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The Role of Financial Health in Predicting Long-Term Performance in Selected Industries in Thailand

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Abstract

Aim/Purpose: In this study, the relationship between financial health and long-term performance was investigated across four key Thai industries, including Agribusiness, Automotive, Petrochemicals, and Tourism and Leisure. The research identified which sectors were financially strong or at risk and explored the impact of firm size and industry type on performance. This information is crucial for business leaders, investors, and policymakers when making decisions.

Introduction/Background: Thailand's economy has faced a recent slowdown; the COVID-19 pandemic made things even tougher, especially for industries like Tourism and Leisure. Service and manufacturing firms are vital to national economic development, but both have struggled with profitability amidst global disruption. While much existing research has relied on short-term financial ratios to assess firm performance, a notable gap remains in emerging economies such as Thailand regarding the use of comprehensive financial health indicators. This study utilized the Altman Z-score, a robust measure of long-term financial stability, to predict long-term performance among Thai firms. Furthermore, it addressed the underexplored roles of firm size and industry type, contributing new insights into long-term financial sustainability in emerging markets.

Methodology: The quantitative study utilized the data from 57 companies listed on the Stock Exchange of Thailand (SET), which included 10 firms from the Agribusiness sector, 19 from Automotive, 14 from Petrochemicals, and 15 from Tourism and Leisure from the years 2021 to 2024. To measure financial health, Altman's Z-score was used to predict bankruptcy and assess an industry's solvency risk. Long-term performance was evaluated through key financial metrics, which included Earnings per Share (EPS), Net Profit Margin (NPM), Return on Assets (ROA), and Return on Equity (ROE). Relationships between financial health and performance were examined using Pearson's correlation coefficient and fixed-effects regression analysis, while controlling variables such as firm size, year, and industry-specific effects.

Findings: The findings revealed several important insights. Firstly, the Z-scores exhibited significant positive relationships with performance indicators such as EPS, NPM, ROA, and ROE. These results revealed that financially stable firms tended to perform better in the long run. Secondly, the firm size analysis showed that larger firms demonstrated stronger performance in EPS, ROA, and ROE, but firm size did not significantly affect NPM. This showed that profitability margins are more dependent on operational efficiency than scale alone. Thirdly, the industry analysis revealed that the Tourism and Leisure sector was hit hardest by the pandemic; it demonstrated a strong recovery with higher ROA and ROE once recovery began. However, almost all companies in this sector (96.67%) are still in financial trouble, which is a big concern. Agribusiness exhibited the lowest company risk, which demonstrated stable demand, efficient cost management, and effective performance in the industry. The Automotive and Petrochemical sectors showed moderate financial stability, with some firms facing liquidity challenges, but generally maintaining steady performance. In conclusion, the research findings highlighted the different degrees of financial resilience across industries, emphasizing the need for tailored risk management strategies.

Contribution/Impact on Society: This study makes several important key contributions because it shows how firms with good financial health can remain strong for a long time. It also provides industry-specific information about financial risks and how businesses recover. Thus helping business leaders, investors, and policymakers make smart decisions. The size of a company matters in terms of its performance, but this can change depending on how it is measured. Finally, the research findings can assist investors in finding strong companies in new markets.

Recommendations: Based on these findings, several recommendations are proposed for businesses, policymakers, and investors. For businesses, firms with high risk, such as those in Tourism and Leisure, should prioritize financial health by optimizing liquidity, reducing debt burdens, and improving operational efficiency. Policymakers should implement targeted support mechanisms such as liquidity assistance for Tourism & Leisure, and tax incentives for Agribusiness to encourage efficiency. Additionally, regulatory frameworks that promote financial transparency and robust risk management practices should be established, particularly in volatile industries. Investors should incorporate Z-scores and firm size as screening criteria when evaluating long-term investment opportunities in Thai investments. They should also diversify their portfolios to mitigate risk, for example, by balancing investments in sectors like Agribusiness and Automotive.

Research Limitations: This study was limited to publicly listed companies in four industries and excluded private enterprises, which may have shown different financial behaviors. Additionally, the use of only accounting-based performance measures (EPS, NPM, ROA, ROE) may not capture market-based dimensions of performance. Lastly, the study covered a period that was heavily influenced by the COVID-19 pandemic, which may have skewed the findings.

Future Research: Future research studies could include more industries, private firms, or firms from other ASEAN countries. Including additional control variables (such as leverage, innovation, investment, or corporate governance) may also enhance explanatory power and uncover deeper insights into the determinants of financial performance.

Keywords: *Financial health, long-term performance, Altman Z-scores, industry analysis*

Introduction

Over the last four decades, Thailand has made remarkable progress in social and economic development, moving from a low-income to an upper middle-income country in less than a generation (World Bank, 2024b). However, growth has slowed in recent years, with productivity stagnating and private investment dropping to 16.9% of GDP by 2019. In addition, the pandemic caused a 6.1% contraction in 2020, worsening structural issues (World Bank, 2024b). The World Bank report also mentions that this decline was sharper than during the 2008 financial crisis. Tourism, which is key to growth in Thailand, was expected to return to 90% of pre-pandemic levels by mid-2025 (World Bank, 2024b). Despite this, the nation faces many challenges in maintaining sustainable growth and financial stability. Those include an aging population, rising healthcare costs, and natural disasters that threaten long-term growth and fiscal sustainability (World Bank, 2024a; World Bank, 2024b). Addressing these multifaceted issues is a crucial dilemma for Thailand to maintain its development path and ensure future prosperity (International Monetary Fund, 2024).

