
| RESEARCH ARTICLE

Clustering Capital Management Approaches: Evidence from Banking Firms during Economic Disruptions

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| ABSTRACT

The COVID-19 pandemic significantly disrupted global markets, supply chains, and business operations, leading to adverse effects on firm performance and economic stability. The banking sector, in particular, was compelled to adapt its capital management strategies to remain resilient amid financial uncertainty. Effective capital management—encompassing efficiency, liquidity, and solvency—became critical, as poor financial decisions during crisis periods can threaten organizational survival. This study aims to examine how banking firms respond to financial uncertainty through their capital management practices and to determine how these responses relate to firm profitability. Specifically, it seeks to identify distinct patterns of capital management and assess their implications for financial performance. A quantitative research design was employed using survey data from bank representatives. K-Means Cluster Analysis, utilizing the Lloyd algorithm, was applied to classify firms based on efficiency, liquidity, and solvency. The findings revealed three distinct clusters: efficient-solvent, high-liquid, and safe-player. Results further indicate a significant relationship between capital management approaches and profitability, highlighting the importance of balancing efficiency, liquidity, and solvency. This study contributes to the literature by offering an integrated clustering perspective on capital management and provides practical insights for banking institutions to develop more resilient financial strategies during periods of economic uncertainty.

| KEYWORDS

Capital management, business uncertainty, profitability, efficiency, liquidity, solvency

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Introduction

The COVID-19 pandemic has significantly disrupted both developed and developing economies, placing unprecedented pressure on global healthcare systems and economic stability. The crisis intensified due to heightened healthcare risks and reduced public mobility, which severely affected economic activities. Low-income countries were particularly impacted, experiencing increased unemployment, declining GDP, and reduced remittances from overseas workers (El-Chaarani, 2021). Since late 2019, manufacturing operations have been interrupted, placing both MSMEs and large firms in difficult financial positions characterized by liquidity constraints, overdue obligations, and weakened purchasing power (Bohn et al., 2020). As a

response, firms have been compelled to adjust and redesign their marketing strategies to sustain business operations (Josephson et al., 2020).

In this context of heightened uncertainty, firms have increasingly focused on managing financial risks through capital structure decisions, particularly leverage, liquidity, and efficiency. Leverage, defined as the proportion of debt and equity in a firm's capital structure (Jensen & Meckling, 1976; Myers, 1977; Harris & Raviv, 1990), plays a critical role in influencing investment decisions and firm value. However, excessive leverage may result in inefficient investment behaviors such as underinvestment and suboptimal resource allocation. While leverage can enhance firm value in low-growth firms, it may negatively affect high-growth firms (McConnell & Servaes, 1995), highlighting the complexity of its role under uncertain conditions.

Liquidity also serves as a critical determinant of firm performance, particularly during periods of crisis. It reflects a firm's ability to quickly convert assets into cash with minimal cost (Holden et al., 2014), while illiquidity represents a significant risk that demands higher returns (Amihud & Mendelson, 1986). Alongside this, effective working capital management—defined as the efficient management of current assets and liabilities—plays a vital role in ensuring financial stability and operational efficiency (Mihaiu et al., 2010; Padachi, 2006; Nazir & Afza, 2009). Proper management of working capital enhances profitability, reduces risk, and supports long-term sustainability (Tsagem et al., 2014).

The ability to manage liquidity effectively is directly associated with firm performance. Firms that can meet short-term obligations demonstrate financial stability and operational resilience (Zygmunt, 2013), while aggressive liquidity strategies may further enhance firm value (Wang, 2002). Conversely, failure to meet financial obligations can significantly deteriorate firm performance (Elloumi & Gueyie, 2001). Liquidity challenges often arise from mismatches in funding long-term and short-term liabilities (Garp, 2015), and these risks are frequently interconnected with other financial risks (Akhtar, 2007), making liquidity management essential during periods of uncertainty.

Moreover, the relationship between leverage and firm performance varies depending on firm characteristics such as size. While leverage can improve efficiency through tax advantages (Burja & Seelanatha, 2011; Nirajini et al., 2013; Ghayas & Akhter, 2018), evidence suggests that it may negatively affect financial performance indicators such as ROA and ROE in smaller firms (Ibhagui & Olokoyo, 2018). In addition, firm performance is increasingly assessed using advanced approaches such as Data Envelopment Analysis (DEA) and profit efficiency models, which provide more comprehensive insights compared to traditional financial measures (Seth & Chadha, 2020; Devinney et al., 2020). From a resource-based view (RBV), efficient utilization of firm resources is essential for achieving sustained competitive advantage.

Despite the growing body of literature on capital management and firm performance, several gaps remain. Existing studies present conflicting findings regarding the role of capital management during business crises (Ahmad et al., 2022; Struwig & Watson, 2021; Milojević & Redžepagić, 2020; Zimon & Tarighi, 2021), and there is a notable lack of local empirical evidence, particularly within the same period of analysis. Furthermore, limited research has integrated capital management variables with broader economic performance outcomes under conditions of uncertainty. Therefore, this study aims to address these gaps by examining the optimal capital structure and its relationship with firm performance through a comparative analysis in the context of business uncertainty.

Literature Review

Leverage & Solvency

Leverage plays a critical role in shaping firms' investment decisions, particularly under market imperfections. High leverage may result in distorted investment behaviors such as asset substitution (Jensen & Meckling, 1976), underinvestment (Myers, 1977), and inefficient liquidation policies (Harris & Raviv, 1990). However, it can also improve investment efficiency by limiting managerial discretion over free cash flow and reducing the likelihood of negative net present value investments (Jensen, 1986). Empirical findings remain inconclusive: highly leveraged firms may experience financial constraints that limit valuable investments (Kaplan & Zingales, 1997; Whited, 1992), while in other cases, leverage prevents overinvestment in firms with poor growth opportunities (Lang et al., 1996; Denis, 1993). The relationship between leverage and firm value is therefore complex, with positive effects in low-growth firms and negative effects in high-growth firms (McConnell & Servaes, 1995).

