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SECTORAL DIVERSIFICATION AND FINANCING RISKS IN INDONESIAN ISLAMIC BANKS

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ABSTRACT - The stability of Islamic banking is crucial for financial sustainability, and sectoral diversification plays a key role in mitigating financing risks. In Indonesia, Islamic banks operate under two models: Islamic bank windows and full-fledged Islamic commercial banks, each facing unique risk exposures. This study investigates the impact of sectoral diversification across various economic sectors on the financing risks of Indonesian Islamic banks. It also examines the role of key bank-specific and macroeconomic factors, including asset size, financing volume, operational efficiency, inflation, and the COVID-19 pandemic. Using aggregate monthly data from Islamic bank windows and Islamic commercial banks spanning January 2015 to December 2023, this study employs the Autoregressive Distributed Lag (ARDL) model to assess both short-term and long-term effects on financing risks. The results indicate that concentrated sectoral financing significantly increases financing defaults for both Islamic bank windows and Islamic commercial banks. Furthermore, while larger bank size and greater operational efficiency contribute to lower financing defaults, an increase in financing volume is associated with higher risks. Inflation and the COVID-19 pandemic further exacerbate financing defaults, particularly for Islamic bank windows. These findings underscore the importance of diversifying sectoral financing to mitigate risk. Policymakers and banking practitioners should promote balanced financing strategies complemented by stringent financing monitoring to reduce default risks and enhance financial resilience.
Keywords: Islamic bank windows, Islamic commercial banks, sectoral financing, non-performing financing

ABSTRAK - Diversifikasi Sektoral dan Risiko Pembiayaan pada Bank Syariah di Indonesia. *Stabilitas perbankan syariah sangat penting bagi keberlanjutan sektor keuangan, dan diversifikasi sektor ekonomi memainkan peran kunci dalam mengurangi risiko pembiayaan. Di Indonesia, bank syariah beroperasi dalam dua model: unit usaha syariah (Islamic bank windows) dan bank umum syariah (Islamic commercial banks), yang masing-masing menghadapi eksposur risiko yang berbeda. Penelitian ini mengkaji dampak diversifikasi sektor ekonomi terhadap risiko pembiayaan bank syariah di Indonesia. Selain itu, studi ini mengeksplorasi pengaruh variabel spesifik bank dan kondisi makroekonomi, termasuk ukuran aset, volume pembiayaan, efisiensi operasional, inflasi, serta pandemi COVID-19. Data penelitian berasal dari laporan bulanan dari Unit Usaha Syariah (UUS) dan Bank Umum Syariah (BUS) dari Januari 2015 hingga Desember 2023. Analisis data dilakukan dengan model Autoregressive Distributed Lag (ARDL) yang cocok untuk menguji efek jangka pendek dan panjang dari risiko pembiayaan. Hasil penelitian menunjukkan bahwa pembiayaan yang terfokus pada sektor tertentu secara signifikan meningkatkan risiko gagal bayar pada Islamic bank windows maupun Islamic commercial banks. Selain itu, ukuran bank yang lebih besar dan efisiensi operasional yang lebih tinggi terbukti mengurangi risiko gagal bayar, namun peningkatan volume pembiayaan justru meningkatkan risiko. Inflasi dan pandemi COVID-19 semakin memperburuk risiko gagal bayar, terutama bagi UUS. Temuan ini menegaskan pentingnya diversifikasi sektor pembiayaan untuk mengurangi risiko. Para pemangku kebijakan dan praktisi perbankan disarankan untuk mendorong strategi pembiayaan yang lebih seimbang, didukung oleh pemantauan pembiayaan yang ketat guna mengurangi risiko gagal bayar serta meningkatkan ketahanan keuangan.*
Kata Kunci: *Islamic bank windows, Islamic commercial banks, pembiayaan sektoral, pembiayaan bermasalah*

INTRODUCTION

Islamic banking has emerged as a vital component of the Indonesian financial system, operating alongside conventional banking. The Islamic banking sector in Indonesia consists of Islamic commercial banks (ICB) and Islamic bank windows (IBW), which serve as intermediary financial institutions that mobilize funds from the public and channel them into financing activities (Widarjono & Rudatin, 2021). The performance and sustainability of Islamic banks heavily depend on their ability to manage financing effectively, ensuring that funds disbursed to borrowers are repaid smoothly. One of the key indicators of financing performance is non-performing financing (NPF), which reflects the proportion of financing that is overdue or at risk of default (Widarjono, 2020; Sari et al., 2024).

Ensuring low NPF is crucial for maintaining the financial stability of Islamic banks. The Financial Services Authority (FSA) of Indonesia has set a regulatory threshold, capping NPF at a maximum of 5% for both Islamic and conventional banks (Widarjono, 2020). Between 2015 and 2021, the average NPF of Islamic banks in Indonesia stood at 3.95%, which remains within the regulatory limit. However, this figure is notably higher than the non-performing loans (NPL) of conventional banks, which averaged 2.75% over the same period. This discrepancy suggests that Islamic banks face greater default risks compared to their conventional counterparts, posing a challenge to the resilience and competitiveness of the Islamic banking sector (Ibrahim et al., 2024).

The higher default risk in Islamic banks can be attributed to several factors. First, financing models based on profit-and-loss sharing (PLS)—such as mudarabah and musharakah—are inherently more susceptible to asymmetric information and moral hazard, increasing the likelihood of defaults (Warninda et al., 2019; Nadia et al., 2019). Second, as relatively new players in Indonesia's banking industry, Islamic banks—most of which began operations in 1998 or later—lack the extensive experience that conventional banks have in managing credit risk effectively (Sutrisno & Widarjono, 2022). Consequently, identifying strategies to mitigate financing risks is essential to ensuring the stability of the Islamic banking sector.

Managing financing risk is a critical concern for Islamic banks in Indonesia, and two primary strategies are often considered: sectoral financing diversification and financing concentration. Sectoral diversification involves

allocating financing across multiple economic sectors, which can reduce risk exposure and mitigate the impact of sector-specific downturns. In contrast, financing concentration focuses on a limited number of sectors, which may facilitate better monitoring and risk assessment but could also increase vulnerability to sector-specific shocks (Tabak et al., 2011).

