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Article

Short-Term and Long-Term Effects of the Islamic Bank Financing in Construction Sector on GDP in Indonesia: Evidence from Conditional Error Correction Model

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ABSTRACT - Research on the role of Islamic banks on economic growth has been widely conducted. However, it focuses on total Islamic Bank Financing (IBF) rather than on sector-specific Islamic financing. This research addresses the gap by examining the short-term and long-term influence of Islamic bank financing in the construction sector on the Gross Domestic Product (GDP) in Indonesia. This research uses a quantitative approach, using the Conditional Error Correction Model (CECM) analysis method. Secondary data used in this research are from the first semester of 2006 to the first semester of 2023 and are taken and processed from related official institutions such as Bank Indonesia, the Central Statistics Agency, and the Financial Services Authority. In the autoregressive distributive lag (ARDL) model in the construction sector, IBF's short-term impact on GDP is positive but insignificant, while the long-term effect is significantly positive.

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INTRODUCTION

Development of Islamic bank financing in Indonesia

The foundations of Islamic economics, which encompass Islamic banking and finance, are rooted in the teachings and principles found in Islamic sources of knowledge, including the Quran and the hadiths of Prophet Muhammad. Al-Bukhārī's economic ideas contribute to the operational and ethical framework of Islamic banking and finance, highlighting their role in economic development within the Islamic financial system (Ariffin & Tahir, 2022). This perspective places Islamic banking as a central component of Islamic economics, exemplifying Islam's comprehensive approach to integrating ethical, moral, and social considerations into economic activities. Consequently, Islamic banks are viewed as crucial institutions within the broader landscape of Islamic economics (Ariffin & Tahir, 2022).

Indonesia has focused heavily on expanding its Islamic banking sector in recent years. The industry's roots can be traced back to the establishment of Bank Muamalat Indonesia in 1992 (Trisnaningtyas, 2022). Since then, the Islamic banking sector has witnessed remarkable growth (Trisnaningtyas, 2022). This expansion has been fuelled by various factors, including government

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efforts to support Islamic finance (Maulida et al., 2022), consumer interest in alternative banking options (Agustina & Majid, 2020), and favourable responses to the merging of Islamic banks with state-owned entities (Farhan, 2022). Studies indicate that Islamic banking in Indonesia has made considerable strides, with services now available in almost every province (Afandi & Amin, 2019). The sector has reportedly achieved a yearly growth rate of approximately 23.57% (Annisya & Nurbaiti, 2023). Additionally, research has explored the efficiency and productivity of Islamic banking in Indonesia, drawing comparisons with similar systems in Malaysia and Pakistan and highlighting the need to assess both aspects within the industry (Rodoni et al., 2017).

Islamic bank and economic development

Numerous studies have emphasised the pivotal role of Islamic banks in fostering economic expansion and progress. Research by Anwar et al. (2020) revealed that a robust Islamic banking sector in Indonesia correlated with increased economic growth, indicating its positive influence on economic advancement. Similarly, Farahani and Dastan (2013) demonstrated a significant and positive link between Islamic bank financing and both economic growth and capital accumulation in specific countries, further underscoring the importance of Islamic banks in economic development. Yusof and Bahlous (2013) pointed out that Islamic intermediation generates economic benefits, boosts entrepreneurial competencies, and lowers agency costs, all of which contribute to economic progress. Bilgin et al. (2021) noted more pronounced effects in nations with explicit deposit insurance for Islamic banks and less foreign dominance, highlighting the constructive impact of Islamic banks on economic development. The social dimension of Islamic banking was accentuated by Aisyah et al. (2022), who proposed that these institutions should extend their focus beyond profit maximisation to promote societal development, aligning with broader economic development objectives. Simultaneously, Rasyida et al. (2021) underscored the significance of Islamic banking in furnishing capital support to real sectors, which is regarded as a crucial catalyst for economic growth and development.

The relationship between Islamic Bank Financing (IBF) and economic growth has been a key area of research. Evidence suggests that IBF can contribute to economic expansion, with a notable correlation between IBF and economic growth in Indonesia (Afandi & Amin, 2019). This highlights the importance of Islamic banking in promoting economic progress and financial accessibility within the nation. Furthermore, the distribution of IBF across various economic sectors has been associated with the profitability of Islamic banks in Indonesia. Research also indicates that greater diversification in sectoral financing can boost the profitability of Islamic commercial banks, emphasising the importance of a diverse financing portfolio for long-term financial success (Widarjono & Sidiq, 2022). .

Although prior studies have explored the connection between Islamic Banking Finance (IBF) and economic development, they typically view IBF as a uniform funding source, concentrating on the total financing provided by Islamic banks. This approach, as seen in the works of Afandi and Amin (2019) and Nofrianto et al. (2021), offers valuable insights into the overall impact of Islamic banking on the economy. However, it fails to distinguish the effects across various economic sectors, resulting in a gap in the understanding of how Islamic financing influences specific industries. Consequently, there is a pressing need to break down financing to comprehend the IBF's contribution to different economic activities. While Rasyida et al. (2021) made progress by identifying the positive effects of Islamic financing in certain sectors, comprehensive research in this area remains limited. Thus, the current body of literature highlights the necessity for a more detailed investigation of the varying roles of IBF across different economic sectors. Such research could potentially inform targeted economic policies and guide the strategic development of financial products in Islamic banking.

This study explores the impact of sector-specific Islamic financial services on Indonesia's economic growth, driven by the need to understand how these interventions affect the nation's Gross Domestic Product (GDP). As an emerging economy with a large Muslim population,

Indonesia offers a unique environment in which Islamic finance aligns with cultural values and has significant potential to stimulate economic development. However, the complex relationship between targeted Islamic financial interventions and economic expansion in various sectors remains unclear. By examining key industries within this context, this research seeks to shed light on the intricate connections between specialised Islamic financial products and economic progress. This study aims to provide valuable insights that could inform policy decisions and strategic economic planning. Consequently, this study makes a substantial contribution to both academic discourse and practical financial strategies, potentially enhancing the effectiveness of Islamic banking as a means of promoting socioeconomic empowerment and sustainability in Indonesia.

This study focuses on a prominent sector with substantial Islamic Bank Financing. The decision to analyse one of the top three sectors in-depth within the context of the sectoral IBF's impact on Indonesia's GDP is strategically justified for several reasons. Primarily, concentrating on leading sectors allows for a focused examination of areas in which Islamic financing is the most prevalent and potentially exerts the greatest influence on the national economy. These key sectors, due to their magnitude, growth prospects, and importance to Indonesia's economic structure, are likely to provide the most valuable insights into the effectiveness of Islamic financing. Additionally, this approach enables a more comprehensive and nuanced understanding of sector-specific dynamics, challenges, and opportunities, which might be overlooked in a broader analysis. This facilitates a detailed assessment of how Islamic financing interacts with sectoral peculiarities, either promoting or impeding growth. Furthermore, by identifying the sectors that contribute most significantly to GDP, this research can develop targeted strategies for Islamic banking practices to boost economic development. Finally, given Indonesia's strategic aim to become a global Islamic finance hub, understanding the impact on these crucial sectors can offer actionable intelligence for policymakers, financial institutions, and stakeholders to enhance Islamic financing frameworks for wider economic advantages. This targeted approach not only increases the relevance of the research, but also improves its applicability in shaping Indonesia's economic future.

According to the author's calculations, the construction sector, with an average allocation of approximately 7.15%, has emerged as the third most significant sector, underscoring its crucial role in infrastructure development and urbanisation initiatives that contribute to Indonesia's economic growth and enhance living standards. This strategic emphasis on these sectors by Islamic banking demonstrates a deliberate effort to support areas with high growth potential and substantial contributions to GDP, aligning with broader economic development objectives.

