Measuring Islamic Financial Inclusion and Its Role in Promoting Economic Growth: The Case of Malaysia

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Abstract: Research Question: What is the dynamic relationship between Islamic financial inclusion, trade openness, foreign direct investment (FDI), inflation, and economic growth in Malaysia? **Motivation:** This study is motivated by the growing importance of inclusive and ethical financial systems in supporting sustainable economic growth in Islamic emerging economies, particularly Malaysia, where empirical evidence on the macroeconomic role of Islamic financial inclusion remains limited. **Idea:** The study develops a composite index of Islamic financial inclusion and examines its dynamic relationship with economic growth alongside trade openness, FDI, and inflation, capturing both long-run equilibrium relationships and short-run adjustment dynamics, including the impact of the COVID-19 shock. **Data:** The analysis uses annual Malaysian data covering the period 2013–2022. **Method/Tools:** The Augmented Autoregressive Distributed Lag (ARDL) bounds testing approach is employed, with Augmented Dickey–Fuller (ADF) tests confirming a mixed order of integration and justifying the ARDL framework. **Findings:** The augmented bounds test provides strong evidence of a long-run cointegrating relationship among the variables; long-run estimates reveal that Islamic financial inclusion has a positive and statistically significant effect on economic growth, while trade openness also promotes long-term growth, whereas FDI exhibits a negative long-run impact and inflation is insignificant. In the short run, the error correction term is negative and significant, indicating rapid adjustment toward equilibrium; Islamic financial inclusion continues to exert a strong positive contemporaneous effect, trade openness shows a negative short-run impact likely reflecting adjustment costs, FDI contributes positively to growth, and the COVID-19 dummy variable confirms a significant contractionary effect on GDP. Furthermore, robustness checks using the Toda-Yamamoto causality test confirm a distinct unidirectional causal flow running from Islamic financial inclusion to economic growth. **Contributions:** This study contributes to the literature by constructing a composite Islamic financial inclusion index and providing robust empirical evidence on its pivotal role in enhancing

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macroeconomic stability and growth in Malaysia, while offering nuanced insights into short-run and long-run trade-offs associated with external openness and capital flows, with important policy implications for designing resilient, inclusive, and sustainable growth strategies in Islamic emerging economies.

Keywords: Islamic financial inclusion, GDP, Malaysia, ARDL.
JEL Classification: G21, E01, C33

1. Introduction

The world today poses a major challenge in efforts to achieve sustainable development. One method for achieving this 2030 sustainable development goals (SDG) Agenda, which has been strongly promoted by the international community, is through the concept of financial inclusion. Financial inclusion is based on three dimensions, namely the accessibility, availability and usage of financial services (Sarma, 2008). However, Islamic banks and other Islamic financial institutions provide Islamic financial services yet to be measured under the contemporary financial inclusion index. Islamic financial inclusion emerges as a distinct and innovative dimension of financial inclusion. It reflects the integration of Islamic finance principles with broader financial inclusion goals, ensuring affordable and accessible financial services that comply with Shariah principles—such as the prohibition of interest and a commitment to ethical, socially responsible investment practices (Islamic Financial Services Board (IFSB), 2019, Ameziane, 2024).

Access to credit (as an early term for financial inclusion) may have a direct effect on achieving United Nations (UN) Sustainable Development Goals (SDGs) in ending poverty, improving health and education, and reducing inequality. Financial inclusion may contribute to achieve 9 SDG's goals (Kara *et al.*, 2021). Financial inclusion may help achieve SDG 1 (eradicating extreme poverty) by allowing individuals to finance investments that lead to income-generating businesses, additional education and skills training, or better housing. Farmers may be able to invest in equipment and knowledge to increase crop yields, which is relevant to SDG 2 (reducing hunger and promoting food security). In terms of achieving SDG3, or good health and well-being, credit can assist households in smoothing out medical costs and mitigating the impact of health emergencies. In terms of SDG 4 (promoting quality education) financial inclusion will allow individuals to invest in educational opportunities such as university degrees or further higher education. Women may have more control over household budgets and bargaining power if they have access to credit, which will help to reduce gender inequality and that achieves SDG 5. Financial inclusion may also improve households' accessibility to clean water and energy systems, thereby achieving SDGs 6 and 7. Access to business and microfinance has the potential to increase entrepreneurial activity and innovation, leading to more business and job creation and further economic growth, which is closely related to SDGs 8 and 9, which promote full and productive employment and innovation, respectively.

In 2017, Malaysia was among the earliest countries to present its Voluntary National Review (VNR) on Sustainable Development Goals (SDGs) progress. The VNR was delivered at the High-Level Political Forum (HLPF) at the United Nations, featuring input from a wide array of stakeholders—positioning Malaysia as a model for both developing and Islamic nations (Economic Planning Unit, 2017). The country boasts a well-developed financial market system with strong potential for promoting financial inclusion. Malaysia is also a global leader in Islamic banking, operating under a dual banking system that includes both Islamic and conventional banks. According to Qureshi and Hussain (2020), Malaysia

has five standalone Islamic banks and eleven Islamic banking windows within conventional banks.

Figure 1 shows Malaysia's financial inclusion compared with three regions namely; ASEAN, OIC countries and upper middle-income countries. The data illustrates across the eight metrics considered, Malaysia is above the 65th percentile and often exceeds the 80th percentile. It is thus consistently in the top quartile and never below the top third of its peer groups (World Bank Report, 2020).

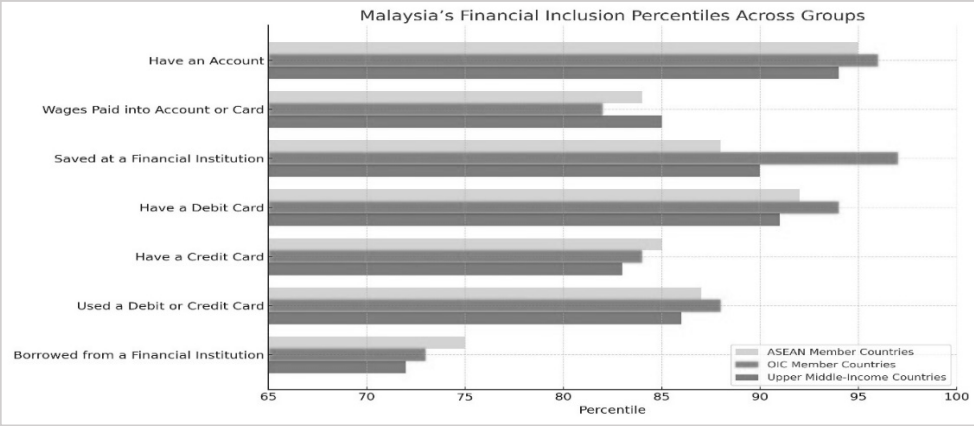

Figure 1: Financial inclusion of Malaysia, OIC countries and upper middle-income countries

Data from Malaysia's central bank, Bank Negara Malaysia (BNM), support the World Bank's Findex database's conclusion that Malaysia has achieved a high level of financial inclusion. According to BNM, as of 2019, approximately 96% of adults had at least one type of regulated deposit account, allowing them to save, withdraw money, use ATM machines, and make payments electronically across the country. Also, this is not only for contemporary access to finance, because Malaysia leading Islamic finance too as stated in the following table.