Numerous empirical studies have examined the impact of financing diversification on the profitability of Islamic banks in Indonesia (Prastiwi & Anik, 2021; Widarjono & Sidiq, 2022; Widarjono et al., 2022). Another strand of research has investigated the relationship between financing diversification and financing risks (Firmansyah, 2015; Widarjono & Rudatin, 2021). However, these studies generally treat Islamic banks as a homogeneous entity and do not differentiate between Islamic commercial banks (ICB) and Islamic bank windows (IBW). This oversight is significant because ICBs and IBWs differ in their operational structures, risk management approaches, and financing strategies, which may influence their exposure to financing risk.

To address this research gap, this study analyzes the impact of sectoral financing diversification on the NPF of Islamic banks in Indonesia, distinguishing between Islamic bank windows (IBWs) and Islamic commercial banks (ICBs). As far as the authors are aware, no prior empirical study has separately examined the NPF dynamics of these two types of Islamic banks in Indonesia. The study offers novel insights into how different types of Islamic banks manage sectoral financing risks and provides empirical evidence that can inform risk mitigation strategies and policy decisions for regulators and banking practitioners.

The main objective of this study is to analyze the impact of sectoral financing diversification across different economic sectors on the NPF of Islamic banks in Indonesia. Specifically, it aims to examine the effect of sectoral financing diversification on the NPF of Islamic banks, compare the financing risk behavior between IBWs and ICBs, and provide empirical insights to guide risk management strategies for Islamic banks in Indonesia.

This study contributes to the literature in three key ways. Firstly, it provides empirical differentiation by distinguishing between IBWs and ICBs, offering a more granular analysis of financing risk. Secondly, the findings have policy implications, helping policymakers and banking regulators develop tailored risk management strategies to enhance the resilience of both IBWs and ICBs.

Lastly, the study offers strategic insights for practitioners, providing practical guidance for Islamic banking institutions on balancing sectoral diversification and financing stability.

LITERATURE REVIEW

Theoretical Perspectives on Financing Diversification and Concentration

In managing financing risk, banks adopt two primary strategic approaches: loan diversification and loan concentration. The traditional banking theory posits that banks can reduce default risk by diversifying financing across multiple economic sectors, thereby mitigating idiosyncratic credit shocks (Berger et al., 2010). When banks spread their financing across different industries, they reduce the risk of being hit hard by downturns in any one sector, which could otherwise lead to more non-performing loans. On the other hand, if banks focus their financing on just a few sectors, they become more exposed to the ups and downs of those industries, which can increase the chances of defaults.

Conversely, corporate finance theory advocates for financing concentration as a means of developing specialized expertise and competitive advantages in specific industries (Denis et al., 1997). When banks focus on just a few sectors, they can improve how they monitor credit, assess risks, and address agency issues, which could help lower the chances of defaults. Concentrating their financing also helps build stronger relationships with borrowers, making it easier for banks to spot potential issues early and take steps to manage risks effectively.

Empirical Evidence on Financing Diversification and Risk

Several empirical studies have explored the impact of loan diversification and concentration on the financial stability of conventional banks. Shim (2019) found that loan diversification reduces risk in U.S. commercial banks by spreading credit exposure across different economic sectors. Similarly, Adzobu et al. (2017) examined the effect of loan portfolio diversification on credit risk, using non-performing loans (NPLs) and loan loss provisions (LLP) as proxies. Their findings indicate that loan concentration increases credit risk, supporting the argument that diversified financing strategies enhance financial stability.

Islamic banks, like their conventional counterparts, employ sectoral diversification to manage financing risks. Additionally, they diversify

financing through various Shariah-compliant contracts, such as *Musyarakah, Mudharabah, Murabahah, Istisna, Ijarah, Salam,* and *Qard*. Al-Kayed and Aliani (2020) analyzed both economic sector diversification and Islamic contract diversification in the Gulf Cooperation Council (GCC) region. Their study revealed that sectoral diversification had no significant effect on default risk, whereas concentration in Islamic instruments helped reduce financing risk. Similarly, Seho et al. (2024) found that sectoral diversification did not significantly impact Islamic bank stability in Malaysia.

A separate body of empirical research has examined sectoral financing concentration and its effects on Islamic banks' default risks. In Indonesia, Widarjono and Rudatin (2021) documented that concentrated financing leads to higher non-performing financing (NPF) in Islamic commercial banks. Similarly, Widarjono et al. (2020) found that financing concentration increases NPF in Islamic rural banks. However, contrasting findings from Sutrisno et al. (2023) suggest that financing concentration reduces NPF in Islamic rural banks, possibly due to improved monitoring and risk control in specific sectors.

Despite extensive research on financing diversification and risk in Islamic banking, existing empirical studies do not differentiate between Islamic commercial banks (ICBs) and Islamic bank windows (IBWs). This distinction is crucial, as ICBs and IBWs have different operational models, risk management strategies, and regulatory requirements. The present study aims to fill this literature gap by analyzing the impact of sectoral financing diversification on NPF while distinguishing between IBWs and ICBs. To the best of the authors' knowledge, no prior study in Islamic banking in Indonesia has separately examined the relationship between sectoral diversification and default risk across these two types of banks.

Methodological Approach to Measuring Diversification and Risk

To quantify sectoral financing diversification, this study employs the Herfindahl-Hirschman Index (HHI), a widely recognized measure of concentration. HHI is calculated as the sum of squared sectoral financing shares relative to total financing. A higher HHI indicates greater financing concentration, while a lower HHI signifies greater diversification. The theoretical foundation suggests that financing diversification could either increase or decrease NPF. According to traditional banking theory, diversification should lower default risk by spreading credit exposure across

various sectors. According to corporate finance theory, concentration may reduce default risk by improving banks' specialized knowledge and monitoring capabilities in key sectors. Given these opposing perspectives, this study hypothesizes that the effect of financing diversification on NPF could be either positive or negative, depending on the underlying economic conditions and bank-specific factors.

