THE ROLE OF FINANCIAL INTELLIGENCE QUOTIENT AND FINANCIAL LITERACY FOR PAVING A PATH TOWARDS FINANCIAL WELL-BEING

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Abstract. This study aims to develop an original financial intelligence quotient (FIQ) measurement conceptual model, including guidelines for adequately handling personal finances in four developed areas to serve as benchmarks of financial intelligence. Four hypotheses were raised, one of them consists of four parts. Methods used: a questionnaire to determine how well a person's financial decisions comply with financial behaviour guidelines, Cronbach's Alpha coefficient to determine the internal consistency of the scales used in the questionnaire, Spearman correlation coefficient to determine the linear dependence between the variables, a linear regression model was developed to substantiate the hypothesis, the MannWhitney-Wilcoxon rank-sum criterion, the Kolmogorov-Smirnov test to choose the data distribution according to the normal distribution, descriptive statistics, the Kruskal-Wallis test to support the hypothesis. The results show that an individual's FIQ influences financial decision-making in essential areas of personal finance management and varies due to education but is not dependent on gender and age. Research limitations: The study focuses only on FI and its impact on the economic well-being of Lithuanian students; the study uses one-year data; data sets for different age groups were not the same size; and the data was not distributed in groups according to the normal distribution.

Keywords: financial intelligence, financial intelligence quotient (FIQ), financial literacy, financial well-being, financial behaviour, personal finance.

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Introduction

People devote much of their time to making money, budgeting it and spending it. However, some people need more money even when they work hard for a good salary. It follows that financial success is highly dependent on three key factors: financial literacy, financial behaviour and financial intelligence. Financial literacy and financial behaviour have become increasingly popular topics and now rank among the top priorities in education. This conclusion is proved by the wide variety of researchers investigating the subjects (for example, Khan et al., 2017; Kamil et al., 2014; Lusardi, 2008; Lusardi & Mitchell, 2007; Hilgert et al., 2003; Hogarth & Hilgert, 2002; Bernheim et al., 1997; and etc.). The level of financial literacy varies according to age, gender, education and other factors. Investigations confirm that people with higher levels of financial literacy are more likely to adopt recommended financial practices and vice versa (Kamil et al., 2014; Hogarth & Hilgert, 2002). Çera et al. (2021b) found that financial behaviour improves as financial inclusion improves, along with financial attitude and knowledge.

Financial literacy is one element of financial intelligence and affects a person's financial behaviour (Khan et al., 2017). Financial literacy (knowledge) assessment is an emerging field of research attracting more and more attention recently. However, as Kamil et al. (2014) stated, there needs to be more literature surrounding financial intelligence and its impact on financial behaviour. Financial intelligence and the availability of relevant financial knowledge can help individuals to analyse their financial situations and protect themselves from financial problems.

"Financial intelligence" is often used in organisations and refers to the knowledge and skills necessary to understand the financial and accounting principles applied in business (Berman et al., 2006). In the business world, financial intelligence means having the competence and knowledge of best practices necessary to achieve specific goals (Scott & McGoldrick, 2018). Financial intelligence can allow a given individual or household to manage their finances properly, plan, maximise the value of their time and, most importantly, reap economic benefits (Saxena & Kadam, 2020). Managing personal finance in all periods of life involves addressing three questions: how much to spend, how to manage investments and how much to borrow. Halimatussakdiyah and Sudarma (2019) have noted that one type of intelligence now necessary for modern people is financial intelligence (which here refers to the ability to manage personal financial assets rather than an understanding of the totality of available financial information and practices). Financial intelligence highly depends on financial literacy and personal finance management skills (Saxena & Kadam, 2020). Mohd et al. (2016) define financial intelligence as the ability of an individual to improve their financial knowledge, which results in an improved ability to manage money, enact best practices in personal finance and thus achieve a better financial situation.

The proposed financial intelligence quotient (FIQ) in this study is a new concept based on a person's behaviour in making money, budgeting, allocating properly and saving money. It helps to reduce the gap in the literature on financial intelligence. The methodology is based on four critical areas of personal finance relevant to financial in-

telligence: 1) earnings and expenses; 2) asset planning (savings, investment, retirement planning and career); 3) financial liabilities; and 4) risk and protection, including a set of guidelines for personal financial behaviour. The developed methodology is unique as it integrates financial intelligence, financial literacy and behaviour. The resultant methodology was applied in an empirical investigation of Lithuanian students' FIQs. Individuals in this age group face critical financial decisions that will significantly affect lasting impacts on their long-term financial well-being. The methods used included a questionnaire, Cronbach's Alpha coefficient, standardised residuals, Cook's distance, the Kolmogorov-Smirnov test, the Kruskal-Walli's test, the Mann-Whitney-Wilcoxon test and the Spearman correlation coefficient.

This study is essential for several reasons and contributes to the existing literature on financial literacy and intelligence in the following ways. First, development of a Financial Intelligence Quotient (FIQ) measurement conceptual model. This model encompasses four critical areas of personal finance: earnings and expenses, asset planning, financial liabilities, and risk and protection. Developing such a comprehensive framework is significant because it provides a holistic understanding of an individual's financial intelligence, going beyond traditional measures of financial literacy. Second, benchmarking financial intelligence. By establishing guidelines within these four developed areas as benchmarks for financial intelligence, the study contributes to the practical application of financial education and assessment. The latter is essential as it offers a clear roadmap for individuals to assess and improve their financial decision-making abilities. Third, identification of influential factors of a Financial Intelligence Quotient (FIQ). The study investigates the impact of education on an individual's financial intelligence quotient and finds that it is a significant factor influencing financial decision-making. This insight is valuable for educators, policymakers, and financial institutions as it underscores the importance of financial education in improving financial outcomes. Fourth, gender and age independence. The study's findings reveal that the financial intelligence quotient is not dependent on gender or age. The latter counters previous assumptions or stereotypes about gender and age-related differences in financial decision-making abilities. The finding challenges existing beliefs and emphasizes the importance of assessing financial intelligence individually rather than relying on demographic factors. In summary, this study significantly contributes to the literature on financial intelligence and behaviour by introducing a novel conceptual model, providing empirical evidence on the factors influencing financial decision-making, and challenging stereotypes related to gender and age. It also highlights the importance of financial education and assessment in promoting better financial outcomes.

