“Capital structure construct: a new approach to behavioral finance”

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CAPITAL STRUCTURE CONSTRUCT: A NEW APPROACH TO BEHAVIORAL FINANCE

Abstract

Within the framework of behavioral finance, this research shows that financial behavior can be assessed as a cognitive construct. Using certain variables, a multidimensional "cognitive finance" construct can thus be established. Through a technological – psychometric type design with descriptive data analysis, a factor analysis is presented to determine which latent variables tend to charge significantly in order to assess the validity of the dimensions comprising the construct of capital structure and explore its dimensions in relation to financial theory. A 44-item questionnaire is adapted and applied to a sample of chief financial officers from diverse public and nonpublic companies in Mexico. The analysis reveals the existence of four construct dimensions consistent with corporate financial theory. The model helps to explain how decision-makers react to uncertainty and environmental conditions, directly affecting the valuation of firm's losses or earnings. As evidenced by the results, application of the Item Response Theory to the field of behavioral finance could open up new avenues to the study of cognitive biases, involved in the financial decision-making process. Thus, this implies that behavioral finance can also be treated as "cognitive finance."

Keywords cognitive finance, decision-making, psychological factors, ownership structure

JEL Classification C38, G40, G41

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INTRODUCTION

Capital structure has been widely studied from traditional corporate finance perspectives. From this perspective, companies finance their activities with a combination of equity and debt, determining the composition of their structures and net liabilities. Those studies exclusively focus on relating this structure to company's value and focusing on accounting components that maximize share prices.

Over the years, scholars have learned that factors like agency costs, taxes, and information asymmetry affect company's value (Jensen & Meckling, 1976)[1]. This has generated several changes to financial theory, such as noting that a company can reach its optimal capital structure if it keeps its weighted average cost of capital (WACC) at a minimum. This implies that firm's funds can be divided into those provided by its partners and those obtained from third parties.

Behavioral finance analysts have strongly questioned conventional economic theory, in which human reasoning and cognitive emotional biases are not generally considered. Given the current interest in the study of psychological biases in financial behavior, and owing to the scarce information available about interventions in corporate de-

1 See, for example, Jensen M. & Meckling W. (1976). "Theory of the firm: managerial behavior, agency costs and ownership structure". Journal of Financial Economics.

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cision-making in terms of capital structure, this study sheds light on cognitive-type factors, having direct repercussions on the valuation of earnings and losses. To evaluate these interventions, this study leverages an adapted questionnaire, created by Graham and Harvey (2001). This questionnaire provides the indicators that allow us to assess the construct of capital structure. The 44-item questionnaire was applied to a group of 31 chief financial officers (CFOs) from different Mexican companies. Using the resultant data, we determine the underlying (latent) variables that form the dimensions of the construct. Then, we compare them to traditional financial theory.

Variables are measured using indirect observation instruments, which is standard practice for psychology, marketing, organizational behavior, and other fields (Thurstone, 1954)[2]. The refinement process of the instrument supports its ability to represent the dimensions of the proposed construct properly. Data are analyzed using factor analysis and reliability coefficients. When choosing scales for cognitive constructs, factorial analysis is commonly used to test convergent and discriminant validity. This research adds the study of cognitive biases to corporate financial decision-making and sets a new precedent. We further propose a construct that, to the authors' best knowledge, has not been discussed before. Human behavior in finance, in contrast with the traditional behavioral finance method[3] (Vitting & Nowak, 2013), can be measured using cognitive psychological variables that are not directly observable. Thus, we propose a capital structure comprising a series of decisions based on perceptions that occur at the cognitive level. While confirming the standard theory, we suggest the existence of factors outside traditional corporate finance fields.

1. LITERATURE REVIEW

The efficient market hypothesis (EMH), which underpins conventional economic theory, is based on rational assumptions about an efficient market and profit maximization (Fama, 1970). However, EMH is often unable to explain the chaotic phenomena observed in financial markets.