This broader economic slowdown, combined with external shocks like the COVID-19 pandemic and global supply chain disruptions, has exposed significant vulnerabilities at the firm level. Many Thai companies have faced declining profits, raising concerns about their overall financial stability. Thai multinational companies whose core businesses focus on hospitality, restaurant, and lifestyle brands encountered severe liquidity issues during the pandemic due to a sharp drop in revenue (Minor International, 2020). Similarly, Toyota Thailand has struggled with production delays from global semiconductor shortages, which have led to lower output and higher product costs, despite being a major car manufacturing company and using high-quality supply chain management practices (Bangkok Post, 2021; Setboonsarng, 2021). In addition, the Charoen Pokphand Group, one of the

largest Thai agribusiness conglomerates, took on significant debt to finance its aggressive expansion, which has resulted in concerns about its long-term financial stability (Charoen Pokphand Group, 2020).

What has caused these issues, and how can such risks be prevented? These questions, among others, sparked the interest of the researchers to pursue this topic. To address these concerns, the financial health and long-term performance of four key industries in Thailand was investigated, namely the Agribusiness, Automotive, Petrochemicals, and Tourism and Leisure sectors. By analyzing financial data of companies from each of the four sectors, the researchers explored the underlying patterns, risks, and resilience of the Thai industrial landscape. More precisely, the study sought to investigate the following issues:

- To investigate relationships between financial health and long-term performance in key Thai sectors, including Agribusiness, Automotive, Petrochemicals, and Tourism and Leisure.
- To examine which of these four industries are financially healthy.
- To examine which of these four industries are at risk.
- To examine if company size and industry type influence long-term financial performance.

Literature Review

Financial Health

Understanding and assessing financial health is crucial for businesses seeking long-term success, especially in uncertain and competitive environments. Financial health refers to a company's ability to maintain profitability, manage its debt effectively, and meet its financial obligations. A financially healthy business is more likely to thrive and maintain its operations within a competitive market (Nagy & Valaskov, 2023). To evaluate financial health, one of the most widely recognized tools is the Altman Z-score model, introduced by Edward I. Altman in 1968. This model serves as a probabilistic indicator of whether a firm is likely to go bankrupt in the next few years by using the key financial ratios from its income statement and statement of financial position.

Many researchers worldwide have worked out predictions of financial health using the Altman Z-score model. For instance, a study by Tung and Phung (2019) in Vietnam looked at the financial health, specifically the risk of bankruptcy, for 180 small and medium-sized businesses in Sóc Trăng Province. They used the Altman Z-score model, along with information from companies' financial reports. Their findings showed that both financial data and non-financial factors were instrumental in determining whether a business was likely to fail (Tung & Phung, 2019). Similarly, Nandini et al. (2018) conducted a study in India focusing on ITI Ltd., a specific company. They evaluated its financial condition over a period of 22 years using the Altman Z-score model and also looked at its profitability using standard ratios for 5 years. By comparing the Z-score results and its profitability analysis, they examined the company's financial health. Their findings suggested that the company lacked an awareness of its worsening financial situation, and increasing debt eventually led to its failure (Nandini et al., 2018).

In Indonesia, a study by Kharisma et al. (2025) of PT Chandra Asri Pacific TBK, a petrochemical company, assessed its potential for financial distress between 2019 and 2023. Their analysis specifically used the Altman Z-score applicable to non-manufacturing and emerging markets. The results indicated that the firm was not experiencing general financial distress during this period, with Z-scores consistently above the 2.60 threshold. Lestari et al. (2021) also examined financial distress in Indonesia's tourism, hospitality, and restaurant subsectors from 2015 to 2019, applying models including the Altman Z-score to assess the financial health of companies in these combined sectors. These studies provide insights into how the Z-score may be used for tourism-related industries in an emerging market context, which is relevant for studies in similar regions like Thailand.

Other sector-specific applications have included agriculture and the automotive sector. Oyinlola et al. (2025) investigated the applicability of Altman Z-score models, including the original Z and the Z'' versions, for predicting the survival of listed agricultural companies in Nigeria, an emerging market in Africa. Their study indicated that Altman's Z-score models were effective tools for assessing financial health and predicting the likelihood of distress among these firms. Furthermore, Bunker et al. (2024) studied the automotive sector in India, comparing the predictive power of four financial distress

models including the Altman Z-score model. Their study analyzed data from 10 Indian automotive firms from 2013 to 2023 to assess the likelihood of financial distress. Their findings showed that the Altman Z-score was an effective model for predicting financial distress in the Indian automotive industry.

Building on these insights, the present study employed the Altman Z-score to evaluate financial health and risk across four critical industries in Thailand: Agriculture, Automotive, Petrochemicals, and Tourism and Leisure. Specifically, it aimed to determine which of these industries demonstrated the strongest level of financial stability, and which might be the most vulnerable to financial distress.

Long-Term Performance

While financial health focuses on a company's ability to remain solvent and avoid distress, assessing long-term performance requires a broader view that captures how well a company delivers value over time. Financial performance identifies how well a company generates revenues and manages its assets, liabilities, and the financial interests of its stockholders and stakeholders (Kenton, 2024). Researchers have worked out predictions of long-term performance using financial ratios.

