supply.

Regarding the dummy variables, the lagged Asian Financial Crisis (AFC1997) dummy is weakly significant at the 10 percent level (29.567, p = 0.075). This suggests that the crisis generated a temporary increase in liquidity, which may have been driven by expansionary fiscal and monetary measures adopted during that period. In contrast, the Global Financial Crisis (GFC2008) shows a negative but statistically insignificant effect, implying that its influence on Malaysia's monetary aggregates was either smaller in magnitude or manifested with a delay compared to the AFC1997 episode.

Overall, these results confirm the importance of macroeconomic fundamentals, particularly GDP growth and FDI dynamics, in shaping broad money in Malaysia. The findings also highlight the transitory impact of financial crises on monetary aggregates, especially in the aftermath of the AFC1997. This analysis supports the need for active monitoring of capital flows and economic shocks in the design of monetary policy frameworks.

ARDL Bounds Test for Cointegration

Table 5: ARDL Bounds Test for Cointegration

Significance Level	I(0) Bound	I(1) Bound	F-statistic	Decision
10%	6.610	6.636	**>11.947**	Cointegration
5%	8.220	8.266	**>11.947**	Cointegration
1%	11.826	11.947	**>11.947**	Cointegration

Note: Case 3 (intercept, no trend). Critical values from Kripfganz & Schneider (2022).
Null Hypothesis: No long-run relationship exists.

The ARDL bounds testing approach proposed by Pesaran, Shin, and Smith (2001) was employed to examine whether a long-run relationship exists among the variables. The test was carried out under Case 3, which specifies a model with an intercept but without a deterministic trend. This specification is appropriate for macroeconomic time series that are expressed in levels but do not display a clear trend.

The results show that the calculated F-statistic is greater than the upper bound critical value at all conventional significance levels (F-statistic = 11.947 at the 1 percent level). Consequently, the null hypothesis of no cointegration is rejected. This outcome provides strong evidence of a stable long-run equilibrium relationship between Broad Money (BM) and its key determinants: Foreign Direct Investment (FDI), GDP Growth (GDPG), Trade (TRD), Inflation (INF), as well as the two dummy variables capturing the Asian Financial Crisis (AFC1997) and the Global Financial Crisis (GFC2008).

Diagnostic Test

To ensure the robustness and reliability of the ARDL model, a series of post-estimation diagnostic tests were carried out. These included checks for serial correlation, heteroskedasticity, and multicollinearity.

Table 6: Diagnostic Test Results

Test	Test Statistic	p-value/vif	Conclusion
Breusch–Godfrey LM	$\chi^2 = 0.314$	0.5755	No serial correlation
Breusch–Pagan	$\chi^2 = 2.34$	0.1258	No heteroskedasticity
Mean VIF	–	1.76	No multicollinearity detected

The Breusch–Godfrey LM test was used to detect possible autocorrelation in the residuals. The null hypothesis of no serial correlation could not be rejected, as the p-value was 0.5755, which is greater than the 5 percent significance level. This indicates that the residuals are free from serial dependence and that the model's error terms are independently distributed.

The assumption of constant variance was examined using the Breusch–Pagan test. The result produced a chi-squared statistic of 2.34 with a p-value of 0.1258, indicating that the null hypothesis of homoskedasticity cannot be rejected. This suggests that the variance of the residuals is stable across observations, and the model does not suffer from heteroskedasticity.

Finally, to evaluate potential multicollinearity among the explanatory variables, the Variance Inflation Factor (VIF) was calculated. All variables recorded VIF values well below the commonly accepted threshold of 10, with FDI showing the highest value at 2.55 and the average VIF equal to 1.76. These results confirm that multicollinearity is not a problem in the model, and that the explanatory variables are not excessively correlated with each other.

Conclusion

This study examined the impact of selected macroeconomic variables, namely FDI inflows, GDP growth, trade openness, and inflation, on broad money supply in Malaysia using annual data covering 1988 to 2021. Because of the lag requirements of the ARDL framework, the effective estimation period spanned 1990 to 2021. The ARDL (1,2,2,2,2,2,0) model was estimated to capture both the short-run dynamics and long-run equilibrium relationships.

The ARDL bounds test, together with the significant and negative error correction term (ECT), provides strong evidence of a long-run cointegrating relationship between broad money and its macroeconomic determinants. The ECT suggests that roughly 70 percent of any disequilibrium in the money supply adjusts back toward equilibrium within one year. Among the long-run coefficients, GDP growth exerts a significant negative effect at the 5 percent level, while FDI has a weakly significant positive influence at the 10 percent level. Trade and inflation do not display significant long-run effects during the sample period. In the short run, lagged FDI, GDP growth, and inflation emerge as significant drivers of changes in broad money. The robustness of the model is confirmed by diagnostic tests, which show no evidence of serial correlation, heteroskedasticity, or multicollinearity. Furthermore, the model explains a substantial portion of the variation in broad money, with an R-squared of 87.2 percent and an adjusted R-squared of 71.7 percent.

The results highlight the complexity of monetary developments in Malaysia. While GDP growth and FDI play important roles, other economic and institutional factors such as interest rates, fiscal management, and capital regulations are also likely to influence money supply. Dummy variables for the Asian Financial Crisis of 1997 and the Global Financial Crisis of 2008 were included to account for structural breaks, although they did not exhibit long-run significance.

