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Capital structure of listed Portuguese companies: determinants of debt adjustment

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Capital structure of listed Portuguese companies

Determinants of debt adjustment

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Abstract

Purpose – This study aims to evaluate the impact of listed Portuguese companies' specific determinants on adjustment of actual debt towards target debt ratio. The specific determinants on adjustment of actual debt towards target debt ratio that we consider are: asset tangibility, size, profitability and market to book ratio.

Design/methodology/approach – Dynamic panel estimators are used to determine adjustment of the actual level of debt towards optimal level of debt, revealing the level of transaction costs borne by companies. OLS regressions are also used, in order to estimate the impacts of companies' specific determinants on debt adjustment.

Findings – The results suggest that transaction costs are relevant in listed Portuguese companies' access to debt. Tangibility of assets and size are determinants that contribute for a greater adjustment of debt towards optimal level. The results also suggest that the capital structure decisions of listed Portuguese companies can be explained in the light of trade-off and pecking order theories, and not according to what is forecast by market timing theory.

Originality/value – Through this study, the level of adjustment of actual debt towards target debt ratio in the context of companies belonging to under-developed capital markets are determined, in the particular case of this study, belonging to the Portuguese capital market. Furthermore, from target debt ratio depending on companies' specific determinants, the explanatory power of trade-off, pecking order and market timing theories are investigated. The results contribute for a deeper understanding about companies' capital structure decisions.

Keywords Portugal, Debts, Companies, Cost estimates

Paper type Research paper

1. Introduction

The pioneering study by Modigliani and Miller (1958) shows that company's value is not dependent on its financial structure. The authors conclude that a company's greater or lesser value depends on the ability of its assets to generate value, it being irrelevant if the assets originate in internal capital or external capital. However, Modigliani and Miller (1963), admitting the existence of taxes conclude that, given tax benefits, companies have an advantage in using debt rather than using internal capital, as they can benefit of debt tax shields.

One of the most relevant questions in the study of company capital structure is to ascertain the level of adjustment of actual debt towards target debt ratio. In this context, according to trade-off theory, companies are expected to look for a target debt ratio (Lev and Pekelman, 1975; Ang, 1976; Taggart, 1977; Jalilvand and Harris, 1984).

Various empirical studies (Kremp *et al.*, 1999; Shyam-Sunder and Myers, 1999; Miguel and Pindado, 2001; Ozkan, 2001; Gaud *et al.*, 2005), in the context of listed companies, estimate companies' debt adjustment towards the optimal level. However,

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there is a gap in the literature due to the absence of studies of the impact of companies' specific determinants on debt adjustment. In order to fill the identified gap concerning the study of company capital structure in general, and in particular concerning study of adjustment of actual debt towards target debt ratio, the main objective of this study is to measure the impact of companies' specific determinants on debt adjustment.

As companies' specific determinants we consider, just as (Rajan and Zingales, 1995; Baker and Wurgler, 2002; Fama and French, 2002):

- asset structure;
- size;
- profitability; and
- market to book ratio.

Through asset structure and size, we test empirically the theoretical relationships forecast by trade-off theory about the capital structure decisions of listed Portuguese companies, through profitability what is theoretically forecast by pecking order theory, and through market to book ratio, what is forecast by market timing theory.

Since most empirical studies estimating level of debt adjustment towards target debt ratio have as their subject of analysis companies in countries with a more developed capital market than Portugal, we consider it relevant to study the Portuguese situation, so as to find out how the limited development of the Portuguese capital market can affect the results obtained, concerning adjustment of debt towards the optimal level, and the impact of companies' specific determinants on the level of adjustment.

Therefore, besides the contribution referred to above, this study intends to make the specific contributions: determine the level of adjustment of actual debt towards target debt ratio in the context of companies belonging to under-developed capital markets, in the particular case of this study belonging to the Portuguese capital market and from target debt ratio depending on companies' specific determinants, we also investigate the explanatory power of trade-off, pecking order and market timing theories, for the capital structure decisions of listed Portuguese companies.

Methodologically, to estimate adjustment of the actual level of debt of listed Portuguese companies, as well as the relationship between specific determinants and debt, we use dynamic panel estimators. To estimate the impact of specific determinants on debt adjustment, we use OLS regressions, initially estimating adjustments to annual debt and afterwards its relationship with specific determinants.

The obtained results allow us to conclude that:

(1) tangibility of assets, and above all the size of listed Portuguese companies, are determinant factors for greater adjustment of actual level of debt towards target debt ratio, profitability and market to book ratio being irrelevant;

(2) adjustment of actual level of debt towards target debt ratio suggests that the transaction costs of listed Portuguese companies are more relevant than for listed companies in Germany, the USA, Spain and the UK; and

(3) market timing theory does not seem to be relevant in explaining the capital structure of listed Portuguese companies, unlike what happens in the case of trade-off and pecking order theories.

To achieve the objectives of this study, we divide it as follows, after this introduction: section 2 presents a review of the literature and the hypotheses for investigation;

section 3 the database and variables used in this study; section 4 the estimation methodology used; section 5 presents the empirical results and discussion of them; and section 6 presents the conclusions of this study.

2. Literature review and research hypotheses

This section begins with a review of the literature and we go on to present the hypotheses for investigation. We present the literature review and corresponding hypotheses for investigation concerning debt adjustment towards target debt ratio and about companies' specific determinants that will be more relevant in explaining adjustments. Finally, we present the hypotheses regarding the expected relationships between determinants and debt, in the light of what is forecast by trade-off, pecking order and market timing theories.

2.1 Debt adjustment to optimal level

The studies by Lev and Pekelman (1975), Ang (1976), Taggart (1977) and Jalilvand and Harris (1984) conclude that companies try to find an optimal level of long-term debt. According to the authors, company capital structure is dynamic, and companies try to adjust the level of debt towards to the optimal level, confirming trade-off theory.

On one hand, Moh'd *et al.* (1998) conclude that adjustments to capital structure in large companies occur as a need to confront agency problems existing between shareholders and managers. On the other, Goldstein *et al.* (2001) conclude that adjustments to capital structure in large companies emerge as a need to react to changes in their market value.

Empirical evidence obtained in various countries indicates that companies adjust actual debt towards target debt ratio. Kremp *et al.* (1999) obtain adjustments of 0.53 and 0.28 for German and French listed companies, respectively, Shyam-Sunder and Myers (1999) 0.59 for American listed companies, Miguel and Pindado (2001) 0.79 for Spanish listed companies, Ozkan (2001) 0.57 for British listed companies and Gaud *et al.* (2005) values between 0.14 and 0.387 for Swiss listed companies, depending on the type of debt used.

Based on theoretical trade-off theory arguments and empirical results, we formulate the following hypothesis:

H1. Companies adjust their debt towards the optimal debt ratio.

According to Scott (1977) and Stulz and Johnson (1985), the existence of tangible assets can increase the probability of issuing debt with a guarantee, significantly reducing the monitoring and control costs associated with debt. Besides that, Scott (1977) concludes that a company can increase the value of its assets by issuing debt with collateral security.