Table 1: Malaysia Islamic Finance in 2018

Islamic Finance Sector	Malaysia Assets	Malaysia Global Rank by Assets	Malaysia Assets, Share of World Total
Banking	$214 Billion	3	12.2%
Takaful	$9 Billion	3	19.6%
Sukuk	$219 Billion	1	46.6%

Source: World Bank Report (2020)

The percentage of adults without a financial account in each of the countries covered is reported by the Findex database. It also includes the percentage of non-accountholders who do not have a financial account for religious reasons. Surprisingly, 0.4 million segments of the financially excluded people are reported to be due to Islamic and religious reasons. Hence, providing an Islamic financial inclusion to these segments would increase access, availability and usage of Islamic financial services, which will be beneficial to Islamic financial institution in Malaysia. Therefore, proposing Islamic financial inclusion index that embeds Islamic financial instruments would reduce level of excluded people from financial services due to religious reasons.

With a dual banking system, Malaysia has used both conventional and Islamic financial instruments to further financial inclusion. The Malaysian government's efforts to create an

ecosystem to assist MSMEs in obtaining financing have benefited Islamic finance. In both the Financial Sector Blueprint and the Financial Sector Masterplan (2000-2010), BNM developed strategies to address financial inclusion (2011-2020). However, Islamic financial inclusion is still yet to get prioritized as the conventional financial inclusion. To achieve the true goal of financial inclusion, the Islamic financial system through its various instruments, which are deemed to be more comprehensive, must also play a role in addition to the traditional financial services providers. Islamic finance is not new to the idea of financial inclusion because Islam places a strong emphasis on inclusion, equality, and justice (Seman *et al.*, 2021).

The issue behind conventional financial inclusion index is still lack of some components that could be inclusive and delivered to a wide range of people in the country, specifically Zakat and Waqf. The research problem stems from the fact that while conventional finance focuses on debt-based access, Islamic finance utilizes Waqf as a mechanism for providing social security and socio-economic support to low-income households, effectively acting as a non-debt-based safety net. Similarly, the systematic collection and distribution of Zakat functions as a macroeconomic tool to reduce income disparities and alleviate the severity of poverty, which directly stimulates aggregate demand and domestic consumption. For instance, Mikail *et al.* (2017) advocated that waqf provides social securities and socio-economic support to low-income households. In addition, Collection and distribution of zakat reduces income disparities, poverty incidence, poverty extent, and poverty severity (Mohd Ali *et al.*, 2015; Bashir, 2018). Therefore, zakat and waqf are in line with financial target and goals.

Despite these instruments being fundamentally aligned with national financial targets and the Sustainable Development Goals (SDGs), they remain excluded from standard indices. This study addresses the 'economic puzzle' of whether integrating these Shariah-compliant dimensions into a composite index reveals a distinct growth-enhancing channel that conventional metrics overlook. By quantifying these instruments within the Islamic Financial Inclusion Index (IFII), this research explores how the ethical mandate of wealth circulation (*Mal*) serves as a driver for long-term economic expansion and structural resilience in Malaysia. However, yet to see Islamic financial inclusion index developed and applied in terms of Islamic banks or in terms of Islamic means and instruments.

Despite the growing emphasis on financial inclusion as a catalyst for economic growth, the existing financial inclusion indices remain largely shaped by conventional banking practices, creating a significant methodological and theoretical gap. This raises an important question: why have Islamic finance instruments not yet been fully incorporated into the dimensions of financial inclusion measurement frameworks? Given that Islamic finance operates under distinct principles—such as profit-and-loss sharing, asset-backing, and ethical investment—it provides alternative pathways for reaching underserved populations who may be excluded from conventional financial systems. Consequently, it is critical to address this issue, as it offers testable insights into how Shariah-compliant systems enhance sustainable development in Muslim-majority and developing countries. Addressing this gap not only helps improve the accuracy of financial inclusion metrics but also offers insights into how Shariah-compliant financial systems can enhance sustainable and inclusive economic development.

The objective of this study is three-fold. First, it addresses the methodological inadequacy of conventional financial inclusion metrics that fail to account for the redistributive and risk-sharing nature of Islamic financial instruments. Second, it demonstrates the incremental macroeconomic relevance of a dedicated Islamic Financial Inclusion Index (IFII), showing that Shariah-compliant access serves as a distinct driver of GDP expansion. Third, the study explores the dynamic interaction between IFI and growth

within the context of global volatility, specifically evaluating how trade openness, FDI, and the COVID-19 pandemic influence the finance-growth nexus in a dual-banking system like Malaysia.

2. Literature Review

2.1 Financial Inclusion

2.1.1 The Evolution of Financial Inclusion

Financial Inclusion (FI), according to the World Bank, means that the public needs to access to useful and affordable financial products and services has been fulfilled. This includes things like saving accounts, payments, transactions, insurance as well as credits being delivered in a responsible as well as sustainable manner. Over the years, different measures of financial inclusion have been made through different perspectives, for instance Dev (2006) considered financial inclusion in terms of disadvantaged or low-income groups while others mainly considered the inclusion within countries, regions or levels of income (Gharbi and Kammoun, 2023; Jungo *et al.*, 2022; Pandey, 2023).

Measuring financial inclusion has undergone significant methodological evolution, reflecting its growing importance for economic development and policymaking (Ozili, 2021). Early empirical studies relied on single-variable proxies, such as the number of bank branches or bank accounts, which were inadequate to capture the multidimensional nature of financial access. This limitation prompted the development of composite indices, most notably the Index of Financial Inclusion introduced by Sarma (2008) and further refined by Sarma and Pais (2011), which integrates dimensions such as availability, accessibility, and usage into a unified framework. Subsequent research expanded this multidimensional perspective by incorporating broader aspects, including affordability, ease of access, and cost considerations, to better reflect the complexity of financial systems (Park and Mercado, 2018; Safdar *et al.*, 2020).

2.1.2 Data Sources and Scope of Analysis

Empirically, the construction of financial inclusion indices predominantly depends on internationally standardized secondary datasets, including the International Monetary Fund's Financial Access Survey (FAS) and International Financial Statistics (IFS), the World Bank's World Development Indicators (WDI), the World Financial Development Database, and the Global Findex Database (Gharbi and Kammoun, 2023; Jungo *et al.*, 2022; Samputra, 2024; Shahzad *et al.*, 2022; Van *et al.*, 2021; Ben Khelifa *et al.*, 2024; Pandey, 2023; Shah and Ali, 2023; Nguyen and Luong, 2023).

Although most financial inclusion studies rely on secondary international datasets, the use of primary data remains relatively uncommon due to its demanding nature. Collecting primary data through surveys and structured questionnaires is both time-consuming and resource-intensive, particularly when covering diverse geographical regions (Forjuoh, 2014; Silman *et al.*, 2018). Consequently, only a limited number of recent studies have adopted this approach in constructing financial inclusion indices. For instance, Nguyen and Luong (2023) conducted face-to-face interviews with more than 1,000 individuals across 52 provinces in Vietnam, categorizing respondents by demographic characteristics before integrating the survey responses with secondary data to develop a more context-specific financial inclusion model. The scope of data collection in the literature largely reflects the underlying motivation and research focus of each study. Country-specific analyses tend to concentrate on subnational or localized contexts to capture domestic disparities (Nguyen and Luong, 2023), whereas other studies adopt broader regional perspectives, examining financial inclusion across Asia, Africa, Latin America, or emerging economies such as the BRICS group (Brazil, Russia, India, China, and South Africa) (Jungo *et al.*, 2022; Pandey,

2023; Shahzad *et al.*, 2022). Additionally, some research classifies countries based on income levels or stages of development to explore structural differences in financial inclusion patterns (Gharbi and Kammoun, 2023; Shah and Ali, 2023). These variations in data sources and scope highlight the trade-off between cross-country comparability and contextual depth in the construction of financial inclusion indices.

2.1.3 Financial Inclusion Index and Dimensions

Beyond methodological and data considerations, the selection of attributes and dimensions remains a central challenge in constructing a Financial Inclusion Index (FII). There are various dimensions proposed across the literature, but for this study, availability, accessibility, and usage are the focus. These are the most common dimensions being adopted and they are based on Sarma (2012). Among the three dimensions, no standard attributes are used to measure them, which indicates the lack of proper standardisation and benchmarking across financial inclusion index.

