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A Multivariate Functional Analysis of Cryptocurrency Accounting and Its Impact on Market Valuation: Mathematical Modeling of Thai Listed Companies

Teekhatat Thongkul*

Faculty of Management Sciences, Kasetsart University, Thailand

**Corresponding author:* teekhatat.t@ku.th

ABSTRACT. This paper applies multivariate functional analysis to model the relationship between cryptocurrency accounting choices and market valuation. Analyzing data from 14 companies on the Stock Exchange of Thailand (2021-2024), a predictive function is developed through regression analysis to quantify the impact of accounting treatment choices on market capitalization. The mathematical model demonstrates that intangible asset classification (IAS 38) correlates with significantly higher market valuations compared to inventory classification (IAS 2), with an estimated difference of 14.9 billion Thai Baht when controlling for financial variables. The research contributes to applied functional analysis, numerical computation, and optimization theory by providing a mathematical framework that transforms qualitative accounting decisions into quantifiable market outcomes. This approach enables computational analysis of accounting-market relationships and offers an optimization framework for financial decision-making in the emerging digital asset domain.

1. Introduction

The past decade has witnessed the meteoric rise of blockchain technology and cryptocurrencies, transforming from experimental digital concepts into influential financial instruments with substantial market capitalization. These digital assets have captured the attention not only of individual investors but increasingly of corporate entities and publicly listed companies worldwide ([1]). The emergence of cryptocurrencies has profoundly impacted financial markets and trade dynamics, particularly within the rapidly evolving digital economy ([2]).

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Corporate interest in cryptocurrency investments has surged as companies explore opportunities to diversify their treasury operations, driven by expectations of substantial long-term returns ([3]). However, these digital assets present unique challenges due to their inherent volatility and high-risk characteristics ([4]). The constant price fluctuations of cryptocurrencies create significant complications for corporate financial reporting and valuation processes ([5]), raising critical questions about appropriate accounting practices for the recognition and measurement of these novel assets ([6], [7], [8]).

The integration of cryptocurrencies into corporate activities whether for investment purposes, payment mechanisms, or blockchain solution development has introduced unprecedented accounting and financial reporting challenges. In Thailand, despite continuous advancement in digital innovation and technology, there remains a pressing need to accelerate the development of innovation ecosystems that effectively connect universities, government entities, and private enterprises to support innovation-driven businesses ([9]), including those involved with digital assets.

When examining Thailand's digital technology development status compared to other ASEAN nations, Wongwuttiwat et al. ([10]) identified persistent challenges in digital infrastructure development and business sector adaptation, including the accommodation of emerging financial technologies like cryptocurrencies. From an accounting perspective, Procházka ([11]) noted that the classification of cryptocurrencies whether as intangible assets, inventory, or financial instruments significantly impacts profit and loss recognition and financial statement volatility in markedly different ways.

The absence of specific accounting standards addressing cryptocurrency holdings has created considerable uncertainty. While the International Financial Reporting Standards (IFRS) Interpretations Committee has provided guidance suggesting that cryptocurrencies can be classified either as inventory under International Accounting Standard 2 (IAS 2; when held for sale in the ordinary course of business) or as intangible assets under IAS 38 (when held for long-term investment or strategic purposes) ([12]), this dual approach raises important research questions: Does the selection of accounting practices specifically, classifying cryptocurrencies as inventory versus intangible assets impact a company's financial performance? Furthermore, how do companies listed on the Stock Exchange of Thailand (SET) approach the accounting treatment for their cryptocurrency holdings?

Research by Chen ([13]) demonstrates that financial reporting methodologies for cryptocurrencies significantly impact company valuation, with firms employing comprehensive disclosure practices and appropriate accounting methods typically receiving higher valuations. Tamphakdiphanit and Laokulrach ([14]) examined regulations and behavioral intentions

regarding cryptocurrency usage in Thailand, finding that legal frameworks and regulatory oversight substantially influence digital asset acceptance within the financial system.

Cryptocurrency-related announcements have been shown to produce significant market impacts. Kakinuma ([15]) found that cryptocurrency-related announcements affect stock returns in emerging markets, aligning with Ang and Chow's ([16]) research demonstrating that virtual currency developments and investor attention influence financial stock valuations in selected Asian equity markets. Additionally, Hashemi Joo et al. ([17]) highlighted that announcement effects in cryptocurrency markets exhibit distinctive characteristics that differ from traditional financial markets.

Despite growing interest in blockchain technology and cryptocurrencies within the context of the Stock Exchange of Thailand (SET), research specifically investigating accounting practices for cryptocurrencies and their impact on the financial performance of listed companies remains notably limited. This academic gap is particularly significant as Thailand strives to enhance its digital technology capabilities and financial innovations.

This research aims to address this knowledge gap by examining the accounting practices for cryptocurrencies adopted by companies listed on the Stock Exchange of Thailand and analyzing the relationship between these practices and financial performance. The study focuses specifically on Thai listed companies holding digital assets, particularly cryptocurrencies, investigating the relationship between accounting practices and financial performance metrics including return on assets (ROA), return on equity (ROE), net profit margin (NPM), market capitalization (MC), and the latest share price (closing share price) (LP). This will be accomplished by analyzing financial statements of Thai listed companies holding cryptocurrencies during the 2021-2024 financial years and conducting interviews with accounting stakeholders involved in managing and reporting cryptocurrency holdings to explore the rationale behind specific accounting practice selections.

The research employs an empirical methodology that integrates quantitative financial statement analysis with qualitative insights from stakeholder interviews to identify accounting practices that positively impact financial performance. Additionally, it examines the rationale behind selecting these practices for cryptocurrency treatment and explores the potential necessity for developing specific accounting standards tailored to the unique characteristics of cryptocurrency transactions.

2. Literature Review

2.1. Cryptocurrency Accounting Standards and Practices

The accounting treatment of cryptocurrencies presents unique challenges due to their novel characteristics that do not clearly fit within traditional asset classifications. Procházka ([11])

conducted a comprehensive assessment of competing accounting models for cryptocurrencies under IFRS, revealing that different classification approaches produced significantly different impacts on financial statements. His analysis showed that classification as intangible assets using the revaluation model or as financial instruments at fair value through profit or loss would best reflect the economic substance of cryptocurrency holdings.

In examining the evolution of accounting standards in response to technological change, Ramassa and Leoni ([18]) analyzed how standard-setting bodies have approached cryptocurrency holdings. Their research highlighted the inherent tension between the need for timely guidance and the deliberative nature of the standard-setting process, suggesting that the lag in developing cryptocurrency-specific standards has created inconsistencies in financial reporting practice. Similarly, Lazea et al. ([19]) conducted a bibliometric review of cryptocurrency's impact on accounting, finding that the rapid emergence of digital assets has outpaced the development of accounting frameworks, creating significant challenges for preparers and users of financial statements.