Other Determinants of Non-Performing Financing (NPF)

Bank-Specific Factors

Apart from sectoral diversification, this study incorporates key bank-specific factors that influence NPF, including bank size, financing intensity, and operational efficiency. Bank size is commonly measured by total assets and serves as a proxy for economies of scale. Larger Islamic banks can leverage their financial strength to manage risk efficiently, potentially reducing NPF. However, larger banks may also experience weaker credit supervision, leading to higher financing defaults (Hamid & Ibrahim, 2021). Accordingly, the relationship between bank size and NPF may be either positive or negative.

The financing-to-deposit ratio (FDR) represents the proportion of third-party funds allocated for financing activities. A high FDR suggests aggressive financing expansion, which can increase profitability. However, excessive financing may lead to liquidity constraints, reducing a bank’s ability to absorb financial shocks, thereby increasing financing risk (Sutrisno & Widarjono, 2022). Therefore, this study hypothesizes that higher FDR is positively associated with NPF.

Operational efficiency is measured by the expense-to-revenue ratio (ERR), which indicates the cost incurred to generate revenue. A high ERR reflects poor cost efficiency, implying weak financial management and greater exposure to financing risk (Sutrisno & Widarjono, 2024). Islamic banks with lower ERR are expected to have better risk control mechanisms, reducing default probabilities (Haryanto et al., 2024). This study predicts that ERR is positively correlated with default risk.

Macroeconomic Factors

In addition to bank-specific variables, macroeconomic conditions significantly influence NPF. This study considers inflation and the COVID-19 pandemic as

external factors affecting Islamic bank stability. Inflation, measured by the Consumer Price Index (CPI), can erode purchasing power, reducing customers' ability to repay financing obligations. Consequently, higher inflation is expected to increase NPF (Widarjono & Rudatin, 2021).

The economic downturn triggered by COVID-19, which began in Q2 2020, severely impacted household and business revenues, leading to widespread loan defaults (Yudaruddin, 2023). Given this, the study anticipates that COVID-19 had a positive effect on NPF, increasing financing defaults across the Islamic banking sector.

METHODOLOGY

Data and Variables

This study examines the impact of sectoral financing diversification, alongside bank-specific and macroeconomic factors, on the Non-Performing Financing (NPF) of Islamic banks in Indonesia. The bank-specific variables considered are total assets, financing deposit ratio (FDR), and operating efficiency, while the macroeconomic variables include inflation (CPI) and the COVID-19 pandemic. The study utilizes monthly aggregate data from Islamic Commercial Banks (ICBs) and Islamic Bank Windows (IBWs), covering the period from January 2015 to December 2023. However, due to data availability constraints, the Financial Services Authority of Indonesia (Otoritas Jasa Keuangan/OJK) only began providing separate aggregate data for ICBs and IBWs from 2015 onwards. The data is sourced from OJK's official website: www.ojk.go.id.

To measure sectoral financing diversification, this study employs the Herfindahl-Hirschman Index (HHI), which quantifies the concentration of financing across 24 economic sectors (Prastiwi & Anik, 2020). A lower HHI indicates greater diversification, whereas a higher HHI reflects greater concentration. The HHI is calculated as follows:

$$HHI = \left(\frac{ES1}{TP}\right)^2 + \left(\frac{ES2}{TP}\right)^2 + \left(\frac{ES3}{TP}\right)^2 + \cdots + \left(\frac{ES24}{TP}\right)^2 \quad (1)$$

where TP represents total financing, and ES denotes economic sectoral financing.

The core relationship being examined is modeled through the following regression equation:

$$NPF_t = \emptyset_O + \emptyset_1 HHI_t + \emptyset_2 LASSET_t + \emptyset_3 FDR_t + \emptyset_4 ERR_t + \emptyset_4 CPI_t + \emptyset_4 COVID_t + \varepsilon_t \quad (2)$$

where:

- NPF = Non-Performing Financing (%)
- HHI = Herfindahl-Hirschman Index (%) (sectoral financing diversification)
- LASSET = Log of total assets (trillion IDR) (bank size) (Widarjono & Misanam, 2024)
- FDR = Financing to Deposit Ratio (%) (Sutrisno & Widarjono, 2022)
- ERR = Operating expense to operating revenue (%) (operating efficiency) (Widarjono & Sidiq, 2022)
- CPI = Consumer Price Index (inflation indicator) (Widarjono et al., 2022)
- COVID = Dummy variable representing COVID-19 economic shock (Ajizah & Widarjono, 2023)

Econometric Approach: ARDL Model

To estimate the impact of sectoral financing diversification on NPF, the study employs the Autoregressive Distributed Lag (ARDL) model (Pesaran & Shin, 1998). The ARDL model is chosen for two key reasons:

1. It accommodates variables with different levels of stationarity **(**I(0) or I(1)), making it suitable for time-series data.
2. It provides both short-run and long-run estimates, capturing the dynamic relationship between variables.

The ARDL equation is specified as follows:

$$\begin{aligned}\Delta NPF_t = {} & \theta_0 + +\pi_1 NPF_{t-1} + \pi_2 HHI_{t-1} + \pi_3 LASSET_{t-1} + \\ & \pi_4 FDR_{t-1} + \pi_5 ERR_{t-1} + \pi_6 CPI_{t-1} + \pi_7 COVID_{t-1} + \\ & \sum_{1=1}^{n} \theta_{1i} \Delta NPF_{t-1} + \sum_{1=1}^{n} \theta_{2i} \Delta HHI_{t-1} + \sum_{1=1}^{n} \theta_{3i} \Delta LASSET_{t-1} + \\ & \sum_{1=1}^{n} \theta_{4i} \Delta FDR_{t-1} + \sum_{1=1}^{n} \theta_{5i} \Delta ERR_{t-1} + \sum_{1=1}^{n} \theta_{6i} \Delta CPI_{t-1} + \\ & \sum_{1=1}^{n} \theta_{7i} \Delta COVID_{t-1} + \varepsilon_t \end{aligned} \quad (3)$$

where Δ represents the first difference operator, and ε_t is the error term.

