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DOES MANAGERIAL EMOTIONAL BIASES AFFECT DEBT MATURITY PREFERENCE? BAYESIAN NETWORK METHOD: EVIDENCE FROM TUNISIA

AZOUZI Mohamed Ali[1]† --- JARBOUI Anis[2]
[1]*Assistant Professor in Finance and Accounting Methods Higher Institute of Business Administration (ISAAS) University of Sfax, Tunisia*
[2]*Doctor and HDR financial and accounting Associate Professor of Universities Higher Institute of Business Administration (ISAAS) University of Sfax, Tunisia*

ABSTRACT

This study documents that managerial characteristics' play an important role in determining corporate debt maturity. Specifically, we focus on the relationship between the managerial biases and firm debt maturity preference. Empirical analysis of the relationship between emotional bias and debt maturity using Bayesian Network Method. We distributed a questionnaire among 100 Tunisian managers to measure their emotional biases. Our results have revealed that the behavioral analysis of debt maturity preference implies leader affected by behavioral biases (optimism, loss aversion, and overconfidence) presence prefer long term debt maturity allowing this protect against the takeover operation Russianness.

Keywords: Emotional biases, Debt maturity, Behavioral corporate finance, Bayesian network, Managerial characteristics.

JEL Classification: G14, G31, G32, D80.

Contribution/ Originality

The paper pushing organizations managers to choose according to their emotional level (applied emotional capacity test up psychometric testing). In addition, it increases the validity of inferences from the research. This paper incites governments to establish training programs aimed at the development of learning of emotional capacity.

1. INTRODUCTION

In most cases, the decision is complex because, in addition to the difficulty of choosing an alternative from a multitude of alternatives, the decision maker often faces the uncertainty of actions whose results are very imperfectly known at the time of choice. Managers must make daily choices related to the definition of sectors and business strategy, monitoring market investments or equipment, supply management and inventory management of financial risks, industrial or environmental, employment, and the launch of new products.

† Corresponding author

Moreover, the nature of the objectives pursued by the leaders can be broken between search security or durability and a desire for growth and acceptance of risk which cannot remain without consequence also their behavior in terms of investment and funding (Julien and Marchesnay, 1987).

In recent decades, a significant amount of research in finance, both theoretical and empirical focused on the psychology of leadership and its impact on the process of decision making. These studies have contributed to the understanding of certain behavioral biases that affect the decisions made by leaders namely through loss aversion in the case of financing choices and investment (Kahneman *et al*., 1991; Stulz, 1996; Zhang, 1997; Helliar *et al*., 2005).

Many contemporary researches in behavioral corporate finance have stressed the importance of the personal equation and objectives of the leaders in explaining corporate finance structure. This theories have illuminated how biases like overconfidence and optimism can affect various corporate decisions (Bernardo and Welch, 2001; Heaton, 2002; Goel and Thakor, 2008).

Recent papers there are findings on managerial fixed effects (Bertrand and Schoar, 2003) on managerial overconfidence proxies relating to firm behavior (Malmendier and Tate, 2005; 2008) and on Chief Executive Officer (CEO) characteristics in private equity firms being related to outcome success (Kaplan *et al*., 2010).

In this context, research in finance, both theoretical and empirical have focused on the psychology of leadership and its impact on the process of decision decisions. These studies have contributed to the understanding or even explaining some decisions by behavioral arguments (Malmendier and Tate, 2005; Lin *et al*., 2007; Azouzi and Jarboui, 2012). Malmendier and Tate (2005) find that CEOs who are optimistic regarding their firm's future performance have greater sensitivity to investment cash flow leading to distortions in investment. Also, Lin *et al*. (2007) show in more financing constrained firms, optimistic managers exhibit higher investment cash flow sensitivity than do non-optimistic managers.

Bison by these studies, on our article examines the possible influence of three closely related emotional biases, which are extensively documented in behavioral research, loss aversion, optimism and overconfidence, on a firm's debt characteristics' choice. More specifically, it examines the links between emotional biases and firm debt maturity preference.

2. HYPOTHESIS DEVELOPMENT

Research related to CEO financing choices have focused on the debt level of analysis and that all debt is homogeneous (Harris and Raviv (1991)). However, as part of a credit report, companies are able to set their preferences regarding debt maturity, level and nature.

It is not yet well understood to what extent firms manage the rollover dates of their bonds by spreading out maturities. Fixed cost components of bond issues and secondary market liquidity considerations should motivate firms to concentrate their debt in a single or few issues.

Static Trade-off Theory (STT) and Pecking Order Theory (POT) is the body of theory of reference that addressed the issue of the firm financial structure choice (Ross, 1977; Jalilvand and Harris, 1984; Myers, 1984; Stulz, 1990; Titman and Wessels, 1998; Graham, 2000; Booth *et al*., 2001; Azouzi and Jarboui, 2012). These approaches argue that firms tend to choose between financial methods based on agency costs (STT) and / or asymmetric information (POT) between leader- shareholders and creditors (Myers and Majluf, 1984; Myers, 1984; Fama and French, 2002; Bushman *et al*., 2004; Antoniou *et al*., 2007; Frank and Goyal, 2007; Huang and Ritter, 2009; Graham *et al*., 2013).

Thus, the choice of debt maturity is explained by the costs of agency debt in the long term, by choosing a reported debt in the short term, the share leader in the capital and the duration its place the head of his company. However, even non-financial firms frequently have several bonds outstanding, with different times to maturity. However, despite the contributions of these approaches in the analysis of financial policy corporate several decisions remain misunderstood. In this sense, several authors have updated the old idea that emotions have an adaptive role. Emotions are necessary for the operation of many of our faculties, such as memory, reasoning, decision making or social adjustment. Only recently has a smaller number of analyses emerged focusing the leader cognitive biases themselves and trying to understand how they can affect their investment and financing decisions (Hawkins *et al*., 2001; Baker *et al*., 2004; Hackbarth, 2009; Ho and Chang, 2009; Malmendier *et al*., 2010; Azouzi and Jarboui, 2012).