The structure of this article is as follows. The first section presents an analysis of the scientific literature. The following section identifies gaps in the literature on financial intelligence and presents a unique methodology for determining FIQs (i.e., the internal consistency of the questionnaire's scale is checked). Moreover, the four hypotheses raised are tested. The research results are discussed, conclusions are presented, and areas for future research are identified in the article's final section.

1. The rationale for financial intelligence and financial intelligence quotient

Financial intelligence is a vital area of economic science and research. It significantly affects financial management, science and technology in the long run and is the primary driving influence on the future of finance. In other words, intelligence is a set of motor and emotional-social skills that help people to negotiate, share information and financial knowledge, model risks and promote economic development (Zhaoyi & Xinyu, 2017).

According to Kamil et al. (2014), *financial intelligence* is the knowledge necessary to understand fundamental economic concepts and their real-world applications, allowing people to make reasonable and responsible personal financial decisions that support their financial well-being. Hafer (2016) stated that policies that increase human intelligence, such as improving early childhood education or healthcare, could increase demand for complex financial tools and markets. Financial intelligence is an essential element of economic activity that enables individuals to manage their finances properly and, in turn, develop the country's economy if entities and individuals use their finances for the common good (Salahodjaev, 2015). He found that individuals with higher levels of intelligence are likely to save more relative to others. Data from macro-level studies suggest that countries with above-average IQs also have higher levels of savings; more developed financial markets lead to higher savings on average. Kodila-Tedika and Asongu (2015) have presented similar results. They argued that people in countries with lower average IQs are more likely to have physical assets than financial ones, which limits their economic development. Muhamad et al. (2021) concluded that financial self-efficacy is one of the critical factors that explain individual saving decision behaviour, as well as – risk preference, gender and area (rural or urban) determining the saving decision behaviour. Thus, governments must address the policies to improve financial achievement, mainly through financial education programs and personal finance.

Remund (2010) stated that financial intelligence includes understanding critical financial concepts to a certain degree and confidently managing one's finances in the short term and long term as is appropriate for one's time of life and changing economic conditions. Financial intelligence is critical to explaining the relationship between one's level of financial knowledge and one's perceptions of financial management. The financial intelligence ratio allows researchers to assess a person's ability to acquire and absorb financial knowledge to create financial well-being.

Činauskaitė-Cetiner (2011) noted that emotional intelligence is one of the internal preconditions influencing the financial well-being level in Lithuanian households. The research of Fauziyah and Ruhayati (2016) showed that financial literacy is not enough to allow individuals to make sound financial decisions when managing their finances. Making financial decisions also requires emotional intelligence, which can shape financial behaviour regarding consumption and saving habits. Financial literacy is not just about knowledge and information; it also involves a person's ability to utilize data and resources. Fauziyah and Ruhayati (2016) and Novak and Pahor (2017) noted that knowledge, attitudes and personality traits are all critical factors in achieving and maintaining economic well-being.

Well-being is closely related to a feeling of sense, relations, finance, community, and physical conditions and is studied in two ways: subjective and objective (Mjeda et al., 2021;

Wosczyk, 2020). Subjective well-being asks people about their thinking and feelings about their well-being and includes life satisfaction, positive emotions, and their lives. Objective well-being is based on basic human needs and rights (food, physical health, education, safety). Objective well-being can be measured through self-reporting, so the questionnaire was used to analyse well-being and financial intelligence.

Mikušová et al. (2023) propose to analyse the following kinds of well-being: career well-being, social well-being, financial well-being, physical well-being, and community well-being. The main object analysed in this article is financial well-being, which is closely related to financial intelligence. Financial well-being includes the management of the economic situation, financial stability, financial intelligence, and sufficient money to ensure everyday habits. It is necessary to mention that the main aspects of financial well-being are financial literacy, socialisation, attitude, confidence and financial behaviour and their positive effect on the growth of financial intelligence (Wosczyk, 2020).

Omoregie (2019) stressed that financial intelligence quotients (FIQs) could be used to measure financial intelligence and emphasized that there is no single objective method for calculating this. The scientific literature generally needs to reach a consensus on financial literacy and ways to measure financial intelligence (Remund, 2010; Social and Enterprise Development Innovations [SEDI], 2004, 2005). Thus, researchers are searching for a metric that covers a wide range of questions and accurately reflects an individual's level of financial literacy or financial IQ (Office of Fair Trading [OFT], 2007). Mohd et al. (2016) identified components of FIQ, including financial knowledge, attitude, confidence and behaviour. Kamil et al. (2014) noted that financial intelligence quotients are not like global IQ as assessed with a standard IQ test and state that a financial intelligence quotient measures an individual's knowledge of critical financial concepts and skills, which inform financial behaviour. The authors note that financial intelligence quotients can be used to assess a person's familiarity with fundamental financial concepts and their suitability for making reasonable and responsible personal economic choices.

Suryanto et al. (2018) divided financial intelligence into five essential areas: earning money, saving money, planning budgets, using money and using financial information (knowledge). A financial intelligence quotient can be calculated by considering all five areas to reveal whether a person handles the money they have available adequately. In assessing financial intelligence quotients, some authors, such as Kamil et al. (2014), distinguished various areas of personal financial management, such as cash flow and budget management, credit management, savings and frameworks for investment practice. However, this schema eliminates high financial techniques such as investing, trading on stock markets and manipulating other financial markets products. The authors made this choice to identify a different type of financial intelligence. The aim was to maximize returns by controlling all risks, which would be more suitable for professional investors and fund managers.