Estimation Process

The analysis follows these key steps:

1. Unit Root Test - The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are conducted to determine the stationarity of the variables.
2. Optimal Lag Selection - The Akaike Information Criterion (AIC) is used to determine the optimal lag length, with a maximum lag of six periods.
3. Cointegration Test (Bounds Testing Approach) - The ARDL Bounds Test (Pesaran et al., 2001) is applied to examine whether a long-run relationship exists between variables. The null hypothesis is:

$$H_0: \pi_1 = \pi_2 = \pi_3 = \pi_4 = \pi_5 = \pi_6 = \pi_7 = 0 \quad (4)$$

   If the F-statistic is greater than the upper bound I(1), a long-run cointegration relationship exists. If it falls below the lower bound I(0), no cointegration is found. If it lies between I(0) and I(1), the result is inconclusive.
4. Error Correction Model (ECM) - If cointegration is confirmed, an ECM model is estimated to capture short-run adjustments toward the long-run equilibrium:

$$\begin{aligned}\Delta NPF_t = {} & \rho_0 + \sum_{1=1}^{n} \rho_{1i}\, \Delta NPF_{t-1} + \sum_{1=1}^{n} \rho_{2i}\, \Delta HHI_{t-1} + \\ & \sum_{1=1}^{n} \rho_{3i} \Delta\, LASSET_{t-1} + \sum_{1=1}^{n} \rho_{4i} \Delta\, FDR_{t-1} + \sum_{1=1}^{n} \rho_{5i}\, \Delta ERR_{t-1} + \\ & \sum_{1=1}^{n} \rho_{6i}\, \Delta CPI_{t-1} + \sum_{1=1}^{n} \rho_{6i}\, \Delta COVID_{t-1} + \rho_7 ECT_{t-1} + \varepsilon_t \end{aligned} \quad (5)$$

   where ECT_{t-1} represents the error correction term, which indicates how quickly deviations from the long-run equilibrium are corrected in the short run. A significant and negative coefficient of ECT confirms the presence of cointegration.

RESULTS AND DISCUSSION

Results

Table 1 presents the descriptive statistics of key variables for Islamic bank windows (IBWs) and Islamic commercial banks (ICBs). The Non-Performing Financing (NPF) of IBWs is lower than that of ICBs, suggesting that IBWs experience a lower risk of nonpayment compared to ICBs. Regarding sectoral financing diversification, the Herfindahl-Hirschman Index (HHI) indicates that IBWs have a higher concentration of financing compared to ICBs. This suggests that IBWs focus their financing activities on fewer sectors, whereas ICBs exhibit a more diversified portfolio.

In terms of total assets, IBWs have a lower average total asset value than ICBs, implying that IBWs operate on a smaller scale. The Financing-to-Deposit Ratio (FDR) is also lower for IBWs, indicating that IBWs are less aggressive in disbursing financing compared to ICBs. Lastly, the operating efficiency ratio (ERR) suggests that IBWs are more efficient than ICBs. A lower ERR signifies better efficiency in managing operational costs relative to income.

Table 1. Descriptive Statistics

	NPF	HHI	ASSET	FDR	ERR
Islamic bank windows					
Mean	2.6741	16.6045	187623.2	67.685	82.827
Maximum	3.9700	19.3846	594708.7	111.760	103.513
Minimum	1.4141	14.0357	71812.1	1.934	70.140
Std. Dev.	0.5816	1.6317	105983.1	46.541	9.069
Islamic commercial banks					
Mean	3.8647	11.0069	336428.2	80.1830	87.8349
Maximum	6.1700	15.1116	541071.6	92.5600	99.0400
Minimum	2.3500	8.5352	197854.3	68.9800	75.7800
Std. Dev.	1.0419	2.0448	98043.3	5.4031	6.4892

ARDL Model Results

The Autoregressive Distributed Lag (ARDL) model is appropriate for this study, as all variables exhibit stationarity at different levels but none at the second difference. Therefore, stationarity tests were conducted before estimating the ARDL model. Table 2 presents the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) test results, showing that all variables are

stationary at the first difference. The stationarity test confirms that the ARDL model is suitable for estimating NPF behavior in Islamic banks in Indonesia in both the short run and the long run.

Table 2. ADF and PP Unit Root Test Results

	Level		**First difference**	
	ADF	**PP**	**ADF**	**PP**
IBW				
NPF	-3.3409*	-3.2785*	-11.6076***	-11.8222***
HHI	-1.9754	-1.8732	-12.9234***	-12.8888***
LASSET	-2.7090	-4.5316***	-5.0441***	-10.9490***
FDR	-2.2066	-2.1894	-10.8939***	-10.8942***
CIR	-2.4991	-2.3276	-10.9373***	-11.5776***
ICB				
NPF	-3.7321**	-4.1443***	-4.9317***	-13.7511***
HHI	-1.4554	-1.5353	-9.1688***	-9.1492***
LASSET	-3.1216	-3.1147	-6.1135***	-12.8742***
FDR	-1.1369	-0.9968	-11.0706***	-11.1186***
CIR	-3.7861**	-3.7133*	-10.0864***	-12.4782***
Macro Variables				
CPI	-1.5418	-1.7768	-8.5965***	-8.5508***

*Note: ***, **, and * significant at 1%, 5% and 10%*

Table 3 presents the estimated ARDL model results. The ARDL model for IBWs is (3,5,6,4,6,3,2), while for ICBs, it is (4,0,1,0,1,1,0). The R-squared values of 0.9613 for IBWs and 0.9744 for ICBs indicate that the independent variables explain 96.13% and 97.44% of the variation in NPF, respectively.

