Risk and maturity effects on Iberian Companies' Capital Structure Speed of Adjustment

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Abstract

This study intends to analyse the financial market and default risk effects on firms' capital structure speed of adjustment (SOA), investigating the determinants of a time varying target capital structure. We consider a sample of 1405 Iberian (Portugal and Spain) companies, over the years from 2010 to 2017 applying a two-step model (censored Tobit and dynamic GMM) on the panel data collected for traditional determinants of the capital structure and exploring the effects of the categorical variables size, age, default risk and returns volatility. We find that Iberian firms have extremely high adjustment costs to the target leverage and a very small SOA, being the SOA greater for under-levered firms. Moreover, it is found that smaller firms and younger firms exhibit faster SOA. Under-levered firms have higher SOA when the volatility of returns is taken into account where the SOA is greater when the return risk is higher. In what concerns over-levered firms, the SOA is higher in the presence of positive risk of default. Results are robust to the categorizing criterion employed, target leverage specification or even the model. Results have important implications for both researchers and decision makers.

Keywords: Capital structure; Speed of capital structure adjustment; Panel data

JEL Classification: G32; G34

1. Introduction

The capital structure is a classical topic on corporate finance. The determinants of capital structure have been analysed during many years by the empirical literature (Titman & Wessels, 1988; Rajan & Zingales, 1995; Ramalho & Silva, 2009; Ahmed et al., 2010; Bhaird & Lucey, 2010; González & González, 2011; Mostarac & Petrovic, 2013; Matias & Serrasqueiro, 2017; Namara et al., 2017; Zeitun et al., 2017).

In the last decades, the empirical studies on this domain have focused on the capital structure speed of adjustment (SOA), adopting dynamic models in order to consider the possibility that observed and target leverage may differ due to the presence of adjustment costs (Miguel & Pindado, 2001; Korajczyk & Levy, 2003; Banerjee et al., 2004; Welch, 2004; Drobetz & Wanzenried, 2006; Hackbarth et al., 2006; Byoun, 2008; Faulkender et al., 2012; Warr et al., 2012; Mukherjee & Wang, 2013; Dufour et al., 2018).

Estimating the SOA toward target leverage using the standard partial adjustment model accepts that all firms within the sample adjust at the same step (Elsas & Florysiak, 2011). The dynamic capital structure theory predicts heterogeneity in adjustment speed due to firm-specific adjustment costs. Only recently, the authors start to use a dynamic panel fractional (DPF) estimator to investigate heterogeneity in SOA, such as Elsas and Florysiak (2011, 2015), on the US, and Fitzgerald and Ryan (2019) on the UK market.

In addition, the risk is a firm variable in need of research. Only a few previous studies analyse this variable (e.g. Elsas & Florysiak, 2011) in the context of capital structure SOA. Consequently, we intend to study the risk effect on the capital structure SOA.

This chapter has several contributions. Firstly, this study intends to provide further empirical analysis on the effect of risk on the SOA, since there is a limited evidence on this subject. Secondly, we use a censored estimator in our approach. To the best of our knowledge, this is the first study to use the censored estimator to investigate heterogeneity in SOA for a sample of firms in the Iberian market. Elsas and Florysiak (2011, 2015) and Fitzgerald and Ryan (2019) analyse this kind of relationship, but for the US and the UK firms, respectively. Thirdly, another contribution of our study is to consider the maturity of the firm into the analysis. The only study that we are aware of accounting for age effects in the relationship between the target leverage and the speed of adjustment is the one of Castro et al. (2016), applied to a sample of European firms.

Moreover, studying the Iberian market is important for several reasons. Firstly, the main studies done so far focus on the Anglo-Saxon markets (e.g., Graham & Harvey, 2001). Portugal and Spain are still in need of research, and they are two markets with significant differences from the American economy. Secondly, Portugal and Spain have some similarities, such as geographical, historical and economic. Both countries have historical high unemployment rates and high concentrated levels of share ownership (La Porta et al., 1998). However, they have some particularities in what concerns countries' dimension, number of companies, and market liquidity (Miralles-Marcelo et al., 2014).

Finally, as opposed to the Anglo-Saxon countries (where most literature focus) which are common law, Iberian countries operate in the civil law system. The legal rules of common law countries protect more their investors than the civil law countries (La Porta et al., 2002). Consequently, we add to the scarce literature on the topic considering two countries characterized by concentrated ownership structures, lower investor protection and less effective external control mechanisms.

In this context, the main goal of this study is to investigate the risk effect on companies' capital structure SOA, using a two-step estimations in our approach, and considering a sample of 1405 Iberian listed firms, 46 from Portugal and 1359 from Spain, for the period between 2010 and 2017. Overall, the results suggest that smaller firms adjust faster than larger firms, which may be justified due to higher costs of deviation resulting from increased risk of financial distress and/or higher degree of opacity. Moreover, it was found that the SOA is greater for under-levered firms and that Iberian firms have extremely high adjustment costs to the target leverage and a very small SOA.

With respect to age, empirical evidence shows that younger firms exhibit faster SOA, as compared to older firms, justified by the number of years they have in the market and by investor confidence issues. Finally, it was possible to observe that under-levered firms have higher SOA when the volatility of returns is taken into account, where the SOA is greater when the return risk is higher. Over-levered firms have higher SOA when positive default risk is evidenced and, as such, increased risk of financial distress implies higher SOA. These results provide strong support for the continued investigation of heterogeneity in SOA. With regards to decision makers, our results related to risk suggest that this endogenously determined firm characteristic may hinder a firm's ability to achieve target leverage, and thus should be considered in this light when firms set there stalls out and try to signalize the market, clearly affecting investors behaviour, mainly considering their investment decisions.

The remaining of the chapter is organized as follows. The second section offers a literature review, and formulates the hypotheses. The third section presents the variables, the sample, and explains the methodology. Next section presents the empirical results, and finally, section five discusses and summarizes the findings.

2. Literature Review

Capital structure is one of the core subjects studied in corporate finance. Considering the assumptions of a perfect capital market, Modigliani and Miller (1958) show that firms' value is independent of their financing decisions. Latter, Modigliani and Miller (1963) recognize that the presence of tax favours the use of debt capital rather than equity, since the tax benefit provided by debt causes a decrease in the weighted average cost of capital (WACC), and therefore an increase in the firms' value. Consequently, the optimal capital structure is the one that increases the value of firms and minimizes the WACC.

The trade-off theory (Myers, 1977) argues that there is an optimal debt ratio, reached at the point where the incremental costs of failure equals the tax relief marginal increase in the debt. Leverage is advantageous because of its tax benefit, but high debt levels can induce the presence of bankruptcy costs, since the probability of incurring bankruptcy increases with the degree of indebtedness of firms, so, firms need to balance the tax benefits and the costs of bankruptcy of high borrowing levels.

The pecking order theory (Myers, 1984; Myers, & Majluf, 1984) states that firms follow a hierarchical sequence in the selection of their funding sources, in order to minimize the costs of financing. Firms prefer to use internal financing, using only new debt when internal funds are not enough, and leaving a last resort to issuing new shares. The agency conflicts between managers and shareholders and shareholders and bondholders offers an important determinant of capital structure (Jensen, & Meckling, 1976), weakening the corporate performance.

Although this subject is extensively studied during the last decades, most of the empirical studies apply static models, which are not able to capture dynamic adjustments in leverage ratios (Drobetz

& Wanzenried, 2006), since they consider the observed debt ratio as a proxy for firms' optimal leverage ratio (Titman & Wessels, 1988; Rajan & Zingales, 1995).

Several authors suggest that firms' main objective in setting capital structure policy is not to minimize the WACC, but to preserve financial flexibility, pursuing a target debt-equity ratio (Graham & Harvey, 2001; Brounen et al., 2004). This assumption is explained in the context of the pecking order theory (Myers, 1985; Myers & Majluf, 1984).

2.1. Dynamic adjustments in leverage ratios

In order to avoid the static model approach problems, some authors adopted dynamic models, considering the possibility that observed and target leverage may differ due to the presence of adjustment costs.

Fischer et al. (1989) analyse the difference between the firms' maximum and minimum debt ratios over time, identifying firms' characteristics with larger fluctuations in the capital structures. Their results support the theoretical model of relevant capital structure choice in a dynamic setting. Miguel and Pindado (2001) develop a target adjustment model, in order to capture the dynamics of capital structure decisions more properly, using a panel data from non-financial listed Spanish companies, considering the period from 1990 to 1997. Their results show that Spanish firms face lower adjustment costs than US firms. The authors find evidence of tax and financial distress theories, as well as the pecking order and free cash flow theories. Moreover, the evidence checks the impact of some institutional characteristics on capital structure.

Banerjee et al. (2004) consider a model that allows estimating the SOA towards the target capital structure and identifying the determinants of the SOA simultaneously. Considering data from the US and the UK, the authors find evidence, contrary to what they expected, that firms with higher growth opportunities adjust slower towards the target capital structure, and that larger firms adjust to changes in capital structure more readily. However, they find no significant relationship between the likelihood of adjustment and the absolute difference between target leverage in time t and observed leverage at the previous period.