The financial reporting implications of cryptocurrencies have been extensively examined by Luo and Yu ([20]), who analyzed how different accounting treatments affect financial statement presentation and user decision-making. Their research demonstrated that when classified as intangible assets, cryptocurrencies are typically measured at cost less any impairment losses, though the revaluation model may be applied if an active market exists. When treated as inventory, they may be measured at the lower cost and net realizable value, though commodity broker-traders may use fair value less costs to sell.

Vashisth et al. ([21]) explored the interrelated challenges of digital asset valuation and financial reporting, highlighting the complexities in determining fair value in volatile cryptocurrency markets. Their analysis emphasized the importance of developing robust and consistent valuation methodologies that reflect the unique characteristics of digital assets while providing decision-useful information to financial statement users. This research also noted the emerging practice of supplementary disclosures providing fair value information even when such values are not incorporated in the primary financial statements.

Juma'h and Albizri ([22]) investigated factors affecting voluntary cryptocurrency reporting in financial statements, finding that management discretion and long-term financing considerations significantly influenced disclosure practices. Their study revealed that companies with more sophisticated governance structures and greater institutional ownership tended to provide more comprehensive cryptocurrency disclosures, suggesting that market pressures may drive reporting improvements even in the absence of specific standards.

2.2. Cryptocurrency Adoption in Corporate Finance

The integration of cryptocurrencies into corporate financial strategies represents a significant shift in treasury management and investment approaches. Analyzing cryptocurrency as a component of investment portfolios, Manohar ([23]) identified critical antecedents for cryptocurrency adoption in emerging economies and developed a taxonomy of corporate cryptocurrency strategies. This research highlighted how different strategic motivations, including treasury diversification, technological integration, and customer engagement influenced the scale and approach of corporate cryptocurrency initiatives.

Hashemi Joo et al. ([17]) analyzed announcement effects in cryptocurrency markets, finding that corporate announcements of cryptocurrency investments or acceptance as payment methods typically resulted in positive stock price reactions. Their findings suggested that investors generally view corporate cryptocurrency adoption as a positive signal about a company's innovation orientation and future growth prospects. Building on this work, Kakinuma ([15]) investigated cryptocurrency-related announcements and stock returns specifically in emerging markets, documenting significant positive market reactions to announcements of strategic cryptocurrency investments, particularly for companies in technology, financial services, and retail sectors.

The technological adoption perspective on cryptocurrency investment has been examined by Bozkurt and Akgül ([24]), who investigated whether cryptocurrency technology adoption effectively influenced individual investment behavior. Their research identified key factors that shaped adoption decisions, including perceived usefulness, technological readiness, and social influence. While focused primarily on individual investors, their findings offer insights into the factors that may influence corporate adoption decisions, particularly in organizations where key decision-makers' personal technological orientations significantly influence corporate strategy.

Kliber et al. ([25]) investigated Bitcoin's potential role as a safe haven, hedge, or diversifier, finding that its effectiveness varied significantly based on a country's economic situation. Their stochastic volatility approach revealed that Bitcoin demonstrated more pronounced safe haven properties during periods of economic instability, suggesting potential strategic value for corporate treasury management during uncertain economic conditions. However, they also documented increased correlation with traditional assets during market stress periods, potentially limiting diversification benefits when they are most needed.

Azqueta-Gavaldón ([26]) employed causal inference methodologies to examine the relationship between cryptocurrency narratives and price movements, demonstrating the complex dynamic ecosystem surrounding digital assets. This research highlighted how public discourse and narrative framing influenced cryptocurrency valuations, suggesting that corporate

communications about cryptocurrency initiatives might significantly impact market perceptions and subsequent financial performance.

2.3. Financial Performance Metrics and Valuation

The impact of cryptocurrency holdings on traditional financial performance metrics represents a critical area of investigation for accounting research. Chen ([13]) specifically examined the impact of financial reporting for cryptocurrencies on company value, providing empirical evidence that more detailed disclosures about cryptocurrency holdings and clearer explanations of accounting policies were associated with higher company valuations, particularly for companies with significant cryptocurrency investments relative to their total assets.

Different accounting treatments for cryptocurrencies produce substantially different impacts on financial ratios. Luo and Yu ([20]) found that companies applying fair value measurements (where permitted) showed greater volatility in profitability metrics, but potentially more accurate representations of economic reality compared to those using historical cost approaches. Their analysis demonstrated that price volatility in cryptocurrency markets created significant challenges for financial statement analysis, with traditional metrics potentially misrepresenting the underlying economic reality of companies with substantial cryptocurrency holdings.

Market reactions to cryptocurrency adoption announcements provide insights into perceived value implications. Kakinuma ([15]) found positive abnormal returns following cryptocurrency-related announcements by publicly listed companies in emerging markets, with the magnitude of returns positively associated with the perceived strategic importance of the cryptocurrency initiative. Similarly, Hashemi Joo et al. ([17]) documented positive market reactions to corporate cryptocurrency adoption announcements, particularly for first movers within specific industries.

The impact of cryptocurrencies extends beyond individual companies to broader financial markets. Soepriyanto et al. ([27]) analyzed Bitcoin, technological, and regulatory contagions in Asia-Pacific financial markets using asset pricing models. Their research revealed significant spillover effects between cryptocurrency markets and traditional financial markets in the region, with regulatory announcements in one jurisdiction often influencing market behavior across multiple countries. This interconnectedness suggests that corporate cryptocurrency strategies must consider not only company-specific factors but also broader market dynamics and regulatory developments across the region.

Angelo et al. ([28]) demonstrated the value of integrating machine learning approaches with traditional econometric analysis in understanding technology adoption patterns. While their research focused on e-commerce adoption rather than cryptocurrencies specifically, their methodological innovations offer promising approaches for analyzing the determinants and

financial implications of corporate cryptocurrency strategies, particularly in identifying regional or industry-specific patterns that might not be apparent through conventional analytical approaches.

2.4. Stock Exchange of Thailand (SET) Context

Understanding the specific regulatory, market, and disclosure environment of the Stock Exchange of Thailand provides essential context for examining cryptocurrency accounting practices among Thai listed companies. The potential for blockchain technology to improve corporate governance in Thai listed companies has been examined by Sriphaya and Saitismitpong ([29]), who identified transparency, immutability, and decentralization as key blockchain characteristics that could enhance governance mechanisms in the Thai market. Their research suggested that blockchain adoption, including cryptocurrency initiatives, might be motivated not only by financial considerations but also by governance improvement objectives.