Earnings per share (EPS) represent the share of a company's profits that is allocated to each outstanding share, and it serves as an important gauge of performance. Islam et al. (2014) argued that long-term EPS trends are indicative of profit sustainability and shareholder value. Likewise, Mao (2023) showed that EPS has implications for firm valuation and share pricing.

Net Profit Margin (NPM), another profitability metric, compares net income to total sales, and reflects a company's cost efficiency within a specific time frame (Sutrisno, 2013). Royda (2019) and Nariswari and Nugraha (2020) observed that NPM had no significant impact on company profit growth.

Return on Assets (ROA) is a profitability ratio that measures how efficiently a company utilizes its assets to generate profits. A study by Hagel and Brown, (2013) used ROA trends to understand long-term performance. However, the study also highlighted the limitations of using a single metric to measure long-term performance and indicated that ROA should not be analyzed in isolation. Their study suggested that ROA should be considered alongside other financial ratios, qualitative factors, and industry benchmarks to understand firms' long-term performance. Damodaran (2006) and Penman (2013) similarly emphasized that high ROA signals operational efficiency and sound management, as it reflects a company's ability to generate profits on its asset base. It is also known that ROA is effective in measuring all of an enterprise's operational processes, from production to marketing activities (Tutcu et al., 2024).

Another key indicator is Return on Equity (ROE), which evaluates how effectively a company uses shareholders' equity to generate profits. The use of ROE as a measure of corporate financial performance was examined in a South African study, including its application in assessing long-term value creation for shareholders (De Wet & Du Toit, 2007). The results suggested that analyzing ROE trends over time can provide valuable insights into a company's long-term profitability and efficiency in utilizing shareholders' equity. However, the results also highlighted the limitations of ROE and consider it as part of a broader analysis of long-term financial health. A study by Brigham and Ehrhardt (2017) emphasized that high ROE shows that firms generate high returns by using their equity effectively, which is attractive to investors. At the same time, ROE can also be used to assess the effectiveness of a firm's financial strategies and capital structure. The literature also shows that ROE reflects competitiveness and a firm's sustainable growth rate (Tutcu et al., 2024).

In light of these perspectives, in this study EPS, NPM, ROA, and ROE were utilized to assess the long-term financial performance of four key industries in Thailand: Agribusiness, Automotive, Petrochemicals, Tourism and Leisure. These metrics provide a multidimensional view of how each sector performs over time, helping to identify which industry is most financially resilient.

Related Research That Uses Financial Health to Predict Long-Term Performance

Building upon the discussion of financial ratios and their role in assessing long-term performance, several studies have employed correlation analysis to explore these relationships in different contexts.

For instance, a study on Thai banking firms investigated the relationship between various financial ratios and total stock returns (Sharma & Luciani, 2023). This research is particularly relevant as it utilized correlation analysis to examine the associations between financial ratios (such as those related to profitability, such as ROA and ROE) and market-based outcomes representing long-term value. The findings indicated significant correlations between financial ratios and performance measures. Despite its banking sector focus, this study's use of correlation analysis to link financial indicators with long-term performance provides a local example and highlights the need for such analysis in other Thai industries such as agribusiness, automotive, petrochemicals, tourism and leisure.

Another study, Crăciun et al. (2021) used correlation analysis to study the relationship between company financial indicators and sustainable development indicators. Utilizing both correlation analysis and panel data regression, the study explored the influence of financial metrics on sustainable development indicators in companies listed on the Bucharest Stock Exchange. However, the results of this study showed no strong or statistically significant linear relationships between their financial performance and their sustainable development indicators.

Additionally, a systematic review by Seretidou et al. (2025) looked at studies comparing traditional financial ratios (like ROA and ROE) with cash flow ratios for predicting performance and risk. This review confirmed the use of various research methods, including correlation analysis, to evaluate how well these ratios predict future performance and financial health. This review is relevant because it showed that financial ratios are commonly used to predict future performance and financial health, and it validated the use of correlation analysis for examining these relationships.

Based on these studies, and to explore the connection between financial health and long-term performance in the Thai industrial context, the following hypotheses were used in this study.

Null Hypothesis (H_0): There is no significant positive relationship between the financial health of companies in the Agribusiness, Automotive, Petrochemicals, and Tourism and Leisure sectors in Thailand and their long-term performance.

Alternative Hypothesis (H_1): There is a significant positive relationship between the financial health of companies in the Agribusiness, Automotive, Petrochemicals, and Tourism and Leisure sectors in Thailand and their long-term performance.