We investigate the influence of managerial bias (loss aversion, optimism and overconfidence) about corporate debt maturity choice.

2.1. Optimism and Debt Maturity

CEO optimism and overconfidence have been shown theoretically and empirically to explain important corporate decisions, including investment, financing, and dividends (Bernardo and Welch, 2001; Heaton, 2002; Goel and Thakor, 2008; Hackbarth, 2009; Ho and Chang, 2009; Malmendier *et al*., 2010; Azouzi and Jarboui, 2012).

Hackbarth (2009) argue that managers are optimistic more likely to excel in tournaments and can be promoted to senior positions. This leader optimistic with its firm growth opportunities uses its decisional leverage to improve its reputation on the labor market. He opts for long-term debt indicating the convergence of its interests with those of shareholders. This implies a positive correlation between CEO optimism level and firm long-term debt choice.

Menkhoff and Nikiforow (2009) show that the knowledge of behavioral biases changes the way the managers perceive the markets, but not the way they see themselves. Optimistic leader is aware that his company is undervalued by the market. It therefore seeks to limit its reliance on external financing modes whose debt. However, if insufisance internal financing mode it chose not risky debt (short-term) first then risky debt (long-term debt), and finally the capital increase

(Heaton, 2002; Malmendier and Tate, 2005). This implies that the optimistic manager seeks to reduce the debt maturity.

Malmendier *et al.* (2010) also show that leaders optimistic are able to take risky decision, and find that overconfident CEOs take on more debt. This optimistic leader underestimates its firm total risk. It tends to preferred of long-term debt positively correlated with firm value increase. The choice of debt maturity level improves mutual trust between manager and shareholders. The establishment of a trust environment increase CEO freedom rate and enhances its reputation on the labor market. This implies the presence of a positive correlation between firm maturity debt and leader optimism level.

Hirshleifer (1993) shows that managers invest in short-term projects to generate a positive cash flow, increase their income and their managerial reputation on the labor market. This leader opts for choice related to the duration of his Monday. Optimistic leader kept his place at the head of his company opts for long-term financial policy which long term debts choice. This implies a positive correlation between optimism and debt maturity.

Azouzi and Jarboui (2012) find that the find that the analysis of managerial decisions (financing and investment) within the behavioral approach is consistent with the financial Organizational theory. In other word, the optimistic leader uses his decisional power to converge with the interest of shareholders and ensure its place at the head of the management team. This prediction in Tunisian context implies that optimistic leader adjusted its firm maturity according to their confidence kept its place at the head of his company.

H1: Optimistic leader accepts level of maturity debt greater than rational leader

2.2. Loss Aversion and Debt Maturity

Psychological studies document that loss aversion causes people to overestimate risk, be more uncertain about forecasts and opt for making it safer to limit the likelihood of his removal (Bertrand and Mullainathan, 2003; Baker *et al.*, 2007; Azouzi and Jarboui, 2012).

Adams *et al.* (2005) also show that in firms where CEOs are powerful and dominate most major decisions, the risk arising from judgment errors is not well-diversified, resulting in more extreme decisions and higher variance of firm performance. This shower head to risk of loss of earnings or reputation seeks to limit the potential loss by choosing low-risk decisions including short-term debt choice. This implies negative correlation between CEO loss aversion level and firm debt maturity choice.

Baker *et al.* (2007) shows that loss aversion causes CEO to overestimate its firm total risk. This overestimation of the risk of the business leader impulse decision to choose less risky. He prefers the short-term debt low risk compared to long term. This implies a positive correlation between CEO loss aversion level and firm short-term debt level.

Nosic and Weber (2008) have shown the importance of perception yields and risk officer in explaining these choices. Indeed a leader who undervalued the capacity of its business to generate

future revenues is encouraged to undertake choices consistent with shareholder interest. He opted for policies and strategies converge with the interests of major shareholders with long term debt. This implies a positive correlation between CEO loss aversion level and firm short-term debt level.

Chang *et al.* (2009) argue that the stock price variation affects the firm capital structure composition. This explains the limited use of the leaders (loss aversion) in equity financing. He opts for long term risky debt reporting the performance of its business (able to comply with the commitments of long-term debt). This choice of risky financing improves the evaluation of its business in the market and increases its reputation on the labor market.

H2: Loss aversion leader accepts level of maturity debt greater than rational leader

2.3. Overconfidence and Debt Maturity

The human tendency to be overconfident has been widely documented in psychology and has become a central feature in economics and behavioral finance (Heaton, 2002; Malmendier and Tate, 2005; Ben-David *et al.*, 2007; Hackbarth, 2009; Landier and Thesmar, 2009; Malmendier *et al.*, 2010; Azouzi and Jarboui, 2012). Many facets of overconfidence have been examined through the tendency to overestimate our own knowledge (in particular in miscalibration studies), our abilities compared to others (better-than-average effect), or the degree to which we control future events.

Landier and Thesmar (2009) explored the impacts of overconfidence and/or optimistic entrepreneur on financial contracting and corporate performance and found that optimistic entrepreneur tend to make decisions under-reacting the negative information. So, CEO overconfidence debt maturity choice is a reaction to undervaluation. It uses long-term debt reported to the performance of its business and corrected firm market valuation.

Malmendier *et al.* (2010) argue that overconfident managers perceive their firms to be undervalued. To correct this undervaluation leader opts decisions by indicating the performance of its business, the choice of long term debt. This choice of risky financing improves the evaluation of its business in the market and increases its reputation on the labor market. This implies positive correlation between CEO overconfidence level and firm debt maturity choice.