Thus, financial intelligence quotients have a new, rapidly expanding scope, involving several essential factors that influence the development of individuals' intelligence and their ability to use it to manage their finances (Suryanto et al., 2018; Wang & Hu, 2018). Kumar et al. (2023) in their studies identified determinants, including skills, digital financial literacy, financial acumen, and analytical skills, which collectively enhance an individual's financial

decision-making, reduce impulsivity, improve financial capability, and ultimately enhance perceived well-being. Niţoi et al. (2022) proposed one index for measuring financial well-being and three difficulty-ranked financial literacy indices. The indices are modified to align with established measurement methods, enabling comparisons between different countries, and the dataset bridges the gap between research on factors influencing financial well-being, socio-economic attributes, and behavioural traits with the assessment of financial knowledge and skills. Barrafrem et al. (2021). They have examined what leads to individuals experiencing subjective financial well-being and overall well-being amid the ongoing COVID-19 pandemic. Financial IQs can describe a person's ability to earn money, spend it wisely, make a personal budget, evaluate their available capital, save money and, if necessary, borrow on the most favourable terms. The collection and use of appropriate (accurate, reliable and relevant) financial information and knowledge are essential for the sound management of one's finances. These factors explain how gathering and organising data and improving people's financial planning skills can help them plan their finances properly. Financial IQ correlates economic benefits with specific skills and encourages individuals to manage their money correctly, as only the right combination of financial development measures can positively affect financial management (Salahodjaev, 2015). Financial management can allow individuals to achieve maximum benefits with available funds.

To summarise, financial intelligence and its measurement are becoming increasingly relevant topics. Financial intelligence refers to financial knowledge and the ability to use this knowledge to manage personal finances, make financial decisions and enact best practices in personal finance.

2. Financial intelligence quotient measurement conceptual model

Analysing various authors' definitions of financial intelligence and the peculiarities of measuring financial intelligence quotients (FIQs) allowed us to develop a method of measuring financial intelligence quotients. A conceptual model for FIQ determination is presented in Figure 1.

First, we identified four key areas of personal finance that are relevant to financial intelligence: 1) earnings and expenses (Suryanto et al. 2018); 2) asset planning (saving, investment, retirement planning, career planning) (Kodila-Tedika & Asongu, 2015; Suryanto et al., 2018; Halimatussakdiyah & Sudarma, 2019); 3) financial liabilities (Kamil et al., 2014, Mjeda et al., 2021); and 4) risk and protection (Kamil et al., 2014; Wosczyk, 2020; Mikušová et al., 2023). Guidelines for the proper handling of personal finances in these four areas were developed to serve as benchmarks of financial intelligence (Table 1). Twenty guidelines cover the essential aspects of a person's behaviour with money, which, together with the use of available information, can ensure an individual's sustainable financial development. FIQ can thus be measured based on financial behaviour.

A special questionnaire was developed to determine how well a person's financial decisions comply with these financial behaviour guidelines to test an individual's financial intelligence. The questionnaire consists of 20 questions. In each question, it is possible to assess the extent to which the financial decision made by the individual complies with the relevant guideline.
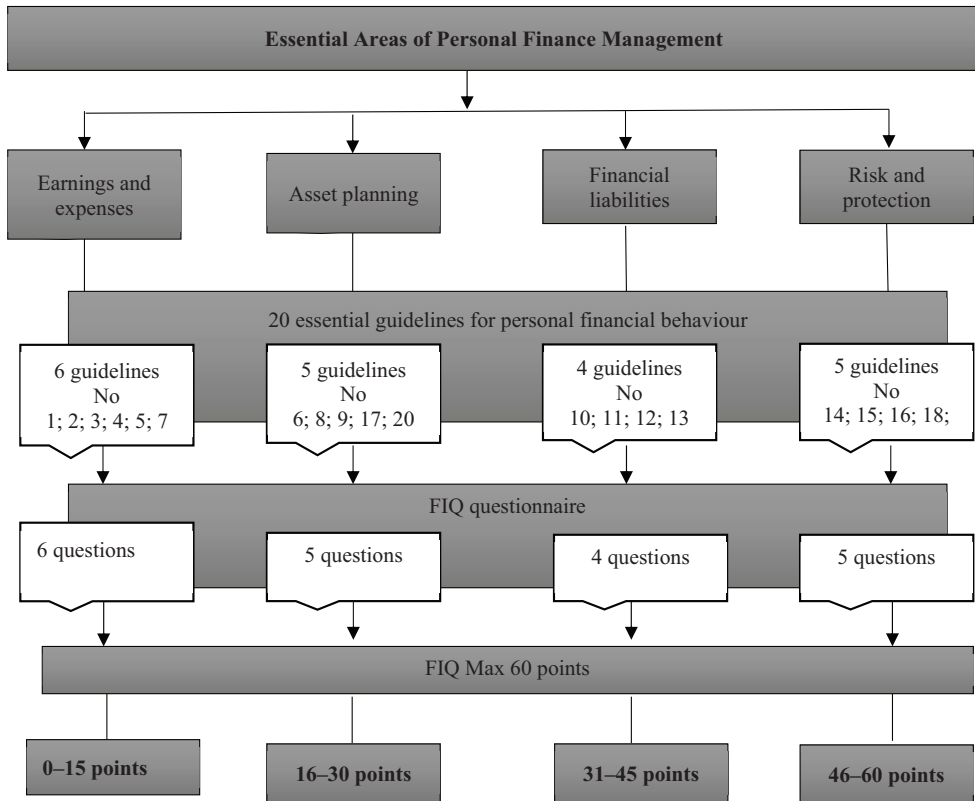
Figure 1. Conceptual FIQ model (created by authors based on a literature review)

Table 1. Guidelines for personal financial behaviour

1. Expenses must not exceed income during a given period.
2. Pay yourself first (upon receipt of income, set some aside for savings, then plan your expenses).
3. Monitor spending.
4. Constantly track your household budget, both income and expenses. At the end of each month, identify the revenue received monthly and the costs or expenses.
5. Plan your primary income and expenses for three to six months.
6. Set savings goals; develop savings priorities and stick to them (buy only things that have been budgeted for).
7. Have contingency savings and cover three to six months' expenses.
8. Save at least 10% of your income; if your revenue increases significantly, try not to increase expenses as fast but increase savings.
9. Retirement planning must be a priority. As soon as you start working, start accumulating your pension in private pension funds, even in small amounts.
10. If you plan to take out a loan, investigate at least three different offers and pay attention to the interest rate structure, interest rate margin, administration, contract and other fees and repayment method.