Titman and Wessels (1988) suggested that the influence of the size variable on debt can occur in two ways: first is related to the fact of large companies increasing their debt capacity by following a strategy of diversifying its area of activity, allowing them to obtain less volatile financial flux and contributing to diminished risk of bankruptcy; the second comes from the fact of fixed bankruptcy costs representing a small amount compared with the total value of the company and this contributes to diminishing the total cost of debt. As well as this, Warner (1977), Ferri and Jones (1979) and Ang *et al.* (1982) mention that the debt capacity of large companies gives them the possibility of obtaining greater amount of debt and obtaining lower interest rates on loans.

We can state that first, a higher level of tangible assets in companies contributes to greater ease in obtaining credit, given the greater possibility of providing collateral in the case of company insolvency, and secondly, greater size allows greater diversification of company activities, contributing to reduced likelihood of bankruptcy, which also contributes to obtaining credit on more favourable terms.

Considering that asset tangibility and greater company size contributes to reduced information asymmetry, and can consequently contribute to a reduction of the transaction costs companies face in their relationships with external agents, we formulate the following hypothesis.

H2. Asset tangibility and size are more relevant determinants than profitability and MTB ratio for greater adjustment of actual level of debt towards target debt ratio.

2.2 Determinants of debt

According to trade-off theory, it is expected that higher levels of collateral and greater company size contribute to them turning more to debt. For one thing, companies with higher levels of collateral find it easier to access debt, given that companies' fixed assets contribute to reduced information asymmetry between managers/shareholders and creditors, as a consequence of the latter being able to recuperate the capital owed in the form of collateral in the case of company failure (Scott, 1977). For another, larger companies are more able to face up to increased debt, given the lesser likelihood of bankruptcy (Warner, 1977; Ang *et al.*, 1982).

Based on trade-off theory forecast, we formulate the following hypothesis:

H3. Level of tangible assets and company size are positively related to level of debt.

Companies make their financing decisions according to a hierarchical order: first, they turn to internal funds; if external finance is required, companies first issue debt, and as a last resort they issue equity (Myers, 1984). The reason for establishing a hierarchical order, concerning sources of finance is related to information asymmetry. Poorly informed, investors are subject to high risk faced with the possibility of the company being in a less favourable position than managers' claim, and so investors penalize companies' market value (Myers and Majluf, 1984).

According to what is forecast by pecking order theory, the most profitable companies with greater capacity to self-finance, resort less to external equity, compared to less profitable companies, and so we formulate the following hypothesis:

H4. Profitability is negatively related to level of debt.

The market timing theory has developed from the studies of Loughran and Ritter (1995) and Spiess and Affleck-Graves (1995) that conclude that firms experience long-term underperformance in the period following equity issuance. Afterwards, the study of Stein (1996) showed that managers can time the market to maximize current shareholders' wealth. More recently, the market timing theory has found support in the work of Baker and Wurgler (2002). These last-named authors, suggest that a company's capital structure is the cumulative result of past attempts by its managers to programme the stock market, given that companies issue shares when they perceive, they are overvalued and buy them back when they consider their shares to be undervalued.

Baker and Wurgler (2002) use an external finance weighted average market to book ratio (calculated as the external capital weighted by historical market to book ratio) to capture companies' equity market attempts. The authors show that, after controlling for companies'

growth opportunities based on the use of market to book ratio (MTB), debt is inversely related to historical market to book ratio. This relationship allows authors to accept the equity market timing hypothesis. The empirical evidence obtained by Baker and Wurgler (2002), shows that low-leverage companies with a high-MTB ratio raise funds by issuing shares, whereas high-leverage companies raise funds when their MTB ratio is low.

Based on the market timing theoretical arguments, we formulate the following hypothesis:

H5. The MTB ratio is negatively related to level of debt.

3. Sample and variables

3.1 Sample

To carry out the empirical study, we collected secondary data. Collection of secondary data allows us to economize on resources, provide more efficient management of the time needed to collect the information, as well as letting us obtain a greater number of observations. However, use of secondary data presents limitations in terms of obtaining information of a qualitative nature. The data about Portuguese companies listed on the Lisbon Stock Market, since 2002 designated by Euronext Lisbon, is taken from the information supplied by the Documentation Centre of Euronext Lisbon, as well as information from the Finbolsa database. The data collected from the Documentation Centre of Euronext Lisbon, and on the Finbolsa database, are official and are the results of published data from all companies listed on the stock market in the period of analysis. The fact that companies listed on the stock market are officially obliged to publish data periodically, besides having their accounts audited, confers a high degree of reliability to the data used in this study.

The Portuguese stock market started up again in the second half of the 1980s after a long interval following the end of the dictatorship in 1974. It started up again in 1986, showing relative dynamism with more than 100 new firms joining the Stock Market between 1986 and 1987. However, after the crash in 1987, the number of companies trading on the Stock Market decreased significantly. The limited dynamism of the Portuguese Stock Market, contributed to by the predominance of the banking sector as the main external source of finance, is mirrored in the limited number of listed Portuguese companies making up the Finbolsa database, which contains the financial status of all listed Portuguese companies since 1986. The stock market crash in 1987, which substantially reduced the number of companies listed on the Portuguese stock market. Using dynamic panel estimators leads to the need for companies to be present on the database for several consecutive years. Between 1987 and 1990, there was great instability in the Portuguese stock market, with the exit of many companies each year.

To respond to the need for companies to be present on the database for several consecutive years, we consider the period of analysis between 1991 and 2004, preventing the instability of the Portuguese stock market between 1987 and 1990 from meaning distortion of the results obtained using dynamic panel estimators.

Selection of the investigation sample was based on a procedure of sorting information supplied by the Finbolsa database, which involved several stages. At a first stage, we eliminated financial companies, namely banks, insurance companies and investment societies, as the elements of their financial information have different characteristics from non-financial companies.

At the second stage, we eliminated companies where information covering all the variables was not available, that is, we eliminated from the sample companies that did

not show values for the variables of debt, tangibility, size, profitability and MTB ratio for the period of analysis between 1991 and 2004. Therefore, after subjecting the initial data from 237 companies to this selection process, we obtained a sample of 41 non-financial companies from the public and private sector (Appendix Tables AI and AII).

The information contained in this database includes all the information that can be analysed in the form of Balance Sheets, Income Statements and economic data considered relevant for listed companies and for the aims of this study. We add that all monetary data concerning companies were deflated, using inflation rates taken from the annual books of the Bank of Portugal.

3.2 Variables

Table I presents the dependent and independent variables used in this study, and their corresponding measures.

In this study, we consider book debt as the dependent variable, determined by the ratio of total company liabilities to total assets, according to accounting values, similarly to the studies by Rajan and Zingales (1995), Fama and French (2002) and Frank and Goyal (2004). As independent variables, we consider the tangibility of assets, size, profitability and MTB ratio.

4. Estimation methodology

4.1 Debt adjustment to optimal level

Static data panel models do not allow us to analyse the possible dynamism in companies' decisions when choosing their capital structure. Use of dynamic panel estimators also allows us, in a convenient way, to determine adjustment of the actual level of debt towards optimal level of debt, revealing the level of transaction costs borne by companies. That adjustment process can be described in the following way:

$$\mathrm{LEV}_{i,t} - \mathrm{LEV}_{i,t-1} = \alpha(\mathrm{LEV}^{*}_{i,t} - \mathrm{LEV}_{i,t-1}), \quad (1)$$

in which: $\mathrm{LEV}_{i,t}$ is the actual debt of company i in the period t, $\mathrm{LEV}_{i,t-1}$ is the actual debt of company i in period $t-1$ and, $\mathrm{LEV}^{*}_{i,t}$ is the optimal debt of company i in period t.