The significance of the construction sector in economics

The construction sector is a critical component of economic development and contributes significantly to various aspects of the economy. They play a pivotal role in responding to economic fluctuations and driving growth, particularly in developing economies (Olanipekun & Saka, 2019). Research has demonstrated that the construction sector is an integral element of national economic growth and development, exhibiting strong linkages with other economic sectors (Alhowaish, 2015). On a global scale, the construction industry is flourishing, transforming resources into essential infrastructure for socioeconomic development (Nigussie et al., 2019). Studies have elucidated the impact of the construction industry on economic growth, with some studies indicating a positive correlation between construction investment and economic expansion (Venegas-Martínez & Aali-Bujari, 2021). The construction sector is a prominent industry responsible for infrastructure design, planning, construction, and maintenance, fulfilling a crucial role in national development plans (Tlapana & Mngeni, 2021). Furthermore, the construction industry facilitates the creation of social and economic infrastructure, generates employment opportunities, and contributes to regional economic development (Xiahou et al., 2018). In summary, the construction sector is a key driver of economic growth, infrastructure development, and employment generation, making it essential for overall economic development and prosperity.

Purpose of the study

This investigation seeks to address the existing knowledge gap by examining the specific influences of Islamic Banking and Finance (IBF) in the construction sector on Indonesia's Gross Domestic Product (GDP). These sectors were strategically selected because of their substantial receipt of Islamic financing and their potential impact on the national economy. Employing a quantitative approach and the Auto Regressive Distributive Lag (ARDL) method, this study analyses secondary data from the first semester of 2006 to the first semester of 2023, obtained from Bank Indonesia, the Central Statistics Agency, and the Financial Services Authority.

LITERATURE REVIEW

Grand theory

Production theory

Production Theory, a key economic concept, explores how the interplay between capital and labour inputs influences production processes and output levels within an economy. This theory posits that the effective utilisation of financial and human resources can lead to increased productivity, efficiency, and overall output. By strategically combining these inputs, businesses can enhance their production capacity, adopt new technologies, and improve their economic performance. The theory also underscores the importance of optimising capital and labour inputs to drive economic growth and development. Shone (1975) highlights the critical role of capital and labour inputs in the production process. As explained by Robinson (1953), the production function illustrates how different combinations of capital and labour inputs can yield varying output levels. This insight allows companies to make informed decisions regarding resource allocation and production strategies. Färe (1988) discusses how the fundamental principles of Production Theory provide a framework for analysing the relationship between inputs and outputs in production. By considering the interaction of capital, labour, and technology, companies can boost their productivity and competitive edge in the market. This theory serves as a cornerstone for economic analysis, guiding businesses in their decision-making processes and resource management approaches to foster sustainable growth and development.

Finance-growth theory

The Finance-Growth Theory, also known as Finance-Growth Nexus Theory, examines the relationship between financial sector development, particularly in terms of lending and financing, and economic growth. This theoretical framework proposes that enhancements in the financial sector, such as improved credit accessibility and efficient financial systems, can stimulate economic expansion by promoting investment, entrepreneurship, and increased productivity. Beck et al. (2004) support the idea that well-functioning financial systems can help reduce external financing obstacles for companies, thereby positively affecting economic growth. The finance–growth theory highlights the critical role of financial development in driving economic expansion and promoting sustained growth. Additionally, this theory emphasises the significance of financial intermediaries in facilitating economic advancement. As observed by Trew (2008), the elements that determine the effectiveness of finance in fostering growth are fundamental to the Finance-Growth Nexus Theory. This theoretical perspective argues that financial systems are essential for providing the necessary capital for investment, innovation, and business expansion, thus contributing to overall economic development. By investigating the connection between finance and growth, the Finance-Growth Theory illuminates the mechanisms through which financial development influences economic performance and prosperity.

Endogenous growth theory

Endogenous Growth Theory is a framework in economics that emphasises the role of internal factors, such as human capital, innovation, and knowledge accumulation, in driving long-term

economic growth. Unlike traditional neoclassical growth theory, which attributes economic growth to exogenous factors such as technological progress, Endogenous Growth Theory posits that growth is endogenously determined by factors within the economic system (Jones & Manuelli, 1997). The theory suggests that investments in research and development, education, and technology can lead to sustained economic growth by increasing productivity and fostering innovation (Benjamin, 2023). By treating factors such as technological change and human capital as endogenous to the growth process, Endogenous Growth Theory highlights the significance of internal dynamics in shaping economic development (Ben, 2019). Furthermore, Endogenous Growth Theory also focuses on the concept of increasing returns to scale, wherein investments in knowledge and technology can lead to positive feedback loops that drive further growth (Becker, 2004). This perspective contrasts with the notion of diminishing marginal returns to physical capital in traditional growth models, suggesting that economies can overcome stagnation and achieve sustained growth through continuous innovation and learning (Becker, 2004). Moreover, the theory underscores the importance of human capital in driving economic growth, emphasising that investments in education and skill development are essential for enhancing productivity and competitiveness (Sieng & Yussof, 2014). Accordingly, by integrating ideas, learning, and research and development into the growth process, Endogenous Growth Theory provides a comprehensive framework for understanding the mechanisms through which economies can achieve sustainable and inclusive growth (Puaschunder, 2023).

The role of sectoral bank credit on economic growth

Timsina (2014) and Topić-Pavković et al., (2023) underscore the profound effect of bank credit allocation across economic sectors on GDP, illuminating credit's pivotal role in fostering economic expansion. These investigations particularly emphasise the private sector credit to GDP ratio as a crucial metric for gauging the influence of financial development on economic advancement. Moreover, an analysis of sector-specific credit distribution reveals how targeted financial assistance can catalyse growth in individual industries, shaping the broader economic landscape.

The construction sector's impact on economic output, examined by Saka and Adegbembo (2022) and Abubakar et al. (2018) further elucidates the intricate consequences of credit allocation. Although direct GDP effects may be variable, financial support for construction is essential in fostering infrastructure development, creating employment opportunities, and invigorating other productive sectors. This industry's expansion not only directly contributes to economic progress but also generates multiplier effects that bolster overall economic vitality and growth.

The role of financing in specific economic sector on GDP

Extensive research has been conducted on the effects of agricultural financing on economic growth and the GDP. For example, Obioma et al. (2021) examined how agricultural funding affects the performance of Nigeria's agricultural sector, demonstrating its positive effects on efficiency and effectiveness. In a related study, Rasyida et al. (2021) analysed the impact of Islamic banking finance on various sectors, including agriculture, and its contribution to Indonesia's economic growth, illuminating the connection between financing and sectoral economic development. Moreover, Putra et al. (2021) evaluated the role of conventional bank lending in Indonesia's agricultural sector, noting the growing confidence in banks to bolster agricultural business operators' capital through loans. Collectively, these studies offer valuable insights into the positive relationship between agricultural financing, sector performance, and economic growth. This body of research emphasises the crucial role of financial support in promoting agricultural development and its subsequent contribution to overall economic expansion.

Numerous studies have explored the impact of financing, particularly credit, on specific economic sectors, such as services and manufacturing, and its subsequent effects on economic growth or GDP. Research by Ajmair et al. (2016) focused on identifying the factors that contribute to the growth of the services sector in Pakistan. The evolution of modern finance and its

implications for real GDP per capita were examined by Greenwood and Scharfstein (2013) and Philippon and Reshef (2013), offering a comprehensive view of the relationship between financial development and economic expansion. In addition, Koivu (2002) investigated the acceleration of economic growth in transition economies, emphasising the connection between stock market liquidity, bank development, and overall economic progress. These investigations collectively enhance our understanding of the intricate relationships between financing, economic sectors, and GDP, providing valuable insights into the mechanisms of economic growth and the influence of financial development on specific industries.