Beyond overall investment levels, leverage also influences how resources are allocated within firms. Evidence suggests that diversified firms often reallocate capital across business segments based on internal cash flows rather than optimal investment opportunities (Lamont, 1997; Shin & Stulz, 1998). Studies show that capital expenditures are not always directed toward segments with the highest potential returns, and diversified firms may even overinvest in low-performing segments (Scharfstein, 1998; Rajan et al., 2000). These findings raise concerns about inefficient capital allocation, although the specific

role of leverage in shaping these internal allocation decisions remains unclear. Thus, examining how leverage affects investment distribution across business segments is essential in understanding its broader implications on firm performance and value.

In addition to leverage, the growing importance of intangible assets has reshaped how firm value and solvency are assessed. Intangibles such as human capital, knowledge, and organizational capabilities are increasingly recognized as key drivers of firm value (Aboody & Lev, 1998; Lev et al., 2009; Wyatt, 2005), yet their omission from financial statements remains a concern (Penman, 2009). While capitalization of intangible assets may enhance reported firm value, critics argue that it introduces subjectivity, reduces reliability, and increases the risk of earnings manipulation (Watts, 2003; Ramanna, 2008; Skinner, 2008). Empirical evidence also suggests that firms with strong contracting incentives may exhibit biased valuation of intangibles (Kallapur & Kwan, 2004). Consequently, debates continue regarding the trade-off between relevance and reliability in financial reporting, particularly in the context of solvency, bankruptcy risk, and financial transparency.

Liquidity

Lamberg and Vålming (2009) examined the adaptation of liquidity strategies during financial crises and found that firms rely on critical liquidity parameters, particularly focusing on sales outstanding and working capital management. Their findings indicate that liquidity strategies do not directly influence Return on Assets (ROA); however, the increased use of liquidity forecasting and short-term financing or investment during crises positively impacts profitability. Similarly, working capital ratios and Days Inventory Outstanding (DIO) became more prominent measures during economic downturns. These findings highlight that while liquidity management may not directly drive performance, its strategic application during crises enhances firm resilience and profitability.

Liquidity has also been widely studied from a market microstructure perspective. Holden et al. (2014) define market liquidity as the ability to trade large quantities of assets quickly and at low cost, emphasizing the interaction between liquidity suppliers and demanders. Supporting this, O'Hara (2003) describes a liquid market as one where transactions occur with minimal price impact. Prior studies argue that illiquidity represents a risk requiring higher returns (Amihud & Mendelson, 1986; Amihud, 2003; Pastor & Stambaugh, 2003), while greater liquidity reduces risk and increases investor willingness to hold assets. However, evidence suggests that higher liquidity may be negatively associated with profitability in SMEs (Kontus & Mihanovic, 2019), indicating a trade-off between liquidity and returns.

Macroeconomic uncertainty further complicates liquidity management and financial decision-making. Baum et al. (2008) highlight that inflation volatility, as a proxy for macroeconomic uncertainty, imposes real costs on firms, while both macroeconomic and idiosyncratic uncertainties lead firms to hold more cash, potentially reducing economic efficiency. During financial crises, banks adjust liquidity risk management by increasing liquid asset holdings and reducing lending, particularly when exposed to risky assets, while those with stable funding sources maintain lending activities (Curnett et al., 2011). Liquidity risk is multidimensional, encompassing market, funding, and central bank liquidity (Nikolaou, 2009), and these risks are interrelated with asset return uncertainty (Acharya & Schaefer, 2006). Effective management requires transparency, regulation, and proactive policies, as emphasized by O'Hara (2004), to mitigate systemic risk and maintain financial stability.

Efficiency

Efficiency, defined as the ratio of outputs to inputs, is a fundamental determinant of a firm's financial health and performance (Mihaiu et al., 2010). Within this context, working capital plays a crucial role as it reflects how effectively firms utilize their short-term resources, measured as the difference between current assets and current liabilities (Nurein, 2014; Finau, 2011). Efficient management of these resources ensures optimal allocation and utilization (Oruc, 2009), while poor working capital management has been linked to business failures (Smith, 1973). Conversely, improved efficiency in working capital management enhances profitability, firm value, and competitive advantage (Aktas et al., 2015), whereas inefficiencies may result in reduced sales, customer loss, and financial distress (Goel & Sharma, 2016).

From a strategic perspective, efficiency in working capital management is essential for sustaining firm performance and growth. It enables firms to balance liquidity and profitability while minimizing financial risk (Eljelly, 2004; Padachi, 2006; Nazir & Afza, 2009; Tsagem et al., 2014). Various financial indicators, such as the current ratio, receivables turnover, and net working capital turnover, are used to assess efficiency (Munawir, 2010), although traditional measures like the cash conversion cycle (CCC) have been criticized for their limitations (Goel & Sharma, 2015). Empirical findings show that efficiency improvements may be driven by technological advancements and firm-specific factors, although inefficiencies persist, particularly among SMEs (Kasiran et al., 2015; Goel & Sharma, 2015).

Empirical studies further demonstrate that efficiency significantly influences firm performance, though its effects vary across industries and firm characteristics. Efficient working capital practices contribute to higher profitability when firms effectively manage credit policies and short-term obligations (Jayarathne, 2014; Richard et al., 2013). Index-based and frontier

approaches, such as Bhattacharya's efficiency index and Data Envelopment Analysis, highlight variations in efficiency across firms, with some industries achieving high efficiency levels while others face constraints (Afza & Nazir, 2011; Shehzad et al., 2012; Kaur & Singh, 2013; Kavitha & Shanmugam, 2015). However, some findings indicate an inverse relationship between efficiency measures such as the cash conversion cycle and asset utilization (Press et al., 2012; Ganesan, 2007). These studies suggest that efficiency is a critical but context-dependent driver of firm performance.