The behavioral finance hypothesis argues that sophisticated and thorough mathematical models are insufficient for explaining the current financial paradigm. Social behavior must be considered to explain market anomalies. In this regard, the work by De Bondt and Thaler (1999) marked a turning point in economic research, providing empirical evidence that human prejudices were directly interconnected with financial decision-making. Bianchi, Pantanella, and Pianese (2015) showed that the paradigm of the behavioral approach is increasingly integrated with traditional financial research (i.e., EMH).

Following a behavioral approach, corporate decision-making is understood to be affected by human beliefs underlying the financial environment of a company. Moreover, decisions regarding capital structure involve the variables affected by unconscious deeds. Studying those variables from the perspective of a cognitive construct provides an opportunity to understand the intervention of new variables in the valuation of capital structure.

1.1. Constructs in human behavior research

In psychometry, a construct is an explanatory variable that is not directly observable but can be assessed using several latent variables. To measure a construct, researchers identify the observable indicators representing the components (i.e., dimensions) that will integrate the cognitive construct. Some examples of constructs in behavior research include suspicion, resilience, perceived value, impulsivity, moral injury, and more. An interesting example can be consulted in the work of Bobko, Barelka, Hirshfield, and Lyons (2014). In a classic paper on the history of psychology, Cronbach and Meehl (1955) defined a construct using a network of associations or propositions, where validation

2 Interested readers in this kind of research procedure can consult the work of Thurstone, L. L. (1954). The Measurement of Values. Psychological Review 61 (1954): 47–58.

3 In the traditional behavioral finance method, the irrational beliefs and biases have been tested in well-controlled laboratory experiments, where the researchers study the sentiments of investors and the impact in the decision-making through directly observable behavior. For more details: Vitting Andersen J. & Nowak A. (2013). An Introduction to Social-Finance. Ed. Springer.

is possible only when some of the statements in the network lead to predicted relations among observables.

Within social research, theories are the mechanisms required to feasibly represent a systematic vision of phenomena using a set of interrelated constructs. These comprise a series of interconnected variables that allow researchers to formulate dimensions that explain a certain phenomenon. When a theory is established, a researcher makes predictions and explains a concept. Simultaneously, the reliability of a prediction is derived from the level of control and the prediction's capacity to explain that theory. Kerlinger and Lee (2002) argued that, in behavioral sciences, a theory must possess three features: a set of properties based on defined and interrelated constructs; a systematic determination of the interrelations among a group of variables; and an explanation of phenomena. This first level is the theory – hypothesis construct, and it comprises the first approximation toward understanding a phenomenon. According to Bunge (1973), a construct is a non-observational concept, contrasting with observational or empirical concepts that cannot be demonstrated. These concepts cannot be directly manipulated, but they can be inferred from behaviors. Tolman (1951) called constructs intervening variables to address non-observable internal psychological processes that account for behavior. To verify a theory and the factors in variables that compound it, we must operate at an observational level, understanding that constructs comprise variables that simultaneously represent multiple phenomenal properties to which a value or number can be assigned. Thus, the construct is a non-observational concept made up of dimensions, formed from the influence of observable variables that determine certain covariance structures needed to explain the systematic relations among latent variables. This paper seeks to determine the dimensions underlying those variables observed in the construct of the capital structure, establishing systematic relations among the variables to assess cognitive behaviors and to establish their relationship to financial theory. Interpreting the theory of capital structure at a construct level provides a valuable opportunity to discuss the fundamental approaches of corporate financial theory. Specifically, this new approximation allows the verification of theory in terms of cognitive biases related to the corporate financial decision-making process. Psychological variables implicated in this construct can be proven empirically by using a valid and reliable scale.

1.2. Capital structure

The first and most pertinent allusion to the term "capital structure" was made by Modigliani and Miller (1958, 1963). Capital structure is a specific mix of long-term debt and equity used by a company to finance its operations. The CFO determines the right balance of debt and capital while looking for the least costly sources of funds for the business. The most important challenge for a CFO lies in creating and managing value for shareholders. According to Weston and Brigham (1998), an optimal capital structure is one that accomplishes a balance between risk and payback, maximizing stock prices. Modigliani and Miller (1963) stated that "due to the tax deductibility of the interests over the debts, the value of a firm will increase according to its leverage ratio; therefore, its value will be maximized by funding itself almost entirely with debt." They concluded that an optimal capital structure would maximize share price. It would also minimize the weighted average cost of capital, WACC[4] (Mian & Velez-Pareja, 2007). Assaf (2005) suggested that a firm could achieve its optimal capital structure when its indebtedness level kept the WACC at a minimum. Harris and Raviv (1991) indicated that models based on agency costs verified that there was a leverage level that could maximize the value of a firm by reducing conflicts of interests among economic agents.