Table 3. ARDL Results – Financing Risk

Variable	**Islamic bank windows**		**Islamic commercial banks**	
	Coefficient	**P-value**	**Coefficient**	**t-Statistic**
C	3.5989	0.2304	2.7757	0.6748
NPF (-1)	0.6432	0.0000	0.7445	0.0000
NPF (-2)	0.1193	0.2713	-0.0331	0.7144
NPF (-3)	-0.2818	0.0140	0.3511	0.0003
NPF (-4)	-	-	-0.4164	0.0000
HHI	0.1303	0.0779	0.0836	0.0042
HHI (-1)	-0.1412	0.0333	-	-
HHI (-2)	0.1116	0.2198	-	-
HHI (-3)	-0.0283	0.7140	-	-

HHI (-4)	-0.0608	0.2821	-	-
HHI (-5)	0.1520	0.0465	-	-
LASSET	-1.4253	0.0003	-3.2845	0.0020
LASSET(-1))	0.4519	0.0000	3.4987	0.0008
LASSET(-2))	0.0347	0.7382	-	-
LASSET(-3))	-0.1626	0.0883	-	-
LASSET(-4))	0.2133	0.0000	-	-
LASSET(-5))	0.1523	0.0000	-	-
LASSET(-6))	-0.2529	0.0000	-	-
FDR	0.0105	0.0000	-0.0022	0.7915
FDR(-1)	-0.0019	0.1621	-	-
FDR(-2)	-0.0030	0.0374	-	-
FDR(-3)	0.0035	0.0936	-	-
FDR(-4)	0.0054	0.0017	-	-
CIR	0.0141	0.1014	0.0321	0.0095
CIR(-1)	-0.0087	0.1494	-0.0163	0.1774
CIR(-2)	0.0206	0.0091	-	-
CIR(-3)	-0.0085	0.3202	-	-
CIR(-4)	0.0105	0.2466	-	-
CIR(-5)	0.0227	0.0009	-	-
CIR(-6)	-0.0099	0.0595	-	-
CPI	0.0984	0.0482	-0.1336	0.0021
CPI(-1)	-0.1244	0.0324	0.0927	0.0303
CPI(-2)	0.1106	0.0267	-	-
CPI(-3)	-0.0685	0.0435	-	-
COVID	0.0993	0.2510	-0.1110	0.0300
COVID(-1)	0.3847	0.0172	-	-
COVID(-2)	-0.3134	0.1557	-	-
R-squared	0.9613		0.9744	
Diagnostic test				
LM	5.9282	0.0516	1.1062	0.5752
ARCH	0.1712	0.6791	0.0782	0.7798
Cointegration test				
F-statistics	3.9783**		3.7679**	

*Note: ***, **, and * significant at 1%, 5% and 10%. Upper bounds for 1%, 5%, and 10% are 3.99, 3.28, and 2.94*

Diagnostic tests confirm the robustness of the model. The LM and ARCH tests indicate no issues with autocorrelation and heteroskedasticity for both IBWs

and ICBs. Additionally, stability tests using CUSUM and CUSUM-Squares confirm that the estimated parameters remain stable over time.