11. Borrow for consumption only if it is possible to earn a more significant sum using the borrowed money compared to the credit service costs.
12. If you have more than one loan and have managed to earn extra money, you must repay the most "expensive" loan (the one for which you pay the highest interest rate).
13. If you are considering a mortgage loan, keep the following in mind. Remember that when buying a home, you undertake to pay a monthly instalment on the loan and interest for the long period. Interest is usually variable. The interest variable share (which can be 2–7%) depends on the price of money in the market, which can increase significantly and increase the credit payment; in addition, homeowners need to insure their properties, and the property tax may apply, which further increases monthly liabilities. Borrowers need to 1) have good credit history; 2) have sufficient monthly income to cover not only mortgage loan instalments and interest payments but also other liabilities, utilities and subsistence; 3) have money for the initial contribution; 4) have money to cover the contract costs (notary fee, property valuation fee, registration of a mortgage, property insurance, and bank loan agreement fee). The longer the credit maturity, the higher the cost of the home (monthly interest payments increase the final price). It is a monthly financial commitment, depending on the term of the loan, up to 40 years. It is essential to buy a property that you can afford (i.e., you can cover your financial obligations), not to impress others.
14. You always need to research the market and consider three to five offers for any financial product (insurance, loan, credit card, etc.).
15. Non-life insurance (e.g., car, home, etc.) is not an investment; it is protection against unlimited financial losses in the event of a disaster.
16. Review your insurance package annually, compare its costs with those offered by other insurance companies and ensure that you are not insuring the same object multiple times.
17. Money must work. Choose an investment offering financial returns that cover inflation. Invest in assets that can increase revenue, not ones that will incur additional costs.
18. Higher returns on investment usually also mean higher levels of risk.
19. Do not put all your eggs in one basket. Financial investments must be diversified (choose different investment instruments with various risks and returns).
20. If you do what you love, you'll never need to work. Several aspects should be considered when planning a career: – education, competencies, abilities, and salary in the context of the market; – lifelong learning is essential, so do not be afraid to change in response to labour market trends and evolving desires; – set specific career goals, including when and how to achieve them, which will increase personal income.

Each question has four possible answers. The four answer options correspond to scores of zero, one, two or three points. Three points are awarded for the answer that best meets the specified guideline, while zero are given for the answer that the least corresponds to the guideline. Answers that partially comply with the guideline are assigned one or two points, with a higher score for closer compliance. The maximum possible financial IQ score is 60 points. An individual's score corresponds to one of the following four evaluations:

   – FIQ = 0–15 points: financial decisions the individual makes comply with only 25% or less of the guidelines. Individuals need to fundamentally overhaul their financial decision-making to achieve a higher FIQ and, thus, personal financial well-being.

- FIQ = 16–30 points: financial decisions the individual makes comply with up to 50% of the guidelines. Individuals need to reconsider their financial decisions to achieve a higher FIQ and, thus, personal financial well-being.
- FIQ = 31–45 points: financial decisions the individual makes comply with up to 75% of the guidelines. The individual's financial decisions are adequate, though some need to be reviewed to achieve a higher FIQ and, thus, personal financial well-being.
- FIQ = 46–60 points: financial decisions the individual makes comply with up to 100% of the guidelines. Their financial decisions are appropriate to achieve financial well-being.

Thus, identifying an individual's FIQ allows self-assess of the gaps in financial decision-making and the areas that must be improved to achieve a higher FIQ and better money management.

3. Research methodology

An empirical study of Lithuanian students' FIQs was performed using the proposed FIQ measurement methodology. Various studies have shown that young people have a relatively low level of financial literacy and financial intelligence, while this age group is just beginning to make important financial decisions. Students were chosen for the study because young people are the most promising target market identified by financial services companies. At the same time, they can be considered a particularly vulnerable group as their financial situation is usually not very stable. Young adults are likely to be at above-average financial risk due to increasing life expectancy, reduced well-being and occupational benefits and uncertain economic and employment prospects. In addition, students aged 18–25 may also face immediate financial decisions. It is essential to remember that today's students are future or even current financial market participants, taxpayers, depositors and borrowers. The development of modern society has assigned young people increasing amounts of responsibility and authority in making financial decisions, and students' decisions as financial services users are becoming increasingly complex. Many young people have to start living independently and making their own financial decisions when they begin their undergraduate studies. The increased responsibilities of young people require them to know early on to make informed financial decisions. Their decisions at a young age can have an outsized, lasting impact on their long-term financial well-being.

Drawing from the Conceptual FIQ Model (Figure 1) and established theoretical groundwork from previous research, four hypotheses are formulated:

Hypothesis H1: The higher a student's FIQ, the better they make financial decisions in Essential Areas of Personal Finance Management:

a) track and manage income and expenses;
b) plan their finances;
c) the more responsibly assumes financial liabilities;
d) the more adequately assesses the risk-benefit ratio.

Hypothesis H2: Females have a higher FIQ than males.

Hypothesis H3: The younger the student, the lower the FIQ.

Hypothesis H4: Economics, finance, and business students have higher FIQs than students in other fields.