The role of financing in the construction sector on GDP

The relationship between financing, the construction industry, and GDP has been thoroughly examined in various studies. Research conducted by Camino-Mogro and Bermúdez-Barrezueta (2021) established a positive association between construction sector productivity and access to debt and credit. The construction industry's responsiveness to economic fluctuations in both short- and long-term periods, as observed by Olanipekun and Saka (2019), demonstrates its susceptibility to financial influences. Hartarska et al. (2015) discovered a beneficial connection between credit availability and economic expansion in rural regions, highlighting the significance of financing in driving sectoral economic growth. The crucial role of financial deepening in stimulating economic progress, which is relevant to comprehending the effects of financing on construction and GDP, was underscored by Nwanna and Chinwudu (2016). Additionally, Taujiharrahman et al. (2021) investigated the financial relationships between Micro, Small, and Medium Enterprises (MSMEs) and Gross Regional Domestic Product, providing valuable insights into the connection between financing activities and regional economic output. Taken together, these findings suggest that financing, including credit and debt mechanisms, plays a pivotal role in the construction sector and significantly contributes to economic growth, as measured by GDP.

The role of Islamic bank financing in the construction sector on GDP

To the author's knowledge, no studies have directly examined the impact of Islamic Banking and Finance (IBF) on GDP within the construction sector. Nevertheless, several investigations have suggested a potential connection between IBF and GDP. The relationship between IBF, the construction industry, and economic growth has garnered attention in various research efforts. Hachichaand and Ama (2015) identified a long-term "Schumpeterian" supply leading correlation between IBF and economic expansion, as indicated by GDP. Similarly, Anwar et al. (2020) emphasise the positive effect of total deposits on GDP, which is significantly influenced by Islamic bank intermediation. In Indonesia, Rasyida et al. (2021) explored IBF's influence on the construction sector and its subsequent contribution to economic development, revealing a positive impact on both fronts. Riaz et al. (2022) demonstrated a strong positive association between industrial production indices, Islamic bank deposits and financing, and gross fixed capital formation, while noting a negative significant relationship with trade openness, indicating Islamic finance's effect on real sector growth. In Malaysia, Tekin (2021) analysed the connection between Islamic finance and industrial production, concluding that Islamic finance plays a crucial role in boosting industrial output in both short and long terms. Farrasanandand and Darwant (2021) also found evidence supporting the positive and essential long-term role of Islamic finance in economic growth and capital accumulation. Notably, econometric models employing the ARDL methodology are instrumental in predicting the impact of one variable on another in economics. The ARDL approach is particularly valuable for examining the dynamic relationships between economic variables over time. By capturing both short- and long-run effects within a single framework, ARDL models offer a comprehensive understanding of how changes in one variable can influence another in the economy (Meyer, 2019).

METHODOLOGY

Research approach

Quantitative research approaches are commonly utilised in studies that analyse and quantify relationships, patterns, and trends within specific contexts. In the banking sector, quantitative research involves collecting and analysing numerical data to understand the impact of sectoral bank credit allocation on economic indicators such as GDP growth. Studies by Buallay (2019) and Wahyudi et al. (2021) have employed quantitative approaches, utilising data analysis techniques such as pooled data analysis and panel regression analysis to examine the relationship between bank credit allocation to sectors such as construction and their influence on GDP.

Variables and data

Table 1 provides a detailed overview of the variables used in the study, where the data were gathered semi-annually from the first semester of 2006 to the first semester of 2023. Real GDP, measured in billion rupiah, serves as the dependent variable and is sourced from the Indonesian Financial and Economic Statistics published by Bank Indonesia. The main independent variables include IBF Construction (IBFCS), denominated in billion rupiah and sourced from Indonesian Islamic Bank Statistics provided by the Indonesian Financial Services Authority. The control variables in the study consist of the Islamic Financial Margin Fee for Productive Financing (IFMF), expressed as a percentage, Total Direct Investment (TDI) in billion rupiahs, and the Human Development Index (HDI) measured in index units. IFMF and TDI data are obtained from the same sources as GDP, while HDI data are sourced from the Indonesian HDI table, courtesy of the Indonesian Statistic Agency.

Table 1: Description of variable

Symbol of Variable	Kind of Variable	Definition	Unit	Document Sources	Data Publisher
GDP	Dependent Variable	Real Gross Domestic Product	Billion Rupiah	Indonesian Financial and Economic Statistics	Bank Indonesia
IBFCS	Main Independent Variable	Islamic Bank Financing in Construction	Billion Rupiah	Indonesian Islamic Bank Statistics	Indonesian Financial Services Authority
IFMF	Control Variable	Islamic Bank Financing Margin Fee for Productive Financing	Percent	Indonesian Islamic Bank Statistics	Indonesian Financial Services Authority
TDI	Control Variable	Total Direct Investment	Billion Rupiah	Indonesian Financial and Economic Statistics	Bank Indonesia
HDI	Control Variable	Human Development Index	Index Unit	Indonesian HDI table	Indonesian Statistic Agency

Control variable

The inclusion of control variables is crucial in economics research, as they help account for potential confounding factors and ensure the accuracy and reliability of the analysis. Control variables are additional factors included in a statistical model to isolate the relationship between the independent and dependent variables of interest.

Islamic bank margin fee

The Islamic Financial Margin Fee (IFMF) is a key metric for assessing capital costs in Islamic banking, analogous to the interest rates in traditional financial institutions. This fee encompasses the expenses that borrowers must bear when seeking funds from Islamic banks, substantially

influencing the overall capital expenditure for both corporations and individuals. While conventional banks use interest rates to denote borrowing costs, Islamic banks employ margin fees to signify the price of capital for those utilising their financial services. A comparative analysis by Zarrouk et al. (2016) explored the profitability drivers of Islamic and conventional banks, revealing commonalities in the factors that contribute to their financial success. This finding implies that the elements affecting Islamic bank profitability, including the margin fee as a capital cost component, may correspond to those affecting conventional banks. Moreover, Zulkhibri (2018) conducted an examination of monetary policy's influence on Islamic Banking and Finance (IBF) in Malaysia, demonstrating that Islamic banks respond to interest rate fluctuations that parallel those of their conventional counterparts.

Direct investment

In Indonesia, both Foreign Direct Investment (FDI) and Domestic Direct Investment (DDI) are essential drivers of GDP growth, contributing significantly to the country's economic expansion and progress. Faizah et al. (2019) examined the impact of DDI on Indonesia's economic development, highlighting the critical role of capital expenditures as a moderating factor in this relationship. Importantly, the influx of direct investment, whether from domestic or foreign sources, provides capital to the economy, resulting in expanded production, upgraded infrastructure, and improved productivity, all of which foster GDP growth. The factors influencing foreign investment, as investigated by Fathia et al. (2021) and Cahyaningsih (2016), are crucial in shaping Indonesia's investment environment. Specifically, elements such as inflation rates, interest rates, GDP growth, and export values affect a country's appeal to international investors.

Human development index

The Human Development Index (HDI) plays a pivotal role in boosting Indonesia's GDP by fostering socioeconomic advancement and improving overall well-being. As a composite measure encompassing indicators such as longevity, educational attainment, and income level, the HDI serves as a barometer for assessing a country's quality of life and human capital development. Research conducted by Dreher (2006) and Samimi and Jenatabadi (2014) highlighted the positive correlation between human development and economic growth, emphasising the importance of education, life expectancy, and other human capital elements in driving economic progress. By allocating resources to education, healthcare, and social welfare initiatives, Indonesia can strengthen its human capital base, leading to a more competent workforce, increased productivity, and consequently, economic expansion.