Company Size and Industry Type Influence Long-Term Performance

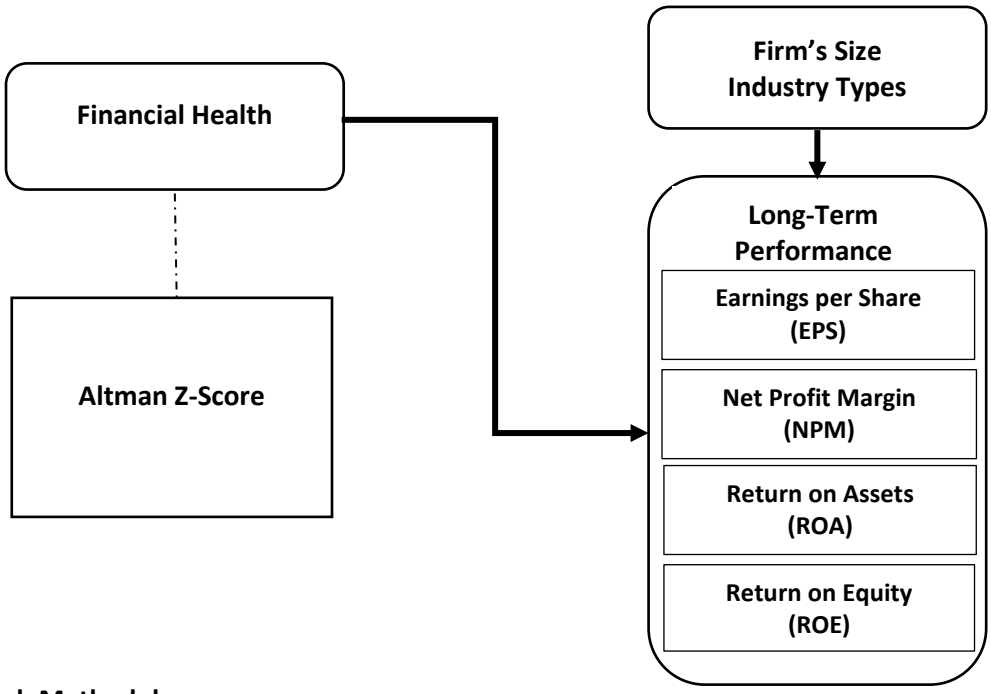
Beyond financial health and performance indicators, company-specific characteristics such as firm size and industry type also play a critical role in shaping long-term performance. The relationships between company characteristics such as size, industry type, and long-term performance can be complicated. Several studies have explored size and industry type factors to evaluate a company's ability to achieve sustained success. Larger, well-established firms often display significant market power, allowing them to influence pricing, negotiate better terms with suppliers, and dominate distribution channels. The studies of Porter (1980) indicate that strong brand recognition is an important factor for customer loyalty and competitive advantage, supporting long-term performance. Along with the study of Siahann et al. (2014), it highlights that larger companies may attract more investor attention due to their perceived stability. On the other hand, a study by Hartoyo et al. (2023) found that company size had no effect or even a negative effect on company value, with investors potentially viewing very large companies as less efficient in supervising the firm.

Industry type is also an important factor that influences long-term performance. Porter (1980) mentioned the Five Forces Framework as a foundational concept emphasizing how industry structure, including barriers to entry, buyer and supplier power, threat of substitutes, and intensity of rivalry, influence firms. These factors are considered attractive and can add to the potential for profitability and robust long-term performance. Additionally, the sustained performance of firms is often linked to their ability to adapt and maintain a sustainable competitive advantage within their specific industry context (Martynov & Shafti, 2016).

Research Framework

The research framework is shown below in Figure 1.

Figure 1 *Research Framework*



Research Methodology

Research Design and Sampling

In this study, a quantitative research approach was employed using secondary data sourced from the Stock Exchange of Thailand (SET). The population of this study included 921 publicly traded companies listed on the SET. To align with the research objectives and enhance representativeness, the study focused on four key industries: Agriculture and Food, Automotive, Petrochemicals and Chemicals, and Tourism and Leisure. These sectors were selected based on their relevance to the research purpose and to ensure comprehensive industry coverage. The final sample consists of 57 companies, distributed as follows: 10 Agribusiness, 19 Automotive, 14 Petrochemicals, and 15 Tourism and Leisure. The data that was collected covered a four year-period from 2021 to 2024.

Data Collection

Data for this study (financial statements) were primarily collected from the SET and individual firm websites. Only firms with non-missing values for key variables were included in the final analysis.

Research Models and Variables Measurement

To assess the determinants of a firm's long-term performance and examine whether firm size and industry type influence performance outcomes, the following fixed effects regression model was used:

$Y_{it} = \beta_0 + \beta_1 ZScore_{it} + \beta_2 Size_{it} + \delta_t YearFixedEffects + \gamma_j IndustryFixedEffects + \varepsilon_{it}$

Where:

Y_{it} is the financial performance indicator of firm *i* in year *t*, represented in separate models by Earnings Per Share (EPS), Net Profit Margin (NPM), Return on Assets (ROA), or Return on Equity (ROE).

$ZScore_{it}$ is Altman's Z-score.

$Size_{it}$ represents the size of the firm.

δ_t is a set of year fixed effects, included to control for time-specific shocks and macroeconomic trends that could affect all firms.

γ_j is a set of industry fixed effects, accounting for structural differences across industries.

ε_{it} is the error term.

The models were estimated separately for each dependent variable as below:

Model 1: $EPS_{it} = \beta_0 + \beta_1 ZScore_{it} + \beta_2 Size_{it} + \delta_t YearFixedEffects + \gamma_j IndustryFixedEffects + \varepsilon_{it}$

Model 2: $NPM_{it} = \beta_0 + \beta_1 ZScore_{it} + \beta_2 Size_{it} + \delta_t YearFixedEffects + \gamma_j IndustryFixedEffects + \varepsilon_{it}$

Model 3: $ROA_{it} = \beta_0 + \beta_1 ZScore_{it} + \beta_2 Size_{it} + \delta_t YearFixedEffects + \gamma_j IndustryFixedEffects + \varepsilon_{it}$

Model 4: $ROE_{it} = \beta_0 + \beta_1 ZScore_{it} + \beta_2 Size_{it} + \delta_t YearFixedEffects + \gamma_j IndustryFixedEffects + \varepsilon_{it}$

Definitions and measurement parameters for each variable are shown below in Table 1.