Variables	Denomination	Proxies
Debt	LEV	$\frac{\text{Total debt}}{\text{Total liquid assets}}$
Assets tangibility	TANG	$\frac{\text{Tangible assets}}{\text{Total liquid assets}}$
Size	SIZE	LN (sales+services)
Profitability	PROF	$\frac{\text{Earnings before interest taxes and depreciation and amortization (EBITDA)}}{\text{Total liquid assets}}$
Market-to-book ratio	MTB	$\frac{\text{[Book value total liquid assets + Market value of equity − Book value of equity]}}{\text{Book value total liquid assets}}$

Table I.
Variables and measurement

Regrouping the terms and solving to the order of $LEV_{i,t}$, we have:

$$LEV_{i,t} = \alpha LEV^{*}_{i,t} + (1 - \alpha)LEV_{i,t-1}. \quad (2)$$

If $\alpha = 1$, we have $LEV_{i,t} = LEV^{*}_{i,t}$, the actual level of debt being equal to the optimal level of debt. In these circumstances, companies manage to find an optimal capital structure, showing the inexistence of transaction costs. On the other hand, if $\alpha = 0$, we have $LEV_{i,t} = LEV_{i,t-1}$, the actual level of debt in the current period is equal to the level of debt in the previous period, and the adjustment of actual level of debt towards optimal level of debt is nil, showing transaction costs to be very high.

To estimate equation (2), it is necessary to find the optimal level of debt, which is not directly observable. Marsh (1982) and Jalilvand and Harris (1984) propose to find the optimal debt level based on the mean of historic values. However, as Shyam-Sunder and Myers (1999) state, this methodology has two great limitations: first, we must have a base of a substantial number of periods and second justifying that the optimal debt level remains constant over certain periods is not an easily admissible assumption.

As Shyam-Sunder and Myers (1999) claim, companies' optimal level of debt depends on their specific characteristics such as size and profitability, among others. In this study, we consider, just as Shyam-Sunder and Myers (1999), Miguel and Pindado (2001), Ozkan (2001), Fama and French (2002) and Gaud *et al.* (2005), that optimal debt level depends on companies' specific characteristics, that is on the determinants considered relevant in explaining debt. Therefore, the optimal level of debt is given by:

$$LEV^{*}_{i,t} = \lambda_0 + \lambda_1 TANG_{i,t} + \lambda_2 SIZE_{i,t} + \lambda_3 PROF_{i,t} + \lambda_4 MTB_{i,t} + d_t + v_i + e_{i,t}, \quad (3)$$

where d_t are dummy time variables that measure the impact of possible macroeconomic changes on the level of debt, v_i are companies' non-observable individual effects and $e_{i,t}$ correspond to the error which is assumed to have normal distribution.

Substituting equation (3) in equation (2), and solving to the order of $LEV_{i,t}$, we have:

$$LEV_{i,t} = \beta_0 + \delta LEV_{i,t-1} + \beta_1 TANG_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 PROF_{i,t} + \beta_4 MTB_{i,t} + \theta_t + \eta_i + \varepsilon_{i,t}, \quad (4)$$

in which: $\delta = (1 - \alpha), \beta_0 = \alpha\lambda_0, \beta_1 = \alpha\lambda_1, \beta_2 = \alpha\lambda_2, \beta_3 = \alpha\lambda_3, \beta_4 = \alpha\lambda_4, \theta_t = \alpha d_t, \eta_i = \alpha v_i, \varepsilon_{i,t} = \alpha e_{i,t}$.

Considering $X_{i,t} = (TANG_{i,t}, SIZE_{i,t}, PROF_{i,t}, MTB_{i,t})$ and substituting in equation (4), we have finally:

$$LEV_{i,t} = \beta_0 + \delta LEV_{i,t-1} + \sum_{K=1}^{n} \beta_K X_{k,i,t} + \theta_t + \eta_i + \varepsilon_{i,t}, \quad (5)$$

in which k is the determinant of company debt, in the present study: tangibility, size, profitability and the ratio MTB.

Nickel (1981) concludes that estimating dynamic relationships between variables with static panel models leads to bias of the estimated parameter measuring the relationship between the lagged dependent variable and the dependent variable in the

current period. According to the author, this is due to the correlations between non-observable individual effects and the lagged dependent variable.

Based on the results of Nickel (1981), we can conclude that estimating equation (5) using static panel models, admitting or not correlation between non-observable individual effects and the debt determinants, we obtain biased and inconsistent estimations of the estimated parameters, since as well as there being correlation between η_i and $\text{LEV}_{i,t-1}$, there is also correlation between $\varepsilon_{i,t}$ and $\text{LEV}_{i,t-1}$.

In the context of possible bias of the estimated parameter measuring the relationship between $\text{LEV}_{i,t}$ and $\text{LEV}_{i,t-1}$, use of dynamic panel estimators becomes essential, so as to have a correct inference of the adjustment of actual debt towards target debt ratio.

Given the correlation between η_i and $\text{LEV}_{i,t-1}$ and between $\varepsilon_{i,t}$ and $\text{LEV}_{i,t-1}$, Arellano and Bond (1991) propose estimation of equation (5) in first differences, using as instruments the dependent and independent variables lagged two periods. The dynamic estimator proposed by Arellano and Bond (1991), became known in the literature as (general method of moments (GMM), 1991).

Nevertheless, Blundell and Bond (1998) conclude that when the dependent variable is persistent, there being high correlation between its values in the current period and the previous one, and the number of periods is not very high, the GMM (1991) estimator is inefficient, the instruments used being generally weak. In these circumstances, Blundell and Bond (1998) extend the GMM (1991) estimator, considering a system with variables at level and in first differences. For the variables at level in equation (5), the instruments are the lagged variables in first differences. In the case of the variables in first differences in equation (5), the instruments are those lagged variables at level.

The estimators GMM (1991) and GMM system (1998) lead to robust estimates, since: (1) they eliminate companies' non-observable individual specific effects (η_i), given the estimate in first differences, consequently eliminating the correlation between η_i and $\text{LEV}_{i,t-1}$, that is $E\left[\eta_{i,t}, \text{LEV}_{i,t-1}\right] = 0$; (2) they control the possible endogeny as their lagged values are used as instruments, expecting the greater control of endogeny to mean a null correlation between the instruments used and the error, that is, $E\left[\varepsilon_{i,t} X_{k\,i,t-s}\right] = 0$, with $s \geq 1$; and (3) given the orthogonal conditions between the lagged variables and the error ($\varepsilon_{i,t}$), they eliminate the problem of possible correlation between the lags of the dependent variable ($\text{LEV}_{i,t-1}$) and the error ($\varepsilon_{i,t}$), that is, $E\left[\varepsilon_{i,t} \text{LEV}_{i,t-1}\right] = 0$.

However, the GMM (1991) and GMM system (1998) estimators can only be considered valid after checking two conditions:

(1) If the restrictions created, as a consequence of using the instruments, are valid.