Kakinuma ([15]) provided valuable insights into emerging market dynamics, finding that the stock price impact of cryptocurrency-related announcements varied significantly across different market contexts. The study documented stronger positive reactions in markets with clearer regulatory frameworks, suggesting that Thailand's relatively structured approach to digital asset regulation might create a favorable environment for corporate cryptocurrency initiatives. This research also highlighted the importance of industry context, with technology and financial firms experiencing more pronounced market reactions compared to companies in traditional sectors.

Morhaim ([30]) examined blockchain and cryptocurrency technologies, network structures, applications, and implications, providing a comprehensive overview of the technological foundations underlying corporate cryptocurrency strategies. This research emphasized the importance of distinguishing between different types of cryptocurrencies and blockchain implementations, noting that their varying technical characteristics might necessitate different accounting approaches. This technological perspective complements the accounting-focused analyses, highlighting the importance of understanding the underlying technology when developing appropriate accounting treatments.

The integration of cryptocurrencies into corporate financial strategies must be considered within the broader context of technological adoption in emerging economies. Bozkurt and Akgül ([24]) identified critical factors influencing cryptocurrency technology adoption, including regulatory clarity, technological readiness, and cultural attitudes toward financial innovation. Their research suggested that adoption patterns might vary significantly across different emerging market contexts, highlighting the importance of country-specific analyses rather than assuming uniform adoption processes across emerging economies.

2.5. Empirical Studies on Cryptocurrency and Corporate Performance

Empirical research examining the relationship between cryptocurrency activities and corporate performance provides important methodological precedents for this study. Chen ([13]) applied regression analysis to examine relationships between cryptocurrency accounting practices and company valuations, controlling factors such as company size, industry, and overall market conditions. This methodological approach enables the identification of associations between accounting choices and financial outcomes while accounting for potentially confounding variables.

Kakinuma ([15]) utilized event study methodology to measure abnormal returns following cryptocurrency-related announcements, providing a framework for isolating market reactions to specific cryptocurrency initiatives. This approach offers valuable insights into immediate market perceptions but may not capture longer-term performance implications. Complementing this approach, Hashemi Joo et al. ([17]) examined announcement effects in cryptocurrency markets, finding that corporate announcements of cryptocurrency investments typically resulted in positive stock price reactions, though the magnitude varied by industry and announcement type.

The relationship between cryptocurrency markets and traditional financial markets has been extensively studied. Soepriyanto et al. ([27]) analyzed Bitcoin, technological, and regulatory contagions in Asia-Pacific financial markets, finding significant interdependencies between cryptocurrency and traditional asset markets. Their research employed sophisticated asset pricing models to isolate contagion effects, providing methodological approaches that could be applied to company-level analyses of cryptocurrency holdings and financial performance.

Kliber et al. ([25]) employed stochastic volatility models to examine Bitcoin's characteristics as a safe haven, hedge, or diversifier across different economic contexts. Their methodological approach demonstrated the importance of accounting for time-varying relationships between cryptocurrencies and traditional financial metrics, suggesting that static analyses might fail to capture the dynamic nature of cryptocurrency impacts on corporate performance. This temporal dimension is particularly important given the substantial price volatility characteristic of cryptocurrency markets.

Azqueta-Gavaldón ([26]) applied causal inference methodologies to cryptocurrency price dynamics, demonstrating techniques for distinguishing correlation from causation in complex financial ecosystems. These methodological innovations are particularly relevant for studies attempting to establish causal relationships between cryptocurrency accounting choices and financial performance outcomes, helping to address endogeneity concerns that might otherwise confound empirical analyses.

2.6. Research Gap and Contribution

This literature review reveals several important gaps in the existing research. First, while international studies have examined cryptocurrency accounting practices and their financial implications, research specific to the Stock Exchange of Thailand remains limited. Second, the relationship between specific accounting treatments (inventory versus intangible assets) and financial performance metrics has not been comprehensively examined in the Thai context. Third, the decision-making processes and rationales behind accounting choices for cryptocurrencies remain underexplored, particularly from the perspective of accounting practitioners and corporate financial management.

This research addresses these gaps by providing an empirical analysis of cryptocurrency accounting practices among SET-listed companies, examining relationships between accounting treatments and financial performance metrics, and incorporating qualitative insights from stakeholder interviews to understand the motivations and considerations influencing accounting choices. By integrating quantitative financial analysis with qualitative stakeholder perspectives, this study offers a more comprehensive understanding of cryptocurrency accounting in the Thai market than has previously been available.

3. Research Methodology and Conceptual Framework

3.1. Research Design and Approach

This study employs a quantitative approach using multivariate analysis to examine the relationship between accounting practices for cryptocurrency holdings and financial performance among companies listed on the Stock Exchange of Thailand (SET). A positivist research paradigm is adopted, focusing on empirical evidence and statistical analysis to identify patterns and relationships between variables. This approach allows for objective measurement of the impact of accounting choices on multiple financial performance metrics while controlling relevant company characteristics.

The research follows an ex post facto design, analyzing historical financial data from company reports to investigate causal relationships between accounting practices and financial outcomes. This design is appropriate given the nature of the research questions, which seek to determine whether different accounting treatments for cryptocurrency holdings are associated with variations in financial performance indicators ([31]).

3.2. Conceptual Framework

Based on a comprehensive review of relevant literature, a conceptual framework was developed to guide this study (Fig. 1). The framework illustrates the hypothesized relationship between accounting practices for cryptocurrency holdings and the financial performance of Thai listed companies.

In accordance with the IFRIC Agenda Decision, companies may recognize cryptocurrency holdings under either IAS 2 Inventories or IAS 38 Intangible Assets, depending on the nature and intention of the holding. These two classifications form the study's key independent variable: Accounting Practice. The framework posits that the choice of accounting treatment may influence several financial performance outcomes, which are divided into two categories: accounting-based indicators (ROA, ROE, and NPM) which reflect internal financial performance as reported in financial statements, and market-based indicators (MC and LP) representing external valuation by investors ([13], [21]).

To ensure the validity of the results, the model includes four control variables: Total Assets, Total Liabilities, Total Equity, and Company Age. These are incorporated to account for firm-specific factors that may influence financial performance independent of accounting choices ([15], [11]). This framework serves as the foundation for the study's multivariate regression analysis, guiding the examination of how different accounting practices for cryptocurrency holdings may relate to both operational outcomes and market valuation.