Availability is a dimension which measures the widespread presence of the financial sectors (Allen *et al.*, 2014). Some of the common attributes of availability are the number of ATMs and bank branches per 100,000 adults and per 1,000 km^2, and the number of bank employees per 10,000 members of the population (Gharbi and Kammoun, 2023; Huang and Zhang, 2020; Nguyen, 2020; Park and Mercado, 2018; Van *et al.*, 2021). Other less common attributes for the availability dimension are the proportion of adults with accounts in financial institutions, ownership of a bank card, the proportion of adults with mobile accounts and mobile money agents (Nguyen, 2020).

Accessibility is a dimension which measures the ability of users to access financial services and products (Gharbi and Kammoun, 2023). Some of the common attributes to accessibility are the number of ATMs and banks per 100,000 adults and per 1,000 km^2, the number of bank employees per 10,000 km^2, and the number of bank deposit accounts per 1,000 adults (Cámara and Tuesta, 2014; Huang and Zhang, 2020; Jungo *et al.*, 2022). Other less common attributes to accessibility dimensions are the number of deposit accounts and the number of mobile money accounts (Nguyen, 2020).

Usage is a dimension which measures the amount of usage of financial products or services (Gharbi and Kammoun, 2023). Some of the common attributes to usage are the number of depositors, accounts and borrowers in banks per 100,000 adults, deposits and credit per capita relative to GDP per capita, and the ratio of bank credit and private sector to GDP (Cámara and Tuesta, 2014; Gharbi and Kammoun, 2023; Huang and Zhang, 2020; Jungo *et al.*, 2022; Park and Mercado, 2018). Other less common attributes to usage are the number of withdrawals from banks, the rate of use of digital payments, and the life and non-life insurance policy usage.

Besides the three named dimensions, there are also other studies which use different types of dimensions such as barriers (Cámara and Tuesta, 2014; Nguyen and Luong, 2023). The attribute to barriers measures the distance of consumers to financial institutions, affordability of adopting financial services, documentation issues, lack of trust, as well as other issues which are relevant to obstruct users from using financial products and services.

The method of analysis for financial inclusion index depends solely to the specific objectives which the authors wanted to tackle.

A dominant methodological approach in the financial inclusion literature is the application of Principal Component Analysis (PCA) to reduce multidimensional indicators into a composite index. Given that financial inclusion typically comprises availability, accessibility, and usage dimensions, PCA is widely employed to extract underlying factors and assign data-driven weights while addressing multicollinearity and dimensionality issues. For instance, Gharbi and Kammoun (2023) applied PCA to compute eigenvalues across sub-

indices and classify 91 developed and developing countries according to their financial inclusion levels, identifying San Marino as the highest-ranked country.

Similarly, Ben Khelifa *et al.* (2024) adopted a two-stage PCA procedure to generate endogenous weights for attributes and dimensions, thereby overcoming the limitations of equal or exogenous weighting schemes; their findings ranked Luxembourg highest and Egypt lowest among 35 countries across Europe, the Mediterranean, Africa, and the Middle East. Jungo *et al.* (2022) also utilised PCA to manage the multidimensional structure of financial inclusion indicators, demonstrating its significant implications for competitiveness, credit risk, and bank profitability across Sub-Saharan Africa, Latin America, and Caribbean economies.

Other studies which did not utilise PCA implemented different analysis methods such as three-panel cointegration methods, index composite analysis as well as a simple descriptive statistic. Based on Samputra (2024), the most important dimensions for financial inclusion index are accessibility and usage when analysed using the index composite method. As for Nguyen and Luong (2023), the descriptive statistics show that the average level of financial inclusion among the people in Vietnam is still low. The richest 20% have the highest mean for financial inclusion index while the poorest 20% is vice versa. This indicates that the income level of a person plays an important role in determining the level of their financial inclusion.

Based on the literature reviewed, there are some gaps worth mentioning. Firstly, the development of financial inclusion index is bound to the specific objectives of the researchers without having any standard definitions in terms of attributes, dimensions, as well as analysis methods. This may prevent researchers from benchmarking their studies according to previous works as the degree of differences will contradict the financial inclusion indexes.

Secondly, the scope of financial inclusion index covered extends towards the macro scale of analysis only as the majority of the works outsourced their data from secondary databases. To get a better view of the financial inclusion state of a country or region, the data points should extend towards the supply and demand perspectives of financial inclusion. Some studies only incorporate the supply side of financial inclusion whereas few of them include dimensions from the demand side.

Thirdly, the categorisation of financial inclusion index does not follow any standardised approach. Due to the availability of data, some studies incorporated a large number of panel data from different countries while others only considered a few. The categorisation of countries is also a dynamic matter where the past members of certain groups of countries might not reflect the future list of members for certain categorisations. Thus, in comparing the financial inclusion index, a standard categorisation should be done to promote sustainable financial inclusion index outputs in the future.

2.2 Islamic Financial Inclusion

Islamic Financial Inclusion (IFI) refers to the availability of access to Islamic Financial Products and Services among the community members. According to Ahyar (2019), Islamic financial inclusion refers to the specific access of community members to the Islamic Financial Products and Services through the financial institutions. Financial services which are in line with Islamic principles may promote the economic well-being and prosperity of the Muslim community in a permissible way (Aziz, 2022; Dzulkepli and Barom, 2021).

Various studies have developed an Islamic Financial Inclusion Index (IFII) under different terminologies and empirical settings. Although labeled differently—such as the Integrated Islamic Finance-Based Index (Seman *et al.*, 2021) and the Index of Syariah Financial Inclusion (Lubis and Ramadhoni, 2019; Umar, 2017)—these measures share the

same conceptual objective of capturing access to and usage of Shariah-compliant financial services. Despite variations in naming and construction, the underlying motivation remains consistent: to quantify the extent of Islamic financial inclusion within a given economy. Therefore, this study considers prior works that aim to measure Islamic financial inclusion through structured index development, regardless of terminological differences.

Empirically, the literature is heavily concentrated in Indonesia, reflecting the country's large Muslim population and policy emphasis on strengthening the Islamic financial ecosystem (Amilahaq *et al.*, 2021). Indonesian studies consistently report significant regional disparities, with Jakarta ranking highest in Islamic financial inclusion while many provinces lag behind. Although research on Malaysia and Organisation of Islamic Cooperation (OIC) countries exists, it remains comparatively limited. This geographical concentration suggests that Islamic financial inclusion research is still unevenly distributed and largely shaped by domestic policy priorities and demographic contexts.

Methodologically, much of the empirical literature adopts Sarma's (2012) framework, focusing on accessibility, availability, and usage as core dimensions. Studies such as Umar (2017), Ali *et al.* (2019), and Isrowiyah *et al.* (2020) applied this multidimensional structure to Indonesian data and reported relatively low Islamic financial inclusion indices, ranging from 0.123 to 0.139. Jakarta consistently recorded the highest scores, while regional disparities persisted nationwide. Prastowo and Putriani (2019) reinforced these findings, linking low Islamic financial inclusion levels to income inequality. While these studies effectively document structural limitations in expanding Islamic banking penetration, they largely remain descriptive and do not sufficiently explore the dynamic relationship between Islamic financial inclusion and macroeconomic performance.

A parallel strand of research extends the analysis to OIC member states, yielding similarly mixed results. Lubis and Ramadhoni (2019) and Suseno and Fitriyani (2019), employing Sarma's index framework across countries, found that Islamic financial inclusion levels in OIC economies generally fall below global standards. Kuwait achieved the highest index value (56.7), whereas Sudan ranked lowest (2.8). Malaysia performed relatively better, particularly in terms of availability, reflecting its more developed Islamic financial infrastructure. Nonetheless, both studies emphasize significant disparities among OIC members, highlighting uneven integration and development of Islamic financial systems across jurisdictions.

