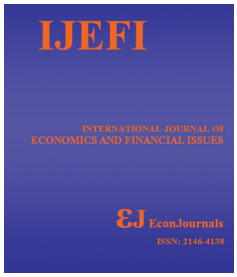

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Capital Structure Choices and Behavioral Biases: An Application to a Panel of US Industrial Companies

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ABSTRACT

This paper examines the financing decision within the framework of the behavioral corporate finance. It empirically analyzes the role of psychological factors related to the managers' overconfidence and optimism in explaining the financing choices of a panel of 160 US industrial companies listed over the period from 2009 to 2015. Our findings confirm the positive and significant impact of managers' overconfidence and optimism on the leverage of their firms. Our tests also highlight the negative and significant impact of the market mispricing perceived by the manager on the debt level of his firm, supporting its market timing behavior. A non-less interesting final result concerns the positive impact of managers' overconfidence on their pecking order preferences, thus rejecting the theoretical hypothesis under which the managers' overconfidence leads to a reverse pecking order preference over the financing sources.

Keywords: Capital Structure, Optimism, Overconfidence, Market Timing, Pecking Order
JEL Classifications: G32, C23

1. INTRODUCTION

In corporate finance, the study of capital structure has always constituted a controversial field in perpetual evolution. In line with market finance, which has used the behavioral argument to better understand financial market anomalies not well explained in the paradigm of market efficiency and the substantive rationality of agents, the study of corporate finance from a behavioral perspective has also found its legitimacy in the often limited explanatory power of conventional mainstream thought. In fact, by simplifying the individual behavior, and even neglecting his role in decision-making, these theories have become too standardized to claim a conclusive empirical validation. The plethora of often contradictory empirical evidence has raised questions about the relevance of each of these conventional approaches, leading researchers to focus more deeply on the real factors that can explain these decisions in practice. Hence, in recent years some researchers have begun to focus more on understanding the basic source of financial decision-making, namely the human factor, than on analyzing sets of figures in an attempt to solve financial problematics. In particular, a great doubt has been raised about the holding of the rationality hypothesis in the actual decision-making process. March and Simon (1958) and Simon (1960) did show that in reality this rationality is limited by the incomplete information available to the individual, his personal motivations as well as his limited capacities. Furthermore, in their prospect theory, Kahneman and Tversky (1979) proved that there is an asymmetry between the assessment of potential gains and losses by the individual which causes the former to be underestimated and the latter to be overestimated. Under these conditions, the influence of framing effects and biased beliefs such as overconfidence, optimism and loss aversion on the financial behavior of managers emerged in the context of corporate behavioral finance and has since been an attempt to alternatively explain business' financial decisions.

In this same perspective, our study is aimed at analyzing the impact of psychological biases such as overconfidence and optimism of managers on the financing decision of a panel of 160 US industrial companies listed over a period from 2009 to 2015. For this purpose, the current paper has been organized in the following way: A first title will be devoted to a review of the theoretical frameworks dealing with behavioral biases and their impact on the company's capital structure within the

framework of the irrational manager's approach and that of the irrational investor approach. The empirical part of this article will be mainly devoted to the experimentation of the assumptions about the behavioral model of capital structure. First, we will test the conventional model which examines the nature of the relationship between the leverage level of the firm and the market mispricing of its securities (the irrational investor approach) and how it relates to the manager's sentiment measured by his degree of optimism and overconfidence (the irrational manager approach). Considering the ineludible heterogeneity of firms and their managers, both the within estimator for the fixed-effects specification and the generalized least-squares for the random effects specification will be tested (as well as the ordinary least squares on stacked data).

In a second step, we will test the explanatory power of behavioral variables in a dynamic financing model. Because of the endogeneity bias induced by the autoregressive character of the dynamic models, the generalized moments method (GMM) in first difference according to Arellano and Bond (1991) and in system according to Blundell and Bond (1998) will be used.

In a third step, we will test whether the manager's overconfidence reinforces or weakens his pecking order preference. To do this, an experimentation of the explanatory power of the behavioral variable will be carried out within the framework of a modified pecking order financing model. The results of the tests and their discussion will be described throughout this last part.

2. REVIEW OF THEORETICAL FRAMEWORKS

Recent developments in behavioral models applied to corporate finance have taken two main directions, referred to as external and internal approaches by Baker et al. (2004), depending on whether the limited rationality is attributed to the investors in the market or to companies' managers. The first axis was concerned with the managers' responses to the mispricing of their firm by the financial market, errors imputed by behavioral finance to the limited rationality of investors. The second axis is attached to the bounded rationality of the managers while assuming that the financial market is rational.

2.1. The Irrational Investor Approach

This approach has two cornerstones: First of all, irrational investors are supposed to influence the prices of securities. This is due to limited arbitrage and lack of perfect market efficiency in such a way that rational investors would be limited in their ability to correct market mispricing problem. Second, managers are supposed to be intelligent and smart in the sense that they are able to distinguish between market prices and fundamental values and thus to recognize the mispricing problem created by irrational investors (Baker et al., 2004). This ability to identify the exuberance of irrational investors and to benefit from it by managers is due in particular to the asymmetric information, an asymmetry which is more an axiom than a hypothesis because of the informational advantage that managers have.

The theoretical modeling of the approach of the rational manager adapting to the irrationality of financial markets (also known as the irrational investor approach or market timing theory) is essentially derived from the work of Stein (1996), but also has its roots in the work of Fischer and Merton (1984), De Long et al. (1989), Morck et al. (1990b), Blanchard et al. (1993). It was then taken over by Baker et al. (2004) and dynamic considerations were added to it by Bolton et al. (2013).

An examination of the empirical literature on this subject suggests that the overvaluation of equities by an irrational market is an important reason for the issuance of shares. Companies would be tempted to issue shares when their costs are abnormally low or when the market-to-book ratio (considered as a proxy of a stock mispricing) is extremely high. In this context, Stein (1996) was among the first to provide a useful framework for reflecting on this idea and showed that when the stock price of a company is too high, the rational manager should issue more shares to take advantage of the exuberance of investors.

In their study of the implications of investor irrationality on the managers' choice of capital structure, Baker and Wurgler (2002) assume that firms with low levels of debt tend to be those which collected funds when their valuation measured by the market-to-book ratio was high, and conversely, heavily-leveraged firms tend to be those which raised funds when their valuation was low.

Backer and Wurgler also note that fluctuations in market valuations have crucial effects on the capital structure that persist for at least a decade. These results are difficult to understand in the context of conventional capital structure theories such as the trade-off theory, which predicts a temporary effect of any fluctuation in the market-to-book ratio considered here as a proxy of growth opportunities and future investments not as a measure of market mispricing of the company's stocks. Besides, within the framework of the pecking order theory, according to the version of Myers (1984), the adverse selection completely dissuades the managers from issuing shares. Even in its standard version, it advocates that periods of high investment push the leverage level towards the limit of the firm's capacity and not down as suggested by the results of Baker and Wurgler (2002). The latter assume that the most realistic explanation for these results is that the capital structure is largely the cumulative result of past attempts to adapt to equity market valuations. In fact, according to their theory there is no optimal capital structure; financing decisions based on securities mispricing by irrational investors accumulate over time to form the current capital structure of the firm.

This proposal by Baker and Wurgler inspired debate. On one hand, Hovakimian (2006) argues that equity issuances have no persistent effects on the capital structure and that the explanatory power of the external finance weighted average market-to-book ratio used in the Baker and Wurgler model (2002) derives from its informative content on growth opportunities, a determinant of the target debt level advocated by the trade-off theory, which is not captured by the current market-to-book ratio. Leary and Roberts (2005), Kayhan and Titman (2007), Flannery and Rangan (2006) also corroborate firms' adjustment to a target debt level.