Evaluating Working Capital Management

Previous studies have employed measurements based on the Cash Conversion Cycle (CCC) to assess working capital management (Soenen, 1993; Deloof, 2003; Padachi, 2006; Garcia & Martinez, 2007). Cash conversion cycle (CCC) was used to measure the efficiency of working capital management. It is a comprehensive measure because it measures both the efficiency of current assets as represented by receivables and inventories (Gitman, 1974).

Using the Cash Conversion Cycle (CCC), Deloof (2003) discovered a negative relationship between gross operating revenue and the times it takes for creditors to be paid, for receivables to be collected, and for inventories to turn over. The findings indicate that the managers may increase stockholder value if they slashed the time periods for receivables and inventories to a manageable minimum. These findings demonstrate that a specific level of working capital maximizes business value.

Impact of Working Capital Management on Firm Performance

Afza and Nazir (2009) through cross-sectional regression models on working capital policies and profitability and risk of the firms, established a link between a firm's profitability metrics and how aggressive it was with its working capital investment and financing strategies. Their findings indicate that businesses that adopt an aggressive working capital policy actually experience negative returns.

Raheman and Nasr (2007) conducted a study to ascertain the impact of working capital management on the profitability and liquidity of net operations. They conducted the analysis using net operating profit as the dependent variable and average collection period, inventory turnover in days, average payment period, cash conversion cycle, current ratio, debt ratio, firm size, and the ratio of financial assets to total assets as the independent variables. They discovered a significant inverse relationship between working capital management variables and firm profitability. Their study also revealed a significant negative relationship between liquidity and profitability, as well as a positive relationship between firm size and profitability.

Soenen (1998) reported similar findings, but used the net trading cycle (NTC) as a comprehensive measure of working capital management and discovered a significant negative relationship between NTC and profitability. However, when the analysis was done for a specific industry, this relationship was not found to be very significant. While Raheman and Nasr (2007) employed a static measure of liquidity and an ongoing operating measure of working capital management, researchers looked at the link between working capital management and corporate profitability for 94 firms listed on the Karachi Stock Exchange. According to the study's findings, there is a negative relationship between working capital management metrics and performance. As a result, working capital management is central to the firm's day-to-day operations and the improvement of corporate performance, as measured by profitability (Ross, 2009).

Hypothesis Development

Based on the literature review, the following hypotheses are proposed:

1. There is a significant cluster that can be formed based on the capital management response of banking firms.
2. There is a significant relationship between the clusters of capital management responses and firms' profiles.
3. There is a significant relationship between the clusters of capital management response and profitability.

Conceptual Framework

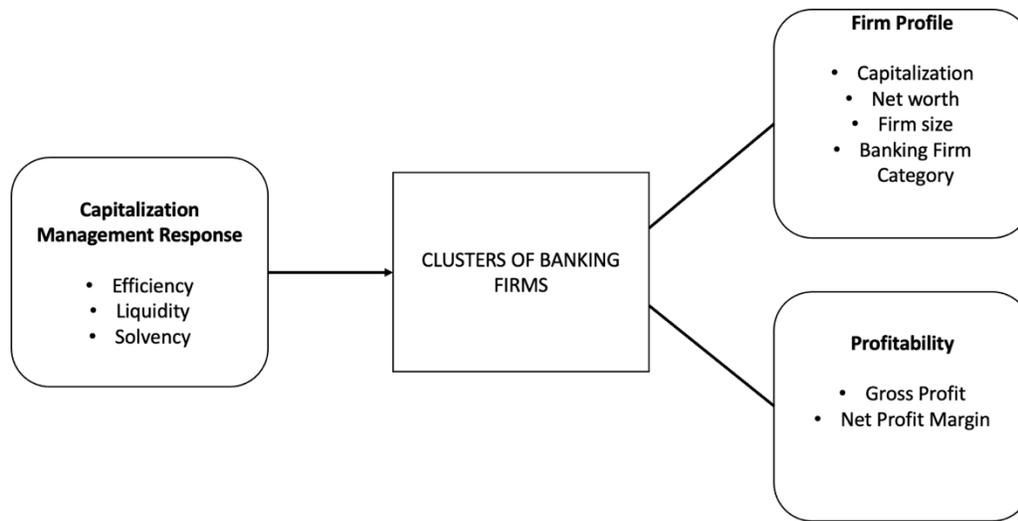


Figure 1 Framework on Capital Management Response to form Clusters of Banking Firms related to Firm Profile and Profitability

This conceptual framework shows capital management response of the banking firms to business uncertainty which may form clusters of banking firms. Capitalization management approach will be measured through the efficiency, liquidity, or solvency. Banking firms may have similarity in their capital management approach and may form clusters or groups. These clusters of banking firms can possibly related to their profile such as capitalization, net worth, firm size, and banking firms category. This is to test whether banks with similar decisions on capital management are most likely related to their characteristics as a business organization. Furthermore, it may also be determined if the cluster of banking firms is related to their profitability. The profitability will be measured through gross profit and net profit margin. Thus, there may be a specific set of decisions on efficiency, liquidity, and solvency that may lead to a certain level of profitability.

METHODOLOGY

Sample and Sampling Technique

The target population of this study consists of banking firms providing financial services to consumers and businesses in the Philippines. As of 2021, there were over 29,000 financial institutions in the country, including approximately 13,000 banks, with the majority classified as universal and commercial banks. Additionally, there were six (6) Non-Bank Quasi-Banks (NBQBs), composed of one investment house, four financing companies with a total of 121 branches, and one additional NBQB. Based on data from the Bangko Sentral ng Pilipinas, 16,351 financial service firms are located in the National Capital Region, which serves as the basis for the study's sampling frame.