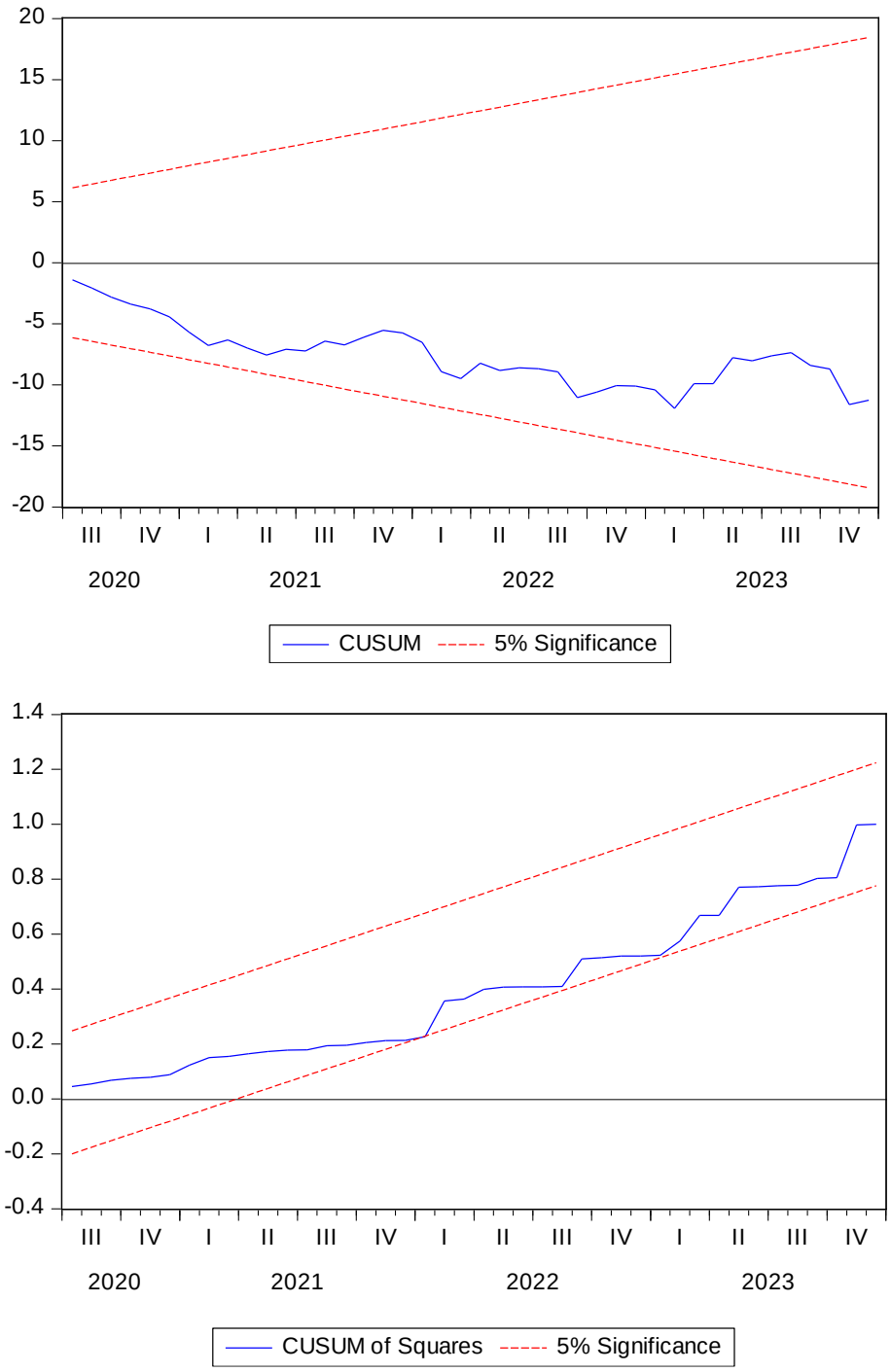

Figure 1. CUSUM and CUMSUM-Squares stability test for IBWs

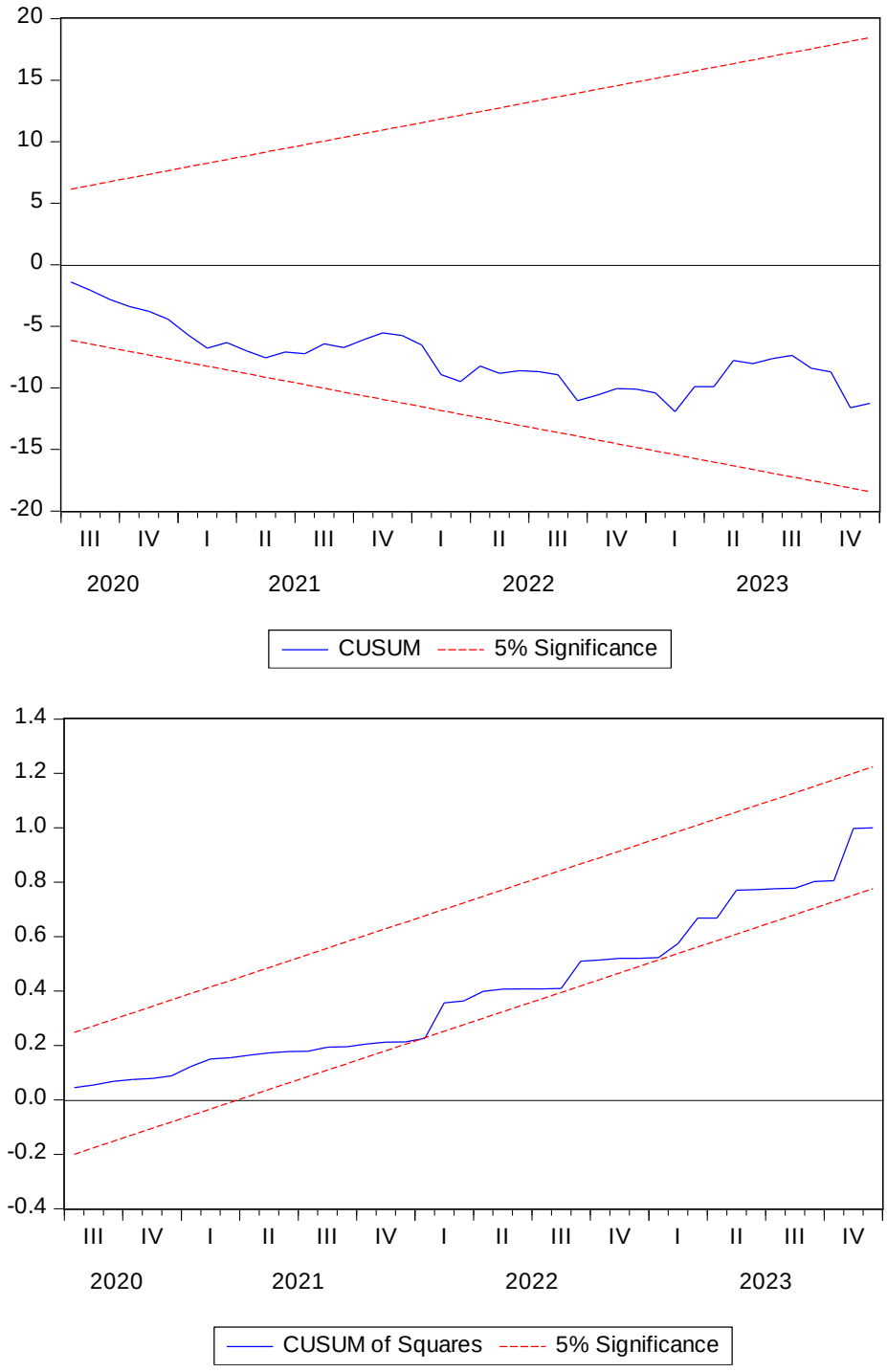

Figure 2. Stability test of CUSUM and CUMSUM-Squares for ICBs

The cointegration test (Table 3) confirms long-run relationships among the variables, with F-statistics of 3.9783 for IBWs and 3.7679 for ICBs, exceeding

the upper bound critical values at 5% significance. This validates the ECM-ARDL model for analyzing short-run imbalances.

Error Correction Model (ECM-ARDL) Results

Table 4 presents the ECM-ARDL model, which corrects short-term disequilibrium. The error correction term ECT(-1) is negative and significant for both IBWs (-0.5193) and ICBs (-0.3540), confirming that the models adjust towards equilibrium in the long run. The adjustment speed is faster for IBWs, indicating that IBWs correct short-term imbalances more efficiently than ICBs.

In the short run, NPF in Islamic bank windows (IBWs) is significantly influenced by past NPF values, sectoral financing concentration (HHI), inefficiency (ERR), inflation, and the COVID-19 crisis. In contrast, NPF in Islamic commercial banks (ICBs) is mainly affected by bank size (LASSET), inefficiency (ERR), and inflation, which surprisingly lowers financing risk.

