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Developing Financial Intelligence with Financial Mathematics

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Abstract
Financial intelligence is an individual's ability to understand, manage, and optimize the management of personal finances. Financial mathematics is becoming an important tool in developing financial intelligence. In this research using literature study method this method involves the search and collection of information from related literature sources. Through financial mathematics, one can calculate the future value of an investment, estimate the return on an investment, calculate annuity payments, understand the concept of time value of money, and analyze investment risk. The application of financial mathematics in financial intelligence provides an advantage in taking better financial decisions and managing finances effectively. By utilizing financial mathematics, one can improve their understanding of Finance, make effective financial planning, and take better financial decisions.

Keywords: Financial intelligence, financial mathematics, developing intelligence

1. Introduction

Developing financial intelligence through financial mathematics is an essential approach to enhance individuals' understanding and abilities in managing finances (Yulianti, 2019). According to Darmawan (2021), financial mathematics involves the use of mathematical concepts to analyze, understand, and make decisions related to financial aspects such as investments, loans, risks, and long-term financial planning. Understanding financial mathematics provides a strong foundation for managing personal finances wisely (Kusumawati, 2021). Through an understanding of concepts such as interest, discount, and time value of money, individuals can make smarter decisions regarding savings, investments, and debt (Hamidah, 2020). For example, using the compound interest concept, one can calculate how much savings will grow over a specific period or how long it will take to pay off a debt.

Financial mathematics also aids in investment analysis (AKKAŞ, 2021). According to Werner et al. (2006), utilizing concepts like return rates, risk, and portfolio diversification, individuals can make more informed investment decisions. For instance, by employing calculations like Net Present Value (NPV) or Internal Rate of Return (IRR), one can evaluate whether an investment is worth pursuing. Financial mathematics is also useful in long-term financial planning, such as retirement. When calculating the required savings to achieve retirement goals, individuals can use financial mathematics formulas like annuities or future value (Banerjee, 2015). This helps individuals plan their finances by considering factors like inflation, return rates, and estimated future living costs.

Financial mathematics also aids individuals in understanding and managing financial risks (Rachmawati, Ardiansari, 2022). By using concepts such as probability distribution and portfolio risk management, one can identify potential risks and take appropriate actions to minimize their impact. For instance, understanding the

concept of diversification allows individuals to allocate their investments across various asset types to reduce concentration risk (Dindin and Lidinillah 2022).

Developing financial intelligence through financial mathematics is also reflected in the increasingly complex and dynamic global environment (Lee, 2020). Given the continuously changing and rapidly developing world, the ability to understand and apply financial mathematics concepts provides an advantage in making financial decisions. In an environment filled with complex financial products and instruments, understanding financial mathematics becomes key to maintaining stability and optimizing financial performance (Shmueli 2011).

2. Material and Method

The method used in this research is a literature review. This method involves searching and collecting information from relevant literature sources. Researchers can read books, journals, articles, and other sources related to the development of financial intelligence and the application of financial mathematics (Ekowati, 2021). By studying previous research and relevant theories, researchers can identify relevant financial mathematics concepts and develop them in the context of financial intelligence.

3. Result and Discussion

Financial intelligence is an individual's ability to manage finances wisely, including financial decision-making, financial planning, risk management, and intelligent investing (Gunardi, 2017). One crucial aspect of financial intelligence is an understanding of basic financial concepts. Financially intelligent individuals have a strong knowledge of concepts such as expenditures, income, savings, and debt (Yulianti, 2019).

Financial intelligence involves the ability to plan finances. Financially intelligent individuals can plan their finances thoroughly, including budgeting, setting long-term financial goals, and planning for emergencies or unforeseen circumstances (Benito, 2007). They consider aspects such as inflation, income growth, and future living costs. With good planning, they can efficiently manage their financial resources and achieve desired financial goals.

Financial intelligence involves wise risk management. Financially intelligent individuals can recognize and manage risks associated with their financial decisions. They take steps to reduce unwanted risks, such as having an emergency fund, considering appropriate insurance, or diversifying investments. By understanding risks and taking appropriate actions, they can protect their finances from adverse events (Widjaja 2021).

Financial intelligence involves the ability to make smart investment decisions. Financially intelligent individuals can analyze and understand different investment instruments, evaluate associated returns and risks, and make investment decisions that align with their goals and risk profiles (Yulianti, 2019). They consider long-term investment strategies, conduct thorough research, and avoid emotional decision-making. Thus, they can achieve sustainable wealth growth (Sudakova, 2018).

Financial mathematics is a field of study that uses mathematical concepts to analyze and understand financial problems. It involves the use of mathematical formulas, equations, and models to calculate and predict various financial aspects such as investments, loans, financial planning, risk, and the time value of money (Lusardi, 2008).

One fundamental concept in financial mathematics is the time value of money. This concept states that the value of money can change over time (Lusardi, 2008). Money received or paid in the future has a different value than money received or paid currently. This is due to the opportunity to generate profits through investment or the presence of inflation that can reduce the value of money over time. Therefore, in financial mathematics, we use mathematical tools such as interest, discount, and interest factors to calculate the future value or present value of money (Shmueli, 2011).

According to Borhan (2014), financial mathematics also involves the use of concepts such as interest rates, time, future value, present value, annuities, risk, and diversification (Putra, 2023). By using appropriate

mathematical formulas and methods, we can calculate the amount of loan to be paid, estimate future investment value, determine annuity payments, measure investment risk, and conduct smart financial planning (Husain, 2021).