(2) There is no second-order autocorrelation.

To test for the validity of the restrictions, we use the Sargan test in the case of the GMM (1991) estimator and the Hansen test in the case of the GMM system (1998) estimator. In both cases, the null hypothesis indicates that the restrictions, imposed by use of the instruments, are valid. Rejecting the null hypothesis, we conclude the restrictions are not valid, and so the estimators are not robust.

We test for the existence of first- and second-order autocorrelation. The null hypothesis is that there is no autocorrelation, the alternative hypothesis being existence of autocorrelation. Rejecting the null hypothesis of non-existence of second-order autocorrelation, we conclude that the estimators are not robust.

Bruno (2005a) concludes that in situations where the number of cross-sections is not very high, and consequently nor is the number of observations, use of the dynamic estimators, given the number of instruments generated, can lead to bias of the estimated parameters. In this study, use of the (least square dummy variable corrected (LSDVC), 2005) dynamic estimator can be fundamental since: first, the excessive number of instruments can be particularly relevant in the case of the GMM system (1998) dynamic estimator, which can mean, given the rather low number of observations, bias of the estimated parameters and secondly, given that persistence is normally associated with company debt, use of the GMM (1991) dynamic estimator may lead to bias of the estimated parameter that allows us to determine adjustment of actual debt towards target debt ratio. Therefore, we also use in this study the LSDVC dynamic estimator, by Bruno (2005a), which corrects the results estimated with the GMM (1991) and GMM system (1998) dynamic estimators.

In order to test the inappropriateness of using static panel models, with the aim of estimating adjustment of actual debt towards target debt ratio, Appendix 2 presents the results of the dynamic model of capital structure, estimated with static panel models. For the different methods of estimation used in the current study, we calculate the root mean squared error (RMSE) as the criterion for comparing the performance of the forecasting models.

4.2 Relationship between adjustment to debt and determinants

To fill a gap in studies about company capital structure in general, and study of debt adjustment in particular, we intend to estimate the impact of the specific determinants of listed Portuguese companies, previously used in this study, on adjustment of actual debt towards target debt ratio.

Initially, we estimate annually the adjustment of actual debt towards target debt ratio. For this purpose, we consider the relationship forecast in equation (1) considering the values of the current year and the one immediately before[1], in order to estimate annually the adjustment of actual debt towards the optimal level. Therefore, α ceases to be an estimated mean value for the whole period, and now varies annually (α_t). The regression to estimate is:

$$\mathrm{LEV}_{i,t} - \mathrm{LEV}_{i,t-1} = \alpha_t(\mathrm{LEV}^{*}_{i,t} - \mathrm{LEV}_{i,t-1}). \tag{6}$$

Since the dependent variable is the variation of the level of actual debt, companies' non-observable individual effects are nil, that is, $\eta_i = 0$. Therefore, the most correct way to estimate annual adjustment of actual debt towards optimal level is through OLS regressions.

To determine the values of optimal debt ($\mathrm{LEV}^{*}_{i,t}$) we use, for this purpose, the relationship forecast in equation (3), optimal debt being dependent on the specific determinants of listed Portuguese companies[2].

After estimating annual adjustments of the actual debt of listed Portuguese companies towards optimal level, we estimate the relationship between these and specific determinants. So that the estimated parameters (γ_k) can be comparable, we consider the percentage variations of adjustments of actual debt towards target debt ratio, as well as percentage variations of mean annual specific determinant factors of listed Portuguese companies (TANG_t, SIZE_t, PROF_t, MTB_t)[3].

The regressions to estimate are:

$$\frac{\Delta\alpha_t}{\alpha_{t-1}} = \beta_0 + \gamma_1 \frac{\Delta \mathrm{TANG}_t}{\mathrm{TANG}_{t-1}} + e_t; \quad (7)$$

$$\frac{\Delta\alpha_t}{\alpha_{t-1}} = \beta_0 + \gamma_2 \frac{\Delta \mathrm{SIZE}_t}{\mathrm{SIZE}_{t-1}} + e_t; \quad (8)$$

$$\frac{\Delta\alpha_t}{\alpha_{t-1}} = \beta_0 + \gamma_3 \frac{\Delta \mathrm{PROF}_t}{\mathrm{PROF}_{t-1}} + e_t; \quad (9)$$

$$\frac{\Delta\alpha_t}{\alpha_{t-1}} = \beta_0 + \gamma_4 \frac{\Delta \mathrm{MTB}_t}{\mathrm{MTB}_{t-1}} + e_t; \quad (10)$$

$$\frac{\Delta\alpha_t}{\alpha_{t-1}} = \beta_0 + \gamma_1 \frac{\Delta \mathrm{TANG}_t}{\mathrm{TANG}_{t-1}} + \gamma_2 \frac{\Delta \mathrm{SIZE}_t}{\mathrm{SIZE}_{t-1}} + \gamma_3 \frac{\Delta \mathrm{PROF}_t}{\mathrm{PROF}_{t-1}} + \gamma_4 \frac{\Delta \mathrm{MTB}_t}{\mathrm{MTB}_{t-1}} + e_t. \quad (11)$$

From the regressions presented above, we can ascertain the impact of each specific determinant factor on adjustment of actual debt towards target debt ratio.

Since we have here time series, we estimate relationships between adjustment and debt through OLS regressions. We test for the existence of first- and second-order autocorrelation. The null hypothesis is non-existence of autocorrelation. If autocorrelation exists, we lag the adjustment until autocorrelation of errors is eliminated.

5. Results and discussion

5.1 Results

Next, we present the descriptive statistics of the dependent variable and independent variables considered in our study of the capital structure determinants of listed Portuguese companies in the period 1991 to 2004. The results are presented in Table II.

We find that volatility of variables is not very high, since the respective SDs are less than the respective averages. However, although volatility is not very high, we find that the differences between minimum and maximum values of the variables take on special relevance.

Variables	Observations	Mean	SDs	Minimum	Maximum
$\mathrm{LEV}_{i,t}$	428	0.6436	0.1804	0.0608	1.2044
$\mathrm{TANG}_{i,t}$	428	0.3684	0.1939	0.0012	0.9253
$\mathrm{SIZE}_{i,t}$	428	19.073	1.8089	12.936	22.700
$\mathrm{PROF}_{i,t}$	428	0.1095	0.0875	−0.4906	0.6442
$\mathrm{MTB}_{i,t}$	412	1.3551	1.2574	0.3192	17.169

Table II.
Descriptive statistics

It should be noted that the debt of listed Portuguese companies represents values on average of 0.64, with a minimum value of 0.06 and maximum of 1.20.

The results of the correlations between variables are presented in Table III.

From observation of the results of the correlation matrix, we can conclude that the correlation between size and debt is positive and statistically significant at the 1 per cent level. The correlation between profitability and debt is negative and statistically significant at the 1 per cent level. The correlation coefficients of tangibility and MTB ratio with debt are not statistically significant.

Aivazian *et al.* (2005), state that the problem of collinearity between explanatory variables will be particularly relevant when correlation coefficients are >30 per cent. In this study, the correlation coefficients between explanatory variables are not above 30 per cent, and so the problem of collinearity will not be particularly relevant. Companies with a higher value for the tangibility variable are the larger companies. The most profitable companies are those that have a greater amount of tangible assets and are larger in size.

