9th International Conference on Information Technology and Quantitative Management

Enablers to Financial Literacy: A DEMATEL Approach

Swati Sharma

Jindal Global Business School, OP Jindal Global University, Sonipat, India

Abstract

Financial literacy is seen as key instrument to ensure financial inclusion. Hence, financial literacy is one of the focus areas for governmental agencies. Financial literacy can be assessed with different measures and the present study investigates those measures of financial literacy and draw causal relation among those measures by employing DEMATEL method. The study also ranks the measures as per their importance in ensuring financial literacy. The findings of the study suggests that money management is the most important measure of assessing financial literacy whereas basic knowledge of finance affect other measure i.e., risk management, money management and saving and investment. Thus, ensuring the dissemination of basic knowledge of finance, financial literacy can be ensured. Study also comments on how to increase awareness of basic finance knowledge. This study finding has great application for researchers and institutional authorities.

Keywords: DEMATEL; Financial Literacy; Financial education; Measures; Policymaking.

1. Introduction

The awareness about financial products has been increased in recent year given high level of advertising through internet. People are now more concerned about their financial wellbeing than they were previously. Reserve Bank of India (RBI), central bank of country, has convened the Financial Literacy Week 2022 with theme of "Go Digital, Go Secure" to promote the financial literacy among citizens [1]. Various government and non-government agencies are in process to make people aware of financial knowledge to enable them to take informed financial decisions. Primarily, financial education is one of the focus areas for promoting economic development of a country. Financial literacy enables an individual to optimize the use of their limited financial resources [2].

The extant literature on financial literacy suggests that financial literacy not only help people in taking financial decisions, but their wellbeing is also associated with the level of financial literacy [3]. A number of studies has

* Swati Sharma. Tel.: +91 9795684488
E-mail address: swati@jgu.edu.in

explored the different criteria as measures to quantify the level of financial literacy among different populations. A thorough literature review on those measures is explained in section 2 of this study.

Though the measures of financial literacy have been investigated in literature to a great extent, but no study examines the contextual relationship of those measure. Hence, the present study attempts to examine the contextual relationship of those identified measures in literature. For this purpose, Decision making trial and evaluation laboratory (DEMATEL) is employed. This study contributes in following ways to current literature:

- Develops a cause-and-effect diagram to classify and rank each of the measures
- Advise strategies to regulatory institutions on how to increase the financial literacy of the populations.

The remainder of the paper is explained in six section excluding section 1 on Introduction. Section 2 discuss the extant literature and identifies the key measure of financial literacy followed by Section 3 on Research objectives. Section 4 explains the employed DEMATEL method as Research Methodology. Data analysis of the study is discussed in section 5. Section 6 describes the findings and implications of present study and Section 7 concludes the study with limitation, scope and applications of study results.

2. Literature Review

Financial literacy is knowledge of finance which enables one to take informed financial decision [4]. These informed financial decisions are used as measures of financial literacy in literature. These measures have been explored equally in developed, emerging and under-developed market. Another strand of literature has explored the relationship between financial literacy and financial behavior of individuals to signify the need of financial literacy [5]. The present study enlists the literature on financial literacy to identify such key measures.

Money basics, borrowing, investing and protecting resources are four measures which used as instruments to measure the financial literacy. A successful measure of financial literacy will improve a researcher's ability to distinguish when a deficiency in financial literacy may be responsible for welfare-reducing financial choices and will allow educators to identify education to achieve a desired outcome. [6]

Inflation knowledge, financial mathematics, financial knowledge, mathematics skills and cognitive reflection are listed as instruments to measure the financial literacy based on literature review by Rieger 2020 [7]. His studies has found that not necessarily all identified variable to measure financial literacy are reliable and weak level of correlation exists among them.

Nicolini & Haupt 2019 have examined relationship between financial literacy and financial behaviors by identifying trends in investment choices, retirement planning, emergency funds, and use of plastic money like cards etc. of individuals across different countries. This study uses different methods to measure financial literacy to explain the underlying variables relationship. The study concludes that additional measures of financial literacy are useful to explain the relationship between financial literacy and financial behaviors [8].

Folke et al. 2021 employs a new measure of financial literacy named ASSET (Assessment of Economic and Financial Literacy). They conclude that interest, investment, inflation, exchange are the relevant variables for measuring financial literacy. [9]

Kiliyanni and Sivaraman 2016 measures financial literacy of target populations with questions based on basic knowledge of finance like knowledge about ATM, saving and investment decisions of individuals, day to day money transaction knowledge, risk management insights and perception about financial knowledge about oneself and others. [10]

Sunderaraman et al. 2022 study on measures of financial literacy advocates numeracy being the most important variable of financial literacy. Their study employs Big Three scale questions to quantify financial literacy and employs Wechsler Adult Intelligence Scale-III, Math Computation subtest; Arithmetic subtest; the Wide Range Achievement Test-IV, and the Weller's Abbreviated Numeracy Scale (WANS) to assess the numerical ability of target individuals [11].

