The Impact of Interest Rate, Gross Domestic Product, and Debt-To-Income Ratio on Debt Management among University Students

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ABSTRACT

The purpose of this study is to examine the impact of interest rate, gross domestic product (GDP), and debt-to-income ratio on debt management practices among students at Universiti Malaysia Sarawak (UNIMAS). The study employs a mixed approach, with primary data collected via structured surveys targeting 300 respondents and secondary data on Malaysia's macroeconomic indicators obtained from the World Bank. Findings reveal that interest rates and GDP have weak, insignificant effects on debt management, while the debt-to-income ratio shows a slightly stronger link. Respondents who compare loan options and manage loans well tend to have lower debt burdens. This suggests personal financial behaviour plays a more crucial role than macroeconomic factors, highlighting the need for financial literacy programs to support responsible borrowing in university communities.

KEYWORDS

Interest rate, Gross Domestic Product, Debt-to-income, Debt management

INTRODUCTION

Statistics data from the Ministry of Finance, Malaysia (2023), indicated a steady increase in the country's debt-to-gross domestic product (GDP) ratio over recent years, highlighting the urgent need for effective debt management strategies at both individual and national levels. Rising debt levels suggest that Malaysians, including university students, are struggling to manage their debt. In a university setting, students may face distinct financial challenges. Students often manage debt from education loans and personal expenses, which later affect their longer-term financial commitments, such as mortgages and family expenses.

There is a pressing need to understand interest rates and debt-to-income ratios in debt management. As household and corporate debt continue to rise, it becomes increasingly important to examine the key factors that influence effective debt management. Understanding these factors is essential for developing strategies to enhance financial stability and promote responsible borrowing behaviour in Malaysia. According to the Ministry of Finance (2023), Malaysia's highest rate of central government debt, as a percentage of gross domestic product (GDP), in the past decade has soared 58 percent, underscoring the severity of the situation. This alarming trend highlights the urgency of addressing the growing financial pressures on both households and businesses. Higher debt levels can strain the economy, increase default risks, and potentially destabilize financial institutions. Consequently, a comprehensive understanding of these factors is crucial for policymakers and financial institutions to promote sustainable borrowing practices and ensure economic well-being.

Economic issues, poor debt management, can also lead to significant social problems and unlawful means to additional benefits. Excessive financial pressure can drive individuals toward criminal behaviour as a desperate coping mechanism. Studies have shown that economic distress is often correlated with increased crime rates, such as robbery and fraud, as individuals seek immediate relief from their financial struggles (Hagan & Dinovitzer, 1999). In Malaysia, Selvam (2024) states that this trend is mirrored by the increase in crimes involving dishonesty, such as cheating and criminal breach of trust (CBT). According to Selvam (2024), the Malaysian Anti-Corruption Commission (MACC) chief commissioner, Tan Sri Azam Baki, revealed that corruption has cost Malaysia approximately RM277 billion over the past five years. This highlights the intersection of economic strain and dishonest activities, showing that significant financial pressure can contribute to a surge in crime as individuals and institutions struggle with economic and ethical challenges.

Additionally, the stigma associated with debt can cause social withdrawal, further isolating individuals and exacerbating mental health issues (Wenzel et al., 2007). This combination of financial strain and social isolation highlights the need for effective debt management solutions that consider both economic and social implications. According to Money and Mental Health Policy Institute (2020), one in five or 18 percent of people with mental health problems have a debt problem, where people experiencing mental health problems are three and a half times more likely to be in debt than people without mental health problems.

In light of the pressing issues surrounding rising debt levels in Malaysia, this study aims to investigate the intricate relationships between interest rates, GDP, debt-to-income ratios, and effective debt management. This research seeks to provide valuable insights that can inform policymakers, financial institutions, and individuals alike. Effective debt management has become increasingly crucial due to its link to household financial stability and national economic health. Ultimately, the findings may inform the development of comprehensive strategies that not only address the economic aspects of debt management but also mitigate the associated social challenges. Fostering responsible borrowing practices and enhancing financial literacy can help Malaysia work toward a more stable economic environment that supports the well-being of its citizens.

