



## **Are Euribor rates relevant for Indebtedness of Companies Listed on the Portuguese Stock Index (PSI-20) and the Iberian Index (IBEX 35)? An Empirical Study**

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### **Abstract**

*We analysed the determinants of indebtedness amongst Portuguese companies listed on the PSI-20 and 15 Spanish companies listed on the IBEX 35. The companies operate in various sectors. The study was carried out between 2018 and 2022. We used a panel data methodology and employed three indebtedness models: total assets (TTA), long-term assets (LTA), and short-term assets (STA). We used pooled, fixed, and random effects to generate a model for the determinants of indebtedness; the fixed effects model proved to be the most appropriate. The size of the company and its book value were the most statistically significant variables: the larger the company size, the greater the debt. Meanwhile, higher market capitalization had a negative and statistically significant impact on indebtedness. An increase in Euribor rates resulted in lower debt both in the long term (non-current liabilities) and the short term (current liabilities) for companies in both countries. Therefore, Euribor's behavior translated into a small but significant reduction in company indebtedness.*

**Keywords:** Indebtedness, Book Value, Euribor, Panel Data

**JEL classification:** G15; H63, C14

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### **1. Introduction**

Capital structure plays an important role in business. The sources of funding are quite diverse. The company's form of financing (equity/debt) will have a significant impact on its performance, profitability and value.

Portugal and Spain are two Iberian countries. These two countries, as a rule, finance themselves more through banking. On the other hand, Anglo-Saxon countries finance themselves on the market. So, we decided to study the capital structure of companies in Portugal and Spain, where comparative analysis makes perfect sense.

In this sense, we analysed the indebtedness of companies listed on the Portuguese Stock Index (PSI-20) and the Iberian Index (IBEX 35) between 2018 and 2022. Our sample comprised of 14 Portuguese companies listed on the PSI-20 and 15 Spanish companies listed on the IBEX 35. To determine whether the potential determinants were equally significant for total, long-term, and short-term indebtedness. For this purpose, we evaluated three models: total indebtedness (TTA), long-term indebtedness (LTA), and short-term indebtedness (STA), each as dependent variables.

The Iberian Balance Sheet Analysis System (SABI) was consulted to obtain the panel dataset. The Euribor data were obtained online via Portuguese Bank databases. In accordance with the literature, we applied as our explanatory variables size, tangibility, profitability, and liquidity, along with market capitalization and the Euribor rate. The exploratory variables market capitalization and the Euribor rate are the first time they have been studied in this context. Which shows innovation in analysis. The Iberian Balance Sheet Analysis System (SABI) was consulted to obtain the panel dataset.

We used RStudio software to test three models: the pooled OLS, the fixed effects model, and the random effects model. The fixed model was chosen after applying the Breusch-Pagan and Hausman Tests.

The main objectives of our work were to analyse and to look the determining factors of the indebtedness of the companies under study; to see if the rise in the Euribor rate has had an impact on their indebtedness; to look for any differences or similarities in the indebtedness of the companies between the two countries under study.

Research in this area is numerous and varied. However, comparing the determinants of indebtedness between Portuguese and Spanish companies is the first time this has been done. On the other hand, different explanatory variables have been used, such as stock market capitalisation and the Euribor rate. A comparative analysis between Iberian and Anglo-Saxon countries would not make any sense, as the financing realities are very different. In this sense, comparability becomes changeling and complex.

The study is organized as follows: Section 2 comprises a brief literature review; Section 3, the methodology, econometric approach, and data; Section 4, the results and a discussion; and Section 5 the main conclusions.

## 2. Literature review

The following table shows the most recent work in this area. From our analysis, we can see that these are empirical studies. There is no systematic literature review in this area, and case studies are widely used.

From our review of the literature, we found that most of the articles (see for example, Gajdosikov et al. 2023; Đaković et al. 2023; Gomes et al. 2023; among others) used exploratory variables (company size, tangible assets, profitability, growth opportunities and liquidity ratios). In

our study we consider the book value ratio and the Euribor rate. We regard two variables as differentiating those used in existing studies.

