

Segmentation of Household Financial Vulnerability And Credit Risk Mitigation Strategies

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ABSTRACT

Households are a sector with significant aggregate financial implications. Financially vulnerable households can have adverse effects on the economy. Accordingly, borrowers highlight issues worthy of further investigation. This study aims to segment the levels of household financial vulnerability and the strategies chosen to alleviate financial distress. The objective of the research is to determine the level of household financial vulnerability and the mitigation strategies adopted to overcome financial stress. The Financial Margin Approach (FMA) was used to assess household vulnerability issues. The financial margin is a method of calculating a household's residual income after deducting basic expenses, debt repayments, and interest payments. The respondents in this study were financially vulnerable households, defined as borrowers with negative financial margins. Segmentation was performed using the K-Means algorithm. K-Means is a data science algorithm in unsupervised learning, primarily for clustering problems. The K-Means clustering results with three clusters showed that the main differences were in economic capacity (expenditure and socio-economic status) and financial adjustment responses. Cluster 2 showed a greater willingness to face financial pressures with more diverse resources and strategies compared to cluster 1 and cluster 0.

Keywords: household vulnerability; risk coping; credit risk; mitigation strategies.

Segmentasi Kerentanan Keuangan Rumah Tangga dan Strategi Mitigasi Risiko Kredit

ABSTRAK

Rumah tangga adalah sektor yang memiliki implikasi finansial agregat yang signifikan. Rumah tangga yang rentan secara finansial dapat memberikan dampak buruk terhadap perekonomian. Oleh karena itu, rumah tangga peminjam menjadi isu yang layak untuk diteliti. Penelitian ini bertujuan untuk mengelompokkan tingkat kerentanan finansial rumah tangga dan strategi yang dipilih untuk mengurangi tekanan finansial. Tujuan dari penelitian ini adalah untuk menentukan tingkat kerentanan finansial rumah tangga serta strategi mitigasi yang dapat dilakukan untuk mengatasi tekanan finansial. Pendekatan *Financial Margin (FMA)* digunakan untuk menilai isu kerentanan rumah tangga. *Financial margin* adalah metode untuk menghitung pendapatan sisa rumah tangga setelah dikurangi pengeluaran dasar, pembayaran utang, dan pembayaran bunga. Responden dalam penelitian ini adalah rumah tangga yang rentan secara finansial, yang didefinisikan sebagai peminjam dengan *financial margin* negatif. Segmentasi dilakukan menggunakan algoritma *K-Means*. *K-Means* adalah algoritma *data science* dalam pembelajaran tanpa pengawasan (*unsupervised learning*), terutama untuk

masalah pengelompokan (*clustering*). Hasil pengelompokan *K-Means* dengan tiga klaster menunjukkan bahwa perbedaan utamanya terletak pada kapasitas ekonomi (pengeluaran dan status sosial-ekonomi) serta respons penyesuaian finansial. Klaster 2 menunjukkan kesediaan yang lebih besar untuk menghadapi tekanan finansial dengan sumber daya dan strategi yang lebih beragam dibandingkan klaster 1 dan klaster 0.

Kata kunci: kerentanan rumah tangga; mitigasi risiko; risiko kredit; strategi mitigasi.

INTRODUCTION

Households represent a sector with significant aggregate financial impacts due to their high interconnectivity with other sectors. Financially vulnerable households can adversely affect the economy (Mokhova & Zinecker, 2014). The subprime mortgage crisis in the United States exemplifies how household credit risk can have systemic economic repercussions (Conklin et al., 2022).

Vulnerability is a multifaceted concept encompassing various factors at the individual, community, and population levels (Hoogeveen et al., 2004). Such vulnerabilities may arise as asset owners or borrowers from financial institutions. Since household balance sheets correlate with other sectors, such as corporate, public, and financial sectors, both in assets and liabilities, household risk exposure can lead to macroeconomic imbalances.

Several studies emphasize the importance of understanding factors contributing to household vulnerability (Shi & Lim, 2024). These factors include socioeconomic status (SES), resource access, social capital, and environmental conditions. Households with limited financial resources, inadequate social support, or those residing in disadvantaged areas may face increased vulnerability to health, social, and economic challenges.