Financial mathematics is used by individuals, companies, financial institutions, and other institutions to make more informed and rational financial decisions. Through careful mathematical analysis, we can optimize investment decisions, manage risk better, plan savings and retirement, compare financial options, and make overall intelligent financial decisions (Darmawan 2021).

Understanding and applying financial mathematics concepts, we can enhance our understanding of finances, make better decisions in managing money, and achieve short-term and long-term financial goals (Ekamarinda, 2024). Financial intelligence is the ability to understand and manage finances wisely. In achieving financial intelligence, financial mathematics plays a crucial role. Financial mathematics involves the use of mathematical concepts and formulas to calculate, analyze, and model financial problems (Zhou, 2023).

By using financial mathematics, one can calculate the future value of an investment, estimate investment returns, determine loan amounts and annuity payments, understand investment risks, and plan finances more effectively. Through accurate calculations, one can make informed decisions about investments, savings, loans, and other financial planning (Zhou, 2023).

Financial mathematics helps in understanding essential concepts such as the time value of money, interest rates, discount, present value, and future value (Darmawan 2021). By understanding and applying these concepts, one can optimize financial decision-making, manage risk better, and plan for long-term finances.

Financial intelligence with financial mathematics can be used by individuals, businesses, and organizations in managing their finances. For example, one can use mathematical calculations to determine how much needs to be saved each month to achieve specific financial goals, calculate interest earned from investments, or decide whether taking a loan is a wise option (Jaya, 2018).

By combining knowledge of financial intelligence and financial mathematics, one can make better financial decisions, manage finances more effectively, and achieve short-term and long-term financial goals (Lee, 2020).

Case Example of Financial Intelligence with Financial Mathematics (Dindin and Lidinillah 2022):

Siti is an employee who wants to prepare for her retirement fund. She wants to know how much she needs to save each month for 20 years to reach a retirement fund target of IDR 2,000,000,000. Siti invests in instruments with an average return rate of 7% per year.

Case Solution:

To find out how much Siti needs to save each month, we can use financial mathematics by applying the annuity formula. The annuity formula is as follows:

$$P = FV \times \frac{r}{(1+r)^n - 1}$$

Where:

P : The annuity payment per period

FV : The future value desired, which is Rp 2,000,000,000,

r : The interest rate per period, which is 7% per year (0.07),

n : The number of periods, which is 20.

For this case:

$$r = \frac{0{,}07}{12} = 0.00583$$

$$P = 2{,}000{,}000{,}000 \times \frac{0.00583}{(1 + 0.00583)^{20} - 1}$$

$$P = 2{,}000{,}000{,}000 \times \frac{0.00583}{1.13864 - 1}$$

$$P = 2{,}000{,}000{,}000 \times \frac{0.00583}{1.13864}$$

$$P = 2{,}000{,}000{,}000 \times 0.04202$$

$$P = 84{,}040{,}000$$

Siti needs to save approximately IDR 84,040,000 per month for 20 years with a return rate of 7% per year to reach a retirement fund target of IDR 2,000,000,000.

This case illustrates how financial intelligence can be applied using financial mathematics to plan for retirement funds. Financial intelligence involves a deep understanding of financial concepts and the ability to manage finances wisely. Financial mathematics, as a tool used in financial intelligence, helps in calculating, modeling, and analyzing financial aspects such as investment returns, savings planning, and annuity calculations.

In Siti's case, financial intelligence is applied by utilizing financial mathematics to plan her retirement fund. She wants to know how much she needs to save each month for 20 years to reach a retirement fund target of IDR 2,000,000,000. In this scenario, Siti applies the concept of annuities, which are regular fixed payments, to calculate the required monthly savings.

By using the annuity formula in financial mathematics, Siti can calculate the required monthly savings by inputting the desired future value, interest rate, and investment period. Through these calculations, Siti learns that she needs to save approximately IDR 84,040,000 per month for 20 years to reach her retirement fund target.

Financial intelligence is demonstrated by Siti's ability to understand and apply financial mathematics concepts, such as the annuity formula, to plan her retirement fund. By using the tool of financial mathematics, Siti can produce accurate calculations and gain a better understanding of how much she needs to set aside each month to achieve her desired financial goal.

The application of financial mathematics in financial intelligence provides advantages in making better financial decisions and managing finances effectively. With a good understanding of financial mathematics concepts, one can plan better, understand investment risks, calculate expected investment returns, and optimize long-term financial decisions (Werner et al. 2006).

4. Conclusion

In developing financial intelligence, the use of financial mathematics plays a crucial role. Financial mathematics provides the necessary tools and concepts to accurately calculate, analyze, and model financial aspects. By leveraging financial mathematics, individuals can enhance their understanding of finance, create effective financial plans, and make better financial decisions. Through financial mathematics, individuals can calculate the future value of investments, estimate investment returns, calculate annuity payments, understand

the concept of time value of money, and analyze investment risks. Additionally, financial mathematics helps in long-term financial planning, such as planning for retirement, calculating the required monthly savings, or deciding on taking loans. By understanding and applying financial mathematics concepts, individuals can optimize their financial decisions, manage risks better, and plan finances more effectively. Financial mathematics provides a strong foundation for financial analysis and decision-making supported by accurate calculations.

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