Table 1 - Fundamental literature review – data, variables and main conclusions

Author(s)	Data	Variables	Conclusions
Gajdosikov et al. (2023)	Slovenian companies	Size and legal characteristics	Findings confirmed previous studies: company size and legal forms are important aspects of company debt
Đaković et al. (2023)	Serbian textile industry	Debt to assets, return on assets, general liquidity, current liquidity, and financial stability	Negative impact of greater liquidity, profitability, and stability on debt
Gallardo and Teixeira (2023)	Brazilian Companies	General debt, short-term debt, long-term debt, size, profitability, growth, tangibility, and risk	Most statistically significant variables: profitability, company growth, tangibility, and risk
Gomes et al. (2023)	Portuguese hotels	Return on assets, size, tangibility, growth opportunities and risk	Size, tangibility, and other tax benefits (besides debt) were statistically significant on debt
Stoiljković et al. (2022)	Serbian companies	Long-term leverage, short-term leverage, total leverage, size, profitability, growth opportunities, and risk	Findings confirmed the significance of size, profitability, tangibility, and risk in determining capital structure
Oliveira et al. (2013)	Brazilian companies	Size, profitability, growth opportunities, tangibility, and volatility	Positive relationship between profitability, tangibility, size, and indebtedness
Miloš and Jelena (2023)	Companies in Bosnia and Herzegovina	Size, profitability, growth opportunities, tangibility, risk, and dividend policy	A significant linear relationship between the variables and the indebtedness ratio
Serrasqueiro et al. (2016)	Small Portuguese companies	Size, liquidity, profitability, tangibility, growth opportunities, and short-term and long-term debt	Liquidity positively correlated with long-term debt and negatively correlated with short-term debt. Higher profitability correlated with lower levels of debt
Kuč and Kaličanin (2021)	Serbian companies	Size, tangibility; growth, volatility, liquidity, and short- and long-term debt	Profitability, tangibility, liquidity, and cash gap negatively correlated with levels of debt

Several authors have used total assets (TTA); long-term assets (LTA) and short-term assets (STA) to examine company debt (e.g., Carvalho et al., 2019; Kuč and Kaličanin, 2021; Gallardo and Teixeira, 2023; Oliveira et al., 2013; Stoiljković et al., 2022). We applied the same variables to measure the indebtedness.

These authors applied internal variables relating to size, profitability, liquidity and tangibility. We apply the same internal variables, but we consider the book value and the Euribor rate too. Some authors applied a macroeconomic variable to measure the indebtedness, for example the growth opportunities (Gomes et al., 2023; Oliveira et al., 2013; Serrasqueiro et al., 2016). In our study we decided to use the Euribor rate macroeconomic variable instead of the growth opportunities. According to Carvalho et al. (2019), Gajdosikov et al. (2023), Gomes et al. (2023), Oliveira et al. (2013), and Stoiljković et al. (2022), company size has a positive and statistical significance in indebtedness.

With regards to Oliveira et al. (2013) and Gallardo and Teixeira (2023), the profitability has a positive and significant impact in indebtedness. However, many researchers have verified that it correlates negatively (Carvalho et al., 2019; Đaković et al., 2023; Kuč and Kaličanin, 2021; Serrasqueiro et al., 2016; Sonza et al., 2019). For Gallardo and Teixeira (2023) and Sonza et al. (2019), tangibility also correlated positively with indebtedness, though Carvalho et al. (2019) and Kuč and Kaličanin (2021) found the opposite. According to Daković et al. (2023) the greater the liquidity the lower the indebtedness.

### 3. Data and methodology

#### 3.1. Methodology

We tested three models using RStudio software: the pooled OLS; the fixed effects model, and the random-effects model. Using a balanced panel made it possible to identify the variables of each of the companies throughout the entire period in question (2018 - 2022). The fixed model was chosen, since this model assumes that the unobserved characteristics that affect the dependent variable are constant over time but can vary between companies. By including fixed effects, we can control for these unobserved characteristics through isolating the effect of the explanatory variables.