Graham, Leary, and Roberts (2014) documented a shift in corporate financial policy in US firms over the past century, where the firms appear to have increased their propensity to use debt financing. According to the paper, the factors that are involved in said propensity within the economic environment are increased corporate tax rates, reductions in aggregate uncertainty, growth in

4 The concept of the WACC is commonly accepted but there are a number of different models and formulae that can be used to estimate this cost, for example, the "real WACC" and the "nominal WACC". The real WACC excludes inflation from the calculated return and is applied to a regulatory asset base that is indexed by inflation. In the "nominal WACC" the nominal free cash flows should be discounted.

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financial intermediation and large reduction in government borrowing. This suggests that the monitoring and information-gathering functions of financial intermediaries may have been important in expanding firms' debt capacities.

Graham and Harvey (2001) used a comprehensive questionnaire, surveying 392 CFOs from different companies to analyze corporate financial practices in terms of capital costs, capital budgets, and capital structures. They had a response rate of 9%, obtaining 392 results. They identified aspects like investment opportunities, creditworthiness, debt, external debt, expiration, credit ratings, and debt ratios as variables. The results allowed them to identify aspects of corporate practice consistent with finance theory and others that are difficult to reconcile with business school standards. Their conclusions were as follows: capital structure choices are influenced by transactions costs; there are fundamental differences between large and small companies, suggesting that finance theory may be gaining ground faster among larger companies; tax advantages are more important for large companies; international debt issuances respond to a favorable tax treatment, especially for companies with great exposure abroad; companies are concerned about their credit ratings; and CFOs are concerned about earnings volatility related to debt decision-making. Their data showed that there were important differences in the composition of financing sources needed to generate a reduction in total costs.

1.3. Construct of capital structure

The principal components can be explained in WACC terms using different criteria for its calculation: an asset analysis according to market value; a beta estimation for companies not listed on the stock exchange; and consideration of fixed assets such that the cost of resources is reflected in the WACC. However, this concept is built with methodological biases conceived on the valuation of capital stock and subjective valuations. Thus, we can assume that the valuation of the capital structure alludes to irrational components that are conceived in terms of financial risk valuation. This is, in turn, associated with behavioral mechanisms based on perceptions of the environment. This assumption drives the present research work. We propose that the capital structure concept is formed by combined perceptions of behavioral, structural, and process variables formulated during the valuation of an optimal financial structure aiming to explain the multidimensional complex construct related to the capital structure of the CFOs' cognitive representation built from their traditional financial approach. In this construct, risk valuation is in line with environmental conditions.

The importance of this construct lies in its potential to reflect the values, attitudes, and beliefs of the CFOs, creating an opportunity to study capital structure from a behavioral cognitive approach, supplementary to the traditional direct behavioral method[5]. The traditional direct behavioral method assumes that the agents have limits to their self-control and are influenced by their own biases (e.g., social, cognitive, and emotional). However, the conventional study of behavioral finance has been based on the classic paradigm of behaviorism, which has its origins in the functionalist school and defends the use of strictly experimental procedures to study observable behavior as a set of stimulus-responses. Interested readers can consult the work of Torga, Barbosa, de Pádua Carrieri, Ferreira, and Yoshimatsu (2018).

2. METHODOLOGY

This study begins with the 44-item survey from Graham and Harvey (2001) and, after debugging, ends with a 30-item survey applied online to 31 Mexican CFOs. Therefore, we create an attitudinal measurement scale for measuring the cognitive representation of decision-makers.

Our study design is a technological – psychometric type with descriptive data analysis. The design of the scale starts with the questionnaire as an inventory of tested items. We proceed in two stages.