LITERATURE REVIEW

Debt Management

Debt management is a strategic approach to handling financial obligations, focusing on systematic planning and budgeting to regain control over outstanding debt (Guinan, 2024). According to Guinan (2024), the primary objective of a debt management strategy is to reduce current debt while creating a pathway toward eventual elimination. This approach involves developing a clear repayment schedule, adjusting spending habits, and potentially renegotiating terms with creditors to achieve a sustainable financial position.

The state of global debt management has been a significant challenge, especially for developing nations. According to UNCTAD (2023), public debt has intensified since the 2000s, reaching an estimated $92 trillion by 2022, largely driven by crises such as the COVID-19 pandemic, inflation, and climate challenges. UNCTAD (2023) also stated that developing countries, responsible for nearly 30 percent of this debt, face disproportionately high interest rates and limited access to affordable financing. This financial burden hampers their ability to invest in essential areas like healthcare and education. The United Nations has called for reforms to the international financial system, proposing measures such as affordable long-term financing and improved debt restructuring processes to help address these challenges.

Debt management in Malaysia has become a pressing issue as the nation grapples with escalating household debt levels, which are among the highest in the region. Economic Outlook (2024) reports that the household debt-to-GDP ratio has risen significantly, raising concerns about financial stability and consumers' ability to manage their debts during economic fluctuations. Many Malaysians rely heavily on various forms of credit, including personal loans, credit cards, and mortgages, to meet their financial needs and long-term aspirations. In response to these challenges, the government and financial institutions have increasingly emphasized the importance of financial literacy and responsible borrowing practices. According to Bank Negara Malaysia (2023), enhancing debt management skills is crucial for individuals to effectively navigate their financial obligations and mitigate the risk of default, contributing to overall economic health.

Interest Rate

Interest rates represent the cost of borrowing or the reward for saving, commonly expressed as a percentage of the principal amount. They reflect the price one pays to use funds for a period and are influenced by several factors. For instance, risk levels and loan duration play significant roles in determining the rate, as lenders demand higher rates for higher risk or longer-term loans (Mishkin, 2016). Additionally, inflation and central bank policies play a crucial role in determining interest rates. When inflation is high, lenders tend to raise interest rates to preserve the purchasing power of their money. Conversely, during an economic downturn, central banks often lower interest rates to encourage borrowing, investment, and consumer spending (Malkiel, 2023).

In Malaysia, interest rate trends are largely influenced by the central bank, Bank Negara Malaysia (BNM). BNM has periodically adjusted interest rates in response to global economic pressures to maintain economic stability and growth. For example, during inflation, BNM has raised interest rates to counter inflationary pressures, while in weaker economic periods, it has reduced rates to support domestic demand (Mishkin, 2016). These adjustments demonstrate how BNM uses interest rate policies as a strategic tool to ensure financial stability and foster economic growth (World Bank, 2023).

The impact of interest rates on debt management increases with interest rates, affecting the debt level. According to the International Monetary Fund (2001), central banks worldwide have raised interest rates to combat inflation, leading to higher borrowing costs for both public and private sectors. As a result, increased debt servicing costs can strain national budgets and limit fiscal flexibility. The International Monetary Fund (2001) states that countries with high levels of existing debt are particularly vulnerable, as rising interest rates can lead to debt levels if not managed properly. Chadha et al. (2013) state that the sustainability of public debt is closely tied to interest rates, as higher interest rates can increase the cost of servicing debt, making it more challenging for countries to maintain fiscal stability. This is especially critical for developing nations, where a significant portion of government revenue may be allocated to interest payments rather than essential services (Chadha et al., 2013).

In Malaysia, the effects of interest rates on debt management are particularly pronounced due to the country's unique economic context. Wilson (2024) states that Bank Negara Malaysia (BNM) has adjusted its monetary policy in response to inflationary pressures, impacting borrowing costs across the economy. According to Wilson (2024), the Credit Counselling and Debt Management Agency (CCDM) also plays a vital role in assisting Malaysians with debt management. In addition, CCDM helps borrowers consolidate their debts into more manageable payments through negotiating lower interest rates through its Debt Management Programme (DMP).