2.2. The Irrational Manager's Approach

The second approach of behavioral corporate finance examines the behavior of irrational managers operating in an efficient financial market (Baker et al., 2004, Backer and Wurgler, 2012). Irrational managerial behavior refers here to a behavior that derogates from rational expectations and the maximization of the manager's expected utility. This limited rationality, coupled with a set of psychological biases and non-standard preferences, is likely to affect the firm's financing decision, particularly in the presence of limited governance in its ability to force the manager to make rational decisions.

In behavioral corporate finance, the literature dealing with the irrational manager approach has mainly focused on two psychological biases: The illusion of optimism and the over confidence. In the psychological and behavioral literature, optimism is generally associated with an overly positive perception of the likelihood of favorable events occurring and simultaneously underestimating the likelihood that adverse events might take place (Shefrin, 2001). Overconfidence, on the other hand, can be associated with overestimating the quality and accuracy of information (signals on future possibilities) available to the person or, in the same line, associated with the underestimation of the volatility of processes involving uncertainties (Lichtenstein et al., 1977). Similarly, overconfidence may lead the individual to believe that he is more competent and qualified than others (Svenson, 1981) or, in other words, that he is "above average." Generally, optimism is modeled as an overestimation of the mean capacity or outcome and overconfidence as an underestimation of the variance or risk.

Several reasons have favored the selection of these biases in particular and their integration in the modeling of the financial decision-making of an irrational manager. First, these two biases are strong and tough, since they have been detected in many real samples of managers (Ben-David et al., 2010; Larwood and Whittaker, 1977; March and Shapira, 1987). On the other hand, managerial decisions tend to be very complex, a framework where the overconfidence is most pronounced and idiosyncratic (Griffin and Tversky, 1992), which reduces the potential for their elimination through learning (Gervais, 2010). Also, these biases are often quite easy to integrate into existing models (Backer and Wurgler, 2012).

In his 1986 article, Roll explored the impact of managers' overconfidence on examples of takeovers. However, the merit of modeling financial decision making under the irrational manager approach comes from Heaton (2002). In the founding model proposed by Heaton (2002), overoptimistic managers believe that the projects available to their firms are better than they actually are (in terms of return and expected cash flow). Consequently, they believe that risky securities issued by their companies, whether bonds or stocks, are systematically undervalued by external investors (the model assumes that financial markets are efficient and the absence of asymmetric information and agency costs). By nature, compared to other financial securities, equities are the most to be perceived as undervalued by managers. Consequently, the company would rather finance its investment projects with its internally generated resources, subsequently issuing debt securities and issuing new equities only as a last resort. These results are compatible with the pecking order theory. However, unlike the initial proposal of Myers (1984) and Myers and Majluf (1984), Heaton (2002) assumes that the more optimistic the manager is, the more hierarchical the choice will be, ceteris paribus.

A similar idea was proposed by Fairchild (2005), who - considering only the optimism bias - comes to the same conclusion as Heaton (2002) in models that also integrate asymmetric information and conflicts of interest between managers and external shareholders. Later, Fairchild (2007) argues that the reluctance of overconfident managers to issue shares explains the empirical evidence that the overconfidence of the manager leads to higher leverage levels of his firm.

However, according to Hackbarth (2008), when overconfidence is integrated into the analysis, (i.e., a biased perception of the volatility of the firm's future profits), the pecking order behavior may disappear. In a more complete modeling, Hackbarth (2008) shows that under certain circumstances (especially in the case of a perceived overvaluation by the manager), the issuance of shares may become the preferred source of funding. In other words, companies managed by optimistic and also overconfident people will not necessarily follow a standard pecking order, although this may occur as a particular case, depending on the prevalence of one of the two biases.

A theoretical outcome related to capital structure decisions that seems consistent with all available models and which appears as the central prediction in all the theoretical researches, establishes that managers who are cognitively biased (optimistic and/or overconfident) will choose to issue more debts than their rational counterparts. Intuitively, this happens because the irrational manager believes that the firm is less likely to experience financial distress than it might actually do. Thus, it will underestimate the expected costs of bankruptcy and incur more debt in order to exploit its tax advantages (or any other type of benefits that may arise from higher debt). The positive impact of the managers' degree of optimism and overconfidence on the level of debt of their firms is, in fact, the main unambiguous prediction in all the theories and models observed. This justifies the distinctive interest of researchers in its empirical verification.

3. TESTS AND EMPIRICAL RESULTS

3.1. Sample Characteristics

Our sample is made up of US industrial companies[1] and extends from 2009 to 2015. The World Scope Industrial database was used for the collection of annual data. During the construction of our sample, companies belonging to the finance, real estate and those that are state-regulated were excluded. In fact, the financial structure of banks, insurance companies, real estate companies and holdings meets specific requirements and do not directly reflect industrial logics. The financing of state-regulated companies (gas, electricity…) may be affected by political considerations that do not correspond to market criteria.

1 See the list of the sample enterprises in the Appendix B.

Our analysis covers the period 2009-2015. This choice is guided by the absence of recent researches on the subject studied. This allowed us to retain a set of 160 companies. However, some aberrant observations required supplementary cleaning which resulted in the exclusion of some additional observations, thus reducing the number of observations selected to around 950 observations.

3.2. The model Used

Traditionally, the managers' financing decisions are generally considered to be the result of a broad set of determinants related to the characteristics of the market, the industry and the firm. Following Baker and Wurgler (2002), Hovakimian (2006) and Oliver (2005), among others, we will use a model that links debt (a proxy of the capital structure chosen by the firm) to a range of independent variables related to the market, the industry and the firm's specifications.We will add to the basic model two additional variables that capture the managers' sentiment (optimism and confidence) and the market mispricing of the firm's securities to test the validity of the two behavioral theories developed previously. Backer and Wurgler (2002), Hovakimian (2006), Oliver (2005), among others, found that asset tangibility, market-to-book ratio, size and profitability constitute important determinants of US companies' capital structure. Our estimated model takes the following form:

$$D_{it} = \beta_0+\beta_1 CONF_{i,t-1}+\beta_2 OPT_{i,t-1}+\beta_3 MTB_{i,t-1}+\beta_4 EFWAMTB_{i,t-1}+\beta_5 TANG_{i,t-1}+\beta_6 PROF_{i,t-1}+\beta_7 SIZE_{i,t-1}+\varepsilon_{it} \quad (1)$$

Where

D: Measures the firm's leverage;

CONF : Measures the manager's confidence;

OPT: Measures the manager's optimism;

MTB: The market-to-book ratio;

EFWAMTB: The external finance weighted average market-to-book ratio;

TANG: The asset's tangibility;

PROF: The firm's profitability;

SIZE: The firm's size.

All the independent variables are delayed by 1 year. This allows the information on the capital structure's determinants to be available to managers during the year previous to the observed level of debt.

During our tests, we have measured the leverage D_{it} of the firm i during period t using two manners: The sum of long-term debt and short-term debt, reported consecutively to the book value (BV) and the market value (MV) of the asset. According to Rajan and Zingales (1995) and Frank and Goyal (2010), this last measure constitutes the most appropriate assessment of leverage.

$$LEV1_{i,t} = \frac{\text{Total debt}_{i,t}}{\text{Book value of the total assets}_{i,t}}$$

$$LEV2_{i,t} = \frac{\text{Total debt}_{i,t}}{\text{Market value of the total assets}_{i,t}}$$

Where:

Total debt = Long term debt (item03251) + short term debt and current portion of long term debt (item 03051).

