# “Influence of collateral and age on corporate capital structure”


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# INFLUENCE OF COLLATERAL AND AGE ON CORPORATE CAPITAL STRUCTURE

## Abstract

Being financed by third-party capital requires the companies to put up collateral or assets in guarantee, consisting of real estate, inventories, and accounts receivable that in turn depend on specific life cycles, among other aspects. The main object of this study is to analyze whether corporate debt is related to age and collateral. To do so, a sample of 194 public and private Brazilian companies was studied between 2010 and 2017. The findings indicate that more mature businesses have lower debt levels. In terms of the collateral variable and interactions between collateral and age, a negative relation was noted with financial leverage, contrary to what was expected. This fact indicates a possible lack of quality in collateral over time. Furthermore, it is noted that there is no directly proportional relationship between progression in age and collateral. The contribution of the study consists of analyzing the relationships between collateral and age in terms of the debt levels of public and private Brazilian businesses. The distinctions between these groups may throw light on organizations in the emerging countries in terms of how to handle financing decisions with financial and capital market institutions.

**Keywords** leverage, real estate assets, inventory, accounts receivable, age, pooled cross-section, private companies, public companies, Brazil

**JEL Classification** G31, G32

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## INTRODUCTION

A major aspect of corporate finance is defining the capital structure of companies, as well as deciding what is the best distribution among internal and external sources (Perobelli & Famá, 2003; Sheikh & Wang, 2011). Although the seminal paper by Modigliani and Miller (1958) indicates the irrelevance of this topic, friction in the capital market challenges the assumptions underlying their proposals. The main theories exploring these points of friction and suggesting possible indicators for corporate financing decisions are Pecking Order (POT), Trade-Off (TOT), Informational Asymmetry (IAS), Agency Theory and Life-Cycle (LC), among other factors (Sheikh & Wang, 2011; Naomi, Ekaputra, & Wibowo, 2018).

According to Caprio and Demirguç-Kunt (1998), companies in developing countries raise fewer long-term funds than those in more developed nations, not necessarily due to shortcomings in their credit markets. For the former, this problem is caused mainly by different features, notably company age and collateral value. Indeed, a company may change its capital structure for a wide variety of reasons, including debt market access, life cycle stage and a good match between its investment decisions, amounts and funding source maturity, among others (Ezeoha & Botha, 2012).

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Zica and Martins (2008) argue that large Brazilian corporations find it easier to raise funds, while small and medium-sized enterprises (SME) must surmount barriers in order to obtain the financing. The suggested reasons for this include the fact that major corporations have more assets available as collateral, which is important for bank loans (Hall, 2012).

For Frank and Goyal (2003), and Dewaelheyns and Van Hulle (2010), more mature companies have more robust credit histories and reputations, underpinning better relationships with creditors. Thus, due to their age, they face fewer problems arising from adverse selection, with less uncertainty among their investors. Furthermore, older companies are more strongly leveraged, with less information asymmetry and more efficient credit allocations (Ezeoha & Botha, 2012). In contrast, Huynh and Petrunia (2010) assert the opposite: corporate debt levels drop as businesses mature.

Caprio and Demirgü-Kunt (1998), as well as Damodaran (2012), state that corporate funding sources change throughout their life cycles, with older firms having a competitive advantage over their younger counterparts. In this study, the authors found out that lack of collateral and limited experience are the factors that trip up small businesses when accessing the long-term debt market. It is thus clear that the influence of tangible assets on corporate debt is dependent on company's age.

Consequently, the main research problem addressed by the study is: Does interaction between collateral and corporate age change the capital structure of companies? As secondary goals, the stand-alone impacts of collateral and age on company debt are analyzed.

The contribution by the study consists in analyzing the relationships between collateral and age in terms of debt levels by public and private Brazilian businesses. Possible distinctions between these groups may throw a light on organizations in emerging countries in terms of how to handle financing decisions with financial and capital market institutions.

## 1. LITERATURE REVIEW

The capital structure of a business is defined as a set of papers used to finance its activities, or as the ratio between its short- and long-term debt and its capital (Myers, 1984). The two main capital structure theories clash: the conventional theory drawn up by Durand (1952) and proposals put forth by Modigliani and Miller (1958). According to Durand (1952), there is an optimum capital structure based on the ratio between the combination of financing sources – equity and third-party capital. This optimum ratio is attained when the mean capital structure cost drops to its lowest point.