Method analysis

Auto regressive distributed lag and conditional error correction model

The ARDL approach is used to investigate long-run and short-run relationships among variables, while the Conditional Error Correction Model (CECM) concentrates on the short-term dynamics of variables as they converge towards their long-run equilibrium. By combining these methods, researchers gain comprehensive insight into the dynamic interactions of economic variables. The ARDL technique is particularly useful for assessing cointegration relationships and examining the long-term effects of variables, allowing the exploration of both symmetric and asymmetric variable associations. In conjunction with this, the CECM captures the short-term adjustments of variables as they move towards their long-run equilibrium, which is crucial for understanding the immediate impacts of variable changes or shocks on the system's stability. Researchers frequently employ both the ARDL method and CECM to conduct thorough analyses of economic relationships. For example, Ahmed et al. (2020) employed the ARDL model to examine symmetric relationships and the Non-Linear ARDL (NARDL) model to study asymmetric relationships among variables. Similarly, Yorucu (2016) implemented Granger causality tests within the CECM framework when

level relationships were identified, demonstrating how both approaches can be integrated to analyse economic dynamics.

The analysis incorporates both the ARDL method and CECM to gain a comprehensive understanding of how IBF and the construction sector interact and influence Indonesia's GDP growth. ARDL serves as a robust tool for examining short- and long-term relationships between variables. Mehmood et al. (2021) employed ARDL to investigate symmetric and asymmetric connections, offering a detailed perspective on variable interactions. The ARDL approach also enables the assessment of cointegrating relationships and long-term variable dynamics, which are crucial for understanding the lasting effects of the IBF on the construction sector and its long-term contribution to GDP growth. Additionally, ARDL is well suited for studying the economic impact of infrastructure investments, such as airport facilities, as shown by Campos (2023). This demonstrates ARDL's versatility of ARDL in capturing the intricate dynamics of economic variables and their influence on GDP growth. The inclusion of CECM complements ARDL by capturing short-term adjustments of variables towards their long-term equilibrium. The CECM is particularly useful for understanding how quickly the construction sector adapts to deviations from its long-term growth trajectory due to IBF. For instance, Etukafia et al. (2017) used the CECM to estimate the immediate and long-term effects of FDI on manufacturing sector growth, providing insights into FDI's short-term and sustained impacts on sectoral growth. Similarly, Yorucu (2016) applied the CECM to analyse the immediate and long-term effects of tourist arrivals on CO2 emissions, showing the CECM's ability to capture both the short-term and enduring impacts of variables on economic outcomes.

Limitation of ARDL

The Autoregressive Distributed Lag (ARDL) technique is a frequently employed econometric tool for assessing the connections between variables over short and long periods. However, researchers must be cognizant of various constraints when implementing this approach. A critical limitation of ARDL is its responsiveness to lag length selection. The determination of an appropriate lag length is vital because it can profoundly affect the analytical results. Bahaman-Oskooee et al. (2021) caution that an improper lag length may lead to distorted parameter estimates and erroneous interpretations of variable relationships. Insufficient lag length risks omitting crucial data, whereas excessive lag length could introduce extraneous noise into the model. Furthermore, a significant drawback of the ARDL method is its presumption regarding the integration order of the variables. ARDL is solely applicable to variables that are either I(0) or I(1), indicating that they must be stationary or integrated of order one. The method proves ineffective when handling I(2) variables or those integrated of order two (Shrestha & Semmler, 2014). This restriction curtails the utility of the ARDL method in specific empirical situations where variables might exhibit higher-order integration.

Explanation of variables and symbols

In the CECM equations provided for Models 1, 2, and 3, the variables and symbols represent specific economic measures and mathematical coefficients that play distinct roles in the econometric analysis. A detailed explanation of each is as follows.

- GDP: Gross Domestic Product, measured in billion rupiah, serves as the dependent variable, representing the market value of all final goods and services produced within a country.
- IBFCS: Islamic Bank Financing in Construction, denoted in billion rupiah, represents financing from Islamic banks for construction activities.
- IFMF: Islamic Financial Margin Fee, expressed as a percentage, is a control variable that indicates the profit margin of Islamic banks.

- TDI: Total Direct Investment, measured in billion rupiah, is a control variable that accounts for the total investments made directly in the economy.
- HDI: Human Development Index, an index unit, serves as a control variable, and is a composite statistic of life expectancy, education, and per capita income indicators.
- ECT: The Error Correction Term captures the previous period's deviation from the long-run equilibrium.
- α: The speed of the adjustment coefficient indicates how quickly variables return to equilibrium after a shock.
- δ: Short-term coefficients for lagged changes in the dependent variable, demonstrating the impact of its own previous values on its current change.
- θ: Immediate impact coefficients of changes in the independent and control variables on the change in GDP.
- ψ: The coefficients for the lagged changes in each independent and control variable, indicating the influence of their past values on the current change in GDP.
- ε: The error term represents random fluctuations in GDP that are not explained by the model.

The model's equation integrates the variables in a way that allows the estimation of both short-term impacts and long-term adjustments to the equilibrium. The lagged variables (denoted by the t-i subscript) allow the models to consider not just the immediate effects of changes in the variables but also how past changes continue to influence GDP. This holistic approach facilitates a nuanced understanding of economic dynamics.

Model development

The basic econometric model created in this study, based on the description above, is shown in Equation 1. Equation 1 illustrates that GDP is a function of capital (IBFCS), cost of capital (IFMF), Human Capital (HDI), and investment (TDI). The model is based on Endogenous Growth Theory.

Endogenous Growth Theory offers crucial insights into the roles of capital, human development, and direct investment in shaping GDP. This theoretical framework posits that economic growth is not exclusively driven by external factors, such as technological progress, but is also substantially influenced by internal economic dynamics (Munir & Arshad, 2018). A key component of this theory is human capital, which encompasses the collective knowledge, skills, and abilities of a population. Human capital is viewed as a fundamental catalyst for economic growth (Elakkad, 2024). Investments in education and training can enhance human capital, leading to increased productivity and innovation, which, in turn, fosters long-term economic development (Alkousini 2020). The theory also underscores the significance of capital accumulation, including physical assets such as infrastructure and machinery, in promoting sustained economic growth (Al-Jabsheh et al., 2021). Private investment is a crucial driver of long-term economic expansion, contributing to enhanced productivity and efficiency within the economy (Mehrara & Rezaei, 2015). By directing resources towards productive endeavours, investments in physical capital can stimulate economic growth and elevate overall GDP (Duwal, 2023). Moreover, the theory emphasises the role of FDI in propelling economic growth through mechanisms such as technology transfer, knowledge spillovers, and capital formation (Zulkifli, 2024). FDI can significantly contribute to human capital development by facilitating skill acquisition and technological advancement, thereby boosting productivity and GDP growth (Rahim, 2023). The influx of foreign capital can enhance efficiency and competitiveness, ultimately improving economic performance (Liu et al., 2009).

Research has shown that IBF contributes positively to GDP, especially in nations such as Indonesia. Evidence suggests that IBF is crucial in boosting economic expansion by directing

funds towards productive economic sectors (Anggraini, 2019). In Indonesia, the role of Islamic banks as intermediaries that facilitate the transfer of funds from surplus to deficit units has been shown to strengthen the economy (Bella, 2023). Islamic finance has been linked to enhancements in economic activity, job creation, and overall economic performance (Setiawan, 2019).

Conversely, studies have indicated that investment, including FDI, can aid the growth of various Indonesian sectors, resulting in improvements to the real economy (Asnawi et al., 2020). The beneficial effects of FDI on economic growth have been emphasised, indicating the importance of investment in stimulating GDP growth and promoting economic development (Hardi et al., 2021).