This study employed stratified sampling to ensure balanced representation across key firm characteristics, including capitalization, net worth, firm size, and banking category. Stratified sampling involves dividing the population into subgroups with shared attributes to improve representativeness (Acharya et al., 2013). Respondents were selected from bank managers with direct access to financial statements and a strong understanding of firm performance, drawn from randomly selected cities within Metro Manila.

For sample size determination, the study followed Dolnicar et al. (2014), which recommends a minimum of 70 observations per clustering variable. Given the three clustering variables—efficiency, liquidity, and solvency—the minimum required sample size was 210 respondents.

Research Instrument

A structured survey questionnaire was utilized as the primary data-gathering instrument. The instrument was developed based on existing literature discussed in the review, ensuring that all variables were grounded in established theoretical and empirical foundations. It was specifically designed to measure the key variables of the study and to ensure the collection of accurate, reliable, and relevant data aligned with the research objectives.

The questionnaire focused on direct variables, including firm profile characteristics, capital management indicators, and profitability indicators. Each section of the instrument was systematically organized to capture these variables in a clear and coherent manner. The firm profile section gathered essential organizational information, while subsequent sections measured capital management practices and financial performance indicators, ensuring consistency in responses and facilitating efficient data analysis.

A four-point Likert scale was employed to measure respondents' perceptions, with response options structured to eliminate neutrality and encourage more definitive answers. The scale ranged from (1) strongly disagree, (2) disagree, (3) agree, to (4) strongly agree, allowing for clear interpretation of the degree of agreement with each statement.

Procedures

The study was conducted in three phases. In the first phase, formal permission was sought from the target respondents, specifically authorized representatives of banking institutions, prior to data collection. Official request letters were sent to selected banks to obtain approval for the conduct of the study for academic purposes. This process ensured institutional consent and proper coordination with participating organizations.

The second phase involved the administration of the survey questionnaire to bank representatives, particularly managers or officers with direct access to financial records and a comprehensive understanding of the institution's financial performance. This ensured that responses were accurate, reliable, and relevant to the study. Participation was voluntary, and respondents were informed of the purpose of the study, their right to withdraw at any time, and that all information provided would be treated with strict confidentiality and used solely for academic purposes. No personally identifiable information was disclosed, in compliance with ethical research standards and the Data Privacy Act of 2012.

The third phase consisted of data processing and analysis. Collected responses were encoded, organized, and subjected to appropriate statistical analyses, which are discussed in the succeeding section. All data were securely stored and handled with confidentiality throughout the study.

Statistical Analysis

The study employed K-Means Cluster Analysis to classify banking firms into distinct groups based on key financial indicators, namely efficiency, liquidity, and solvency. K-Means clustering is a non-hierarchical partitioning technique that groups observations into mutually exclusive clusters by minimizing within-cluster variance and maximizing between-cluster differences. This method is appropriate for identifying homogeneous subgroups within datasets and is widely used in financial and business analytics for segmentation purposes.

Prior to clustering, the data were screened, cleaned, and standardized to ensure comparability across variables and to eliminate scale bias. The clustering variables—efficiency, liquidity, and solvency—were treated as continuous measures. The optimal number of clusters was determined based on theoretical considerations and empirical validation to ensure meaningful and interpretable groupings of banking firms.

The clustering process was implemented using the Lloyd algorithm, the most commonly applied procedure in K-Means clustering. This algorithm begins by initializing cluster centroids, either randomly or based on predefined criteria. Each observation is then assigned to the nearest centroid using a distance metric, typically Euclidean distance. After assignment, new centroids are recalculated as the mean of all observations within each cluster. This iterative process of assignment and centroid updating continues until convergence is achieved, i.e., when cluster memberships no longer change or the reduction in within-cluster variance becomes negligible.

The resulting clusters were interpreted based on their centroid values to identify distinct financial profiles among banking firms. Descriptive statistics were used to characterize each cluster, and comparisons were conducted to examine differences in financial performance across clusters. This analytical approach enabled the identification of patterns in financial behavior and provided insights into how variations in efficiency, liquidity, and solvency contribute to firm performance.

Table 1 Interpretation of Mean Values

Range of Mean Values	Interpretation			
	Efficiency	Liquidity / Solvency / Net Profit	Gross Profit	Overall Profitability
3.26 - 4.00	More than 12%	More than 18% ave. growth	More than 30%	Highest
2.51 - 3.25	9% to 12% ave. growth	13% to 18% ave. growth	21% to 30% ave. growth	High
1.76 - 2.50	5% to 8% ave. growth	7% to 12% ave. growth	11% to 20% ave. growth	Low
1.00 - 1.75	1% to 4% ave. growth	1% to 6% ave. growth	1% to 10% ave. growth	Lowest

RESULTS AND DISCUSSION

Profile of the Banking Firms

Table 2 Sample Distribution based on Capitalization

Capitalization	Counts	% of Total	Rank
P10 Million to P200 Million	23	9.2 %	4
P201 Million to P14 Billion	50	20.0 %	3
P15 Billion to P19 Billion	91	36.4 %	1
P20 Billion and more	86	34.4 %	2

The findings shown in this table are the result of the sample distribution based on capitalization. Out of 250 respondents, P15 Billion to P19 Billion capital is the highest among the four categories wherein the total number of respondents is 91 with a total percentage of 36.4%. The second one is the P20 Billion and more capital wherein the total number of respondents is 86 and has a total percentage of 34.4%. The next one is P201 Million to P14 Billion capital wherein the total of respondents is 50 with a total percentage of 20.0%. Lastly, P10 Million to P200 Million capital got 23 respondents with a total percentage of 9.2%.