Gross Domestic Product (GDP)

Gross Domestic Product (GDP) is a fundamental indicator of economic performance, the total monetary value of all finished goods and services produced within a country's borders during a specified period (Fagan, 2019). This measure is pivotal for assessing the economic health of nations and is widely utilized by policymakers, economists, and investors alike. GDP is defined as the market value of all final goods and services produced in a country over a given timeframe, typically expressed annually or quarterly. It functions as a comprehensive scorecard of a nation's economic activity, providing insights into its size and growth trajectory. As noted by Fernando (2024), GDP is crucial for an economy, guiding strategic decision-making across various sectors. The International Monetary Fund (IMF) emphasizes that GDP is not only a measure of output but also reflects the living standards and economic well-being of a country's population (Callen, 2024).

Gross Domestic Product (GDP) plays a crucial role in shaping debt management strategies at both global and national levels. Understanding the interplay between GDP and debt management is essential for policymakers, especially in a landscape marked by rising debt levels and economic uncertainties. The relationship between GDP and public debt is often expressed through the debt-to-GDP ratio, which measures a country's ability to manage its debt. As of late 2023, global public debt is projected to exceed $100 trillion, approximately 93 percent of global GDP, highlighting the precarious fiscal situation many countries face (Dabla-Norris et al., 2024). A high debt-to-GDP ratio can signal potential risks to economic stability, particularly when growth rates are insufficient to keep pace with rising debt levels.

In Malaysia, the relationship between GDP and debt management reflects broader global trends but also includes specific national considerations. Malaysia's current economic landscape has shown resilience with moderate GDP growth; however, public debt has been rising alongside it. Malaysia's public debt stands at approximately 60 percent of GDP, raising concerns about fiscal sustainability pressures from both domestic needs and external economic conditions (Hazim, 2024). From the perspective of debt servicing costs, the Malaysian government faces challenges, including rising interest rates and the ability to service existing debt, as government revenue is allocated to interest payments, limiting the funds available for critical infrastructure and social services (UNCTAD, 2023).

Debt-To-Income

The debt-to-income ratio is a financial metric that assesses the amount of debt a person has compared to their monthly income. It is calculated by dividing the total monthly debt obligation by gross monthly income, which is income before taxes and other deductions. Lenders used this ratio to assess a borrower's financial capacity and creditworthiness. For example, a debt-to-income ratio of 20 percent 20 percent of the income is directed toward debt, indicating a balanced level of income and debt that lenders generally view as manageable (Consumer Financial Protection Bureau, 2023). This metric helps lenders evaluate if additional debt may strain the borrower's finances (Hipple, 2022).

The debt-to-income ratio is a critical financial metric that measures an individual's or household's total monthly debt payments relative to their gross monthly income. This ratio is an essential indicator of borrowers' ability to manage their debts effectively and is a key factor in debt management strategies globally. In the global context, during an economic downturn, debt-to-income ratios can indicate increased financial vulnerability among consumers, leading to higher rates of insolvency and bankruptcy. This phenomenon was evident during the global financial crisis when many households faced unsustainable debt levels relative to their incomes. As highlighted by various economic studies, managing debt-to-income ratios effectively is essential for fostering economic resilience and stability (Xu et al., 2021).

Malaysia has witnessed a rising trend in household debt, which reached approximately 84 percent of GDP in 2023 (CEIC DATA, 2024). This high level of debt relative to income raises concerns about financial stability and how to manage their debts. A high debt-to-income ratio indicates that a significant portion of household income is allocated to debt service, which can lead to financial strain and increased risk of insolvency if economic conditions worsen (CEIC DATA, 2024).

METHODOLOGY

This study employed a quantitative approach to quantify the relationships between the independent variables (interest rate, GDP, and debt-to-income ratio) and the dependent variable (debt management). This study aims to provide measurable insights into how macroeconomic factors and individual financial behaviours interact by using this approach. The number of respondents is based on Krejcie and Morgan (1970). The Krejcie and Morgan Table is a widely used tool for determining the appropriate sample size for research studies. It provides researchers with a quick reference to ascertain how many participants are needed based on the total population size and a specified confidence level (KENPRO, 2012). According to the UNIMAS official website, the number of communities at UNIMAS is 19427 people. A population of 19427 will give a 384-sample size, with a 95 percent confidence level and a 5 percent margin of error. Due to time constraints, this study will only include 300 randomly selected respondents for data collection.