Thus, students studying at Lithuanian universities were selected for this study, which was conducted using the following methods:

- Regarding the reliability and representativeness of the study sample, according to the Lithuanian Department of Statistics, 73,000 students studied undergraduate, master's and integrated studies at universities in Lithuania in 2021. A possible 5% error was selected for the study. According to the formula for calculating representative sample sizes, to ensure the sample's representativeness, it was necessary to interview at least 382 students randomly; 440 students ultimately participated in the survey. Five questions were added to identify the main socio-demographic characteristics of the respondents (gender, age, level of study, field of study) in addition to the questions about the four main areas of personal finance.
- The Cronbach's alpha coefficient was used to determine the internal consistency of the scales used in the questionnaire.
- The standardised residue method and Cook's measure were used to identify outliers.
- The Spearman correlation coefficient was used to determine the linear dependence of Hypothesis H1 (all four aspects) between the variables. A linear regression model was developed to substantiate the hypothesis (model summary; coefficients; scatterplot).
- The Mann-Whitney-Wilcoxon rank-sum criterion was used to substantiate Hypothesis H2 and Hypothesis H4. The Kolmogorov-Smirnov test was used to determine the data distribution according to the normal distribution.
- Descriptive statistics were used for the analysis of Hypothesis H3. A nonparametric analogue of ANOVA, the Kruskal-Wallis test, was used to support the hypothesis.

4. Results

Before examining the hypotheses raised, it is necessary to ensure the questionnaire's reliability and its measurements' accuracy. It was determined that Cronbach's alpha coefficient values should not be less than 0.7. The FIQ assessment questionnaire consists of 20 questions. A Cronbach's Alpha coefficient value greater than 0.7, e.g., 0.711 (see Table 2), indicates that the questionnaire for FIQ measurement is well designed.

Table 2. Reliability and validity of the FIQ questionnaire's scale

Cronbach's Alpha	Cronbach's Alpha Based on Standardised Items	N of Items
0.711	0.726	20

The value of Cronbach's alpha based on standardised items, 0.726, remains close to the value of Cronbach's alpha coefficient, so the distributions of the answers to the individual questions are similar. The total amount of the distributions of the particular questions is 0.726, which is close to the full-scale distribution of 0.711 and indicates that the individual questions do not correlate with each other and do not reflect the same subject matter.

A check was conducted to identify outliers, i.e., values not consistent with the total mass of data. The outlier is determined based on the standardised residual, which is obtained by

subtracting the arithmetic mean of the sample of residuals from residual e_i and dividing the result by the standard deviation. The mean of the standardised residual is zero, and the standard deviation is one. We consider a data point an outlier if the absolute magnitude of the standardised residual exceeds three standard deviations. The outliers table contains five outliers (Table 3); these are respondents whose data are presented in rows 1, 2, 3, 170 and 298 of the data matrices.

Table 3. Outliers determined from the standardised residual

Casewise Diagnostics[a]				
Case Number	Std. Residual	FIQ	Predicted Value	Residual
1	−3.215	29	48.910	−19.912
2	−3.377	28	48.910	−20.912
3	−3.699	26	48.910	−22.912
170	−3.861	25	48.910	−23.912
298	−3.054	30	48.910	−18.912

Note: a. Dependent Variable: FIQ

A measure of Cook's influence was also calculated (CookDi, Cook's distance), showing the change in prognosis when the ith observation is removed. If $CooksDi > 4/n$, the ith observation is considered an outlier, $i = 1, ..., n$, where n is the sample size ($n = 445$ for our example). The measure of the Cook's influence (CooksD) threshold value $4/n = 4/445 = 0.008988763$. We found five outliers in the sample (visible in the database) because they exceed the limit value 0.008988763. Therefore, we removed these five values from the study to test the hypotheses raised.

Hypothesis H1 a: The higher a person's FIQ, the better they plan their finances.

The Spearman correlation coefficient is 0.746, indicating that the relationship between FIQ and the income/expense variables is strong (Table 4). Since 'Sig. (2-tailed)' $p = 0.000 < 0.01$, this indicates that the calculation of the Spearman correlation coefficient is reasonable (with 99% statistical reliability).

Table 4. Determination of FIQ and income/expense correlation significance

Correlations				FIQ	Income/Expenses
Spearman's rho	FIQ		Correlation Coefficient	1.000	0.746[**]
			Sig. (2-tailed)	.	0.000
			N	440	0.440
	Income / Expenses		Correlation Coefficient	0.746[**]	1.000
			Sig. (2-tailed)	0.000	.
			N	440	440

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

We constructed a linear regression model (Table 5).

Table 5. Determining the appropriateness of the FIQ and income/expense linear regression analysis model

Model Summary[a,b]					
Model	R	R Squared	Adjusted R Squared	Std. Error of the Estimate	Durbin-Watson
1	0.758[a]	0.574	0.573	1.771	2.043

Notes: a. Predictors: (Constant), FIQ; b. Dependent Variable: Income and expense.

In the linear regression model (Table 5), $R^2 = 0.574 > 0.25$; this suggests that the model fits the data and describes the data well. The variable FIQ can explain 57% of the behaviour related to *monitoring and managing one's finances*. The Durbin-Watson statistic is 2.043 < 2.5, which shows no autocorrelation.

Table 6. Determination of linear regression equation coefficients for the relationship between FIQ and income/expense tracking

Model		Unstandardized Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	−4.122	0.726		−5.674	0.000
	FIQ	0.357	0.015	0.758	24.287	0.000

In the coefficients column (Table 6), Sig. p = 0.00 < 0.05, which suggests that the coefficients *a* and *b* are statistically significant to differ from zero. The fact that *b* differs statistically significantly from zero predicts the student's tendency to monitor and manage their income and expense more than average. A variable FIQ is essential in the regression model.

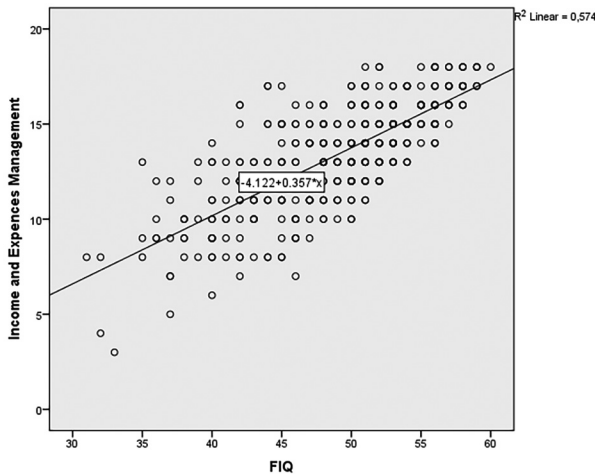In Figure 2 and Column B of Table 6, we see that the regression equation is Y = −4.122 + 0.357X.