Kadoya and Khan, in their study of measuring financial literacy in Japan, uses depth of knowledge of finance domain, and individuals' attitude and behavior as financial literacy measure. Their analysis confirms positive relation among education, financial assets, and employed financial information, whereas negative correlation between financial crisis to financial knowledge and individuals' attitude, and behavior [12].

Based on the literature evidence, the study classifies measures being relevant to study the financial literacy in following categories:

2.1 Basic knowledge of finance

This category includes awareness about interest rate, inflation rate, tax knowledge, exchange rate, ATM usage etc. it's basics of finance to be known by any individual. Almost all studies have identified this category with same or different nomenclature as measure to financial literacy.

2.2 Saving and Investment decisions

Retirement planning, emergency funds and precautionary saving are part of this category. This category basically judges people if they can manage some funds for their future monetary needs or not. Insurance product is one of the most used financial products of this category. Anyhow it is observed that most of the insurance product are bought without being aware about its features.

2.3. Risk Management insights

The knowledge of capital market, money market and other financial market is assessed in this category. Speculative nature of individual is the basis of risk management insight. The literature includes this category as an essential measure to financial literacy.

2.4 Money Management

Day to day transaction dealing, use of smart money, basic mathematical calculation is part of money management category. This category is used as primary measure of assessing financial literacy given its inevitable usage. Either one has financial knowledge or not, one has to indulge in money management activities in order to survive. The advent of digital economy has also boosted the use of money management by common people.

Table 1 summarizes this categorization of measure of financial literacy by mentioning the literature on that category. These four categories are mentioned in literature in different ways therefore the present studies take all these four categories measure for further analysis.

Table 1 Category of Financial Literacy measures based on literature

Study/Category	Basic Knowledge of Finance	Saving And Investment Decisions	Risk Management Insights	Money management
Huston 2010	✓	✓	✓	✓
Rieger 2020	✓			✓
Nicolini & Haupt 2019	✓	✓	✓	✓
Folke et al. 2021	✓	✓	✓	✓
Kiliyanni and Sivaraman 2016	✓	✓	✓	✓
Sunderaraman et al. 2022	✓	✓		✓
Kadoya and Khan	✓	✓	✓	✓

3. Research Objectives

Based on reviewed literature the study finds that the linkage of identified measures of financial literacy is not investigated in literature and no study establishes cause and effect relationship among identified measure. Hence, these research gaps are developed as following research objective for the present study:

3.1 To identify and establish linkage between the measures to financial literacy
3.2 to establish cause-and-effect relationship among identified measure

4. Research Methodology

The study employs DEMATEL method of for establishing and identifying the relationship of different measures of financial literacy and surveys the experts on finance domain and uses their responses as input to DEMATEL method. Hence, this section explains the research methodology in two sub-sections on Data Collection & DEMATEL Method as following:

4.1 Data Collection

The study collects primary data in form of questionnaire response from finance area expert. Convenience sampling is used to select the expert for surveying. Response from six experts are obtained in form of rating each of identified measure of TABLE 1 as how these measure influence other measure. There are five rating i.e., very strong influence, strong influence, weak influence, very weak influence, and no influence. These ratings are further assigned numbers as 0 to 4, 4 for very strong influence and 0 for no influence at all. Further to develop single rating for constructing relation matrix, the average of six respondent ratings are taken for each cell.

4.2 DEMATEL Method

 The study follows steps of DEMAEL method discussed by Sheng et al. 2018 [13], explained as under:

4.2.1 Construct Direct-Influence Matrix (DI) of variables

Direct influence matrix takes their values based on responses of floated questionnaire. Each cell of matrix takes average of number of respondents (R) rating to that measure influence on other measure i.e., Four measures of financial literacy M1, M2, M3, M4 influences each other. Therefore, Direct-Influence matrix DI_k can be calculated as $[DI_{ij}^k]_{n*n}$.
Each $[DI_{ij}^k]$ is as aggregate of respondents rating i.e.,

$$DI_{ij} = \frac{1}{R}\sum_{k=1}^{R} DI_{ij}^k \qquad (1)$$

4.2.2 Develop Normalized Direct-Influence Matrix (N)

After the construction of direct influence matrix, normalized direct-influence matrix is created by diving each entry of cell by diving the maximum cell entry i.e.,

$$N = \frac{DI}{Max\ of\ DI} \qquad (2)$$

Equation 2 will covert each cell entries that will lie between 0 to 1.