Goel and Thakor (2008) find that excessively overconfident CEOs invest less in information reception and jeopardize the stakeholders. This implies that the CEO overconfident of their personal abilities opts for diverging choice with shareholders' interests. The diminution of his loss aversion level he impulse to choose risky decisions and negatively correlated with creation value objective (expensive), the choice of risky debt in the long term. This implies positive correlation between CEO overconfidence level and firm debt maturity choice.

Ben-David *et al.* (2010) suggest that overconfident managers will either tend to underestimate the volatility of their firms' future cash flows or overweight their private signals relative to public information. This firm risk probability underestimation impulse CEO

overconfident to undertake risky policy, the choice of high debt maturity. This implies positive correlation between CEO overconfidence level and firm debt maturity choice.

H3: overconfidence leader accepts level of maturity debt greater than rational leader.

3. RESEARCH METHOD

3.1. Data

To note, the empirical tests are based on 100 non-financial Tunisian firms during the 2010 fiscal year (28 are listed companies and 82 are non-listed companies, see Table 1). All financial firms (including banks) outing to the fact that this business sector is regulated and likely to have fundamentally different cash flows and characteristics. Firms with insufficient data regarding about emotional characteristics and the board of director's composition are also excluded. The board's compositions, as well as financial characteristics data, are gathered from the BVMT annual report.

Emotional and psychological characteristics are collected by means of an administered questionnaire. Actually, the selected choice deals with some homogeneous individuals representing some Tunisian CEO representatives of 100 firms (60 males, 35 females, 5 unreported), ranging in age from 25 to 58 (Table 2).

Table-1. Visited Companies

Initial BVMT sample for 2010	50
Financial firms	(22)
Other non financial firms	120
Insufficient data to emotional intelligence	(40)
Insufficient data to board of directors compositions	(8)
Final sample	100

Source: BVMT

Most questionnaires have been distributed by the method of door to door to ensure they are personally delivered to the person concerned; few among them have been mailed, for businesses located outside the Greater Tunis area.

It is worth noting, however, a broader sample that even if it had been envisaged to be studied and that more than 100 questionnaires had been distributed for this purpose, we would have received far fewer responses than expected (return rate 44.84 per cent: although the number of distributed questionnaires reached 223, the responses received did not exceeded 100 CEO).

Table-2.CEOs' characteristics

	n	Percentages
Age		
25-30 years	5	5%
31-40 years	20	20%
40-49 years	35	35%
Over 50 years	40	40%
Gender/sex		
Males	60	60%
females	35	35%
Unreported	5	5%
Degree		
Baccalaureate	15	15%
Bac + 2	20	20%
Bac + 4	30	30%
DAS/HDSS	35	35%

Indeed, many of the adduced have refused to respond to our questions on the ground of several reasons, namely, that:

- They are too busy and have no time to devote to research;
- they generally do not pay any interest to the questionnaires submitted by students and would return them to their assistants or other staff for a response (this has been the case of our officer-centered research); and
- They perceive that the questionnaire is a sort of "control" damage to their private lives and that it is out of the question to answer.

Other encountered difficulties are mainly due to the administrative procedures and hierarchical procedures which linger questionnaires to the recoveries. Fortunately, the leaders who had been so kind as to cooperate and help us formulate and set up our sample eventually composed of 100 private company leaders, belonging mostly to the industrial sector.

3.2. Variables' Measurement

The objective of this section is to determine the variables' measurement.

3.2.1. Debt Maturity

The deadline is the measure most famous of the life of the debt that is the time between the date of possession of the borrowing and repayment. Debts are classified according to the three following periods: one year at most, one year and five years and more than five years. For our part, we consider bank debt long-term (or more logically medium and long term), any debt granted to a credit institution having a period of payment over a year. We propose to use in our study the ratio of long-term debt term total debt as a measure of the dependent variable. The amount of debt reported long-term to total debt and total assets not to separate the decision of the debt maturity and the decision of leverage.

DMAT= Long Term Debet/Total Debet

This measured is used by Scherr and Hulbert (2001); Barclay and Smith (1995) and Gueney and Paudyal (2003)

3.2.2. Emotional Bias

The questionnaire focuses on evaluating and scoring of the three emotional biases (risk aversion, optimism and overconfidence). The questions have been inspired from the questionnaires formulated by the Fern Hill and Industrial Alliance companies (Table 3).

The emotional bias takes 2 follows:

• 1 if the individual has a high level for each bias.

• 0 if not.

3.2.3. Investment Decision

The purpose of this article is to show the impact of emotions on the firms' investment decision

(Investment nature, level and horizon). The appropriate measures in the literature to evaluate investment decision are:

3.2.3.1. Assets Specificity

In our study, we will use the degree of assets intangibility as a proxy of the specific investments. The degree of assets intangibility can be appreciated on many levels. The France Bank and Ministry of

Industry in studies devoted to the development of intangible investments in France has used the ratio often intangible / tangible assets. In Tunisia, as in France, the intangible asset accounting record comes from the capitalization of such expenses. However, the unavailability of information legitimizes the use of the amount of intangible assets is presented in the balance sheet although this amount is usually surrounded by doubt as the result of discretionary choices performed by the leaders. Akin to the French context, the measurement of intangible capital in the Tunisian context has the same problems, which leads us to adopt accounting. Based on that discussion and the availability of data of Tunisian companies we offer the following indicator of the degree of activation of intangible expenses:

Asset Specificity Rate (ASR) = Intangible Assets / Asset Accounting.

This measured is used by Cazavan-Jeny (2004); Moussu and Thibierge (1997); Thibierge (2001) etc.