Figure 2. FIQ and income/expense relationship scatterplot with regression line

Consequently, when X – FIQ changes by one unit, Y, the tendency to monitor your income and expenses changes by 0.357. *The hypothesis that the higher a person's FIQ, the more likely they are to track and manage their income and expenses has been confirmed.*

The remaining three parts of the first hypothesis are tested analogously. The following results were obtained:

Hypothesis H1 b: The higher a person's FIQ, the better they plan their finances.

We used the Spearman correlation coefficient to determine the linear dependence of the interval variables. Spearman's correlation coefficient is 0.769, indicating the strong relationship between the variable FIQ and proficient planning of expenses. As Sig. (2-tailed) p = 0.000 < 0.01, this suggests that the calculation of the Spearman correlation coefficient is reasonable (with 99% statistical reliability). The linear regression model $R^2 = 0.584 > 0.25$ indicates that the model fits the data and describes the data well; the variable *FIQ can explain* 58% of specific financial planning behaviour. The Durbin-Watson statistic, 1.958 < 2.5, shows no autocorrelation. Sig. p = 0.00 < 0.05 suggests that the coefficients *a* and *b* differ statistically significantly from zero. Because *b* differs statistically significantly from zero, this predicts the student›s propensity to plan their assets. A variable FIQ is essential in the regression model. The regression equation is Y = –2.373 + 0.281X. Consequently, when X – FIQ changes by one unit, Y (the tendency to better plan one's finances thoroughly) changes by 0.28. *The hypothesis that the higher a person's FIQ, the more likely they are to plan their finances entirely has been confirmed.*

Hypothesis H1 c: The higher a person's FIQ, the more responsibly they assume financial liabilities.

Applying the Spearmen correlation coefficient to determine the linear dependence of the interval variables, we obtained a value of 0.564, which indicates that the relationship between the variables FIQ and responsibly assuming financial liabilities is strong. As Sig. (2-tailed) p = 0.000 < 0.01, this shows that the calculation of the Spearman correlation coefficient is reasonable (with 99% statistical reliability). The linear regression model $R^2 = 0.327 > 0.25$ suggests that the model fits the data and describes the data well. The variable *FIQ can explain* 33% of behaviour relating to *responsibly assuming financial liabilities.* The Durbin-Watson statistic, 1.767 < 2.5, shows no autocorrelation. Sig. p = 0.00 < 0.05 suggests that the coefficients *a* and *b* differ statistically significantly from zero. Because *b* differs from zero statistically significantly, this predicts the student's propensity to assume financial liabilities responsibly. Variable FIQ is essential in the regression model. The regression equation is Y = 3.270 + 0.153X. Consequently, when X – FIQ changes by one unit, Y (the tendency to responsibly assume financial liabilities) changes by 0.153. *The hypothesis that the higher a person's FIQ, the more responsibly they take financial liabilities has been confirmed.*

Hypothesis H1 d: The higher a person's FIQ, the more adequately they assess the risk-benefit ratio.

Applying the Spearmen correlation coefficient to determine the linear dependence of the interval variables, we obtained a value of 0.623, which indicates that the relationship between FIQ and the responsible assumption of financial liabilities is strong. As Sig. (2-tailed)

p = 0.000 < 0.01, this suggests that the calculation of the Spearman correlation coefficient is reasonable (with 99% statistical reliability). The linear regression model $R^2 = 0.412 >$ 0.25; this suggests that the model fits the data and describes the data well and that 41 % of behaviour related to *adequately assessing the risk-benefit ratio* can be explained by the variable *FIQ*. The Durbin-Watson statistic is 1.844 < 2.5 and shows no autocorrelation. Sig. p = 0.00 < 0.05, suggesting that the coefficients *a* and *b* differ statistically significantly from zero. Because *b* differs statistically significantly from zero, this predicts the student's propensity to assess the risk-benefit ratio adequately. Variable FIQ is necessary for the regression model. The regression equation is Y = 3.225 + 0.209X. Consequently, when X – FIQ changes by one unit, Y (the propensity to adequately assess the risk-benefit ratio) changes by 0.209. The question that the higher a person's FIQ, the more adequately they consider the risk-benefit balance has been confirmed.

Hypothesis H2: Females have a higher FIQ than males.

Analysing this hypothesis, we found that the mean FIQ for women was 47.43 while the mean for men was 50.22. To test the hypothesis that women have higher FIQs than men, we used the Mann-Whitney-Wilcoxon nonparametric criterion because the Kolmogorov-Smirnov Test found that $p = 0.000 < \alpha = 0.05$ in different groups of students. It was concluded that the data were not distributed according to the normal distribution and the conditions of the dependent variable normality and equality in the groups were not satisfied.

Table 7. Mann–Whitney–Wilcoxon rank sum criterion to determine differences in FIQ in gender distribution

Ranks				
	Gender	N	Mean Rank	Sum of Ranks
FIQ	Female	204	227.650	46440.000
	Male	236	214.320	50580.000
	Total	440		
Test Statistics[a]				
	FIQ			
Mann-Whitney U	22614.000			
Wilcoxon W	50580.000			
Z	−1.098			
Asymp. Sig. (2-tailed)	0.272			

Note: a. Grouping Variable: Gender

Test statistics in the row labelled 'Asymp. Sig.' show $p = 0.272 < 0.05$ (Table 7); therefore, we concluded that there were no statistically significant differences in average FIQs between women and men. Based on the ranks presented in the mean rank column of Table 7, we can conclude that women's mean FIQ is higher than men's, but this conclusion is not justified and requires further research. The hypothesis that women have higher FIQs than men was not confirmed.

Hypothesis H3: The younger the student, the lower the FIQ.

