The Impact of Cost to Income Ratio on Firm Value with Net Interest Margin as a Mediating Variable in the Banking Sector of ASEAN-5 Countries

Adli Rikanda Saputra[1], Rindu Rika Gamayuni[2], Sudrajad[3]

{adlirikanda@gmail.com[1], rindu.gamayuni@gmail.com[2], drajat239@gmail.com[3]}

Universitas Lampung, Lampung, Indonesia[123]

Abstract. This study aims to analyze the impact of the Cost to Income Ratio (CTI) on Firm Value (FV) with Net Interest Margin (NIM) as a mediating variable in the banking sector of ASEAN countries during the period 2019-2023. Using panel data analysis and two structural models, the study finds that CTI has a significant negative relationship with NIM, indicating that increased cost inefficiency in banks can reduce NIM. Moreover, the results from the fixed effects model show that CTI does not have a significant direct effect on FV, but ROA is found to have a significant positive impact. This research highlights the importance of effective cost management in enhancing profitability and firm value in the ASEAN banking sector. These findings provide insights for policymakers to improve performance and financial stability in this sector.

Keywords: Cost to Income Ratio (CTI), Firm Value (FV), Net Interest Margin (NIM), ASEAN Banking Sector, Panel Data Analysis.

1 Introduction

The banking sector in the ASEAN region is a crucial component of the economy, playing a significant role in economic development and stability. Studies have highlighted the importance of accelerating digital finance within ASEAN countries for banking sector stability, particularly in times of crises such as the post-Covid-19 era [1]. This emphasis on digital financial inclusion not only enhances stability but also contributes to economic and financial resilience in the face of challenges. Research has shown that the competitive advantage between intellectual capital and financial performance is a key area of study in the banking sector of ASEAN countries, emphasizing the role of intangible assets in driving success [2].

Efficiency in the banking market significantly influences the overall performance of the banking sector in the Sino-ASEAN region, as evidenced by empirical studies on banking efficiency determinants [3]. Regulatory regionalism and the integration of banking systems within ASEAN, such as in Indonesia, are crucial considerations for enhancing the industry's performance and reaping benefits at a regional level [4]. Market structure and efficiency performance of ASEAN banks are also key areas of focus, with changes in banking sector characteristics like financial integration, privatization, deregulation, mergers, acquisitions, and foreign bank penetration being crucial for achieving industry goals [5].

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In the context of ASEAN banking, issues such as asset quality, liquidity risk, and regulatory pressures from macroprudential perspectives are key challenges that need to be addressed to ensure the sector's soundness and resilience [6]. Enhancing bank stability through diversification and digitalization perspectives is crucial for the ASEAN banking sector, with countries like Malaysia, Indonesia, Philippines, Singapore, and Thailand playing significant roles in the region's banking landscape [7]. Comparative analyses of financial performance during crises, like the pandemic, highlight the importance of continuous efforts to improve efficiency and competitiveness in the highly dynamic and competitive ASEAN banking market [8].

Systemic risk in ASEAN-6 countries is a critical area of study, shedding light on the vulnerabilities and interconnectedness within the banking sectors of these nations [9]. The relationship between financial development and the effectiveness of monetary policy in ASEAN-3 countries underscores the importance of banking sector expansion and market reforms in driving overall financial market development [4]. The implication of banking regulation on business models within ASEAN countries highlights the impact of regulatory frameworks like Basel II on shaping banking operations and strategies [10].

Firm value, net interest margin, and cost to income ratio are crucial indicators for investors, management, and stakeholders in the ASEAN banking industry. The relationship between these factors is significant as evidenced by studies on the effects of liquidity risk, interest-rate risk, and intrinsic financial risks on firm value [11], [12]. The efficiency and competition within the banking industry also play a role in determining firm value [13], [14]. Moreover, the impact of intellectual capital, board diversity, and corporate governance on firm performance and risk further emphasize the importance of these indicators [15], [16], [17]. Understanding the implications of these factors can provide insights into the overall health and performance of banks in the ASEAN region, aiding decision-making processes for various stakeholders.