Beyond measurement, several studies investigate the determinants and constraints shaping Islamic financial inclusion. From a supply-side perspective, Mujiatun and Badawi (2023) conducted a root cause analysis of Islamic banks in Indonesia, identifying weak infrastructure—limited branches, ATMs, and human resources—as major barriers to expansion, with Islamic commercial banks achieving only 11% penetration despite overall Islamic financial inclusion estimates of 76.9% between 2019 and 2021. On the demand side, Takidah and Kassim (2021) identified five critical determinants—Islamic financial literacy, social influence, trust, financial self-efficacy, and inclusion—finding social influence to be the most decisive factor in adoption. They further recommended integrating fintech adoption and socioeconomic variables into future models. Similarly, Hidayah *et al.* (2023), using SEM-PLS analysis in Islamic boarding schools, demonstrated that Islamic financial literacy significantly enhances welfare outcomes when evaluated through Maqasid al-Shariah. Collectively, these studies broaden the discourse by emphasizing that behavioral, educational, and institutional factors are as crucial as structural indicators.

Finally, the developmental implications of Islamic financial inclusion remain an important but underexplored dimension. Ali *et al.* (2019) and Umar (2017) identified a positive association between Islamic financial inclusion and the Human Development Index (HDI), suggesting that improved access to Islamic finance contributes to social and human

capital development. However, Prastowo and Putriani (2019) argue that income inequality weakens this relationship, limiting inclusive growth outcomes. In Malaysia, Seman *et al.* (2019, 2021) introduced a more holistic framework by incorporating Islamic social finance instruments such as zakat and waqf, alongside satisfaction measures, into the Islamic financial inclusion index. Their findings indicate substantial improvements between 2011 and 2015, suggesting a comparatively resilient Islamic financial ecosystem. Khamis *et al.* (2021) similarly found in Zanzibar that Islamic financial inclusion depends not only on accessibility and usage but also on perceived service quality and satisfaction. These findings collectively underscore the need to move beyond narrow structural measures and incorporate broader social, institutional, and welfare-oriented dimensions when evaluating Islamic financial inclusion.

Despite this growing body of evidence, several critical gaps remain. First, most studies continue to rely on Sarma's framework or descriptive statistics, offering useful benchmarking but limited analytical depth. Even when alternative dimensions such as trust, literacy, or Islamic social finance are incorporated, the focus often remains micro (households and consumers) or meso (Islamic banks, provinces, OIC cross-country comparisons), examining provinces, institutions, or specific user groups rather than the macroeconomy. Second, while some studies connect Islamic financial inclusion with welfare or human development, there is little work exploring its relationship with macroeconomic stability and growth. Finally, few studies employ advanced econometric approaches capable of distinguishing short-run dynamics from long-run equilibria.

The present study seeks to address these limitations. By developing a composite Islamic financial inclusion index for Malaysia and empirically examining its relationship with trade openness, FDI, inflation, and economic growth using the Augmented ARDL approach, this research moves beyond descriptive analysis to a dynamic macroeconomic investigation. This contributes to the literature by providing new evidence on how Islamic financial inclusion interacts with external sector variables and growth outcomes in an Islamic emerging economy, offering insights that are both theoretically significant and policy relevant.

The major research gap for Islamic financial inclusion index is the standardization of attributes and dimensions which make up the index. Although most of the studies adopted the approach by Sarma (2012) with a slight twist from their end, these methods of measuring the Islamic financial inclusion index are not suitable for all regions especially countries which do not have well-established Islamic Financial Institutions. To ensure the robustness of the Islamic financial inclusion index, other factors such as Islamic social financial services including zakat, waqf, and others should be included as one of the dimensions. Hence, a universal and standardised Islamic financial inclusion index measurement can be proposed.

3. Methodology

3.1 Method

This study applies the Autoregressive Distributed Lag (ARDL) approach as proposed by Pesaran *et al.* (1999) and extended by Pesaran *et al.* (2001). There are a bunch of reasons for the adoption of ARDL. Mainly, the conventional Johanssen cointegration method uses a system of equations to estimate the long-run relationship, while ARDL employs a single reduced-form equation. Therefore, the ARDL approach is an estimator that helps to avoid the problem associated with the estimated data (Enisan and Olufisayo, 2009). In addition, the ARDL estimator does not require variables to be stationary at the same level.

Hence, it is applied regardless of whether the underlying variables are I(0) or I(1). Moreover, the long and short-run parameters of the model are estimated simultaneously.

The bounds testing procedure is the first stage of the ARDL cointegration method and is based on the F-test or Wald-statistics. Therefore, a joint significance test that indicates no cointegration (H0: $\varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = 0$) based on the Equation (7) below.

The F-test in the bound test has a non-standard distribution. Three cases could happen of critical values that are computed by Pesaran and Pesaran (1997) for a given significance level. First, the lower band implies that the variables are stationary at I(0), and the upper band implies the variables are all at I(1). The existing of cointegration is when the F-statistic exceeds the upper critical value. Second, there is no cointegration if the F-statistic is below the lower critical value. Third, if the F-statistic falls inside the two bands of critical values then the test becomes inconclusive.

The study adopts an Auto-Regressive Distributed Lag (ARDL) bounds testing approach, which was developed by Pesaran *et al.* (2001) to model the long-run relationship. This technique has some advantages over other estimators, for instance, the Engle and Granger (1987) and maximum likelihood-based approach proposed by Johansen and Juselius (1990), and (Johansen, 1991) cointegration techniques. First, endogeneity problems and the inability to test hypotheses on the estimated coefficients in the long run associated with the (Engle and Granger, 1987) method are avoided. According to (Pesaran *et al.*, 1999), modelling the ARDL with the appropriate lags will correct for both serial correlation and endogeneity problems. It is argued that endogeneity is not a problem if the estimated ARDL model (Jalil and Feridun, 2011) elation (Jalil and Feridun, 2011). Therefore, all the variables are assumed to be endogenous, and the short-run and long-run parameters are estimated simultaneously (Khan *et al.*, 2005). Second, the bounds test does not require pre-testing of the stationary series to determine their order of integration since the test can be applied nevertheless of whether the series are all I(1), all I(0), or integrated with a mix of I(0) and I(1).

3.1.1 Construction of the Islamic Financial Inclusion Index (IIFI)

To measure the level of Islamic financial inclusion, this study adopts the multidimensional index methodology proposed by (Sarma, 2012). This approach is widely favored in the literature for its ability to satisfy mathematical properties such as monotonicity, homogeneity, and comparability, while addressing the "perfect substitutability" limitation found in simple additive indices. The construction of the IIFI follows a three-stage sequential process:

Stage 1: Normalization of Indicators: Since the indicators are measured in different units (e.g., number of branches versus volume of assets), they must first be normalized to a range between 0 and 1. We employ the Min-Max normalization technique. To minimize the distortion caused by extreme outliers in the data, the upper limit (M_i) is set at the 90th percentile of the empirical distribution for the period 2013–2022, following the recommendation of (Sarma, 2012). The lower limit (m_i) is set to 0.

The normalized dimension index, d_i, is calculated as:

$$d_i = w_i \left(\frac{A_i - m_i}{M_i - m_i} \right) \quad (1)$$

where A_i the actual observed value of dimension i, m_i is the lower limit (fixed at 0), M_i is the upper limit (90th percentile of the data), and w_i is the weight assigned to dimension i. In this study, we assign equal weights (w_i = 1) to all dimensions, assuming equal importance for Penetration, Access, and Usage in the inclusion process.