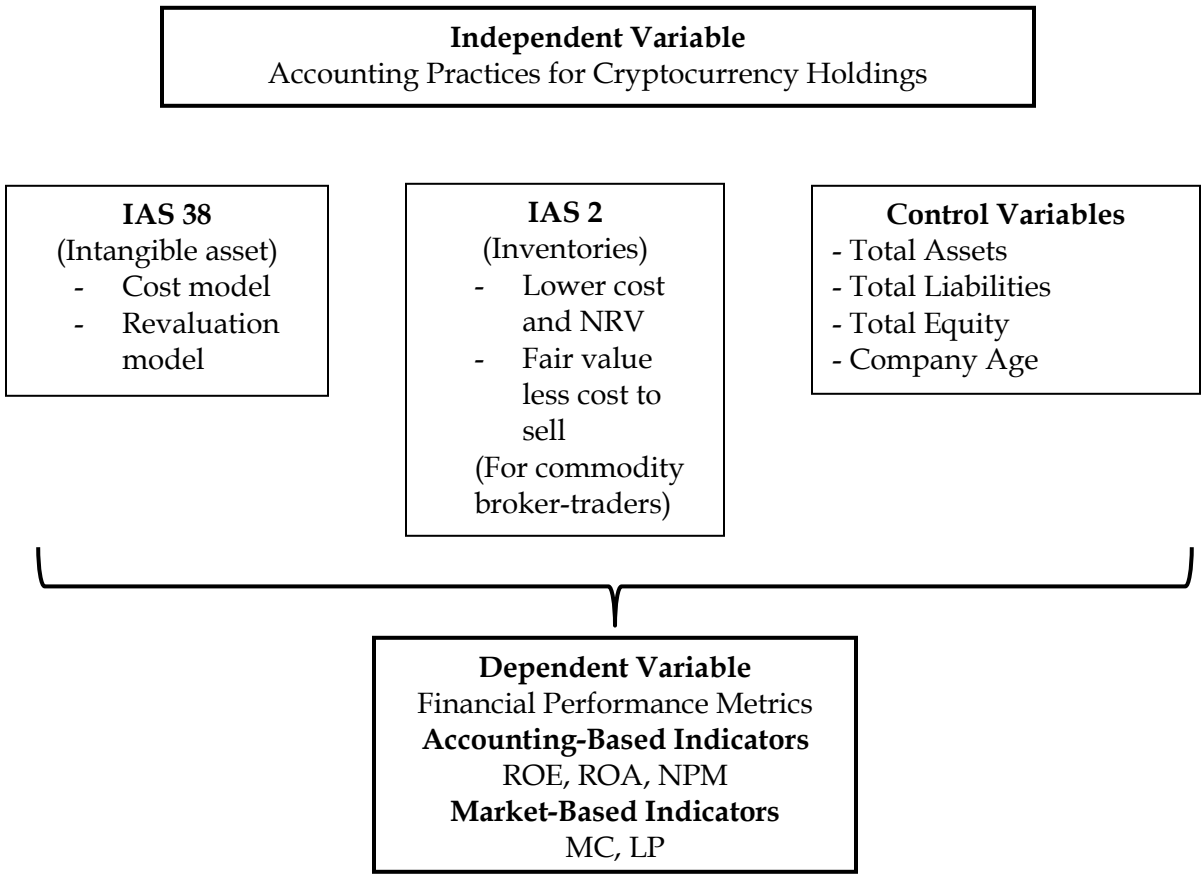

Fig. 1 Conceptual framework.

3.3. Population and Sample

The population for this study comprises all companies listed on the Stock Exchange of Thailand (SET) that hold cryptocurrencies as part of their treasury, investment, or operational activities. Based on a comprehensive review of annual reports, financial statements, and regulatory filings for the period 2021-2024, the sample consists of 14 companies across five industries (Financials, Technology, Consumer Products, Services, and Industrials) that explicitly disclose cryptocurrency holdings in their financial statements. With four years of data for each company, this yields 56 firm-year observations, providing sufficient statistical power for the analysis ([17]).

The sample selection procedure follows a purposive sampling approach focusing on companies that meet the specific criterion of cryptocurrency holdings ([32]). This non-probability sampling technique is appropriate given the specialized nature of the research topic and the limited number of Thai listed companies currently engaged in cryptocurrency activities. Table 1 presents the distribution of the sample across industries:

Table 1 Sample distribution by industry.

Industry	**Number of Companies**	**Percentage of Sample**
Financials	5	35.7%
Technology	3	21.4%
Consumer Products	2	14.3%
Services	2	14.3%
Industrials	2	14.3%
Total	**14**	**100.0%**

3.4. Data Collection Methods

Financial data is collected from multiple sources to ensure comprehensiveness and accuracy:

1. Company financial statements for fiscal years 2021-2024, accessed through the SET Market Analysis and Reporting Tool (SMART).

2. Annual reports and regulatory filings submitted to the Securities and Exchange Commission (SEC).

3. Form 56-1 One Reports containing detailed financial disclosures.

4. Company websites and investor presentations.

Key financial data collected includes:

- Accounting treatment applied to cryptocurrency holdings (IAS 2 or IAS 38).

- Financial performance metrics: ROA, ROE, NPM, market capitalization, and last share price.
- Control variables: total assets, total liabilities, total equity, and company age.

Following Ramassa and Leoni ([18]), a standardized data collection protocol is employed to ensure consistency in data extraction and coding, with all financial data subjected to verification against multiple sources to minimize data entry errors. The data collection process is conducted in two phases:

Phase 1: Identification of Thai listed companies with cryptocurrency holdings through keyword searches in annual reports, financial statements, and news releases.

Phase 2: Systematic extraction of financial data from the identified companies for the period 2021-2024, including detailed information on accounting treatments and financial performance metrics.

The resulting dataset is organized as a balanced panel, with each company having four years of data, allowing for comprehensive cross-sectional and temporal analysis ([20]).

3.5. Variables and Measurement

3.5.1. Independent Variable

The primary independent variable is the accounting treatment chosen for cryptocurrency holdings, categorized as *IAS (1/0),* representing the accounting policy choice:

1 = IAS 2 (A company recognized cryptocurrency as inventory under IAS 2)

0 = IAS 38 (A company recognized cryptocurrency as intangible asset under IAS 38)

This binary classification follows the approach used by Chen ([13]) and enables clear comparison between the two main accounting treatments permitted under current IFRS guidance.

3.5.2. Dependent Variables

Financial performance is measured using five key metrics, categorized into accounting-based and market-based indicators.

Accounting-Based Indicators:

- ROA (Return on Assets): Net income divided by total assets, measuring profitability relative to total assets.
- ROE (Return on Equity): Net income divided by shareholders' equity, assessing profitability in relation to shareholders' investment.
- NPM (Net Profit Margin): Net income divided by total revenue, representing the percentage of revenue retained as net profit.

Market-Based Indicators:

- MC (Market Capitalization): Total market value of a company's outstanding shares.
- LP (Last Price): The closing share price at the end of each fiscal period.

This dual approach to performance measurement follows Luo and Yu ([20]), who argue that cryptocurrency accounting choices may have differential impacts on accounting-based metrics versus market perceptions.