2 Literature Review

2.1. Cost to Income Ratio

The CTI is a fundamental metric used to assess the efficiency and operational performance of banks [18]. It represents the ratio of operating costs to the total income generated by a bank [19]. Research has highlighted the importance of maintaining an optimal CTI in shaping the profitability of commercial banks [20]. Factors such as bank size, nonperforming loans ratio, liquidity position, and capital adequacy have been identified as influencing overall bank performance positively [20]. Moreover, a low CTI signifies operational efficiency within a bank [21]. While some studies suggest a positive correlation between the CTI and bank stability [22], others indicate a negative association between the CTI and bank profitability [23]. Higher cost to income ratios have been linked to lower profits and management inefficiency in banks [24]. Conversely, a low CTI is linked to enhanced profitability [25]. Additionally, a lower CTI reduces the likelihood of banks facing financial crises [26].

2.2. Net Interest Margin

Net interest margin (NIM) is a critical metric in the banking industry, reflecting the efficiency and profitability of banks in managing their assets and liabilities. NIM is defined as

the ratio of net interest income to total earning assets of banks [27]. Various factors influence NIM, including market power, operational costs, risk aversion, interest rate volatility, credit risk, and management efficiency [27]. Additionally, factors like bank liquidity, capitalization, size, and market concentration play crucial roles in explaining the countercyclical behavior of NIM [28]. Furthermore, NIM is not only an indicator of bank efficiency but also reflects banks' ability to generate interest income on their investments in profitable assets [29]. Studies have highlighted the importance of NIM in assessing a bank's operational efficiency and managerial effectiveness in resource utilization [30]. NIM is considered essential for controlling bank expenditures and assessing their ability to manage assets effectively [30].

2.3. Return on Asset

Return on assets (ROA) is a fundamental metric used to assess the performance of banks [31]. It indicates the level of earnings generated from the reinvestment of bank assets over a specific period [32]. Numerous studies have explored the determinants of financial performance in the banking sector, with ROA commonly used as a dependent variable [33], [34]. Factors such as credit risk, liquidity risk, bank size, inflation, and macroeconomic conditions have been scrutinized to comprehend their influence on ROA [35], [36], [37]. Furthermore, the relationship between asset management, operational efficiency, and expense management with ROA has been investigated [38], [39].

2.4. Firm Value

Firm value (FV) in the banking industry is a crucial aspect that impacts various stakeholders such as customers, investors, and the overall financial market. Maintaining and enhancing FV is essential for banks to build trust and attract funds [40]. Establishing strong relationships with banks can lead to improved access to credit, reduced information asymmetries, and an overall enhancement of firm performance and value [41]. In the banking sector, firms adjust their determinants of value, such as dividend payout ratios, to maintain target values and gradually increase dividends, thereby managing FV effectively [42].

2.5. The Relationship between Cost to Income Ratio and Firm Value

Research has shown that nonperforming loans (NPLs) and the CTI have a negative impact on FV, while factors like the NIM and capital adequacy ratio (CAR) positively influence FV [43]. Additionally, intrinsic financial risks, including the CTI, can notably affect the FV of banks in ASEAN-5 countries [12]. Studies have also explored the impact of cost stickiness on FV, indicating that it can negatively affect FV through channels such as the cost of equity and cash flow [44]. Furthermore, the relationship between FV and various financial ratios has been a subject of interest. Internal factors like non-performing loans (NPL), operating costs, operating income (BOPO), loan-to-deposit ratio (LDR), and ROA can influence FV [45]. Capital structure and profitability significantly affect FV, while firm characteristics and disposable income may not have a significant impact [46].

In conclusion, the relationship between the CTI and FV is complex and influenced by various financial factors, operational efficiencies, and market dynamics. Analyzing how metrics like the CTI interact with variables is essential for a comprehensive assessment of FV across different industries and economic contexts.

H1: Cost to Income Ratio has negative impact on Firm Value

2.6. Mediation of Net Interest Margin in the Relationship between Cost to Income Ratio and Firm Value

The NIM is a crucial indicator of a bank's profitability, illustrating the variance between the interest income from loans and investments and the interest paid on deposits and other liabilities [47]. The NIM is influenced by various factors, including operating costs, interest rates, and the broader economic environment [48].