Market value of the total assets = book value of the total assets – book value of equity + market value of equity.

Book value of equity = book value of the total assets (item 02999) – total liabilities (item 03351) - preferred stocks (item 03451) – deferred taxes (item 03263).

Market value of equity = market price (item 05001) * common shares outstanding (item 05301).

Our definition of debt is different from that of Baker and Wurgler (2002) in two important aspects: First, we have considered the convertible debt as debt rather than equity. Most of capital structure studies (Hovakimian [2006], Fama and French [2002], Rajan and Zingales [1995]) incorporate convertible debt into their debt measurements. Moreover, Baker and Wurgler's convertible debt treatment is not coherent, because they add the convertible debt to the book value of equity but not into the market value of equity which, consequently, reduces artificially the market-to-book ratio of enterprises having convertible debts.

Second, our definition of debt excludes all other current and non-current liabilities that are more transactional than financing items (such as supplier credits, deferred taxes, etc.). In addition, Rajan and Zingales (1995) support that the debt ratio using total liabilities is not and won't be a good indicator of the risk of corporate default in the near future.

3.3. Independent Variables' Measures and Hypothesis

The independent variables introduced into the conventional debt model are as follows.

3.3.1. The sentiment of the manager (overconfidence and optimism)

As mentioned earlier, there is a growing number of evidence proving that the manager's sentiment (his optimism and overconfidence) is a determinant of his firm's capital structure. Psychologists believe that emotions and moods can influence decision-making. Nofsinger (2003) suggests that the general level of optimism (or pessimism) in the society affects the mood of financial decision makers and can lead to broad market phenomena. Optimism induces company managers to make investments, to use more debt and to carry out more acquisition operations. Hackbarth (2004) also shows that theoretically, overoptimistic and/or overconfident managers choose higher debt levels and issue new debts more

often. In general, an optimistic society will be more willing to use higher levels of debt and increase its spending.

Thus, the more confident the manager of a firm, the less he expects the bankruptcy of his business and the more he will use debt financing. Hence our hypothesis (H_1): The leverage of the firm is positively affected by the variables measuring the manager' sentiment (CONF) and (OPT).

The biggest challenge for analyzing the effects of behavioral variables (such as overconfidence and/or optimism) is to construct a plausible measure of these variables. There are many sentiments' measures. Nevertheless, biased beliefs naturally defy any direct and precise measure (Malmendier and Tate 2005a). Malmendier and Tate (2005a; 2005b) adopt two methods for measuring the confidence of the manager. The first is based on beliefs revealed by the manager about the future performance of his company, extracted from his transactions conducted on his personal portfolio. The second approach is based on how outsiders perceive managers and classify them as too confident depending on their representation in the press. Such data are unfortunately not easily available. Moreover, they are not available for a sufficient period to be able to obtain significant results from the equation (1).

In our tests, we have proposed a proxy of the variable measuring confidence (CONF) and optimism (OPT) of managers based on the Business Leaders sentiment index derived from a survey conducted by the Federal Reserve Bank of New York with business executives across the area of three states (New York, New Jersey and Connecticut). Surveys are conducted on a monthly basis and involve approximately 150 participants (usually CEOs)[2] who are asked for their views concerning the current and expected trends (over the next 6 months) on some key indicators of their activities and the business climate in general. Respondents come from different industries, with a mixture closely resembling to the structure of the industry in the region.

To measure the optimism and the overconfidence of the managers, we carried out an original technique which consists of:

- Considering the index measuring the manager's forecasts concerning the general business climate for the next 6 months as an indicator of optimism (or pessimism).
- Comparing the manager's forecasts concerning his activity for the next 6 months and his opinion on his current activity 6 months after his forecasts, to measure the excess of his confidence. We have estimated that if the difference is positive, the manager is overconfident in the sense that he overestimated his performance level.

The choice of deriving measures for managers' overconfidence and optimism on the basis of the business leaders sentiment index, compared to other sentiment measures used in other researches (such as the consumer sentiment index[3], the investors sentiment survey[4] or the economic optimism index[5]) seems to us to be wise, due to the construction nature of this index which appears to be more reliable and more targeted to appreciate behavioral factors specific to the companies' managers.

3.3.2. The market-to-book ratio

According to the external version of the behavioral theory of financing that attempts to study the implications of investor irrationality on the managers' choices of capital structure, the market-to-book ratio has often been a measure of the market mispricing of a firm's securities (Rajan and Zingales, 1995). Baker and Wurgler (2002) started from an observation stating that firms with low debt levels tend to be those that raised funds when their market-to-book valuation was high, and vice versa, heavily indebted firms tend to be those that raised funds when their valuation was low. Baker and Wurgler (2002) argue that the MTB ratio affects the firm's leverage. In general, managers are more likely to issue shares when their market values are high relative to their book values or past market values and they are more willing to buy back shares when their market values are low. In other words, managers carry out a market timing when they choose the capital structure of their business. According to previous empirical studies concerning capital structure, a negative relationship between the market-to-book ratio and the debt has been largely highlighted. Baker and Wurgler (2002) found a negative and significant relationship between leverage and the MTB ratio. This has enabled them to support the market timing effect, according to which the managers' beliefs concerning the pricing of their shares by the market can influence their decisions regarding the issue of debts or shares.

Hypothesis (H_2): Leverage is negatively affected by the market-to-book ratio reflecting the effect of managers' market timing.

Yet, this negative sign is predicted by other theories of capital structure. The market-to-book ratio has also been used in previous research to measure growth opportunities (Adam and Goyal, 2002).[6] When the market price of shares is high relative to their book value, the market reports an important expected growth. Indeed, firms with a high market-to-book ratio have higher debt financing costs[7] (Rajan and Zingales, 1995) and therefore should

2 The questionnaire is sent on the first working day of each month for the same sample of about 150 companies' managers, generally the President or the CEO. On average each month, approximately 100 responses are received around the tenth of the month, when the survey closes.

3 The (CSI) of the University of Michigan is based on a direct survey, analyzing public perceptions (US households) about current and predictive economic conditions.

4 The (ISS) is based on a weekly sentiment survey done by the American Association of Individual Investors to its members, it asks them for their point of views regarding the stock market over the upcoming six months and whether they believe that it will be "bullish," "bearish" or "neutral."

5 The IBP/TIPP index of economic optimism measures the Americans opinions on the prospects of the economy. The index is based on a national survey of 900 adults and evaluates the economic outlook of six months, personal financial prospects, confidence in the federal government's economic policies.

6 Adam and Goyal (2002) for a complete review of this literature.

7 In the context of agency conflicts between shareholders and creditors, those latter will require a higher risk premium, making the debt all the more costly as the growth opportunities are important because the firms in question are more flexible in their investment choices and more likely to expropriate the welfare of their creditors (Titman and Wessels, 1988).

have lower debt. This interpretation is consistent with the trade-off theory. However, according to the pecking order theory, firms with many investment opportunities will have a growing need for external financing, which is achieved primarily through an increase in debt, thus the positive relationship between the market-to-book ratio and leverage.[8]

The market-to-book ratio is measured as follows:

$$MTB_{i,t} = \frac{\text{Total assets}_{i,t} - \text{Book value of equity}_{i,t} + \text{market value of equity}_{i,t}}{\text{Total asset}_{i,t}}$$

In accordance with Baker and Wurgler (2002), the observation (firm/year) with a MTB ratio >10 will not be taken into consideration.