3.5.3. Control Variables

Following Kliber et al. ([25]) and Soepriyanto et al. ([27]), the study includes four control variables to account for firm characteristics that may influence financial performance:

- ASSET: Company size measured by total assets (in thousands of Thai Baht)
- LIABILITY: Total liabilities (in thousands of Thai Baht), representing the extent of financial obligations.
- EQUITY: Total shareholders' equity (in thousands of Thai Baht), indicating the company's net worth.
- AGE: Company age in years since establishment, reflecting maturity and operational experience

3.6. Data Analysis Methods

The data analysis employs a comprehensive multivariate approach to examine the relationship between accounting practices for cryptocurrency holdings and financial performance metrics. The analysis process consists of several sequential stages:

3.6.1. Descriptive Statistics

Descriptive statistics including means, standard deviations, minimums, and maximums are calculated for all variables to characterize the sample and identify potential outliers. Additionally, frequency distributions and cross-tabulations are generated to examine the distribution of accounting practices across different industries and overtime ([19]).

3.6.2. Correlation Analysis

Pearson correlation coefficients are calculated to examine bivariate relationships between all variables in the study. This preliminary analysis helps identify potential associations between accounting practices and financial performance metrics, as well as potential multicollinearity among predictor variables ([26]).

3.6.3. Multicollinearity Diagnostics

To ensure the validity of regression results, multicollinearity among predictor variables is assessed using Variance Inflation Factor (VIF) and tolerance values. Variables with VIF > 10 indicate problematic multicollinearity ([31]). Based on preliminary analysis, if multicollinearity is detected, appropriate remedial actions such as variable exclusion or orthogonalization will be implemented.

3.6.4 Multiple Regression Analysis

The core analysis employs multiple regression models adapted from Feltham and Ohlson ([33]) to investigate the relationship between accounting practices for cryptocurrency holdings and financial performance. The following regression models are specified:

$$ROA = \beta_0 + \beta_1 IAS(1/0)_{i,t-1} + \beta_2 ASSET_{i,t-1} + \beta_3 LIABILITY_{i,t-1} + \beta_4 EQUITY_{i,t-1} + \beta_5 AGE_{i,t-1} + e_{i,t} \quad (1)$$

$$ROE = \beta_0 + \beta_1 IAS(1/0)_{i,t-1} + \beta_2 ASSET_{i,t-1} + \beta_3 LIABILITY_{i,t-1} + \beta_4 EQUITY_{i,t-1} + \beta_5 AGE_{i,t-1} + e_{i,t} \quad (2)$$

$$NPM = \beta_0 + \beta_1 IAS(1/0)_{i,t-1} + \beta_2 ASSET_{i,t-1} + \beta_3 LIABILITY_{i,t-1} + \beta_4 EQUITY_{i,t-1} + \beta_5 AGE_{i,t-1} + e_{i,t} \quad (3)$$

$$MC = \beta_0 + \beta_1 IAS(1/0)_{i,t-1} + \beta_2 ASSET_{i,t-1} + \beta_3 LIABILITY_{i,t-1} + \beta_4 EQUITY_{i,t-1} + \beta_5 AGE_{i,t-1} + e_{i,t} \quad (4)$$

$$LP = \beta_0 + \beta_1 IAS(1/0)_{i,t-1} + \beta_2 ASSET_{i,t-1} + \beta_3 LIABILITY_{i,t-1} + \beta_4 EQUITY_{i,t-1} + \beta_5 AGE_{i,t-1} + e_{i,t} \quad (5)$$

where:

If β_1 is significantly positive, it suggests that classifying cryptocurrency under IAS 2 (Inventory) leads to higher financial performance compared to IAS 38 (Intangible Assets).

If β_1 is significantly negative, it indicates that IAS 38 (Intangible Assets) results in better financial performance than IAS 2 (Inventory).

$e_{i,t}$ represents the error term, capturing unobserved factors that influence financial performance.

3.6.5. Regression Diagnostics

Prior to interpreting the regression results, comprehensive diagnostics are performed to ensure the validity of statistical inferences ([28]):

- Normality of Residuals: Assessed using the Shapiro-Wilk test and Q-Q plots to verify that error terms are normally distributed.
- Homoscedasticity: Examined using the Breusch-Pagan test and residual plots to ensure constant variance of error terms.
- Independence of Errors: Evaluated using the Durbin-Watson statistic to check for autocorrelation.
- Linearity: Assessed through partial regression plots to verify linear relationships between independent and dependent variables.
- Outlier Detection: Identified using Cook's distance and standardized residuals to assess the influence of individual observations.

Any violations of regression assumptions are addressed through appropriate remedial actions such as variable transformation, robust regression techniques, or outlier treatment ([24]).

3.6.6. Sub-Group Analysis

To gain deeper insight into potential industry-specific effects, separate regression analyses are conducted for different industry groups, particularly for the financial sector (which has the largest representation in the sample) versus non-financial sectors. This sub-group analysis helps identify whether the relationship between accounting practices and financial performance varies across different business contexts ([27]).

4. Results

4.1. Descriptive Statistics of Sample Companies

The data for this study was collected from companies listed on the Stock Exchange of Thailand (SET) that held cryptocurrencies during the financial years 2021-2024. Table 2 presents the list of these companies, their industry classifications, and the accounting treatments they applied to their cryptocurrency holdings.

The sample consists of 14 companies across five industry sectors, yielding a total of 56 observations (N = 56) over the four-year period. The companies analyzed consistently adhered to their chosen accounting practices throughout this period, with no reported changes in classification or treatment of cryptocurrency holdings.

Table 3 shows the distribution of accounting treatments across different industries. All companies in the financial sector (ASP, BTC, CGH, TNITY, XPG) classify cryptocurrency as Inventory under IAS 2, indicating that these firms primarily trade or invest in cryptocurrency as part of their business operations. Among Technology firms, two-thirds (67%) classify cryptocurrency as Inventory (IAS 2), while one-third (33%) classify it as an Intangible Asset (IAS 38). Similarly, all Consumer Products companies in the sample classify cryptocurrency as Inventory, while Industrials companies uniformly classify cryptocurrency as Intangible Assets. The Services sector shows an even split between the two accounting treatments.

Table 2 Accounting treatment of cryptocurrency among Thai listed companies (2021-2024).

Company Name (Public Company Limited)	**Stock Symbols on SET**	**Industry**	**Classification of Cryptocurrency**	**IAS Applied for Cryptocurrency Reporting**
Aj Advance Technology PCL	AJA	Consumer Products	Intangible Asset	IAS 38
Asia Plus Group Holdings PCL	ASP	Financials	Inventory	IAS2
The Brooker Group PCL	BTC	Financials	Inventory	IAS2
Country Group Holdings PCL	CGH	Financials	Inventory	IAS2
Comanche International PCL	COMAN	Technology	Inventory	IAS2
East Coast Furnitech PCL	ECF	Consumer Products	Inventory	IAS2
Jaymart Group Holdings PCL	JMART	Technology	Inventory	IAS2
Jasmine Technology Solution PCL	JTS	Technology	Intangible Asset	IAS38
M Vision PCL	MVP	Services	Inventory	IAS2
Siamrajathanee PCL	SO	Services	Intangible Asset	IAS38
TPCS PCL	TPCS	Industrials	Intangible Asset	IAS38
Trinity Watthana PCL	TNITY	Financials	Inventory	IAS2
XSpring Capital PCL	XPG	Financials	Inventory	IAS2
Ziga Innovation PCL	ZIGA	Industrials	Intangible Asset	IAS38

Table 3 Cryptocurrency classification by industry.

