Musa, H., Medzihorský, J., Krištofík, P., Musová, Z., & Škvareninová, D. (2025). Reevaluating capital structure theories: The impact of stock yield maximization on leverage in European firms. *Journal of International Studies, 18*(4), 123-152. doi:10.14254/2071-8330.2025/18-4/7

Journal of International Studies

Centre of Sociological Research

Scientific Papers

Reevaluating capital structure theories: The impact of stock yield maximization on leverage in European firms

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Abstract. Several capital structure theories typically consider firm value maximization as the primary goal. In this paper, we propose a shift in this aim to stock yield maximization and investigate its implications. We address two specific issues: first, the redefined primary aim of stock yield maximization; second, the use of

Received: November, 2024
1st Revision: November, 2025
Accepted: December, 2025

adjusted leverage measurement tools to explore the negative correlation between profitability and leverage, which similarly affects the relationship between stock yield and leverage. We verify the validity of capital structure theories under this new aim through an analysis of the relationship between stock yield and leverage, using both standard and adjusted measures. Our study focuses on European listed non-financial firms and reveals a negative correlation between stock yield (both capital and overall) and leverage with standard measures, contradicting existing theories. However, applying adjusted leverage measures confirms capital structure irrelevancy under the new aim, supporting the classical theory and the MM model. Notably, dividend yield positively correlates with leverage, aligning with investor expectations in more leveraged firms, as supported by several theories.

DOI: 10.14254/2071-8330.2025/18-4/7

Keywords: stock price, leverage, capital structure, firm value, the main aim of a firm.

JEL Classification: G32, B26, G11, C20

INTRODUCTION

The main aim of a firm which is usually considered to be the maximization of firm's value, has always been the focus of scientists, managers, investors and the wider public. One of pillars of financial economics is capital structure, including the issue of the relationship between maximization of the value of a firm and leverage, or minimization of the cost of capital and leverage. Capital structure theories can be divided into two groups regarding the focus of the main aim of firm and leverage – one of them focuses on leverage as an independent variable (dependent one is e.g., firm value), while the second group examines leverage as a dependent variable and its determinants. The limitation of this selection means this process cannot be taken unequivocally.

In terms of the first group of theories, the classical theory of capital structure supposes that debt is cheaper than equity, with fixed costs i.e., these costs do not depend on leverage. It is obvious that such an idea leads to leverage maximization if the aim is capital cost minimization. Basically, this relates to the consumption theory which presumes that more expensive commodity is replaced by cheaper commodity.

The U-Curve (traditional) approach (Durand, 1952) assumes that interest rates of new debt rise with the rising leverage, especially when leverage is relatively higher, while zero or only small rise is expected when leverage is low. Together with a gradual rise of cost of equity, which can also be considered as exponential (or parabolic), it leads to U-shaped curve of WACC (weighted average cost of capital).

The irrelevance theory of capital structure (Modigliani & Miller, 1958), known also as the original MM model, and the risk class model, assume that there is no relation between firm value and capital structure. Like classical theory, the MM model considers debt cost (interest rate) to be fixed i.e., unchanged with the changing leverage, as one of the assumptions of the MM model is risk-free debt. In contrast to other theories, the cost of equity rises with the rising leverage with such a rate that, finally, the average cost of capital remains stable.

Modigliani and Miller (1958, 1963), in their second model, added another assumption, which is an existence of corporate income taxes. Consequently, this strongly changed the result of the model. As the interest tax shield cannot be applied to dividends, but only to interests, it leads to a preference of debt, which is similar to the classical theory; however, this concerns only firms with positive EBIT in general.

Similar to the U-curve, the static trade-off theory (Kraus & Litzenberger, 1973; Myers 1984) offers an interior solution for the debt-equity choice, as it considers both advantages of higher leverage of an interest

tax shield and its disadvantages of potential financial distress and its costs. It can be said that it links the second MM model (Modigliani & Miller, 1958, 1963) to bankruptcy theory (Stiglitz, 1969; Scott, 1977; Kim, 1978).