Table 1 *Variables: Definitions and Measurement*

Variables	Abbreviations	Definitions	Measurement
Earnings per Share	EPS	Reflects the earnings attributable to each outstanding ordinary share.	Net income / No. of shares outstanding
Net Profit Margin	NPM	Shows the amount of income generated from sales revenues earned.	Net income / Total revenue
Return on Assets	ROA	Indicates how efficiently a firm utilizes its assets to generate profit.	Net income / Total assets
Return on Equity	ROE	Measures the profit generated from the invested capital.	Net income / Shareholders' equity
Financial health indicator	Z-Score	A bankruptcy risk indicator combining financial ratios into a single metric.	Composite score from Altman's Z-score formula
Firm size	Size	Used to control the scale of the firm's operations.	Natural log of total sales
Industry category (categorical)	Industry Fixed Effects	Categorical classification based on the firm's industry sector.	Dummy-coded variables for industry groups
Year-specific controls	Year Fixed Effects	Controls for year-over-year variation such as macroeconomic changes.	Dummy-coded for 2020, 2021, and 2022 (2019 base)

Financial health was evaluated using the Altman Z-Score, adapted for non-manufacturing and private firms. The Z-Score formula was applied as follows:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + .6X_4 + 1.0X_5$$

Where:

X_1 = Working Capital / Total Assets

X_2 = Retained Earnings / Total Assets

X_3 = EBIT / Total Assets

X_4 = Market Value of Equity / Book Value of Total Liabilities

X_5 = Sales / Total Assets

Z-Score interpretations follow standard benchmarks:

$Z < 1.8$: Distressed Zone

$1.8 < Z < 3.0$: Gray Zone

$Z > 3.0$: Safe Zone (financially healthy)

Data Analysis

Altman Z-Scores for all firms were calculated using Microsoft Excel. Firms and industries were ranked accordingly based on their Z-Scores. To examine the relationship between financial health and long-term financial performance, statistical analyses were conducted using SPSS software. This included correlation analysis and fixed-effects panel regression models, incorporating year and industry fixed effects to control for unobserved heterogeneity across time and sectors.

Findings

Descriptive Statistics

In Table 2 below, descriptive statistics for the study's variables are shown.

Table 2 *Descriptive Statistics*

Variables	Minimum	Maximum	Mean	Std. Deviation
EPS	-41.11	22.93	.99	4.60
NPM (%)	-267.06	338.93	.08	37.18
ROA (%)	-29.29	37.65	5.26	7.62
ROE (%)	-216.73	37.41	2.75	21.45
Z-Score	-2.07	7.03	1.80	1.33
Size	1.41	5.84	3.55	.73

These descriptive statistics provide an overview of the distribution and variation of key variables in the dataset. ROE had a wide range from -216.73% to 37.41%, with an average of 2.75% and a high standard deviation of 21.45%. This suggested that while some firms were highly profitable, others experienced large losses. ROA was more stable, with a mean of 5.26% and a standard deviation of 7.62%. This result indicated a more stable performance compared to ROE. The average Altman Z-Score was 1.80, with values ranging from -2.07 to 7.03, which showed that some firms were financially distressed while others were in a stronger position. EPS also showed high variability, with a minimum of -41.11 and a maximum of 22.93, averaging .99 with a standard deviation of 4.60, which meant that some firms faced large losses per share, while others generated positive earnings. NPM showed the highest variation, ranging from -267.06% to 338.93%, with a mean close to zero (.08%) and a standard deviation of 37.18%. This reflected significant differences in profit efficiency among firms. Firm size, which was measured in logarithmic form, ranged from 1.41 to 5.84 with an average of 3.55 and a relatively low standard deviation of .73. This showed that the firms in the sample were mostly mid-sized with moderate variation.

Correlation Analysis

The results of correlation analysis are shown below in Table 3.

Table 3 *Pearson's Correlation Coefficients*

	ROE	ROA	Z-Score	EPS	NPM	Size
ROE	1					
ROA	.670**	1				
ZScore	.549**	.722**	1			
EPS	.224**	.307**	.190**	1		
NPM	.359**	.377**	.251**	.260**	1	
Size	.173**	.218**	.136*	.209**	.116	1

Note. * 2-tailed correlation significant at the .05 level, ** significant at the .01 level.

The Pearson correlation results reveal several significant relationships among the variables. EPS and NPM were positively correlated (r = .260, p < .01), which showed that firms with higher earnings per share also tended to have better profit margins. Firm size was significant, but weakly, correlated with most variables, particularly with EPS (r = .209, p < .01) and ROA (r = .218, p < .01), which meant that larger firms may have slight advantages in profitability and financial stability. Overall, the correlation matrix indicated meaningful relationships among key financial performance indicators.

ROA was strongly correlated with the Z-Score (r = .722, p < .01), which indicated that more financially stable firms generally achieved better returns on assets. ROA also had significant positive correlations with EPS (r = .307, p < .01), NPM (r = .377, p < .01) and size (r = .218, p < .01). The Z-Score,

as a measure of financial health, was significantly associated with all other variables, although the correlations with EPS, NPM, and size were modest.