Table-3. Items used in the emotional biases scale (14 items)

Items	Factor 1: loss aversion 50.710 % of total variance	Factor 2: optimism 29.450 % of total variance	Factor 3: overconfidence 10.275 % of total variance	Factor 4: cognitive flexibility 5.385 % of total variance
1. What is your propensity to take financial risks with respect to others?	0.802			
2. With a great financial decision, what do you care about more: possible losses or possible gains?	0.742			
3. Insurance can protect us against a wide variety of risks: theft, fire, accidents, illness and death... How many insurance subscriptions have you subscribed to?	0.713			
4. When you think of the word "risk" in a financial context, what term in the following list first comes to mind?	0.686			
5. When I'm faced with a challenge, I give up because I'm afraid of failure.	0.600			
6. What emotional effect do important decisions have on you once they are taken?		0.857		
7. I am motivated by imagining the successful decisions positive results of entrepreneurial tasks		0.851		
8. Do you consider that degree of uncertainty is the business environment is		0.842		
9. I know how to most control my emotions.			0.774	
10. For how long do you reckon to keep your position in your firm?			0.715	
11. How confident are you in your ability to take good financial decisions?			0.641	
12. How easily do you adapt yourself to deterioration of your financial situation?				0.862
13. Your reaction regarding changes in your firm environment is:				0.862
14. In a job search would you rather seek:				0.789

3.2.3.2. Investment Level

In this study, we will use the presence of free cash flow and growth opportunities as two indicators of over-investment (low Future investment opportunities and free cash flow) or underinvestment (low free cash flow and Future investment opportunities). The literature differs on how to measure the free cash flow as conceptualized by Jensen (1986). In general, however, it is defined as operating income before depreciation interest expense and taxes, as well as dividends paid

(Lehn and Poulsen, 1989; Gul and Tsui, 1998; Jaggi and Gul, 1999) divided by book value of total assets to account for effects related to size (Lang *et al.*, 1991).

Free Cash Flow Rate (FCFR) = Operating Profit / Total Assets.

Future investment opportunities are measured by Tobin's Q (Skinner, 1993). Tobin's Q is defined as the ratio of market value of a firm to the replacement value of its assets (Griliches, 1981; Lindenberg and Ross, 1981; Cockburn and Griliches, 1988; Megna and Klock, 1993; Skinner, 1993). A Tobin's Q greater than one then the company has signed a profitable investment opportunities and vice versa. In our study, we will retain an approximation of Tobin's Q, calculated as follows (Chung and Pruitt, 1994):

$$Q_{it} \cong \frac{MVS_{it} + D_{it}}{A_{it}}$$

MVS – market value of common and preferred shares; D – book value of debt, defined as current liabilities plus long-term debt plus inventories minus current assets; A – total assets.

3.2.3.3. Investment Horizon

Referring to the theory of agency leaders has an obligation of result on short horizons. Their wealth is tied to the performance of the firm during the duration of their mission is the period during which they run the firm. These leaders prefer investment projects in the short term to quickly reveal the performance of these investments and reduce uncertainty about their own value on the labor market.

In our study we will use the rate of investment operations (industrial and commercial assets) as an indicator of the investment horizon.

Capital Expenditure Rate (CER) = operating assets / Total assets

This measured is used by Cliche (2000); Gervais *et al.* (2002); Malmendier and Tate (2005); Chang *et al.* (2009); Draief (2010) etc.

The investment decision takes 9 follows:

- 1 if the manager chooses investment specific: positive variation in the rate of assets specificity.
- 2 if the manager chooses overinvestment: low future investment opportunities and free cash flow
- 3 if the manager chooses underinvestment: low free cash flow and future investment opportunities.

• 4 if the manager chooses long-term investment: negative variation in the rate of capital expenditure

• 5 if the manager chooses short-term investments: positive variation in the rate of capital expenditure.

• 6 if the manager chooses (overinvestment+ long-term investment): negative variation in the rate of capital expenditure, low future investment opportunities and free cash flow.

• 7 if the manager chooses (underinvestment+ short-term investments): positive variation in the rate of capital expenditure, low free cash flow and future investment opportunities.

• 8 if the manager chooses (specific investment+ overinvestment + long-term investment): positive variation in the rate of assets specificity, negative variation in the rate of capital expenditure, low future investment opportunities and free cash flow.

• 9 if the manager chooses specific investment+ underinvestment + long-term investment): positive variation in the rate of assets specificity, low free cash flow, future investment opportunities and negative variation in the rate of capital expenditure.

3.2.4. Dividend Policy

The variable used to measure dividends level is the distribution rate (Rozeff, 1982; Agrawal and Jayaraman, 1994). The advantage of the distribution rate is the information that is in terms of retention of earnings and, therefore, whether the flow (the retention rate is equal to 100 in the payout ratio).

Payout ratio = Dividend per share / earnings per share

3.2.5. Control Variables

Static trade-off theory (STT) and pecking order theory (POT) is the body of theory of reference that addressed the issue of the financial structure of the firm. The factors that explain the financial structure are mainly at the cost, size, level of risk, growth opportunities, the structure of assets and business (Rajan and Zingales, 1995; Booth *et al.*, 2001; Dufour and Molay, 2010).

We include in our model three control variables that explain the effectiveness of choice of financial structure of the company. These variables are proxies for profitability, firm size and growth opportunities.

3.2.5.1. Profitability

More profitable firms have, ceteris paribus, more internally generated resources to fund new investments. If their managers follow a pecking order, they will be less likely to seek external financing (Fama and French, 2002). Thus, on average, these firms' leverage ratios will be lower. In trade-off models, on the other hand, this relationship is inverted. More profitable firms are less subject to bankruptcy risks, ceteris paribus. Hence, their expected bankruptcy costs are reduced

and they can make more use of the tax shields provided by debt, thus choosing a position of greater leverage. We will keep the ratio of return on assets ROA to measure this variable:

ROA= Earnings before interest, tax, depreciation divided by total assets, lagged one year period.

