

# Innovations

## Measuring Healthy Financial Behaviour Using Textual Analysis: A Review and Future Prospects

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**Abstract:** *Individuals make infinite decisions in their daily lives that involve money management and investment, such choices are inferred as financial behavior. Healthy financial behavior is a facet of financial behavior. The assessment of healthy financial behavior has large social and economic implications for both policymakers and financial institutions. However, measuring healthy financial behavior quantitatively is difficult and biased, so devising an appropriate measurement for healthy financial behavior is crucial for marketers, policymakers, as well as for the government. The study focuses on reviewing healthy financial behavior, and the common approach for measurements along with its consequent limitations. Further, the study presented the predominant development in the extent of textual analysis and its application in the finance domain. The review of the textual analysis domain helps in understanding its usability in extracting the intended and unintended information about the financial behavior of an individual. The study proposes an integrative framework of how textual analysis can be used to measure financial behavior effectively.*

**Keywords:** *Financial Decisions, Healthy Financial behavior, Review, Textual Analysis, Machine learning.*

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## Introduction

Financial behavior is the practice of managing money to attain financial goals. It encompasses not only practical matters such as setting spending limits and saving goals but also more abstract concepts such as risk-taking and investing. Financial behavior has been studied extensively (Falahati et al., 2012; Xiao et al., 2014) and there is an extant body of knowledge about how people manage their money effectively (Bamforth, et al., 2018; Fan, Chatterjee, and Kim, 2022).

One interesting dimension that has been studied substantially is Healthy Financial Behavior (HFB) as a concept. This refers to different aspects of financial behavior which are all interconnected and have an impact on each other. For example, saving can lead to investing, subsequently contributing to higher levels of financial security. Additionally, healthy financial behaviors will augment an individual's overall financial well-being (Prakash, Alagarsamy, and Hawaldar, 2022; Damian, et al., 2020; Sabri, et al., 2020). Other aspects that were studied substantially concerning financial behavior include financial literacy (Lusardi, and Mitchell, 2014; Ingale and Paluri, 2020) and investment decision-making (Jureviciene, and Jermakova, 2012; Sudindra, and Naidu, 2018). Overall, financial behavior is an immensely complex topic that has a considerable impact on our overall well-being and life satisfaction (Joo, and Grable, 2004; Xiao, Tang, and Shim, 2009). Therefore, it is of paramount importance for academicians, marketers, and policymakers to investigate the HFB of individuals and different ways of its measurement.

Indeed, measuring HFB using the quantitative-based approach is very difficult as individuals are not willing to share their current financial situation effectively and accurately. In general, a subjective-based approach or survey-based measuring instrument was the norm in prior literature. However, the survey-based approach has two major drawbacks that are required to be considered. Firstly, it is unavoidable to get inaccurate answers and a low rate of responses from the respondents (Uher et al., 2013). Second, self-report questions measure the static financial condition of an individual and fail to capture the trend and development of long-term financial behavioral changes (Coughlan et al., 2009). Contrarily, with the help of textual analysis (TA), we can resolve the above-mentioned constraint of the survey-based approach to assessing financial behavior. By employing textual analysis, we can uncover both the intended and unintended cues and information about the individual's financial behavior. *Text mining or Textual analysis* refers to "the process of extracting useful information from narrative contents" (Hotho et al., 2005). An increasing number of recent studies in the domain of finance have started the use of textual analysis (TA) to determine the usually hard-to-value qualitative essentials such as consumer and investor sentiment (Gupta et al., 2020). Thus, through this review we aim to consider the use of TA as a future potential to assess the individual's financial behavior. To address the research gap, this review presents a future use of textual analysis in the domain of financial behavior particularly for explaining the HFB of an

individual. **Figure 1.** Display the logical relationship and use of textual analysis in the domain of financial behavior. The review begins with an explanation of the concept of HFB, its importance in terms of saving and debt reduction, and its measurement using a survey-based approach. Then we elucidate the limitations of the survey-based approach and how the application of textual analysis or text mining could be used to capture the hidden and latent financial behavior of an individual. Finally, we outline the future research direction by discussing how TA could be used in assessing the HFB of an individual effectively. Thus, we can enrich the domain of financial behavior by suggesting a new approach to measuring financial behavior using data mining techniques.