5 The main stream of the traditional direct behavioral method assume that the agents have limits to their self-control and are influenced by their own biases (social, cognitive and emotional aspects). In this sense, there are some direct methods, like simulated traded operations, that allow us to know how that biases influenced the decisions involved in the financial operations. Interested readers can consult the work of Martins Fittipaldi Torga, E. M., Vidal Barbosa, F., de Pádua Carrieri, A., Pérez Ferreira, B., & Hiromi Yoshimatsu, M. (2018). Behavioral finance and games: simulations in the academic environment. Revista Contabilidade & Finanças - USP, 29(77), 297–311.

During the first stage, we follow these steps:

1. *Instrument adaptation*. Spanish translation was made avoiding context errors. The questionnaire initially comprised 44 items grouped into seven components: capital cost, transaction cost, cash-flow adjustment, leverage ratio, international leverage ratio, leverage ratio control, and environment.

2. *Validity check of content*. The preliminary version was assessed by a group of academicians who provided suggestions in terms of grouping, parametrics, and wording of the items.

3. *Piloting*. The preliminary sample comprised 42 CFOs who agreed to participate in the study. By the end, 11 interviews that did not meet the defined selection criteria were discarded.

4. *Depuration*. A first debugging was completed, where items not loaded consistently were modified in terms of context and precision.

During the second stage, we followed these steps:

1. *Instrument assessment*. An exploratory factor analysis was conducted to eliminate or modify latent variables that did not meet the validity levels. The final instrument contained 30 items distributed among four latent variables.

2. *Refinement and application of the new instrument*. The optimized instrument was applied to the same group that participated in the piloting, and analysis was performed.

3. *Reliability*. Finally, we performed a reliability analysis. From this, we got an adequate scale that measured, in cognitive dimensions, the classic components of capital structure.

The features of the final questionnaire include the following: online questionnaire applied via the SurveyMonkey platform; 30 items; the implemented measurement scales of a continuous scalar, representing a continuum in a range from 1 to 100; and four sections (i.e., capital cost, political, social, and economic environments). Valuation of financial assets and company perception was assessed per clients, suppliers, and shareholders. In accordance with the scale design, the following approaches were defined: a descriptive-type approach to identify relevant aspects of the behavior of participants and the financial criterion; and an analytical approach as a first step toward identifying the dimensions associated with the proposed construct.

3. RESULTS AND DISCUSSION

3.1. First stage

3.1.1. Exploratory and descriptive analyses

The questionnaire, in its first phase, was answered by 42 CFOs from Mexican companies. A 100% response rate was obtained. However, of the total of respondents, only 31 answered all 44 items, representing a 70.5% completion rate. Of these, the gender distribution was 71% male and 29% female, following a natural drop. Regarding education, 19.35% had only a bachelor's degree, whereas the rest (80.65%) had completed postgraduate studies. The training areas were diverse, but the great majority (70.97%) was related to finance. Most respondents (48.28%) had a seniority range of 1-4 years, and many were in their positions for 9+ years.

3.1.2. Proposed dimensions

To establish and delimit the dimensions of the construct, indicators describing the traditional financial theory and capital structure (Graham & Harvey, 1999) were considered. Therefore, the following seven dimensions were initially considered:

- capital cost;
- transaction cost;
- cash-flow adjustment;
- leverage ratio;
- international leverage ratio;
- leverage ratio control;
- other factors (environment).

The applied questionnaire considered a continuous scalar measurement from 1 (Completely disagree/Never) to 100 (Fully agree/Always). To simplify the analysis, each item was assigned a number, as shown in Table 1 Intending to facilitate the analysis of the presented data, Table 1 contains a numerical equivalence with the items used in the investigation.