As a key metric for assessing a nation's social and economic progress, the Human Development Index (HDI) offers valuable perspectives on overall development (Anggraini, 2019). This index emphasises the importance of human advancement in conjunction with GDP, underscoring the necessity of evaluating factors beyond economic output when gauging societal well-being and progress (Rasyida et al., 2021). Research has also revealed a direct link between HDI and economic growth, demonstrating HDI's substantial impact on per capita GDP (Andrean & Mukhlis, 2021).

In the Indonesian context, interest rates or capital costs, particularly IBF margin fees, can exert a notable influence on GDP. Research has shown that interest rates significantly shape the financing activities of Islamic banks within a country (Khalidin & Masbar, 2017). The interplay between interest rates and IBF has been investigated, revealing the indirect impact of interest rates on financing provided by Islamic banks in Indonesia (Khalidin & Masbar, 2017). Furthermore, studies have revealed that the effect of interest rates on Islamic banking financing plays a significant role in influencing real production (Nursyamsiah, 2017).

$$GDP = IBFCS + IFMF + TDI + HDI. \qquad (Equation\ 1)$$

ARDL Models

Equation 2 states the General ARDL Model as follows:

$$\Delta y_t = \alpha + \sum_{i=1}^{p} \phi_i \Delta y_{t-i} + \sum_{j=1}^{q} \theta_{1j} \Delta_{xjt} + \sum_{j=1}^{q} \theta_{2jxj,t} + \varepsilon_t. \qquad (Equation\ 2)$$

The ARDL model plays a crucial role in elucidating how present fluctuations in a dependent variable are influenced by its historical values and those of various independent variables. Short-term dynamics are captured through the inclusion of first differences of the dependent variable, while immediate effects are accounted for by incorporating first differences of the independent variables. Concurrently, the model integrates long-term equilibrium relationships by utilising lagged levels of the independent variables. This framework enables the concurrent examination of short-term disruptions and long-term adaptations without requiring variable stationarity. Consequently, the applicability of the model to real-world scenarios is greatly enhanced, particularly in situations where preliminary unit root testing is unfeasible.

Conditional Error Correction Model (CECM)

Equation 3 states the Conditional ECM based on ARDL as follows:

$$\Delta y_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta y_{t-1} + \sum_{j=1}^{q} \gamma_{1j} \Delta x_{jt} + \gamma_2 (y_{t-1} - \sum_{j=1}^{q} \delta_j x_{j,t-1}) + \eta_t. \qquad (Equation\ 3)$$

This model integrates the Error Correction Term (ECT) $y_{t-1} - \sum_{j=1}^{q} \delta_j x_{j,t-1})$ that reflects the long-term equilibrium relationship (from ARDL estimation) into the short-term dynamics of the ARDL model. β_i and γ_{1j} are the short-term adjustment coefficients for the dependent and independent variables, respectively, while γ_2 captures the speed of adjustment towards equilibrium. η_t is the stochastic error term.

For the ARDL model, Equation 3 would be structured to analyse how the current changes in GDP are influenced by its own previous values and the past values of the independent variables. This equation can be written as follows:

$$\Delta GDP_t = \alpha + \sum_{i=1}^{p} \phi_i \Delta GDP_{t-i} + \sum_{j=1}^{q} \theta_{ij} \Delta GDP_{t-i} + \theta_{1j} \Delta IFMF_{jt} + \theta_{1j} \Delta TDI_{jt} + \theta_{1j} \Delta HDI_{jt} + \sum_{j=1}^{q} \theta_{2j} \Delta IBFCS_{jt-i} + \theta_{2j} IFMF_{jt} + \theta_{2j} TDI_{jt} + \theta_{2j} HDI_{jt-1} + \in_t. \quad \text{(Equation 3)}$$

This model captures both the short-term dynamics and long-term equilibrium relationships between the variables.

For the CECM, which incorporates the ECT to adjust for deviations from the long-term equilibrium, Equation 4 is set as follows:

$$\Delta GDP_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta GDP_{t-i} + \sum_{j=1}^{q} \gamma_{1j} \Delta IBFCS_{jt} + \gamma_{1j} \Delta IFMF_{jt} + \gamma_{1j} \Delta TDI_t + \gamma_{1j} \Delta HDI_t + \gamma_2 (GDP_{t-i} - (\delta_1 IBFCS_{jt-1} + \delta_2 IFMF_{jt-1} + \delta_3 TDi_{jt-1} + \delta_4 TDi_{jt-1} + \delta_4 HDi_{jt-1}) + \eta_t. \quad \text{(Equation 4)}$$

This equation helps capture the speed at which adjustments are made towards equilibrium, focusing on both short- and long-term adjustments. In implementing these models, the number of lags, \(p \) and \(q \), should be selected based on statistical criteria, such as the Akaike Information Criterion (AIC). The parameters in these models must be estimated using the EViews econometric software. Moreover, it is crucial to ensure stationarity of the variables. Meanwhile, the ARDL model allows for the mixing of I(0) and I(1) variables, including I(2) variables, which is generally not advisable. This approach offers a robust method for analysing how these economic and financial variables interact over time, capturing both immediate impacts and adjustments towards long-term relationships.

RESULT

Unit root test result

Table 2 presents the unit root test results of all variables, as we cannot reject the null hypothesis of a unit root presence. However, after differencing the series (as indicated by D( ) in the 'ADF First Difference Individual Intercept' and 'ADF First Difference Individual Intercept and Trend' columns), the p-values drop sharply to 0.0000. This indicates strong results from the Augmented Dickey-Fuller (ADF) tests, confirming the stationarity of the various time series data. Initially, the 'Intermediate ADF test results' and the 'ADF Level Intercept and Trend' columns reveal high p-values, suggesting that the time series are non-stationary in their original forms and suggesting stationarity. This indicates that the original series has a unit root but becomes stationary when the first differences are recorded, which is a prerequisite for many time-series modelling techniques. The unusually large t-statistic value for D(LOGTIBF) could be a data entry error or an extreme value that requires further investigation.

Table 2: Unit root test

Intermediate ADF test results			ADF Level Intercept and Trend		
Series	**t-Stat**	**Prob.**	**Series**	**t-Stat**	**Prob.**
HDI	-0,993	0,744	HDI	-1.744	0,709
IFMF	-1.139	0,687	IFMF	-1.686	0,734
LOGIBFCS	-1.091	0,707	LOGIBFCS	-1.928	0,617
LOGIBFTRHR	-0,882	0,781	LOGIBFTRHR	-1.744	0,708
LOGRGDP	-0,579	0,861	LOGRGDP	-2.349	0,395
LOGTDI	-1.708	0,418	LOGTDI	-1.786	0,689
LOGTIBF	-2.037	0,269	LOGTIBF	-1.267	0,877
ADF First Difference Individual Intercept			**ADF First Difference Individual Intercept and Trend**		
Series	**t-Stat**	**Prob.**	**Series**	**t-Stat**	**Prob.**
D(HDI)	-5.594	0.00000	D(HDI)	-5.666	0.0000
D(IFMF)	-7.725	0.00000	D(LOGIBFBUSSERVC)	-4.414	0,007
D(LOGIBFCS)	-4.545	0.0010	D(LOGIBFTRHR)	-4.057	0,016
D(LOGRGDP)	-8.593	0.00000	D(LOGRGDP)	-8.442	0.0000
D(LOGTDI)	-6.190	0.00000	D(LOGTDI)	-6.116	0.0000
D(LOGTIBF)	-613.386	0.0000	D(LOGTIBF)	-6.596	0.0000

Bound Test Result

Table 3 showcases the F-statistic from a cointegration test on the 'IBFCS on GDP model,' which is used to assess whether there is a long-run relationship between the 'IBFCS' series and GDP. The F-statistic of 3.560346 was compared against various critical values at different significance levels for two models: I(0), indicating no unit root, and I(1), indicating a single unit root. At the 10% level, the F-statistic exceeds the critical value for both I(0) and I(1), suggesting evidence of cointegration. However, at the 5% and 1% levels, the F-statistic falls below the critical value, implying that the evidence for cointegration is weaker. The 'Asymptotic I(0)' and 'Asymptotic I(1)' values represent the asymptotic critical values, against which the F-statistic does not exhibit cointegration. Overall, although there may be some indication of a long-run equilibrium relationship at less strict levels, stronger evidence is not found at more conventional significance levels.