## Literature Review

### Healthy Financial Behavior

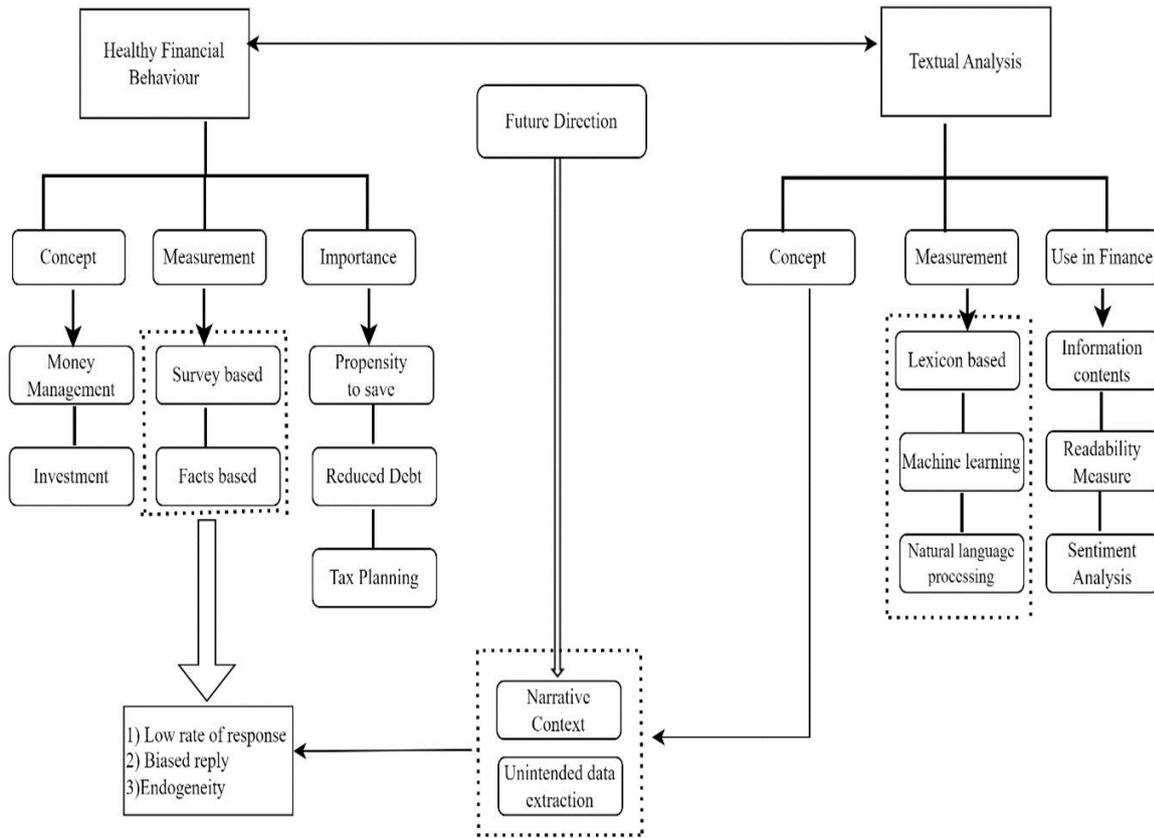
Individuals make infinite decisions in their day-to-day lives that involve money management and investment, such choices are inferred as *financial behavior*. According to the extant studies the phrase “Financial behavior” can be attributed to desirable and positive money management that improves overall financial well-being (Xiao 2008). Comparing the lexical meaning of the words positive or desirable can be considered analogous to the word healthy. Thus, HFB encompasses the attitude and perceptions about how well an individual is managing money in terms of borrowing, spending, saving, and investment in the short and long term (Hilgert et al., 2003; Xiao et al., 2006).