Drobetz and Wanzenried (2006) analyse the impact of firm-specific characteristics on the speed of adjustment to the target debt ratio, considering a sample of Swiss firms for the period between 1991 and 2001, finding that the firms that adjust more readily, are the faster growing ones and the ones that are more away from their optimal capital structure. The authors conclude that the SOA is higher when the term spread is higher and when economic prospects are good.

Several authors study the speed of adjustment towards the target capital structure, taking into account the state of the economy, considering periods of financial prosperity and periods of recession (Korajczyk & Levy, 2003; Hackbarth et al., 2006). The results find some evidence that leverage is counter-cyclical and that firms tend to adjust their capital structure more often and by smaller amounts in booms than in recessions. Drobetz, Schilling and Schroder (2015) study the G7 countries. Examining the role of macroeconomic conditions on firms' SOA, they find that firms in market-based economies adjust faster than those in bank-based countries, whereas adjustment is slowest in recessionary periods.

Based on the importance of adjustment costs, previous literature shows some variables that moderate the speed of adjustment, since high adjustment costs have a negative impact on this speed (Dufour et al., 2018). Mukherjee and Wang (2013) and Welch (2004) show a positive relationship between the distance to the target leverage and the speed of adjustment. According to Dufour et al. (2018), it can be justified by the fact that costs of not adjusting increase with this distance. Consequently, managers are more prompt to adjust.

Based on a sample of US listed firms, Warr et al. (2012) find that over-levered firms adjust more quickly when equity is over-valued because when equity is undervalued, issuing equity is more costly and adjustment costs are higher. Mukherjee and Wang (2013) show evidence that large firms adjust more quickly than the smaller ones, giving support for the hypothesis that firms' size is likely to impact adjustment costs.

There is some evidence of the moderating effect of cash flows on the speed of adjustment. Considering samples of American listed firms, Byoun (2008) and Faulkender et al. (2012) document that cash flows have a strong influence on the speed of adjustment, concluding that positive cash flows enables financial structure adjustment at low transaction costs. Byoun (2008) finds also that most adjustments occur when firms have above-target (below-target) debt with a financial surplus (deficit), suggesting that firms move toward the target capital structure when they face a financial deficit/surplus, but not in the way that is hypothesized by the pecking order theory.

More recently, Dufour et al. (2018) examine the influence of cash flow speed of adjustment to their capital structure targets, considering a sample of French SME for the period between 2005 and 2014. The authors find a significant difference in the speed of adjustment between over-levered and under-levered firms, but only for short-term leverage. Contrary to findings related to listed companies, for under-levered firms, their results do not show that a negative cash flow implies a faster adjustment to target leverage.

Castro et al. (2016) consider the age effects in the relationship between the target leverage and the SOA for a sample of European listed firms, including Portugal and Spain. Considering the trade-off theory, it is expected that through the life cycle of a firm, the costs and benefits of debt financing change. During their growth and development, firms turn to be more profitable and possess more tangible assets, which serve as collateral, reducing the risk of default and bankruptcy costs (Castro et al., 2016; Dufour et al., 2018; Fitzgerald & Ryan, 2019). As such, more mature firms are more trustworthy by shareholders and have greater participation on markets, reducing the risk of default and the return risk. Therefore, in line with Castro et al. (2016) and Frelinghaus et al. (2005) it is expected higher target leverage and higher levels of debt in larger, holder and more mature firms. Thus it is expected that age exerts a positive impact over the leverage ratio.

Based on the previous evidence, we formulate the following hypotheses:

H_1: *The SOA is greater for over-levered firms than for under-levered firms.*

H_2: *The SOA is greater for large firms than for small firms.*

H_3: *The SOA is greater for older firms than for younger firms.*

2.2. Risk and leverage ratios

The studies that relate the risk and the capital structure decisions are scarce. Kisgen (2006, 2009) conclude that adjustment speeds tend to vary between rated and unrated companies and between different rating categories. Elsas and Florysiak (2011) analyse a sample consisting of all industrial Compustat firms with complete data for two or more consecutive years during the period between 1965 and 2009, finding evidence that the SOA is highest for firms with high default risk and expected bankruptcy costs, finding also evidence consistent with the trade-off theory.

Elsas and Florysiak (2015) argue that rated firms and low default risk firms have better access to external capital markets, allowing a higher SOA. Nevertheless, rated firms with higher debt capacities will also have lower opportunity costs of deviating from target leverage, due to accessibility or to low default risk, which implies a lower SOA. Dufour et al. (2018) do not find a statistically significant relationship between default risk and debt, despite the fact that a negative relationship has been documented by Psillaki and Daskalakis (2009) and by Ozkan (2001), and a positive one by Michaelas et al. (1999), for a sample of UK firms.

Using a sample of UK listed firms, Fitzgerald and Ryan (2019) find that a firm's SOA to target leverage depends on firm size, growth opportunities, and dividend policy. The results show that smaller firms adjust faster than larger firms resulting from the higher costs of deviation due to the increased risk of financial distress or higher degree of opacity.

Thus, we believe that default risk might lead to a quicker SOA, as well as return risk, being the return risk a measure of the investor's confidence, since they demand a premium on their equity investment return relative to lower risk alternatives because their capital is more jeopardized. Based on the scarce, but recent evidence, we formulate the last hypothesis:

H_4: *The SOA is greater when the risk is higher.*

3. Research Design

3.1. Methodology

Our methodology follows a two stage approach as in most of the existent studies (Dufour et al., 2018; Castro et al., 2016; Warr et al., 2012). One model applied by authors is the dynamic partial adjustment (DPA) model, where it is assumed that a firm has a unique target leverage ratio in a specific time period. The dependent variable to be considered is the ratio of total debt to total assets (Elsas and Florysiak, 2015; Fitzgerald and Ryan, 2019; and almost all SOA articles that were consulted). Moreover, it assumes that the firm actively adjusts its leverage ratio (LEV) each time period in order to approach the actual leverage ratio as close as possible to the target leverage ratio. With this in mind we may write the change in a firm's present leverage ratio in a given time period as:

$$LEV_{it} - LEV_{it-1} = \alpha(LEV_{it}^{*} - LEV_{it-1}) \quad (1)$$

where LEV_{it}^{*} and LEV_{it} are, respectively, the target and actual leverage ratios of the i^{th} firm at time t. The change in the leverage ratio between consecutive time periods is described by the left hand side of equation (1), and the term in parenthesis in the right hand side describes the required change in the actual leverage ratio to achieve the target leverage ratio between time t and t-1. We may even write equation (1) as $VLEV_{it} = \alpha VTLEV_{IT}$. The α term represents the proportion of the required change in the actual leverage ratio achieved. As discussed in Fitzgerald and Ryan (2019), static trade-off models assume the firm is always at its optimal leverage ratio, implying that $\alpha = 1$. However, based on the fact that firms face adjustment costs when they try to achieve the target leverage, the present change will be a proportion of the required change, implying that $0 < \alpha < 1$. Thus, we may interpret α as the speed at which a firm adjusts to its target, being the magnitude dependent on the relative costs of deviating from and adjusting to target leverage. Simplifying equation (1) leads us to equation (2):

$$LEV_{it} = (1 - \alpha)LEV_{it-1} + \alpha LEV_{it}^{*} \tag{2}$$

This is the model to be tested, which states that the firm i leverage ratio in time t depends over the firm's leverage ratio in the previous time period (t-1) and over the target leverage ratio in time t. To determine the firm's target leverage, once it is unobservable, it is usual to assume it as a function of a set of observable lagged firm characteristics, as well as unobservable firm-specific time invariant effects as in equation (3):

$$LEV_{it}^{*} = \sum_{n=1}^{n} \beta_n x_{nit-1} + \gamma_i + \varepsilon_{it} \tag{3}$$

Being the sum of x_{nit-1} a set of n firm characteristics for firm i in period t-1, γ_i represents firm-specific time-invariant unobserved effects and ε_{it} represents the error term. Our first target leverage estimation is the predicted value $TLEV_{it} = \sum_{n=1}^{n} \hat{\beta}_n x_{nit-1}$ where $\hat{\beta}$ is the vector of coefficients estimated from equation (3) by the panel censored Tobit, being[1] the left and right limit censored variable that of INDLEV (see table 1 for variables definition). We may thus substitute equation (3) in equation (2) to get:

$$LEV_{it} = (1 - \alpha)LEV_{it-1} + \alpha \sum_{n=1}^{n} \beta_n x_{nit-1} + \alpha\gamma_i + \alpha\varepsilon_{it} \tag{4}$$

This is the standard version of the DPA model, where one minus the coefficient on the lagged dependent variable implies the speed at which firms on average adjust to target leverage (Fitzgerald and Ryan, 2019; Dufour et al., 2018).