Table 3: Bound test result

Test Section	IBFCS on GDP model
F-statistic	3.560346
Critical Value I(0) at 10%	2.525
Critical Value I(1) at 10%	3.56
Critical Value I(0) at 5%	3.058
Critical Value I(1) at 5%	4.223
Critical Value I(0) at 1%	4.28
Critical Value I(1) at 1%	5.84
Asymptotic I(0)	2.2
Asymptotic I(1)	3.09

Conditional error correction model result/short-term estimation

The results from Table 4 of the CECM/Short-Term ARDL Estimation present a nuanced view of the short-term dynamics between the IBFCS and GDP growth in Indonesia. In this model, several variables were estimated to understand their impact on GDP. Notably, the lagged log of

real GDP (LOGRGDP(-1)) exhibits a significant negative coefficient of -1.035, with a standard error of 0.228 and a t-statistic of -4.525, indicating a robust negative impact on GDP in the short run, with a probability of error (p-value) of 0.003. This suggests that previous GDP values are inversely related to current GDP, highlighting possible adjustments or corrections from past economic conditions.

The variable of primary interest, Lagged Islamic Bank Financing in the Construction Sector (LOGIBFCS(-1)), has a positive coefficient of 0.257 with a standard error of 0.117 and a t-statistic of 2.196, which is statistically significant at the 0.042 level. This finding indicates a positive short-term influence of Islamic financing on GDP in the construction sector, although the effect is modest.

The variable LOGIBFCS(-1), which represents the log-transformed IBFCS from the previous period, exhibits a positive relationship with GDP in the short term. The coefficient of 0.257 indicates the magnitude of this relationship, suggesting that a 1% increase in the IBFCS from the previous period is associated with an approximate 0.257% increase in GDP, all else being equal. A standard error of 0.117 provides an estimate of the variability or uncertainty around the coefficient. Meanwhile, a smaller standard error indicates more confidence in the precision of the estimated coefficient, whereas a larger standard error suggests more variability. A t-statistic of 2.196 was used to assess the hypothesis that the coefficient is significantly different from zero. It was calculated as the ratio of the coefficient to its standard error. The larger the absolute value of the t-statistic, the stronger the evidence against the null hypothesis (that the coefficient is zero). A t-statistic of 2.196 indicates a statistically significant result.

Finally, a probability value (p-value) of 0.042 is crucial for determining statistical significance. It represents the probability of observing a t-statistic as extreme as, or more extreme than, the one calculated if the true coefficient was zero (no effect). A p-value of 0.042, which is less than the conventional threshold of 0.05, suggests that there is statistically significant evidence to reject the null hypothesis. Thus, the positive coefficient of LOGIBFCS(-1) is statistically significant, indicating a positive effect of previous IBFCS on current GDP. However, the effect is described as modest since the coefficient itself is relatively small, suggesting that the impact, while positive, is not very large.

Other control variables, such as IFMF for Productive Financing and TDI, display mixed results. The lagged IFMF(-1) variable, for instance, has a non-significant impact in its direct form but produces a significant negative impact when first-differenced (D(IFMF(-1)) with a coefficient of -0.467 and a p-value of 0.015. This could suggest that changes in Islamic financing costs negatively affect GDP in the short term. Similarly, TDI's direct lagged effect is not significant, but its dynamics indicate complex interactions in the investment climate that affect the GDP.

HDI, another control variable, consistently demonstrates no significant direct or short-term impact on GDP growth, with its differenced forms also remaining statistically insignificant. This could imply that broader development factors may exert a more lagged or indirect influence on economic output than financial and investment variables.

In summary, Table 4 suggests that the IBFCS does have a positive influence on GDP in the short term, although the magnitude of this effect is relatively modest. However, broader economic conditions reflected by past GDP values and changes in financing costs seem to play more substantial roles, indicating the complex interplay of economic factors influencing short-term GDP dynamics in Indonesia.

Table 4: Conditional error correction model result/short-term ARDL estimation

Model IBFCS on GDP				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LOGRGDP(-1)*	-1.035	0,228	-4.525	0.003
LOGIBFCS(-1)	0.257	0,117	2.196	0.042
IFMF(-1)	0.187	0,187	0,998	0.332
LOGTDI(-1)	0.332	0,164	2.024	0.059
HDI(-1)	-0.079	0,217	-0,365	0.719
C	1.368	1.621	0,844	0.410
D(LOGIBFCS)	0.165	0,098	1.683	0.110
D(LOGIBFCS(-1))	-0.155	0,15	-1.029	0.317
D(IFMF)	-0.354	0,167	-2.115	0.049
D(IFMF(-1))	-0.467	0,174	-2.683	0.015
D(LOGTDI)	0.267	0,193	1.381	0.185
D(LOGTDI(-1))	-0.095	0,189	-0,504	0.620
D(HDI)	-0.103	0,202	-0,51	0.616
D(HDI(-1))	-0.054	0,121	-0,451	0.657

Error correction term

Table 5 presents the coefficient of the ECT from the IBFCS on the GDP model, which measures how quickly the variables return to equilibrium after a shock. The coefficient of ECT, denoted as COINTEQ*, is -1.035, indicating that deviations from the long-run relationship are corrected by approximately 103.5% in each period. The t-statistic of -5.257, with a p-value of 0.000, strongly suggests that this ECT is statistically significant. Thus, the negative sign and significance of the ECT imply that any short-term disequilibrium in the model will be adjusted relatively quickly back towards the long-run equilibrium.

Table 5: Error correction term

Model of IBFCS on GDP				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
COINTEQ*	-1.035	0.196	-5.257	0.000

Long-term estimation

In the Long Run or Cointegration Estimation provided in Table 6, the coefficients derived from the model analysing the impact of IBFCS on Indonesia's GDP are reported. The lagged value of IBFCS, LOGIBFCS(-1), has a positive coefficient of 0.248, which is statistically significant with a t-statistic of 2.561 and a probability of 0.016. This result indicates that the historical values of IBF have a significant positive long-term impact on GDP.

Furthermore, the TDI coefficient (LOGTDI(-1)) is also positively related to GDP, with a coefficient of 0.321 and a t-statistic of 2.313, and is significant at the 0.028 level. This finding suggests a robust contribution of direct investments to economic growth in the long run. Conversely, the HDI at lag one, HDI(-1), exhibits a negative coefficient of -0.076. However, this relationship was not statistically significant, as indicated by a t-statistic of -0.367 and a high probability of 0.716. IFMF at lag one, IFMF(-1), also displays a positive coefficient of 0.18. However, this is not significant, with a probability value of 0.317, suggesting that margin fees have a negligible long-term impact on GDP.

The constant term (C) in the model was reported to have a coefficient of 1.321. Nevertheless, it is not statistically significant ($p = 0.395$), indicating that it does not substantially contribute to explaining the long-term variance in GDP within the framework of this model. These

results collectively emphasise the significant roles that specific financial and investment factors play in shaping the long-term economic landscape. However, some traditionally important variables, such as human development, do not exhibit significant impacts.