3.3.3. The external finance weighted average MTB ratio (EFWAMTB)

According to Baker and Wurgler (2002), the MTB ratio affects the firm's debt over the short term through shares issuances when those latter are overvalued by the market. Nevertheless, this market timing can only be the result of a punctual opportunism whose effect will be quickly rebalanced and will not have a persistent effect. If managers do not subsequently readjust their capital structure to a target level of debt, then the changes in debt levels induced by market timing will persist. On this basis, Baker and Wurgler (2002) proposed the new variable (EFWAMTB), which summarizes the historical variations in market assessments to measure the persistence of historical MTB ratios. This variable is calculated as follows:

$$\text{EFWA MTB}_{i,t} = \sum_{s=1}^{t-1} \frac{(e_s + d_s)}{\sum_{r=1}^{t-1}(e_r + d_r)} \text{MTB}_{i,s}$$

With e and d, representing respectively, net issuance of shares and net issuance of debt, measured as follows:

$$e_{i,t} = \frac{(\Delta \text{ book value of equity}_{i,t} - \Delta \text{ retained earnings}_{i,t})}{\text{Total assets}_{i,t}}$$

$$d_{i,t} = \frac{(\Delta \text{ long term debt}_{i,t} - \Delta \text{ short term debt}_{i,t})}{\text{Total assets}_{i,t}}$$

Retained earnings (item 03495)

Long term debt (item 03251)

Short term debt and current portion of long term debt (item 03051).

For a firm observed in period t, (EFWAMTB) is the weighted average of a time series of past market-to-book ratios, beginning with the first observation available in the sample (year l) and ending with the market-to-book ratio at (t−1).The weight for each year is measured by the ratio of the external financing of the year in question to the total external financing collected by the company during years (1) to (t−1). Thereby, companies that issue stocks when their market-to-book ratios are relatively high tend to have high values of the variable (EFWAMTB) and vice versa.

According to Baker and Wurgler, what motivates this measure is the fact that external financing opportunities represent opportunities to change the debt level. As a result, this measure gives a greater weight to valuations that prevailed when significant external financing decisions (debt or equity) were made. Baker and Wurgler, estimate that this weighted average is better than a set of delayed MTB ratios since it retains precisely for each firm the delays that are the most relevant.

In accordance with Baker and Wurgler (2002) and Hovakimian (2006), negative values of the ratio (EFWAMTB) are replaced by nil values and those >10 are eliminated.[9]

Baker and Wurgler affirm that in order for the capital structure to respond to the market timing by managers, a negative relationship between the variable (EFWA MTB) and debt should be observed to justify that firms do not subsequently adjust their debt to a target.

Hypothesis (H_3): The variable (EFWAMTB) has a negative effect on leverage.

In his test of the hypotheses proposed by Baker and Wurgler (2002), Hovakimian (2006) finds that although shares issues were limited to periods where the market-to-book ratio was high, the effect of these issues on debt is economically weak and of short-term. He, thus, rejects Backer and Wurgler's idea under which the issuance of shares according to the market timing is responsible for the important negative effect of the historical weighted average market-to-book ratio on leverage. He also notes that the market-to-book ratios of shares issuers, compared to those of debt issuers are significantly higher before and after the transaction. These results imply according to Hovakimian (2006), that the negative effect of market-to-book ratios on debt and the probability of choosing debt in comparison to shares issuance is more due to a difference in growth opportunities among firms (analyzed in cross-section) rather than to the market timing. He thus asserts that the variable (EFWAMTB) - just like the case for the MTB ratio - can also be considered as a proxy for growth opportunities rather than a measure of market timing persistence.

3.3.4. The firm's size

In most of the previous studies of capital structure, the firm size has formed a determinant having a positive effect on its debt level (Agrawal and Nagarajan, 1990; Baker and Wurgler, 2002; Hovakimian, 2006). The size of the company can represent a proxy

8 Nevertheless, according to the same pecking order theory, a negative relationship can also emanate from the fact that if growth opportunities are profitable and generate a lot of profits, then the firm will have less need for external financing, therefore less debt.

9 For more details on this variable, see Baker and Wurgler (2002), Page 11.

for many variables such as weaker information asymmetries, better access to debt markets, reduction in the debt issuance costs.

The logarithm of total sales is generally considered as an indicator of the size of each firm:

$SIZE_{i,t} = \ln(\text{total sales}_{i,t})$ (item 01001)

3.3.5. The tangibility of assets (TANG)

The value of tangible assets held by an enterprise has also constituted a significant determinant of firm's capital structure in the main previous studies (Rajan and Zingales, 1995). Firms with important tangible assets are more likely to have a relatively high level of leverage. Tangible fixed assets (property, plant and equipment) are likely to have an impact on a company's financing decisions because they are less subject to information asymmetries and they generally have a greater value than intangible assets in case of bankruptcy. In addition, the risks of moral hazard are reduced when the company offers tangible assets as collateral, because this constitutes a positive signal for creditors.

Following Baker and Wurgler (2002), Oliver (2005) and Hovakimian (2006), we defined the value of tangible assets for each enterprise as follows:

$$TANG_{i,t} = \frac{\text{Tangible assets}_{i,t} \text{ (item 02649)}}{\text{Total assets}_{i,t} \text{ (item 02999)}}$$

3.3.6. The profitability of the firm (PROF)

In most capital structure researches, the profitability was measured by the earnings before interest and tax to total assets of the year ratio:

$$PROF_{i,t} = \frac{\text{Earnings before interest and tax}_{i,t} \text{ (item 18191)}}{\text{Total assets}_{i,t} \text{ (item 02999)}}$$

The nature of the relationship between this variable and the firm' leverage has not been unanimous. Indeed, in the context of trade-off theory, the profitability should impact positively the firm's debt because a profitable company, on one hand, will prefer debt to benefit from the tax deductibility of Interest' charges, and on the other hand because of its great ability to repay its debts. In the agency theory framework (Jensen and Meckling, 1976; Jensen, 1986), additional debt would be a means of disciplining and controlling managers in case of the existence of excessive cash flows in the profitable firm. Conversely, the pecking order theory predicts a negative impact of profitability on debt level. According to Myers (1984), the legitimacy of this negative effect is due to the fact that a profitable firm can generate more internal funds and will use this self-financing as a primary source of financing before debt and shares' issuance.

3.4. Estimations and Results

3.4.1. Testing of behavioral variables under the conventional debt model (1)

The estimation of the relation (1) is done by applying the OLS with the robust option to correct the standard deviations from an eventual heteroscedasticity. In addition, we applied the estimation according to the fixed effects and random effects specifications. The results of the estimates are reported in Table 1.

Columns (1), (3) and (5) report respectively the OLS estimate results, fixed and random effects when the accounting measure of debt is used, while columns (2), (4) and (6) are related to the same valuation techniques applied to the measurement of debt based on the market value of the asset.

We find that the significance of the regression of the model 1 is satisfactory. The value of R^2 is between 12% and 16% according to the model specification and exceeds 30% when the OLS estimate (robust) is used in the regression of the market value of leverage. This adjustment is correct compared to the 17.6% of Hovakimian (2006) and the 25% of Oliver (2005).