4.2.3 Create Total-Influence Matrix (TI)

Using the normalized direct-influence matrix X, the total-influence matrix $TI = [tij]n \times n$ is then computed by summing the direct effects and the indirect effects by

$$TI = N + N^2 + N^3 + N^4 + \ldots \ldots N^h = N (I - N)^{-1}$$

(3)

When h →∞ and I is Identity matrix.

4.2.4 Develop Influence Relation Map

After the construction of total-influence matrix, value of R and C is calculated. R represent sum of the rows and C represents the sum of the columns of TI.

4.2.5 Create Cause-and-Effect diagram

Cause and effect diagram will be created based on R and C value. For the diagram, threshold value will be decided to avoid negligible differences. For the present study, the threshold value is set up by computing the average of the elements in matrix T.

5. Data Analysis

The study employs the explained methodology of DEMATEL method on received input of expert. Each step of explained researcher methodology is followed, and its results are shared below:

5.1 Construction of Direct-Influence Matrix (DI) of Measures of Financial Matrix

The study collects experts view on how much a financial literacy measure influence the other financial literacy measures. Their aggregate responses are entered into Direct-Influence matrix. Table 2 summarizes the results of direct influence matrix. Each entry of the matrix explains how one measure influences the other measure. For example, the value of 4.00 into cell x_{12} means basic knowledge very strongly influences money management and value 1.67 in cell x_{41} means risk management does not influence basic knowledge. This way all cell values are representative of relationship-influence among financial literacy measures in Table 2. Basic knowledge is found to be the most influencing measure as all cell value in first row is more than 3 summing up as 11.67. Comparatively saving & investment measure is found to be only moderately influencing the other financial literacy measures as it has the lowest sum of the row i.e., 8.67.

Table 2 Direct Relation Matrix

	Basic knowledge	Money Management	Saving and investment	Risk Management	Σ
Basic knowledge	0.00	4.00	4.00	3.67	11.67
Money Management	2.33	0.00	4.00	3.00	9.33
Saving and investment	1.33	3.67	0.00	3.67	8.67
Risk Management	1.67	4.00	3.67	0.00	9.33

5.2 Development of normalized direct-influence matrix (N)

Each entry of direct influence matrix is further divided by the highest sum of row given in Table 1 i.e., 11.67. this way, normalized direct influence matrix is developed. Now each cell entry hold value between 0 to 1 as shown in Table 3.

Table 3 Normalized Direct Relation Matrix

	Basic knowledge	Money Management	Saving and investment	Risk Management
Basic knowledge	0.00	0.34	0.34	0.31
Money Management	0.20	0.00	0.34	0.26
Saving and investment	0.11	0.31	0.00	0.31
Risk Management	0.14	0.34	0.31	0.00

5.3 Total-influence matrix (TI)

From normalized direct relation matrix, total influence matrix is calculated with equation 3 as explained in section 4 on research methodology. Table 4 summarizes the results of employed equation 3 by summing the direct effects and the indirect effects.

Table 4 Total Relation Matrix

	Basic knowledge	Money Management	Saving and investment	Risk Management
Basic knowledge	0.46	1.16	1.13	1.04
Money Management	0.50	0.68	0.91	0.79
Saving and investment	0.41	0.84	0.61	0.77
Risk Management	0.46	0.91	0.88	0.60

5.4 Development of influence relation map

After the construction of total-influence matrix, value of R and C is calculated. R represent sum of the rows and C represents the sum of the columns of TI. These values of R and C is used further to rank each financial measures as per priority and to categories them as either cause or as effect. To assign the rank of financial literacy measure, value of R and C is added. Highest value of C+R is assigned with first rank and other accordingly. For classifying the measures as cause and effect, value of C-R is calculated. The negative value of D-R is considered as cause whereas positive values are considered as effect. Hence, Basic knowledge of finance is cause and other three measures i.e., money management, saving and investment and risk management is effect.