We calculate the correlation coefficient between debt in the current period and debt in the previous period. The correlation coefficient is 0.7845. The high correlation coefficient between debt in the previous period and debt in the current period indicates the debt of listed Portuguese companies is a persistent series. Therefore, by using the GMM (1991) dynamic estimator, it is possible to find bias of the estimated parameters measuring relationships between companies' specific determinants and debt, as well as between debt in the current period and debt in the previous period.

The results of the GMM (1991), GMM system (1998) and LSDVC (2005) dynamic estimators are presented Table IV. The results of the Wald and *F*-tests indicate that in all the estimated models we can reject the null hypothesis at the 1 per cent level of statistical significance, implying that the explanatory variables as a whole are determinants of the level of debt.

From application of the GMM (1991) and GMM system (1998) dynamic estimators, we can conclude by observing the results of the Sargan and Hansen tests, respectively, that we cannot reject the null hypothesis of validity of the instruments and consequent restrictions. The results of the second-order autocorrelation tests, whatever dynamic estimator used, indicate that we cannot reject the null hypothesis of absence of second-order autocorrelation. Based on these results, we can conclude that applications of the GMM (1991) and GMM system (1998) estimators are valid.

The coefficient measuring the impact of debt in the previous period on debt in the current period is positive, and statistically significant at the 1 per cent level, varying between 0.479 and 0.710, according to the dynamic estimator used. Therefore, the coefficient of adjustment of the level of actual debt towards the optimal level of debt

Variables	$LEV_{i,t}$	$TANG_{i,t}$	$SIZE_{i,t}$	$PROF_{i,t}$	$MTB_{i,t}$
$LEV_{i,t}$	1				
$TANG_{i,t}$	−0.0266	1			
$SIZE_{i,t}$	0.1844*	0.2278*	1		
$PROF_{i,t}$	−0.1853*	0.1935*	0.2423*	1	
$MTB_{i,t}$	−0.0416	0.1500*	0.1188**	0.2928*	1

Table III.
Correlation matrix

Notes: *, ** and *** statistical significance at the 1, 5 and 10 per cent level, respectively

Independent variables	Dependent variable: $LEV_{i,t}$ GMM (1991) I	GMM system (1998)	LSDVC (2005) I (GMM, 1991)	LSDVC (2005) I (GMM system, 1998)
$LEV_{i,t}$	0.47941*	0.71064*	0.63346*	0.68238*
	(0.06363)	(0.0607)	(0.04332)	(0.04502)
$TANG_{i,t}$	0.04768	0.10734	0.10057**	0.10077**
	(0.0594)	(0.0826)	(0.0498)	(0.04993)
$SIZE_{i,t}$	0.04968*	0.01842***	0.04031*	0.04018*
	(0.01334)	(0.0109)	(0.0085)	(0.00879)
$PROF_{i,t}$	−0.34319*	−0.57522*	−0.37559*	−0.36761*
	(0.11025)	(0.12188)	(0.10576)	(0.10607)
$MTB_{i,t}$	0.00312	0.00353	0.00932	0.00878
	(0.00742)	(0.0099)	(0.0078)	(0.00783)
Instrument	GMM	GMM system		
F(N(0,1))		38.49*		
Wald (χ^2)	81.39*			
Sargan (χ^2)		36.38		
Hansen ($N(0,1)$)	35.07			
$m_1(N(0,1))$	−7.30*	−6.77*		
$m_2(N(0,1))$	0.74	1.07		
Observations	346	387	346	387

Notes: Column (2) adopts the one-step Arellano and Bond GMM (1991) estimation method, using instruments: ($LEV_{i,t-2}$, $\sum_{K=1}^{n} X_{k,i,t-2}$); column (3) adopts the one-step Blundell and Bond GMM system (1998) estimation method, using instruments: ($LEV_{i,t-2}$, $\sum_{K=1}^{n} X_{k,i,t-2}$) in differenced equations and ($LEV_{i,t-2}$, $\sum_{K=1}^{n} X_{k,i,t-2}$) in the levels equations; X_K is a k debt determinant; heteroskedasticity consistent and asymptotic robust SDs are reported in brackets; *, ** and *** statistical significance at the 1, 5 and 10 per cent level, respectively; the Wald test has χ^2 distribution and tests the null hypothesis of non-significance as a whole of the parameters of the explanatory variables; The F-test has normal distribution $N(0,1)$ and tests the null hypothesis of non-significance as a whole of the estimated parameters, against the alternative hypothesis of significance as a whole of the estimated parameters; the Sargan test of over-identifying restrictions is distributed as χ^2 under the null hypothesis of instrument validity, used in one-step Arellano and Bond GMM (1991) estimation method; the Hansen test of over-identifying restrictions is distributed as $N(0,1)$ under the null hypothesis of instrument validity, used in one-step Blundell and Bond GMM system (1998); the m_1 test is a test for first-order autocorrelation of residuals and is distributed as $N(0,1)$, under null hypothesis of no first-order autocorrelation; the m_2 test is a test for second-order autocorrelation of residuals and is distributed as $N(0,1)$, under null hypothesis of no second-order autocorrelation; the estimates include constant; year – dummies are included, in estimation, but not shown

Table IV.
Dynamic estimators – GMM (1991), GMM system (1998) and LSDVC (2005)

varies between 0.290 and 0.521. From application of the LSDVC (2005) estimator, there is a smaller variation of the coefficient measuring the impact of debt in the previous period on debt in the current period, varying between 0.634 and 0.682. In these circumstances, the adjustment of the level of actual debt towards the optimal level of debt varying between 0.318 and 0.366.

Applying the GMM (1991) and GMM system (1998) estimators, we obtained a positive, but statistically insignificant, relationship between asset tangibility and debt. However, after applying the LSDVC (2005) estimator, that relationship became statistically significant. Therefore, we can conclude, from application of the dynamic estimators, that there is a positive and statistically significant relationship between asset tangibility and debt.

Although statistically insignificant from application of the GMM system (1998) estimator, the relationship between size and debt is statistically significant on application of the GMM (1991) and LSDVC (2005) estimators. This being so, we can conclude that from application of the dynamic estimators, there is a positive and statistically significant relationship between size and debt.

The relationship between profitability and debt showed itself to be statistically significant, whatever the dynamic estimator used, and so we can conclude, there is a negative and statistically significant relationship between profitability and debt.

From application of the dynamic estimators, we always conclude that the relationship between MTB ratio and debt is not statistically significant. We therefore conclude that, from application of the dynamic estimators, there is no relationship between MTB ratio and debt.

Appendix B presents the results of estimation of the dynamic model, using for this purpose static panel models. We can state that by using a fixed or random effect panel model, the parameter allowing determination of the adjustment of actual debt towards target debt ratio could be biased, corroborating the conclusions of Nickel (1981). The correlation between $\varepsilon_{i,t}$ and $\text{LEV}_{i,t}$, and particularly the correlation between η_i and $\text{LEV}_{i,t-1}$, could contribute to bias of the estimated parameter δ, overvaluing the adjustment of actual level of debt towards target debt ratio ($\alpha = 0.4947$ with a random effect panel model, and $\alpha = 0.5710$ with a fixed effect panel model). Using an OLS regression, the adjustment is closer to that obtained with the GMM system (1998) and LSDVC (2005) dynamic estimators, at $\alpha = 0.2332$. However, regarding the relationship between determinants and debt, only the relationship between debt and profitability is statistically significant, although only at the 10 per cent level.