3.2.5.2. Firm Size

Studies suggest that the probability of bankruptcy is lower in larger firms and that, therefore, their debt capacity is higher than that of smaller ones, all else equal. On the other hand, fixed transaction costs can make new stock issues unattractive to small corporations, stimulating them to issue debt (Rajan and Zingales, 1995; Hovakimian *et al.*, 2004; Dufour and Molay, 2010). Indeed, most studies have applied total assets or turnover as a measure for firm size (Bujadi and Richardson, 1997). In this paper, it is measured through the log of the firm's total assets (LNSIZE).

MVS – market value of common and preferred shares; D – book value of debt, defined as current liabilities plus long-term debt plus inventories minus current assets; A – total assets.

3.2.5.3. Board of Directors

To note, theories regarding the board of directors, along with prior empirical researches and various recommendations have suggested that some board characteristics have an influence on the quality of the financial report and on firms' performance. Board characteristics are examined here:, independence (Fama and Jensen, 1983).

The board's independence

The different characteristics pertaining to the board's independence are measured by the following variable: BIND is defined as the percentage of the board members who are simultaneously independent and non-executives which is equal to the number of outside directors divided by the total board members (Forker, 1992; Wright, 1996; Haniffa and Cooke, 2000; Chtourou *et al.*, 2001).

BIND = number of outside directors /total board members.

Table 4 presents the characteristics of boards of directors of the 100 Tunisian companies included in our study. Tunisian companies are run by independent boards, medium (seven directors) and not dominated by CEOs.

Table-4. Board of Directors' Characteristics

Variables	Mean	Std	Min	Max	N
Entire Board	7.60	2.56	4	12	100
Outside Directors	2.62	1.11	1	4	100
Affiliated Directors	1.98	0.80	1	3	100
Inside Directors	3.360	1.34	1	5	100
CEO Duality	0.26	0.44	0	1	100

For simplification purposes, the summary of each variable extent range in the model, its name as well as its expected impact on the firm assets specificity choice are depicted in Table 3.

Table-5. Operational definitions of variables

Class :	Phenomena :	Mesure :	Variables :	Predictions :		
						Endogens variables :
Debet maturity	Debt deadline	DMAT= Long Term Debet/Total Debet				DM
						Exogenous variables :
				Short Term	Medium	Long-Term
Optimism	Directors overestimate capacity of their firms	The questionnaire obtained score	OP	-	+	+
Lost aversion	Loss rumination and reputation	The questionnaire obtained score	LA	+	+	-
overconfidence	Directors overestimate their personal competences	The questionnaire obtained score	OVER	+	+	+
Investment decision	Assets specificity	Asset Specificity Rate (ASR) = intangible assets / asset accoun ting.	AS	-	+	+
	Investment level	Free Cash Flow Rate (FCFR) = Operating profit / total assets. and $Q_{it} \cong \frac{MVS_{it} + D_{it}}{A_{it}}$	INL	-	+	+
	Investment horizon	Capital Expenditure Rate (CER) = operating a ssets / Total assets	INH	+	+	+
Dividend Policy	The presence of a dividend policy	Payout ratio = Dividend per share / earnings per share If the payout ratio <0 or> 0: yes: presence of a policy of dividend distribution. If the payout ratio = 0: no, absenc e of a policy of dividend distribution	DV	+	-	-
						Controls variables:

Profitability	Reports on the company's ability to meet its commitments	ROA= Earnings before interest, tax, depreciation divided by total assets, lagged one year period	PF	-	+	+
Firm size	Firms signaled performance	Ln (total assets)	LNSIZE	+	+	+
Board Of Directors	The presence of independent members in the board	Number of outside directors /total board Members.	BIND	+	-	-

3.3. Bayesian Network Method

The definition of a Bayesian network can be found in many versions, but the basic form (Pearl, 1986) is stated as follows: a Bayesian network is a directed probability graph, connecting the relative variables with arcs, and this kind of connection expresses the conditional dependence between the variables. The formal definition follows.

A Bayesian network is defined as the set of (D, S, and P), where:

(1) D is a set of variables (or nodes): in our case it consists of investment cash flow sensitivity, optimism, loss aversion, overconfidence, profitability, firm size and future investment opportunities.

(2) S is a set of conditional probability distributions (CPD). S = {p (D /Parents (D) / D ∈ D), Parents (D) ⊂ D stands for all the parent nodes for D, p (D/Parents (D) is the conditional distribution of variable D.

(3) P is a set of marginal probability distributions. P = {p (D) / D ∈ D} stands for the probability distribution of variable D.

In the Bayesian network, variables are used to express the events or objects. The problem could be modeled with the behavior of these variables. In general, we first calculate (or determine from expert experience) the probability distribution of each variable and the conditional probability distribution between them. Then from these distributions we can obtain the joint distributions of these variables.

Finally, some deductions can be developed for some variables of interest using some other known variables.

3.3.1. Define Network Variables and Values

The first step in building a Bayesian network expert is to list the variables recursively, starting from the target variable to the causes. In this order we present the variables in the table below:

Table-6. The network variables and their values

Variables	Type
Debt maturity	Discret [1 ; 2 ; 3]
Investment decision	Discret [1 ; 2 ;3 ;4 ;5 ;6 ;7 ;8 ;9]
Dividend Policy	Discret : YES/NO
Optimism	Discret : YES/NO
Loss aversion	Discret : YES/NO
overconfidence	Discret : YES/NO
Profitability	Discret : YES/NO
Firm size	Discret [1 ; 2 ; 3]
Future investment opportunities	Discret : YES/NO
Board Independence	Discret : YES/NO

3.3.2. Graphical Model

The second step of Bayesian network the construction is to express the relationships between variables. The BayesiaLab learning of Bayesian network by taking the database as a discrete entry process without sampling data. The Bayesian network constructed is the result for the total database. According to the data that we have received through the questionnaire, we have established relationships following graph (Fig. 1).