[1] $TLEV_{it}$ = 0.0037732*SIZE-0.0126529*ROA+0.2113803*NDTS+0.9872357*INDLEV+0.0005387*MTB+1.003915*RISKD +0.0887423*TANG +0.0095746*INV-0.0021649*TQ+0.0017386*AGE+0.0096389*RRISK

Following Dufour et al. (2018) and references therein, we have used a second specification to estimate the target leverage, being $TL_{it} = \frac{1}{\hat{\alpha}}(\widehat{LEV_{it}} - (1-\hat{\alpha})LEV_{it-1}$, being $\widehat{LEV_{it}}$ the predicted leverage obtained through equation (4) and $\hat{\alpha}$ the estimated coefficient of equation (1).

We follow a two-stage approach, by estimating initially both target leverage measures using a panel censored Tobit regression (being the censoring variable defined the industry median leverage - INDLEV). By definition, a firm's leverage ratio as measured by its debt to value ratio, is bounded between 0 and 1, but standard estimators commonly used to measure the speed of adjustment fail to take this into account turning their estimates severely biased (Fitzgerald and Ryan, 2019). Therefore we use the censored Tobit panel regression analysis with random effects that specifies a conditional distribution for the unobserved firm fixed effects to allow for unbalanced panels (Harford et al., 2009; Fitzgerald and Ryan, 2019).

In the second stage we employ dynamic panel data estimations based on Arellano-Bover/Blundell-Bond estimation with standard errors based on the generalized method of moments (GMM) to account for the dynamic nature of the target leverage. We have used different model specifications to test the validity of our hypotheses and for robustness check. Further, we have repeated the estimations of the target leverage using also the t values of the determinants X in equations (3) and (4) but conclusions were comparable to those presented below, and as such we skipped their analysis in the current work. The GMM estimator addresses heterogeneity issues by modelling it as an individual effect and shows its efficiency by adding new nonlinear functions of the exogenous variables to the instruments, like in Castro et al. (2016).

Based on equation (1) and following the previous literature, we specify the models:

$$VLEV_{it} = \beta_0 + \beta_1 NVTLEV_{it} + \beta_2 PVTLEV_{it} + \varepsilon_{it} \quad (5)$$

$$LEV_{it} = \beta_0 + \beta_1 NVTLEV_{it} + \beta_2 PVTLEV_{it} + \varepsilon_{it} \quad (6)$$

$$VLEV_{it} = \beta_0 + \beta_1 NDEV_{it} + \beta_2 PDEV_{it} + \varepsilon_{it} \quad (7)$$

$$LEV_{it} = \beta_0 + \beta_1 NDEV_{it} + \beta_2 PDEV_{it} + \varepsilon_{it} \quad (8)$$

Where the variables are described in Appendix 1 and NVTLEV or NDEV account for negative deviations for firm i at time t (leverage above the target) and PVTLEV or PDEV account for positive deviations (leverage below the target). Equations (5) and (6) are for the first specification to estimate the target leverage (TLEV) and (7) and (8) for the second specification (TL). The model associated with equations (5) and (7) allows the adjustment speed to vary depending on the debt-ratio position from the target leverage. Those of equations (6) and (8) relate leverage to negative and positive deviations from the target leverage. The model used for these second steps was a dynamic panel model, whereas it is also accounted the first lagged effects of both leverage deviations and leverage.

Our aim is to identify the factors that result in different SOA due to varying deviation and adjustment costs. For this, we use the dynamic panel estimator and the censored Tobit estimator that facilitates the use of lagged dependent variables as regressors in the presence of unobserved fixed effects, which also controls for unobserved heterogeneity and unbalanced panel data. We believe that this is the first work that investigates heterogeneity in SOA of Iberian firms. Only Elsas and Florysiak (2011, 2015) and Fitzgerald and Ryan (2019) analyse this effect, but for the US and for the UK firms, respectively. In addition, as far as we know, this is the first study to investigate the effects of firm's risk (default and return risk) characteristics on firm's SOA. As such, we add to the growing body of heterogeneity in SOA considering financially listed firms. Table 1 presents the variables definitions, name and respective measures.

3.2. Determinants of the capital structure

There is a vast empirical literature analysing the determinants of capital structure, such as the works of Titman and Wessels (1988), Harris and Raviv (1991), Rajan and Zingales (1995), Fama and French (2002), Flannery and Rangan (2006) and Chang et al. (2014). In view of previous empirical results, we consider as determinants of capital structure, the tangibility of assets (TANG), the firm size (SIZE), the market-to-book ratio (MTB), the return on assets (ROA), the non-debt tax shield (NDTS), the industry leverage (INDLEV), the risk of default (RISKD), the investment level (INV), the Tobin's Q ratio (TQ) as a measure of firm's market performance, the age (AGE) representing the maturity of the firm and the return risk (RRISK) or operational risk.

TANG is measured as the ratio of fixed to total assets (Harris & Raviv, 1991; Rajan & Zingales, 1995; Fama & French, 2002; Drobetz & Wanzenried, 2006; Dufour et al., 2018). The trade-off theory (Myers, 1977) predicts a positive relationship between the proportion of tangible assets and leverage, since fixed assets are considered as collateral. In this context, we expect a positive sign for the TANG variable.

SIZE is measured as the natural logarithm of the book value of total assets of a firm. Based on the assumption of the trade-off theory that predicts a positive relationship between a firm size and leverage, as well as previous empirical results (Titman and Wessels, 1988; Chittenden et al., 1996; Romano et al., 2000), we expect a positive sign for SIZE.

The MTB is considered as a proxy for investment opportunities, and is calculated as the ratio of market price for share to book value per share. The trade-off theory expects that firms with more investment opportunities present less leverage, because they are motivated to signal that they do not engage in underinvestment strategies, since the costs from issuing debt and the shareholder and bondholder conflicts are higher for firms with significant growth opportunities (Drobetz & Wanzenried, 2006; Fitzgerald & Ryan, 2019). In addition, the free cash flow theory (Jensen, 1986) predicts that firms with more investment opportunities have less need for the monitoring effect of debt payments to control free cash flows. Thus, we expect a negative sign for the MTB variable. While Rajan and Zingales (1995) report a positive relationship, supporting the pecking order theory, Titman and Wessels (1988) and Fitzgerald and Ryan (2019) find a negative relationship between growth opportunities and leverage, where high growth firms maintain debt capacity for future investment needs (Myers, 1984).

The ROA is a measure of firms' performance, calculated as the ratio of operating profits to total assets. The trade-off theory, the agency model (Jensen & Meckling, 1976; Easterbrook, 1984) and the signalling hypothesis (Ross, 1977), predict a positive relationship between profitability and debt. However, the pecking order theory predicts a negative relationship. Therefore, we cannot predict the signal for this variable.

Another suitable measure of firm's performance is that of Tobin's Q (TQ). Lang and Ofek (1996) use Tobin's Q as a proxy for growth opportunities and find a negative relation between investment and leverage for manufacturing firms. But only for firms whose growth opportunities are either not recognized or not sufficiently valuable to overcome the effects of their debt overhang, whereas they find no such relationship for growth firms. Korajczyk and Levy (2003) also conclude in favour of a negative relationship between TQ and the target leverage. Bolton et al. (2011) propose a model of dynamic investment, financing, and risk management for financially constrained firms. They conclude that investment depends on the ratio of marginal TQ to the marginal value of liquidity, and the relation between investment and marginal TQ changes with the marginal source of funding and that optimal external financing and payout are characterized by an endogenous double-barrier policy for the firm's cash-capital ratio.

With respect to firm's investment (INV), the higher the need for investments the higher will be the amount of financing required (Dufour et al., 2018). The literature on corporate finance identifies both potentially positive and negative effects of debt on investment. Rajan and Zingales (1995) support the pecking order theory by reporting a positive relationship between investment opportunities and leverage, whereas Titman and Wessels (1988) and Fitzgerald and Ryan (2019) find a negative relationship. Thus the effect of investment over the speed of adjustment to the target leverage is expected to be positive. Gebauer et al. (2018) investigate the link between indebtedness and investment at the firm level, highlighting the non-linear aspect of this relationship. It has been reported a positive relationship provided that debt financing may give rise to tax advantages compared to alternative forms of financing (Modigliani and Miller, 1963), and it can reduce agency costs between managers and shareholders (Ross, 1977).

But a negative one is also reported since high corporate indebtedness implies higher interest expenses and thus lowers funds available for investment. Debt levels below a certain threshold – if at all – positively affecting investment to the extent that the costs of holding debt are lower than marginal returns from further investment (Gebauer et al., 2018). However, high debt levels on firms' balance sheets presumably exert a negative effect on investment, as costs associated with high debt holdings increase significantly and thus reduce marginal returns on investment (Gebauer et al., 2018).

Has identified by Dufour et al. (2018), firms with higher depreciation expenses will be less prone to apply for tax deduction due to debt financing. This occurs provided that they can use non-debt tax benefits as a substitute for leverage tax benefits. Also Fitzgerald and Ryan (2019) include in their study as a proxy for a firm's target debt-to-value ratio non debt tax shields (NDTS) being expected a positive relationship between these and leverage.