On the other hand, by using fixed effects, we are essentially ‘differencing’ the data by subtracting the average over time for each company. This eliminates the influence of constant characteristics over time which assists in obtaining less biased estimates of the explanatory variables. The decision to use fixed effects is supported by the Hausman test, which compares the consistency of the fixed effects and random effects estimates. If the test indicates that the random effects estimates are inconsistent (due to the correlation between the random effects and the explanatory variables), then fixed effects are preferred. The main reason for using fixed effects in panel data models is to control for unobserved heterogeneity between companies that may be correlated with the explanatory variables. This is a benefit in obtaining unbiased and more reliable estimates of the effects of the explanatory variables on the dependent variable. On that account the Breusch-Pagan test was applied. (Wooldridge, 2010).

To investigate the effects of the rise in EUR we used the following formula:

$$Y_{i,t} = \beta_0 + \sum_{k=1}^8 \beta_k X_{k,i,t} + \varepsilon_{i,t} \quad (1)$$

where  $Y_{i,t} = TTA, LTA, STA$  from company  $i = 1, \dots, 29$ , year  $t = 1, \dots, 5$  (2018 – 2022),  $\beta_0 =$  constant,  $\beta_k =$  coefficients to be estimated by the model,  $X =$  vector of the explanatory variables, and  $\varepsilon_{i,t} =$  random error.

#### 3.2. Data

The dependent variables were total assets (TTA), long-term assets (LTA), and short-term assets (STA), and the independent variables were profitability (ROA and ROE); tangibility (TANG); book value (BV); firm size (SIZE), debt capital costs (DCC); liquidity (CR); Euribor (EUR); and the DUMMY variable.

- Return on assets (ROA) is a proxy for profitability, or the ratio of net profit to total assets. Some studies have shown that the higher the ratio, the lower a company's indebtedness (Carvalho et al., 2019; Đaković et al., 2023; Kuč and Kaličanin, 2021; Serrasqueiro et al., 2016; Sonza et al., 2019), while others have shown the opposite (Gallardo and Teixeira, 2023; Oliveira et al., 2013).
- Return on equity (ROE) is a proxy for profitability, computed as the net profit ratio to equity. It reflects the net return of the capital invested by the shareholders. An increase in ROE was expected negatively impact indebtedness (Carvalho et al., 2019; Đaković et al., 2023; Kuč and Kaličanin, 2021; Serrasqueiro et al., 2016; Sonza et al., 2019).
- Tangibility (TANG) represents fixed assets over total assets. It was expected that tangible assets might be used as collateral for loans, increasing the incentive to take on more debt (Gallardo and Teixeira, 2023; Sonza et al., 2019). According to Carvalho et al. (2019) and Kuč and Kaličanin (2021), the greater the tangibility of assets, the lower the need for debt.
- Company dimension (SIZE) was calculated as the logarithm of a company's total assets. This proxy has been widely used in previous studies; its impact on company indebtedness is unpredictable. However, studies have shown a positive correlation between company size and indebtedness (Carvalho et al., 2019; Gajdosikov et al., 2023; Gomes et al., 2023; Oliveira et al., 2013; Stoiljković et al., 2022).
- Book value (BV) is the ratio of the shareholders' equity to the number of shares outstanding. We expected it to have a positive impact on company indebtedness.
- Debt capital costs (DCC) is defined as interest expense over total liabilities. The greater the debt, the greater the expense.
- Liquidity (CR) or current ratio is a measure of a company's ability to pay short-term liabilities such as payable accounts and short-term loans. It represents the ratio of current assets to current liabilities. It was expected that the greater the current ratio the less the need for debt capital (Đaković et al., 2023).
- Euribor (EUR) is an abbreviation for the Euro Interbank offered rate; it represents the average interest rate charged (in €) on loans between a specific group of banks. A rise in the Euribor rate was expected to have a negative impact on company indebtedness.
- DUMMY allowed us to distinguish Portuguese companies (PSI-20) from Spanish ones (IBEX 35).