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Table 1. Items

Equivalence table	
No.	**Equivalence**
1	Average historical returns
2	Frequency of Profitability Index usage
3	Implementation of financial simulations
4	Capital cost according to the investors' decisions
5	We issue debt abroad according to the banking restrictions
6	We issue debt abroad according to the term
7	Capital cost according to the regulatory decisions
8	We issue debt abroad according to the interest rate
9	We issue debt abroad according to the credit lines' maximum amounts
10	We issue debt abroad according to the regulations that force to issue debts in other countries
11	We issue debt according to the feasibility of tax deduction
12	We issue debt according to the indebtedness level of other companies
13	We issue debt abroad according to the guarantee requirements
14	We issue debt according to the political risk
15	We issue debt according to the feasibility for the tax deduction
16	The atmosphere or the political environment intervene in the financial decision-making
17	The national economic environment intervenes in the financial decision-making of the company
18	We use the inflation criterion
19	The social environment intervenes in the financial decision-making within the company
20	Frequency of net present value usage
21	WE use the criterion of the company's value on the market
22	We issue debt according to the transaction cost
23	We issue short-term debt with the intention of minimizing the financial risk
24	A range is set for the debt ratio
25	We issue debt according to the company's transaction cost
26	We issue short-term debt according to the interest rates
27	We issue debt in order to have a better credit rating
28	Valuation of financial assets
29	Valuation of financial assets with calibration by risk factors
30	Frequency of internal rate of return usage
31	The political environment intervenes in the rotation of the senior positions of the company
32	We use the leverage ratio criterion
33	Frequency of the amortization usage
34	We limit the leverage ratio to increase the trust of the suppliers
35	We limit the leverage ratio so the future-projects profits can be captured by the shareholders in an efficient fashion
36	We limit the leverage ratio to increase the trust of our clients
37	We use the interest rate criterion

3.1.2.1. Exploratory factor analysis

Here, we present a factor analysis to determine which latent variables the items tend to charge higher in order to assess the validity of the scale. The rotated component matrix using the VARIMAX method enabled us to observe the relationships among variables, grouping them according to the most associated of each factor. The results are shown in Table 2. Items would show convergence validity if they were designed for the same theoretical dimension and charged highest in a single component.

Table 2. Rotated component matrix using the VARIMAX method. Cut level: 0.3

Rotated component matrix								
No.	**Component**							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	0.937							
2	0.925							
3	0.886							
4	0.872						–0.306	
5	0.859	VALU	0.368					
6	0.844		0.375					
7	0.828					0.312		
8	0.827		0.369					
9	0.804							
10	0.776							
11	0.750		0.449					
12	0.625					0.438		
13	0.613		0.392		0.444			
14	0.610	0.349			0.356			–0.360
15	0.512		0.412				0.425	
16		0.905						
17		0.887						
18		0.873						
19		0.803						0.318
20		0.544	0.458	0.407			0.328	
21		0.517	0.430			0.327		0.426
22			0.844	0.332				
23			0.795					
24	0.516		0.727					
25	0.515	0.383	0.709					
26	–0.309	0.386	0.663					0.406
27			0.574	0.335	0.347	0.388		
28				0.923				
29				0.919				
30				0.741	0.413		0.312	0.310
31					–0.830			
32				0.305	0.767			
33		–0.425			–0.646	–0.330		
34						0.906		
35					0.612	0.624		
36	0.448	0.541				0.571		
37							0.781	

Some items load with different factors. We wanted to obtain higher factorial loads, but we found some relevance. The first component clusters were items related to "capital cost." Consistently, when

valuating capital cost, various fund sources, such as indebtedness, were considered. Likewise, it is observed that political risk, tax impositions, and supply and demand for financing resources played an important role in cost valuation. Regarding the second component, "political, economic, and social environment," it is evident that this conjugation of variables concerns inflation, net present value (NPV), and company market value, especially with the utility and interference in the evaluation of long-term projects and the maximization of investment.

The third component clustered most of the variables related to the "criteria for debt issuance." The variable connected to tax deductions and the corresponding variable associated with the valuation of debt according to political risk were grouped in the first component and not in this one. This suggests that, during the valuation of capital cost, these two variables integrated the costs derived from loans, including interest payments and dividend obligations. The integration of variables suggests that debt valuation forms a core part of the construct by representing certain redundancies. This denotes a specific weight to the leverage ratio because of the chance that excess will trigger an event with negative consequences for the company (i.e., financial risk).