In contrast, the theory proposed by Modigliani and Miller (1958) has grounds on the assumption that a perfect capital market exists, disregarding the existence of real-life friction points such as taxes and others. When taking these underlying assumptions into account, their proposals uphold that capital structure is irrelevant. Subsequently, theories have arisen that challenge these assumptions, namely, TOT, POT, IAS, and LC (Myers, 1984).

The Life-Cycle (LC) theory is related to the various stages through which a company passes, including start-up, expansion, maturity, and decline. During the maturity phase, sales growth flattens out, while operating outcomes continue to grow, underpinned by past investments. Furthermore, investment needs for assets, research, marketing, and new products are reduced. Value creation is thus based far more on current assets rather than on growth expectations. From this time onwards, the company begins to decline or moves into a deterioration process. At this stage, the ability to contract debt drops, with higher cash flow generation (Kayo, Kimura, Martin, & Nakamura, 2006; Pfaffermayr, Stöckl, & Winner, 2013; Reis, Campos, & Pasquini, 2017). Therefore, it might be stated that:

*H1: The more mature the company, the lower its debt level.*


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In turn, the Trade-Off (TOT) theory confirms that there is an ideal proportion between equity and third-party capital that can maximize the value of the business. Under this theory, the companies seek debt to their tax benefit limits. Empirical surveys show that company assets (such as land, buildings, equipment, and inventories) and rights (e.g., accounts receivable) help it to increase the indebtedness, as they may be used as collateral with creditors (Miller, 1977; Myers, 1984; Frank & Goyal, 2003; Pontoh & Budiarso, 2018). Consequently, it can be assumed that:

*H2: The larger the collateral, the higher the debt level of a company.*

Conceptualized by Myers and Majluf (1984), the Pecking Order (POT) theory proposes a tiering system for sources of funding. Myers (1984) explains that due to asymmetrical information among managers, shareholders, and investors, the companies prefer to fund their investments internally, obtaining loans, and issuing shares. For Sakai, Uesugi, and Watanabe (2010), a marginal increase in company size leads to greater volatility in its profits due to financial friction points. This means that they strive to mitigate their risks by reducing the indebtedness and boosting their funding through equity capital.

Companies still in the development stage enter into associations with others endowed with low debt and collateral levels. Good examples are start-ups financed by loans from relatives, equity funding, angel investors, or venture capital funds. As the business grows, it begins to access other loan providers such as banks and other agents with surplus funds. It is thus evidenced that company age is a significant factor for its capital structure (Vasconcelos, Santos, Almeida, & Silva, 2015; Matias & Serrasqueiro, 2017; Reis, Campos, & Pasquini, 2017).

These company life cycle analyses were supplemented by Huynh and Petrunia (2010) who asserted that corporate growth is dependent on asset levels. Businesses with ample assets indicate that they can access means of raising funds. These authors also argue that although young companies are endowed with a high growth outlook, they also find it difficult to access the debt market due to high costs charged by creditors in order to offset their bankruptcy risks. Consequently, these firms are mainly financed through equity capital.

However, Huynh and Petrunia (2010) mention that young businesses starting up with ample tangible assets can raise funds in the debt market in order to capitalize their activities, boosting their chances of growth. These authors also note that asset quality provides leverage for businesses, meaning that corporate growth is tied simultaneously to company age, size, and capital sources. This relation is confirmed by Caprio and Demirgü-Kunt (1998), as well as by Ezeoha and Botha (2012), by demonstrating that start-ups with little collateral find it extremely difficult to access the loan market. It is thus clear that:

*H3: The influence of collateral on debt levels depends on company's age.*

## 2. METHODS AND DATA

The final sample consisted of 194 Brazilian businesses, 52 of them held privately and 142 publicly. Data obtained from the Capital IQ database between 2010 and 2017 were analyzed by means of descriptive statistics and correlation, with the assumptions tested through a cross-section pooled regression model. Linear regression is intended to analyze the relation between two or more explanatory variables – shown linearly – and a metric dependent variable (Fávero, Belfiore, Silva, & Chan, 2009).