Stage 2: Distance Calculation: Sarma's (2012) methodology improves upon earlier indices by capturing the multidimensionality of inclusion relative to two reference points: the "worst-case" scenario (total exclusion) and the "ideal" scenario (total inclusion).

First, we calculate X_1, the normalized Euclidean distance between the country's position and the worst point. Higher values of X_1, indicate greater progress away from exclusion:

$$X_1 = \frac{\sqrt{\sum_{i=1}^{n}(d_i - 0)^2}}{\sqrt{\sum_{i=1}^{n} w_i{}^2}} \tag{2}$$

Second, we calculate X_2, the inverse normalized Euclidean distance from the ideal point. This measures how close the country is to the ideal state of inclusion:

$$X_2 = 1 - \frac{\sqrt{\sum_{i=1}^{n}(w_i - d_i)^2}}{\sqrt{\sum_{i=1}^{n} w_i{}^2}} \tag{3}$$

Stage 3: Aggregation: The final Islamic Financial Inclusion Index (IIFI) is derived by averaging the progress made from the worst-case scenario X_1) and the proximity to the ideal scenario (X_2). This composite index lies between 0 and 1, where 1 represents complete inclusion.

$$IFII = \frac{1}{2}(X_1 + X_2) \tag{4}$$

While the mathematical calculation of the IIFI mirrors standard indices, the conceptualization and indicator selection fundamentally differ to account for the specific nature of Islamic finance. The traditional Financial Inclusion Index (IFI) focuses on the availability and usage of conventional, interest-based (Riba) banking services. However, in many Muslim-majority countries, a significant portion of the population voluntarily excludes themselves from the conventional financial system due to religious prohibitions against interest (voluntary exclusion).

The IIFI adjusts the three core dimensions of inclusion; Penetration, Access, and Usage to capture participation in the Sharia-compliant financial system. The distinctions are summarized in three aspects.

First, penetration (Infrastructure). Traditional IFI typically counts commercial bank branches and ATMs. While IIFI replaces this with the number of Islamic bank branches and Islamic windows (dedicated counters in conventional banks). This is crucial because access to a conventional branch does not constitute "inclusion" for a user seeking Sharia-compliant services.

Second, access (Financial Depth). Traditional IFI often uses total Credit and Deposits as a percentage of GDP. While IIFI utilizes Islamic Banking Assets and Islamic Fund Assets. This shift captures the availability of risk-sharing and asset-backed financial resources rather than interest-bearing loans.

Third, usage (Financial Activity). Traditional IFI tracks the number of deposit accounts or loan accounts. While IIFI incorporates specific Islamic financial instruments, namely Takaful (Islamic insurance contributions) and Outstanding Sukuk (Islamic bonds). These indicators reflect active engagement with Islamic financial markets beyond basic banking.

Therefore, by substituting conventional metrics with these Islamic counterparts, the IIFI provides a more accurate measure of financial inclusiveness in OIC countries, treating Sharia-compliance not just as a product feature, but as a prerequisite for access.

3.1.2 Model Specification

The ARDL model was developed by (Pesaran and Shin, 1999) as a time series regression model that allows for the inclusion of both lagged values of the dependent variable and lagged values of the explanatory variables within the model. The general form of ARDL is represented in the following equation:

$$ARDL(p,q): Y_t = \beta_0 + \sum_{i=1}^{P} \beta_y Y_{t-i} + \sum_{i=0}^{q} \delta_x X_{t-i} + \varepsilon_i \quad (5)$$

where Y_t is the dependent variable, X_{t-i} are the explanatory variables, p and q are the optimal lag length of y and x respectively, β_0 is the constant, and $\varepsilon_i$is the error term.

The primary contribution of the ARDL model lies in its ability to test for cointegration through the bounds testing approach developed by (Pesaran *et al.*, 2001) The ARDL bounds test is particularly valuable for examining long-run relationships as it does not require all variables to be of the same integration order. This flexibility allows for a mix of I(0) and I(1) variables within the same model.

The ARDL bound test model can be formulated as follows:

$$\Delta Y_t = \beta + \sum_{i=1}^{p} \lambda_i \Delta Y_{t-i} + \sum_{i=0}^{q} \delta_i \Delta X_{t-i} + \varphi_1 Y_{t-1} + \varphi_2 X_{t-1} + \varepsilon_i \quad (6)$$

where ΔY_{t-i} and ΔX_{t-i} are the differenced terms, capturing short-run effects. $Y_{t-1} and\ X_{t-1}$ represent the lagged levels which are used in the bounds test to assess the long-run relationship.

The null hypothesis for the bounds test is φ_1=φ_2 = 0, which implies no cointegration. Firstly, to check for stationarity, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests were conducted. The results of ADF and PP tests in table 1 indicate the presence of mixed integration orders among the variables, with some being integrated of order I(0) and others of order I(1).

Traditionally the ARDL Bounds Test developed by (Pesaran *et al.*, 2001) requires that the dependent variable be integrated of order one [I(1)] in order to validly test for cointegration. However, in our case, the dependent variable was found to be stationary at level [I(0)].

To overcome this limitation, (Sam *et al.*, 2019) introduced Augmented ARDL bounds test by including an extra F-test that focuses exclusively on the lagged levels of the independent variables, making it applicable even when the dependent variable is I(0). (Sam *et al.*, 2019) provides a table of critical values of the additional F-test.

Given this situation the Augmented Bounds Test for cointegration is applied within the ARDL framework. To determine the optimal lag length for the ARDL model, we rely on the Akaike Information Criterion (AIC). The results indicate that the optimal lag structure for the ARDL model is ARDL (4, 4, 4, 4, 3) for the variables GDP, IFII, Trade Openness, Investment, and Inflation. Based on this, our model can be formulated as follows:

$$\Delta GDP_t = \beta + \sum_{i=1}^{4} \lambda_1 \Delta GDP_{t-i} + \sum_{i=1}^{4} \lambda_2 \Delta IFII_{t-i} + \sum_{i=1}^{4} \lambda_3 \Delta TO_{t-i} + \sum_{i=1}^{4} \lambda_4 \Delta FDI_{t-i} + \sum_{i=1}^{3} \lambda_5 \Delta INF_{t-i} + \varphi_1 GDP_{t-1} + \varphi_2 IFII_{t-1} + \varphi_3 TO_{t-1} + \varphi_4 FDI_{t-1} + \varphi_5 INF_{t-1} + \varphi_6 covid + \varepsilon_i \quad (7)$$

The optimal lag length for the ARDL model was selected based on the Akaike Information Criterion (AIC) to ensure the residuals are white noise. The results of the Augmented ARDL bound test presented in Table 2 indicate the presence of cointegration among the variables in an ARDL framework implying that there exists a long-run equilibrium relationship between them. This finding allows for the estimation of both long-run and short-run dynamics within the same model.

3.1.3 Data Sources

The table below indicates variables definitions with their proxies used in this study, as well as the data sources.

Table 2: Variables definition

Variable	Symbol	Proxy	Source
Inflation	INF	Producer price index	OpenDOSM
Trade Openness	TO	Ratio of total Import and export to GDP	
LN of GDP	GDP	Adjusted Real GDP	
Investment	FDI	Ratio of total Foreign Direct Investment to GDP	
IFII	IFII	Islamic Financial inclusion index	Refenitiv
Metrics used to calculate IFII		1. Penetration: Number of Islamic bank branches & windows per 10 million people. 2. Access: Total Islamic banking & fund assets per 1 million people. 3. Usage: Volume of Takaful contributions & Outstanding Sukuk per 1 million people.	From Refinitiv (Islamic Finance Development Indicator database)

Quarterly data for the independent variables were collected from the official OpenDOMS website, covering Q1 2013 to Q4 2022. The calculated IFII index available annually was interpolated to align with the quarterly frequency. The COVID-19 dummy variable is included in the model as a fixed regressor to capture the economic shock induced by the pandemic during the second quarter of 2020.