Besides this, it involves strategies for real estate investment and long-term retirement planning inclusive of short-term saving and spending (DeVaney, and Lytton, 1995; Sudhindra, and Naidu, 2018). Positive financial behavior in households encourages cohesion and affection between the family members and helps in maintaining the appropriate saving and investment balance (Fagan and Brayman, 2011; Gokhan, and Mutlu, 2019; Widyastuti, 2020). Notably, extant literature substantiates various factors impacting the individual’s financial behavior, i.e social interactions among friends and family, demographic characteristics, psychological variables, income as well as expenditure level, and financial literacy (Hilgert et al., 2003; Mitchell & Lusardi, 2011). Also, scholars have established financial literacy as the antecedent of HFB in terms of saving, credit, (Allgood and Walstad, 2013), and investment (Hastings and Mitchell, 2020). HFB has a relationship with the individual’s consumption level, types of assets, wealth management, taxes, and long-term planning (Hira, 2012; Barbić, Lučić, and Chen, 2019). In this endeavor, some researchers attempt to explore its potential consequences on financial well-being, financial satisfaction (Gunay et al., 2015), long-term security, and overall life satisfaction of individuals (Atkinson et al., 2015). Joo and Grable (2004) concluded that the financial behavior of an individual is related to one’s financial stress level and overall life satisfaction.

### **Importance of healthy financial behavior**

Previous studies have provided substantial evidence exhibiting the importance of HFB and its contribution to imparting the financial well-being of an individual. Also, it plays a crucial role in the financial decisions taken by the individual in their routine life. In particular, we discuss the HFB as the instrument for the propensity to save and reduction in debt amount.

Adequate saving is perhaps one of the important outcomes of HFB. Well-planned and systematic savings are required for long-term investment and to cover sudden future expenses as well as to avoid the debt burden. Also, the savings made by an individual in their employment tenure provides a source of income during the retirement period. Adequate investment and saving are the prerequisites for maintaining a stress-free and desired financial standard for the secured future (Munnell, et al., 2012). Often it was found that people do not save enough for future expenses and maintain the same living standard post-retirement (Benartzi & Thaler, 2013). There could be several predictors of individual saving behavior such as low income, unfavorable economic situation, and unemployment at any stage of life (Mirach, and Hailu, 2014). Whereas motivation to save more could be realized by setting concrete and attainable goals (Fry et al., 2008; Cho, 2009). Framing of attainable saving goals has a positive impact on the saving intention as well as the saving behavior (Andoko, and Martok, 2020). Likewise, “earmarking”- keeping a certain amount of money in a separate “account” for savings increases the propensity to save more. Soman and Cheema (2011) experimented to examine the role of visual reminders and partitioning (i.e., earmarking) on consequent saving and spending behavior for 14 weeks.



**Figure 1.** Display the logical relationship and use of textual analysis in the domain of financial behavior

Authors found that both the visual reminders and the earmarking were positively associated with saving more and spending less for that period. Along similar lines, researchers found that social norms and daily habits have been determining factors that influence saving behavior for retirement (Chen, et al., 2019; Wiener & Doescher, 2008). Regular saving habits of an individual could help them to achieve their monthly saving goals (Lopez, et al., 2022; Loibl, et al., 2011). Positive and HFBin terms of attainable goals and regular habits help individuals to save more in the short and long-term periods.

Also, a reduction in the debt burden of an individual could be attained with the help of HFB. Prior research provides considerable evidence that having a debt burden is a stressful situation (Achtziger et al., 2015; Brown, Taylor, and Price, 2005), and paying back the debt is even more stressful (Greenberg & Hershfield, 2016). In general, individuals are debt averse as they want to take minimal stress of debt and repayment. Even though consumers are debt-averse, most of them still accrue debt in the form of credit cards. Scholarly studies suggest that many consumers are using credit cards as a mode of spending rather than a way of borrowing (Wilcox, et al., 2011), even if such spending leads to an increased debt burden. Some of them use credit cards to meet their desired lifestyle, which is

unaffordable with their income level (Wickramasinghe, and Gurugamage, 2012; Bernthal, et al., 2005). As a result of unplanned expenditure and with the easy use of credit cards, the consumer may accrue a huge amount of debt. It was also found that a higher credit limit escalates these issues and leads to more credit borrowing by consumers (Soman & Cheema, 2002). Prior research implies that spending using credit cards has been psychologically less strenuous as compared with shopping from cash or savings. Individuals found it more accessible to borrow in terms of high-interest credit cards than to spend from existing savings (Sussman & O'Brien, 2016).