The underlying assumptions for a cross-section pooled regression model are coefficient linearity and normality and homoscedasticity of remaining values, together with the absence of multicollinearity for the explanatory variables (Gujarati & Porter, 2011). Specifically, for the normality of remaining values, the Gauss-Markov theorem demonstrates that, even if the distribution of the remaining values is not normal, the Ordinary Least Squares (OLS) estimator is the best non-skewed linear estimator (Gujarati & Porter, 2011; Wooldridge, 2007).

According to a review of literature, corporate debt drops as its life cycle progresses. As a com-

**Table 1.** Econometric model variables

| Initials | Name | Type | Theory | ES | Formula | Components | References |
|---|---|---|---|---|---|---|---|
| *LEV* | Leverage | D | n/a | n/a | *LEV* = (*DCP* + *DLP*)/*TA* | *STD* = Short-term debt<br>*LTD* = Long-term debt<br>*TA* = Total assets | Marinšek et al. (2016), Munisi (2017) |
| *AGE* | Age | I | LCT and IAS | – | *AGE* = Ln(*CY* – *YF*) | Ln = Neperian logarithm<br>*CY* = Current year<br>*YF* = Year founded | Huynh and Petrunia (2010), Matias and Serrasqueiro (2017) |
| *COL* | Collateral | I | TOT | + | *COL* = (*INV* + *NPP* + *REC*)/*TA* | *INV* = Inventory<br>*NPPE* = Net property, plant, and equipment<br>*REC* = Accounts receivable short- and long-term<br>*TA* = Total assets | Perobelli and Famá (2003), Bastos and Nakamura (2009) |
| *COL*AGE* | Interaction variable | I | LCT | + | *COL*IDA* = *COL* x *AGE* | *COL* = Collateral<br>*AGE* = Age | Ezeoha and Botha (2012) |
| *ROA* | Return on assets | C | POT | – | *ROA* = *Ebit*/*TA* | *Ebit* = Earnings before interest and taxes<br>*TA* = Total assets | Bastos and Nakamura (2009), Marinšek et al. (2016) |
| *SIZ* | Size | C | TOT | + | *SIZ* = Ln(*RV*) | Ln = Neperian logarithm<br>*RV* = Revenue | Bastos and Nakamura (2009), Ezeoha and Botha (2012) |
| *GOP* | Growth opportunity | C | POT<br>TOT | +<br>– | *GOP* = $(RV_t - RV_{t-1})/RV_{t-1}$ | $RV_t$ = Revenue for current year<br>$RV_{t-1}$ = Revenue for previous year | Munisi (2017) |

*Notes:* D – dependent, I – independent, C – control, ES – expected sign, IAS – informational asymmetry, LCT – Life-Cycle theory, TOT – Trade-Off theory, POT – Pecking Order theory, n/a – not applicable.

pany becomes more mature, it assigns higher priority to its own capital instead of incurring in debt. Thus, more mature companies have lower debt levels (*H1*). In turn, corporate life cycles are related to their ability to increase their assets. These assets (or collateral) can be given as guarantee to creditors, which encourages indebtedness (*H2*). It is thus clear that the influence of collateral on debt levels depends on company's age (*H3*). Consequently, companies adjust their actual leverage ratios throughout their life cycles, as shown in Equation 1, whose variables are demonstrated in Table 1:

$$\begin{aligned} LEV_i &= \beta_0 + \beta_1 AGE_i + \beta_2 COL_i + \\ &+ \beta_3 COL * AGE_i + \beta_4 ROA_i + \\ &+ \beta_5 SIZ_i + \beta_6 GOP_i + \varepsilon_i, \end{aligned} \quad (1)$$

where $\beta_0$ is the linear coefficient, $\beta_1$ to $\beta_6$ are the explanatory variable coefficients, $i$ is the company, $\varepsilon_i$ is the stochastic error term.

## 3. RESULTS

Results are based on a final sample that varies from 190 to 194 non-financial Brazilian companies between 2010 and 2017 (see Table 2). In addition to the total sample, sub-samples of private and public companies are analyzed. Data were obtained from the Capital IQ database. Table 2 shows the number of observations for each variable, as well as the companies for each sample during the period shown as a total, as well as by private and public companies. The change in the number of observations during the period is due to the fact that some companies do not necessarily have data for all the years. Moreover, the same companies are not addressed between 2010 and 2017. Over time, several companies joined and left the sample. It is noted that the *LEV* independent variable and the *AGE*, *COL* and *COL*AGE* independent variables have the same amount of data between 2010 and 2017.