When analyzing the correlation between the CTI and the NIM, it is vital to consider their impact on FV. FV is a comprehensive measure reflecting a company's overall worth and is affected by various financial indicators and performance metrics [49]. Studies have demonstrated that factors like return on equity, debt to asset ratio, current ratio, and net profit margin can notably influence FV [49]. Additionally, liquidity risk, NIM, and GDP have been identified as factors impacting FV in the banking sector [50].

The interaction among the CTI, NIM, and FV is intricate and multifaceted. Research has indicated that nonperforming loans, NIM, and the CTI exhibit a significant negative relationship with FV [43]. Furthermore, the increase in risk-weighted assets has been recognized as a factor contributing to the decrease in the capital adequacy ratio, which can be influenced by aspects of financial performance such as the NIM and ROA[51].

Within the banking industry, the NIM plays a pivotal role in determining the profitability and value of financial institutions. Studies have emphasized the significance of bank-specific variables (e.g., asset size, deposit ratio, loan ratio) in influencing the NIM [52]. Moreover, operating costs have been identified as a primary driver of banks' NIMs, underscoring the importance of cost management in enhancing profitability [47].

In conclusion, the CTI and NIM are critical indicators that can substantially influence FV, especially in the banking sector. Effective cost management, reflected in a lower CTI, can bolster profitability and ultimately enhance FV. Understanding the interplay between these metrics is imperative for financial institutions aiming to optimize their performance and maximize their market value.

H2: Net Interest Margin Ratio can mediate the effect of Cost to Income Ratio on Firm Value

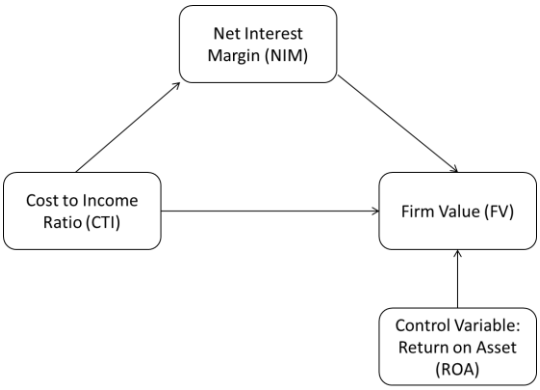

Fig. 1. Research Framework

3 Research Method

In this study, path analysis was employed using panel data regression models to examine the relationships between the CTI, NIM, ROA, and FV among banks over a specific period. The analysis was conducted through two sub-structural models, each tested using both Fixed Effects Model (FEM) and Random Effects Model (REM) to determine the most appropriate approach for the data. The selection of the models was guided by the Chow, Hausman, and LM tests. Based on the outcomes of these tests, the first sub-structural model, which explored the impact of CTI on NIM, was analyzed using the REM. Meanwhile, the second sub-structural model, which investigated the combined effects of CTI, NIM, and ROA on FV, was analyzed using the FEM. The use of path analysis allowed for a more nuanced understanding of both the direct and indirect relationships among these variables.

Table 1. Statistic Descriptive

	CTI	*NIM*	*ROA*	*FV*
Mean	0.453776	0.035558	0.014339	1.038409
Median	0.443500	0.032550	0.012000	1.003306
Maximum	0.637000	0.083000	0.040300	1.778576
Minimum	0.315000	0.014500	0.002000	0.884291
Std. Dev.	0.066323	0.016038	0.008237	0.159261
Skewness	0.485999	1.015694	1.480447	3.326200
Kurtosis	3.329343	3.461854	4.509230	14.25182
Jarque-Bera	4.827385	19.89095	50.62140	783.0991
Probability	0.089484	0.000048	0.000000	0.000000
Sum	49.91540	3.911400	1.577300	114.2250
Sum Sq. Dev.	0.479463	0.028038	0.007395	2.764691
Observations	110	110	110	110

The descriptive statistics in Table 1 provide an overview of these variables. The mean values indicate that, on average, the CTI is 45.38%, suggesting that nearly half of the banks' income is consumed by operating costs. The NIM stands at an average of 3.56%, reflecting the profitability of the banks in terms of interest income relative to their interest-earning assets. ROA, which measures the efficiency of asset utilization to generate profits, has a relatively low mean of 1.43%. Meanwhile, the average FV is slightly above 1.03, indicating a modest valuation of the banks in the sample.