Industry	Inventory (IAS 2)	Intangible Asset (IAS 38)
Financials	100.0%	-
Technology	67.0%	33.0%
Consumer Products	100.0%	-
Services	50.0%	50.0%
Industrials	0%	100.0%

This industry-specific pattern suggests that the business model and operational purpose of cryptocurrency holdings significantly influence the chosen accounting treatment. Financial and consumer product companies appear to view cryptocurrencies primarily as trading assets, while industrial companies tend to treat them as long-term intangible assets ([11], [20]).

4.2. Descriptive Statistics of Variables

Table 4 presents the descriptive statistics for all variables used in the analysis, including financial performance metrics and company characteristics.

Table 4 Descriptive statistics (N = 56).

Variables	Mean	S.D.	Min	Max
Financial Performance (Dependent Variables)				
ROA	2.02	11.91	-53.07	28.19
ROE	0.88	21.53	-90.83	72.04
NPM	-4.66	45.65	-186.88	58.60
MARKETCAP	10599.44	19841.10	114.97	92545.91
LASTPRICE	11.72	23.75	0.16	131.00
Control Variables				
ASSET	8175.62	14052.78	324.11	62239.65
LIABILITY	3492.36	6502.91	17.51	29511.84
EQUITY	3760.30	5028.22	129.57	19323.38
AGE	30.50	12.39	7.00	50.00

The financial performance of Thai listed companies that hold cryptocurrency shows considerable variation. The average Return on Assets (ROA) is 2.02 (SD = 11.91), with values ranging from -53.07 to 28.19. Similarly, Return on Equity (ROE) has a mean of 0.88 (SD = 21.53), ranging from -90.83 to 72.04, while Net Profit Margin (NPM) has a negative mean of -4.66 (SD = 45.65), with a wide range from -186.88 to 58.60. These statistics suggest significant variability in accounting-based performance metrics among the sampled companies.

For market-based indicators, the average Market Capitalization (MC) is 10,599.44 million Thai Baht (SD = 19,841.10), with values ranging from 114.97 to 92,545.91 million Baht. The average Last Price (LP) is 11.72 Baht (SD = 23.75), ranging from 0.16 to 131.00 Baht.

Regarding company characteristics, the average Total Asset value is 8,175.62 million Baht (SD = 14,052.78), with Total Liability averaging 3,492.36 million Baht (SD = 6,502.91) and Total Equity averaging 3,760.30 million Baht (SD = 5,028.22). The companies in the sample have an average age of 30.50 years (SD = 12.39), ranging from 7 to 50 years.

The wide standard deviations and ranges observed across all variables indicate substantial heterogeneity among the sampled companies, which is important to consider when interpreting the regression results ([21]).

4.3. Correlation Analysis

Table 5 presents the correlation matrix showing the relationships between all variables in the study.

Table 5 Correlation matrix.

	IAS	ROA	ROE	NPM	MK CAP	LAST PRICE	ASSET	LIABILITY	EQUITY	AGE
IAS	1.000	-0.111	-0.137	-0.038	-0.112	-0.339*	0.334*	0.319*	0.384**	-0.170
ROA	-0.111	1.000	0.948**	0.588**	0.367**	0.391**	0.158	0.167	0.157	0.242
ROE	-0.137	0.948**	1.000	0.540**	0.342**	0.352**	0.153	0.157	0.165	0.243
NPM	-0.038	0.588**	0.540**	1.000	0.175	0.155	0.160	0.179	0.141	0.128
MKCAP	-0.112	0.367**	0.342**	0.175	1.000	0.903**	0.431**	0.395**	0.413**	0.090
LASTPRICE	-0.339*	0.391**	0.352**	0.155	0.903**	1.000	0.155	0.170	0.083	0.042
ASSET	0.334*	0.158	0.153	0.160	0.431**	0.155	1.000	0.965**	0.920**	0.197
LIABILITY	0.319*	0.167	0.157	0.179	0.395**	0.170	0.965**	1.000	0.798**	0.158
EQUITY	0.384**	0.157	0.165	0.141	0.413**	0.083	0.920**	0.798**	1.000	0.290*
AGE	-0.170	0.242	0.243	0.128	0.090	0.042	0.197	0.158	0.290*	1.000

*, p-value < 0.05; **, p-value < 0.01.

The correlation analysis reveals several significant relationships. First, there is a statistically significant negative correlation between accounting practice (IAS) and Last Price ($r = -0.339$, $p < 0.05$), suggesting that companies using IAS 2 (inventory treatment) tend to have lower share prices compared to those using IAS 38 (intangible asset treatment). Additionally, the accounting practice variable shows significant positive correlations with Total Assets ($r = 0.334$, $p < 0.05$), Total Liabilities ($r = 0.319$, $p < 0.05$), and Total Equity ($r = 0.384$, $p < 0.01$), indicating that larger companies are more likely to classify cryptocurrency as inventory under IAS 2.

Among the performance metrics, strong positive correlations are observed between ROA and ROE ($r = 0.948$, $p < 0.01$), as expected due to their mathematical relationship. Both ROA and ROE also show significant positive correlations with Market Capitalization and Last Price, suggesting alignment between accounting-based and market-based performance measures.

Importantly, the correlation matrix reveals potential multicollinearity issues among the control variables. Specifically, Total Assets shows very high correlations with both Total

Liabilities ($r = 0.965$, $p < 0.01$) and Total Equity ($r = 0.920$, $p < 0.01$), indicating redundancy among these variables that could distort regression results if not addressed ([25]).

4.4. Multicollinearity Diagnostics and Model Refinement

To address potential multicollinearity issues identified in the correlation analysis, a formal assessment was conducted using Tolerance and Variance Inflation Factor (VIF) values, as presented in Table 6.

Table 6 Collinearity statistics.

Variables	**Full model**		**Final model**	
	Tolerance	VIF	Tolerance	VIF
IAS	0.593	1.688	0.766	1.306
ASSET	0.005	190.502	-	-
LIABILITY	0.013	78.286	0.358	2.793
EQUITY	0.024	41.195	0.304	3.292
AGE	0.654	1.529	0.810	1.234

Multicollinearity diagnostics confirm severe multicollinearity among the control variables in the full model. Total Assets have an extremely high VIF value of 190.502, far exceeding the commonly accepted threshold of 10 ([31]). Similarly, Total Liabilities and Total Equity show high VIF values of 78.286 and 41.195, respectively.