Table 3 Sample Distribution based on Net Worth

Net Worth	Counts	% of Total	Rank
P20 Million to P999 Million	24	9.6 %	4
P1 Billion to P149 Billion	46	18.4 %	3
P150 Billion to P199 Billion	120	48.0 %	1
P200 Billion and more	60	24.0 %	2

The findings shown in this table are the result of the sample distribution based on net worth. Out of 250 respondents, P150 Billion to P199 Billion net worth is the highest among the four categories wherein the total number of respondents is 120 with a total percentage of 48.0%. The second one is the P200 Billion and more net worth wherein the total number of respondents is 60 and has a total percentage of 24.0%. The next one is P1 Billion to P149 Billion net worth wherein the total of respondents is 46 with a total percentage of 18.4%. Lastly, P20 Million to P999 Million capital got 24 respondents with a total percentage of 9.6%.

Table 4 Sample Distribution based on Firm Size

Firm Size	Counts	% of Total	Rank
100 to 4,000 employees	15	6.0 %	4
4,001 to 7,000 employees	50	20.0 %	3
7,001 to 10,000 employees	76	30.4 %	2
More than 10,000 employees	109	43.6 %	1

The findings shown in this table are the result of the sample distribution based on the firm size. The data shows that 43.6% said that their firm have more than 10,000 employees, while 30.4% said that their firm have 7,001 to 10,000 employees. A total of 20.0% indicated that their firm have 4,001 to 7,000 employees, and 6.0% said it have 100 to 4,000 employees.

Table 5 Sample Distribution based on Banking Firm Category

Category	Counts	% of Total	Rank
Universal Banks	11	4.4 %	6
Commercial Banks	130	52.0 %	1
Thrift Banks	17	6.0 %	4
Rural Banks	18	7.2 %	3
Cooperative Banks	8	3.2 %	7
Islamic Banks	13	6.0 %	5
Government-Owned Banks	53	21.2 %	2

The findings shown in this table are the result of the sample distribution based on banking firm category. Out of 259 respondents, the commercial banks is the highest among the seven categories wherein the total number of respondents is 130 with a total percentage of 52.0%. The second one is the government-owned banks wherein the total number of respondents is 53 and has a total percentage of 21.2%. Rural banks got 18 respondents with a total percentage of 7.2%, while thrift banks got 17 respondents with a total percentage of 6.0%. The next one is Islamic banks wherein the total of respondents is 13 with a total percentage of 6.0%. Meanwhile, universal banks received 11 respondents and have a total percentage of 4.4%. Lastly, cooperative banks got 8 respondents with a total percentage of 3.2%.

Capital Management Response

Table 6 Descriptive Table of Capitalization Management

Capital Management Approach	Mean	SD	Rank	Interpretation
Efficiency	3.34	0.744	2	9 to 12% average increase
Liquidity	3.24	0.631	3	13 to 18% average increase
Solvency	3.46	0.614	1	13 to 18% average increase

The table shown above shows that the capitalization management response in terms of solvency have the mean score of 3.46 with a standard deviation of 0.614 and a rank of 1 (the highest) and got 13 to 18% rate. Next one is efficiency; the mean score is 3.34 with a standard deviation of 0.744 and got a rate of of 9 to 12%. For liquidity, the mean score is 3.24 with a standard deviation of 0.631 and a rank of 3 (the lowest), and got a rate of 13 to 18% as well.

The response through capitalization management of the banking firms seems that these companies have relatively strong solvency (M = 3.46, SD = 0.614) but may have room for improvement in efficiency (M = 3.34, SD = 0.744) and liquidity (M = 3.24, SD = 0.631).

Level of Profitability**Table 7** Descriptive Table of Profitability

Indicators	Mean	SD	Rank	Interpretation
Gross Profit	3.18	0.77	1	21% to 30% average growth
Net Profit	2.45	0.758	2	7% to 12% average growth
Profitability	2.815	0.546		Good

The table shown above shows that the level of profitability in terms of gross profit ($M = 3.18$, $SD = 0.77$) indicates that the organization is experiencing a growth rate of 21% to 30%. However, the net profit is relatively lower ($M = 2.45$, $SD = 0.758$), indicating a growth rate of only 7% to 12%.

This supports the previous study stating that effective working capital management can increase profitability and add value to a company (Jose et al., 1996; Shin & Soenen, 1998; Deloof, 2003; Padachi, 2006; Garcia & Martinez, 2007; Raheman & Nasr, 2007). The overall analysis indicates the level of Profitability ($M = 2.815$, $SD = 0.546$) is interpreted as Good.

Formation of Significant Clusters based on Capital Management Response of Banking Firms**Table 8** Formed Clusters based on Capital Management Response of Banking Firms

Cluster No	Given Name	N	Efficiency	Liquid	Solvency
1	Efficient Solvent	147	3.844	3.279	3.85
2	High Liquid	42	2.762	3.976	2.738
3	Safe Player	61	2.508	2.623	3

Table 8 exhibits the results of the cluster analysis performed. There are three clusters that have been detected by the analysis. The cluster analysis is formed through the mean responses for each response shown in the succeeding columns. Cluster names are devised only by the researchers based on the preferences given by respondents grouped in each cluster as indicated by the level of their mean responses for each response.

The first cluster is given the name "Efficient Solvent" because Cluster 1 has the highest mean scores in all three categories, indicating that these companies are generally efficient and solvent while also maintaining a reasonable level of liquidity.

The second cluster is given the name "High Liquid" because Cluster 2 has the highest mean score for liquidity but lower scores in the other two categories, suggesting that these companies may prioritize short-term liquidity over long-term efficiency or solvency.

The third cluster is given the name "Safe Player" because Cluster 3 has the lowest mean score in all three categories, indicating that these companies may be less efficient, less liquid, and less solvent than those in the other clusters.

This supports the acceptance of H1 which suggests that bank clusters can be formed based on the capital management response.