Table 4. ECM-ARDL Model Results – Financing Risk

Variable	Islamic bank windows		Islamic commercial banks	
	Coefficient	**P-value**	**Coefficient**	**P-value**
D(NPF(-1))	0.1625	0.0962	0.0985	0.2664
D(NPF(-2))	0.2818	0.0048	0.0654	0.4330
D(NPF(-3))	-	-	0.4164	0.0000
D(HHI)	0.1303	0.0108	-	-
D(HHI(-1))	-0.1746	0.0011	-	-
D(HHI(-2))	-0.0630	0.2328	-	-
D(HHI(-3))	-0.0913	0.0711	-	-
D(HHI(-4))	-0.1520	0.0022	-	-
DL(ASSET)	-1.4253	0.0000	-3.2845	0.0003
DL(ASSET(-1))	0.0153	0.8738	-	-
DL(ASSET(-2))	0.0500	0.6121	-	-
DL(ASSET(-3))	-0.1126	0.1510	-	-
DL(ASSET(-4))	0.1006	0.1291	-	-
DL(ASSET(-5)	0.2529	0.0005	-	-
D(FDR)	0.0105	0.0000	-	-
D(FDR(-1))	-0.0059	0.0289	-	-
D(FDR(-2))	-0.0089	0.0007	-	-
D(FDR(-3))	-0.0054	0.0107	-	-
D(ERR)	0.0141	0.0442	0.0321	0.0032
D(ERR(-1))	-0.0354	0.0002	-	-

Variable	Islamic bank windows		Islamic commercial banks	
	Coefficient	**P-value**	**Coefficient**	**P-value**
D(ERR(-2))	-0.0148	0.1027	-	-
D(ERR(-3))	-0.0232	0.0052	-	-
D(ERR(-4))	-0.0128	0.0413	-	-
D(ERR(-5))	0.0099	0.0706	-	-
D(CPI)	0.0984	0.0056	-0.1336	0.0002
D(CPI(-1))	-0.0421	0.2284	-	-
D(CPI(-3))	0.0685	0.0417	-	-
D(COVID)	0.0993	0.3514	-	-
D(COVID(-1))	0.3134	0.0033	-	-
ECT(-1)	-0.5193	0.0000	-0.3540	0.0000
R-squared	0.8044		0.5652	

*Note: ***, **, and * significant at 1%, 5% and 10%*

Long-Run Estimation

In the long run, higher financing concentration (HHI) increases NPF in both IBWs and ICBs. Larger assets reduce NPF in IBWs, suggesting economies of scale, but do not significantly impact ICBs. Operating inefficiency (ERR) raises financing risk, while inflation and COVID-19 increase NPF in IBWs but lower it in ICBs.

Our findings indicate that for Islamic bank windows, HHI has a positive and significant effect on NPF at $\alpha = 1\%$. Assets exhibit a negative influence on NPF at the same significance level, suggesting that larger assets help mitigate financing defaults. Similarly, FDR and ERR both have a positive impact on NPF at $\alpha = 1\%$, indicating that higher financing exposure and lower operational efficiency contribute to increased default risk. Additionally, inflation and COVID-19 show a positive effect on NPF at $\alpha = 5\%$, implying that macroeconomic instability and pandemic-related disruptions exacerbate financing risks.

For Islamic commercial banks, HHI remains positive and significant at $\alpha = 1\%$, reinforcing the idea that market concentration influences default risk. Furthermore, ERR has a positive effect on NPF, highlighting the role of operational inefficiency in financing defaults. However, in contrast to Islamic bank windows, inflation and COVID-19 exhibit a negative impact on financing risk at $\alpha = 1\%$, suggesting that economic and pandemic-related factors have a mitigating effect on default risks in fully-fledged Islamic banks.

Table 5. Long-Run Coefficients – Financing Risk

Variable	Islamic bank Windows		Islamic commercial banks	
	Coefficient	**P-value**	**Coefficient**	**P-value**
C	6.9301	0.1470	7.8418	0.6711
HHI	0.3153***	0.0005	0.2361***	0.0024
LASSET	-1.9038***	0.0012	0.6053	0.7034
FDR	0.0280***	0.0000	-0.0063	0.3954
ERR	0.0785***	0.0001	0.0447*	0.0555
CPI	0.0311**	0.0467	-0.1156***	0.0026
COVID	0.3286**	0.0056	-0.3136***	0.0110

Defects: ***, **, and * significant at 1%, 5% and 10%

Overall, our results document that a higher concentration of financing increases the likelihood of financing defaults in both Islamic bank windows and Islamic commercial banks. This finding implies that excessive market concentration contributes to higher impaired financing, ultimately diminishing the performance of Islamic banks in Indonesia.

Regarding control variables, we find that several factors influence NPF. As expected, assets negatively impact NPF, indicating that larger asset bases help reduce default risk in Islamic bank windows, likely due to economies of scale. However, financing volume increases NPF in Islamic commercial banks but does not have the same effect on Islamic bank windows. Furthermore, as predicted, operating efficiency (ERR) positively affects NPF in both banking models, confirming that inefficient operations contribute to deteriorating default risk management and higher non-performing financing.

Finally, inflation raises nonpayment risk for Islamic bank windows but, conversely, reduces financing risk for Islamic commercial banks. Similarly, COVID-19 increases default risk for Islamic bank windows while lowering the default risk for Islamic commercial banks, suggesting that different banking structures respond differently to macroeconomic shocks and external crises.

Discussion

The primary focus of this study is to examine the impact of sectoral financing diversification, as measured by the IHH index, on the Non-Performing Financing (NPF) of Islamic banks in Indonesia. Our findings indicate that a higher concentration of financing increases the likelihood of financing defaults (NPF) for both Islamic Bank Windows (IBWs) and Islamic Commercial Banks

(ICBs). As illustrated in Figure 3, the sectoral financing concentration index for both IBWs and ICBs has shown an upward trend, aligning with the rising NPF levels in Indonesian Islamic banks. The average NPF stands at 4.29% for ICBs and 3.01% for IBWs.

A significant portion of sectoral financing in both IBWs and ICBs is allocated to homeownership financing, a sector particularly vulnerable to economic shocks. These findings are consistent with previous research, which has demonstrated that sectoral concentration increases NPF in conventional banks across emerging markets in Africa (Adzobu et al., 2017; Mulwa, 2018) and in Indonesia (Prastiwi & Anik, 2020). Additionally, our results strengthen prior studies suggesting that financing based on contract types—such as Mudharabah, Musyarakah, Murabahah, Istisna, and Ijarah—also contributes to higher NPF in Islamic commercial banks (Widarjono & Rudatin, 2021) and Islamic rural banks in Indonesia (Widarjono et al., 2020).