Additionally, there are extant studies on how individuals go about repaying their existing debts, especially the repayment of credit card bills. Notably, prior research showed that consumers prefer to pay back their debt with a higher interest rate first (Besharat et al., 2014), especially when the debt is due to a hedonic purchase. However, the repayment of smaller debts first can be an effective motivator for the repayment of higher debts (Gathergood et al., 2019). Also, concentrating on repaying the loans one by one leads to faster repayment (Kettle et al., 2016). Individuals with HFB are apprehensive of their budget, the loan amount, and their ability to pay off their debt burden.

### **How to Measure Healthy Financial Behavior**

Extant literature suggests that financial behavior could be examined both objectively and subjectively. The objective measures include the facts and figures about the individual or household income, expenditure, financial ratios, and other financial information displaying their financial position (Porter, and Garman, 1992). On the contrary, the subjective measures include the self-reported statement about attitudes and perceptions of an individual's financial situation (Norvilitis et al., 2003). Table 1 displays some studies and various measures used to assess financial behavior. Some researchers used single items to measure financial behavior, based on saving behavior (Gathergood, 2012). Contrarily, overall financial behavior could be measured based on the activities involved such as cash management, credit, and saving strategies (Hilgert et al., 2003, Xiao et al., 2009). The scale used by Xiao et al., (2009) to measure financial behavior has ten questions having two sets, first set of questions is related to past financial behavior for measuring cash and credit management, and another set is based on the saving behavior of an individual. Healthy financial behaviors are measured by the frequency of activities such as preparing the monthly budget, tracking, saving, and spending as per the budget (Shim et al., 2010). The respondents have to make choices about how often from 1 (never) to 5 (very often) they discharge the activities related to healthy financial behavior.

Although a survey-based approach has been the predominant way to examine the individual's financial behavior, there are a few limitations. In general, the survey-based method has a low rate of responses and is sometimes inaccurate as well as

biased (Coughlan et al., 2009). There could be a social desirability bias in which the respondents respond to the question with more socially acceptable answers rather than giving their true feelings. Also, it captures the current financial status of individuals at the specific time when the survey was conducted and fails to capture the dynamic financial condition. The dynamic changes in one’s financial situation will help to explore their impact on overall financial behavior. Understanding the trend in financial condition of an individual or household is a prerequisite for shaping a policy by the policymaker and the government. To overcome these limitations textual analysis could be used as an alternative measurement tool.

Table 1. Literature review of financial behavior and survey-based measurement.

Citation	Discipline	Country	Survey Name	Survey questions (Objective/Subjective)
Gathergood (2012)	Economics	UK	DebtTrack survey	Question based on income and balance sheet. (O)
Strömbäck et al., (2017)	Finance	Sweden	CMA Research	Financial Management Behavior Scale (FMBS) consists of 12 items (S)
Fünfgeld and Wang (2008)	Finance	Switzerland	NA	17 items on their financial behavioral practice (S)
Rha, Montalto, and Hanna (2006)	Finance	United States	Survey of Consumer Finances	Spending and Income of a Household and Saving Goals (O)
Dew and Xiao (2011)	Finance	United States	Familial Response to Financial Instability Survey	14 items to measure consumption, cash management, investment, and credit management (S)
Zakaria et al., (2012)	Finance	Malaysia	NA	5 items scale
Allgood and Walstad (2016)	Economics	United States	“National Financial Capability Study”	Items related to investment (4), mortgages (4), insurance (4), and financial counseling (5)
Robb and Woodyard (2011)	Consumer Finance	United States	National Financial Capability Study	Six questions based on financial best practices (S)
Asaad (2015)	Consumer	United States	National	Questions related to saving