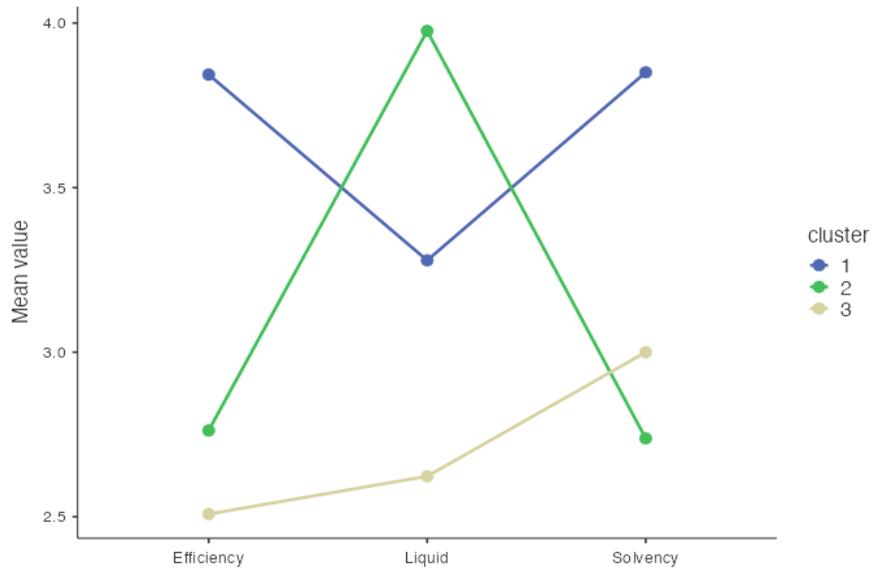


Figure 2 Graph of clusters based on Capital Management Response of Banking Firms

The graph shows that clusters 1 and 2 are more closely related to each other than they are to cluster 3. This is indicated by the shorter distance between clusters 1 and 2 on the y-axis compared to cluster 3.

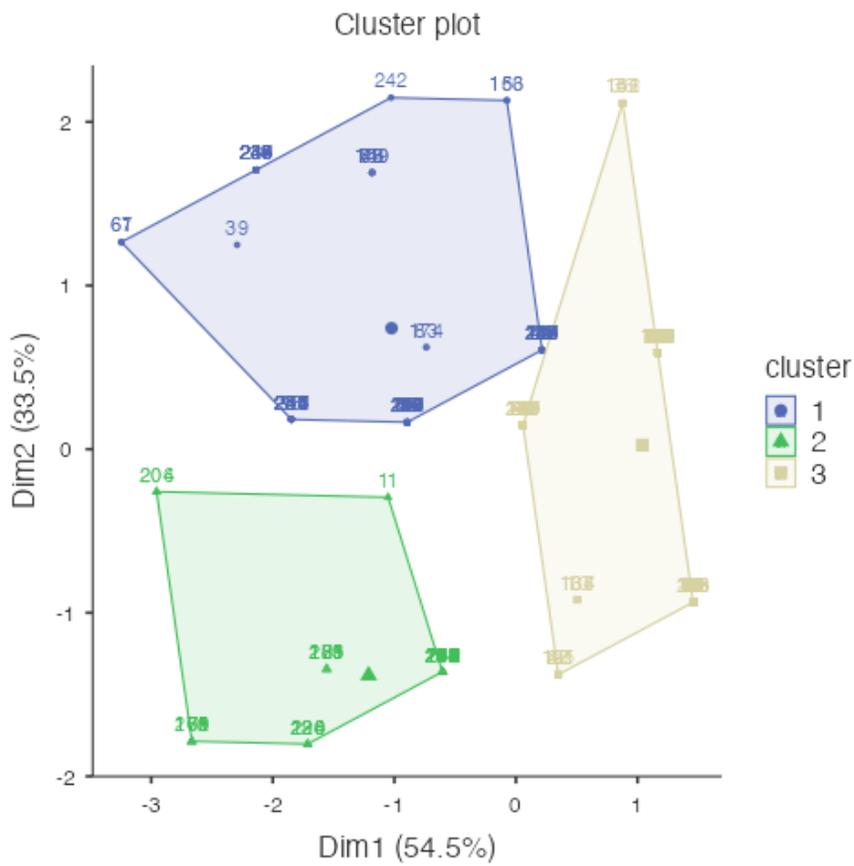


Figure 3 Cluster's Plot

Formed Clusters based on Capital Management Response of Banking Firms**Table 9** Significant Clusters formed based on Capital Management Response of Banking Firms

Capital Management Approach	Clusters	Mean	SD
Efficiency	Efficient Solvent	3.84	0.365
	High Liquid	2.76	0.484
	Safe Players	2.51	0.504
Liquidity	High Liquid	3.98	0.507
	Efficient Solvent	3.28	0.154
	Safe Players	2.62	0.489
Solvency	Efficient Solvent	3.85	0.358
	Safe Players	3	0.408
	High Liquid	2.74	0.445

Table 9 provides information about the significant clusters formed based on capital management response of banking firms. For the Efficiency measure, the Efficient Solvent cluster has the highest mean score of 3.84, indicating that this cluster is the most efficient in managing its capital, while High Liquid got the second highest mean score of 2.76. On the other hand, the Safe Players cluster has the lowest mean score of 2.51, suggesting that this cluster is the least efficient in managing its capital. For the Liquidity measure, the High Liquid cluster has the highest mean score of 3.98, indicating that this cluster has the highest liquidity, which means it has a higher ability to meet its short-term obligations. The Efficient Solvent cluster has the second-highest mean score of 3.28, followed by the Safe Players cluster with the lowest mean score of 2.62. For the Solvency measure, the Efficient Solvent cluster has the highest mean score of 3.85, indicating that it has the highest solvency, which means it has a higher ability to meet its long-term obligations. The Safe Players cluster has the second-highest mean score of 3.0, followed by the High Liquid cluster with the lowest mean score of 2.74.