Finally, the industry median leverage (INDLEV) may contribute for higher SOA (Fitzgerald and Ryan, 2019) provided that investors will observe the median industry leverage and compare it to the target leverage of the firm. It is expected a positive relationship between the industry median leverage and the firms leverage as also indicated by Hu and Gong (2018). All variables used within estimations are listed and explained in table 1. Moreover, we include as determinants of the capital structure, but also considered as categorical variables to explain the SOA and explained in more detail in the following section, the default risk (RISKD), the return risk (RRISK), age (AGE) of the firm as well as size (SIZE) already discussed.

Table 1. List of variables

Variable	Name used	Description of the formula used	Authors
Leverage (dependent variable)	LEV	The ratio of total debt to total assets	Elsas and Florysiak (2015); Fitzgerald and Ryan (2019); Almost all SOA articles.
Firm size	SIZE	The natural log of total assets	Titman and Wessels (1988); Chittenden et al. (1996); Romano et al. (2000) ; Bennouri et al. (2018); Fitzgerald and Ryan (2019)
Asset tangibility	TANG	The ratio of net tangible fixed assets to total assets	Harris and Raviv (1991); Rajan and Zingales (1995); Fama and French (2002); Drobetz and Wanzenried (2006); Dufour et al. (2018); Fitzgerald and Ryan (2019)
Profitability	ROA	Ratio of operating profits to total assets	Drobetz and Wanzenried (2006); Fitzgerald and Ryan (2019)
Growth Opportunities	MTB	The ratio of market value ordinary shares + total debt + book value preference shares to total assets	Titman and Wessels (1988); Fitzgerald and Ryan (2019); Rajan and Zingales (1995); Green and Homroy (2018)
Market performance	TQ	Tobin's Q is the ratio of the total market value of the firm to total assets	Green and Homroy (2018); Lang and Ofek (1996); Bolton et al. (2011)
Non-debt tax shields	NDTS	The ratio of depreciation, depletion and amortization to total assets	Dufour et al. (2018); Fitzgerald and Ryan (2019)
Industry median leverage	INDLEV	The industry median leverage in a given year. Industry is defined by using SABI datatype INDUSTRY GROUP	Fitzgerald and Ryan (2019); Drobetz and Wanzenried (2006); Hu and Gong (2018)
Risk of Default	RISKD	The ratio of the standard deviation of the difference between operating cash flows and working capital needs variation over the period starting in 2009 until the current year to the mean of total assets over the same period	Elsas and Florysiak (2011, 2015); Dufour et al. (2018)
Return Risk	RRisk	The natural logarithm of the standard deviation of monthly returns of over the previous 12-month period	Green and Homroy (2018); Byoun (2008)

Investment	INV	The ratio of the difference between total fixed assets, sales and extra revenue from capital transaction to total assets.	Dufour et al. (2018); Byoun (2008); Drobetz and Wanzenried (2006); Rajan and Zingales (1995)
Age	AGE	The natural logarithm of the difference in years between the constitution date of the firm and the current year t of analysis.	Castro et al. (2016)

3.3. Variables that influence the speed of adjustment to the target debt ratio

A number of factors have been used in the literature to categorize observations into sub-samples across which SOA is likely to differ, either due to varying deviation or adjustment costs. We explore heterogeneity in the SOA of Iberian firms using four firm characteristics as categorizing variables. Because if heterogeneity in SOA is present, categorizing firms based on these characteristics should make it observable. These variables have also been included as determinants of the firms leverage in the initial estimations. We do this following the works of Dufour et al. (2018) and Fitzgerald and Ryan (2019). For this effect, we have considered several variables, which are described in Appendix 1.

The first categorizing variable used was the risk of default (RISKD). The variability of the firm's future income can affect the firm's ability to manage debt-related fixed charges (Dufour et al., 2018), and we should expect a negative link between risk and leverage. As identified by Gebauer et al. (2018), firms with high debt also find it harder to obtain new funds from external finance sources due to higher default risk when only a small share of assets is financed with equity. The desire to repair weak balance sheets to lower external finance costs leads firms to increase savings and to forego otherwise possibly profitable investment opportunities (Myers, 1977). Thus firms with positive risk of default will tend to deviate more from their target leverage, and the SOA tend to be higher, the higher the risk of default.

We permit the speed to vary according to the risk of default by considering in the dynamic panel (GMM) estimations a model that includes interactions between dummy variables (see Appendix 1 for variables description).

$$VLEV_{it} = \beta_1 NRISKD_{it} + \beta_2 PRISKD_{it} + \beta_3 NRDNVTL_{it} + \beta_4 PRDNVTL_{it} + \beta_5 NRDPVTL_{it} + \beta_6 PRDPVTL_{it} + \varepsilon_{it} \quad (9)$$

To check the robustness of our results we use both measures of the target leverage (replacing VTL by DEV) as independent variables and the variable leverage as dependent[2]. Moreover, we further estimate the target leverage with time t determinants (X_{it}) and different model specifications (panel fixed effects, panel random effects, panel GMM), being the conclusions comparable to the results presented below[3].

Higher volatility of listed firms returns and high transaction costs prevent firms from quickly adjusting to target leverage. Yin and Ritter (2018) demonstrate that the entire literature using firm-fixed effects to estimate the market leverage SOA is deeply flawed, with the estimated SOA more than twice its actual value. They conclude that the bias is more severe the higher is the variance of stock returns, and the shorter is the length of time over which the speed is estimated. However, we do not find in the literature studies which relate operational risk or returns volatility (RRISK) to the SOA, despite the fact that higher demanded returns or increased volatility influence the firm performance and thus condition the SOA. Moreover, Hu and Gong (2018) identify that leverage and expected equity returns generally exhibit positive and negative relationships in gain and loss domains, respectively, using a sample of firms from the US stock market using empirical data for the 1998-2013 period. This paper contributes to the existing literature by confirming the applicability of prospect theory (Kahneman & Tversky, 1979) in explaining expected returns in the stock market, but not the effect of these returns volatility. Thus it is expected that higher return volatility of a firm increases its SOA.

We permit the speed to vary according to the operational risk or return risk (volatility) by considering in the dynamic panel (GMM) estimations a model that includes interactions between dummy variables (see Appendix 1 for variables description).

$$VLEV_{it} = \beta_1 NRRISK_{it} + \beta_2 PRRISK_{it} + \beta_3 NRRNVTL_{it} + \beta_4 PRRNVTL_{it} + \beta_5 NRRPVTL_{it} + \beta_6 PRRPVTL_{it} + \varepsilon_{it} \quad (10)$$

To check the robustness of our results we used both measures of the target leverage (replacing VTL by DEV when appropriate) as independent variables and the variable leverage as dependent[4].

[2] Results are not showed here but will be provided upon request. This is so because the main goal is the SOA and not the leverage ratio effects *per si*.
[3] Consequently, we do not present the results, but they are available upon request.
[4] Results are not showed here but will be provided upon request. This is so because the main goal is the SOA and not the leverage ratio effects per si.

Castro et al. (2016) explore the differences in target leverage and SOA considering three life cycle stages (introduction, growth and maturity) of European listed firms, including Portugal and Spain. They conclude that the SOA does not increase as the firm evolve, provided that firms in introduction are able to adjust the fastest. They even call our attention to the fact that firms changing stage adjust leverage at a lower speed and that their target is more affected by profitability when a firm goes from the growth stage to the maturity one. In fact, during maturity the trust of shareholders and the market is greater, decreasing costs and easing the transactions. Thus, as firms grow and mature, profitability, size and tangibles become stronger positive drivers of the target leverage (Dinlersoz et al., 2018; Castro et al., 2016; Titman and Wessels, 1988).

Dinlersoz et al. (2018) evidence that young private firms borrow more, but firm age has no relation to public firms' leverage and that private firms switch from debt to equity financing as they age. The authors study the leverage of US firms over their life cycle and implications for firm growth using the U.S. Census Bureau's Longitudinal Business Database (LBD) for the period 2005–2012. They show that, for private firms, firm size can serve as a good predictor of financial constraints and provide evidence that private firms' growth is positively related to leverage, as they finance their growth during normal times with short-term borrowing, whereas the relationship between leverage and firm growth is negative for public firms. To account for firm size within our estimations we have divided our sample of aged firms (AGE being the natural logarithm of the difference between the constitution year and the current year of analysis) into two variables: AGE1 if the natural logarithm is lower than 2, representing the less mature firms and AGE 2 if the natural logarithm is higher than or equal to 2, representing the more mature firms in the sample.