The distribution of these variables shows considerable variation. For instance, the maximum CTI reaches 63.7%, while the minimum is 31.5%, reflecting differences in operational efficiency among the banks. NIM ranges from 1.45% to 8.3%, and ROA varies from

0.2% to 4.03%, highlighting disparities in profitability and asset management. FV shows the most skewed distribution with a maximum value of 1.78 and a minimum of 0.88, suggesting significant differences in market valuation across the banks.

Table 2. Data Distribution by Country and Year

Year	Malaysia	Singapore	Indonesia	Philippines	Thailand	Obs. per year
2019	5	3	5	3	6	22
2020	5	3	5	3	6	22
2021	5	3	5	3	6	22
2022	5	3	5	3	6	22
2023	5	3	5	3	6	22
Number of observations	25	15	25	15	30	110

Table 2 provides the data distribution by country and year, showing that the research covers a balanced sample of 110 observations from five ASEAN countries—Malaysia, Singapore, Indonesia, the Philippines, and Thailand—over the period from 2019 to 2023. Each year, 22 observations were recorded, with Malaysia and Indonesia contributing the most data points (25 observations each), followed by Thailand (30 observations), while Singapore and the Philippines each provided 15 observations. This balanced panel data structure enables a comprehensive analysis of the trends and relationships between CTI, NIM, ROA, and FV across different countries and over time.

3.1. Evaluation of Measurement Models

The study begins by rigorously selecting the appropriate models for analysis through a series of diagnostic tests, including the Chow, Hausman, and LM tests. These tests are essential in determining whether the Fixed Effects Models (FEM) or Random Effects Models (REM) are more suitable for each specific sub-structural equation in the analysis. For Substructural 1, which investigates the impact of the CTI on the NIM and or Substructural 2, which examines the combined effects of CTI, NIM, and ROA on FV.

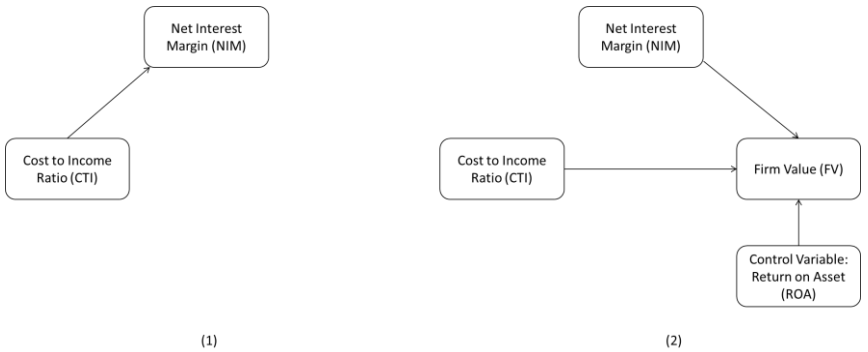

Fig. 2. Substructural 1 and 2

The study employs a rigorous model selection process to determine the most appropriate analytical approach for each substructural equation. For Substructural 1, which examines the relationship between the Cost to Income Ratio (CTI) and NIM, several tests were conducted. The Chow Test yielded a p-value of less than 0.05, suggesting that the Fixed Effects Model (FEM) might be more suitable. However, the Hausman Test, with a p-value greater than 0.05, indicated a preference for the Random Effects Model (REM). This finding was further supported by the LM Test, which also returned a p-value of less than 0.05, confirming the suitability of REM for analyzing the impact of CTI on NIM.

In contrast, for Substructural 2, which explores the combined effects of CTI, NIM, and ROA on FV, the tests pointed towards a different model. The Chow Test again showed a p-value of less than 0.05, indicating a preference for the Fixed Effects Model (FEM). This was reinforced by the Hausman Test, which also returned a p-value of less than 0.05, providing strong evidence in favor of FEM. Given this consistent indication, the LM Test was deemed unnecessary for Substructural 2, as the FEM was clearly the most appropriate model for capturing the relationship between these variables and FV.