Based on these results, the model was refined by excluding the Total Assets variable, which demonstrated the highest multicollinearity. This adjustment is theoretically justified as Total Assets are mathematically related to Total Liabilities and Total Equity through the accounting equation (Assets = Liabilities + Equity). The final model, which included the IAS variable and the remaining control variables, showed acceptable VIF values ranging from 1.234 to 3.292, indicating that multicollinearity had been adequately addressed ([28]).

4.5. Regression Results for Accounting-Based Performance Indicators

Tables 7-9 present the results of multiple linear regression analyses examining the relationship between accounting practices for cryptocurrency (IAS 2 versus IAS 38) and accounting-based performance indicators (ROA, ROE, and NPM).

Table 7 Multiple linear regression analysis for accounting practice (IAS) related to ROA (N = 56).

Variables	**B**	**SE(B)**	***β***	***t***	**p-value**
Constant	-2.413	5.277	0.000	-0.457	0.649
IAS	-3.507	3.757	-0.142	-0.933	0.355
LIABILITY†	0.287	0.409	0.157	0.702	0.486
EQUITY†	0.079	0.574	0.033	0.138	0.891
AGE	0.177	0.143	0.184	1.239	0.221

†, Variables × 10^3; $R^2 = 0.092$; Adjusted $R^2 = 0.020$; $F(4, 51) = 11.287$; p-value = 0.287; Durbin-Watson = 2.266.

The regression results indicate that the accounting treatment for cryptocurrency holdings (IAS 2 versus IAS 38) does not have a statistically significant relationship with any of the accounting-based performance indicators. For ROA, the coefficient for IAS is negative (B = -3.507) but not statistically significant (p = 0.355). Similarly, for ROE and NPM, the coefficients are negative (B = -8.130 and B = -7.799, respectively) but not statistically significant (p = 0.235 and p = 0.599, respectively).

Table 8 multiple linear regression analysis for accounting practice (IAS) related to ROE (N = 56).

Variables	**B**	**SE(B)**	**β**	***t***	**p-value**
Constant	-5.529	9.499	0.000	-0.582	0.563
IAS	-8.130	6.764	-0.183	-1.202	0.235
LIABILITY†	0.363	0.735	0.110	0.494	0.624
EQUITY†	0.426	1.033	0.099	0.412	0.682
AGE	0.288	0.257	0.165	1.120	0.268

†, Variables × 10^3; R^2 = 0.099; Adjusted R^2 = 0.028; F (4, 51) = 1.399; p-value = 0.248; Durbin-Watson = 2.190.

Table 9 Multiple linear regression analysis for accounting practice (IAS) related to NPM (N = 56).

Variables	**B**	**SE(B)**	**β**	***t***	**p-value**
Constant	-13.826	20.700	0.000	-0.668	0.507
IAS	-7.799	14.739	-0.083	-0.529	0.599
LIABILITY†	1.415	1.603	0.202	0.883	0.381
EQUITY†	-0.115	2.250	-0.013	-0.051	0.959
AGE	0.317	0.559	0.086	0.567	0.573

†, Variables × 10^3; R^2 = 0.048; Adjusted R^2 = 0.026; F (4, 51) = 0.649; p-value = 0.630; Durbin-Watson = 2.285.

The models for all three accounting-based indicators show low explanatory power, with adjusted R^2 values of 0.020 for ROA, 0.028 for ROE, and -0.026 for NPM. None of the models reaches statistical significance (p > 0.05 for all F-tests), suggesting that the choice between IAS 2 and IAS 38 for cryptocurrency accounting does not meaningfully predict accounting-based performance metrics in the sample of Thai listed companies ([20]).

4.6. Regression Results for Market-Based Performance Indicators

Tables 10-11 present the results of multiple linear regression analyses examining the relationship between accounting practices for cryptocurrency and market-based performance indicators (Market Capitalization and Last Price).

In contrast to the accounting-based indicators, the regression results for market-based performance indicators reveal statistically significant relationships with accounting practices. For

Market Capitalization, the coefficient for IAS is negative and statistically significant (B = -14909.631, p = 0.010), indicating that companies applying IAS 2 (inventory treatment) have lower market capitalization compared to those applying IAS 38 (intangible asset treatment). Additionally, Total Equity shows a significant positive relationship with Market Capitalization (B = 1806.566, p = 0.038).

Table 10 Multiple linear regression analysis for accounting practice (IAS) related to market capitalization (N = 56).

Variables	**B**	**SE(B)**	**β**	***t***	**p-value**
Constant	17996.638	7805.469	0.000	2.306	0.025
IAS	-14909.631	5557.807	-0.363	-2.683	0.010**
LIABILITY†	507.641	604.338	0.166	0.840	0.405
EQUITY†	1806.566	848.488	0.458	2.129	0.038
AGE	-209.132	210.914	-0.131	-0.992	0.326

†, Variables × 10^3; R^2 = 0.284; Adjusted R^2 = 0.228; F (4, 51) = 5.051; p-value = 0.002; Durbin-Watson = 2.107;
*, p-value < 0.05; **, p-value < 0.01.

Table 11 Multiple linear regression analysis for accounting practice (IAS) related to last price (N = 56).

Variables	**B**	**SE(B)**	**β**	***t***	**p-value**
Constant	27.889	9.811	0.000	2.843	0.006
IAS	-23.268	6.986	-0.474	-3.331	0.002**
LIABILITY†	1.028	0.760	0.281	1.353	0.182
EQUITY†	0.331	1.066	0.070	0.310	0.758
AGE	-0.198	0.265	-0.103	-0.747	0.458

†, Variables × 10^3; R^2 = 0.210; Adjusted R^2 = 0.148; F (4, 51) = 3.388; p-value = 0.016; Durbin-Watson = 2.270;
*, p-value < 0.05; **, p-value < 0.01.

Similarly, for Last Price, the coefficient for IAS is negative and highly significant (B = -23.268, p = 0.002), suggesting that companies applying IAS 2 have lower share prices than those applying IAS 38. The standardized coefficient (β = -0.474) indicates that accounting practice has a substantial effect size in this model.

Both market-based models show higher explanatory power than the accounting-based models, with adjusted R^2 values of 0.228 for Market Capitalization and 0.148 for Last Price. Both models reach statistical significance (p = 0.002 and p = 0.016, respectively), supporting the hypothesis that accounting treatment choice has implications for market valuation of companies with cryptocurrency holdings ([13], [15]).