Considering the theories which focus on a firm's aim and leverage (these are taken into account in this paper), as well as the theories that focus on the determinants of leverage, it should be admitted that both the second MM model and the trade-off theory bring some leverage determinants (such as taxation, profitability, business risk, and costs of financial distress) into view. However, classification of the agency costs theory (Fama & Miller, 1972; Jensen & Meckling, 1976) seems to be even more complicated, as it sets an optimal capital structure represented with minimization of agency costs, which, apparently, cannot be easily calculated. Regardless of this calculations, different perceptions of owners and managers on a firm and its financial management are noticeable (Belas & Rahman, 2023; Feng et al., 2024). Besides, external factors matter like national monetary and tax policy (Azizov et al., 2023; Mukhtarov et al., 2020), public debt and overall macroeconomic stability (Jabiyev et al., 2022; Vysochyna et al., 2024), expenditures structure (Bilan et al., 2025; Gasim et al., 2025; Yurchyk et al., 2024). Other well-known capital structure theories, such as the pecking-order (Myers & Majluf, 1984), life cycle (Weston and Brigham, 1981; Chittenden et al., 1996), and market-timing theory (Baker & Wurgler, 2002) would be, for this case, considered as theories oriented on leverage determinants, and their conclusions mostly show how firms choose their capital structure, and what affects their debt-equity choice. With regard to this, a closer look at these theories is provided by Krištofík et al. (2022) as well.

A plethora of empirical studies focus on capital structure, including the studies which consider a leverage independent variable with an impact on a selected corporate output or another variable include. Cheng and Tzeng (2011), Siahaan (2013), Farooq and Masood (2016), Markonah (2020) who study relations between leverage and firm value; Menon (2016), Vo and Ellis (2017), Do et al. (2022), Akron and Taussig (2022) with their focus on leverage and stock price/return; Valašková et al. (2019) who deal with leverage and WACC; Cattaruzzo and Turuel (2022) who study leverage and growth (of productivity and sales); Sheikh a Wang (2013), Vătavua (2016), Vithessonthi and Tongurai (2015), Alarussi and Alhaderi (2018) who pay attention to leverage and profitability. Empirical research cannot confirm any capital structure theory as prevailing. Therefore, the statement that "There is no universal theory of the debt-equity choice, and no reason to expect one" (Myers, 2001, p. 81) seems to be true.

The differences between the results of empirical studies can also relate to several possible definitions of leverage, which (Al-Najjar and Hussainey, 2011) make a comparison between results of different studies more difficult. Such issues are supported by Frank and Goyal's (2015) statement that a calculation of leverage affects the relationship between leverage and profitability, as profits (retained earnings) are part of equity. That leads to the preference of the negative relationship between profitability and leverage in empirical studies over the positive one. As a result, e.g. pecking-order and life-cycle theories are preferred, and the empirical results are in contrast to the MM model with taxes and trade-off theory – especially from the view of profitability as the capital structure determinant. However, an analogical issue can occur when leverage (as an independent variable) and profitability, or any aim of a firm which should have the positive relationship with profitability, are studied.

Consequently, several issues may arise, e.g. whether a firm should maximize its leverage because debt is cheaper than equity, or because of a positive effect of the interest tax shield. An optimal leverage should be found if the risk of potential financial distress is considered, which can also lead to higher interest rates acquired by potential creditors. Another consideration is whether the capital structure is irrelevant to firm value. At the same time there are the issues whether it is possible that these partial effects of leverage on firm value (as defined by capital structure theories) are so contradictory that the overall effect of leverage on firm value is theoretically unpredictable and practically different, which depends on a select dataset.

Another question that may arise is whether capital structure theories will be valid if we change the main aim of a firm.

This question was studied by Ardalan (2017), who specified it in the context of the validity of the original MM model. The author indicates that capital structure is relevant if we apply stock price maximization instead of firm's value maximization as the main aim of a firm, and if we consider debt to be risky (risk-free debt is an unrealistic assumption in the original MM model).

In accordance with these assumptions, the verification of the validity of capital structure theories – in the case of a changed main aim of a firm – is the aim of this research alongside calculation issues related to leverage and profitability, as profitability should have a long-term relationship with the changed aim of a firm.

This paper is structured as follows: theoretical background (Section 1), data and methodology (Section 2), results and discussion (Section 3). The final section comes with conclusions.