In this study, both primary and secondary data sources are used to analyse the impact of interest rate, GDP, and debt-to-income ratio on debt management in Malaysia. The survey is designed to capture the debt-to-income ratio by asking specific questions about income levels and their debt obligations. The survey uses structured questionnaires as the primary data collection method, providing quantitative data that can be analysed to understand personal debt levels relative to income. This data is expected to offer insights into individual debt management within a controlled demographic setting. The survey data is analysed using the Statistical Package for Social Sciences (SPSS) to categorize debt-to-income ratios and to evaluate attitudes towards debt management. The classification of the debt-to-income ratio provides insights into the proportion of respondents

within each category, reflecting their financial stability. Descriptive statistics such as frequencies, means, and standard deviations are used to summarize the data. Debt management perception is measured using a Likert scale to gauge attitudes and behaviours related to debt management, enabling a deeper understanding of financial behaviour patterns.

Secondary data on both interest rate and GDP in Malaysia has been collected for five years from the World Bank, a reputable source known for its reliable and comprehensive economic data. These variables play essential roles in evaluating their relationship with debt management trends over the specified time frame. The interest rate data helps in understanding borrowing costs and their implications on debt levels. On the other hand, GDP serves as an indicator of overall economic activity, providing insights into how economic growth influences debt sustainability and repayment capacity. Data from the World Bank on the accuracy and relevance of the interest rate and GDP metrics, reflecting economic conditions that may impact individual and aggregate debt behaviour in UNIMAS for this study. The secondary data is summarized using descriptive statistics to highlight trends in GDP growth and interest rate fluctuations over the specified period. Key indicators such as averages, variances, and trends are reported to provide context for their potential in debt management. Pearson correlation analysis is also used to examine the relationships between GDP, interest rates, and the debt-to-income ratios collected from the primary survey data. This approach helps identify whether macroeconomic factors significantly affect personal debt management practices.

RESULTS AND DISCUSSION

Table 1 states the demographic characteristics of the respondents in this study. The majority of the respondents were young adults (99%), single (99%), Malay (39%), and had a monthly income of less than RM2,500 (93%).

Table 1: Demographic Information

Characteristics	**Frequency (N=300)**	**Percentage (%)**
Age		
18 – 35 years old	297	99
36 – 55 years old	3	1
Gender		
Male	149	50
Female	151	50
Marital status		
Single	298	99
Married	2	1
Ethnicity		
Malay	118	39
Chinese	98	33
Indian	45	15
Others	39	13
Monthly income (RM)		
<2,500	280	93
2,500 – 10,959	17	6
>10,959	3	1

Based on Table 2, most respondents tend to take on debt to cover their household day-to-day expenses. A total of 73 respondents (24.33%) strongly agree with this statement, and 104 respondents (34.67%) agree, resulting in a mean score of 3.64. This shows that many people use debt as a short-term solution to make ends meet, especially when their income is not enough for basic needs. This is consistent with previous research showing that individuals with limited income often rely on debt to manage routine living costs such as groceries, utility bills, and rent (Lusardi & Tufano, 2015). However, respondents disagree on whether to purchase expensive clothing or jewellery. 155 respondents, more than half (51.67%), strongly disagree with purchasing expensive clothing or jewellery. This suggests that people are being more cautious and responsible, using debt mainly for needs. Similarly, studies have found that most consumers are less likely to borrow money for non-essential luxury items, preferring to reserve debt for more urgent or necessary expenses (Norvilitis et al., 2006).

Table 2: Debt Management

Item	**Frequency (%)**					**Mean**
	5	4	3	2	1	
Do you agree with taking on debt for the following purposes?						
To purchase expensive clothing or jewellery	4 (1.33)	9 (3.00)	68 (22.67)	64 (21.33)	155 (51.67)	1.81
To fund a vacation trip	31 (10.33)	53 (17.67)	40 (13.33)	73 (24.33)	103 (34.33)	2.45
To cover day-to-day household expenses	73 (24.33)	104 (34.67)	76 (25.33)	36 (12.00)	11 (3.67)	3.64
To buy a car	58 (19.33)	69 (23.00)	61 (20.33)	71 (23.67)	41 (13.67)	3.11
To pay for education	23 (7.67)	92 (30.67)	62 (20.67)	67 (22.33)	56 (18.67)	2.86
Do you agree with the following statements about borrowing and financial management?						
I tend to be impulsive when borrowing and spending loans.	20 (6.67)	201 (67.00)	24 (8.00)	32 (10.67)	23 (7.67)	3.54
I borrow money sometimes to balance my budget.	7 (2.33)	12 (4.00)	117 (39.00)	100 (33.33)	64 (21.33)	2.33
I compare loan options from different lenders before borrowing.	11 (3.67)	240 (80.00)	23 (7.67)	11 (3.67)	15 (5.00)	3.74
I have taken salary advances to cover financial gaps.	32 (10.67)	10 (3.33)	19 (6.33)	16 (5.33)	223 (74.33)	1.71
I struggle to find solutions during financial difficulties.	10 (3.33)	114 (38.00)	137 (45.67)	7 (2.33)	32 (10.67)	3.21
I manage my loans effectively.	213 (71.00)	30 (10.00)	28 (9.33)	6 (2.00)	23 (7.67)	4.35