ROE was strongly and positively correlated with ROA (r = .670, p < .01) and moderately correlated with the Altman Z-Score (r = .549, p < .01). This result suggested that firms with higher profitability on assets and stronger financial health tended to also have higher equity returns. ROE also showed weaker but significant positive correlations with EPS (r = .224, p < .01), NPM (r = .359, p < .01), and firm size (r = .173, p < .01).

Regression Analysis

Regression analysis was employed to examine linear relationships between financial health and long-term performance. This analysis aimed to identify the direction, strength, and significance of these relationships. To control for time-specific effects, year dummy variables were included in the model. Specifically, Year 2 Dummy, Year 3 Dummy, and Year 4 Dummy represented the years 2022, 2023, and 2024, respectively, while the year 2021 served as a reference point (coded as 0). These dummy variables helped account for unobserved year-specific influences on long-term performance.

Industry dummy variables were also included to capture the effects of sectoral differences on long-term performance. Firms were categorized into four industry sectors: (1) Automotive (reference group), (2) Agriculture and Food, (3) Petrochemicals and Chemicals, and (4) Tourism and Leisure. Industry 2 Dummy represented firms in the Agriculture and Food sector, Industry 3 Dummy corresponded to the Petrochemicals and Chemicals sector, and Industry 4 Dummy denoted firms in the Tourism and Leisure sector. By using the Automotive sector as the base category, the coefficients for each industry dummy reflected the difference in long-term performance (EPS, NPM, ROA, and ROE) relative to firms in the Automotive group. This approach provided a clearer understanding of how financial health, time trends, and industry context influence firm profitability and marketability.

Table 4 presents the determinants of Earnings per Share using multiple regression analysis.

Table 4 *Model 1: Multiple Regression Analysis Predicting Earnings Per Share (EPS)*

Variables	Coeff. (B)	*SE*	*t*	Sig.
(Constant)	-4.258	1.692	-2.516	.013
Z Score	.563	.266	2.117	.035
Size	1.214	.423	2.872	.004
Year 2 Dummy	.665	.840	.792	.429
Year 3 Dummy	1.046	.841	1.243	.215
Year 4 Dummy	.491	.840	.585	.559
Industry Type 2 Dummy	-1.547	.894	-1.730	.085
Industry Type 3 Dummy	-.628	.799	-.786	.432
Industry Type 4 Dummy	-.757	.881	-.859	.391
R = .300, R^2 = .090, Adjusted R^2 = .057, F = 2.705**				

Note. DV = EPS; **Significant at 1% level.

This model achieved statistical significance overall (F = 2.705, p < .01), although it explained a relatively modest portion of the variation in EPS, with an R^2 of .090 and an adjusted R^2 of .057. This suggested that while the predictors included offer some explanatory power, other factors may also contribute meaningfully to EPS outcomes. Both Z-Score (B = .563, p = .035) and firm size (B = 1.214, p = .004) emerged as significant positive predictors of EPS. This indicated that firms with strong financial health and large size tended to report higher earnings per share.

The year dummy variables were not statistically significant. This implied that EPS performance remained relatively stable across the observed time period. Likewise, the industry dummy variables did not show significant differences in EPS compared to the reference group (Automotive sector).

Though Industry type 2 Dummy approached marginal significance (p = .085), its negative coefficient suggested that firms in this sector may exhibit slightly lower EPS.

Model 2 estimated the effect of Net Profit Margin (NPM) on firm financial health by utilizing a multiple regression approach; please see Table 5.

Table 5 *Model 2: Multiple Regression Analysis Predicting Net Profit Margin (NPM)*

Variables	Coeff. (B)	*SE*	*t*	Sig.
(Constant)	-29.593	13.556	-2.183	.030
Z Score	6.007	2.131	2.819	.005
Size	3.593	3.385	1.061	.290
Year 2 Dummy	9.897	6.729	1.471	.143
Year 3 Dummy	13.450	6.738	1.996	.047
Year 4 Dummy	17.099	6.726	2.542	.012
Industry Type 2 Dummy	-6.074	7.162	-.848	.397
Industry Type 3 Dummy	-2.742	6.401	-.428	.669
Industry Type 4 Dummy	-8.607	7.058	-1.220	.224
R = .327, R^2 = .107, Adjusted R^2 = .074, F = 3.276**				

Note. DV = NPM; **Significant at 1% level.

The model was statistically significant (F = 3.276, p < .01), but with a relatively low explanatory power (R^2 = .107, Adjusted R^2 = .074). This indicated that approximately 7.4% of the variance in NPM was explained by the variables included in the model. This suggested that profit margins may be more sensitive to other unobserved factors. The Z-Score exhibited a significant and positive effect on NPM (B = 6.007, p = .005), which reinforces the idea that financially healthier firms tend to achieve better profitability. Firm size, on the other hand, did not show a significant impact (B = 3.593, p = .290). This result showed that larger firms did not necessarily have an advantage in profit margins over smaller firms within this sample.

The coefficients for Year 3 Dummy (2023) and Year 4 Dummy (2024) were both positive and statistically significant (B = 13.450, p = .047; B = 17.099, p = .012, respectively). This outcome indicated that average net profit margins were higher in these years compared to 2021. Year 2 Dummy (2022) showed a positive but statistically insignificant effect. Regarding sectoral effects, none of the industry dummies were statistically significant. This implied that sector affiliation did not substantially differentiate firms' NPM from the reference group (Automotive sector).

Table 6 presents the impact of financial health on Return on Assets using multiple regression.