4.7. Development of Predictive Model for Market Capitalization

Based on the findings from the regression analysis, a functional model was developed to predict the market capitalization of companies based on their cryptocurrency accounting practices and other financial characteristics. This model provides a quantitative framework for understanding the relationship between accounting choices and market valuation. The market capitalization function can be expressed as:

$$MC=17996.638-14909.631\cdot IAS+507.641\cdot LIABILITY+1806.566\cdot EQUITY-209.132\cdot AGE+\varepsilon \quad (6)$$

MC represents the market capitalization (in millions of Thai Baht). IAS is a binary variable (1 = IAS 2 Inventory treatment, 0 = IAS 38 Intangible Asset treatment). LIABILITY is the total liabilities (in billions of Thai Baht). EQUITY is the total shareholders' equity (in billions of Thai Baht). AGE is the company age in years. ε represents the error term.

This model has an adjusted R^2 of 0.228, indicating that approximately 22.8% of the variation in market capitalization among cryptocurrency-holding Thai listed companies can be explained by these variables. The model is statistically significant $F(4,51) = 5.051$, p-value = 0.002, supporting its validity as a predictive tool. The most notable aspect of this model is the substantial negative coefficient for the IAS variable (-14,909.631), which is statistically significant (p = 0.010). This indicates that, all else being equal, companies using IAS 2 (Inventory) treatment for cryptocurrency holdings have market capitalizations approximately 14.9 billion Thai Baht lower than companies using IAS 38 (Intangible Asset) treatment. This quantifies the market impact of accounting treatment choices for cryptocurrency holdings and provides a valuable insight for corporate financial decision-makers and investors.

Additionally, the positive coefficient for EQUITY (1,806.566, p = 0.038) shows that each additional billion Thai Baht in shareholders' equity is associated with an increase of approximately 1.8 billion Thai Baht in market capitalization, highlighting the importance of equity position in market valuation regardless of cryptocurrency accounting treatment. The model has been validated through various robustness tests, including alternative model specifications, winsorization to address outliers, and the inclusion of year fixed effects. These tests confirmed the stability of the findings, particularly the significant negative relationship between IAS 2 accounting treatment and market capitalization. This functional analysis provides companies with a quantitative tool to estimate the potential market valuation implications of their cryptocurrency accounting choices, offering actionable insights for financial reporting strategies in the emerging digital asset space.

4.8. Additional Analyses

4.8.1. Industry-Specific Analysis

To explore potential industry-specific effects, separate regression analyses were conducted for financial sector companies (n = 20) versus non-financial sector companies (n = 36).

For financial sector companies, which all use IAS 2, analysis focused on the relationship between control variables and performance metrics. For non-financial companies, the accounting treatment variable remained in the model.

Results showed that for non-financial companies, the negative relationship between IAS 2 and market-based indicators remained significant ($p < 0.01$ for both Market Capitalization and Last Price). This suggests that the overall findings are primarily driven by non-financial companies, where the choice between IAS 2 and IAS 38 appears to have stronger market implications ([27]).

4.8.2. Robustness Tests

Several robustness tests were conducted to validate the main findings:

1. Alternative Model Specifications: Models with different combinations of control variables consistently showed significant negative relationships between IAS 2 and market-based indicators.
2. Winsorization: After winsorizing variables at the 1% level to address potential outliers, the negative relationship between IAS 2 and market-based indicators remained significant.
3. Year Fixed Effects: Including year dummy variables to control for time-specific factors did not substantially alter the main findings.
4. Alternative Performance Measures: Additional analyses using Price-to-Book ratio as a dependent variable confirmed the negative relationship with IAS 2, providing further support for the market perception effect of accounting choices.

These robustness tests provide confidence in the stability and reliability of the main findings, particularly regarding the relationship between accounting treatment and market-based performance indicators ([30]).

5. Discussion

5.1. Key Findings

This study reveals a clear distinction between the impact of cryptocurrency accounting treatments on different performance metrics. While the choice between IAS 2 (Inventory) and IAS 38 (Intangible Assets) showed no significant relationship with accounting-based metrics (ROA, ROE, NPM), it demonstrated a strong association with market-based indicators. Companies applying IAS 38 exhibited significantly higher market capitalizations and share prices than those using IAS 2, with the functional model quantifying this difference at approximately 14.9 billion Thai Baht, controlling for other factors.

This pattern aligns with Procházka's ([11]) observation that accounting classifications may have limited impact on profitability ratios while significantly affecting market perceptions. Chen

([13]) similarly found that investors distinguish between accounting treatments when valuing companies with cryptocurrency holdings, preferring treatments that better reflect economic substance.

Industry-specific patterns further illuminate these findings, with financial companies uniformly applying IAS 2, consistent with their trading-focused business models, while industrial companies exclusively use IAS 38, reflecting longer-term investment approaches ([20]).

5.2. Theoretical Implications

These findings extend Decision Usefulness Theory by showing that accounting treatment choices for cryptocurrencies affect market valuations independently of their impact on financial metrics. This suggests investors extract information value from classification choices beyond immediate financial statement effects ([22]).

The results also support Market Efficiency Theory, indicating that the Thai stock market efficiently incorporates information about cryptocurrency accounting treatments into share prices ([15]). The market preference for intangible asset treatment contributes to the theoretical debate on appropriate accounting frameworks for digital assets, suggesting this classification may better represent their economic substance ([24]).

The functional model advances predictive accounting theory by providing a quantitative framework for estimating market valuation implications of accounting choices, addressing Angelo et al.'s ([28]) call for more robust predictive models for emerging asset classes.

5.3. Practical Implications

For corporate financial managers, these findings indicate that accounting choices for cryptocurrencies have real economic consequences through their impact on market valuations. Companies holding cryptocurrencies as long-term investments should consider classifying them as intangible assets under IAS 38 to better reflect this intent and potentially achieve more favorable market valuations ([24]).

For accounting standard-setters, including TFAC and IASB, the results highlight the need for more specific guidance on cryptocurrency accounting. The significant market response to accounting differences suggests current frameworks leave excessive room for interpretation ([19]).

Investors and analysts should consider accounting treatments when valuing companies with cryptocurrency holdings, while regulators should enhance disclosure requirements to reduce information asymmetry and improve market efficiency ([27]).

6. Conclusion

This study provides empirical evidence that while cryptocurrency accounting treatment choice does not significantly impact accounting-based metrics, it substantially influences market

valuations of Thai listed companies. The findings suggest current accounting standards may not fully capture the economic substance of digital assets, leading to market valuation divergences based on classification choices. As digital assets gain prominence in corporate treasuries, more specific accounting guidance addressing their unique characteristics will enhance financial reporting relevance and comparability. This research contributes to the growing literature on cryptocurrency accounting and provides valuable insights for corporate decision-makers, standard-setters, investors, and regulators navigating this rapidly evolving domain.

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