To summarize, we state that estimating a dynamic model of capital structure using static panel models is not a methodologically suitable option, it being more appropriate in this context to use dynamic panel estimators.

The estimation of the RMSE for the several dynamic estimators used in the current study, provide us results that show that for LSDVC (2005) dynamic estimator, the RMSEs assume the values of 0.0238 and 0.0221, considering the correction of the results obtained with the GMM (1991) and the GMM system (1998) estimators, respectively. These values are inferior to RMSEs of 0.0491 for the GMM (1991) and of 0.0448 for the GMM system (1998) dynamic estimators. Concerning the static panel data models, the values of RMSEs are superior to those ones obtained with the use of LSVC (2005) dynamic estimator: 0.0881 for the OLS regression; 0.078 for the random effects panel data model; and 0.0749 for the fixed effects panel data model. The values of RMSEs estimated for the different estimation methods used in the current study corroborate the conclusions of Bruno (2005b) that the use of the LSDVC (2005) estimator allow inferior values of RMSE, mainly in short panel data. The inferior values of RMSEs obtained with the use of LSDVC (2005) dynamic estimator enhance the importance of this estimator for an inference of parameters nearer of its real values.

Table V presents the results of estimation of annual adjustments of actual debt towards target debt ratio[4].

In all years we find that adjustment of actual debt in listed Portuguese companies towards optimal level of debt is statistically significant at the 1 per cent level. The greatest level of adjustment ($\alpha = 0.3449$), is found in 1993, and the smallest level ($\alpha = 0.2500$) in 1996.

After determining the annual adjustments of the actual debt of listed Portuguese companies towards target debt ratio, Table VI presents the results referring to the

Dependent variable: $LEV_{i,t}$			
Independent variable: $LEV^{*}_{i,t}-LEV_{i,t-1}$ Year	α	Independent variable: $LEV^{*}_{i,t}-LEV_{i,t-1}$ Year	α
1991		1998	0.32410*
1992		1999	0.31112*
1993	0.34494*	2000	0.30223*
1994	0.26112*	2001	0.33482*
1995	0.30898*	2002	0.28717*
1996	0.25002*	2003	0.27802*
1997	0.26480*	2004	0.29112*

Notes: *Statistical significant at the 1 per cent level; **statistical significant at the 5 per cent level; and ***statistical significant at the 10 per cent level; year – dummies are included, in estimation considering all years, abut not shown; corrected heteroscedasticity OLS according to White's estimator; estimations include constant

Table V.
Year debt adjustment: OLS regressions

relationships between companies' specific determinants and adjustment of debt towards optimal level.

The results of the first and second autocorrelation tests indicate, we cannot reject the null hypothesis of absence of autocorrelation. Therefore, autocorrelation of the errors does not affect the estimated parameters measuring the relationships between companies' specific determinants and debt adjustments.

We find that tangibility of assets and size of listed Portuguese companies are relevant specific determinants for listed Portuguese companies making greater adjustment of actual debt towards target debt ratio, the influence of size being considerably more significant than the influence of asset tangibility.

The empirical evidence shown in Table VI lets us conclude that[5]: (1) an increase of 1 per cent in the average size of listed Portuguese companies means an increase of 0.1289 per cent in adjustment of debt towards optimal level; (2) an increase in tangibility of assets of 1 per cent means an increase of 0.0384 per cent in adjustment of

	Dependent variable: α_t				
Independent variables	I	II	III	IV	V
$TANG_{i,t}$	0.0384*				0.0394*
	(0.00934)				(0.00973)
$SIZE_{i,t}$		0.1289*			0.13001*
		(0.01004)			(0.01124)
$PROF_{i,t}$			0.01239		0.01287
			(0.01049)		(0.01089)
$MTB_{i,t}$				0.00891	0.00918
				(0.01291)	(0.01212)
$F(N(0,1))$	14.98**	20.42*	0.48	0.12	11.41*
R^2	0.1483	0.4981	0.0123	0.0076	0.5023
m_1 $F(N(0,1))$	−1.03	−0.98	−0.67	−0.87	−0.62
m_2 $F(N(0,1))$	−0.76	−0.91	−0.82	−0.23	−0.34
Observations	12	12	12	12	12

Notes: *, ** and *** statistical significant at the 1, 5 and 10 per cent level, respectively; estimations include constant

Table VI.
Relationship between determinants and debt adjustment: OLS regressions

debt towards optimal level; and (3) the impacts of profitability and MTB ratio on adjustment of debt towards optimal level are not statistically significant.

5.2 Discussion of the results

In this study, given the rather limited number of observations, compared to the relatively high number of instruments generated by the GMM (1991) and GMM system (1998) dynamic estimators, we consider relevant the correction proposed by Bruno (2005a). That implies the application of the LSDVC (2005) dynamic estimator, so as to correct the results obtained with the GMM (1991) and GMM system (1998) dynamic estimators. Therefore, to test the previously formulated hypotheses in this study, we consider the results of the LSDVC (2005) estimator as a reference.

We find that the adjustment is not very pronounced, varying between 0.366, when we use the LSDVC (2005) dynamic estimator, to correct the results of the GMM (1991) dynamic estimator, and 0.318, when we use the LSDVC (2005) dynamic estimator, concerning correction of the results of the GMM system (1998) dynamic estimator. The empirical evidence obtained in this study allows validation of the previously formulated *H1*, corroborating what is forecast by the trade-off theory, since listed Portuguese companies adjust actual level of debt towards target debt ratio.

The degree of adjustment in listed Portuguese companies of actual debt towards optimal debt is close to the values obtained for French (Kremp *et al.*, 1999) and Swiss (Gaud *et al.*, 2005) listed companies, and lower than the adjustment of listed companies in Germany (Kremp *et al.*, 1999), the USA (Shyam-Sunder and Myers, 1999), Spain (Miguel and Pindado, 2001) and the UK (Ozkan, 2001).

In spite of dealing with listed companies, and therefore relatively large in size with access to diversified capital sources, the slow adjustment suggests that listed Portuguese companies have relatively relevant transaction costs and consequently, they adjust slowly towards optimal level of debt. However, considering the heavy dependence of listed Portuguese companies on debt, this slow adjustment may be caused by a low risk premium charged by creditors to companies in financial disequilibrium.

When analysing the results of the relationships between specific determinants and adjustment of actual debt of Portuguese listed companies towards optimal level of debt, we find that tangibility of assets, and above all company size, are relevant specific determinants for listed Portuguese companies making greater adjustment of actual debt towards optimal level of debt. The influence of profitability and MTB ratio on adjustment of actual debt towards optimal level of debt cannot be considered relevant.

Based on the obtained results, we can consider valid the previously formulated *H2*, since tangibility of assets and size are more relevant specific determinants than profitability and MTB ratio, for listed Portuguese companies making greater adjustment of actual debt towards optimal level of debt.