According to Hoogeveen et al. (2004), households respond to risks using three strategies: risk prevention, risk mitigation, and risk coping. Risk prevention refers to preemptive measures before an event occurs, risk mitigation involves strategies for predicted events, and risk coping pertains to managing events that have already occurred. Among these, risk coping is the most critical strategy for evaluating household financial resilience against events causing vulnerability or financial distress. Risk coping involves actions taken by households to alleviate financial pressure, including adaptive measures or asset divestment (Dercon, 2002). Adaptive strategies, such as reducing expenses or increasing working hours, typically correspond to moderate vulnerability. Liquid asset divestment often indicates high vulnerability, while productive asset divestment reflects extreme vulnerability.

Although vulnerability affects all living beings, certain groups experience it more severely due to social, economic, and demographic characteristics. In Indonesia, household financial vulnerability has increased with the rise of peer-to-peer (P2P) lending platforms and online loans. As of January 2024, 101 conventional and sharia-based

fintech P2P lending firms operated, with outstanding loans amounting to IDR 59.64 trillion by the end of 2023.

With the increase in loan volume, default risks have also grown. By January 2024, the TWP90 (a metric for non-performing loans exceeding 90 days past due) reached 2.95%. According to the Financial Services Authority (OJK), the majority of online loan recipients are young individuals and young households. As of June 2023, 10.91 million active borrowers aged 19-34 held loans totaling IDR 26.87 trillion.

Consequently, the surge in P2P lending poses risks if borrowing households face financial difficulties or defaults. Unresolved vulnerabilities hinder basic needs fulfillment and elevate the probability of loan default (Noerhidajati et al., 2021). While fintech provides positive contributions (Salampasis & Mention, 2018), the large number of borrowers and loan amounts, particularly among young households, underscores significant challenges requiring further investigation.

This research addresses these gaps by segmenting household vulnerability levels and examining chosen risk coping strategies. To date, no study has specifically investigated household vulnerability segmentation and financial distress strategies in Indonesia. This research is important because household behavior and performance significantly influence the financial system. Monitoring household sector conditions and behavior is essential to prevent systemic financial imbalances originating from households.

The novelty of this study includes segmenting household financial vulnerability conditions, profiling households within each vulnerability cluster, and identifying strategies to overcome financial pressures. It explores the segmentation of household financial vulnerability in Indonesia, the profiles of households within each cluster, and the strategies used to navigate financial challenges.

RESEARCH METHOD

Primary data were collected from households with loans. Data collection was conducted online through the paid survey platform *Jajak Pendapat (Jakpat.net)*, involving 100 respondents. The sample was randomly drawn from Jakpat.net's database of loan borrowers residing in West Java. West Java was selected because according to the OJK report "P2P Lending Statistics for the July 2024 Period," the province had the highest outstanding loans in Indonesia, amounting to IDR 18 trillion, with 5.2 million active borrower accounts.

The financial margin approach (FMA) was employed to analyze household vulnerability issues. FMA calculates the individual financial margin as the residual income after deducting basic expenses, principal debt repayments, and interest payments (Bilston et al., 2015). Financially vulnerable households are defined as those with a negative financial margin.

Segmentation was performed using the K-Means algorithm. K-Means is a widely used data science algorithm for unsupervised learning, particularly for clustering problems. The algorithm partitions data into one or more clusters; data points with similar characteristics are grouped into the same cluster, while data points with different characteristics are assigned to separate clusters.

Clustering calculations focused on respondents whose monthly income was less than their basic expenses, principal debt repayments, and interest payments. These households were classified as financially deficit and potentially experiencing financial distress. Clustering was conducted using Python programming commands (Appendix A).

RESULTS AND DISCUSSION

Clustering

Out of 100 respondents, 37 (37%) had monthly incomes lower than their basic expenses, principal debt repayments, and interest payments. K-Means clustering results segmented the respondents into three clusters as follows.

Cluster Descriptions

Descriptions for each cluster are based on questions related to expenditures, socioeconomic status, and actions taken to cope with financial pressure.