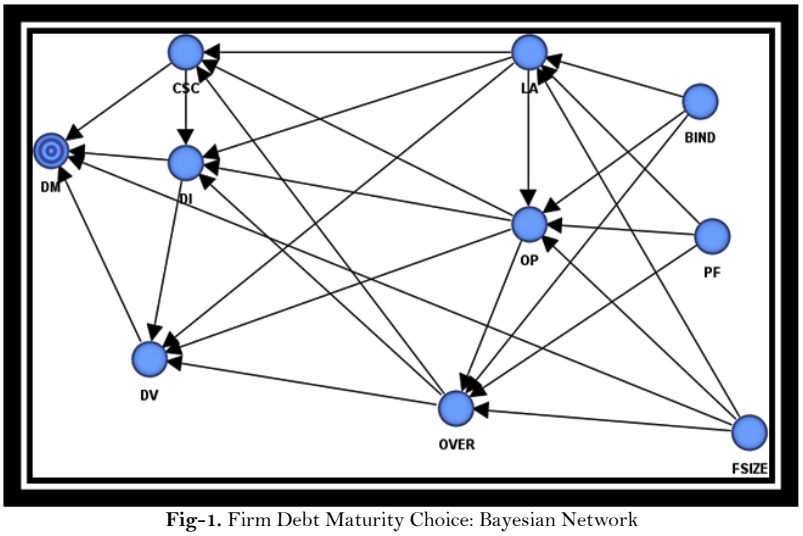

Fig-1. Firm Debt Maturity Choice: Bayesian Network

The graphical model if it (Figure 1) explains the debt maturity choice of Tunisian firms. This decision is affected by the CEO emotional bias (optimism, loss aversion, and overconfidence). These emotional biases originate the firms' financial position (capital structure choice, dividend policy, size, profitability and board independence).

In what follows, we describe in detail the various correlations between these variables and their effect on the target variable (debt maturity: DM).

4. EMPIRICAL RESULTS

4.1. The Relationships Discovered Analysis

The relationships between the variables in the database are directed at the parent node child node. Each relationship is composed of three different measures: the Kullback-Leibler, the relative weight and the Pearson correlation (direction of relation). Indeed, the Kullback-Leibler and the relative weight are two measures indicating the strength of relationships and the level correlation between variables, in that while the correlation measure of personal meaning and relationship significance. The relative weight scale of 0 to 1. Thus, the table (Table 5) below shows the relationships analysis results between variables across the network Pearson correlation. Table 7 examines the relationship (independence and correlation) between networks variables.

Table-7. The relationships analysis

Parents Nodes	Childs Nodes	Kullback-Leibler Divergence	Relative Weight	Pearson Correlation
CSC	DI	0,9159	1,0000	0,1911*
BIND	OP	0,8846	0,9659	0,9724
OP	CSC	0,6031	0,6585	-0,0395**
FSIZE	DM	0,5750	0,6278	0,5422
OVER	DI	0,4591	0,5012	0,1448*
LA	DI	0,4122	0,4500	-0,0117***
DI	DM	0,3374	0,3684	-0,0694**
LA	CSC	0,3240	0,3538	-0,0612**
CSC	DM	0,2999	0,3274	-0,0636**
DI	DV	0,2939	0,3209	-0,0857*
OP	DV	0,2703	0,2951	0,5527
OP	DI	0,2484	0,2713	-0,1453*
OVER	CSC	0,1946	0,2124	0,2642
LA	DV	0,1727	0,1886	-0,0555**
FSIZE	LA	0,1416	0,1546	-0,3055
OVER	DV	0,1006	0,1098	-0,1486
DV	DM	0,0936	0,1022	0,0956*
PF	LA	0,0745	0,0813	-0,1532*
BIND	LA	0,0708	0,0773	-0,0117***
FSIZE	OP	0,0491	0,0536	-0,0694**
PF	OVER	0,0352	0,0384	-0,0612**
FSIZE	OVER	0,0256	0,0280	-0,0636**
PF	OP	0,0149	0,0163	-0,0857*
BIND	OVER	0,0032	0,0034	0,5527
OP	OVER	0,0000	0,0000	-0,1453*
LA	OP	0,0000	0,0000	0,2642

Note: a. Kullback-Leibler close to 1: important correlation between the variables

b. Relative weight close to 1: important correlation between the variables.

c. Pearson correlation:*, **, ***, respectively at 10%, 5%, 1%.

Table 7 examines the relationship (strength and correlation type) between networks variables.

The analysis of the relations shows the presence of a strong relationship (Kullback- Leibler=0, 9159/ relative weight =1) and positive (β = 0, 1911) between capital structure choice and firm investment decision. This confirms the predictions of organizational financial theory independence between the two decisions. The results also show the presence of a strong and non-significant relationship between board of director's independence and investment decision (Kullback-Leibler=0, 8846/relative weight = 0, 9659/β=0, 9724).