This method is methodologically justified because financial inclusion is inherently a slow-moving structural variable, driven by gradual changes in banking infrastructure and long-term regulatory policies rather than high-frequency stochastic shocks. This approach aligns with (Danisman and Tarazi, 2020), who employed linear interpolation to generate missing years for the Global Findex database, arguing that since financial inclusion changes gradually, this technique produces a consistent and smooth value-generating process. Consequently, the linear interpolation preserves the underlying secular trend of Islamic financial development without introducing artificial volatility.

4. Results and Discussion

Table 3 presents the descriptive statistics and pairwise correlation matrix for the variables employed in the analysis. Real GDP displays a relatively high standard deviation (SD = 34,708.36), reflecting pronounced quarterly fluctuations in economic output over the 2013–2022 period. This variability may be attributed to external shocks, such as global commodity price cycles and the COVID-19 pandemic, as well as domestic macro-financial adjustments. The Islamic Financial Inclusion Index (IFII) exhibits a mean value of 0.5911 with a moderate dispersion (SD = 0.0567), indicating a steadily improving but uneven pace of Islamic financial integration across the Malaysian economy. Trade openness (TO) has a high average of 134.94%, consistent with Malaysia's long-standing position as a highly globalized, export-oriented economy. However, the relatively widespread (SD = 20.05) suggests some degree of trade volatility, possibly due to exchange rate movements, tariff revisions, and shifts in global demand.

Table 3: Descriptive statistics

Variable	Obs	Mean	Std. dev.	Min	Max
IFII	40	0.5911384	0.0566849	0.5249907	0.6832507
Adjusted Real GDP	40	325824.1	34708.36	254230.9	386812
TO	40	134.9435	20.05002	110.092	202.2295
FDI	40	21.17264	7.067243	13.42883	42.88107
INF	40	107.5775	5.744897	99	122.6

Foreign direct investment (FDI) and inflation (INF) exhibit notably higher standard deviations (7.07 and 5.74, respectively), indicating exposure to external vulnerabilities and policy uncertainties. The sharp variations in FDI inflows may reflect fluctuations in investor sentiment, sectoral shifts, and regulatory changes, while the inflation variability points to transitory price pressures from global oil prices, exchange rates, or supply chain disruptions. These descriptive patterns collectively signal considerable heterogeneity in Malaysia's macroeconomic dynamics over the study period, justifying the application of time series econometric techniques capable of capturing such fluctuations—such as the ARDL model.

Table 4 represents the correlation matrix to further reinforce the relevance of the selected variables. Real GDP is positively and significantly correlated with IFII (r = 0.7809), indicating a strong association between Islamic financial inclusion and economic performance. This supports the theoretical premise that inclusive financial systems enhance access to capital and stimulate productive activity. GDP also correlates positively with trade openness (r = 0.5282), FDI (r = 0.5228), and inflation (r = 0.4387), suggesting interconnectedness among macroeconomic variables consistent with open-economy growth models. Notably, IFII also shows strong positive correlations with TO (r = 0.7336) and FDI (r = 0.6530), hinting at the possibility that deeper trade and investment integration may reinforce the development of Islamic financial ecosystems. These preliminary correlations underscore the theoretical plausibility of long-run and short-run linkages explored in the subsequent ARDL analysis.

Table 4: Correlation matrix

	Adjusted Real GDP	IFII	TO	Inv	Inflation
Adjusted Real GDP	1.0000				
IFII	0.7809*	1.0000			
TO	0.5282*	0.7336*	1.0000		
FDI	0.5228*	0.6530*	0.7733*	1.0000	
INF	0.4387*	0.4581*	0.6875*	0.5496*	1.0000

Notes: * indicates significance at 5% level.

The stationarity properties of the variables were assessed using the Augmented Dickey-Fuller (ADF) and Phillips-Perron tests, as reported in Table 5. The results indicate a mix of integration orders among the series, a common feature in macroeconomic datasets from emerging economies (Narayan, 2005). Specifically, GDP and FDI are stationary at level [I(0)] at the 5% significance level ($p = 0.0295$ and $p = 0.0359$, respectively), while Islamic financial inclusion (IFII), trade openness (TO), and inflation (INF) are non-stationary at level but become stationary after first differencing [I(1)], significant at the 1% level ($p < 0.01$). This heterogeneity in integration orders precludes the use of traditional cointegration techniques such as the Johansen method, which requires all variables to be integrated at the same order.

Table 5: Augmented Dicky Fuller and Phillips Perron Unit Root tests

Test	Augmented Dicky Fuller		Philips Perron		Stationary
	Integration order				
Variable	Level	1st Difference	Level	1st Difference	
GDP	0.0295**	0.0000***	0.0374**	0.0000***	level
IFII	0.3479	0.0098***	0.4205	0.0300**	1st difference
TO	0.5889	0.0000***	0.7552	0.0000***	1st difference
FDI	0.0359**	0.0000***	0.0912*	0.0000***	level
INF	0.2023	0.0000***	0.6769	0.0000***	1st difference

Notes: ***and ** indicate significance at the 1% and 5% levels, respectively.

Instead, the Augmented ARDL bounds testing framework, as developed by (Sam *et al.*, 2019) is appropriate and methodologically robust in this context, where the dependent variable is stationary at level. The ARDL approach accommodates a combination of I(0) and I(1) variables without requiring pre-testing for unit roots at identical orders of integration, thereby mitigating potential errors in model specification. Moreover, the augmented bounds testing procedure does not require the dependent variable to be strictly I(1). These findings reinforce the suitability of the ARDL model for exploring both short-run dynamics and long-run equilibrium relationships between Islamic financial inclusion, trade, FDI, inflation, and economic growth in Malaysia. The use of a flexible econometric framework like ARDL is essential in capturing the nuanced behavior of mixed-order variables, particularly in the presence of structural shifts and macroeconomic volatility typical of emerging market economies.

The results of the Augmented ARDL bounds test for cointegration, presented in Table 6, provide strong evidence of a stable long-run relationship among the variables in the model. The computed F-statistics of 64.685 substantially exceeds the upper critical value of 4.01 at the 5% significance level for I(1) variables, as established by Pesaran *et al.* (2001). Furthermore, the computed extra F-statistic of 6.89 also surpasses the 5% upper critical value from (Sam *et al.*, 2019)'s critical value table, reinforcing this conclusion. In addition, the associated t-statistic for the lagged dependent variable is statistically significant, leading to the rejection of the null hypothesis of no cointegration.

Table 6: Augmented ARDL Bounds test

Statistics		Critical values 5%		Interpretation
		I(0)	I(1)	
F	64.685	2.86	4.01	Reject H_0
t	-12.098	-2.86	-3.99	
F- augmented bound test	6.89	2.64	4.54	

Notes: ***and ** indicate significance at the 1% and 5% levels, respectively.

This decisively rejects the null hypothesis of no long-run relationship, confirming that Islamic financial inclusion, trade openness, foreign direct investment, inflation, and GDP are cointegrated over the period 2013–2022. The strength of this cointegrating relationship reflects a well-defined economic equilibrium, where deviations from long-run growth trajectories are corrected over time through the endogenous dynamics of the system.

This finding reinforces earlier work by Abduh and Chowdhury (2012), who also identified a stable long-run link between Islamic financial development and economic growth in Bangladesh. In the Malaysian context, the result affirms that these key macro-financial variables—despite external shocks such as COVID-19—move together in the long run, underscoring the structural integration between inclusive finance and the broader economy. The presence of cointegration validates the use of the ARDL model to estimate both long-run and short-run effects, ensuring the econometric rigor and theoretical consistency of the analysis.