The next table provides a summary of the independent variables used and the expected effect on total indebtedness (TTA); long-term asset indebtedness (LTA), and short-term asset indebtedness (STA).

Table 2 - Independent Variables and Expected Effects

Variable	Expected effect
ROA	-
ROE	-
TANG	+
SIZE	+
BV	-
DCC	+
CR	-
EUR	-
DUMMY	+/-

First, we expected to find a negative effect on profitability variables ROA, ROE, and CR. The expected effects reflected our belief that the higher the ratio (TTA, LTA, and STA), the lower the need for internal funds, leading to lower profitability, as measured by ROA and ROE. Given that debt implies tax benefits (i.e., tax savings through the marginal tax rate), this tax saving should translate into a lower net result, hence the lower profitability. Second, we expected that the greater the CR, which is the measure of a company's ability to pay short-term liabilities such as payable accounts and short-term loans, the less need for debt capital.

Third, we expected that TANG, SIZE and DCC, would have a positive effect; for instance, tangible assets could be used as collateral for loans, increasing the incentive to take on more debt. Fourth, we expected to find a negative correlation between BV and indebtedness. Fifth, we expected that the greater the debt, the greater the financial expenses incurred. The impact of the DUMMY variable could not be predicted. As some readers may know, we have lived through years in which the Euribor presented negative values and banks presented lower returns.

However, companies benefited, particularly in terms of loan payments. In 2021, EUR began to rise, and banks naturally benefited. On the other hand, companies had to pay more for the money they borrowed.

#### 4. Results and discussion

The next table presents the statistic descriptive of independent variables, namely the mean, standard deviation, maximum and minimum.

Table 3 - Summary Statistics

Variable	N	Mean	SD	Min	Max
ROA	145	0.05	0.04	0.07	0.29
SIZE	145	22.73	1.46	19.79	25.76
BV	145	6.23	4.85	0.15	20.24
CCA	145	2.73	1.93	0.02	10.33
TANG	145	0.70	0.18	0.21	0.98
LG	145	1.20	0.73	0.35	6.29
ROE	145	0.16	0.12	0.02	0.72
EUR	145	0.40	1.14	-0.51	2.56

The 29 companies had an average ROE of 16% with a SD of 12%, and an average ROA of 5% with an SD of 4%.

The SD suggested considerable heterogeneity in terms of profitability. The EUR returned negative values for several years (the minimum rate was - 0.51%). The rate began to increase in 2021 to its maximum value of 2.56% (in 2023). The average was 0.4% and the SD was 1.14%.

Table 4 shows that all variables had appropriate values. According to the literature, variance inflation factor (VIF) values are problematic only if they are greater than 5 (Fox and Monette, 1992). We were then able to verify that there were no collinearity problems between the independent variables.

Table 4 - VIF Values

ROA	SIZE	BV	CCA	TANG	LG	ROE	DUMMY	EUR
2.823	1.744	1.695	1.234	1.339	1.629	2.805	1.859	1.256

Pearson's correlation matrix for the independent variables (Table 5) allowed us to verify that all the variables returned adequate values regarding correlation.

Table 5 - Pearson's Correlation Matrix for the Independent Variables

	ROA	SIZE	BV	CCA	TANG	LG	ROE	EUR
ROA	1							
SIZE	-0.3521	1						
BV	-0.0194	0.4333	1					
CCA	0.1280	-0.0837	-0.0882	1				
TANG	-0.0163	0.1026	0.0995	0.0771	1			
LG	0.1887	-0.1631	0.1717	0.1144	-0.2702	1		
ROE	0.6963	-0.2946	-0.2347	0.0663	-0.1822	-0.0679	1	
EUR	0.2576	0.0542	0.0998	0.2592	-0.1151	-0.0150	0.2741	1

We tested the three models (the pooled OLS, the fixed effects model, and the random effects model) to establish whether potential determinants had the same significance for effect on long-term, short-term, and total indebtedness. Three indebtedness models were evaluated: TTA, LTA, and STA, all as dependent variables. For Panel A (Table 6), we first applied the pooled OLS model. Then, the Breusch – Pagan test was applied to verify the existence of homoscedasticity. We obtained a  $p$  value of 0.003758. Therefore, we decided that this model was less suitable than the random model.