Table 3 reflects the descriptive statistics for the private, public, and total samples over the study period (2010–2017). Total sample includes public and private companies. For the accounting leverage (*LEV*) variable, a similar mean debt level was noted for each sample type, notwithstanding the fact that the public sub-sample was larger than the private group. A similar feature may be detected for the *AGE*, *COL* and *COL*AGE* independent variables and the *ROA*, *SIZ*, *GOP* controls.

For private and public companies, Figure 1a presents a comparison between progression in age


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**Table 2.** Distribution of samples over time

| No. of observations / Variables | 2010 | | | 2011 | | | 2012 | | | 2013 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PR | PU | TS | PR | PU | TS | PR | PU | TS | PR | PU | TS |
| *LEV* | 52 | 142 | 194 | 50 | 141 | 191 | 51 | 139 | 190 | 51 | 140 | 191 |
| *AGE* | 52 | 141 | 193 | 50 | 141 | 191 | 51 | 139 | 190 | 51 | 140 | 191 |
| *COL* | 52 | 142 | 194 | 50 | 141 | 191 | 51 | 139 | 190 | 51 | 140 | 191 |
| *COL*AGE* | 52 | 141 | 193 | 50 | 141 | 191 | 51 | 139 | 190 | 51 | 140 | 191 |
| *ROA* | 52 | 142 | 194 | 50 | 141 | 191 | 51 | 139 | 190 | 51 | 140 | 191 |
| *SIZ* | 52 | 142 | 194 | 50 | 141 | 191 | 50 | 139 | 189 | 50 | 140 | 190 |
| *GOP* | 47 | 138 | 185 | 50 | 141 | 191 | 50 | 139 | 189 | 49 | 140 | 189 |
| No. of companies | 52 | 142 | 194 | 50 | 141 | 191 | 51 | 139 | 190 | 51 | 140 | 191 |
| **No. of observations / Variables** | **2014** | | | **2015** | | | **2016** | | | **2017** | | |
| | PR | PU | TS | PR | PU | TS | PR | PU | TS | PR | PU | TS |
| *LEV* | 52 | 142 | 194 | 52 | 141 | 193 | 52 | 142 | 194 | 51 | 142 | 193 |
| *AGE* | 52 | 142 | 194 | 52 | 141 | 193 | 52 | 142 | 194 | 51 | 142 | 193 |
| *COL* | 52 | 142 | 194 | 52 | 141 | 193 | 52 | 142 | 194 | 51 | 142 | 193 |
| *COL*AGE* | 52 | 142 | 194 | 52 | 141 | 193 | 52 | 142 | 194 | 51 | 142 | 193 |
| *ROA* | 52 | 142 | 194 | 52 | 141 | 193 | 52 | 142 | 194 | 51 | 142 | 193 |
| *SIZ* | 51 | 142 | 193 | 51 | 140 | 191 | 50 | 141 | 191 | 50 | 141 | 191 |
| *GOP* | 50 | 142 | 192 | 51 | 141 | 182 | 51 | 142 | 193 | 51 | 141 | 192 |
| No. of companies | 52 | 142 | 194 | 52 | 141 | 193 | 52 | 142 | 194 | 51 | 142 | 193 |

*Notes:* PR – private companies, PU – public companies, TS – total sample.

**Table 3.** Descriptive statistics of samples

| Variables | Private companies | | | | | Public companies | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Obs | Mean | SD | Min | Max | Obs | Mean | SD | Min | Max |
| *LEV* | 411 | 0.33 | 0.19 | 0.00 | 0.85 | 1129 | 0.32 | 0.18 | 0.00 | 0.95 |
| *AGE* | 411 | 3.88 | 0.51 | 2.64 | 4.82 | 1128 | 3.85 | 0.74 | 0.69 | 4.99 |
| *COL* | 411 | 0.59 | 0.24 | 0.03 | 0.95 | 1129 | 0.56 | 0.20 | 0.01 | 0.95 |
| *COL*AGE* | 411 | 2.33 | 1.06 | 0.00 | 4.37 | 1128 | 2.23 | 0.97 | 0.02 | 4.62 |
| *ROA* | 411 | 0.07 | 0.10 | –0.38 | 0.47 | 1129 | 0.06 | 0.09 | –0.83 | 0.62 |
| *SIZ* | 404 | 6.58 | 1.79 | 1.79 | 10.28 | 1126 | 7.28 | 1.82 | 0.58 | 12.72 |
| *GOP* | 399 | 0.05 | 0.23 | –1.00 | 0.89 | 1124 | 0.08 | 0.22 | –0.10 | 0.99 |