Table 6 *Model 3: Multiple Regression Analysis Predicting Return on Assets (ROA)*

Variables	Coeff. (B)	*SE*	*t*	Sig.
(Constant)	-9.489	1.922	-4.937	.000
Z- Score	4.606	.302	15.243	.000
Size	1.560	.480	3.251	.001
Year 2 Dummy	-.971	.954	-1.017	.310
Year 3 Dummy	-.044	.955	-.046	.963
Year 4 Dummy	1.717	.954	1.801	.073
Industry Type 2 Dummy	-.910	1.015	-.896	.371
Industry Type 3 Dummy	.617	.907	.680	.497
Industry Type 4 Dummy	2.813	1.001	2.811	.005
R = .757, R^2 = .573, Adjusted R^2 = .557, F = 36.712**				

Note. DV = ROA; **Significant at 1% level.

Model 3 yielded a statistically significant fit ($F = 36.712$, $p < .01$). With an R^2 of .573 and an adjusted R^2 of .557, the results showed that approximately 57% of the variation in ROA was explained by financial health. The Z-Score demonstrated a significant influence (B = 4.606, $p < .001$), which indicated that firms with higher financial health tended to achieve better asset returns. Firm size was also positively and significantly associated with ROA (B = 1.560, $p = .001$). This suggested that larger firms may benefit from stronger asset utilization.

Regarding the time fixed effects, none of the year effects were statistically significant at conventional levels, although the Year 4 Dummy approached significance (B = 1.717, $p = .073$). This meant that there was a modest improvement in ROA during 2024 relative to the base year (2021). Regarding industry-specific effects, Industry type 4 Dummy (representing the Tourism sector) showed a significant and positive association with ROA (B = 2.813, $p = .005$). This suggested that firms in this sector outperformed those in the Automotive sector (used as the reference category). By contrast, firms in the Agriculture and Food sector (Industry type 2 Dummy) and the Petrochemicals and Chemicals sector (Industry type 3 Dummy) did not exhibit statistically significant differences in ROA compared to the base group.

Table 7 presents the impact of financial health on Return on Equity using multiple regression.

Table 7 *Model 4: Multiple Regression Analysis Predicting Return on Equity (ROE)*

Variables	Coeff. (B)	*SE*	*t*	Sign.
(Constant)	-34.403	6.376	-5.396	.000
Z-Score	10.663	1.002	10.637	.000
Size	4.266	1.592	2.680	.008
Year 2 Dummy	.865	3.165	.273	.785
Year 3 Dummy	4.055	3.169	1.279	.202
Year 4 Dummy	6.818	3.164	2.155	.032
Industry Type 2 Dummy	-13.490	3.369	-4.005	.000
Industry Type 3 Dummy	1.602	3.011	.532	.595
Industry Type 4 Dummy	6.981	3.320	2.103	.037
$R = .637$, $R^2 = .406$, Adjusted $R^2 = .385$, $F = 18.735$**				

Note. DV = ROE; **Significant at 1% level.

The regression analysis for Model 4, which examines the determinants of ROE, revealed several statistically significant predictors. The model explained approximately 40.6% of the variance in ROE ($R^2 = .406$, Adjusted $R^2 = .385$) and was statistically significant overall ($F = 18.735$, $p < .01$). The Z-Score, a measure of financial stability, was positively and significantly associated with ROE (B = 10.663, $p < .001$). This result indicated that firms with stronger financial health tended to achieve higher returns on equity. Firm size also showed a positive and significant effect ($B = 4.266$, $p < .01$), which suggested that larger firms may benefit from economies of scale or stronger market positions that enhance profitability.

Regarding time effects, Year 2 and Year 3 dummy variables were not statistically significant. This implied that there was no meaningful difference in ROE compared to the base year (Year 1). However, the Year 4 Dummy was significant and positive (B = 6.818, $p = .032$), which meant that firms had higher ROE in the fourth year relative to the base year, possibly reflecting broader economic or sectoral improvements.

For industry-specific effects, Industry Type 2 Dummy (with Industry 1 as the base group) was negative and highly significant (B = -13.490, $p < .001$). This means that firms in Industry 2 tended to have significantly lower ROE than those in Industry 1. Industry Type 3 Dummy was not significant, indicating no notable difference from the base industry. However, Industry Type 4 Dummy was positively associated with ROE (B = 6.981, $p = .037$). This implied that firms in Industry 4 generally

achieved higher ROE than those in the reference industry. These results highlighted the importance of both firm-specific financial indicators and industry context in explaining variations in ROE.

Altman Z-Score Analysis

The Altman Z-scores for all selected firms were analyzed using Microsoft Excel; the results are presented in Table 8. The appropriate financial data inputs for each company were utilized, such as working capital, retained earnings, earnings before interest and taxes (EBIT), market value of equity, and total assets. Along with Z-score calculation, firms were ranked individually based on their Z-score values to assess their relative financial health and risk of bankruptcy. Moreover, an industry-level ranking was performed by aggregating and analyzing the Z-scores within each industry sector to identify comparative financial stability trends.