As it is found that there are three clusters that can be formed based on the capital management response, it therefore rejects H01 which states that there are no significant clusters that can be formed through the level of capital management response.

Relationship between the Clusters of Capital Management Response and their Firm Profile**Table 10** Relationship between the Clusters of Capital Management Response and their Firm Profile in terms of Capitalization

Capitalization	Efficient Solvent	High Liquid	Safe Players	Total
P10 Million to P200 Million	14	5	4	23
P201 Million to P14 Billion	28	5	17	50
P15 Billion to P19 Billion	55	16	20	91
P20 Billion and more	50	16	20	86
Total	147	42	61	250

Table 10 shows the relationship between the clusters of capital management response and their firm profile in terms of capitalization. In the P10 Million to P200 Million category, there are only 14 firms that are considered efficient solvent, 5 firms with high liquid, and 4 firms with safe players with a total of 23. In the P201 Million to 14 Billion category, there are 28 firms that are considered efficient solvent, 5 firms with high liquid, and 17 firms with safe players with a total of 50. In the P15 Billion to 19 Billion

category, there are 55 firms that are considered efficient solvent, 16 firms with high liquid, and 20 firms with safe players with a total of 91. While, in the P20 Billion and more category, there are 50 firms that are considered efficient solvent, 16 firms with high liquid, and 20 firms with safe players with a total of 86. The Efficient Solvent got a total of 147, High Liquid got a total of 42, and Safe Players got a total of 61. The overall total is 250.

The table shows that for capitalization indicators, Efficient Solvent has the highest count. The P15 Billion to P19 Billion capital (55 counts) which is the highest among the relationships, P20 Billion and more capital (50 counts), P201 Million to P14 Billion (28 counts), P10 Million to P200 Million (14 counts) and Efficient Solvent.

Table 11 Chi-square Tests Table

	Value	df	p
χ^2	4.66	6	0.588

Table 11 shows the Chi-square test of the clusters that were formed based on capital management response in the firm profile in terms of capitalization ($\chi^2 = 4.66$, $df = 6$, $p = 0.588$). In this case, since the p-value is greater than the significance level of <0.05 , there is no significant relationship between the clusters formed based on capital management response in the firm profile in terms of capitalization. This supports the rejection of H2.

Table 12 Relationship between the Clusters of Capital Management Response and their profile in terms of Net Worth

Net Worth	Efficient Solvent	High Liquid	Safe Players	Total
P20 Million to P999 Million	16	2	6	24
P1 Billion to P149 Billion	28	7	11	46
P150 Billion to P199 Billion	68	23	29	120
P200 Billion and more	35	10	15	60
Total	147	42	61	250

Table 12 shows the relationship between clusters of capital management responses and firms' net worth profiles. In the P20 Million to P99 Million category, there are only 16 firms that are considered efficient solvent, 2 firms with high liquid, and 6 firms with safe players with a total of 24. In the P1 Billion to 149 Billion category, there are 28 firms that are considered efficient solvent, 7 firms with high liquid, and 11 firms with safe players with a total of 46. In the P150 Billion to 199 Billion category, there are 68 firms that are considered efficient solvent, 23 firms with high liquid, and 29 firms with safe players with a total of 120. While, in the P200 Billion and more category, there are 35 firms that are considered efficient solvent, 10 firms with high liquid, and 15 firms with safe players with a total of 60. The Efficient Solvent got a total of 147, High Liquid got a total of 42, and Safe Players got a total of 61. The overall total is 250.

The net worth indicators, and Efficient Solvent, that have the highest counts. The P150 Billion to P199 Billion capital (68 counts) which is the highest among the relationships, P200 Billion and more capital (35 counts), P1 Billion to P149 Billion (28 counts), P20 Million to P999 Million (16 counts) and Efficient Solvent.

Table 13 Chi-square Tests Table

	Value	df	p
χ^2	1.89	6	0.929

Table 13 shows the Chi-square test of the clusters that were formed based on capital management response in the firm profile in terms of net worth ($\chi^2 = 1.89$, $df = 6$, $p = 0.929$). In this case, since the p-value is greater than the significance level of

<0.05, there is no significant relationship between the clusters that were formed based on capital management response in the firm profile in terms of net worth. This supports the rejection of H2.

Table 14 Relationship between the Clusters of Capital Management Response and their Firm Profile in terms of Firm Size

Firm Size	Efficient Solvent	High Liquid	Safe Players	Total
100 to 4,000 employees	7	3	5	15
4,001 to 7,000 employees	26	9	15	50
7,001 to 10,000 employees	51	11	14	76
More than 10,000 employees	63	19	27	109
Total	147	42	61	250

Table 14 shows the relationship between clusters of capital management responses and firm profiles, with respect to firm size. In the 100 to 4,000 employees, there are only 7 firms that are considered efficient solvent, 3 firms with high liquid, and 5 firms with safe players with a total of 15. In the 4,001 to 7,000 employees, there are 26 firms that are considered efficient solvent, 9 firms with high liquid, and 15 firms with safe players with a total of 50. In the 7,001 to 10,000 employees, there are 51 firms that are considered efficient solvent, 11 firms with high liquid, and 14 firms with safe players with a total of 76. While, in the category of more than 10,000 employees, there are 63 firms that are considered efficient solvent, 19 firms with high liquid, and 27 firms with safe players with a total of 109. The Efficient Solvent got a total of 147, High Liquid got a total of 42, and Safe Players got a total of 61. The overall total is 250.

The firm size indicators and Efficient Solvent, that have the highest counts. More than 10,000 employees (63 counts) which is the highest among the relationships, the 7,001 to 10,000 employees (51 counts), 4,001 to 7,000 employees (26 counts), 100 to 4,000 employees (7 counts) and Efficient Solvent.