My debt plans usually work out as intended.	191 (63.67)	58 (19.33)	36 (12.00)	9 (3.00)	6 (2.00)	4.40
I save money in advance to pay my bills.	22 (7.33)	71 (23.67)	89 (29.67)	34 (11.33)	84 (28.00)	2.71
I always pay my bills on time.	54 (18.00)	58 (19.33)	86 (28.67)	23 (7.67)	79 (26.33)	2.95
I closely monitor my finances.	93 (31.00)	44 (14.67)	148 (49.33)	10 (3.33)	5 (1.67)	3.70
I know exactly how much debt I have.	30 (10.00)	206 (68.67)	48 (16.00)	6 (2.00)	10 (3.33)	3.80
I set limits for my daily or monthly expenses.	222 (74.00)	43 (14.33)	24 (8.00)	7 (2.33)	4 (1.33)	4.57
Average Mean						**3.42**

Note: 5 = Strongly agree, 1 = strongly disagree

Additionally, the second part of the survey collected data about self-control, overconfidence, and money management skills, including debt management. The result shows a mean of 3.42, indicating a slightly positive tendency toward the favourable end of the scale. This indicates a moderately favourable perception among the respondents, though the score does not reach the level of satisfaction. According to Perry & Morris (2005), individuals with moderate levels of self-control and financial literacy tend to exhibit better, though not optimal, debt management behaviours. The respondents seem to have a basic sense of financial responsibility, but there's still room to improve their confidence and money-handling skills.

According to Table 3, the correlation coefficient is -0.089, a very weak negative linear relationship between interest rate and debt management. The p-value is 0.887, meaning the correlation is not statistically significant. In short, there is no meaningful correlation between interest rate and debt management. This finding aligns with the results of Agarwal et al. (2015), who often do not consider interest rates as a primary factor when managing debt, especially when financial literacy or awareness is low. In other words, people may not pay much attention to interest rates when dealing with debt, possibly because they focus more on short-term needs than long-term costs. The Pearson correlation coefficient between GDP and debt management is -0.213, suggesting a weak negative relationship. The result is not statistically significant; a trend of an increase in GDP may be associated with a slight reduction in debt management. This observation is consistent with research suggesting that in periods of GDP growth, individuals may experience improved financial conditions, which can slightly reduce the emphasis on strict debt management; the relationship is often weak (Barba & Pivetti, 2009).

Table 3: Correlation Analysis

Variable	**Pearson Correlation, r**	**Sig. (2-tailed)**
Interest rate	-0.09	0.89
Gross Domestic Product	-0.21	0.73
Debt Management Items		
I tend to be impulsive when borrowing and spending loans.	-0.04	0.44
I borrow money sometimes to balance my budget	-0.01	0.92

I compare loan options from different lenders before borrowing.	-0.21*	<0.00
I have taken salary advances to cover financial gaps	0.03	0.62
I struggle to find solutions during financial difficulties.	0.04	0.45
I manage my loans effectively.	-0.12	0.04
My debt plans usually work out as intended.	-0.11	0.06
I save money in advance to pay my bills	0.03	0.60
I always pay my bills on time.	-0.02	0.73
I closely monitor my finances.	-0.04	0.45
I know exactly how much debt I have.	-0.04	0.50
I set limits for my daily or monthly expenses.	-0.09	0.13

*Correlation is significant at the 0.01 level (2-tailed)