Table 1: Results of the estimation of behavioral variables under the conventional debt model (relation 0.1)

Variables	OLS		Fixed effects		Random effects	
	LEV1 (1)	LEV2 (2)	LEV1 (3)	LEV2 (4)	LEV1 (5)	LEV2 (6)
Constant	−0.0744 (0.344)	−0.0766 (0.224)	−0.4681* (0.058)	−0.4187* (0.066)	−0.3215** (0.037)	−0.2706** (0.033)
$CONF_{t-1}$	0.0037*** (0.000)	0.0020*** (0.000)	0.0019*** (0.000)	0.0006* (0.056)	0.0023*** (0.000)	0.0009*** (0.003)
OPT_{t-1}	0.0019*** (0.000)	0.0012*** (0.000)	0.0011*** (0.000)	0.0006*** (0.000)	0.0012*** (0.000)	0.0007*** (0.000)
MTB_{t-1}	−0.0264*** (0.002)	−0.0419*** (0.000)	−0.0089 (0.430)	−0.0269*** (0.000)	−0.0126 (0.227)	−0.0305*** (0.000)
$EFWAMTB_{t-1}$	−0.0075*** (0.000)	−0.0049*** (0.000)	−0.0041** (0.032)	−0.0025** (0.017)	−0.0049*** (0.006)	−0.0030*** (0.004)
$TANG_{t-1}$	0.1425*** (0.000)	0.1189*** (0.000)	0.0067 (0.971)	0.152 (0.332)	0.0880 (0.221)	0.1269** (0.036)
$PROF_{t-1}$	−0.1976** (0.038)	−0.02395*** (0.002)	−0.1151 (0.120)	−0.0043 (0.918)	−0.1283* (0.091)	−0.0346* (0.438)
$SIZE_{t-1}$	0.0194*** (0.000)	0.0176*** (0.000)	0.0465*** (0.003)	0.0377*** (0.008)	0.0364*** (0.000)	0.0289*** (0.001)
Number observed	838	820	838	820	838	820
R^2	0.1486	0.3131				
R^2 (within)			0.1615	0.1266	0.15.81	0.12.28
Wald 1 test					59.58 (0.000)	73.87 (0.000)
F-statistics	16.14 (0.000)	27.33 (0.000)	31.11 (0.000)	6.85 (0.000)		
F test			32.27 (0.000)	27.99 (0.000)		
Hausman test					9.28 (0.2333)	17.60 (0.0139)

*.**.***Denote statistical significance at the 10%, 5% and 1% level, respectively. The P values are in parentheses, LEV1: Stands for book leverage ratio, LEV2: Stands for market leverage ratio, CONF: Measures the manager's confidence, OPT: Measures the manager's optimism, MTB: The market-to-book ratio, EFWAMTB: The external finance weighted average market-to-book ratio, TANG: The tangibility of the assets, PROF: Measure the company's profitability, SIZE: Measures the size of the firm, AR (1) and AR (2) test the absence of residuals autocorrelation in first and second difference respectively. Wald 1 tests the joint significance of the estimated coefficients. F-statistics measures the joint significance of all the coefficients. Sargan test is a test of the over-identification of restrictions and the instruments validity. Here the F-test is given without the robust option, it tests the hypothesis that all the u_i are equal to zero (absence of fixed effects). The Hausman test is conducted when the robust option is not used and tests the validity of the random effects specification

The first interesting result concerns the significance at the 1% level of the two behavioral variables (CONF) and (OPT). The positive sign of these two variables corroborates the positive theoretical effect of managers' overconfidence and their optimism on leverage that corporate behavioral finance predicts. This result supports the idea that overconfidence and optimism lead the manager to overestimate the likelihood of his success and underestimate the risks and consequences of his decisions, resulting in greater use of the debt. Our hypothesis (H_1) is thus validated.

The second important result concerns the negative and statistically significant sign of the market-to-book ratio supporting the idea of Baker and Wurgler (2002) according to which, when the market value of the firm is relatively high, leverage is low. The hypothesis (H_2) is thus validated. Baker and Wurgler's explanation is based on the notion of market timing and the fact that the manager takes advantage of the investors mispricing of his company's securities to issue shares when the latter are overvalued.

However, in order for this idea of market timing to hold, its effect must persist over time and not be followed by an adjustment of the capital structure to a target level. To verify this, the variable measuring the past emissions, whenever the market to book ratio was high, (EFWAMTB) must be significant and act negatively on the debt level. The examination of the coefficient of the variable (EFWAMTB) shows that the latter is also significantly negative whatever the specification of the model and the retained measure of leverage. Our hypothesis (H3) is thus validated. This result is in accordance with that of Baker and Wurgler (2002) and Hovakimian (2006). Nevertheless, the latter offers another explanation for the negative and significant signs of variables (MTB) and (EFWAMTB).

For the three other control variables, their integration into the model with a delayed coefficient did not affect their degree of significance. The positive coefficient of the variable measuring the tangibility of assets (TANG) finds its legitimacy in most of the conventional theories. Indeed, a company with significant tangible assets is probably safer in the eyes of creditors, which facilitates its access to the debt market. Regarding the positive sign of the variable (SIZE) measuring the size of the company, several arguments support its positive impact on debt. Firstly, large firms, because of the diversification of their activities, have a lower risk of bankruptcy and therefore a relatively low cost of bankruptcy and financial distress. Also, large firms, compared to small firms, have an advantage in accessing the credit market and can borrow on more favorable terms. From the point of view of agency conflicts between shareholders and creditors, small enterprises are also more disadvantaged.

Concerning the negative sign of the variable (PROF) capturing the profitability of the company, it is explained by the fact that the more profitable a company is, the more it generates internal funds and will therefore use less debt in its capital structure.

3.4.2. Testing behavioral variables under the dynamic financing model

Baker and Wurgler (2002) support the integration of the delayed endogenous variable (D_{t-1}) in the basic equation (1). They argue their idea by the fact that, since the debt ratio is between zero and one, when this latter is close to one of the two extremes of this interval, the change in the debt level can only be made in one direction regardless to the value of other variables. Not taking into consideration the delayed value of leverage could skew the effect of the other variables. The dynamic specification of equation (1) results in the following relation (2):

$$D_{it} = \beta_0+\beta_1 CONF_{i,t-1}+\beta_2 OPT_{i,t-1}+\beta_3 MTB_{i,t-1}+\beta_4 EFWAMTB_{i,t-1}+\beta_5 TANG_{i,t-1}+\beta_6 PROF_{i,t-1}+\beta_7 SIZE_{i,t-1}+\beta_8 D_{i,t-1}+\varepsilon_{it} \quad (2)$$

With D_t et D_{t-1} representing the endogenous variable measuring the leverage of the firm respectively on the date t and the date t−1. All the other variables are identical to those specified in relation (1).

The estimation of the dynamic panels is done using the two-stage GMM,[10] the GMM in first difference (GMM/diff) according to Arellano and Bond (1991) and the GMM system (GMM/system) proposed by Blundell and Bond (1998). The results of the various estimates are reported in Table 2.

The columns (1) and (2) show the estimates results of the two-steps first difference GMM model respectively for the accounting measure of debt and the measure depending on the market value of assets. The columns (3) and (4) present the estimates results of the two-steps GMM System respectively for the two measures of leverage.

For the book value measure of debt, we can see that the results of the GMM/Diff estimate according to Arellano and Bond (1991) are globally appropriate (column 1). Both the AR(2) and Sargan tests suggest that the absence of second-order autocorrelation and the absence of over-identification cannot be rejected. When the market value measure of debt is retained, neither the GMM/Diff nor the GMM/system are appropriate since both the AR(2) and Sargan tests are unsatisfactory (column 2 and 4).

The first interesting finding is related to the coefficients of the behavioral variables (CONF) and (OPT) which remain positive and statistically significant at the 1% level for the first variable and the 5% level for the second variable (columns 1 and 3). For the measure based on the book value of the debt, the coefficient obtained by the GMM/diff of the delayed variable of the debt (D_{t-1}) is 0.51. Contrarily, the coefficient of the delayed variable obtained by the GMM/sys attends 0.84, a value considerably higher than all the other values reported in the table. This result must be treated with caution since other experiments have revealed that the coefficient of the delayed variables obtained using GMM in system is always larger.