| Variables | Total sample | | | | |
|---|---|---|---|---|---|
| | Obs | Mean | SD | Min | Max |
| *LEV* | 1540 | 0.32 | 0.18 | 0.00 | 0.95 |
| *AGE* | 1539 | 3.87 | 0.68 | 0.69 | 4.99 |
| *COL* | 1540 | 0.57 | 0.21 | 0.01 | 0.95 |
| *COL*AGE* | 1539 | 2.26 | 0.99 | 0.01 | 4.62 |
| *ROA* | 1540 | 0.06 | 0.09 | –0.83 | 0.62 |
| *SIZ* | 1530 | 7.10 | 1.84 | 0.58 | 12.73 |
| *GOP* | 1523 | 0.07 | 0.22 | –1.00 | 0.99 |

*Notes:* Obs – observations, SD – standard deviation, Min – minimum, Max – maximum.

(in a Neperian logarithm for years in operation) and total percentage of collateral. Moreover, also for private and public companies, Figure 1b presents an analysis about the collateral composition. It is noted that there is no directly proportional relation between progression in age and collateral, which may corroborate the understanding of the negative regression coefficients for leverage and collateral, as shown in Table 5. In terms of composition of collateral compared to total assets, both samples indicated around 30% for property, plant, and equipment, 17% for receivables and 11% for inventories.

The correlation analysis is intended mainly to measure the level of linear association between two