	r Finance	States	Financial Capability Study	and loan behavior and Risky Financial Behavior (O)
Perry and Morris (2005)	Marketing	United States	Freddie Mac Consumer Credit Survey	5-item measure the skills to budget, save, and control spending. (S)
Tang and Baker (2016)	Economic	United States	National Longitudinal Survey of Youth (1979)	8 items based on saving barring of retirement accounts, credit management, investment in risky assets, and retirement saving. (O)
She et al., (2021)	Economic	Malaysia	NA	12 items financial behavior Scale
Joo and Gable (2008)	Finance	Texas	NA	10 items based on various financial activity (S)
Rey-Ares et al., (2021)	Economic	Spain	Survey of Financial Competences	Dichotomous questions on investment and indebtedness behavior (S)
Xiao, Sorhaindo and Garman (2006)	Consumer Finance	United States	Personal Finances Survey'	Scale is comprised of both objective and subjective measures of financial behavior.
Watson and Barber (2017)	Economic	Australian	Youth Activity Participation Study	4-item HFB scale (S)
Mudzingiri et al., (2018)	Economic	South Africa	NA	6 questions related to debt, personal finance, saving and Investment. (S)
Cwynar (2020)	Economic/ Legal	Poland	NA	Questions related to legal advice on credit and debt issues and investment and cash management (S)
Hastings and Mitchell (2020)	Consumer Finance	Chile	Social Protection Survey	Experimental Study to Examine Retirement Saving and Investments in Health. (S/O)
Çera et al., (2021)	Economic	Albania	NA	5 items based on expenses and investment (S)
Kim,	Economic	United	National	Dichotomous question on

Anderson, and Seay (2019)	c	States	Financial Capability Study	short-term and long-term financial behavior (S)
Shim et al., (2010)	Finance	United States	NA	HFB items (i.e., tracking expenses monthly, spending limits to budget, monthly paying off credit bills, regular saving, and investing for the future). (S)
Pandey (2023)	Finance	India	NA	6 items for positive financial behavior (S)

**Textual analysis**

“Textual Analysis (TA)” or “text mining” is defined as “the process of purposive extraction of useful information and data from the text”. It is a measure of the magnitude of the positive and negative words in a text or data. Broadly, a TA may involve computational syntax, natural or statistical-based language procedure, stylometric, cues and information extraction, and content analysis(Loughran and McDonald, 2016). Initially, Frazier et al., (1984) did a content analysis for quantitative assessment of the historical data on the frequency of individual words. The authors divided the text-based data into words, tagged the words, counted the frequency of the word, and applied the factor analysis for further investigation. However, with the recent progress in data mining, TA has been extended to the field of accounting, management, and finance to analyze and infer various qualitative evidence that is difficult to decipher using traditional measurements. The textual analysis involves three major steps- “text harvesting”, “cleaning”, and “text analyzing/parsing”. The collection of multi-dimensional datasets is done through text harvesting. Generally, researchers obtain data from paid financial databases, i.e., CompStat, Bloomberg, Thompson Reuters, etc. With the proliferation of social networks and Internet search engine advancement, researchers can extract both structured and unstructured data by applying web crawling techniques (Kumar, Bhatia, and Rattan, 2017). The data used in the accounting and finance domain consists of filings and disclosures (e.g.SEC filings, 10-K or 8-K annual reports, data from social media platforms, etc.), earnings conference calls, news or media articles, analyst reports, internet-based message platforms (e.g., Raging Bull, Yahoo! Finance, and Seeking Alpha), data from e-commerce websites and posts as on online social networks (e.g., Tweets, Instagram, Facebook status). Usually, unstructured data is in the form of text contents, voice, images, etc. Text cleaning transforms qualitative text into a meaningful and structured word format that can be used for the extraction of hidden information. The extraction of valuable information from the structured