Table 1. Cluster Description

Cluster	Profile	Monthly Expenditure	Socioeconomic Status (SES)	Response to Financial Pressure
Cluster 0 (Moderate Age and Spending)	Moderate age and spending, average SES	Around average, neither high nor low	Stable at a moderate level	Adaptive: reducing expenses, seeking additional income, or liquidating assets if necessary
Cluster 1 (Older Age, Low Spending and SES)	Older individuals with lower spending and lower SES	Low, reflecting frugality or limits	Lower SES, limited income	Relying on borrowing from family/friends, rarely having emergency savings
Cluster 2 (Middle Age, High Spending, Medium SES)	Middle-aged individuals, higher spending, medium SES	High, indicating financial capability	Medium SES, relatively stable	Diverse: utilizing emergency savings or formal borrowing, such as from banks

a. Cluster 0 (Moderate Age and Spending)

- Cluster 0: Consists of 5 individuals characterized by near-average monthly expenditures.
- Profile: Individuals in this cluster have moderate age and spending, as well as average socioeconomic status (SES).

- Monthly Expenditures: Tend to be around the average, neither high nor low.
 - Socioeconomic Status (SES): Most have stable SES, neither markedly low nor high.
 - Response to Financial Pressure: Tend to be adaptive, reducing expenses or seeking additional income when facing financial stress. In some cases, they also liquidate liquid assets if necessary.
- b. Cluster 1 (Older Age, Low Spending, and SES)
- Cluster 1: Consists of 7 individuals who are generally older but have lower monthly expenditures and socioeconomic status.
 - Profile: This group comprises individuals of relatively older age with lower monthly expenditures and SES.
 - Monthly Expenditures: Typically low, reflecting frugality or limitations.
 - Socioeconomic Status (SES): Lower SES, possibly due to limited income or unstable employment.
 - Response to Financial Pressure: Often rely on basic methods to manage financial stress, such as borrowing from family or friends, and rarely have emergency savings for long-term challenges.
- c. Cluster 2 (Middle Age, High Spending, Medium SES)
- Cluster 2: Consists of 14 individuals with higher monthly expenditures and medium socioeconomic status.
 - Profile: Individuals in this cluster are middle-aged with higher expenditures and medium SES.
 - Monthly Expenditures: Relatively high, indicating financial capacity to spend more or larger living needs.
 - Socioeconomic Status (SES): Generally medium, reflecting relatively good economic stability.
 - Response to Financial Pressure: Often employ diverse strategies to address financial issues, such as utilizing emergency savings or formal loans from banks.

Cluster Differences

The most noticeable differences among the three clusters primarily lie in the following aspects.

Table 2. Differences Between Clusters

Aspect	Cluster 0 (Moderate Age and Spending)	Cluster 1 (Older Age, Low Spending and SES)	Cluster 2 (Middle Age, High Spending, Medium SES)
Age and Monthly Spending	Younger or early adulthood with moderate spending	Older individuals with low spending, reflecting frugality	Middle-aged with higher spending compared to other clusters
Socioeconomic Status (SES)	Average SES, stable but not extreme	Lower SES, limiting financial flexibility	Medium SES, indicating good economic stability
Response to Financial Pressure	Adaptive: reduces spending, takes extra jobs, or liquidates assets	Relies on simple methods like borrowing from family/friends	Diverse strategies: emergency savings or formal loans

a. Age and Monthly Expenditure

- Cluster 0 has moderate expenditures at a relatively younger or early adulthood age.
- Cluster 1 consists of older individuals with lower monthly expenditures, which may indicate spending limitations or a frugal lifestyle.
- Cluster 2 represents a middle-aged group capable of allocating higher monthly expenditures compared to the other clusters.

b. Socioeconomic Status (SES)

- Cluster 1 has a lower SES compared to the other two clusters, which may limit their ability to cope with financial pressures.
- Cluster 2 has a middle SES, indicating relatively good economic stability and tends to have more options to handle financial stress.
- Cluster 0 is at an average SES level, showing stability but not standing out in either low or high SES categories.

c. Response to Financial Pressure

- Cluster 2 shows more varied strategies and tends to have emergency savings or access to formal loan sources.
- Cluster 1, on the other hand, relies on simpler methods, such as assistance from family or friends, and generally lacks emergency savings.
- Cluster 0 is more adaptive, reducing expenditures or taking on additional work when facing financial stress and also divesting liquid assets if necessary.