Table 6: Long run or cointegration estimation

Model of IBFCS on GDP				
Variable *	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LOGIBFCS(-1)	0.248	0.097	2.561	0.016
IFMF(-1)	0.18	0.177	1.018	0.317
LOGTDI(-1)	0.321	0.138	2.313	0.028
HDI(-1)	-0.076	0.208	-0,367	0.716
C	1.321	1.531	0,863	0.395

Diagnostic test result

Table 7 summarises various diagnostic tests for the 'IBFCS on GDP' model, aiming to validate the model's integrity and the assumptions of regression analysis. The Breusch-Godfrey Serial correlation LM test, which checks for autocorrelation in the residuals, produces an F-statistic of 0.672 with a probability of 0.525 and an Obs*R-squared of 2.550 with a chi-square probability of 0.279, suggesting no significant serial correlation. The Jarque-Berra test for normality of residuals returns a value of 1.109 with a probability of 0.574, indicating that the residuals are normally distributed. The R-squared value was 0.814, with an adjusted R-squared of 0.672, demonstrating a good fit for the model. The Ramsey RESET test for the model specification yields a t-statistic of 0.398 and an F-statistic of 0.158, both with probabilities of 0.695, suggesting that the model has no omitted variables. Finally, the CUSUM and CUSUM Square tests indicate stability, indicating that the model's coefficients are stable over time.

Table 7: Diagnostic test result

Model IBFCS on GDP			
F-statistic	0.672	Prob. F(2,15)	0.525
Obs*R-squared	2.550	Prob. Chi-Square(2)	0.279
Jarque Berra Value			
JB Value	1.109	Prob	0.574
R-squared	0.814	Adjusted R-squared	0.672
Ramsey Reset Test			
Ramsey Reset Test	Value	df	Probability
t-statistic	0.398	16	0.695
F-statistic	0.158	(1.16)	0.695
CUSUM and CUSUM SQUARE Test			
CUSUM Test	stable	CUSUM Square	stable

Figure 1 provides an overview of the CUSUM and CUSUM Square tests. Both images illustrate that the blue residual line between the red lines represents the confidence level.

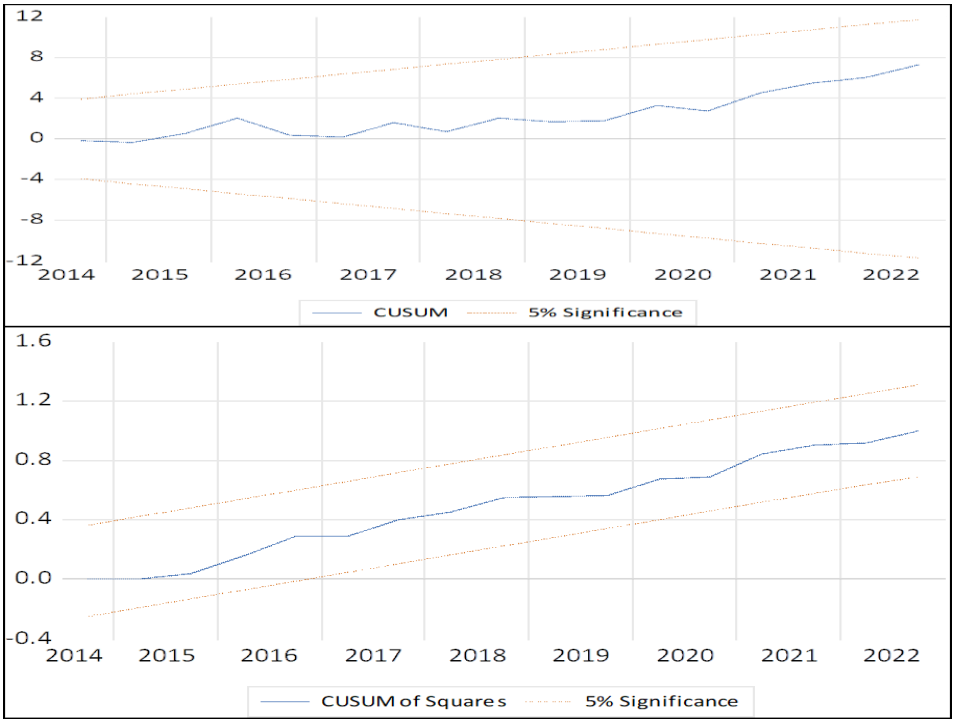

Figure 1: CUSUM and CUSUM square model IBFCS on GDP

Key findings

The econometric analysis presented in Tables 2 through 7 investigates the impact of the IBF on the GDP of Indonesia's construction sector using the ARDL method. The ADF test results provided in Table 2 indicate that most variables, such as HDI, IFMF, and various financial logs, are initially non-stationary at levels but become stationary after differencing, suggesting that they are integrated of order 1, I(1). This is critical, as it validates the use of these variables in the ARDL framework.

Table 3's Bound Test results reveal that the F-statistic meets the upper bound critical value at the 10% significance level, suggesting the existence of a long-term cointegrating relationship among the variables. This is fundamental for applying cointegration and error-correction techniques in the ARDL approach. In Table 4, the CECM presents both the short-run dynamics and adjustments towards the long-term equilibrium. Notably, significant variables such as LOGRGDP(-1) and LOGIBFCS(-1) imply that previous levels of GDP and Islamic finance in the construction sector influence the current period's GDP adjustments, with the negative coefficient of LOGRGDP(-1) indicating a corrective downward adjustment from previous periods.

Moreover, the ECT in Table 5, with a significant negative coefficient of -1.035, indicates that deviations from the long-term equilibrium are corrected rapidly at a rate of over 100% per year. This reflects a dynamic and responsive relationship between financing in the construction sector and GDP. Table 6 extends this analysis to long-term cointegration estimations, where positive and significant coefficients for variables such as LOGIBFCS(-1) and LOGTDI(-1) accentuate the positive influence of Islamic finance and TDI on GDP in the long run.

Lastly, the diagnostic tests in Table 7 indicate a high R-squared value of 0.814, suggesting a good fit of the model to the data, and stability tests such as CUSUM confirm the model's stability. However, the Ramsey Reset Test indicates potential specification errors, although these are not statistically significant.

ANALYSIS AND DISCUSSION

Production theory analysis

Production Theory delves into the interplay between capital and labour inputs, which is fundamental to driving productivity and economic growth. Researchers such as Shone (1975), Robinson (1953), and Färe (1988) explored how various combinations of these inputs impact output levels. A crucial lesson from their research was the necessity of optimal resource allocation. By skilfully managing capital and labour, organisations can not only maximise production but also innovate and adapt, thus strengthening their competitive position in the market. This theory is particularly pertinent in today's technology-centric economy, in which the integration of cutting-edge technologies often demands significant capital investment and a skilled workforce. The practical application of this theory is evident in sectors such as manufacturing and technology, where efficiency gains from capital-intensive automation and skilled labour have led to substantial increases in output and reductions in operational costs.

Finance-growth theory analysis

The Finance-Growth Theory, as explained by Beck et al. (2004) and Trew (2008), emphasises the crucial importance of financial development in driving economic growth. This suggests that the availability of financial services, particularly credit, enables investment and entrepreneurship, which are essential for economic expansion. Studies have shown that well-functioning financial systems improve resource allocation, lower transaction costs, and foster an environment that promotes innovation and economic vitality. The relationship between finance and growth underlines the importance of financial intermediaries for supporting economic stability and promoting sustained economic development. Furthermore, the capacity of financial systems to drive growth highlights the necessity of policy frameworks that promote financial inclusion and stability.