We permit the speed to vary according to the firm age (maturity) by considering in the dynamic panel (GMM) estimations a model that includes interactions between dummy variables (see Appendix 1 for variables description).

$$VLEV_{it} = \beta_1 AGE1_{it} + \beta_2 AGE2_{it} + \beta_3 AGE1AGE_{it} + \beta_4 AGE2AGE_{it} + \beta_5 AGE1NVTL_{it} + \beta_6 AGE1PVTL_{it} + \beta_7 AGE2NVTL_{it} + \beta_8 AGE2PVTL_{it} + \varepsilon_{it} \quad (11)$$

$$VLEV_{it} = \beta_1 AGE1_{it} + \beta_2 AGE1AGE_{it} + \beta_3 AGE1NVTL_{it} + \beta_4 AGE1PVTL_{it} + \varepsilon_{it} \quad (12)$$

$$VLEV_{it} = \beta_1 AGE2_{it} + \beta_2 AGE2AGE_{it} + \beta_3 AGE2NVTL_{it} + \beta_4 AGE2PVTL_{it} + \varepsilon_{it} \quad (13)$$

To check the robustness of our results, we used both measures of the target leverage (replacing VTL by DEV when appropriate) as independent variables and the variable leverage as dependent[5].

We also repeat estimations considering SIZE to test our hypothesis 2, as a categorizing variable, whose influence over leverage, the capital structure and the SOA to the target leverage has already been emphasized previously. Estimations (11) - (13) were repeated replacing AGE by SIZE (see Appendix 1) where smaller firms are those where SIZE < 9 and higher firms are those respecting the condition SIZE ≥ 9.

3.4. Sample

The sample is comprised of listed firms that constitute the PSI Index (Portugal) and the IBEX (Spain), for the period between 2010 and 2017 (data was collected for 2009 also in order to create the final variables). In total, we have 1405 firms being 46 from Portugal and 1359 from Spain, whose data was available considering this article topic. Data were collected from SABI, a private database provided by Bureau van Dijk. The initial download comprised 2500 firms but we have imposed has a first limitation that the last period of available data was 31 December 2017, leading us with a sample of 1432 firms. Afterwards, we removed all the outliers considering the leverage variables, where all those firms that did not complied with the requirement of having at least 4 years of consecutive data available for leverage have been removed. Moreover, we removed as outliers those firms that presented in any year a negative leverage value or that the leverage ratio was not within the range of 0 and 1. The final sample is an unbalanced panel of 11240 firm-year-variable observations across 1405 firms.

Leverage is our dependent variable measured as the ratio of total debt to total assets (Elsas and Florysiak, 2015; Fitzgerald & Ryan, 2019). The independent variables are described in table 1 and at the Appendix 1 (variables transformation).

4. Empirical results

This section describes our main results in terms of variables descriptive statistics, with respect to the target leverage estimations and with respect to the adjustment speed.

4.1. Descriptive Statistics

[5] Results are not showed here but will be provided upon request. This is so because the main goal is the SOA and not the leverage ratio effects *per si*.

As identified previously our sample is composed by an unbalanced panel of 1405 firms for the period 2010-2017. The leverage mean is of 7% with a standard deviation of 18.7%. The mean size of the firms is high, which is expected provided the fact that the analysed firms are listed ones. The highest mean performance measure is that of Tobin's Q, but the MTB ratio presents higher volatility as evidenced in table 2.

Table 2. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
LEV	0.070	0.187	0.000	0.999
SIZE	8.877	2.286	0.000	18.349
ROA	0.031	0.369	-10.800	32.077
NDTS	0.002	0.013	0.000	0.288
INDLEV	0.071	0.139	0.029	0.687
MTB	0.649	2.712	-8.387	9.254
RISKD	0.000	0.003	0.000	0.143
TANG	0.096	0.278	0.000	9.981
INV	0.138	0.324	-1.812	9.984
TQ	1.336	2.257	0.000	16.210
AGE	2.468	0.794	0.000	4.927
RRISK	-0.023	0.159	-2.557	2.807

Note: variables definition is presented in table 1.

The default risk variable presents the lowest mean among all other variables as well as the lowest standard deviation (as a measure of volatility) and the operational risk or return risk is the only variable presenting a negative mean. The mean age of our sample is above our defined limit of 2, evidencing that the average age of the firms in our sample are concentrated in the maturity phase, which is also consistent with the fact that being listed firms they need to be robust and of high growth. The industry leverage mean is slightly higher than the firms leverage presenting lower volatility as measured by standard deviation. For an initial observation of variables correlations, we present in table 3 the Pearson correlations and respective significance values.

Leverage is significantly and negatively correlated with ROA, MTB and TQ which are our measures of firm accounting and market performance, respectively. It reveals a significant and positive correlation with all the other variables considered as determinants of the firm's capital structure. INDLEV and LEV show a high correlation as expected, as well as TANG and INV inducing for the possibility of multicollinearity issues among these variables and due to this we have performed the estimations of possible effects over LEV and VLEV.

Table 3. Pearson correlations

Variable	LEV	SIZE	ROA	NDTS	INDLEV	MTB	RISKD	TANG	INV	TQ	AGE	RRISK
LEV	1											
SIZE	0.525***	1										
ROA	-0.029***	-0.009	1									
NDTS	0.459***	0.150***	-0.020**	1								
INDLEV	0.724***	0.431***	-0.015	0.336***	1							
MTB	-0.060***	-0.024***	0.030***	-0.023**	-0.074***	1						
RISKD	0.020**	-0.053***	-0.005	0.050***	0.053***	-0.004	1					
TANG	0.732***	0.539***	-0.023**	0.393**	0.598***	-0.071***	0.017*	1				
INV	0.701***	0.502***	0.158***	0.408***	0.580***	-0.058***	-0.010	0.902***	1			
TQ	-0.113***	-0.053***	0.001	-0.030***	-0.096***	0.288***	0.016*	-0.091***	-0.083***	1		
AGE	0.330***	0.623***	0.015	0.124***	0.302***	0.131***	-0.048***	0.288***	0.282***	0.145**	1	
RRISK	0.076***	-0.011	-0.015	-0.004	0.032***	-0.046***	0.013	0.022**	0.003	-0.021**	0.006	1

Note: Variables are defined in table 1. *,**,*** stand for significance levels at 10%, 5% and 1% respectively.

4.2. Target leverage estimations

We begin by estimating the determinants of the capital structure to highlight a target financial structure. Table 4 shows the results of the dynamic panel regressions and that of the initial censored Tobit regression to determine the first measure of target leverage [equation (3)]. As for the second measure ($TL_{it} = \frac{1}{\hat{\alpha}}(\widehat{LEV_{it}} - (1 - \hat{\alpha})LEV_{it-1}$, being $\widehat{LEV_{it}}$ the predicted leverage obtained through equation (4) and $\hat{\alpha}$ the estimated coefficient of equation (1), the coefficient estimate obtained through the Tobit censored panel regression was of 0.049075[6].

The leverage (LEV) estimation shows several interesting results. SIZE, NDTS, INDLEV, RISKD, TANG and RRISK are statistically significant and positively related to leverage. But there is no statistically significant relationship between MTB, INV, AGE and leverage revealed through our results. However, when considering a different estimation model (dynamic GMM panel) we observe that the previous year leverage exerts a positive and significant influence over current leverage, evidencing historical effects over current leverage ratios, or, as argued by Fitzgerald and Ryan (2019), also Iberian listed firms exhibit leverage targeting behaviour and adjust to target leverage.

[6] Results will be provided upon request.

Moreover, some of the variables able to explain the capital structure remain significant but their coefficient sign changes under the dynamic panel model and remain robust to different model specifications. This happens for size, MTB (which is now significant), TANG, being that INV turns out to be significant both when considering TANG or not. But NDTS loses its significance and TQ also, under the dynamic GMM panel model.

Table 4. Parameter estimates on the determinants of the leverage ratio

	Estimation (1)		Estimation (2)		Estimation (3)		Estimation (4)	
DEP	LEV		LEV		LEV		LEV	
INDEP	Coef.	z	Coef.	z	Coef.	z	Coef.	z
LEV t-1			0.580	30.63***	0.573	30.74***	0.635	38.53***
SIZE	0.004	3.40***	-0.010	-8.93***	-0.010	-9.04***	-0.010	-9.22***
ROA	-0.013	-2.61***	-0.010	-3.11***	-0.007	-2.46**	-0.004	-1.48
NDTS	0.211	2.13**	0.118	0.86			0.168	1.21
INDLEV	0.987	84.29***	0.348	6.51***	0.347	6.57***		
MTB	0.001	1.01	-0.015	-10.79***	-0.015	-10.64***	-0.014	-10.18***
RISKD	1.004	2.57**	5.225	5.36***	5.082	5.23***		
TANG	0.089	4.40***	-0.023	-2.88***			0.005	0.89
INV	0.010	1.44	0.025	4.59***	0.014	3.63***		
TQ	-0.002	-2.59**	0.003	1.29				
AGE	0.002	0.87	0.002	0.62	0.002	0.59		
RRISK	0.010	2.15**	0.033	8.01***	0.034	8.11***		
Wald chi2(11)	8994.35		Wald chi2(12)	1798.44	Wald chi2(9)	1806.95	Wald chi2(6)	1543.87
Prob > chi2	0.000		Prob > chi2	0.000	Prob > chi2	0.000	Prob > chi2	0.000
/sigma_u	0.037***							
/sigma_e	0.035***		GMM type		GMM type		GMM type	
rho	0.528							
Model	Tobit		Dynamic		Dynamic		Dynamic	

Note: Variables are defined in table 1. *,**,*** stand for significance levels at 10%, 5% and 1% respectively.