Overall, the main differences lie in economic capacity (expenditure and SES) and financial adaptation responses, where Cluster 2 tends to be better equipped to handle financial pressure with more resources and strategies compared to Clusters 1 and 0.

Financial Vulnerability and Mitigation Strategies

The results of the calculations of the three clusters reveal diverse characteristics related to household financial vulnerability and the mitigation strategies employed in response to financial pressures.

Household Financial Vulnerability

Household financial vulnerability refers to the condition in which a household struggles to meet basic needs and adjust expenditures with limited income, particularly under economic pressure. [Lusardi & Mitchell \(2013\)](#) stated that households with low SES and unstable income are more susceptible to financial crises and are more likely to incur risky debt. This is evident in Cluster 1, which has a lower SES and limited expenditure, making them more vulnerable to financial crises with fewer resources to handle economic pressures.

Households with low socioeconomic status and limited expenditures often face higher financial vulnerability during economic crises ([Lusardi et al., 2011](#)). These households typically have tighter budgets, lower savings and liquid assets, and fewer resources to manage unexpected financial shocks ([Hamid et al., 2023](#)). The recent global financial crisis and the COVID-19 pandemic further exacerbated the financial fragility of these households, as they struggled to meet basic needs and faced economic challenges ([Bufe et al., 2022](#)).

Research shows that financial literacy and readiness play a crucial role in determining household financial resilience. Households with higher income and education levels are not immune to financial vulnerability, as the cost of living can burden even those with relatively high earnings ([Ramli et al., 2022](#)). However, lower SES households are more affected, as they often lack the financial knowledge and behavioral skills required to manage their finances effectively during periods of economic stress ([Lusardi et al., 2021](#)).

Monthly Expenditure and Socioeconomic Status as Indicators of Vulnerability

Cluster 2, which has higher expenditure and a middle SES, exhibits more stable economic characteristics. They are also better able to access formal financial resources, such as banks, to mitigate credit risks. This group likely has better access to information and banking facilities that help them manage their finances more effectively.

Households with higher expenditures and middle SES typically demonstrate more stable economic characteristics because they have sufficient income to cover living expenses and maintain a good quality of life. Higher expenditures in this category often reflect investments in key areas such as education, health, and housing, which serve as long-term protections against socio-economic risks. These investments create a solid

foundation for their financial stability, ensuring that households continue to have access to essential resources and services that support their productivity and well-being.

This stability is also supported by better access to financial services, such as credit or profitable investments, allowing middle SES households to cope with unexpected financial situations without experiencing significant stress. They tend to have savings or investments that can be used in emergencies, and with access to low-cost credit facilities, they can maintain liquidity amid short-term economic fluctuations. This flexibility allows them to delay or adjust expenditures without sacrificing basic needs or long-term financial security.

Additionally, middle SES is often accompanied by higher financial literacy, which enhances the ability of households to manage expenditures and debt more effectively (Hidajat, 2021). This financial literacy enables them to make informed decisions regarding financial management, such as limiting consumer debt, allocating funds for emergency savings, and creating realistic budgets. With better financial knowledge, these households can avoid the risks of overspending or uncontrolled debt, which are often the primary causes of economic instability.

Overall, higher expenditures and middle SES provide these households with access to resources and knowledge that support stable financial management. They have the capacity to adapt to short-term financial changes without undermining their economic foundation, making them more resilient in facing economic challenges and better prepared to meet future financial needs.

Credit Risk Mitigation Strategies

Regarding risk mitigation strategies, there are clear differences among the three clusters in terms of financial strategy choices when facing financial pressures. Households with liquid assets or access to formal loans tend to reduce the impact of financial pressure through adaptive strategies, such as increasing income or temporarily reducing expenditures. This is evident in Cluster 2, which relies on formal strategies and emergency savings to cope with pressure.

Households with liquid assets or access to formal loans can reduce the impact of financial pressure by being more flexible in making decisions. With liquid assets, they can quickly access funds to meet urgent needs without resorting to high-interest debt, as often happens with informal loans. Moreover, access to formal loans allows them to obtain funds under better conditions, thus maintaining long-term financial stability and avoiding greater risks (Hidajat, 2016).