Table 8 *Altman Z-Score Analysis of Industry Financial Health*

	***Z* < 1.80**	**1.80 < *Z* < 3.0**	***Z* > 3.0**
Agribusiness	31.82%	38.64%	29.55%
Automotive	34.21%	43.42%	22.37%
Petrochemicals & Chemicals	42.86%	37.50%	19.64%
Tourism & Leisure	96.67%	3.33%	.00%

The data in Table 8 shows significant variation in financial health indicators across industries based on Altman Z-Score classifications that pertained to this study. The tourism and leisure sector was in the weakest financial position, with 96.67% of firms falling into the high-risk ($Z < 1.80$) category and 0% in the safe zone ($Z > 3.0$), reflecting the severe and prolonged impact of the pandemic on this industry during the study period. On the other hand, the agribusiness sector was the most financially resilient, with the lowest percentage of high-risk firms (31.82%) and the highest share of firms in the safe zone (29.55%). This highlighted its stability and the strong demand for essential goods in this industry. The automotive industry showed a moderate risk profile, with the largest share of companies (43.42%) in the medium-risk category and 22.37% in the safe zone. The petrochemicals and chemicals sector had a relatively balanced distribution but still had a high proportion (42.86%) of financially distressed firms. This distribution was likely due to volatility in global oil prices. Overall, the analysis suggested that while agribusiness demonstrated a financially healthier position compared to the other industries, tourism remained the riskiest, while the automotive and petrochemical industries faced moderate financial challenges.

Discussion

Implications of Findings

This study examined the relationships between financial health, firm size, industry type, and long-term financial performance among publicly listed companies in Thailand across four key industries from 2021 to 2024. The findings highlight several important implications.

First, the results confirmed the strong and consistent influence of financial health, measured by the Altman Z-score, on all four dimensions of long-term firm performance: EPS, NPM, ROA, and ROE. This aligns with previous studies which have found that financially healthier firms are more likely to deliver higher returns and earnings (Altman, 1968). Notably, the Z-score remained a significant predictor in all models, which supported its utility as a comprehensive indicator of firm stability and profitability potential.

Second, firm size had a positive and significant effect on EPS, ROA, and ROE, but not on NPM. This suggests that larger firms may benefit from economies of scale or operational efficiencies that improve returns and earnings per share. However, these advantages may not translate directly into profit margins, which could be more affected by cost structure or pricing strategies. These findings

were consistent with prior research suggesting that size can moderate performance, but it is not a universal determinant (Serrasqueiro & Nunes, 2008).

The time (year) dummy variables revealed that financial performance (particularly NPM and ROE) improved in 2024 relative to 2021. This may have reflected macroeconomic recovery following global or regional economic disruptions from the COVID-19 pandemic. The significance of year effects for NPM and ROE, but not for EPS or ROA, indicated that not all performance measures respond equally to external economic conditions.

With regard to industry effects, only a few sectoral differences were found. For example, firms in the Tourism sector showed higher ROA and ROE than those in the Automotive sector, while the Agriculture and Food sector had significantly lower ROE and marginally lower EPS. These findings indicated that structural and sectoral characteristics can influence profitability, though their effects may be less consistent than firm-level financial metrics. This contrasted with some earlier studies suggesting stronger industry-level differences (Rumelt, 1991). This implied that within-industry factors or firm-level strategies may play a more critical role in performance outcomes.

Practical Implications

The study provides several managerial and policy implications. The consistent positive impact of the Z-score on all financial performance indicators (EPS, NPM, ROA, ROE) suggested that maintaining strong financial health should be a strategic priority. This involves managing financial health to minimize the risk of financial distress. Managers in firms with lower Z-scores should consider strengthening internal controls, improving operational efficiency, and reducing excessive debt to enhance overall performance. Firms in the Agriculture and Food sector should be cautious, as they were associated with significantly lower ROE and marginally lower EPS compared to those in the Automotive sector. This may have indicated structural challenges in this sector, such as cost volatility or lower pricing power, and calls for targeted efficiency improvements or product innovation.

Conversely, firms in the Tourism sector showed better ROA and ROE, possibly due to post-pandemic recovery. Managers in this sector should continue to leverage demand rebounds by investing in quality service and digital transformation. Additionally, investors and analysts may use the Z-score and firm size as reliable indicators when screening investment projects. Firms with strong Z-scores and moderate-to-large size tend to deliver superior financial returns and earnings. For policymakers and regulators, the findings highlight the need to support the development of financial monitoring tools that emphasize predictive indicators like the Z-score. Regulators may consider requiring periodic disclosure of such metrics, particularly in sectors more prone to financial instability.

Conclusion

This study assessed the effects of financial health, firm size, time trends, and industry sectors on long-term financial performance among selected Thai listed companies during 2021–2024. The results consistently showed that Altman's Z-score was a significant predictor of all four financial performance indicators (EPS, NPM, ROA, ROE). This demonstrated the importance of financial stability in driving firm success. Firm size was also a relevant factor, although its effect was not uniform across all models.

Year and industry dummy variables helped control for temporal and sectoral differences. While some year effects (especially in 2024) were statistically significant, industry effects were more limited, with notable differences observed in only a few sectors. These findings suggested that firm-specific factors, especially financial health, exerted greater influence on performance than sector affiliation or macro-level conditions.

Limitations and Further Studies

Since this study was limited to publicly listed companies in four industries, its generalizability is limited. Additionally, the use of only accounting-based performance measures may not have captured market-based dimensions of performance. Future research could extend the sample to include more industries, private firms, or firms from other ASEAN countries. Including additional control variables

(such as leverage, innovation, investment, or corporate governance) may also enhance explanatory power and uncover deeper insights into the determinants of financial performance.

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