We do not find any statistically significant relationship between age and leverage, but we do find a positive and significant relationship for both return risk and default risk. For the last, our results favour those of Michaelas et al. (1999), Elsas and Florysiak (2011) and Fitzgerald and Ryan (2019), contradicting those of Dufour et al. (2018) who found no significance, Psillaki and Daskalakis (2009), Ozkan (2001) and Elsas and Florysiak (2015). We find a negative relationship between leverage and profitability which is reasonable considering the fact that high profitability is associated with low leverage, consistent with Dufour et al. (2018) results. Finally, when considering the dynamic panel approach, non-debt tax benefits seem to have no influence on debt and thus on leverage, similar to the findings of Dufour et al. (2018), but opposed to those of Fitzgerald and Ryan (2019) who found a positive and significant impact, that we also have but only for the censored Tobit. Thus, combining size and NDTS, our initial results suggest that higher firms and less profitable firms employ more debt financing as they wish to maximize the value of the debt tax-shield, contradicting Modigliani and Miller (1963) as for profitability.

Before starting with the adjustment speed estimation results presentation we have tried to observe which of these capital structure determinants would also influence the target leverage measures we have considered. Table 5 presents the estimation results considering our dependent variables TLEV, TL, VTLEV and DEV under the dynamic panel GMM specification.

The adjustment to the target leverage (dependent variable in t-1) or the leverage targeting behaviour of Iberian firms is only positive for the second specification of the target leverage and its deviation (DEV). Table 5 also evidences that size only exerts positive influence over the TLEV (specification 1), the performance measures ROA and TQ continue to exert a negative impact over the TLEV, as for leverage, being all the remaining variables statistically and positively significant for the target leverage. Curiously, age is now significant and positive but only for the target leverage, and under its first specification. But, both default risk and return risk are important variables which positively influence the target leverage, as well as deviations (from previous period leverage).

Non-debt tax shields reveal unusual results considering both LEV (table 4) and TLEV (table 5). The trade-off theory predicts non-debt tax-shields will be negatively related to leverage. According to Fitzgerald and Ryan (2019), firms with alternative methods of shielding tax stand to have lower benefits derived from debt financing. However, the industry mean leverage has a positive and statistically significant impact over both LEV and TLEV, as opposed to the findings of Fitzgerald and Ryan (2019).

However, estimation (3) in table 5 evidences a negative and significant impact that may be explained by the use of lagged dependent variables into estimations. That is, whilst a firm's leverage ratio and target leverage ratio in time t is likely positively related to industry median leverage in time t-1, its actual deviation (target leverage in t – leverage in t-1) may be negatively related to the industry median leverage in time t-1. Thus previous high industry leverage ratios negatively influence the change or deviation of the target leverage in the present.

Table 5. Parameter estimates on the determinants of the target leverage ratio and variations of the target leverage (target leverage in t – leverage ratio in t-1): Dynamic panel GMM type

	Estimation (1)	Estimation (2)	Estimation (3)	Estimation (4)
DEP.	TLEV	TL	VTLEV	DEV
INDEP	Coef.	Coef.	Coef.	Coef.
DEP. t-1	-9.7E-11	0.394***	-0.166***	0.402***
SIZE	0.004***	-0.302***	-0.0159***	-0.323***
ROA	-0.013***	-0.435***	-0.011***	-0.442***
NDTS	0.211***	2.164	0.0136	2.151
INDLEV	0.987***	0.428	-0.318***	-1.132
MTB	0.001***	-0.460***	-0.021***	-0.485***
RISKD	1.004***	96.092***	6.437***	96.030***
TANG	0.089***	1.286***	-0.029***	1.253***
INV	0.010***	0.809***	0.030***	0.842***
TQ	-0.002***	0.045	0.003	0.049
AGE	0.002***	0.038	0.007	0.054
RRISK	0.010***	0.760***	0.036***	0.789***
Constant	-8.7E-10	3.190***	0.156***	3.406***
Wald chi2(.)	2.69E+17	1864.74	908.29	1874.08
Prob > chi2	0.000	0.000	0.000	0.000

Note: Variables are defined in table 1 and at Appendix 1. *,**,*** stand for significance levels at 10%, 5% and 1% respectively.

4.3. Adjustment speed

Table 6 shows the results of the first and second adjustment specifications considering as dependent variables VLEV and LEV (see appendix 1 for more details). We have obtained an average SOA [as provided by equation (1)] of 0.049075, a far lower result than that obtained by Dufour et al. (2018) and references therein (see page 68, section 3.2.2). The coefficient α varies between 0 and 1 and is inversely related to adjustment costs (Castro et al., 2016). Thus, we may infer from our results that the sample of Iberian firms have extremely high adjustment costs to the target leverage, even higher than those reported by Dufour et al. (2018) for their sample of French SMEs.

In table 6 we test whether there is a difference between the adjustment speed of over-levered firms and the adjustment speed of under-levered firms, being the speed of adjustment a trade-off between deviation costs and adjustment costs (Castro et al., 2016; Dufour et al., 2018). Deviation costs are higher for over-levered firms, where also high financial distress costs provide stronger incentives to adjust their capital structures, being the associated transaction costs also higher for over-levered firms. Mukherjee and Wang (2013) state that manager's incentive to adjust is higher for an over-levered firm than that of under-levered firms. This was even the conclusion undertaken by Warr et al. (2012) and Dufour et al. (2018), the latter only for the short-term debt.

Table 6. Parameter estimates on the target adjustment model of equations (5)-(8): Dynamic panel GMM type

	Estimation (1)	Estimation (2)	Estimation (3)	Estimation (4)
DEP. t	VLEV	VLEV	LEV	LEV
INDEP	Coef.	Coef.	Coef.	Coef.
DEP. t-1	0.070***	0.070***	1.531***	1.531***
NVTLEV	1.300***		1.629***	
PVTLEV	1.005***		1.162***	
NDEV		0.064***		0.080***
PDEV		0.049***		0.057***
Constant	-0.040***	-0.040***	-0.082***	-0.082***
Wald chi2(.)	11728.95	11728.95	1690.90	1690.90
Prob > chi2	0.000	0.000	0.000	0.000
test NVTLEV=PVTLEV; test NDEV = PDEV				
chi2(1)	100.87	100.87	193.79	193.79
Prob > chi2	0.000	0.000	0.000	0.000

Note: Variables are defined in table 1 and at Appendix 1. *,**,*** stand for significance levels at 10%, 5% and 1% respectively. Results are consistent for both VLEV and LEV and thus we skip the presentation of the results associated to the LEV dependent variable in the rest of the estimations. However, results will be provided upon request.

The coefficient estimate corresponding to the SOA of over-levered Iberian listed companies is 1.3 and the coefficient estimate corresponding to the SOA of an under-levered firm is 1.005, both statistically significant, and 0.064 and 0.049 when considering the first and the second target leverage measures, respectively. The difference in the estimates is highly significant: we performed a chi-squared test that led to a strong rejection of the null hypothesis that both coefficients are equal. This result is in line with evidence from the literature and with our raised hypothesis 1 that the SOA is greater for over-levered firms than for under-levered firms.

Furthermore, we also confirmed that size has a positive influence both over leverage and the target leverage previously. With this in mind, and in order to test hypothesis 2, in the spirit of the work of Dufour et al. (2018) but for cash flows, we present in table 7 the estimations with respect to size. Here we have allowed the speed to vary according to SIZE1 (measured as the natural logarithm of total assets below 9) and SIZE 2 (for values above or equal to 9 of the SIZE variable).

Table 7. Parameter estimates on the target adjustment model for SIZE: Dynamic panel GMM type

	Estimation (1)	Estimation (2)	Estimation (3)	Estimation (4)	Estimation (5)	Estimation (6)
DEP t	VLEV	VLEV	VLEV	VLEV	VLEV	VLEV
INDEP	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
DEP. t-1	0.045***	0.045***	-0.132***	-0.057***	-0.132***	-0.057***
SIZE1	+	+	0.056***		0.056***	
SIZE2	-0.026	-0.027		0.089***		0.089***
SIZE1SIZE	-0.011***	-0.011***	-0.010***		-0.010***	
SIZE2SIZE	-0.005*	-0.005*		-0.013***		-0.013***
SIZE1NVTL	0.149***		0.094***			
SIZE1PVTL	0.128***		0.093***			
SIZE2NVTL	0.103***			0.083***		
SIZE2PVTL	0.070***			0.057***		
SIZE1NDEV		0.007***			0.005***	
SIZE1PDEV		0.006***			0.005***	
SIZE2NDEV		0.005***				0.004***
SIZE2PDEV		0.003***				0.003***
Constant	0.051***	0.051***	-0.011***	0.016***	-0.011***	0.016***
Wald chi2(.)	10221.08	10221.08	1312.05	4765.54	1312.05	4765.54
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000
test coefficients equality						
chi2(1)	7.26[a]	7.26[a]	0.03	69.41	0.03	69.41
Prob > chi2	0.000	0.000	0.863	0.000	0.863	0.000

Note: Variables are defined in table 1 and at Appendix 1. *,**,*** stand for significance levels at 10%, 5% and 1% respectively. Results are consistent for both VLEV and LEV and thus we skip the presentation of the results associated to the LEV dependent variable in the rest of the estimations. However, results will be provided upon request. + Variable dropped because of collinearity. [a] Test of equality of coefficients realized and consistent (although) different between the different parameters.