Table 3. Heteroskedasticity Test of Substructural 1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010873	0.004204	2.586163	0.0110
CTI	0.004359	0.008069	0.540216	0.5902

In the evaluation of Substructural 1, the REM was chosen based on the results of the model selection tests. Multicollinearity testing was not required due to the presence of only one independent variable. The heteroskedasticity test showed a p-value greater than 0.05, suggesting that heteroskedasticity is not a concern.

Table 4. Multicollinearity Test of Substructural 2

	CTI	NIM	ROA
CTI	1	0.08664322398333376	-0.374949459951382
NIM	0.08664322398333376	1	0.6756052203561252
ROA	-0.374949459951382	0.6756052203561252	1

Table 5. Heteroskedacity Test of Substructural 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.046912	0.031317	-1.497992	0.1378
CTI	0.077300	0.045844	1.686129	0.0954
ROA	-0.085043	0.398002	-0.213673	0.8313
NIM	0.712631	0.626903	1.136748	0.2588

For Substructural 2, FEM was selected, and multicollinearity was checked among the variables. The correlation matrix revealed that all correlation values were below 0.8, indicating

no severe multicollinearity. Additionally, the heteroskedasticity test results (p-values > 0.05) confirmed the absence of heteroskedasticity.

3.2. Structural Model Evaluation

Table 6. Random Effect Model of Substructural 1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.043379	0.005221	8.308240	0.0000
CTI	-0.017234	0.008527	-2.021216	0.0457
R-squared				0.036558
Adjusted R-squared				0.027637
F-statistic				4.098055
Prob(F-statistic)				0.045401

In the analysis of Substructural 1, which investigates the impact of the CTI on NIM, the Random Effects Model (REM) estimation revealed a negative and statistically significant relationship between CTI and NIM. Specifically, the coefficient of -0.017234 with a p-value of 0.0457 indicates that as CTI increases, NIM tends to decrease, suggesting that higher cost inefficiencies within banks may erode their NIMs. This result is further substantiated by the F-test for the model, which yielded a p-value of 0.045401, confirming that CTI, as a whole, has a significant impact on NIM. However, the low R-squared value of 2.7% suggests that while CTI does have a significant effect, it only explains a small portion of the variability in NIM, indicating that other factors not included in the model may also play a critical role in determining NIM.

Table 7. Fix Effect Model of Substructural 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.022248	0.051449	19.86917	0.0000
CTI	-0.070455	0.075316	-0.935465	0.3522
ROA	2.681481	0.653857	4.101017	0.0001
NIM	0.272288	1.029906	0.264381	0.7921
R-squared				0.984820
Adjusted R-squared				0.980534
F-statistic				229.7737
Prob(F-statistic)				0.000000

In Substructural 2, the analysis shifts to examine the combined effects of CTI, NIM, and ROA on FV using a Fixed Effects Model (FEM). The results showed that CTI and NIM were not significant predictors of FV, as indicated by their p-values being greater than 0.05. This suggests that, within the context of this model, variations in cost efficiency (as measured by CTI) and NIMs do not significantly influence the overall value of firms. In contrast, ROA emerged as a highly significant predictor, with a coefficient of 2.681481 and a p-value of 0.0001,

indicating that higher profitability, as reflected by ROA, is strongly associated with increases in FV. The F-test for this model confirmed that when considered together, CTI, NIM, and ROA collectively have a significant impact on FV (p-value < 0.05). Moreover, the R-squared value of 98.05% suggests that the model explains nearly all the variation in FV, highlighting the importance of ROA as a key determinant in the valuation of banks within the study.

The Sobel test was employed to rigorously examine whether NIM functions as a mediator in the relationship between the CTI and FV. This test is specifically designed to evaluate the significance of an indirect effect in a mediation model, providing insight into whether the mediator (in this case, NIM) carries the influence of the independent variable (CTI) to the dependent variable (FV). The results of the Sobel test yielded a p-value of 0.7932, which is substantially higher than the commonly accepted significance level of 0.05. This high p-value suggests that the indirect effect of CTI on FV through NIM is not statistically significant. In other words, the data does not support the idea that NIM acts as a significant pathway through which CTI influences FV. Furthermore, the test statistic of -0.2621 further reinforces this conclusion. A test statistic close to zero, as observed here, typically indicates a weak or non-existent mediation effect. In this context, it implies that the relationship between CTI and FV does not materially change when NIM is considered as a mediator.