data is done by text parsing and analyzing. Scholars used different techniques to extract the information from the text. Generally, the Lexicon-based method (“the bag-of-words”), is used to list down the similar words that are required for calculating the frequency of words in the whole text. The targeted collection of phrases was later used for the required investigation. A more advanced and improved procedure of analysis is done by compiling similar characteristics of a word list such as risk aversions, risk-taker, positive/negative sentiment, credit risk, credit rates, loan default, monthly budget, investment, financial literacy, and financial behavior. The bag of word approach may help in the extraction of emotions and the underlying perceptions of individuals by matching the textual content data with the word list. In the Lexicon-based method dictionary construction is one of the vital steps for text analysis. These are the following dictionaries used in the study related to finance –“Harvard General Inquirer” (GI) word lists, “Henry word list” (Henry, 2008), Loughran and McDonald word lists, and “Diction optimism and pessimism” word lists (Loughran, and McDonald, 2016). Scholars use these dictionaries for conducting text or semantic analysis by creating their own word lists. Along with this, machine learning and artificial intelligence techniques were used to classify and outline the textual patterns in the extracted data. Machine learning is based on computational statistics and consists of two important steps. In the first step, a sample dataset is given, and based on the mathematical algorithms a “training dataset” is created. Following this, the prediction or future decisions are made based on the “learning experience” dataset (Ikonomakis, et al., 2005). For precise predictability, two criteria need to be followed in machine learning 1) high-quality datasets and 2) competent algorithms language. The widely used machine learning techniques in the finance domain are “Naïve Bayes”, “Neural Networks”, and “Support Vector Machines”. However past literature suggests that semantic analysis is a commonly used technique in analyzing the informational content of financial reports and analysts’ forecasts (Fisher et al., 2016; Mazis, and Tsekrekos, 2017). As compared to the Lexicon-based approach, Machine learning techniques possibly do not generate better performance in financial textual analysis.

### **Textual analysis in finance**

With the advancement of computing analysis and data mining, researchers started using TA in the domain of finance to measure the factors that were difficult to quantify earlier. The textual analysis approach of measurement provides an accurate and direct way to quantify both the intended and subtle clues which are difficult to measure through the survey-based approach or another traditional way of measurement. In the domain of finance and accounting, the readily available online news articles, earnings conference proceedings, posts from social media, activity on e-commerce websites, and investment research provide

sufficient raw data for textual analysis. In this field, we do textual analysis by examining information sources, text readability, and sentiment analysis.

### **Information sources**

In general, textual mining is done by examining the targeted phrases, document similarity measures, and topic modeling. The sources of the information could be the regular information broadcasting channels, such as the companies' filings and disclosures, earning announcements, reports by analysts, news articles, and social media messages and updates. The underlying sentiment in the contents displays the firm's developments and information about the market participants and investors' behavior. The research based on sentiment analysis using information on corporate disclosure and filings are Feldman et al., (2010) and Henry and Leone (2016). Davis et al., (2011) analyzed the 23000 quarterly press releases using the "Diction Optimism and Pessimism" word lists and concluded that the net optimistic texts in earnings press releases impacted the market returns, Return on Assets (ROA) positively more on the announcement dates. The firm's future performance can be assessed as per the quarterly press release. Recently, Boudoukh et al., (2019) applied machine learning (ML) techniques to segregate the bulk of news from "Dow Jones Newswire" into different events-based news such as value-relevant events and events with distant complexity and "unidentified" news. On a granular level, they investigated the reaction of the news types on the stock market during trading and nontrading hours. They concluded that the intensity of the reaction to information varies from different news sources. Extant studies on internet messages or posting are Das and Chen (2007), and Chen et al., (2013). Antweiler and Frank (2004) studied the effect of board message posts on Raging Bull and Yahoo! Finance on trading volume and stock market returns. The authors used machine-learning techniques such as Support Vector and Naïve Bayes to analyze the information content extracted from the Raging Bull and Yahoo! Finance. The online "talk" may contain relevant financial information that can predict the trading volume as well as stock returns of a company.