Higher Default Risk in Islamic Bank Windows

An interesting finding is that the coefficient for IBWs (0.3153) is higher than that of ICBs (0.2361). This suggests that sectoral financing concentration poses a greater default risk for IBWs than ICBs. A key reason for this disparity is the dual management structure of IBWs, which are supervised both by the IBW itself and its parent conventional bank. Since conventional parent banks lack specialized experience in Islamic banking, ICBs tend to have more effective financing monitoring systems than IBWs. This aligns with prior research indicating that Islamic banks generally have limited experience in monitoring revenue-based financing contracts, which contributes to higher default risks (Azmat et al., 2015; Risfandy, 2018).

Sectoral Financing Diversification as a Risk Mitigation Strategy

Our findings suggest that diversifying financing across multiple economic sectors is an effective strategy for reducing financing risk in Islamic banks. However, sectoral diversification must be complemented by robust financing monitoring mechanisms. The monitoring process should encompass customer selection, fund disbursement, business performance tracking, and repayment oversight. While implementing financing diversification entails additional costs that may reduce bank profitability, it can simultaneously lower NPF levels when coupled with strong monitoring systems. The additional monitoring

expenses, however, can be minimized if Islamic banks enhance their customer selection process to ensure more creditworthy borrowers.

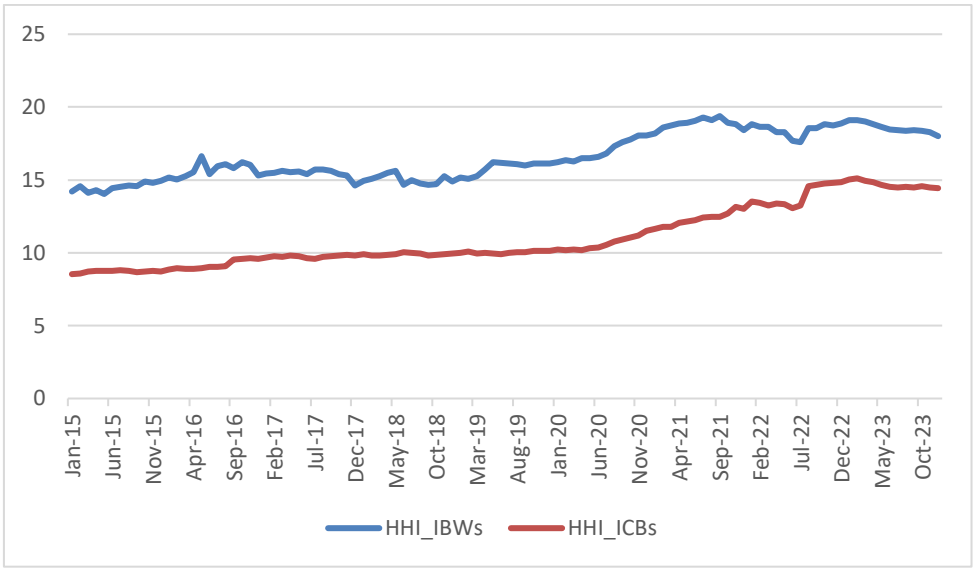

Figure 3. Sectoral Financing Concentration for IBWs and ICBs

The Role of Bank-Specific Variables in NPF

Several bank-specific factors also influence NPF levels in Islamic banks. One key determinant is bank size, measured by total assets. Larger banks tend to exhibit lower levels of bad financing due to economies of scale, which enhance operational efficiency. This finding aligns with previous studies indicating that larger Islamic banks experience lower NPF levels (Abedifar et al., 2013; Widarjono & Rudatin, 2021).

Moreover, a higher financing volume is associated with increased nonpayment risk, as Islamic banks in Indonesia generally have less experience in financing disbursement than their conventional counterparts (Risfandy, 2018). Additionally, operating efficiency, measured by the expense-to-revenue ratio (ERR), has a positive relationship with NPF, indicating that lower efficiency leads to higher default rates due to ineffective risk management and poor monitoring of sectoral financing. This finding is in line with research on Islamic banks in the Gulf Cooperation Council (GCC) (Belkhaoui et al., 2020).

Lastly, macroeconomic conditions also play a critical role in financing risk. Economic downturns, such as those caused by the COVID-19 pandemic, have

increased nonpayment risk for Islamic bank windows, corroborating empirical findings from Islamic banks in the MENA region (El-Chaarani, 2023).

CONCLUSION

This study examines the impact of sectoral financing diversification on non-performing financing (NPF) in Islamic banks in Indonesia, incorporating several bank-specific variables as controls. By distinguishing between Islamic Bank Windows (IBWs) and Islamic Commercial Banks (ICBs), our findings provide deeper insights into the role of sectoral financing concentration in determining financing risk. The results indicate that a higher concentration of sectoral financing leads to an increase in NPF, highlighting the risks associated with excessive exposure to specific sectors. Notably, Islamic commercial banks (ICBs) face greater financing risk than Islamic bank windows (IBWs). Additionally, larger bank size and improved operational efficiency contribute to lower default risk, suggesting that economies of scale and cost efficiency play a crucial role in mitigating financing risks.

The findings offer several important practical and policy implications. To reduce default risk, Islamic banks should adopt a sectoral financing diversification strategy. However, this strategy must be complemented by rigorous monitoring mechanisms to mitigate risks effectively. Particular attention should be given to Mudharabah and Musyarakah contracts, as these revenue-sharing financing models are susceptible to moral hazard and asymmetric information, which could further elevate default risks. Increasing bank size through asset expansion can enhance operational efficiency and reduce financing risk by lowering operating costs. This supports the argument for scaling up Islamic banks to strengthen their risk management capabilities. Given the importance of bank size in reducing financing risk, regulatory authorities, particularly the Indonesian Financial Services Authority (OJK), should expedite the spin-off policy requiring IBWs to increase their capital base. Strengthening capital requirements can facilitate the transformation of IBWs into independent Islamic commercial banks, thereby improving their ability to manage default risk.

This study utilizes aggregate data from Islamic banks, which limits its ability to capture bank-level variations in managing financing risk. Future research should adopt a panel data approach, incorporating both cross-sectional and time-series data, to provide a more granular analysis of individual Islamic

banks' risk management strategies. Additionally, exploring bank-specific factors, such as governance structures, risk appetite, and internal monitoring mechanisms, would offer further insights into default risk determinants in Islamic banking.

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