In this sense, the random effects model was also being evaluated, because the pooled OLS model was inconsistent. We subsequently applied the Hausman test to check the consistency of random effects compared with fixed effects. The  $p$  value was 0.012e-13. The fixed effects model was chosen because the random effects model was inconsistent.



Table 6 - Regression Results (TTA)

Panel A: Determinants of total indebtedness (TTA)			
Variables	OLS model	Random effects model	Fixed effects model
ROA	-2.197*** (0.0000)	-1.069*** (0.0000)	-0.553*** (0.0000)
SIZE	0.009** (0.0750)	0.031** (0.0011)	0.195*** 0.0000
BV	-0.016*** (0.0000)	-0.016*** (0.0000)	-0.026*** (0.0000)
DCC	0.010** (0.0317)	0.009** (0.0182)	0.005 (0.1049)
TANG	-0.132*** (0.0000)	-0.102** (0.0364)	0.073 (0.1600)
CR	-0.058*** (0.0000)	-0.036*** (0.0000)	-0.006 (0.3560)
ROE	0.735*** (0.0000)	0.347*** (0.0000)	0.162*** (0.0012)
EUR	-0.007 (0.2254)	-0.003 (0.3907)	-0.005* (0.0957)
DUMMY	0.021 (0.1923)	0.029 (0.3024)	
Constant	0.624*** (0.0000)	0.1591 (0.4528)	
R <sup>2</sup>	0.72168	0.62434	0.75841
<i>p</i> value, <i>F</i> stat:	2.22e-16	2.23e-12	2.27e-14

Note. \*, \*\*, and \*\*\* represent significance at the 10%, 5% and 1% level, respectively.

Table 6 shows why the fixed model was consistent: the *F* statistic was significant at the 1% level ( $p = 2.22e-16$ ). The  $R^2$  was 76%; in other words, 76% of the TTA variance was explained by the exploratory variables. Return on assets, SIZE, BV, and ROE were highly statistically significant (at the 1% level). The ROA and SIZE presented the expected results, while ROE and BV did not. Finally, when EUR increased by 1%, TTA decreased by 0.5%. The EUR confirmed that the post-2021 increase negatively impacted company indebtedness. The same tests were applied to Panel B, where the fixed effects model proved to be more consistent (Table 7).

Table 7 - Regression Results (LTA)

Panel B: Determinants of long-term indebtedness (LTA)			
Variables	OLS model	Random effects model	Fixed effects model
ROA	-0.661 (0.6581)	-0.010 (0.9713)	0.118 (0.6943)
SIZE	0.007* (0.0750)	0.021 (0.2294)	0.068 (0.1960)
BV	-0.002 (0.3837)	-0.007* (0.0656)	-0.011** (0.0256)
DCC	0.002** (0.0317)	0.013** (0.0410)	0.013* (0.0618)
TANG	0.231*** (0.0000)	0.083 (0.3314)	0.036 (0.7489)
CR	0.027 (0.1421)	0.001 (0.9393)	0.001 (0.8968)
ROE	-0.017 (0.9118)	-0.032 (0.7470)	-0.057 (0.5923)
EUR	0.035*** (0.0000)	0.023*** (0.0000)	-0.020*** (0.0011)
DUMMYE	-0.001 (0.9664)	0.031 (0.5491)	
Constant	0.099 (0.6581)	-0.103 (0.7925)	
R <sup>2</sup>	0.17993	0.21112	0.25828
<i>p</i> value, <i>F</i> stat	0.0011744	3.7623e-05	5.8223e-05

Note. \*, \*\*, and \*\*\* represent significance at the 10%, 5%, and 1% level, respectively.