### **Readability measurements**

In text mining, readability is an important factor as it affects the accuracy and effectiveness of the analysis, and it refers to the ease with which a text can be understood and interpreted by a reader (Loughran, and McDonald, 2016). It is a measure of the complexity of the language used in a text. Text that is written in a clear, concise, and easy-to-understand is typically more readable and therefore more useful for text mining. In general, readability measurements in the field of accounts and finance are related to the effective dissemination and understanding of the information present in companies' annual reports and market news. In textual analysis domain, there are various readability measures

**(Table 2).** Amongst them, the Fog Index is the most widely used readability measure.

Prior research work on readability experienced a problem of small sample size and methodological flaws (such as Lewis et al., 1986). Tennyson, et al., (1990) did a comparative analysis of 23 bankrupt firms with nonbankrupt firms to examine the relation between managerial disclosure and financial distress. They found that the management narrative-based information is different from the company financial-based information. However, with the progress in the field of data mining and analysis, researchers can decompose long sentences into small, targeted text, and further analysis is done using the pre-defined word list. The first use of the Fog index was done by Li (2008) to examine the association between firm performance and report readability. The author defined the defined the Fog Index as “ $\frac{1}{4} 0.4$  (average number of words per sentence  $\times$  percent of complex words)”. Authors found that firms with lower reported earnings are likely to have hard-to-read annual reports. The results supported the findings that firms with meager earnings have more complex and longer sentences to explain their condition to stakeholders and investors. Along a similar line, Lawrence (2013), studied a positive relation between the readability of the annual report and the financial trading behavior of individual retail investors using a sample of 78000 U.S households.

**Table 2. Readability measure**

S.No.	Measure	Formula
1	Flesch Kincaid	$0.39 * (\text{number of words}/\text{number of sentences}) + 11.8 * (\text{number of syllables}/\text{number of words}) - 15.59$
2	LIX	$(\text{Number of words}/\text{number of sentences}) + (\text{number of words over 6 letters} * 100 / \text{number of words})$
3	RIX	$(\text{Number of words with 7 characters or more}) / (\text{number of sentences})$
4	ARI	$4.71 * (\text{number of characters}/\text{number of sentences}) + 0.5 * (\text{number of words}/\text{number of sentences}) - 21.43$
5	Fog	$0.4 * (\text{number of words}/\text{number of sentences}) + 40 * (\text{number of words with more than two syllables}/\text{number of words})$
6	SMOG	$1.043 * \sqrt{30 * (\text{number of words with more than two syllables}/\text{number of sentences})} + 3.1291$

Source: - (Li, 2008)

## Sentiment Analysis

This is one of the predominant and widely used techniques having applications in numerous fields. Also referred to as opinion mining as it extracts the underlying opinion and feeling from the text (Akaichi et al., 2013). The basic use of this technique is to extract information based on emotions and sentiments from various online sites/platforms such as social media, blogs, and e-commerce sites. The use of sentiment analysis (SA) can be widely dealt with in two phases- emotion detection and polarity detection. As the name suggests, emotion detection focuses on the separation and understanding of a set of emotions, and polarity detection is a classifier-oriented approach with discrete outputs (e.g., positive, and negative) (Cambria et al., 2017). There are three basic approaches for doing sentiment analysis i.e., Knowledge-based (Dictionary-based), statistical-based (Machine learning), and hybrid learning. Knowledge or Lexicon approaches are based on “SentiWordNet” word maps, where the sentiment total score is calculated by dividing the number of sentiment recurrences by the sum of positive and negative sentiments. Whereas in machine learning the text is classified as per the label in the supervised method and in the unsupervised method, raw data is then directly used for extracting the sentiments (Medhat, et al., 2014). In a hybrid approach, a combination of knowledge and a statistical-based approach are used to enhance accuracy and performance. Usually, researchers can source the intended and unintended sentiments from traditional media sites and social networking platforms (Alessia, et al, 2015). In the domain of finance, sentiment analysis is widely used to forecast changes in trends and price movements of the stock market based on the happenings of financial news and events. Earlier work on predicting the movement of the stock market based on news events was done by Tetlock, (2007); Fang, and Peress, (2009); and Garcia, (2013). With the increased usage of social media and internet posting, a new source emerged for extracting the hidden information from these narrative texts. A few commonly used media platforms referred by investors for securing information and disseminating ideas are Yahoo! Finance, Raging Bull, Moneycontrol, Seeking Alpha, etc. Antweiler and Frank (2004) used 1.5 million postings of stock messages from Yahoo! Finance and Raging Bull and applied the “Naïve Bayes” method to build a bullishness index to examine the various sentiments of retail investors. Additionally, Das and Chen (2007) apply machine learning (ML) techniques to group and extract the investor’s sentiments from an online message platform. Recently, enough studies were done by researchers using sentiment analysis of narrative text posted on Twitter and Facebook such as Bollen et al., (2011); Zhang et al., (2018); Saurabh and Dey, (2020).