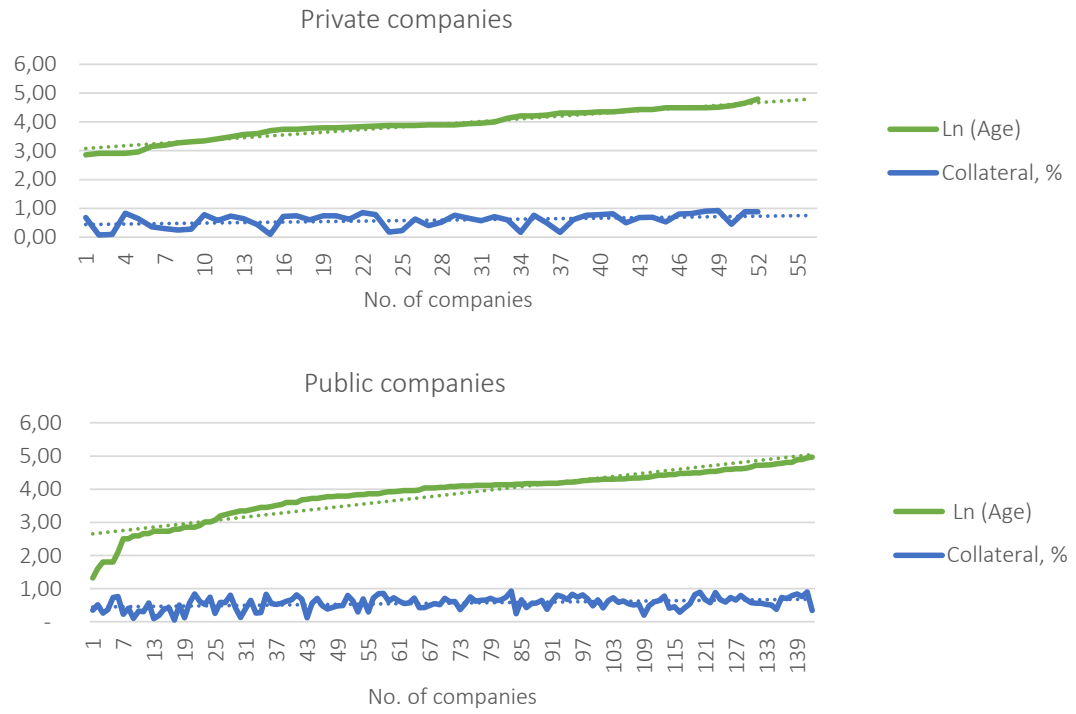
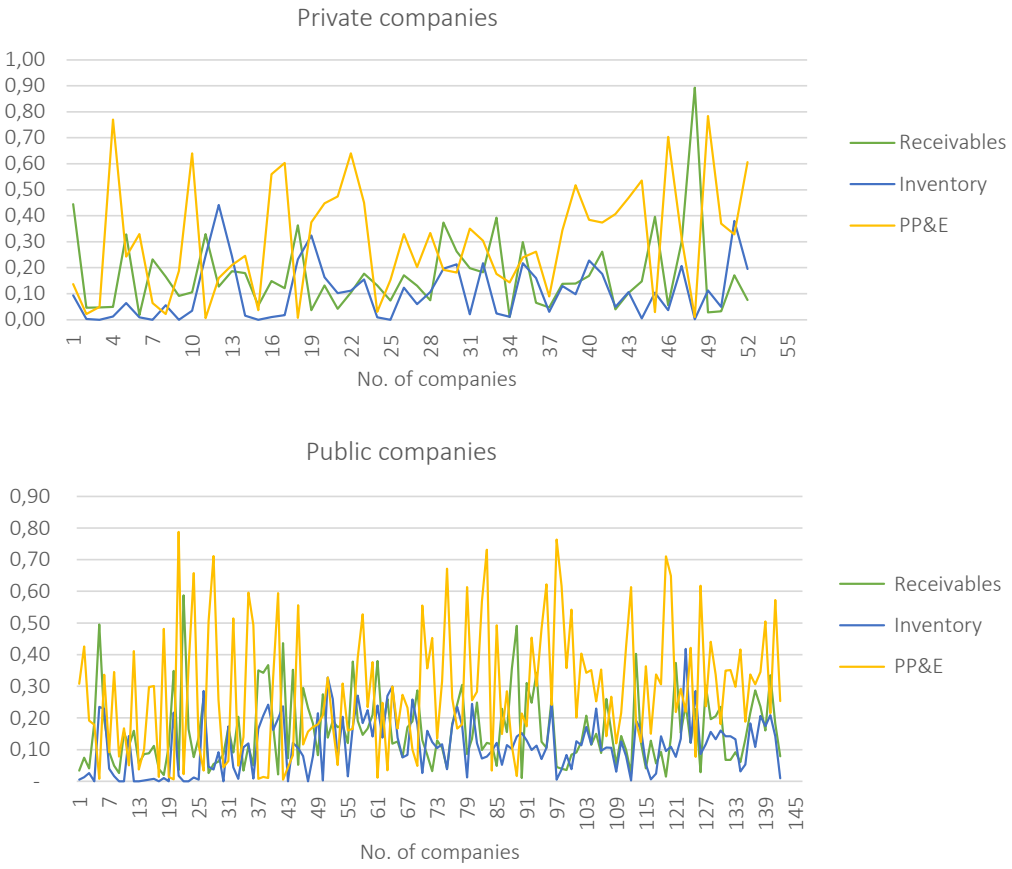



**Figure 1a.** Comparison between age and collateral




*Note:* PP&E – property, plant, and equipment.

**Figure 1b.** Collateral composition



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**Table 4.** Analysis of total sample correlation

| Variables | LEV | AGE | COL | *COL*AGE* | ROA | SIZ | GOP |
|---|---|---|---|---|---|---|---|
| *LEV* | 1.000 | – | – | – | – | – | – |
| AGE | –0.1303 [0.0000] | 1.0000 | – | – | – | – | – |
| COL | –0.0798 [0.0017] | 0.3120 [0.0000] | 1.0000 | – | – | – | – |
| *COL*AGE* | –0.1314 [0.000] | 0.6282 [0.0000] | 0.9203 [0.0000] | 1.0000 | – | – | – |
| ROA | 0.0498 [0.0508] | –0.0893 [0.0005] | –0.0688 [0.0069] | –0.0728 [0.0042] | 1.0000 | – | – |
| SIZ | 0.2706 [0.0000] | –0.0147 [0.5661] | –0.1294 [0.0000] | –0.1238 [0.0000] | 0.2420 [0.0000] | 1.0000 | – |
| GOP | 0.0436 [0.0890] | –0.0902 [0.0004] | –0.0053 [0.8358] | –0.0337 [0.1892] | 0.3654 [0.0000] | 0.1795 [0.0000] | 1.0000 |