Figure 3 revealed that 18–25-year-old students' median FIQ was 50, close to the mean of 49.03. All FIQ scores ranged from 32 to 60 points. Fifty per cent of all respondents in the 18–25-year-old age group received FIQ scores between 45 and 53. The median FIQ for 26–35-year-olds was 50.50, close to the average of 49.94 points. All values for 26–35-year-olds ranged from 35 to 57 points. Half of all respondents received FIQ scores between 46.75 and 54.25. The median FIQ for those over 35 was 47, the furthest of all groups from the mean of 45.64. All values for those 35 or older ranges from 31 to 57 points. Fifty per cent of all FIQ scores for those over the age of 35 were between 40 and 50. There were also two conditional outliers in the first group and one in the second group, marked with a circle. There are no outliers; they would be marked with a star (Figure 3).
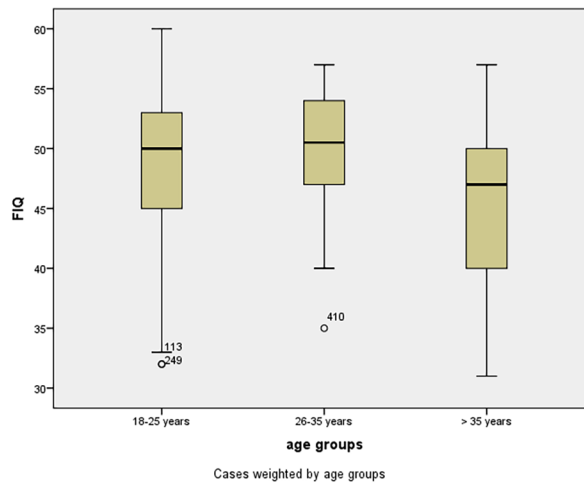

Figure 3. FIQ descriptive statistics for different age groups

Since we did not find significant differences in the descriptive statistics of the three age groups (Figure 3), we employed the Kolmogorov-Smirnov test for different age groups to select an appropriate method for analysing the dependence of FIQ on age groups. It was found that $p = 0.000 < α = 0.05$; therefore, it was concluded that the data were not distributed according to the normal distribution. To ascertain a significant difference between the FIQ distributions of different age groups, we chose the ANOVA nonparametric analogue, the Kruskal-Wallis test, to analyse data outside the standard distribution and the other age groups not of a similar size.

Table 8. Kruskal-Wallis test to determine differences FIQ among three age groups

Ranks	Age group	N	Mean Rank
FIQ	18–25 years	394	219.880
	26–35 years	34	240.870
	>35	11	159.950
	Total	439	

Test Statistics[a,b]			
	FIQ		
Chi-Squared	3.395		
Df	2		
Asymp. Sig.	0.183		

Notes: a. Kruskal-Wallis Test; b. Grouping Variable: age group.

The test statistics in the row labelled 'Asymp. Sig. ' show p = 0.183 > 0.05 (Table 8). Therefore, we concluded that there are no statistically significant differences in mean FIQs between different age groups. The hypothesis that the younger a student is, the lower their FIQ will be was not confirmed.

Hypothesis H4: Economics, finance, and business students have higher FIQs than students in other fields.

Analysing the fourth hypothesis, we found that the average FIQs of students in economics and finance was 50.32; the average for students in other fields was 48.51. We tested this hypothesis using the Mann-Whitney-Wilcoxon nonparametric criterion because, after trying the Kolmogorov-Smirnov Test, the value obtained was $p = 0.000 < α = 0.05$ among different groups of students. It was concluded that the data were not distributed according to the normal distribution, and the conditions of the dependent variable's normality and equality in the groups were not satisfied.

Table 9. Mann-Whitney-Wilcoxon rank sum criterion to determine differences of FIQ in the distribution of study programmes

Ranks				
	Study programme No	N	Mean Rank	Sum of Ranks
FIQ	Economics, finance and business	124	253.270	31405.000
	Other fields	314	206.170	64736.000
	Total	438		
Test Statistics				
	FIQ			
Mann–Whitney U	15281.000			
Wilcoxon W	64736.000			
Z	−3.514			
Asymp. Sig. (2-tailed)	0.000			

Test statistics in the row labelled 'Asymp. Sig. ' reveal that $p = 0.000 < 0.05$ (Table 9). Therefore, we concluded that there were statistically significant differences between *Economics, finance, and business* and other students. Based on the mean rank presented in Table 9,

the FIQs of students studying economics, finance and business are statistically significant (with 95% statistical reliability) and higher than those of students studying other fields. *The hypothesis that Economics, finance, and business students' have higher FIQs than students in other fields has been confirmed.*

To summarise, this study found that:

H1 a: The hypothesis that the higher a person's FIQ, the more likely they would be to track and manage their income and expenses was confirmed. Therefore, it can be stated that FIQ can explain 57% of behaviour related to tracking and managing finances.

H1 b: The hypothesis that the higher a person's FIQ, the better they would plan their finances was confirmed. Therefore, it can be said that FIQ can explain 58% of behaviour related to planning one's financial future.

H1 c: The hypothesis that the higher a person's FIQ, the more responsibly they would assume financial liabilities was confirmed. Therefore, we can say that FIQ can explain 33% of behaviour related to responsibly assuming financial liabilities.

H1 d: The hypothesis that the higher a person's FIQ, the more adequately they would assess the risk-benefit ratio was confirmed. Therefore, we can say that FIQ can explain 41% of behaviour related to adequately assessing the risk-benefit ratio.

H2: The hypothesis that women would have higher FIQs than men was not confirmed. From the obtained ranks, can we say only that the women's mean FIQ was higher than men's but this was not justified and requires further research.

H3: The hypothesis that the younger the student, the lower their FIQ would be was not confirmed. From the obtained ranks, we can only say that the scores for the first age group (18–25 years) are lower than those of the second age group (26–35 years). However, in the third age group (>35 years), the average FIQ score was the lowest.

H4: The hypothesis that economics, finance and business students would have higher FIQs than students in other fields was confirmed.