This consideration of smaller and larger firms respects to the minimum and maximum values reported by the variable SIZE in table 2. Table 7 reports the estimation results for the adjustment model specified for low sized firms (SIZE $<$ 9) and high sized firms (SIZE $\geq$ 9). The aim of this table is to test the influence of the sign of SIZE on the adjustment speeds of over-levered firms and under-levered firms. The coefficient estimates on the above-target debt with a small size (SIZE1) is 0.149 and that of below-target leverage is 0.128. The coefficient estimates on the over-levered firms with high size (SIZE2) is 0.103 and that of under-levered firms is 0.07. The chi-squared tests with null hypothesis that the parameter estimates are equal for over and under levered firms is highly significant revealing their clear difference. Thus, when a firm is over-levered, size influences the adjustment speed, revealing that SOA is higher for smaller firms. This finding is validated for both leverages and considering different model specifications [estimations (3) - (6)].

This result contradicts the hypothesis (2) which, in accordance to previous empirical findings, stated that the SOA is greater for larger firms. As such, we contradict the findings of Frelinghaus et al. (2005), Mukherjee and Wang (2013), Castro et al. (2016) and Dinlersoz et al. (2018), but favour those of Fitzgerald and Ryan (2019).

These results suggest that although small firms may face higher adjustment costs than larger firms provided their limited access to capital markets or the fixed cost nature of transaction costs, the costs incurred by small firms due to significant deviations will imply potential financial distress costs and information asymmetry leading smaller firms to exhibit faster SOA. This finding is consistent also with the results of Elsas and Florysiak (2011) and the obtained negative coefficient sign relating firm size and leverage in table 4 under the dynamic panel GMM specification.

With respect to AGE, table 8 reports the estimation results for the adjustment model specified by equations (11) - (13). The aim of this table is to test the influence of the sign of AGE on the adjustment speeds of over-levered firms and under-levered firms. Considering first over-levered firms the coefficient estimates on the above-target debt for younger firms (AGE1) is 0.446 and that for older firms (AGE2) is 0.373.

Considering the under-levered firms, the coefficient estimates on the below-target debt for younger firms is 0.3925 and that of older firms is 0.255. The chi-squared test is highly statistically significant thus inducing that results are different for younger and older firms. From the evidence in table 8, also robust considering different model specifications, we may argue that the SOA is higher for younger firms. However, this result also contradicts the hypothesis 3, where, in accordance to previous empirical findings (Castro et al., 2016), the SOA is higher for older firms. The same pointed reasons with respect to size (maturity) of the firm maybe extended to the evidence undertaken for firm age (higher potential financial distress costs, information asymmetry concerns, more limited access to capital markets and lower confidence by investors).

Table 8. Parameter estimates on the target adjustment model of equations (11)-(13) for AGE: Dynamic panel GMM type

	Estimation (1)	Estimation (2)	Estimation (3)	Estimation (4)	Estimation (5)	Estimation (6)
DEP t	VLEV	VLEV	VLEV	VLEV	VLEV	VLEV
INDEP	Coef.	Coef.	Coef.	Coef.	Coef.	Coef.
DEP. t-1	-0.023***	-0.023***	-0.185***	-0.022***	-0.185**	-0.022***
AGE1	+	+	0.022***		0.022***	
AGE2	-0.008	-0.009		0.002		0.002
AGE1AGE	-0.024***	-0.024***	-0.026***		-0.026***	
AGE2AGE	-0.013***	-0.013***		-0.012**		-0.012**
AGE1NVTL	0.446***		0.170***			
AGE1PVTL	0.3925***		0.270***			
AGE2NVTL	0.373***			0.355***		
AGE2PVTL	0.255***			0.246***		
AGE1NDEV		0.022***			0.008***	
AGE1PDEV		0.019***			0.013***	
AGE2NDEV		0.018***				0.017***
AGE2PDEV		0.013***				0.0121***
Constant	0.019**	0.019**	-0.001	0.008**	-0.001	0.008**
Wald chi2(.)	6596.84	6596.84	588.84	5291.14	588.84	5291.14
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000
test coefficients equality						
chi2(1)	110.3[a]	110.3[a]	3.99	87.78	3.99	87.78
Prob > chi2	0.000	0.000	0.046	0.000	0.046	0.000

Note: Variables are defined in table 1 and at Appendix 1. *,**,*** stand for significance levels at 10%, 5% and 1% respectively. Results are consistent for both VLEV and LEV and thus we skip the presentation of the results associated to the LEV dependent variable in the rest of the estimations. However, results will be provided upon request. + Variable dropped because of collinearity. [a] Test of equality of coefficients realized and consistent (although) different between the different parameters.

Concerning our hypothesis 4 that the SOA is greater when the risk is higher, table 9 presents the estimation results for the adjustment model specified by equations (9) and (10) with respect to default risk and return risk, respectively. Our initial prediction is that for both kinds of risk, the higher the risk, the higher will be the investors demand and as such the higher the expected SOA. Table 9 shows the influence of the sign of RISKD and RRISK on the adjustment speeds of over-levered firms and under-levered firms.

Considering the default risk, the coefficient estimates where only possible to be obtained (the other variables were dropped from the estimation due to collinearity) for positive risk of default, and this for both leverages. The SOA is higher for over-levered firms and when the default risk is positive than for under-levered firms. The coefficient equality test estimates reveal their significant difference at the 1% level, being valid for both kinds of target leverage considered.

Table 9. Parameter estimates on the target adjustment model of equations (9)-(10) for default and return risk: Dynamic panel GMM type

	Default Risk RISKD			Return Risk RRISK	
DEP t	VLEV	VLEV	DEP t	VLEV	VLEV
INDEP	Coef.	Coef.	INDEP	Coef.	Coef.
DEP. t-1	-0.175***	-0.175***	DEP. t-1	-0.181***	-0.181***
NRISKD	+	+	NRRISK	0.002	0.002
PRISKD	+	+	PRRISK	+	+
NRDNVTL	+		NRRNVTL	-0.260***	
PRDNVTL	78.928***		PRRNVTL	0.025	
NRDPVTL	+		NRRPVTL	-0.192***	
PRDPVTL	3.945***		PRRPVTL	0.289***	
NRDNDEV		+	NRRNDEV		-0.013***
PRDNDEV		3.873***	PRRNDEV		0.001
NRDPDEV		+	NRRPDEV		-0.009***
PRDPDEV		0.194***	PRRPDEV		0.014***
Constant	0.0004	0.0004	Constant	-0.0014	-0.0014
Wald chi2(.)	497.36	497.36	Wald chi2(.)	572.01	572.01
Prob > chi2	0.000	0.000	Prob > chi2	0.000	0.000
test coefficients equality					
chi2(1)	9.58	9.58	chi2(1)	32.53[a]	32.53[a]
Prob > chi2	0.000	0.000	Prob > chi2	0.000	0.000

Note: Variables are defined in table 1 and at Appendix 1. *,**,*** stand for significance levels at 10%, 5% and 1% respectively. Results are consistent for both VLEV and LEV and thus we skip the presentation of the results associated to the LEV dependent variable in the rest of the estimations. However, results will be provided upon request. + Variable dropped because of collinearity. [a] Test of equality of coefficients realized and consistent (although) different between the different parameters.

Our results favour those of Fitzgerald and Ryan (2019) and Michaelas et al. (1999), validating the hypothesis 4. However, we contradict the findings of Elsas and Florysiak (2015), Ozkan (2011), Psillaki and Daskalakis (2009) who found that risk and leverage have a negative relationship and that the SOA is greater when the risk is lower, and those of Dufour et al. (2018) where no relationship was found between both variables.

Provided that operational risk, represented by returns volatility, influences the capital structure of firms and thus leverage in a negative way, we also report in table 9 the estimation results for the variable RRISK. We should start by mentioning that for both over-levered and under-levered firms whose returns volatility is negative, the coefficient estimates are negative and results are statistically significant and robust for different leverage measures. As such, when a firm is under-levered (-0.192), negative return risk leads to higher SOA. Moreover, the SOA is higher for firms evidencing positive return risk (0.289). Our results show that a negative return risk does not lead to faster adjustment to the target leverage, thus leading us to conclude that the SOA is greater when the risk is higher (positive volatility), validating our hypothesis 4, and that the SOA is higher for under-levered firms.