## Discussion and future directions

Delving from the extant literature, there were flaws in measuring the HFB of an individual, and they need to be rectified urgently. A more effective mode to examine and measure HFB is required to understand the nuances and factors impacting the financial behavior of an individual. To dissipate financial worries and reduce the occurrence of non-normative stressful financial events, there is a need to understand the financial behavior of an individual. Understanding HFB is of increasing importance among financial institutions and their managers, public policy officials, and academia (Consumer Financial Protection Bureau, 2015; Netemeyer et al., 2017). Therefore, it becomes extremely critical to have an effective technique and understanding of both intended and unintended factors influencing healthy financial behavior. Insights from text analysis provides a valuable understanding of actual financial behaviour and decision making of an individual through the cues hidden behind their daily routine on social media networks such as their online posting content, specific word search frequencies, and response to official announcements. This will help in understanding the accurate and effective financial behavior of an individual. The use of textual analysis helps in capturing day-to-day financial information, as well as long-term changing patterns of individual investment pattern and financial behavior. By leveraging the information from social media, personal accounts, investment patterns, and news articles, scholars can apply sentiment analysis to measure positive and negative sentiments enclosing any financial instruments and unveil individuals' behavioral biases. In future, deep learning and interdisciplinary collaboration will lead to precise and sophisticated predictive models for gauging financial behaviour. Also, using machine learning techniques and combining psychological theories with narrative text datasets researchers can formulate more effective instruments. Apparently, the textual analysis will improve the measurement of HFB by contributing to the well-established questionnaire.

## Conclusion

Specifically, HFB is the action related to being helpful in budgeting, spending, and saving money performed by an individual, in turn, which leads to maintaining overall well-being and a satisfactory life. In that rationale, measuring HFB accurately and effectively is of increasing importance among financial institutions and their managers, and for public policy officials in terms of formulating welfare schemes and policies to enhance the nation's economy as a whole. However, measuring financial behavior in a subjective or survey-based approach fails to capture the dynamic and longitudinal pattern of financial behavior. Also, the survey-based approach has the drawback of a low response rate and inaccurate and biased responses. As there is rapid advancement in data mining techniques, we propose that textual analysis may provide better opportunities to measure the

financial behavior of an individual. To be precise, the method will allow for measuring both the intended and unintended cues and information through the individual's behavior and activities on social media platforms. This information not only assists in devising a new way of measuring the HFB of an individual but also aids in measuring financial behavior on a long-term basis. The information on time series data will help the policymaker and the government in formulating financial programs and consequent policy changes. Also, this review concludes that future researchers possibly will include a textual analysis approach to measure HFB more accurately. Marketers can take advantage of data/ text mining to provide tailor-made financial solutions to their consumers. By pursuing these approaches, scholars can unlock new future scope into measuring financial behavior and pave the way for innovative applications in investment, personal finance, and regulatory compliance.

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The authors declare no conflict of interest.

### **Data for the research**

The data will be available upon request through an email to the corresponding author.

**JEL code:** G00, G51, O31

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