Table 7 shows that the fixed model was appropriate: the *F* statistic was significant at the 1% level ( $p = 5.8223e-05$ ). The  $R^2$  was 26%; that is, 26% of the variance of LTA was explained by the exploratory variables. The Euribor variable was highly statistically significant (at the 1% level). When EUR increased by 1%, the TTA decreased by 2%. The Euribor variable presented the expected sign, confirming that the increase since 2021 negatively impacted company indebtedness. The same tests were applied to Panel C, where the fixed effects model proved to be more consistent (Table 8).

Table 8 - Regression Results (STA)

Panel C: Determinants of short-term indebtedness (STA)			
Variables	OLS model	Random effects model	Fixed effects model
ROA	0.642 (0.2903)	-0.179 (0.5205)	-0.218 (0.4655)
SIZE	-0.044*** (0.0014)	-0.042* (0.0942)	0.029 (0.5719)
BV	0.001 (0.8516)	0.009** (0.0224)	0.012** (0.0205)
DCC	0.004 (0.6413)	-0.006 (0.3198)	-0.008 (0.2621)
TANG	-0.237** (0.0155)	-0.236** (0.0145)	-0.251** (0.0300)
CR	-0.043 (0.1008)	-0.019 (0.1507)	-0.018 (0.244)
ROE	-0.293 (0.1727)	0.038 (0.6988)	0.053 (0.6186)
EUR	0.033** (0.0248)	0.032*** (0.0000)	-0.031*** (0.0000)
DUMMYE	-0.293 (0.1727)	-0.068 (0.3861)	
Constant	1.526*** (0.0000)	1.440** (0.0105)	
R <sup>2</sup>	0.75841	0.32975	0.36538
<i>p</i> value, <i>F</i> stat	2.22e-16	7.646e-11	3.4033e-08

Note. \*, \*\*, and \*\*\* represent significance at the 10%, 5%, and 1% level, respectively.

Table 8 shows that the fixed model was appropriate: the *F* statistic was significant at the 1% level ( $p = 3.4033e-08$ ). The  $R^2$  was 37%; that is, 37% of the variance of LTA was explained by the exploratory variables. The Euribor variable was highly statistically significant (at the 1% level). When EUR increased by 1%, the STA decreased by 3.1%. The Euribor variable presented the expected sign and confirmed that the post-2021 increase negatively impacted company indebtedness.

We therefore concluded that EUR had a small negative and statistically significant impact on the indebtedness of Portuguese and Spanish companies: when it rose, company debt decreased. However, in the fixed effects model, the DUMMY variable disappeared, so we analysed the fixed effects model for both Portugal and Spain. This made it possible to better understand the effect of the DUMMY variable on company indebtedness and analyse the statistical significance of the exploratory variables in the two countries, respectively (Table 9).

Table 9 - Regression Results

Determinants of total indebtedness (TTA)			
Variables	Fixed effects model (PT and SP)	Fixed effects model (PT)	Fixed effects model (SP)
ROA	-0.553*** (0.0000)	-1.628*** (0.0000)	-0.014 (0.9310)
SIZE	0.195*** (0.0000)	0.0934*** (0.0091)	0.228*** (0.0000)
BV	-0.026*** (0.0000)	0.019*** (0.0009)	0.028*** (0.0000)
DCC	0.005 (0.1049)	0.0101*** (0.0040)	-0.004 (0.6734)
TANG	0.073 (0.1600)	0.0305 (0.6785)	0.004 (0.9563)
CR	-0.006 (0.3560)	-0.008 (0.7411)	0.003 (0.6865)
ROE	0.162*** (0.0012)	0.551*** (0.0000)	0.046 (0.3580)
EUR	-0.005* (0.0957)	-0.007* (0.099)	-0.001* (0.0974)
R <sup>2</sup>	0.75841	0.81459	0.84204
p value, F stat:	2.22e-16	4.4262e-15	2.22e-16
Determinants of long-term indebtedness (LTA)			
Variables	Fixed effects model (PT and SP)	Fixed effects model (PT)	Fixed effects model (SP)
ROA	0.118 (0.6943)	0.746 (0.4469)	0.072 (0.8029)
SIZE	0.068 (0.1960)	0.073 (0.5126)	0.084 (0.1132)
BV	-0.026*** (0.0000)	0.027 (0.1386)	0.009** (0.0176)
DCC	0.013* (0.0618)	0.015 (0.1856)	0.139 (0.2573)
TANG	0.036 (0.7489)	-0.023 (0.9216)	0.139 (0.2573)
CR	0.001 (0.8968)	0.038 (0.6180)	0.010 (0.4582)
ROE	-0.057 (0.5923)	-0.418 (0.1930)	0.051 (0.5683)
EUR	-0.005* (0.0957)	-0.018** (0.0405)	-0.023*** (0.0029)
R-squared	0.25828	0.25999	0.41224
p value: F stat:	5.8223e-05	(0.0532)	(0.0003)
Determinants of short-term indebtedness (STA)			
Variables	Fixed effects model (PT and SP)	Fixed effects model (PT)	Fixed effects model (SP)
ROA	-0.218 (0.4655)	-0.312 (0.6972)	-0.084 (0.8209)