An increase of 1 per cent in size and tangibility of assets corresponds, respectively, to percentage increases of 0.1289 and 0.0384 per cent to adjustment of actual debt in listed Portuguese companies towards optimal level of debt. The results allow the conclusion that size and tangibility of assets are relevant determinants for reduction of the transaction costs that listed Portuguese companies.

Compared to companies in countries like the USA and the UK, with market-based financial systems, listed Portuguese companies face higher transaction costs, which is reflected in less adjustment of actual level of debt towards target debt ratio. The empirical evidence obtained in this study indicates that even Spanish and German

listed companies, that like Portugal have bank-based financial systems, apparently face lower transaction costs than listed Portuguese companies.

However, higher levels of tangible assets (Scott, 1977; Stulz and Johnson, 1985) and greater size (Warner, 1977; Ferri and Jones, 1979; Ang *et al.*, 1982; Titman and Wessels, 1988) of listed Portuguese companies, contribute to diminished information asymmetry.

The obtained results show that higher levels of tangible assets and above all greater size of listed Portuguese companies are apparently fundamental aspects for reducing the transaction costs that managers/shareholders of listed Portuguese companies face in their relationships with creditors, contributing to listed Portuguese companies making greater adjustment of actual level of debt towards target debt ratio.

We found a positive and statistically significant relationship between the tangibility of assets of listed Portuguese companies and debt. This result corroborates the arguments of the trade-off theory, as companies with a higher level of tangible assets are more able to offer collateral security and therefore turn more to debt (Scott, 1977). The results obtained in this study corroborate the empirical results of Rajan and Zingales (1995), Kremp *et al.* (1999), Baker and Wurgler (2002) and Gaud *et al.* (2005).

In this study, we also find a positive and statistically significant relationship between size and debt. The positive relationship between size and debt corroborates the arguments of the trade-off theory. Greater company size means a greater possibility to diversify activities and a consequent decrease in the likelihood of bankruptcy (Warner, 1977; Ang *et al.* 1982). The positive relationship between the size of listed Portuguese companies and their level of debt corroborates the results of the studies by Rajan and Zingales (1995), Booth *et al.* (2001), Baker and Wurgler (2002), Bie and Hann (2004), Frank and Goyal (2004), Hovakimian (2003) and Gaud *et al.* (2005).

Given that the empirical evidence obtained in this study indicates that level of tangible assets and the size of listed Portuguese companies contribute to greater recourse to debt, we can consider valid the previously formulated *H3*.

We found a negative and statistically significant relationship between the profitability of listed Portuguese companies and their level of debt, and so we can validate the previously formulated hypothesis *H4*. This result corroborates the arguments of the pecking order theory. The fact that the more profitable listed Portuguese companies have lower levels of debt suggests they follow a hierarchical order of preference concerning financing sources, preferring internal sources of finance rather than external sources of finance (Myers, 1984), this result indicating that information asymmetry is especially relevant (Myers and Majluf, 1984) in the capital structure decisions of listed Portuguese companies.

Besides access to the capital market, listed Portuguese companies seem to prefer internal finance, which contributes to the small supply of equity in the Portuguese Stock Market. Jin and Myers (2006) conclude that less developed capital markets have higher costs of raising capital due to opaqueness, which forces companies to rely more on internal funds or on bank debt to finance their needs.

Diamond (1984) and Boyd and Prescott (1986) argue that banks can more easily overcome the problem of asymmetric information that implies lower costs of acquiring and processing information concerning the companies in a bank-based system. Farhat *et al.* (2006) conclude that in civil law countries, with a bank-based system like Portugal, there is less available information about companies, which increases the information asymmetry between companies' insiders and outsiders. For these authors,

in the context of the pecking order theory, these circumstances force companies to rely more on internal funds and debt to face their financial needs.

The negative relationship between profitability and debt found in the current study agrees with several studies (Titman and Wessels, 1988; Rajan and Zingales, 1995; Booth *et al.*, 2001; Miguel and Pindado, 2001; Baker and Wurgler, 2002; Fama and French, 2002; Hovakimian, 2003; Bie and Hann, 2004; Frank and Goyal, 2004; Gaud *et al.*, 2005). Furthermore, Coelho *et al.* (2004) conclude, concerning Euronext market countries including Portugal, that the pecking order theory is present in companies' capital structure decisions.

We do not find a statistically significant relationship between MTB ratio and debt, and so we cannot consider *H5* valid. Based on this result, we cannot conclude that listed Portuguese companies behave according to the market timing theory (Baker and Wurgler, 2002), concerning the choice of capital structure. This result corroborates that obtained by Hovakimian (2003) who did not find evidence of market timing in company capital structure, but does not agree with the results obtained by Baker and Wurgler (2002), Frank and Goyal (2004) and Gaud *et al.* (2005), who obtain a negative relationship between MTB ratio and debt.

The capital structure of listed Portuguese companies can be explained in the light of the theoretical relationships forecast by the trade-off theory (influence of tangibility of assets and size on debt) and the pecking order theory (influence of profitability on debt). However, the capital structure decisions of listed Portuguese companies cannot be explained according to what is forecast by the market timing theory (influence of MTB ratio on debt).

6. Conclusion

In companies, finance, although not the only factor, is a necessary factor in companies' activities or future investments. Therefore, companies make capital structure decisions on finance based on the cost and on the characteristics of the alternative capital sources available which may come from equity and/or debt.

In this study, we analyse the company capital structure of listed Portuguese companies:

(1) filling a gap in empirical studies that analyse adjustments to debt, namely finding out which are the relevant specific determinants for companies making greater adjustment of actual level of debt towards optimal level;

(2) determining the adjustment of actual level of debt in listed Portuguese companies towards optimal level of debt, investigating the transaction costs borne by companies and comparing the results with other countries; and

(3) from optimal level of debt depending on companies' specific determinants, checking the applicability of what is forecast by trade-off, pecking order and market timing theories to the situation of listed Portuguese companies.

Listed Portuguese companies adjust actual level of debt towards target debt ratio, corroborating what is forecast by the trade-off theory. The empirical evidence allows us to conclude that listed Portuguese companies look for a target debt ratio. However, adjustment is not particularly great, when compared with the debt adjustment found in listed companies in the USA and some European countries such as Germany, Spain and the UK. The fact of not finding great adjustment of actual debt towards optimal level of debt indicates the relevance of transaction costs borne by listed Portuguese companies.

Nevertheless, the specific determinants of listed Portuguese companies are not similarly relevant in explaining adjustment of debt towards optimal level. The empirical evidence obtained in this study lets us conclude that level of tangible assets, and above all company size, are relevant specific determinants for listed Portuguese companies making greater adjustment of actual debt towards optimal level of debt. The greater possibility to diversify, less probability of bankruptcy and greater level of collateral are seen to be fundamental aspects for listed Portuguese companies making greater adjustment of debt towards optimal level. Profitability and MTB ratio are seen not to be determinants of greater adjustment of debt towards optimal level in listed Portuguese companies.

Finally, the obtained results show that the capital structure of listed Portuguese companies is influenced by tangibility of assets, by size and by profitability. We do not find a statistically significant relationship between the MTB and debt in listed Portuguese companies. Higher level of tangible assets and greater size contribute to increased debt, while profitability means diminished debt. The results suggest that the capital structure decisions of listed Portuguese companies can be explained in the light of trade-off and pecking order theories, but not according to what is forecast by the market timing theory.