Additionally, households with these financial resources tend to be better able to implement adaptive strategies (Hamid et al., 2023), such as increasing income through side jobs or temporarily reducing expenditures. With better financial stability, they can take time to plan and manage expenditures more wisely, as well as seek opportunities to

increase income. This approach not only helps them cope with current financial pressures but also builds long-term resilience against future crises.

Cluster 1, on the other hand, relies on support from friends or family and often lacks emergency savings. Households with lower income tend to be less prepared for credit risks and often use simpler, riskier strategies, such as informal loans or selling liquid assets.

Households with lower income are generally less prepared to face credit risks due to limited access to formal financial services. Many of them do not have bank accounts or do not qualify for loans from financial institutions, forcing them to rely on informal loans, which usually come with stricter terms and higher interest rates. Income instability and the lack of savings make it difficult for them to cope with emergencies without resorting to risky options.

Moreover, the low level of financial education among these households results in a lack of understanding of the consequences of financial decisions. In emergencies, they may choose to sell liquid assets, such as jewelry or other valuables, rather than seek more sustainable solutions. These decisions are often driven by immediate needs, without considering the long-term impact, which ultimately worsens their financial situation and increases vulnerability to credit risk.

Preparedness and Flexibility in Facing Financial Crises

The way individuals respond to financial pressure varies widely among the three clusters, reflecting their unique socio-economic characteristics and financial stability.

a. Cluster 0 with Moderate Age and Expenditure

Individuals in this cluster exhibit adaptive financial behavior when facing financial challenges. They tend to respond by reducing expenditures or seeking additional work to generate extra income. If necessary, they are also willing to divest liquid assets to meet urgent financial needs. This adaptive approach reflects their moderate stability, allowing them to manage financial pressure without significant disruption to their overall economic well-being.

b. Cluster 1 (Older Age, Low Expenditure, and SES)

This cluster shows dependence on basic strategies when dealing with financial pressure. With limited economic resources, they often rely on informal support systems, such as borrowing from family or friends. However, the lack of emergency savings makes them vulnerable to long-term financial pressure, reflecting the limitations caused by a lower socio-economic status (SES) and a limited capacity to absorb unexpected expenditures.

c. Cluster 2 (Middle Age, High Expenditure, Middle SES)

Members of this cluster use a variety of proactive strategies to manage financial pressure. Their middle SES provides a relatively stable financial foundation, allowing

access to options such as emergency savings or formal financial services, such as bank loans. These varied approaches reflect their ability to plan and reduce risks, making them more resilient than the other clusters.

Financial preparedness often reflects a combination of emergency fund accessibility and flexibility in adjusting lifestyle to maintain economic stability (Baker, 2018). Cluster 0, with moderate expenditure and SES, reflects good adaptability without relying too heavily on high-risk strategies like borrowing or selling assets. This group is more flexible in temporarily reducing expenditures, indicating moderate financial readiness, although not as strong as Cluster 2 in terms of formal access and savings.

CONCLUSION

The findings suggest that socioeconomic status and financial mitigation strategies play a significant role in determining household financial resilience.

Cluster 1 has a lower SES and limited expenditures, making them more vulnerable to financial crises and leaving them with fewer resources to cope with economic pressures. Cluster 2, with higher expenditures and middle SES, shows more stable economic characteristics. They are also better able to access formal financial resources, such as banks, to mitigate credit risks. Cluster 2, with middle SES and higher expenditures, shows better resilience to credit risks, while Cluster 1, with lower SES, is more vulnerable to financial pressures. Cluster 0, with moderate expenditures and SES, reflects good adaptability without relying heavily on high-risk strategies like borrowing or selling assets. This group is more flexible in temporary expenditure reduction strategies, indicating moderate financial preparedness, though not as strong as Cluster 2 in terms of formal access and savings.

These findings align with literature emphasizing that households with better financial resources tend to have more mitigation options in facing financial risks, while households with low SES rely more on riskier or less flexible strategies.

This study also highlights the importance of financial education. Policies and interventions should focus on improving financial literacy and financial security for Cluster 1, while strengthening adaptive strategies for Cluster 0 and maintaining the stability observed in Cluster 2.

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