Table 5 Influence relation mapping

Financial Measure	C	R	C+R	Rank	C-R	Cause/Effect
Basic knowledge	1.824408468	3.786009152	5.61041762	4	-1.96160068	Cause
Money Management	3.586699398	2.873074858	6.459774256	1	0.71362454	Effect
Saving and investment	3.529593863	2.638732103	6.168325966	2	0.89086176	Effect
Risk Management	3.198793768	2.841679384	6.040473153	3	0.357114384	Effect

Figure 1 shows the cause-and-effect diagram of financial measures. Threshold value for this diagram development is taken as 0.76 i.e., the average of total influence matrix. As except C-R value of saving and investment, all C-R value are higher than considered threshold, the map is created accordingly. It means the effect of basic knowledge of finance has negligible effect on saving and investment decisions. It can also be concluded that saving and investment variable can be a causal measure of financial literacy under different circumstances.
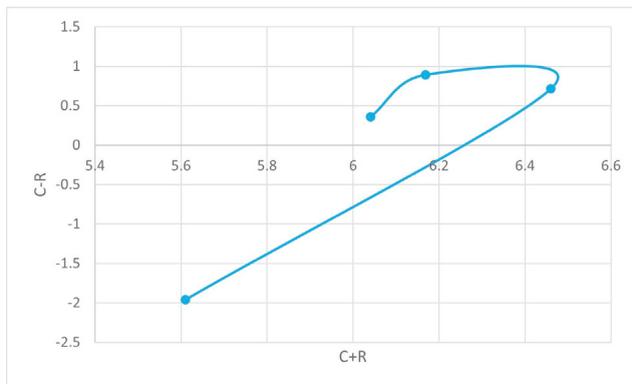
Figure 1 Casual relation diagraph of financial literacy measures

6. Findings & Implications

The data analysis of the study suggests that basic knowledge of finance is the most important enablers of financial literacy. As explained earlier, the basic knowledge of finance includes knowledge of inflation, exchange rates, interest rate and tax system therefore the policy maker should focus on disseminating information related to these terms to targeted population. Figure 2 list all such activities that can induce basic knowledge of finance among individuals like integration of financial education at school and college level, conduct periodical sessions and workshop on financial literacy, promote use of FinTech, budget discussion with public, encouragement to go cashless, promote banking culture, simplified rules regarding taxation, increase financial knowledge penetration among female population, increased financial inclusion. The use of FinTech especially is helpful in disseminating information as most of the population uses cellphone. People are also being very aware about their future financial needs and that make them take saving and investment decision. This habit does not necessarily prove that they have good level of financial knowledge as most of the saving decisions do not result in desirable profit. Hence, imparting knowledge to make informed decision is also very important for government.
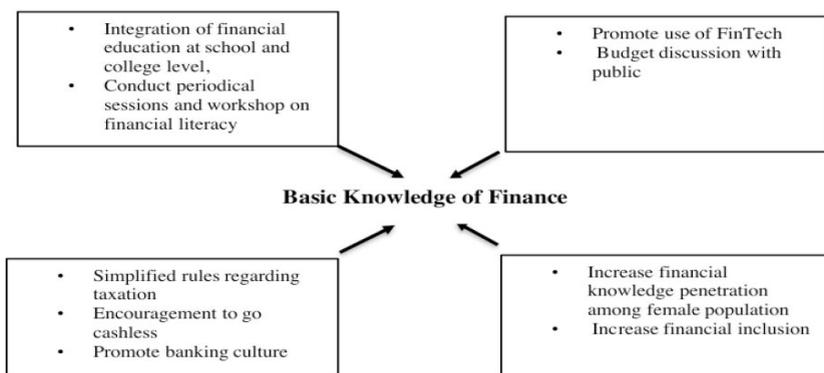

Figure 2 Inducing basic knowledge of Finance

7. Conclusion

Financial education and financial literacy are inter-connected with each other. For last few decades, effort has been made to disseminate financial knowledge among population for them to take better financial decisions. As people gains pensions and other form of savings, they need to have financial knowledge to exercise beneficial use of their monetary resources. This phenomenon increases the significance of financial education to great extent. The

availability of hybrid financial products has also increased considerably in last decade. Hence, to choose the best financial product available in market, individual requires to have financial knowledge. This financial decision making can be optimized by being aware of taxation, interest rates, exchange rate, IPOs, stocks, bonds etc. this paper attempts to comment on strategies which can be induced in targeted population to increase their financial knowledge by employing DEMATEL method on financial literacy measures. The study concludes that basic knowledge of finance can exponentially increases knowledge of other literacy measures such as saving and investment, money management and risk management.

The suggested measures can be empirically tested by employing statistical tools like structural equation modelling as scope of this study. The relationship of financial measures can also be explored with other method like Fuzzy MCDM, System Dynamics and AHP.

8. Online licence

I transfer the Online licence before the article can be published.

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