Therefore, higher volatility of returns leads to higher SOA, especially for under-levered firms. Results evidence that under-levered firms will adjust its leverage more rapidly when facing positive return risk than when facing negative returns volatility. A listed company will prefer to adjust its leverage by increasing its debt instead of by reducing its equity and avoiding having to face investors response to volatility increases. Although higher returns volatility increase transaction costs it enhances a firm's motivation to increase its leverage to reduce its deviation costs and listed firms are more concerned with deviation costs when they are under-levered (Castro et al., 2016), at least for the considered sample of Iberian firms.

5. Conclusions

In this paper, we analyse the speed of 1405 listed Iberian firms' adjustment to their optimal capital structure using a two-step procedure. Estimation results were obtained for the period 2010-2017 using firstly the censored panel Tobit model and afterwards dynamic panel GMM estimates, to emphasize the influence of size, age, default risk and return risk realizations on the SOA of both over-levered firms and under-levered firms. To our knowledge, our work is the first to address this influence in the context of Iberian listed firms. Both Iberian countries are characterized by concentrated ownership structures, lower investor protection, high transaction costs related to funding, insufficient protection offered to creditors and equity investors, as well as less effective external control mechanisms. We use two methods to estimate the target leverage and compare the adjustment speeds of over-levered and under-levered firms, considering commonly used determinants of the capital structure and new ones, combined, having us obtained several interesting results.

Some of our results are in line with evidence in the literature. For example, over-levered firms adjust more quickly than under-levered firms. Both default risk and return risk exhibit a positive influence over leverage and over the target leverage, which means that the higher the risk, independently of the type of risk considered, the higher will tend to be the debt level adopted by firms and the higher the target leverage. However, the maturity of the firm seems to have no significant influence over leverage but results pointed for a significant and positive effect of firms' age over the target leverage.

Results also point that Iberian firms have extremely high adjustment costs to the target leverage and a very small SOA. This finding could encourage policy-makers to facilitate access to and the renegotiation of debt in the Iberian market (for both Portugal and Spain). We also studied the effect of size and age on the adjustment speed by distinguishing four situations, for both categorical variables, depending on whether size and age are high or low and whether the firm is over-levered or under-levered. For under-levered firms the SOA is greater and smaller firms exhibit faster SOA, contradicting some of the previous empirical findings but favouring more recent empirical evidence using dynamic panel models. Moreover, younger firms seem to exhibit faster SOA.

Additionally, we tested the categorical variable risk effect on the adjustment speed by differentiating between default risk and return risk (returns volatility), finding that both variables are important to explain firm's SOA. We do that by distinguishing also four situations depending on whether risk is positive or negative and whether the firm is over-levered or under-levered. For under-levered firms, our statistical results showed that the SOA of firms is higher when the volatility of returns is taken into account, where the SOA is greater when the return risk is higher. In the case of negative default risk, results were inconclusive for both over and under-levered firms.

Many avenues of research remain open. Provided that in both Iberian countries there is a large number of SMEs, it would be interesting to analyse the SOA for the entire number of firms in both markets. Other explanatory factors such as the effect of takeovers, ownership or investor behavioural effects could be introduced, provided that return risk is an important variable to explain the SOA of listed Iberian firms. Thus, market expectations could be an important issue to be taken into account to explain deviations and adjustment speeds.

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Appendix 1

Table A.1. Variables specification (Table 1 continued…): all computed by firm (i) and period (t)

Variable	Specification/Explanation
TLEV	Target leverage measure 1: $TLEV_{it} = \hat{\beta}X_{it-1}$ (censoring variable was INDLEV); no constant term; censored panel Tobit (regression re) – see equations (1)-(4)
LEVT	LEVT = LEV_{t-1}
VLEV	VLEV = LEV_t – LEV_{t-1}
VTLEV	VTLEV = TLEV – LEVT; measure 1 of target leverage deviation $VLEV_{it} = \alpha VTLEV_{it}$ (censoring variable was INDLEV); no constant term; censored panel Tobit (regression re); $\hat{\alpha}$ taken
TL	Target leverage measure 2: $TL_{it} = \frac{1}{\hat{\alpha}}(TLEV_{it} - (1-\hat{\alpha})LEVT)$
NVT	Is a dummy variable equal to 1 if the deviation (VTLEV) is negative for firm i at time t (leverage above the target); NVT = VTLEV < 0
PVT	Is a dummy variable equal to 1 if the deviation (VTLEV) is positive for firm i at time t (leverage below the target); PVT = VTLEV ≥ 0
NVTLEV	NVTLEV = NVT*VTLEV
PVTLEV	PVTLEV = PVT*VTLEV
DEV	DEV = TL – LEVT; measure 2 of target leverage deviation
NTL	Is a dummy variable equal to 1 if the deviation (DEV) is negative for firm i at time t (leverage above the target); NTL = DEV < 0

PTL	Is a dummy variable equal to 1 if the deviation (DEV) is positive for firm i at time t (leverage below the target); PTL = DEV ≥ 0
NDEV	NDEV = NTL*DEV
PDEV	PDEV = PTL*DEV
NRISKD	Is a dummy variable equal to 1 if the default risk (RISKD) is negative for firm i at time t; NRISKD = RISKD < 0
PRISKD	Is a dummy variable equal to 1 if the default risk (RISKD) is positive for firm i at time t; PRISKD = RISKD ≥ 0
NRRISK	Is a dummy variable equal to 1 if the return risk (RRISK) is negative for firm i at time t; NRRISK = RRISK < 0
PRISKD	Is a dummy variable equal to 1 if the return risk (RRISK) is positive for firm i at time t; PRRISK = RRISK ≥ 0
AGE1	Is a dummy variable equal to 1 if age (AGE) is lower than 2 for firm i at time t; AGE1 = AGE < 2
AGE2	Is a dummy variable equal to 1 if age (AGE) is higher or equal than 2 for firm i at time t; AGE2 = AGE ≥ 2
SIZE1	Is a dummy variable equal to 1 if the size (SIZE) is lower than 9 for firm i at time t; SIZE1 = SIZE < 9
SIZE2	Is a dummy variable equal to 1 if the size (SIZE) is higher or equal than 9 for firm i at time t; SIZE2 = SIZE ≥ 9
Including interactions between dummy variables:	
NNRISKD	NNRISKD = NRISKD*RISKD
PPRISKD	PPRISKD = PRISKD*RISKD
NNRRISK	NNRRISK = NRRISK*RRISK
PPRRISK	PPRRISK = PRRISK*RRISK
AGE1AGE	AGE1AGE = AGE1*AGE
AGE2AGE	AGE2AGE = AGE2*AGE
NRDNVTL	NRDNVTL = NNRISKD*NVTLEV
PRDNVTL	PRDNVTL = PPRISKD*NVTLEV
NRDPVTL	NRDPVTL = NNRISKD*PVTLEV
PRDPVTL	PRDPVTL = PPRISKD*PVTLEV
NRDNDEV	NRDNDEV = NNRISKD*NDEV
NRDPDEV	NRDPDEV = NNRISKD*PDEV
PRDNDEV	PRDNDEV = PPRISKD*NDEV
PRDPDEV	PRDPDEV = PPRISKD*PDEV
NRRNVTL	NRRNVTL = NNRRISK*NVTLEV

NRRPVTL	NRRPVTL = NNRRISK*PVTLEV
PRRNVTL	PRRNVTL = PPRRISK*NVTLEV
PRRPVTL	PRRPVTL = PPRRISK*PVTLEV
NRRNDEV	NRRNDEV = NNRRISK*NDEV
NRRPDEV	NRRPDEV = NNRRISK*PDEV
PRRNDEV	PRRNDEV = PPRRISK*NDEV
PRRPDEV	PRRPDEV = PPRRISK*PDEV
AGE1NVTL	AGE1NVTL = AGE1AGE*NVTLEV
AGE1PVTL	AGE1PVTL = AGE1AGE*PVTLEV
AGE1NDEV	AGE1NDEV = AGE1AGE*NDEV
AGE1PDEV	AGE1PDEV = AGE1AGE*PDEV
AGE2NVTL	AGE2NVTL = AGE2AGE*NVTLEV
AGE2PVTL	AGE2PVTL = AGE2AGE*PVTLEV
AGE2NDEV	AGE2NDEV = AGE2AGE*NDEV
AGE2PDEV	AGE2PDEV = AGE2AGE*PDEV
SIZE1SIZE	SIZE1SIZE = SIZE1*SIZE
SIZE2SIZE	SIZE2SIZE = SIZE2*SIZE
SIZE1NVTL	SIZE1NVTL = SIZE1SIZE*NVTLEV
SIZE1PVTL	SIZE1PVTL = SIZE1SIZE*PVTLEV
SIZE1NDEV	SIZE1NDEV = SIZE1SIZE*NDEV
SIZE1PDEV	SIZE1PDEV = SIZE1SIZE*PDEV
SIZE2NVTL	SIZE2NVTL = SIZE2SIZE*NVTLEV
SIZE2PVTL	SIZE2PVTL = SIZE2SIZE*PVTLEV
SIZE2NDEV	SIZE2NDEV = SIZE2SIZE*NDEV
SIZE2PDEV	SIZE2PDEV = SIZE2SIZE*PDEV