The fourth component clusters three variables associated with the "valuation of financial assets." It considers that the valuation of firm assets forms a latent variable reflecting the importance of investment analysis and capital budgeting. The internal rate of return (IRR), by indicating the annual percentage yield that the invested resources provide in a project, delivers valuable information in terms of profitability and, consequently, additional knowledge to the valuation of a company's assets. Ideally, the NPV rate is grouped into this component because of its relation to the evaluation of investment projects. In the final scale, this variable will be added.

The fifth component, called "perception of the company according to its leverage ratio," represents an inverse relation among the following variables: (–) political environment intervention into the rotation of senior positions at the company; (+) using the leverage ratio criterion; (–) frequency of amortization usage; and (+) limited leverage ratios enabling future project profits to be efficiently captured by shareholders.

The two variables with a positive factorial load connected to the leverage ratio have a direct relationship. However, there is an incongruence in terms of the rotation of senior positions. An inverse relationship between leverage ratio and unsophisticated analysis criteria (e.g., amortization) makes sense for the valuation of financial assets. This discrepancy was adjusted during the calibration and validation of the instrument.

The sixth component, called "perception of the company by clients, suppliers, and stockholders," shows that a firm's projection toward its closest stakeholders (e.g., clients, suppliers, and shareholders) comprises a clearly established latent variable that acts as a crucial factor in client decisions and supplier's leverage conditions. This ultimately enables differentiation in a competitive environment and the capture of value by shareholders.

In the seventh component, only the variable "we use the interest-rate criterion" revealed a significant factorial load. Because this variable did not cluster with at least two or more, it was dismissed and adjusted in the final scale. Finally, the eighth component did not produce high factorial loads at all. Therefore, it was dismissed from the final analysis.

3.1.2.2. Verification of the reliability

According to Kerlinger and Lee (2002), content validity is the "representativeness or sampling adequacy of the content – the substance, the matter, the topics – of a measuring instrument." Content validity is guided by the question: "is the substance or content of this measure representative of the content or the universe of content of the property being measured? For that matter, the questionnaire based its information on the validity of the verbal information about perceptions, feelings, attitudes, or behaviors conveyed by the survey respondent" (Arribas, 2004).

With the factor analysis, validation was sought via Cronbach's alpha and Guttman's lambdas. Cronbach's (1951) alpha allows one to quantify

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Table 3. Reliability tests of the first instrument (Scale 1).

Reliability analysis of the instrument			
Dimensions	Cronbach	Guttman	
	Alpha	Standardized alpha	Lambda 1
Component 1. Capital cost	0.822	0.776	0.685
Component 2. Political, economic and social environment	–0.153	–0.059	–115
Component 3. Criteria for the debt issuance	0.625	0.65	0.469
Component 4. Valuation of financial assets	0.827	0.846	0.708
Component 5. Perception of the company according to its leverage ratio	0.95	0.95	0.814
Component 6. Perception of the company by clients, suppliers and stockholders	0.799	0.807	0.639
Component 7. I use the interest rate criterion	0.725	0.771	0.543

the reliability of a measurement scale for the unobservable magnitude built from the N variables observed. The closer it is to its maximum value, 1, the greater the reliability of the scale. According to George and Mallery (2003), an alpha above 0.7 is acceptable; between 0.6 and 0.7 is questionable; between 0.5 and 0.6 is poor; and below 0.5 is unacceptable. Guttman's lambdas are a viable alternative for estimating the reliability of the scale. Particularly, Guttman's lambda 4 decreases as the sample size increases, indicating that it may be biased in those conditions (Benton, 2013).

Table 3 shows the results of Cronbach's alpha and Guttman's lambda 1 for each component established in the previous section. Components 2 and 3 do not yield levels that allow the researcher to determine the validity. Therefore, in the next stage of research, the components are redefined.

3.2. Second stage

3.2.1. Confirmatory factor analysis

Adjustments to the instrument were made based on the correspondence of the results collected with the theory. These allowed us to assume that the instrument was consistent with the financial practice and comments provided by some of the respondents who pointed to certain inconsistencies. The wording of the items was verified with the intent to validate their content, increase clarity, and eliminate redundancy. The adjustment is discussed in the next section.