*Notes:* The figures between [square brackets] represent the level of statistical significance of the total sample's correlation analysis.

variables. Furthermore, it helps verify the working assumption, demonstrating a possible multicollinearity between the variables. Table 4 indicates alignment with *H1*: The more mature (*AGE*) the company, the lower its corporate debt (*LEV*). The existence of positive significant relations was ascertained for size (*SIZ*) and growth opportunities (*GOP*), respectively, confirming TOT and POT. Finally, a significantly high positive (> 0.5) correlation was noted among the *COL*AGE* interaction variables with age (*AGE*) and collateral (*COL*). This indicates a possibly high level of multicollinearity among them.

When testing the assumptions underpinning the econometric model, it became apparent that the private, public, and total company distribution is not normal. However, normality does not play a role in the absence of an OLS skew and does not affect the conclusion that the OLS is the best non-skewed estimator under the Gauss-Markov assumptions (Wooldridge, 2007). Furthermore, they indicate the existence of heteroscedasticity, which is corrected through robust standard errors (Hoechle, 2007). Finally, the existence of high multicollinearity (VIF > 7) is found for the following independent variables: *COL*AGE*, *COL*, and *AGE*. This suggests that three regression models should be taken into consideration with only one of the independent variables, as shown in Equations 2, 3, and 4.

## Model 1:

$$LEV_i = \beta_0 + \beta_1 AGE_i + \beta_2 ROA_i + \\ + \beta_3 SIZ_i + \beta_4 GOP_i + \varepsilon_i, \quad (2)$$

## Model 2:

$$LEV_i = \beta_0 + \beta_1 COL_i + \beta_2 ROA_i + \\ + \beta_3 SIZ_i + \beta_4 GOP_i + \varepsilon_i, \quad (3)$$

## Model 3:

$$LEV_i = \beta_0 + \beta_1 COL * AGE_i + \\ + \beta_2 ROA_i + \beta_3 SIZ_i + \beta_4 GOP_i + \varepsilon_i, \quad (4)$$

where $\beta_0$ is the linear coefficient, $\beta_1$ to $\beta_4$ are the explanatory variable coefficients, $i$ is the company, $\varepsilon_i$ is the stochastic error term.

Table 5 demonstrates the results of the cross-section pooled regressions for Models 1, 2, and 3, as shown in Equations 2, 3, and 4, respectively, for the public and private sub-samples (Table 5a) and total sample (Table 5b). Among the independent variables, age (*AGE*) has a significant negative relation for all the samples, confirming the Life-Cycle theories and thus the informational asymmetry supporting *H1* – the more mature the company, the lower its debt level. This indicates that in the course of their life cycles, companies cease to use the debt market as their only source of financing, but instead fund their operations through other types of indebtedness. This corroborates the empirical test conducted by Matias and Serrasqueiro (2017).

The result for the collateral (*COL*) variable is significant at 5% only for the total sample. However, as the minus sign contradicts TOT, it was not possible to confirm *H2* – the larger the collateral, the high-

**Table 5a.** Cross-section pooled regression for public and private sub-samples

| Variables | Hypotheses | Theory | ES | Private companies | | | Public companies | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | M1 | M2 | M3 | M1 | M2 | M3 |
| *AGE* | ***H1*** | LCT, IAS | – | –0.045 [0.021] | | | –0.0323 [0.000] | | |
| *COL* | ***H2*** | TOT | + | | –0.0596 [0.223] | | | –0.0416 [0.100] | |
| *COL*AGE* | ***H3*** | LC | + | | | –0.0162 [0.118] | | | –0.0206 [0.000] |
| *ROA* | | POT | – | –0.082 [0.355] | –0.0555 [0.541] | –0.0620 [0.487] | –0.4040 [0.000] | –0.3988 [0.000] | –0.3990 [0.000] |
| *SIZ* | | TOT | + | 0.036 [0.000] | 0.0314 [0.000] | 0.0317 [0.000] | 0.0321 [0.000] | 0.0324 [0.000] | 0.0316 [0.000] |
| *GOP* | | POT | +/– | 0.030 [0.501] | 0.0350 [0.445] | 0.0351 [0.439] | 0.0159 [0.546] | 0.0252 [0.344] | 0.0239 [0.371] |
| *F* | | | | 15.25 | 11.19 | 12.08 | 41.02 | 37.74 | 40.24 |
| *Prob > F* | | | | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| $R^2$ | | | | 0.1098 | 0.1011 | 0.1035 | 0.1307 | 0.1160 | 0.1256 |