Table 7 reports the short-run dynamics of the ARDL model, offering several key insights into the behavior of GDP in response to contemporaneous and lagged changes in its determinants. The error correction term (ECT) is negative and highly significant (-0.808, $p < 0.001$), indicating a rapid speed of adjustment toward the long-run equilibrium. Specifically, approximately 80.8% of any deviation from equilibrium is corrected within one quarter, which reflects a strong and responsive adjustment mechanism in Malaysia's macro-financial framework. This finding aligns with Ibrahim and Alagidede (2018), who emphasized the resilience and institutional maturity of Malaysia's financial system in absorbing shocks and restoring stability.

Table 7: Short run coefficients

D.GDP	Coefficient	Std. err.	t	P>t
Erro correction term				
ECT	-.8084392	0.0668234	-12.10	0.000
GDP				
LD.	-.2194877	0.0755776	-2.90	0.014
L2D.	-.1887479	0.0724127	-2.61	0.024
L3D.	0.0841399	0.0780758	1.08	0.304
IFII				
D1.	2.572224	0.6162978	4.17	0.002
LD.	-.5926795	1.021966	-0.58	0.574
L2D.	0.3919897	0.846844	0.46	0.652
L3D.	0.5145998	0.5411519	0.95	0.362
Trade Openness				
D1.	-0.0062715	0.0006187	-10.14	0.000
LD.	-0.0057976	0.0007008	-8.27	0.000
L2D.	-0.0047742	0.0005193	-9.19	0.000
L3D.	-0.0019697	0.0004441	-4.44	0.001
FDI				
D1.	0.0037348	0.0013806	2.71	0.020
LD.	0.0035322	0.0013205	2.67	0.022
L2D.	0.0039374	0.0012202	3.23	0.008
L3D.	0.0009315	0.0008395	1.11	0.291
Inflation				
D1.	0.0003768	0.0011493	0.33	0.749
LD.	0.003198	0.0010719	2.98	0.012
L2D.	0.0050733	0.0013482	3.76	0.003
covid	-.1540674	0.0204468	-7.54	0.000
_cons	9.485537	0.8275296	11.46	0.000

Islamic financial inclusion (IFII) exerts a significant and positive contemporaneous effect on GDP in the short run, with a 1% increase in IFII associated with a 2.57% increase in output ($p = 0.002$). This underscores the catalytic role of inclusive finance in stimulating economic activity by alleviating credit constraints, particularly among small firms and marginalized populations—a relationship well documented in Beck *et al.* (2008). However, the lack of significance in the lagged IFII coefficients suggests that the growth-enhancing effect of Islamic financial inclusion is immediate but not persistent in the short run. This stands in contrast to findings by Kim *et al.* (2018), who observed enduring short-run impacts of financial inclusion in advanced economies, possibly due to deeper financial penetration and stronger institutional frameworks.

Interestingly, trade openness demonstrates consistent negative effects in the short run, with both contemporaneous and lagged coefficients being statistically significant and negative (e.g., D1 = -0.0063, $p < 0.001$). These results suggest that increased openness, while beneficial in the long run, may impose adjustment costs in the short run—particularly through import surges that disrupt domestic production. This finding aligns with Awokuse (2008), who noted that short-run trade liberalization effects can be contractionary in highly trade-dependent economies where import shocks may outweigh immediate export gains.

In contrast to its long-run effect, FDI shows a statistically significant and positive impact on GDP in the short run. The first three lags of FDI (D1, LD, and L2D) all exhibit positive and significant coefficients ($p < 0.05$), implying that while long-term structural inefficiencies may dilute FDI's growth contribution, its short-term inflow provides immediate capital injection and production stimulus, particularly in export-oriented sectors.

Inflation presents a more nuanced picture. While the contemporaneous effect is statistically insignificant ($p = 0.749$), its lagged values (LD and L2D) are positive and significant, suggesting delayed but positive pass-through effects—possibly through nominal income adjustments or pricing mechanisms. This pattern supports the idea that inflation, within a controlled range, does not destabilize growth in the short term and may even reflect rising demand conditions.

Finally, the COVID-19 dummy variable carries a negative and highly significant coefficient (-0.154, $p < 0.001$), reflecting the sharp contraction in economic activity triggered by the pandemic. This finding corroborates the global economic impact highlighting the substantial disruption to GDP levels during the crisis period, particularly through lockdowns, demand shocks, and supply chain interruptions.

Table 8 presents the long-run coefficients estimated from the ARDL model, providing meaningful insights into the structural drivers of economic growth in Malaysia. Islamic financial inclusion (IFII) exhibits a positive and statistically significant coefficient (0.3679, $p = 0.036$), indicating that greater access to Islamic financial services contributes to long-term GDP expansion. This finding supports the notion that Shariah-compliant financial systems can promote inclusive and sustainable growth through risk-sharing mechanisms, ethical investment practices, and financial outreach to underserved populations. The result is consistent with Indrawan and Rahman (2020), who documented long-run gains from Islamic financial expansion in emerging markets and further reinforced by Ismath Bacha and Mirakhor's (2013) theoretical proposition that Islamic finance promotes development through just and equitable capital allocation. In the Malaysian context, this aligns with Hanif *et al.* (2024), though the estimated magnitude here (0.37%) suggesting a more impactful role of Islamic finance in Malaysia's growth trajectory.

Table 8: Long run coefficients

	Coefficient	Std. err.	t	P>t
IFII	.3678751	.1542937	2.38	0.036
Trade Openness	.0070325	.0011909	5.90	0.000
FDI	-.0064724	.002161	-3.00	0.012
Inflation	-.0002448	.0010778	-0.23	0.824

Trade openness is also positively and significantly associated with GDP in the long run (coefficient = 0.0070, $p < 0.05$), consistent with Malaysia's export-oriented growth strategy. The liberalization of trade fosters competition, technological spillovers, and access to larger markets, all of which are well-documented growth-enhancing channels in the literature on open economies.

In contrast, foreign direct investment (FDI) displays a negative and significant coefficient (-0.0065, $p = 0.012$), diverging from the conventional wisdom that FDI spurs growth through capital formation and technology transfer (Borensztein *et al.*, 1998). This unexpected outcome may reflect structural inefficiencies or sectoral misalignment of FDI flows in Malaysia. As suggested by Agosin and Machado (2005), FDI can crowd out domestic investment when it concentrates in capital-intensive or enclave sectors with weak backward linkages. In Malaysia, a significant share of FDI is directed toward industries such as extractives and electronics, which may yield limited spillover benefits for the broader economy. To ensure the technical validity of this finding, a sensitivity analysis was conducted using alternative lag specifications, confirming that the negative long-run coefficient is a robust structural characteristic of the data rather than a statistical artifact. This result highlights a critical 'linkage gap' in the Malaysian economy, where foreign capital fails to reach the Small and Medium Enterprise (SME) sector.

Finally, inflation is found to be statistically insignificant in the long run ($p = 0.824$), implying that within the moderate inflation range observed in Malaysia, price levels do not exert a meaningful influence on economic growth. This result is in line with the threshold effect framework proposed by Khan and Ssnhadji (2001), which argues that inflation below a certain threshold—commonly around 10% for developing economies—has minimal adverse effects on growth. It also reflects Malaysia's prudent macroeconomic management and credible inflation-targeting policies, which have helped anchor inflation expectations and sustain a stable economic environment.

Table 9 presents a comprehensive set of diagnostic tests, confirming that the ARDL model used in this study adheres to the core econometric assumptions necessary for reliable estimation and inference. The Jarque-Bera test ($p = 0.864$) supports the normality of residuals, while the White test ($p = 0.422$) indicates homoscedasticity, suggesting that the variance of error terms is constant over time. These results satisfy the classical linear regression assumptions emphasized by Pesaran and Shin (1999), whose ARDL approach relies on the validity of these conditions for producing unbiased and efficient estimators, particularly in small samples typical of macroeconomic time series data.