Gómez (2001) argued that, to evaluate a firm's capital cost, implicit factors must be considered: degree of commercial and financial risk; tax impositions and taxation; and supply and demand for financing resources. Thus, during exploratory factor analysis, the variables grouped into Component 1, "capital cost," are consistent with the mentioned theory. However, everything seems to indicate that, at a construct level, there is no clear distinction between national and foreign leverage. Additionally, some respondents said that their financing sources were usually national and, where appropriate, they looked for other options because of the restrictions of domestic banks. Therefore, the corresponding items were regrouped to represent a general criterion for obtaining the financing.

The factor analysis showed that the perception and valuation of the political, economic, and social environments emerged as a well-differentiated component with a specific weight in the valuation of the capital structure. Therefore, we sought to confirm these factors during the second stage of research. The "valuation of financial assets" is assumed to be another key factor coinciding with the assessment of capital cost. Every financial asset has intrinsic theoretical value that depends on its ability to generate income and wealth for the company. Hence, valuation must be studied to find signs of future behavior. Checking this component is also part of the objective of the second stage.

Another component that was clearly differentiated corresponds to the "perception of the company by clients, suppliers, and shareholders." This component will be verified via the second version of the instrument. The fifth component, obtained from exploratory factor analysis, was dismissed, because the grouped variables were redundant in relation to other latent variables. Components that did not reach the required reliability and validity levels were eliminated. During this second stage,

it was proposed that the construct of the capital structure be composed of four dimensions, as is indicated further.

1. Capital cost (via the interaction of 11 variables).

2. Political, economic, and social environment (via the interaction of 5 variables).

3. Valuation of financial assets (via the interaction of 4 variables).

4. Perception of the company by clients, suppliers, and shareholders (via the interaction of 3 variables).

This leads to the refinement of the scale, whose features are explained as follows:

- number of latent variables: 4;
- number of questions: 30;
- measurement scale: continuous scalar;
- application mode: online.

The sample to which the new version of the scale was applied involved 30 of 31 original participants from the first phase.

3.2.2. Reliability of the second version of the scale

Unlike the first stage, here, we decided to first verify the reliability of the scale after refinement. Suitability of the items, coherence with scale, and sufficiency of each dimension were appraised. The results are shown in Table 4, where the coefficient Guttman's lambda 3 matches Cronbach's alpha. The latter turns out to be a better alternative in relation to Cronbach's alpha, when it comes to a small sample size and/or many questions (Callender & Osburn, 1979). Accordingly, the reliability of the instrument can be confirmed.

3.2.3. Convergent discriminant validity analysis

A rotated component matrix was obtained using the VARIMAX method. The following assumptions were thus established.

1. For Factor 1 (capital cost), it is presumed that, at a construct level, the evaluation of capital cost contains a strong component related to the projection of the company toward its environment, which impacts the procedural bias during the analysis of the capital structure.

2. For Factor 2 (transaction cost), the NPV represents a fundamental tool for assessing the investment projects. This method's analysis of the time series for obtaining cash flows considers the time value of money, or discount rate, in a way when cash-flow increases, NPV increases. This could be a consequence of inflation. Therefore, at a construct level, the environmental perception produces another procedural bias that, in this case, involves the NPV technique within Dimension 2.

3. For Factor 3 (valuation of financial assets), we can appreciate the redundancy of the NPV variable but with certain variables that make us understand the importance of the long-term valuation of investment projects. According to Stephen et al. (2012), when evaluating financial assets, the deployment of absolute valuation models (e.g., NPV) is necessary to determine the estimated value of the future of projected flows. Consequently, with the valuation of the financial assets corresponding to Factor 3, the interaction with the NPV variable is important.

4. For Factor 4 (leverage ratio), we notice the interaction of variables related to the perception of the company at three different levels: clients,

Table 4. Reliability tests for the second instrument

Component	Reliability analysis to the items of the second version of the scale			
	Corresponding dimension	Cronbach	Guttman	
		Alpha	Lambda 3	Lambda 4
1	Capital cost	0.956	0.956	0.883
2	Political, economic and social environments	0.939	0.939	0.886
3	Valuation of the financial assets	0.888	0.888	0.828
4	Perception of the Company by clients, suppliers and shareholders	0.728	0.728	0.713

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suppliers, and shareholders. This is important, because the projection of a firm toward the environment cannot be explained without the interaction of these main groups.