In addition, the firm capital structure choice is negatively correlated with his level of optimism (β=-0, 0395) and loss aversion (β=-0, 0612), positively correlated with CEO overconfidence rate (β= 0, 2642). The investment decision is positively correlated with the CEO overconfidence level (β=0, 1448) and negatively correlated with the loss aversion level β= (-0, 0117) and optimism (β=-0, 1453). Behavioral investment level analysis has enriched the predictions of theories based on asymmetric information (signals theory and rooting theory) and agency theory in choice of underinvestment or overinvestment. Finally, firm dividend policy is positively correlated with CEO optimism level (β=0, 5527) and negatively correlated with the loss aversion level (β= -0, 0555) and overconfidence (β=-0, 1486). CEO overconfidence/optimistic positively affects firm dividend policy. A confident leader agrees on the establishment of a generous dividend policy. It overestimates the future results of its business and its ability to meet its commitments on dividends distribution

Network debt maturity analysis show the presence of strong relationship (Kullback- Leibler 0, 3374=/relative weight= 0, 3684) and negative (β=-0, 0694) between investment decisions and firm debt maturity choice. Also, there is a strong relationship (Kullback- Leibler=0, 0936/0, 1022=relative weight) and positive (β=0, 0956) between firm debt maturity and dividend payments. This confirms the predictions of financial theory for organizational independence between financing decisions (dividend payment and choice of financing method) and investment. Thus, overconfidence leads the manager to underestimate the company bankruptcy probability and, therefore, a higher debt. This financial decision (external preference method) impulses leader to follow a generous policy dividends distributing to offset the losses associated with its choice.

The relationship analysis find absence of relation between debt maturity choice and managerial biases (optimism, overconfidence and loss aversion). This result is explained by the effect of board independency to moderate CEO emotional bias presence: result finds presence of negative correlation between firm board of director's independence and CEO loss aversion (β= -0, 0117). This confirmed contractual governance theory prediction: the presence of external improves control exercised by the board and the executive disciplined. Thus, CEO overconfidence overestimates his skills to reduce risk. This led him to choose high projects risk which is in the interest of shareholders and increases firm's value. To finance its investment choices, this

overconfidence leader considers his company undervalued by the market limit its emissions securities risky.

Firm capital structure nature affect negatively debt maturity choice (Kullback- Leibler 0, 3374=/relative weight= 0, 3684/ β= -0, 0636). This result confirmed organizational financial theory and shows that the CEO debt nature choice is related to the company's ability to generate internally cash flows. CEO recognizes firms' operational risk level and loss aversion seeks to reduce its firm's total risk by using low of external funding including debt. CEO of high operational firms risk tries to control the total risk by limiting the financial risk introduced by debt and the issuance of new shares. He prefers to finance its investment projects through internal funds.

The relation analysis test shows that firm size affects their debt maturity choice (Kullback-Leibler 0, 5750=/relative weight= 0, 6278/ β= 0, 5422). In addition, firm size is negatively correlated with CEO optimism level (β= -0, 0694), loss aversion rate (β= -0, 0555) and overconfidence (β= -0, 0636).

Finally, the results also show the presence of a negative correlation between managerial overconfidence and his optimism level (β=-0, 1453).

4.2. Target Variable Analysis: Debt Maturity (Dm)

To analyze the CEO assets specificity choice, we must choose the variable Debt maturity as a target variable in the Bayesian network. Then we can use the function that generates the analysis report of the target firm debt maturity level. In this report, the relationship between debt maturity level and the other variables are measured by binary mutual information and the binary relative importance. The mutual information of two random variables is a score measuring the statistical dependence of these variables. It is measured in bits.

The result find that CEO not loss aversion at 50, 8906%, optimism at 58, 3082%, overconfident at 60,785%, preferred equity at 24, 5584%, choice dividend distribution at 72,4981%, opted for overinvestment position at 14,4476%, operated in firm big size at 86,7491%, 58,9050% of independence board presence. This result implies that CEO behavioral characteristics' affect his decision. Firm long term Debt choice is justified by leader emotional profile (optimism, loss aversion and overconfidence). This leader optimistic with its firm future investment opportunities increases debt maturity level to limit the likelihood of its replacement (loss aversion). Loss aversion leaders seek to avoid the worst-case scenarios. They not only use the tools of risk management to reduce the variance of cash flows but rather to avoid the worst scenarios that influence the risk of bankruptcy or preventing the company to take advantage of profitable investment. Thus, a downpour in the loss leader seeks the minimization of the probability of loss for him and a firm. He refuses to debt financing (to avoid the risk of bankruptcy) and prefer self-financing

CEO debt maturity average ratios of the order of 26, 4416% is explained by its optimist level at 56, 2120%, its loss aversion at 78,7610%, its overconfidence at 64,4348%, its preference for AS+LT+UNDIN at 16,0929%, equity preference at 28,4494%,dividend distribution at 64,5319%, firm directors board independence at 57,5172%,firm low profitability at 55,5406% and average size at 71,5105%. Optimistic leader is aware that his company is undervalued by the market. It therefore seeks to limit its reliance on external financing modes whose debt. However, if insufficiency internal financing mode it chose not risky debt (short-term) first then risky debt (long-term debt), and finally the capital increase (Heaton, 2002; Malmendier and Tate, 2005). This implies that the optimistic manager seeks to reduce the debt maturity.

Table-8. Target variable analysis

			DM = LONG TERM (57,8323%)	
Nodes	Binary mutual information	Binary relative importanc	Modal value	
FSIZE	0,3157	1,0000	BIG	86,7491%
LA	0,0601	0,1903	NO	50,8906%
CSC	0,0262	0,0831	EQ	24,5584%
DI	0,0220	0,0695	OVERINV	14,4476%
DV	0,0067	0,0211	YES	72,4981%
OP	0,0029	0,0092	YES	58,3082%
BIND	0,0015	0,0046	YES	58,9050%
OVER	0,0007	0,0023	YES	60,7857%
PF	0,0000	0,0000	NO	55,9322%
			DM = AVERAGE TERM (26,4416%)	
Nodes	Binary mutual information	Binary relative importance	Modal value	
FSIZE	0,2305	1,0000	AVERAGE	71,5105%
LA	0,0367	0,1593	YES	78,7610%
DI	0,0215	0,0934	AS+LT+UNDIN	16,0929%
CSC	0,0124	0,0537	EQ	28,4494%
DV	0,0021	0,0089	YES	64,5319%
OVER	0,0006	0,0026	YES	64,4348%
OP	0,0000	0,0002	YES	56,2120%
BIND	0,0000	0,0001	YES	57,5172%
PF	0,0000	0,0001	NO	55,5406%
			DM = SHORT TERM (15,7261%)	
Nodes	Binary mutuel information	Binary relative importance	Modal value	
FSIZE	0,0792	1,0000	SMALL	36,6580%
CSC	0,0110	0,1386	EQ	33,1499%
LA	0,0108	0,1368	YES	74,4477%
OP	0,0064	0,0809	NO	55,2571%
DI	0,0049	0,0618	AS+LT+UNDIN	16,9809%
BIND	0,0034	0,0426	NO	50,8751%
DV	0,0030	0,0381	YES	61,6434%
PF	0,0001	0,0007	NO	57,0217%
OVER	0,0000	0,0006	YES	63,0190%