5. Discussion

Financial literacy and financial education have attracted growing interest for many reasons, including the economic downturn, low personal savings rates, and excessive consumer confidence in credit. University is a significant transition period for young adults as they seek and gain financial independence (Gerrans, 2021). Saving money and accumulating wealth increases young people's entrepreneurial opportunities (Chowa & Ansong, 2010), facilitating their future plans (Scanlon & Adams, 2009). According to Artavanis and Karra (2020), students with lower levels of financial literacy are more vulnerable to adverse shocks to their payment-to-income ratios, which can impair their future creditworthiness and undermine their ability to service debt post-graduation. Similar results have been obtained in this study, in which the overarching hypothesis – that the higher a person's FIQ, the better they would plan their finances – has been confirmed.

Surveys of sample populations in the Netherlands (Bucher-Koenen et al., 2021) have revealed that men are better informed than women regarding concepts such as compound interest, inflation and risk diversification and that women also need more confidence in the

knowledge they do possess. Our study reveals similar findings, where the hypothesis that women have higher FIQs than men was not confirmed. The World Economic Forum's latest Global Gender Gap Report (Crotti et al., 2021) indicated that the COVID-19 pandemic had lengthened the projected timeline for reaching gender parity in politics, education, health and economics by a generation – from 99.5 years to 135.6 years.

In a 2019 study, Lithuanian Banking Association showed that 15% of people in Lithuania are financially literate, and only 1% are well-versed in finance (Blekaitis, 2019). Respondents aged 18 to 75 participated in the study on financial literacy. The research revealed that young people constituted the group whose results were most concerning. The youngest age group (18–25) received the worst financial literacy scores. The lack of financial literacy among young people who have graduated from secondary school and are launching independent lives was also found in the Youth Financial Literacy Survey conducted by SEB Bank in 2018 (SEB, 2018). Only 25% of the more than 2,000 young people (between 18 and 25) surveyed indicated that they always plan and control their monthly expenses. Comparing the results of that study with the empirical research of Lithuanian students' FIQs that we conducted, we can say that, from the ranks obtained, 18–25-year-olds received lower scores than the 26–35-year-old age group. However, the age group over 35 scored the lowest in FIQ. This confirms that financial education programs will be more effective when targeted at specific population groups.

Financial education for young people is the area where progress is needed most. Thus, financial literacy, as well as financial intelligence, remains one of the top priorities in the field of education. A financially literate person can make better and more appropriate financial decisions. Xue et al. (2020) found similar results: financial literacy significantly improves financial well-being. The relationship between financial literacy, retirement planning and financial well-being has been previously investigated by Adam et al. (2017). Their research revealed that the effect of family support and retirement planning on retirees' financial well-being is more substantial than financial literacy.

Other research has shown that an individual's financial well-being is strongly related to overall well-being when many faces financial problems. It leads to adverse welfare effects, both now and in the future (Brüggen et al., 2017; Xiao et al., 2022; Tsouli, 2022; Kočanová et al., 2023). Van Praag et al. (2003) confirmed that a healthy spending and savings balance is essential for sustaining long-term financial and personal well-being. Generating more knowledge in this area is important. Çera et al. (2021a) obtained similar results to our study. Their study found that increasing individuals' financial knowledge and behaviour and promoting their inclusion in financial services can improve financial capability. Furthermore, some studies report that government support moderates significantly among investment strategies, financial knowledge, and organizational profitability (Hernández-Mejía et al. 2021; Yang & Liu, 2022; Novoa-Hoyos et al., 2022; Gouider, 2022). These recent studies align with our research and assist policymakers and financial intermediaries in understanding the most influential factors on financial literacy, financial education and financial well-being. It highlights that financial education and extensive financial knowledge can enhance financial well-being and underscores the importance of developing financial intelligence as a means to improve one's financial well-being.

Conclusions

Analysis of the scientific literature revealed that personal financial management is increasingly relevant and being analysed by many scientists worldwide. Financial literacy and financial behaviour are also widely researched in the scientific literature. By contrast, financial intelligence is quite a new topic. Still, it is often used in organisations to refer to the knowledge and ability to understand the economic and accounting principles applied in business. To the best of the authors' knowledge, the concept of financial intelligence in personal finance has yet to be widely analysed. This constitutes a significant gap in the literature. The literature analysis showed that financial intelligence is perceived as sufficient knowledge to understand basic financial concepts. In addition, financial intelligence relates to applying such knowledge in daily life and making sound and responsible personal financial decisions, which can affect a person's economic well-being in both the long and short terms. In this respect, financial intelligence highly depends on a person's financial literacy and personal financial management skills. The financial intelligence quotient measures skills related to basic financial concepts and processes involved in prudent financial behaviour; it is a quantitative assessment of particular listed abilities.

The authors have developed a methodology for determining individuals' financial intelligence quotients. The list of guidelines for personal financial behaviour, as an expression of financial intelligence, was created around four critical areas of personal finance management: earnings and expenses; asset planning (saving, investment, retirement planning, and career); financial liabilities; and risk and protection. A questionnaire with 20 questions was developed to determine how individuals handle their finances. If all the answers indicate the individual fully complies with the established guidelines, that person can receive a maximum score of 60 points. FIQ depends on financial behaviour, which undoubtedly springs, at least in part, from financial literacy.

The methodology thus developed for determining FIQ was tested on Lithuanian university students. Four hypotheses were raised and verified using ANOVA nonparametric testing and correlation and linear regression analyses. The research yielded the following results. An individual's financial intelligence quotient is influenced by education but is not dependent on age or gender. However, students in economics, finance and business have higher financial intelligence quotients on average. The most important thing is that students with higher financial intelligence quotients better monitor, manage and plan their finances, more responsibly assume financial liabilities and more adequately assess risk and benefit ratios.

The study's results allow us to find the relationship between financial intelligence quotient and financial decisions in essential areas of personal finance management, age, gender, and education. However, it has limitations. This study focused only on financial intelligence and its impact on the financial well-being of Lithuanian students. Moreover, only one-year data and different age groups were not of equal size, and the data not being distributed in groups according to the normal distribution. Further empirical studies are needed to test the model on people of different ages, genders and levels of education. The implications of FIQ could be extended to help explain financial well-being and to analyse other aspects of financial intelligence in the future.

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