Sector-specific credit and economic growth

Timsina (2014) and Topić-Pavković et al. (2023) demonstrate the substantial impact of credit allocation across different sectors on economic expansion. The way bank loans are distributed among industries, such as agriculture, construction, and services, directly affects GDP growth by facilitating capital improvements and innovation in these areas. For example, when the construction industry receives financial support for infrastructure projects, it not only provides an immediate boost to the economy but also creates a foundation for future economic activities. Similarly, as discussed by Obioma et al. (2021) and Putra et al. (2021), the agricultural sector employs financing to boost productivity and efficiency, thereby contributing to long-term economic sustainability.

Islamic bank financing and the construction sector

Research by Hachicha and Ben Amar (2015) and Rasyida et al. (2021) highlights the unique influence of IBF in the construction industry, offering a fresh perspective on economic growth driven by financial systems. The principles of Islamic finance, which prohibit interest (Riba) and adhere to Sharia law, promote not only profitable ventures but also those that are ethically sound and socially responsible. Furthermore, the notable impact of the IBF on construction activities suggests that this financial model can play a crucial role in fostering economic development, especially in areas where traditional banking is less prevalent. This emphasises the potential of Islamic finance as a framework for sustainable and fair economic progress.

Short-term impact of IBF in construction on GDP in Indonesia

An examination of the CECM results reveals a complex relationship between Islamic financing in the construction sector (IBFCS) and Indonesia's GDP in the short term. This study indicates that previous-period IBFCS levels, denoted by LOGIBFCS(-1), have a positive influence on GDP, with a statistically significant coefficient of 0.257 ($p = 0.042$). This finding suggests that higher past

financing levels contribute to increased economic output, likely through construction-related economic stimulations.

In contrast, the immediate changes in the IBFCS, represented by D(LOGIBFCS) and its lagged term D(LOGIBFCS(-1)), present a more ambiguous picture. While D(LOGIBFCS) showed a positive coefficient of 0.165, it lacked statistical significance ($p = 0.110$). This implies that although increases in financing might boost GDP, the effect is not consistently strong in the short term. Similarly, the financing change from the two periods prior, D(LOGIBFCS(-1)), yields a negative coefficient of -0.155, which is also statistically insignificant ($p = 0.317$). These findings suggest that short-term fluctuations in Islamic financing do not reliably impact GDP, possibly because of the extended timelines associated with construction projects that may exceed the short-term analysis period.

The results emphasise the necessity of steady and ongoing investment in the construction industry through Islamic financing to stimulate economic expansion. Inconsistent or highly variable investment patterns seem to have a reduced immediate economic advantage, stressing the importance of financial stability in maximising its effect on economic progress. IBF has been shown to have a notable influence on GDP in the near term. Research indicates that IBF positively affects economic growth, particularly in the short term (Hachicha & Ben Amar, 2015). Hachicha and Ben Amar (2015) found that Islamic banks participate in non-collaborative activities that generally have a short-term impact on economic growth, supporting the idea of the IBF's positive short-term effect on GDP. Moreover, Zulkhibri and Sukmana (2016) noted the rapid growth of Islamic banks in Indonesia, leading to a significant rise in deposit growth and high liquidity, suggesting a short-term positive impact on GDP. Ibrahim and Sufian (2014) also highlighted the theoretical plausibility of nominal financing's price elasticity, indicating a short-term positive effect on GDP. Saleem et al. (2021) explored the short-term connection between the Islamic financial sector and sustainable economic growth, revealing a short-term positive influence of Islamic debt and the Islamic equity market on GDP (Saleem, Sági, & Setiawan, 2021). Putriani et al. (2021) showed that total financing contributes positively to investment in the long term, implying a short-term positive impact on GDP (Putriani et al., 2021). Gani and Bahari (2021) reveal a two-way relationship between Islamic banking deposits and Malaysian GDP, suggesting a short-term positive effect of Islamic banking on GDP. Abusharbeh (2020) demonstrated that any short-run shock in GDP, inflation, and bank size results in a long-term relationship with IBF, indicating a short-term positive impact on GDP (Abusharbeh, 2020). Finally, Naz and Gulzar (2023) verified that GDP growth is positively correlated with the volume of Islamic banking, confirming a short-term positive impact on GDP (Naz & Gulzar, 2023).

Long-term impact of IBF in construction on GDP in Indonesia

The ARDL cointegration estimation in Table 6 reveals the long-term relationship between the IBFCS and Indonesia's economic growth. The LOGIBFCS(-1) variable shows a statistically significant coefficient of 0.248 (standard error: 0.097, t-statistic: 2.561, p-value: 0.016), indicating that continued Islamic financing in the construction sector positively influences long-term economic expansion. Table 6 also demonstrates that while IBFCS and direct investments significantly drive GDP growth over time, factors such as HDI and Islamic financing margin fees do not show substantial long-term effects within the current model.

Several studies support the long-term positive impact of IBF on GDP. Research has shown a long-run "Schumpeterian" supply leading connection between IBF and economic growth, suggesting a lasting positive effect on GDP (Hachicha & Ben Amar, 2015). Islamic banks have also been found to be receptive to financing Small and Medium-sized Enterprises (SMEs), contributing to sustained economic development and GDP growth (Aysan et al., 2018). Additionally, a long-term correlation between Islamic banks' assets, financing, Islamic bonds, and real GDP in Muslim nations further indicates a prolonged positive impact on economic expansion (Naz & Gulzar, 2023). Moreover, the Islamic banking sector has been shown to significantly and

positively influence sustainable long-term economic growth, reinforcing its beneficial effects on GDP (Saleem et al., 2021).

CONCLUSION

The ARDL and CECM analyses reveal that IBF in Indonesia's construction industry significantly and positively influences GDP growth, both in the short and long run. This highlights the crucial role of Islamic finance in economic advancement, leveraging its distinctive characteristics, such as profit-and-loss sharing, asset-backed financing, and effective risk management. These features align well with the needs of the construction sector, fostering investment and expansion.

In the near term, Islamic financing injects vital liquidity and capital into construction projects, thereby stimulating immediate economic activities. Over time, the sector reaps the benefits of stability and sustainability inherent in Islamic financial principles, thereby facilitating ongoing development and infrastructure improvement.

The substantial positive effect of the IBFCS on economic growth provides valuable lessons for policymaking and financial strategies. Governments should consider incentivising Islamic banking practices, especially in the construction industry, through favourable regulations. This approach harnesses the potential of Islamic finance to drive economic expansion. Utilising Islamic financing for infrastructure projects can yield widespread economic advantages. Therefore, authorities should focus on attracting Islamic capital to major construction and infrastructure initiatives to foster development and economic advancement.

Financial entities should strategically direct resources to maximise the economic impact of IBF, with a focus on high-yield sectors, such as construction, that have significant economic multipliers. Developing investment plans that target industries with strong growth potential, such as construction, can enhance economic progress. Consequently, integrating the IBF into national development strategies can serve as a powerful instrument for long-term economic planning and sustainable growth.

To mitigate risks associated with overreliance on a single sector, it is crucial to ensure diverse allocation of financing across various industries, promoting sustainable economic development. The positive influence of the IBFCS on GDP suggests that a well-managed IBF can contribute to financial stability by fostering a stable and growing economic environment, highlighting the importance of effective risk management and stability in the financial sector. Further research is crucial to gain deeper insights into economic growth and financing dynamics. Exploring the potential non-linear effects of IBFCS on GDP can offer a more nuanced understanding of these relationships. Furthermore, comparative analyses across different countries or regions can help identify the factors affecting IBF effectiveness and highlight best practices.

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