H1: Hypothesis **rejected** that there is no significant effect of Cost to Income Ratio on FV. The statistical results revealed that CTI does not exert a significant influence on FV, as evidenced by a p-value of 0.3522. This suggests that variations in the efficiency of managing costs relative to income, as measured by CTI, do not directly translate into significant changes in the overall value of firms. This finding implies that other factors, potentially external economic conditions or internal business strategies, may play a more critical role in determining FV, beyond the cost efficiency metric alone.

H12: Hypothesis **rejected** that there is no significant mediating effect of NIM on the relationship between CTI and FV. The Sobel test was employed to assess this mediation effect. However, the results showed that the mediation effect of NIM is not statistically significant, with a p-value of 0.7932, well above the threshold of 0.05. The corresponding test statistic of -0.2621 further supports the conclusion that NIM does not significantly mediate the relationship between CTI and FV.

4 Discussion

The findings of this study provide significant insights into the relationships between CTI, NIM, ROA, and FV within the banking sector across ASEAN countries. Through rigorous panel data regression analysis, the study aimed to disentangle the effects of these financial performance metrics on the value of banks.

The analysis of the first substructural model reveals a negative and statistically significant relationship between CTI and NIM. This finding aligns with the general understanding that a higher cost to income ratio, indicating inefficiency in managing operating expenses relative to income, can reduce a bank's NIM. The result suggests that when banks in the ASEAN region fail to manage their costs effectively, it directly diminishes their profitability in terms of interest margins. However, the relatively low R-squared value indicates that CTI alone does not account

for a substantial portion of the variance in NIM, implying that other unexamined factors may also play a critical role.

The second substructural model focused on the impact of CTI, NIM, and ROA on FV. The analysis found that neither CTI nor NIM significantly predicted FV, while ROA emerged as a strong and significant positive predictor. The insignificance of CTI in influencing FV suggests that cost efficiency, as measured by CTI, does not directly affect how the market values banks in this region. Similarly, the lack of significance in NIM's impact on FV may indicate that investors and market participants prioritize other aspects of financial health, such as overall profitability (as reflected by ROA), over operational efficiency or interest margins alone.

The Sobel test results further reinforce the complexity of the relationships among these variables. The test did not support the hypothesis that NIM mediates the relationship between CTI and FV. The non-significant mediation effect suggests that even though CTI influences NIM, this does not translate into an indirect effect on FV. This finding highlights the possibility that other mediating factors or direct influences, such as market conditions, regulatory changes, or even macroeconomic variables, might overshadow the role of NIM in this relationship.

The study's results have broader implications for both academic research and banking practice in ASEAN countries. Academically, the findings contribute to the literature by emphasizing the distinct roles of different financial metrics in influencing FV. Practically, the results suggest that banks may need to focus more on improving overall profitability (as measured by ROA) rather than solely concentrating on cost efficiency or maximizing interest margins. Additionally, the findings highlight the importance of considering a broader range of factors when evaluating FV, as traditional metrics like CTI and NIM may not capture the full picture.

5 Conclusion

This study has provided a comprehensive analysis of the relationships between CTI, NIM, ROA, and FV in ASEAN banks, offering valuable insights into how these financial indicators interact. The results indicate that while cost efficiency negatively impacts NIM, it does not significantly affect FV. Instead, ROA stands out as the primary driver of FV, overshadowing the effects of both CTI and NIM. Furthermore, the expected mediation effect of NIM between CTI and FV was not observed, suggesting the presence of other influential factors that were not considered in this study.

The study's findings underscore the need for future research to explore these other potential determinants of FV, particularly in the dynamic and diverse financial landscapes of ASEAN countries. Additionally, for banking practitioners, the emphasis should be on enhancing overall profitability, as this appears to have the most substantial impact on how firms are valued in the market. By broadening the scope of analysis to include other variables, future studies may provide even deeper insights into the complex mechanisms that drive FV in the banking sector.

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