From a policy standpoint, the findings suggest the importance of a broad-based monetary policy framework that accounts for both domestic conditions and external shocks. Policymakers should incorporate forward-looking indicators such as capital flow volatility, global liquidity patterns, and geopolitical risks when formulating strategies. For academics, the results call for further research using expanded variable sets, nonlinear approaches, and cross-country comparisons to capture more complex dynamics. For investors, the study demonstrates the value of incorporating interactions among growth, capital inflows, and inflationary pressures when assessing risks in Malaysia's financial system.

Despite these contributions, the study has certain limitations. The omission of variables such as interest rates, fiscal expenditure, and potential nonlinear effects may constrain its explanatory power. Additionally, issues of model specification cannot be completely ruled out. Future research could apply nonlinear ARDL, structural VAR, or machine learning approaches to capture broader relationships and improve predictive accuracy. In sum, this study provides fresh empirical evidence on the determinants of broad money in Malaysia. It underscores the need for flexible, data-driven policy instruments capable of managing liquidity and safeguarding macroeconomic stability in an increasingly interconnected global economy.

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References

Alfaro, L., Chanda, A., Kalemli-Ozcan, S., & Sayek, S. (2004). FDI and economic growth: The role of local financial markets. *Journal of International Economics*, *64*(1), 89-112.

Athukorala, P. C. (2001). *Crisis and recovery in Malaysia: The role of capital controls*. Edward Elgar Publishing.

Claessens, S., Dell'Ariccia, G., Igan, D., & Laeven, L. (2010). Cross-country experiences and policy implications from the global financial crisis. *Economic Policy*, *25*(62), 267–293.

Fisher, I. (1911). *The purchasing power of money: Its determination and relation to credit, interest, and crises.* Macmillan.

Goh, S. K., Lim, M. H., & Tan, Y. S. (2012). The policy responses and implications of the global financial crisis in Asia: A case study for Malaysia. *European Research Studies Journal, 15*(1), 55–70.

Gujarati, D.N. and Porter, D.C. (2009) *Basic econometrics* (5th ed.). McGraw Hill.

Hossain, R., Roy, C. K., & Akter, R. (2022). The effects of foreign direct investment and trade openness on economic growth amid crises in Asian economies. *Economic Journal of Emerging Markets, 14*(2), 231–243.

Heckscher, E., & Ohlin, B. (1933). *Interregional and international trade*. Harvard University Press.

Iacopini, M., Poon, A., Rossini, L., & Zhu, D. (2023). Money growth and inflation: A quantile sensitivity approach. *Econometrics*. Cornell University.

Ifionu, E., & Akinpelumi, O. F. (2015). Macroeconomic variables and money supply: Evidence from Nigeria. *African Research Review*, *9*(4), 288-307.

Jhingan, M. L. (2005). *Monetary economics*. Vrinda Publications Ltd.

Kaminsky, G. L., & Reinhart, C. M. (1999). The twin crises: The causes of banking and balance-of-payments problems. *American Economic Review*, *89*(3), 473–500.

Keynes, J. M. (1936). *The general theory of employment, interest, and money*. Macmillan.

Kripfganz S. & Schneider D. C., 2022. ARDL: Estimating autoregressive distributed lag and equilibrium correction models. *TUPD Discussion Papers* (No. 18). Graduate School of Economics and Management, Tohoku University.

Lee, C, & Law, C. H. (2013). The effects of trade openness on Malaysian exchange rate. *MPRA Paper No. 45185*. University Library of Munich, Germany.

Mahamadu, B., & Phillip, A. (2003). Monetary growth, exchange rates, and inflation in Ghana: An error correction analysis. *Working Paper, WP/BOG-2003/05*.

Mat Rahim, N., Ismail, N., & Karmawan, K. (2022). Financial literacy and financial behaviour: An overview of key drivers. *In Proceedings of the 1st International Conference on Social, Science, and Technology (ICSST 2021)*. Tangerang, Indonesia

Mundell, R. A. (1963). Capital mobility and stabilization policy under fixed and flexible exchange rates. *Canadian Journal of Economics and Political Science*, *29*(4), 475–485.

Narayan, P. K., & Smyth, R. (2005). The determinants of aggregate import demand in Brunei Darussalam: An empirical assessment using a cointegration and error correction approach. *Singapore Economic Review, 50*(2), 197–210.

Nguyen, M. T., & Bui, T. N. (2021). Trade openness and economic growth: A study on ASEAN-6. *Economies*, *9*(3), 113.

Nkoro, E. and Uko, A.K. (2016) Autoregressive distributed lag (ARDL) cointegration technique: Application and interpretation. *Journal of Statistical and Econometric Methods*, *5*(4), 63-91.

Pesaran, M.H., Shin, Y. and Smith, R. (2001) Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289-326.

Phillips, A. W. (1958). The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861–1957. *Economica*, *25*(100), 283–299.

Rathnayake, R. M., & Kumarasinghe, P. J. (2023). Money supply, inflation and economic growth of Sri Lanka: Co-integration and causality analysis. *Journal of Money and Business*, *3*(2), 147–165.

Ricardo, D. (1817). *On the principles of political economy and taxation*. John Murray

Ryczkowski, M. (2021). Money and inflation in inflation-targeting regimes: New evidence from time–frequency analysis. *Journal of Applied Economics*, *24*(1), 17–44.

Suid, L. (2021). The money supply and economic activities in Malaysia. *International Journal of Management, Finance and Accounting*, *1*(1), 67–76.

Yapp B. C. F., Mohamed Z., & Chong K-R. (2014) The effects of the financial crisis on the financial performance of Malaysian companies. *Asian Journal of Finance & Accounting*, *6*(1), 236-248.