The third observation concerns the market-to-book ratio (MTB) which remains negative and statistically significant at the 1%

10 According to Arellano and Bond (1991), their two-step estimators are more precise than one stage estimators because the first ones take into account the variance covariance matrix of errors. However, they may be potentially biased for samples of small size. We also carried out the one-step estimation, but for all models the AR(2) test and the Sargan test were unable to reject the presence of second-order autocorrelation and the invalidity of the instruments used.

Table 2: Results of estimation of behavioral variables in the dynamic model (relation 2)

Variables	GMM/difference Arellano and Bond		GMM/system Blundell and Bond	
	LEV1 (1)	LEV2 (2)	LEV1 (3)	LEV2 (4)
D_{t-1}	0.5149*** (0.000)	0.2500*** (0.003)	0.8436*** (0.000)	0.3827*** (0.000)
$CONF_{t-1}$	0.0029*** (0.001)	0.0006 (0.319)	0.0038*** (0.010)	0.0015*** (0.008)
OPT_{t-1}	0.0004** (0.024)	−0.0004*** (0.007)	0.0005** (0.031)	−0.0001 (0.317)
MTB_{t-1}	−0.0245*** (0.001)	−0.0305*** (0.000)	−0.0176** (0.046)	0.0339*** (0.000)
$EFWAMTB_{t-1}$	0.00004 (0.976)	−0.00004 (0.965)	0.0016 (0.348)	0.00025 (0.777)
$TANG_{t-1}$	0.0191 (0.885)	0.2367*** (0.001)	−0.0599 (0.534)	0.2038 (0.745)
$PROF_{t-1}$	−0.36665*** (0.000)	−0.2162*** (0.000)	−0.3022*** (0.002)	−0.1954*** (0.125)
$SIZE_{t-1}$	0.0784*** (0.000)	0.0535*** (0.000)	0.0651*** (0.001)	0.0432*** (0.000)
Constant	−1.0829*** (0.000)	−0.6971*** (0.000)	−0.9891*** (0.001)	−0.5325*** (0.000)
Number observed	679	665	839	820
AR (1) test	−2.9491 (0.0032)	−2.8774 (0.0040)	−4.5837 (0.000)	−3.8995 (0.0001)
AR (2) test	−0.64059 (0.5218)	−1.4786 (0.1392)	−0.8472 (0.3969)	−1.9179 (0.0551)
Wald 1 test	86.44 (0.000)	180.59 (0.000)	242.33 (0.000)	215.52 (0.000)
Sargan test	12.3738 (0.5763)	30.2401 (0.0071)	12.4570 (0.8652)	41.9113 (0.0018)

*.**.***Denote statistical significance at the 10%, 5% and 1% level, respectively. The P values are in parentheses. LEV1: Stands for book leverage ratio, LEV2: Stands for market leverage ratio, CONF: Measures the manager's confidence, OPT: Measures the manager's optimism, MTB: The market-to-book ratio, EFWAMTB: The external finance weighted average market-to-book ratio, TANG: The tangibility of the assets, PROF: Measure the company's profitability, SIZE: Measures the size of the firm, AR (1) and AR (2) test the absence of residuals autocorrelation in first and second difference respectively. Wald 1 tests the joint significance of the estimated coefficients. Sargan test is a test of the over-identification of restrictions and the instruments validity

level according to the GMM/diff and at the 5% level according to the GMM/sys. Nevertheless, its historical weighted average (EFWAMTB) measuring the stability of the market timing effect becomes insignificant.

In sum, the robustness of the behavioral theory captured by the variables (CONF) and (OPT) and their positive impact on the firm's leverage seems to be validated even under the dynamic model of financing, whereas that of the market timing hypothesis seems to be weakened when tested under the dynamic model.

3.4.3. Testing behavioral variables in the framework of pecking order theory

This subsection develops and tests two competing assumptions based on behavioral theories suggesting that the manager's overconfidence can either strengthen or weaken its pecking order preferences.

3.4.3.1. Excessive managerial confidence reinforces its pecking order preference

According to Baker and Wurgler (2011), the existent empirical evidences on the pecking order preferences can partly be explained by the manager's optimism. Nevertheless, the theoretical relationship between the manager's overconfidence and the pecking order behavior is sensitive to the model' structure. As discussed in the theoretical section of this paper, Heaton's (2002) model shows that optimistic managers prefer debt to equity because this latter is perceived to be undervalued. Malmendier and Tate (2005a; 2005b) point out that the Heaton model provides a reinterpretation of the pecking order model of Myers and Majluf (1984) based on information asymmetry. The idea is that the manager's optimism is associated with a perceived positive information. In the same line, Malmendier et al. (2011) develop a model of overconfidence and financing decisions and empirically test its main predictions. Their overriding prediction is that overconfident managers use the external financing only if the overestimated returns from the investment are greater than the perceived costs of external financing. However, when they use external financing, overconfident managers, who believe that debt is less prone to mispricing compared to shares, tend to use more debt than their rational counterparts. In short, their main prediction concerning a pecking order behavior is also consistent with Heaton (2002). Empirically, Malmendier et al. (2011) find that the overconfidence of managers affects positively the coefficient of the pecking order variable. In other words, the overconfidence leads to a more pronounced pecking order behavior.

Hypothesis (H_4): The managerial overconfidence reinforces the preference of debt compared to equity.

3.4.3.2. Excessive managerial confidence weakens its pecking order preference

Contrary to the predictions of Heaton (2002) and Malmendier et al. (2011), the Hackbarth model (2008) shows that the manager's overconfidence can lead to a reverse pecking order preference. This proposition is incompatible with the Heaton model (2002), and can be attributed to the difference in the modeling approach of the manager's overconfidence. In particular, in the Hackbarth model (2008), excess confidence is modeled as a risk perception bias (that is the underestimation of revenues risk), which means that overconfident managers estimate that debt is undervalued by the market because their perceived default risk is lower. In contrast, overconfident managers who underestimate the risk of their revenues estimate that their firm's shares are overvalued because of the convexity of shares. Taken together, the Hackbarth model (2008) suggests that overconfident managers (with a risk perception bias) believe that debt is undervalued, but stocks are overvalued and thus develop a reversed pecking order preference.

Hypothesis (H_5): The manager's overconfidence (particularly linked to the risk perception bias according to Hackbarth (2008) weakens the preference for debt compared to equity.