**Table 5b.** Cross-section pooled regression for total sample

| Variables | Hypothesis | Theory | ES | Total sample | | |
|---|---|---|---|---|---|---|
| | | | | M1 | M2 | M3 |
| *AGE* | *H1* | LCT, IAS | – | –0.0337 [0.0000] | | |
| *COL* | *H2* | TOT | + | | –0.0494 [0.0300] | |
| *COL*AGE* | *H3* | LCT | + | | | –0.0197 [0.0000] |
| *ROA* | | POT | – | –0.2674 [0.0000] | –0.2582 [0.0000] | –0.2640 [0.0000] |
| *SIZ* | | TOT | + | 0.0305 [0.0000] | 0.0297 [0.0000] | 0.0292 [0.0000] |
| *GOP* | | POT | +/– | 0.0134 [0.5450] | 0.0217 [0.3330] | 0.0212 [0.3440] |
| *F* | | | | 46.70 | 41.56 | 45.71 |
| *Prob >F* | | | | 0.0000 | 0.0000 | 0.0000 |
| $R^2$ | | | | 0.1098 | 0.1011 | 0.1035 |

*Notes:* ES – expected sign, M – model, IAS – informational asymmetry, LCT – Life-Cycle theory, TOT – Trade-Off theory, POT – Pecking Order theory. The figures in [brackets] represent the relation's level of statistical significance. The figures in bold type have statistical significance at 1% or 5% levels.

er the debt level of a company. A similar outcome was reached through an empirical study conducted by Rehman, Wang, and Yu (2016), resulting in a significant negative relation to debt. The findings of studies examining Brazilian companies conducted by Vasconcelos, Santos, Almeida, and Silva (2015) and Reis, Campos, and Pasquini (2017) also had no statistical significance.

For the interaction variable between age and collateral (*COL*AGE*), statistical significance was noted at 1% for the public sub-sample and the total sample. Nevertheless, the negative relation contrasts with the corporate lifestyle theory and does not allow confirming *H3* – the influence of collateral on debt level depends on company's age. This result indicates that the influence on corporate leverage does not depend on a company's age, as seen graphically in Figure 1, which shows that there is no directly proportional relation between collateral and age progression. The study by Ezeoha and Botha (2012) found no statistical significance for this variable.

As for control variables, return on assets (*ROA*) showed a significant negative relation to debt, corroborating POT for the total sample and public sub-sample. Size (*SIZ*) was equally significant, confirming TOT for the total sample and the public and private sub-samples. Finally, growth opportunity showed no statistical significance. Most of these findings are aligned with those of other empirical studies mentioned in the review of literature.


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## CONCLUSION

Studies on corporate accounting leverage are intended to understand the factors that intervene in capital structure. Business features in developing countries differ from those in more developed ones. As an example, companies in developing countries raise less long-term funding than those in more developed nations. Noteworthy among the reasons for this are company age and collateral value.

The purpose of this study was to detect the influence of age and collateral on corporate debt levels. It also seeks to ascertain whether the influence of collateral on debt levels depends on corporate age. Tests indicate confirmation of H1 for all the samples – the more mature the company, the lower its debt level. This corroborates the informational asymmetry and life-cycle theories as well as a study by Matias and Serrasqueiro (2017).

In turn, non-confirmation of *H2* and *H3* contradicts TOT and corporate Life-Cycle theories, respectively. The negative outcome between collateral and interaction between collateral and age with corporate debt levels indicates a possible weakness in collateral quality over time, thus discouraging steady increases in third-party loans. Moreover, it is noted that there is no directly proportional relationship between progression of age and collateral.

A limiting factor of this study is the size of its private company sample, which would have contributed to non-confirmation of both assumptions. Thus, it is suggested that future studies work with larger samples and include other emerging nations. In this case, it is recommended that macro-economic factors in such countries be included as a control variable. In addition to the possibility of expanding the sample's quantity and period, it is suggested that the business segments of these companies should be analyzed. Finally, an investigation is recommended to explore the effects of informational asymmetry on the relevance of collateral for private and public company debt levels.

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