One of the key findings with significant negative correlation is "I compare loan options from different lenders before borrowing," with the correlation coefficient (r) = -0.209, $p < 0.001$. This is a statistically significant relationship. It indicates that individuals who frequently compare loan options tend to have a lower debt-to-income ratio. In other words, making informed loan decisions may help reduce personal debt burden. This supports earlier studies showing that consumers who engage in comparison shopping for credit tend to secure better loan terms and manage debt more effectively (Disney & Gathergood, 2013). There is a slightly significant negative correlation between the statement "I manage my loans effectively" and the r = -0.117, p = 0.04. This also shows a statistically significant but weak negative correlation. Respondents who manage loans well tend to have lower debt-to-income ratios, suggesting good financial management is linked to better debt control. This is consistent with prior research showing that individuals with stronger loan management behaviours tend to carry lower debt levels and demonstrate healthier overall financial outcomes (Sabri & MacDonald, 2010). In short, this suggests that people who are organized and responsible with their loans usually have better control over their debt.

Overall, only two variables showed significant correlations with the debt-to-income ratio, and even these relationships are moderate to weak. This implies that while responsible financial behaviours, like comparing loans and managing debt effectively, are somewhat associated with lower debt, most financial habits are not strongly linked to the individual's debt-to-income burden in this sample. Regression analysis in Table 4 revealed that the model is insignificant (p = 0.06). The debt-to-income ratio has a negative coefficient, suggesting that as people's debt load increases, their debt management performance may decrease slightly. This means that when people carry more debt, it may become harder for them to manage it effectively, even if the effect is not conclusively shown here. According to Brown et al. (2005), higher debt burdens can strain individuals' ability to manage finances effectively, even if the statistical significance is marginal.

Table 4: Regression Analysis

Variable	**Unstandardised β**	**Standard Error, SE**	**Standardised β**	**p-value**
Constant	3.439	0.03	-	0.00
Interest rate	-0.27	0.82	-0.26	0.77
Gross Domestic Product	-0.08	0.17	-0.34	0.70
Debt-to-income ratio	0.00	0.00	-0.11	0.06

Note. F (1, 298) = 3.66

CONCLUSION AND RECOMMENDATIONS

This study aimed to examine the influence of macroeconomic factors, including interest rates, gross domestic product (GDP), and the debt-to-income ratio, on debt management among individuals, particularly students and staff at UNIMAS. The analysis was conducted using both correlation and regression methods, along with descriptive statistics from survey responses. The findings reveal that both interest rates and GDP have weak and statistically insignificant relationships with debt management. While the direction of these relationships aligns with economic expectations, such as higher GDP potentially reducing debt levels. The results are not strong enough to confirm a definitive impact due to the small sample size and data variability.

In contrast, the debt-to-income ratio showed slightly stronger correlations with certain debt management behaviours. Specifically, individuals who compared loan options and managed their loans effectively tended to have lower debt-to-income ratios. These findings suggest that personal financial habits and decision-making may play a more important role in managing debt than broader economic indicators. Moreover, the descriptive results showed that most respondents demonstrated reasonable financial discipline and expenses, and had a clear understanding of their debts. However, there was also evidence that many respondents relied on debt to meet daily household needs, indicating some level of financial vulnerability.

Overall, the study concludes that while economic factors, interest rates, and GDP have a theoretical impact on debt behaviour, in practice, individual-level financial management skills have a more direct and meaningful relationship with debt control in this sample. This highlights the importance of promoting financial literacy and responsible borrowing behaviours, especially among young adults and university communities.

Based on the study's findings, several recommendations are proposed to improve debt management practices among individuals. Firstly, it is recommended that universities and other learning institutions introduce comprehensive financial literacy programs as part of their student development initiatives. These programs should focus on practical topics such as budgeting, responsible borrowing, setting financial goals, and comparing loan offers. Secondly, individuals are encouraged to adopt proactive financial behaviours, such as regularly reviewing their income and debt levels, setting monthly spending limits, and considering credit. This study has shown that such habits are associated with better debt outcomes.

Thirdly, financial institutions should improve the transparency and accessibility of their loan products. Providing clear comparisons and personalized advice can help consumers make more informed decisions, potentially reducing impulsive borrowing. Finally, future research should consider using a larger and more diverse sample, as well as incorporating additional economic variables such as inflation, unemployment, or financial stress. This will help provide a more comprehensive understanding of the factors influencing debt management in different economic and demographic contexts.

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Conflict of Interest

The author declares that there is no conflict of interest in this research.

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