In what follows we will try to see empirically whether the excess of confidence reinforces or weakens the pecking order preference. To

Table 3: Estimation results of behavioral variables under the modified pecking order model (relations 3 and 4)

Variables	Fixed effects		Fixed effects	
	ΔLEV1 (1)	ΔLEV2 (2)	ΔLEV1 (3)	ΔLEV2 (4)
Constant	−0.5266*** (0.000)	−0.7564*** (0.000)	−0.3883** (0.018)	−0.5170*** (0.001)
DEF_t	0.2275*** (0.000)	0.1768*** (0.000)	0.4351*** (0.001)	0.1773* (0.067)
$CONF_t$	-	-	0.0013*** (0.000)	0.0016*** (0.000)
$CONF\_DEF_t$	-	-	−0.0082 (0.280)	−0.0006 (0.854)
MTB_t	0.0005 (0.952)	−0.0174*** (0.000)	−0.0055 (0.543)	−0.0219*** (0.017)
$TANG_t$	0.1825* (0.093)	0.1475** (0.011)	0.2834** (0.011)	0.2317*** (0.001)
$PROF_t$	0.1732** (0.030)	0.292*** (0.000)	0.1586* (0.065)	0.2263*** (0.000)
$SIZE_t$	0.0306*** (0.000)	0.0468*** (0.000)	0.0194* (0.068)	0.0289*** (0.004)
Number observed	692	676	692	676
R^2 (within)	0.1192	0.2810	0.1459	0.3497
F-statistics	11.71 (0.000)	32.80 (0.000)	12.45 (0.000)	26.79 (0.000)

*.**.***Denote statistical significance at the 10%, 5% and 1% level, respectively. The P values are in parentheses (clustered robust), ΔLEV1: Stands for the variation of the book leverage ratio, ΔLEV2: Stands for the variation of the market leverage ratio, CONF: Measures the manager's confidence, OPT: Measures the manager's optimism, MTB: The market-to-book ratio, TANG: The tangibility of the assets, PROF: Measures the company's profitability, SIZE: Measures the size of the firm, CONF_DEF: Relationship between the variables CONF and DEF. F-statistics measures the joint significance of all the coefficients

do this we will test the effect of the behavioral variable measuring the manager's overconfidence in the pecking order analysis framework by comparing the regression results of the basic model of deficit financing of Shyam-Sunder and Myers (1999)[11] with a modified version of the model in which we integrate the variable measuring managers' overconfidence (CONF).

The models to be estimated are as follows:

$$\Delta D_{i,t} = \beta_0+\beta_1 DEF_{i,t}+\beta_3 X_{i,t}+\varepsilon_{i,t} \quad (3)$$

$$\Delta D_{i,t} = \beta_0+\beta_1 DEF_{i,t}+\beta_2 CONF_{i,t}+\beta_3 CONF_{i,t}*DEF_{i,t}+\beta_4 X_{i,t}+\varepsilon_{i,t} \quad (4)$$

With:

$\Delta D_{i,t}$: The change in the leverage level measuring the amount of debt issued (or reimbursed if $DEF_{i,t}$ is negative) of firm i.

$DEF_{i,t}$: the financing deficit of the firm i, for the period t measured as follows:[12]

$$DEF_{i,t} = Div_{i,t}+I_{i,t}+\Delta W_{i,t}+R_{i,t}-CF_{i,t}$$

Where:

$Div_{i,t}$: Total dividends paid (item 04551).

$I_{i,t}$: Capital expenditures (item 04601) + increase in investments (item 04760) + net assets from acquisitions (item 04355) + other use of funds (item 04799) - disposal of fixed assets (item 04351) - decrease in investment (item 04440).

$\Delta W_{i,t}$: Measured by changes in working capital requirements (item 04900).

$R_{i,t}$: Change in Short Term borrowings (item 04821).

$CF_{i,t}$: Cash flow from operating activities after interest and taxes measured by net income before extraordinary items (item 01551) + depreciation and amortization (item 01151) + other extraordinary flows (item 04225).

$X_{i,t}$: The vector of the control variables previously used in relation (1).

The results of the within estimators with fixed effects for both models (3) and (4) are reported in Table 3.

Columns (1) and (2) present the estimation results of the deficit financing model according to Shyam-Sunder and Myers (1999) in which the coefficient of the pecking order variable (DEF) appears to be statistically significant at the 1% level but its coefficient is far from one as foreseen by the mentioned theory. When the accounting measure of leverage is retained, the coefficient is 22.75% and it is only 17.68% when the market measure of leverage is used.

Columns (3) and (4) show the effects of managerial optimism on the coefficient of the pecking order variable (DEF). An increase in the coefficient of this variable would indicate a reinforcement of the pecking order preference, while a reduction of the coefficient would indicate a weakening of the pecking order preference. The observed coefficients of the variable (DEF) go from 22.75% to 43.51% when the accounting measure of leverage is used, and from 17.68% to 17.73% when the market measure of debt is used. Certainly, the value of this coefficient is still far from one (contrary to the expectations of the pecking order theory), but the introduction of the behavioral variable in the model has on one hand improved its significance (R^2 is higher) and increased the coefficient of the variable (DEF). This result suggests that

11 Shyam-Sunder and Myers (1999) propose a specific test of the pecking order theory. In their model, the need for external funds arises when there is an imbalance between internal cash flows (net of dividends) and actual investment opportunities. As a result, firms whose investment opportunities exceed their internal funds are turning to the capital market for external funds either by issuing debt and/or shares. The assumption of the pecking order model has been generally formulated in terms of an order of preference using the funds available for the enterprise starting with internal resources, then debt and issuing new shares only at the last resort.

12 For each year t, dividends paid (Div), the amount of investments (I), the increase in working capital requirements (W) and the repaid portion of debts (R) are the main sources of a deficit that the company i has to partially offset by the cash flows generated by its business (its operating cash flow, CF). The rest must be financed by external resources (debt and equity issuance).

overconfidence (and optimism) of managers increases their preferences for debt compared to equity financing.

On the other hand, the behavioral variable (CONF) enters into the model with a positive and statistically significant sign at the 1% level regardless of the measure adopted for the debt. This result confirms the positive effect of managers' overconfidence (and optimism) on the firm's leverage. Thus, despite the negative coefficient of the variable measuring the interaction of managerial overconfidence with the deficit in internal funds (CONF_DEF), the latter remains statistically insignificant, rejecting the hypothesis of a reverse pecking order preference.

4. CONCLUSION

This paper was an attempt to provide an alternative explanation of firms' financing decision based on modeling decision-making in the context of corporate behavioral finance that relies on psychological factors to apprehend the financial behavior of managers. The experimentation of the validity of assumptions related to the behavioral model of the capital structure was carried out on a sample of 160 US industrial firms listed during the period from 2009 to 2015.

The conventional model estimations, which examines the effects on the company's debt of the market mispricing of its securities (irrational investor approach) as well as the manager's sentiment measured by his degree of optimism and overconfidence (the irrational manager approach) provide quite conclusive results.

The first interesting result concerns the positive and significant coefficients at the 1% level of the two behavioral variables measuring the overconfidence and optimism of managers in the estimated regressions. The positive sign of the coefficients of these two variables corroborates the positive theoretical effect of managers' overconfidence and optimism on the leverage level of their firms that the behavioral corporate finance predicts. This result supports the idea that overconfidence and optimism prompt the manager to overestimate the probability of his success and underestimate the risks and consequences of his decisions, leading to a greater use of debt.

The second important finding concerns the negative and statistically significant sign of the market-to-book ratio supporting Baker and Wurgler's (2002) idea under which, when the market value of the firm is relatively high, debt is low. According to the external approach of the behavioral optics, this indicates that the manager takes advantage of the mispricing of his company's securities by the investors (not supposed in this case to be completely rational) to issue shares when the latter are overvalued, this behavior is also qualified as market timing. The confirmation of the persistence of this market timing is supported by the significantly negative effect on the debt of the external finance weighted average market-to-book ratio, measuring the past issuance whenever the market-to-book ratio was high. This result is in line with that of Baker and Wurgler (2002) as well as Hovakimian (2006). Nevertheless, the latter relates this negative significance of (MTB) and (EFWAMTB) coefficients to the growth opportunities captured by these two variables rather than the persistence of market timing.

Another conclusion concerns the robustness of behavioral theory through the variables (CONF) and (OPT), whose positive impact on the firm's leverage remains valid even in the context of the dynamic financing model. However, the hypothesis of market timing seems weakened when it is tested in a dynamic context of financing.