Table 5 shows the results acquired through the VARIMAX type rotation, in which the presence of the four factors (i.e., dimensions), established in the refined scale, can be confirmed with the previously mentioned redundancy of the variable. Note that the variable "Frequency of NPV usage" presents important factorial loads in two different dimensions (Table 5).

Table 5. Rotated component matrix with the VARIMAX method. Cut level: 0.3

Rotated component matrix (VARIMAX)				
No.	Component			
	1	2	3	4
5	0.936			
2	0.929			
1	0.928			
6	0.923			
3	0.911			
4	0.854			
10	0.785	0.336		
7	0.747			0.336
8	0.664			
14	0.654	0.375		0.422
9	0.653	0.325		
36	0.636			
21		0.928		
18		0.895		
17		0.882		
16		0.852		
19		0.834	–0.318	
20		0.611	0.594	–0.321
29			0.915	
30			0.896	
28			0.886	
35	0.368			0.782
36				0.758
34				0.844

The redundancy of the NPV variable makes sense in both dimensions. First, at the construct level, there is strong differentiation with some external components (e.g., economic, political, and social environments) interfering with the valuation of investment projects. The interaction with inflation criteria assumes CFOs concerns about the value of money over time. We can assume that, at the cognitive level, the CFO's are concerned about the future value of the money but, particularly, in the inflation generation processes that, naturally, are involved in the aforementioned environments.

However, the interaction between NPV and the variables conforming to the main criteria for their calculation (i.e., valuation of financial assets, risk factors, and IRR) allows us to suppose that, at a cognitive level, there are clear differences that presuppose the integration of the NPV model in terms of confirming variables. This is relevant because, according to these results, we see that, at the construct level, there is an evident differentiation between "exogenous factors" influencing the valuation of investment projects and the "mathematical basic model" for calculating NPV. If, as indicated by the results, when the CFOs consider both criteria during decision-making, they incur procedural biases according to their perceptions of the environment.

CONCLUSION

This work presented the first approximation of a confirmed financial theory at a construct level for a new approach toward comprehending cognitive biases involved in corporate financial decision-making about capital structure. The birth of behavioral finance was a result of the recognition of the importance of measuring human behavior as a factor with transcendental implications for financial decisions. Thus, most behavioral finance research has focused on directly observable behaviors. However, the item response theory provides a consolidated method for disciplines that commonly work with cognitive variables. Thus, from the results, we presented a good alternative. It is important to accept new knowledge opportunities for corporate decision-making to account for the subjective visions of CFOs.

To establish the validity of the capital structure construct, we presented a new instrument. The reliability and validity of the instrument were supported by the analysis and the refined review. The level of the sample confirmed its predictive scope. Thus, the instrument reflects the elements comprising the capital structure. In this sense, it is interesting to observe how the classic measure of capital structural components can explain CFOs' perceptions of decision-making. The results of the investigation are encouraging because we confirmed a theory of capital structure at a construct level. The consistency of the results and the reliability levels achieved show that the theory is well-represented for the given dimensions. Beyond that, there is relevant evidence that, at a construct level, CFOs assume different postures according to internal and external factors that can lead to methodological biases in decision-making. This is the case for the redundant NPV variable and the dimensions, where it interacts with the same purpose for the valuation of investment projects. However, it does so at different cognitive levels. Further research is now needed to use larger samples to better confirm the construct and the dimensions comprising the established theory.

Interpreting the theory of capital structure at a construct level provides a valuable opportunity to confront this approach with the classical approaches in corporate financial theory. We propose that the application of the item response theory to the field of behavioral finance could open up interesting new avenues to the study of cognitive biases involved in the financial decision-making process. This implies that behavioral finance can also be treated as "cognitive finance." Therefore, in this work, we propose the degree of use of the elements in the capital structure as a cognitive construct comprising four dimensions (capital cost, transaction cost, valuation of financial assets, and leverage ratio). Furthermore, we present the development of a measurement scale to assess the use of the elements of the capital structure by a financial agent (e.g., the CFO) in a given firm.

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