Conjointly, the results of the current study suggest that listed Portuguese companies with capacity to generate internal funds use these funds before turning to debt. This result is according to the pecking order theory, suggesting that listed Portuguese companies prefer internal funds over debt and external equity. The slow adjustment towards the target leverage suggests that listed Portuguese companies have high transaction costs. However, the listed Portuguese companies' level of debt as well as the fact that these companies resort to debt, rather than the equity market for finance, suggest that a low risk premium charged by creditors when companies are in financial disequilibrium explains the slow adjustment of companies towards target leverage. However, level of tangible assets, and above all company size, of listed Portuguese companies contributes to greater adjustment of debt towards optimal level.

Notes

1. For example, to estimate adjustment of the actual level of debt towards optimal level in 1992, we consider the values of the variables referring to the years 1992 and 1991. To estimate adjustment in the year 2001, we use the values referring to the years 2001 and 2000.
2. In the case of statistical irrelevance of η_i, we use an OLS regression. When the η_i are statistically relevant, and not correlated with companies' specific determinant factors, we use a random effect panel model. In the case of correlation with companies' specific determinant factors, we use a fixed effect panel model. To test for the most correct form of estimation, we use the Lagrange Multiplier (LM) and Hausman tests, respectively.
3. The mean annual values regarding companies' specific determinant factors correspond to the sum of the values of the variables of all companies in each year, divided by the total number of companies in existence in that same year.
4. To determine the optimal level of debt in each year, we use static panel models. In every year, the LM and Hausman tests indicate that the most correct way to estimate optimal level of debt is with a fixed effect panel model, given the relevance of η_i, and their correlation with companies' specific determinants.
5. The estimated parameters, when considering simultaneously the effect of all specific determinant factors on adjustment of actual debt towards optimal level, are quite similar to those obtained considering the effect of specific determinant factors in isolation. In this study, and without harming analysis of the results, we choose to interpret the parameters referring to the regressions considering companies' specific determinant factors in isolation.

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Appendix 1
Characterisation to Portuguese companies

Company denomination	Date of admission	Subsector according to Financial Times Stock Exchange (FTSE) UK public limited company (PLC)
CIN	15 September 1998	113 Chemical industries – commodities
CIRES	15 April 1987	113 Chemical industries – commodities
Compta	5 June 1988	972 Computing services
Corticeira Amorim	19 September 1988	416 Drinks – distilling and wine products
EFACEC	25 July 1969	2737 Electronic equipment
FISIPE	25 July 1987	137 Construction and other types
Grão Pará	10 July 1984	113 Chemical industries – commodities
INAPA	25 March 1980	156 Paper
Jerónimo Martins	14 November 1989	630 Retail – food and medicine
Lisgráfica	14 October 1994	547 Printing and publishing
Modelo & Continente	23 July 1991	630 Retail – food and medicine
Mota-Engil	31 March 1995	137 Construction and other types
OREY	13 October 1986	597 Maritime/river transport and ports
Papelaria Fernandes	14 April 1987	156 Paper
REDITUS	28 August 1987	972 Computing services
Salvador Caetano	10 December 1987	263 Commercial vehicles and lorries
Soares da Costa	17 December 1986	137 Construction and other type
Sonae Industria	9 July 1987	862 Property development
Sumolis	31 December 1987	630 Retail – food and medicine
Sonae SGPS	15 September 1989	418 Soft drinks
Teixeira Duarte	31 December 1998	137 Construction and other types
TERTIR	28 March 1988	597 Maritime/river transport and ports
Vista Alegre Atlantis	1 June 2001	345 Electrical appliances and household goods

Table AI.
Classification of companies carrying out initial public offering (IPO) before 1991 by industrial sector of activity

Company denomination	Date of admission	Subsector according to FTSE UK PLC
Brisa	24 November 1997	596 Rail and road transport and loads
Cimpor-SGPS	4 July 1994	132 Construction and construction materials
Cofina-SGPS	17 February 1998	156 Paper
Colep Portugal	14 March 1997	113 Chemical industries – commodities
EDP	16 June 1997	720 Electricity
Grupo Média Capital	30 March 2004	542 Television and radio – suppliers
Ibersol-SGPS	21 November 1997	539 Restaurants and bars
IMPRESA-SGPS	5 June 2000	542 Television and radio – suppliers
Novabase-SGPS	3 July 2000	972 Computing services
Pararede-SGPS	28 June 1999	972 Computing services
Portucel-Emp. Prod. Pasta Papel	27 June 1995	156 Paper
PT Multimédia, SGPS	15 November 1999	543 Cable and satellite
SAG GEST - Sol. Aut. Globais, SGPS	13 July 1998	318 Vehicle distribution
Semapa	26 July 1995	132 Construction and construction materials
Sonae Imobiliária-SGPS	2 December 1997	862 Property development
Sonae.Com, SGPS, S.A.	1 June 2000	678 Mobile phone services
Telecom	1 June 1995	673 Land phone services
Vodafone Telecel	9 December 1996	678 Mobile phone services

Table AII.
Classification of companies carrying out IPO after 1991 by industrial sector

Appendix 2
Static panel models with debt adjustment

Independent variables	Dependent variable: $LEV_{i,t}$ Pooled effects	Random effects	Fixed effects
$LEV_{i,t-1}$	0.76680* (0.03410)	0.50539* (0.04321)	0.42909* (0.04446)
$TANG_{i,t}$	0.02009 (0.03311)	0.06589 (0.04321)	0.13159* (0.04960)
$SIZE_{i,t}$	0.00561 (0.00351)	0.02398* (0.00614)	0.04611* (0.00856)
$PROF_{i,t}$	−0.10134** (0.05623)	−0.16560* (0.06169)	−0.17137* (0.06445)
$MTB_{i,t}$	−0.00136 (0.00165)	−0.00130 (0.00172)	−0.00123 (0.00176)
$F(N(0,1))$	111.03*		51.92*
Wald(χ^2)		310.69*	
R^2	0.5892	0.4146	0.4861
LM (χ^2)		0.19	
Hausman (χ^2)		22.37*	
Observations	412	412	412

Notes: The LM test has χ^2 distribution and tests the null hypothesis that non-observable individual effects are not relevant in explaining the dependent variable, against the alternative hypothesis of relevance of non-observable individual effects in explaining the dependent variable; the Hausman test has χ^2 distribution and tests the null hypothesis that non-observable individual effects are not correlated with the explanatory variables, against the null hypothesis of correlation between non-observable individual effects and the explanatory variables; the Wald test has χ^2 distribution and tests the null hypothesis of non-significance as a whole of the parameters of the explanatory variables, against the alternative hypothesis of significance as a whole of the parameters of the explanatory variables; the *F*-test has normal distribution $N(0,1)$ and tests the null hypothesis of non-significance as a whole of the estimated parameters, against the alternative hypothesis of significance as a whole of the estimated parameters; SDs in brackets; *, ** and *** statistical significant at 1, 10 and 5 per cent level, respectively; the estimates include constant; year – dummies are included, in estimation, but not shown

Table AIII.
Static panel models: estimation debt adjustment

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