SIZE	0.068 (0.1960)	-0.143 (0.1229)	0.084 (0.2181)
BV	0.012** (0.0205)	0.039** (0.0114)	0.005 (0.3510)
DCC	-0.008 (0.2621)	-0.005 (0.5582)	0.024 (0.2259)
TANG	-0.251** (0.0300)	-0.305 (0.1212)	-0.183 (0.2503)
CR	-0.018 (0.244)	-0.073 (0.2393)	-0.008 (0.6660)
ROE	0.053 (0.6186)	0.077 (0.7677)	0.007 (0.9543)
EUR	-0.031*** (0.0000)	-0.028** (0.0224)	-0.022** (0.0283)
R <sup>2</sup>	0.36538	0.40918	0.46245
<i>p</i> value, <i>F</i> stat:	3.4033e-08	0.000782	4.0358e-05

Note. \*, \*\*, and \*\*\* represent significance at the 10%, 5%, and 1% level, respectively.

For both countries, the  $R^2$  increased slightly, albeit the exploratory variables explained company indebtedness less consistently.

#### Regarding the TTA model:

The ROA variable shows a negative and statistically significant level of significance in Portuguese companies. It is not statistically significant in Spanish companies. The total indebtedness of Portuguese companies is therefore more sensitive to the behavior of the ROA variable. The size variable (SIZE) shows a positive and statistically significant level in both Portugal and Spain. The same behavior is shown by Book Value. The ROE variable is positively and statistically significant for the indebtedness of Portuguese companies. The ROE variable is not statistically significant in Spanish companies. Therefore, the indebtedness of Portuguese companies is more sensitive to the behavior of ROE. In both Portuguese and Spanish companies, the Euribor variable is negative and statistically significant. In this sense, the rise in Euribor had a negative impact on the total indebtedness of Portuguese and Spanish companies.

#### Regarding the LTA model:

The Euribor rate shows the same behavior as the TTA model, in both Portuguese and Spanish companies. The rise in the Euribor rate has a negative impact on the long-term indebtedness of companies in both countries. The ROA and ROE variables are not statistically significant for companies in the two countries under study. The Book Value variable has a positive and statistically significant impact on the long-term indebtedness of Spanish companies. This is not the case for Portuguese companies. It was expected that the increase in Book Value would mean that Spanish companies would not have to rely on debt for their operations.

#### Regarding the STA model:

The Euribor variable shows the same behavior as the TTA and LTA models. However, the statistical significance of the STA model is much higher. In this sense, the rise in the Euribor rate had a very negative impact on short-term debt in both Portuguese and Spanish companies.

### **Summarizing:**

For TTA, EUR was negative and statistically significant at the 10% level. SIZE and BV were statistically significant at the 1% level. The larger the company, the greater the debt. However, market capitalization, as measured by BV, had a positive and statistically significant impact on company indebtedness. It was expected that the increase in BV would mean that companies would not have to rely on debt for their operations. In other words, the higher the BV, the more robust a company will be when it must deal with debt. The increase in EUR resulted in a decrease in short-term indebtedness (current liabilities) and long-term indebtedness (non-current liabilities) in both countries. In sum, EUR impacted the short-term and long-term indebtedness of Portuguese and Spanish companies.