c. Modal value: The average values of the explanatory variable for each the target value.

The target variables analysis shows that 57, 8323% of Tunisian is opting to long term debt maturity, 26, 4416% choice average term debt maturity rate and 15.7261% prefer short term debt maturity.

Finally, target variable analysis show that CEO short term debt choice at 15, 7261% is positevelly correlated with its loss aversion at 74,4477%, its pessimism level at 55,2571%, its overconfidence at 63,0190%, its preference for AS+LT+UNDIN at 16,9809%, firm equity choice at 33,1499%, firm small size at 36,6580%, dividend distribution choice at 61,6434%, firm low profitability at 57,0217% and firm depended board at 50,8751%. CEOs are powerful and dominate most major decisions, the risk arising from judgment errors is not well-diversified, resulting in more extreme decisions and higher variance of firm performance. This shower head to risk of loss of earnings or reputation seeks to limit the potential loss by choosing low-risk decisions including short-term debt choice.

4.3. Average Target Maximizing Analysis

Thus, the target dynamic profile capability software (BayesiaLab) to query about an a posteriori maximization of the target average. This test shows the case to maximize the target variable value. Table 7 presents the dynamic profile of the debt maturity (DM).

Table-9. Target maximizing analysis.

DM = SHORT TERM			
Nodes	Optimal modality	Probability	Joint Probability
priori		15,7261%	100,0000%
FSIZE	SMALL	52,4081%	11,0000%
DI	LT+OVERINV	78,3799%	0,9174%
CSC	EQ	100,0000%	0,4528%
DM = AVERAGE TERM			
Nodes	Optimal modality	Probability	Joint Probability
A priori		26,4416%	100,0000%
FSIZE	AVERAGE	65,2017%	29,0000%
DI	ST+UNDERINV	93,4636%	3,0924%
OP	YES	100,0000%	2,1177%
DM = LONG TERM			
Nodes	Optimal modality	Probability	Joint Probability
A priori		57,8323%	100,0000%
FSIZE	BIG	83,6150%	60,0000%
DI	OVERINV	100,0000%	7,5841%

Note: a. Optimal modality: modality is maximizing the traget value.

b. Probability: the prior probability of each variable.

c. Joint probability: the probability that the target variable takes the value n given that the explanatory variable takes the value p. For example, the probability of choosing big level of long term debt by firm big size is 60.000%.

The target maximizing analysis show that 11.00% firm size decrease, 0, 4258% equity choice and 0,9174% overinvestment preference in long term project is positively correlated with CEO preference of short term debt at 15,2761%. The 29,000 % in firm size average rate, 3, 0924% increase CEO preference of underinvestment position in short term project and 2,117 % CEO

optimism level increase is positively correlated with 26,4416 increase in its preference for debt average term maturity. This result implies the impact of CEO optimism in its firm policy. This Optimistic leader kept his place at the head of his company opts for long-term financial policy which long term debts choice. A leader optimistic with the growth opportunities of his business has an interest to limit the risk of hostile takeover. It seeks a debt threshold limiting the risk of failure, the risk of hostile takeover and indicating the health of the business. Finally, target dynamic profile analysis show that CEO increased preferences for long term debt maturity of the order of 57,832% its correlated with its firm size increased at 60,00% and its preference for overinvestment position at 7,5841%.

5. CONCLUSION

This research examines the determinants of firms' debt maturity choice introducing a behavioral perspective. Theoretical analysis presented implications of managerial characteristics (Emotional biases) to explained his preference for debt maturity position. Thus, the optimism of the leader over the problem of managerial opportunism described by the agency theory in debt choice. Leader optimistic interest in bringing to the maximization of shareholder wealth and to know in order to optimize the flow of funds. Debt nature analysis by introducing behavioral dimension enriched organizational financial theory: leader affected by behavioral biases presence prefer long term debt maturity allowing this protect against the takeover operation Russianness.

Empirical analysis presenting survey CEO large private companies in Tunisia. Data analyses revealed CEO emotional biases importance in explaining his debt nature choice. Indeed, empirical relationship analysis between optimism and firm debt maturity shows behavioral dimension role in the explanation. CEO optimism level is positively correlated with a preference for long term/and or average term debt. Optimistic CEO with its firm growth opportunities uses its decisional leverage to improve its reputation on the labor market. He opts for long-term debt indicating the convergence of its interests with those of shareholders. We also note that CEO loss aversion level is positively correlated with firm debt maturity choice. Loss aversion causes CEO to overestimate its firm total risk. This overestimation of the risk of the business leader impulse decision to choose less risky. He prefers the short-term debt low risk compared to long term. Finally, the CEO debt maturity behavioral analysis is consistent with the corporate financial theory, the leader affected by behavioral biases adjusts its debt maturity based on their ability to assess alternatives (optimism and overconfidence) and risk perception (loss aversion) to create of shareholder value and ensure its place at the head of the management team.

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