Table 9: Diagnostic tests

Assumption	Test	P-value	Interpretation
Normality	Jarque-Bera	.8637	Residuals are normally distributed
Homoscedasticity	White`s test	0.4215	Residuals are homoscedastic
Autocorrelation	Breusch–Godfrey	0.2475	No autocorrelation
Omitted variables	Ramsey RESET	0.1634	No omitted variables
parameter stability	Cusum test	T stat: 0.61 < critical value: 0.94	No structural break

Furthermore, the Breusch-Godfrey test (p = 0.247) confirms the absence of serial correlation, indicating that the model appropriately captures the dynamic structure of the variables without distortions from autocorrelated residuals. The Ramsey RESET test (p = 0.163) also affirms that the model is correctly specified and free from omitted variable bias, which is critical when analyzing complex macroeconomic interactions—such as those between financial development, remittances, or trade openness—and their effects on economic growth. By passing all these diagnostic checks, the model demonstrates robustness and econometric reliability, enhancing confidence in the estimated short-run and long-run relationships.

Economically, the validity of these diagnostics ensures that the findings can be interpreted with a high degree of credibility. The model's reliability means that policy implications drawn from the results—such as those concerning investment flows, development strategies, or external shocks—rest on a solid empirical foundation, making them valuable for evidence-based economic planning and sustainable policy formulation.

Figures 2 and 3 present the CUSUM and CUSUMSQ plots, respectively, which provide compelling evidence of the structural stability and robustness of the ARDL model over the study period. Both plots show that the recursive residuals and their squared values remain within the 95% confidence bounds, indicating the absence of structural breaks—even in the presence of major shocks such as the COVID-19 pandemic. This result is particularly important in macroeconomic time series analysis, where data are often susceptible to regime shifts or global disruptions. The findings align with the stability observed in financial inclusion models by Soumaré and Tchana (2015). Moreover, the CUSUMSQ plot (Figure 3) reinforces the model's variance stability, consistent with the simulations of Pesaran *et al.* (2001), further validating the reliability of the estimated coefficients. Overall, these diagnostics strengthen confidence in the model's robustness and its suitability for policy-relevant analysis.

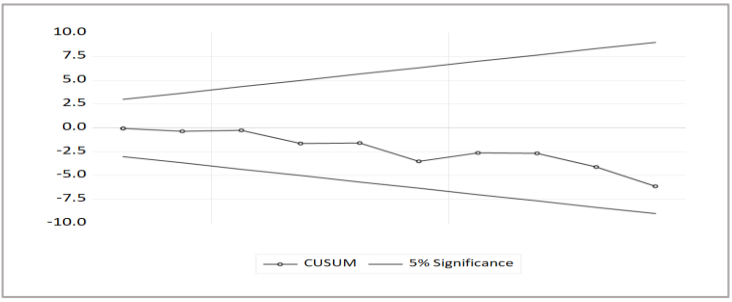

Figure 2: CUSUM test of model stability

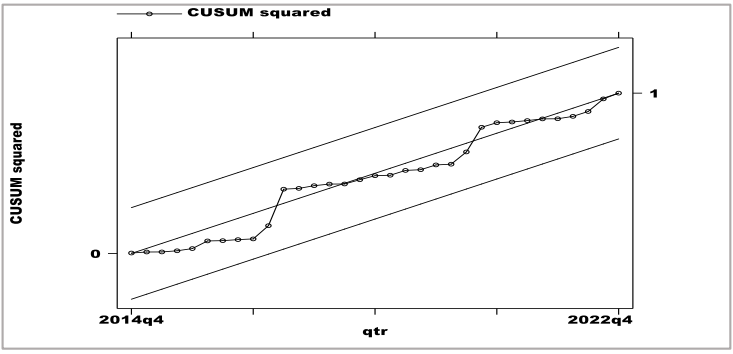

Figure 3: CUSUMSQ test of model stability

To ensure the robustness of our findings and address potential endogeneity arising from reverse causality, we employ the Toda-Yamamoto (T-Y) modified Wald test (Toda and Yamamoto, 1995). Unlike traditional Granger causality tests, the T-Y procedure is robust to the integration and cointegration properties of the variables, estimating a VAR model in levels with extra lags ($k + d_{max}$) to ensure asymptotic standard chi-square distribution.

The results, presented in the Table 10 below, reveal a distinct unidirectional causal relationship running from Islamic Financial Inclusion (IIFI) to Economic Growth. We reject the null hypothesis that "IIFI does not Granger Cause GDP" at the 1% significance level. Conversely, we fail to reject the null hypothesis that "GDP does not Granger Cause IIFI" ($p > 0.10$).

Table 10: Toda-Yamamoto test results

Null Hypothesis (H_0)	Chi-sq ($\chi 2$)	Prob.	Direction	Decision
IIFI doesn't granger cause GDP	13.34	0.009	IIFI → GDP	Reject H_0
GDP doesn't granger cause IIFI	4.91	0.29	GDP → IIFI	Fail to Reject H_0

Notes: ***and ** indicate significance at the 1% and 5% levels, respectively.

The absence of significant reverse causality (from GDP to IIFI) confirms that our main ARDL results are not driven by feedback effects or simultaneity bias. We can confidently interpret the estimated long-run coefficients as the impact of financial inclusion on growth, rather than the result of a wealthier economy simply demanding more financial services.

5. Conclusion

This study provides robust evidence that Islamic financial inclusion is a significant and consistent driver of Malaysia's economic growth in both the short and long run. The findings affirm the transformative potential of Shariah-compliant finance in fostering inclusive, ethical, and sustainable development, moving beyond conventional narratives of financial deepening. Importantly, the results extend the literature by demonstrating that Islamic finance, when operationalized through an inclusion index, contributes not only to social equity but also to macroeconomic stability.

However, the trade openness and capital inflow reveal important nuances. While trade liberalization supports long-term growth, its short-run contractionary effects suggest that adjustment costs are non-trivial and require complementary cushioning policies. Similarly, the negative long-run effect of FDI highlights structural weaknesses in Malaysia's capacity to absorb foreign capital productively, raising questions about sectoral inefficiencies and the limited integration of FDI into domestic value chains. The insignificance of inflation in both horizons points to the effectiveness of Malaysia's macroeconomic management, though it also signals that price stability alone may not be sufficient to drive inclusive growth.

These results carry significant policy and ethical implications. To amplify growth dividends, policymakers should enhance domestic spillovers—specifically by linking FDI with SMEs and Islamic social finance instruments—to ensure more equitable distribution of wealth. Finally, mitigating the short-run volatility of external openness requires adaptive trade facilitation and resilient institutional frameworks that protect the economy's stability, fulfilling the Shariah mandate of preserving public interest (Maslahah).

This study enriches the Islamic and social finance literature by constructing a specialized Islamic Financial Inclusion Index (IFII) that incorporates dimensions often neglected in conventional measures, such as Takaful participation and Sukuk issuance, thereby offering a more comprehensive framework for evaluating Shariah-compliant financial systems. Empirical evidence confirms that Islamic financial inclusion significantly stimulates Malaysia's economic growth in both the short and long run, reinforcing the finance–growth nexus within Islamic economies. The findings also align with the objectives of Maqasid al-

Shariah, particularly *Hifz al-Mal* (the preservation and circulation of wealth), by demonstrating that inclusive access to Islamic finance enhances socio-economic justice and reduces religious-based financial exclusion. Overall, the study bridges the gap between Islamic economic principles and macroeconomic outcomes, advocating a more holistic and sustainable development approach through Shariah-compliant financial instruments.

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