The rise in the Euribor rate has a more significant impact on short-term loans (STA) than on long-term loans (LTA). It is clear that short-term loans are more sensitive to Euribor rate rises. In Portugal, total indebtedness is more sensitive to fluctuations in ROE than in Spain. Note that the ROE variable is not statistically significant for short and long-term debt. Note that the ROA and ROE variables are not statistically significant in terms of short and long-term debt. In this sense, their analysis becomes irrelevant. It is difficult to compare our results with previous studies because BV and EUR have not yet been applied as exploratory variables in similar studies.

## **5. Conclusions**

Our primary objective in this study was to identify the determinants of Portuguese and Spanish company indebtedness by examining 14 companies listed on the PSI 20 and 15 companies listed on the IBEX 35 for the period 2018 to 2022. We applied three indebtedness models: TTA, LTA, and STA, all as dependent variables.

In accordance with the literature, we applied eight explanatory variables. Additionally, we considered EUR and BV. We used RStudio to test the pooled OLS, fixed effects, and random effects models. Using a balanced panel, it was possible to identify the variables of all companies for the period 2018 - 2022. The fixed model was chosen because it generated the best results. In the case of the fixed effects model, we have seen that the DUMMY variable disappeared. We therefore had to apply the fixed effects models to Portugal and Spain, respectively. We were then able to better understand the effect of the DUMMY variable on company indebtedness and establish the statistical significance of the exploratory variables in the two countries. From that, we saw that  $R^2$  increased slightly, but the independent variables were less able to explain company indebtedness.

In conclusion, we can see that the Euribor variable was negative and statistically significant in all three models (TTA, LTA and STA). However, the statistical significance was much higher in the STA model. In this sense, in short-term debt (STA), Portuguese and Spanish companies saw a significant increase in their costs ensuing the rise in the Euribor rate. This factor can have an impact on companies' growth when they face a shortage of working capital in the short term. If the Euribor rate continues to rise, the companies under study could face growth problems. There may be difficulties in making new investments.

In the model TTA, the ROE variable is positively and statistically significant for the indebtedness of Portuguese companies. The ROE variable is not statistically significant in Spanish companies. Therefore, the indebtedness of Portuguese companies is more sensitive to the behavior of ROE.

In the model STA, the ROA and ROE variables are not statistically significant for companies in the two countries under study.

The Book Value variable has a positive and statistically significant impact on the long-term (LTA) indebtedness of Spanish companies. This is not the case for Portuguese companies. It is expected that the increase in Book Value would mean that Spanish companies would not have to rely on debt for their operations. Book value had a positive and statistically significant impact on company indebtedness. We expected that an increase in BV would mean that a company would need to rely less on debt as it would be more robust. Finally, the increase in EUR resulted in a decrease in STA (current liabilities) and LTA (non-current liabilities) in both countries. The rise in the Euribor rate has a more significant impact on short-term loans than on long-term loans. It's clear that short-term loans are more sensitive to Euribor rate rises.

It is hoped that the present study will complement the literature and show future researchers the importance of the subject, particularly the external variable EUR (which could be investigated further in the context of other countries). It is worth reiterating that the increase in EUR (from 2021) led to a small but significant reduction in debt amongst the companies in the sample, which indicates how impactful the Euribor rate can be. Making comparisons with other countries is not easy, given the differences in capital structure. There are countries that finance themselves more from the market and others that finance themselves more from banks. It is difficult to compare different economic and financial realities. Stock market indices also have different rules and specificities.

Reviewing the literature is very important, but it does not always make it possible to form a comparative analysis, especially on sensitive topics like this one.

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## **Conflict of interest**

We declare that we are not subject to any type of conflict of interest with the participants or any other collaborator, direct or indirect, in the development of the research work.

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