Table 15 Chi-square Tests Table

	Value	df	p
χ^2	4.34	6	0.631

Table 15 shows the Chi-square test of the clusters that were formed based on capital management response in the firm profile in terms of firm size ($\chi^2 = 4.34$, $df = 6$, $p = 0.631$). In this case, since the p-value is greater than the significance level of <0.05, there is no significant relationship between the clusters that were formed based on capital management response in the firm profile in terms of firm size. This supports the rejection of H2.

Relationship between the Clusters of Capital Management Response and Profitability

Table 16 Analysis of Variance of the Relationship between the Clusters of Capital Management Response and Profitability

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	93.51	2	46.755	260.886	<.001
Within Groups	44.266	247	0.179		
Total	137.776	249			

Table 16 shows the results of an analysis of variance (ANOVA) conducted to examine the differences in profitability across different clusters. The Between Groups section, Sum of Squares (93.51); df (2); Mean Square (46.755); F-value (260.886); Significance (Sig.) (<.001). While, in the Within Groups, Sum of Squares (44.266); df (247); and Mean Square (0.179).

Based on the ANOVA results, the F-value of 260.886 with a very low significance value (<.001) suggests that there is significant relationship in profitability across the clusters of capital management response. This supports the acceptance of H3.

Conclusion

For financial companies in the banking industry, the existence of three distinct clusters in capital management response—Efficient Solvent, Safe Player, and High Liquid—holds crucial importance. Efficiency and solvency are the primary focus of the Efficient Solvent cluster. For businesses looking to optimize their assets and financial stability, this strategy can be vital. The Safe Player cluster puts safety and stability first; it's perfect for people who are risk-averse or for when the economy is uncertain. A growing trend in maintaining high liquidity as an approach to risk management can be seen in the High Liquid cluster. They enable businesses to modify their plans in accordance with their specific goals and level of willingness to take risks since they offer insight into a range of strategies to capital management. This agility is essential in a financial environment that is changing quickly.

The findings emphasize the need for banking companies to have a balanced strategy to capital management that considers factors including efficiency, solvency, and liquidity. This well-balanced approach is an essential strategy for raising overall financial performance in the real-world context and assuring sustainability and profitability over the long run. Banking companies that successfully balance these factors are better able to handle the constantly shifting financial market. In a market that is dynamic and competitive, this adaptability and resilience are essential qualities.

The study discovered that there is no relationship between the capital management response and firm profiles. This indicates that there isn't only one strategy that applies to all banks. Instead, banks need to develop their own financial management strategies based on their particular objectives, level of capacity for risk, and particular circumstances. To succeed in the complicated field of finance, where being different is more crucial than following others, banks must be adaptable and optimize their strategies.

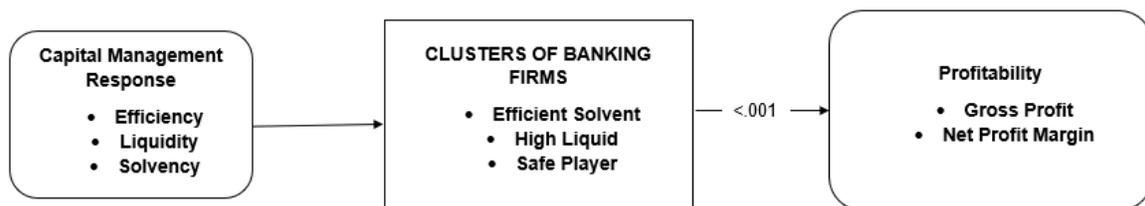
The found clusters' significant impact on banking firms' profitability indicate how crucial it is to choose the proper capital management strategy. In actual, various capital management response, as exemplified by these clusters, have different impacts on a company's profitability. When selecting a strategy, banks must carefully take into account their specific objectives and willingness to take risks. This finding emphasizes the fact that profitability is not a generally applicable result, but rather the outcome of a well-coordinated and planned capital management strategy.

Recommendation for Future Research

Upon review of the whole coverage of this research, the researcher wants to recommend to future research to expand the scope by conducting a similar study in different geographical regions or countries as this study is limited to Metro Manila. This would allow for a comparative analysis of how banking firms in various locations respond to business uncertainty. Comparing the capital management responses of banking organizations with those of firms in other industries is another area for future research. It would be beneficial to look into how different industries respond to economic recessions and crisis. Industry-specific trends can be found by contrasting banking companies' strategies with those of businesses in the industrial, technology, or service sectors.

Proposed Framework on Capital Management Response and its Relationship with Profitability of the Banking Industry based on Cluster Analysis

Figure 4 Framework on Capital Management Response and its Relationship with Profitability of the Banking Industry based on Cluster Analysis



The figure above shows the result of the tested data of this study. Based on the figure, there are indeed significant clusters that can be formed based on the level of capital management response. This suggests that banking firms differ in their approaches to

capital management, and that these differences can be grouped into distinct clusters namely efficient solvent, high liquid, and safe player. However, there was no significant relationship found between the clusters of capital management response and their firm profile. This suggests that the clusters in capital management response are not necessarily related to other firm profile such as size, net worth, capitalization, and bank category. The study indicates that there is a significant relationship between the clusters of capital management response and profitability. The Efficient Solvent cluster, which prioritizes efficiency and solvency, may be better equipped to generate higher levels of gross profit and net profit margin. The High Liquid cluster, which prioritizes liquidity, may be better able to manage risk and generate stable profits over the long-term. The Safe Player cluster, which takes a more balanced approach, may be better equipped to manage both short-term and long-term risks and generate steady profits over time.

Overall, the study provides useful insights into the relationship between capital management response and profitability in the banking industry, as well as the clustering of banking firms based on their capital management practices

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