A final, but no less interesting, conclusion concerns the impact of the managers' overconfidence on their pecking order preference. The results reject Hackbarth's theory (2008) stating that the overconfidence of managers' leads to a reverse pecking order preference for funding sources.

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APPENDIX A

Descriptive Study

Table A1 shows descriptive statistics for our sample. It reports the mean values, the extremes and the standard deviations of the key variables used in this paper.

The average value of the managers' confidence index is 23.31, with a maximum of 29.59 that corresponds to the year 2014. For the optimism index, it shows a mean value of 11.53 and reaches a maximum value of on 2013. The evolution of these indexes as well as the two measures of the companies leverage between 2009 and 2015 are represented in the following Figure 1.

The analysis of the autocorrelation between the different variables is summarized in Table A2. The examination of the correlation matrix and the variance inflation factor (VIF) reveals the absence of a critical level of correlation among the different explanatory variables,[13] confirming the absence of multi-collinearity in our model. In fact, the only relatively high correlation exists between the market-to-book ratio and the profitability variable (0.6352). However, the examination of the VIF shows that the latter vary between 1.84 and 1.02 with an average of 1.30, well below the critical value of 10.

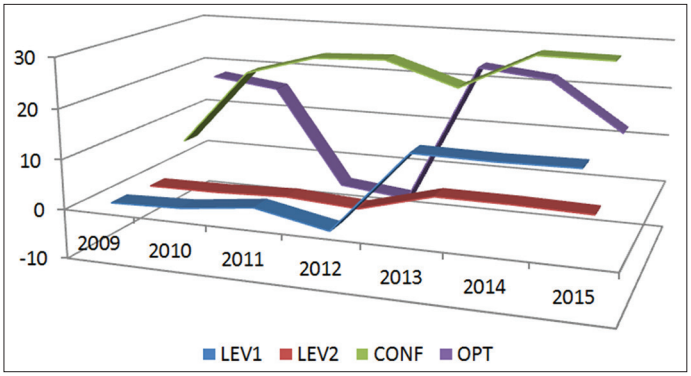
Appendix Table A1: Descriptive statistics of the different variables

Variables	Number observed	Mean	Standard deviation	Minimum	Maximum
LEV1	1103	0.2682	0.1835	0.00	0.9993
LEV2	985	0.1581	0.1303	0.00	0.8122
CONF	1120	23.3088	7.4654	6.3391	29.5941
OPT	1120	11.5285	11.3226	−6.2500	23.6800
MTB	985	2.0841	0.9843	0.7749	9.3873
EFWAMTB	1120	2.7485	3.0561	0	9.9517
TANG	1105	0.2161	0.2112	0.0084	0.9237
PROF	1096	0.1041	0.07145	−0.4939	0.3712
SIZE	1110	15.4999	1.1698	10.8003	20.4771

Appendix Table A2: Autocorrelation matrix of the different variables

Variables	CONF	OPT	MTB	EFWAMTB	TANG	PROF	SIZE	VIF
CONF	1.000							1.18
OPT	−0.288	1.000						1.16
MTB	0.103	0.110	1.000					1.84
EFWAMTB	−0.038	−0.021	−0.149	1.000				1.04
TANG	−0.013	0.0039	−0.099	0.006	1.000			1.02
PROF	0.156	0.005	0.635	−0.089	−0.088	1.000		1.66
SIZE	0.099	0.020	−0.351	0.144	0.115	−0.216	1.000	1.19

Figure 1: Evolution of the leverage, the optimism index and the managers' confidence index



13 Anderson and Hsiao (1982), consider a correlation coefficient is high if it exceeds the critical value of 0.70, Brayman and Cramer (2001) retain a critical value of 0.8 and for Kennedy (1998) a high correlation problem is considered if the coefficient is between 0.80 and 0.90.

APPENDIX B

Appendix B: Sample firms list

Accenture PLC
Acuity Brands Inc.
Aecom
Aercap Holdings N.V.
AGCO Corp
Agilent Technologies
Air Lease Corp
Allegion PLC
Alliance Data System
Allison Transmiss
Ametek Inc.
Amphenol Corp
Aptar Group, Inc.
Arrow Electronics
Automatic Data Proc
Avnet Inc.
B/E Aerospace Inc.
Ball Corporation
Bemis Company Inc.
Berry Plastics
Boeing Co.
Booz Allen Hamilton
Broad Ridge Financial
BWX Technologies Inc.
Carlisle Companies
Caterpillar Inc.
CH Robinson World
Chicago Bridge Iron
Cintas Corporation
Cognex Corp
Colfax Corporation
Corelogic, Inc.
Costar Group, Inc.
Crane Co.
Crown Holdings, Inc.
CSX Corporation
Cummins Inc.
Curtiss-Wright Corp
Danaher Corp
Deere and Company
Deluxe Corporation
Donaldson Co. Inc.
Dover Corp
Eagle Materials, Inc.
Eaton Corporation
Emerson Electric Co.
Euronet Worldwide
Expeditors Intl Wash
Fastenal Company
Fedex Corp
FEI Company
Fidelity Natnl Inf.
Fiserv Inc.
Fleetcor Tech
Flextronics Int'l
FLIR Systems Inc.
Flowserve Corp
Fluor Corporation
Fortune Brands
General Dynamics
General Electric Co.
Genesee and Wyoming
Genpact Limited

Appendix B: Sample firms list

Global Payments Inc.
Graco Inc.
Graphic Packaging
HD Supply
Hexcel Corp
Honeywell International
Hubbell Inc.
J B Hunt Transport
Huntington Ingalls
Idex Corp
Illinois Tool Works
Ingersoll-Rand
IPG Photonics Corp
ITT Corporation
Jabil Circuit Inc.
Henry, (Jack) and ASSC
Jacobs Eng Group Inc.
Kansas City Southern
Key Sight Tech
Kirby Corp
Lennox International
Lincoln Electric
Linkedin Corporation
Lockheed Martin Corp
L-3 Communications
Macquarie INFR
Man power group Inc.
Martin Marietta MAT
Masco Corp
Maximus Inc.
MDU Resources Group
Mettler-Toledo INT'L
MSC Industrial
National Instruments
Nordson Corporation
Norfolk Southern
Northrop Grumman
Old Dominion Freight
Orbital ATK Inc.
Oshkosh Corp
Owens Corning
Paccar Inc.
Packaging Corp
Parker-Hannifin Corp
Paychex Inc.
Paypal Holdings Inc.
Pentair PLC
Perkinelmer Inc.
Quanta Services, Inc.
RR Donnelley and Sons
Raytheon Company
Republic Services
Robert Half Intl Inc.
Rockwell Automation
Rockwell Collins Inc.
Roper Technologies
Ryder System, Inc.
Sealed Air Corp
Sensata Technologies
Sherwin-Williams Co.
Silgan Holdings Inc.
A. O. Smith Corp
Sonoco Products Co.

Appendix B: Sample firms list

Spirit Aerosystems
Stericycle, Inc.
TE Connectivity
Teledyne Tech.
Textron Inc.
Toro Co.
Total System Service
Transdigm GRP Inc.
Transunion
Trimble Navigation
Tyco International
Union Pacific Corp
United Parcel SVCS
United Rentals Inc.
United Technologies
USG Corporation
The Valspar Corp
Vantiv
Verisk Analytics
Vulcan Materials Co.
WESTINGHOUSE AIR
Waste Connections
Waste Management
Watsco Inc.
Westrock Co.
WEX Inc.
Woodward Governor Co.
World fuel services
Grainger (W.W.), Inc.
Xerox Corporation
XPO LOG
Xylem Inc.
Zebra Technologies
3M Company