1. THEORETICAL BACKGROUND

1.1. Theoretical background with a focus on the original main aim of a firm

The classical theory of capital structure supposes that debt is cheaper than equity. Let us note r_e as cost of equity and r_d as cost of debt, E as equity, D as debt, and T as corporate income tax rate. Then WACC without the interest tax shield (if we abstract from taxes), with the interest tax shield, respectively, is calculated, as follows.

$$WACC = r_e \frac{E}{E+D} + r_d \frac{D}{E+D} \quad (1)$$

$$WACC_t = r_e \frac{E}{E+D} + r_d \frac{D}{E+D} (1 - T) \quad (2)$$

If we consider $r_e > r_d$ (note: this assumption is in line with all theories) and both r_e and r_d being fixed (unchanged with the rising leverage), then the optimal (minimal) $WACC$ is represented by $E=0$ i.e., leverage maximization both with the interest tax shield and without it; even though the positive effect of debt is even stronger with the shield. With reference to a value of a firm (V), there is the reciprocal relationship with $WACC$, which Modigliani and Miller (1958) define, as follows:

$$\frac{EBIT}{E+D} = \frac{EBIT}{V} = WACC \quad (3)$$

(note: earnings before interests are used in the original paper instead of $EBIT$, as the non-existence of taxes is supposed in their first theory, thus $EBI = EBIT$ in this case). Considering $EBIT$ fixed variable (not depending on leverage), we can conclude that value of a firm is maximized with leverage maximization (equal to $WACC$ minimization), which is in line with the classical theory of capital structure.

Durand (1952) reformulated the classical theory, supposing that cost of capital is not fixed with the changing leverage. Both shareholders and creditors expect higher revenues from their investments if a firm is more leveraged, thus riskier. It is assumed that interest rates of new debt rise with the rising leverage, especially when leverage is relatively higher, while zero or only small rise is expected when leverage is low (i.e., there is an exponential or parabolic relationship). Optimal leverage is represented by the equality of marginal interest rate and marginal return before interests if we consider price of an existing debt to be

fixed. Such assumption is unpractical, especially if debt maturity is short, or existing debt is paid out by new debt. If we consider the interest rate of the whole debt changeable, optimal leverage would be lower than the optimum presented above. In practice, other facts can also play a role in creditor – debtor relationship e.g., such covenants that do not allow new debt without the allowance of the original creditors, the covenants which request a certain capital structure (especially certain equity ratio) and so on. With reference to WACC, Durand's (1952) assumptions lead to the so called U-curve, which means that there is a kind of convex relationship between the $WACC$ and leverage. Therefore, the concave one is expected to be between value of a firm and leverage.

Modigliani and Miller (1958), in their well-known irrelevance theory of capital structure, presented that value of a firm (and $WACC$) is independent from leverage. That means that value of leveraged and the identical unleveraged firm is the same. The term 'identical' in this case represents firms with the same $EBIT$ and in the same risk-class (the same $WACC$). In other words, value of a firm depends on these two variables (see Equitation 4, derived from Equitation 3).

$$V = \frac{EBIT}{WACC} \tag{4}$$

From the independency of $WACC$ from leverage together with the fact that r_d is set as a constant (debt is risk-free in this theory), it can be derived that r_e (expected stock yield) is the increasing function of leverage defined, as follows. A hindside on this assumption is that r_e rises at such a rate that $WACC$ is flat.

$$r_e = WACC + (WACC - r_d)\,\frac{D}{E} \tag{5}$$

It should be also said that the MM model is based on several unrealistic conditions: prefect capital markets, nonexistence of taxes, nonexistence of transactional and bankruptcy expenses, firms issue only risky shares and risk-free bonds, firms can borrow with risk-free interest rate, there is no expected growth, investors' expectations are homogenous.

In their subsequent theory, Modigliani and Miller (1958, 1963) allowed for the existence of corporate income taxes. Then, value of a firm is positively related to leverage, due to the interest tax shield (see Equitation 6), $WACC_t$ is lower than $WACC$ (see Equations 1, and 2) and cost of equity rises with the rising leverage, but slope of this function is lower (see Equitation 7). As a result, the optimal capital structure is represented by the leverage maximization similarly to the classical theory, i.e. the corner solution.

$$V_L = V_U + D\,T \tag{6}$$

where V_L is value of a leveraged firm, and

V_U is value of the identical unleveraged firm.

$$r_e = WACC + (WACC - r_d)\,\frac{D}{E}\,(1 - T) \tag{7}$$

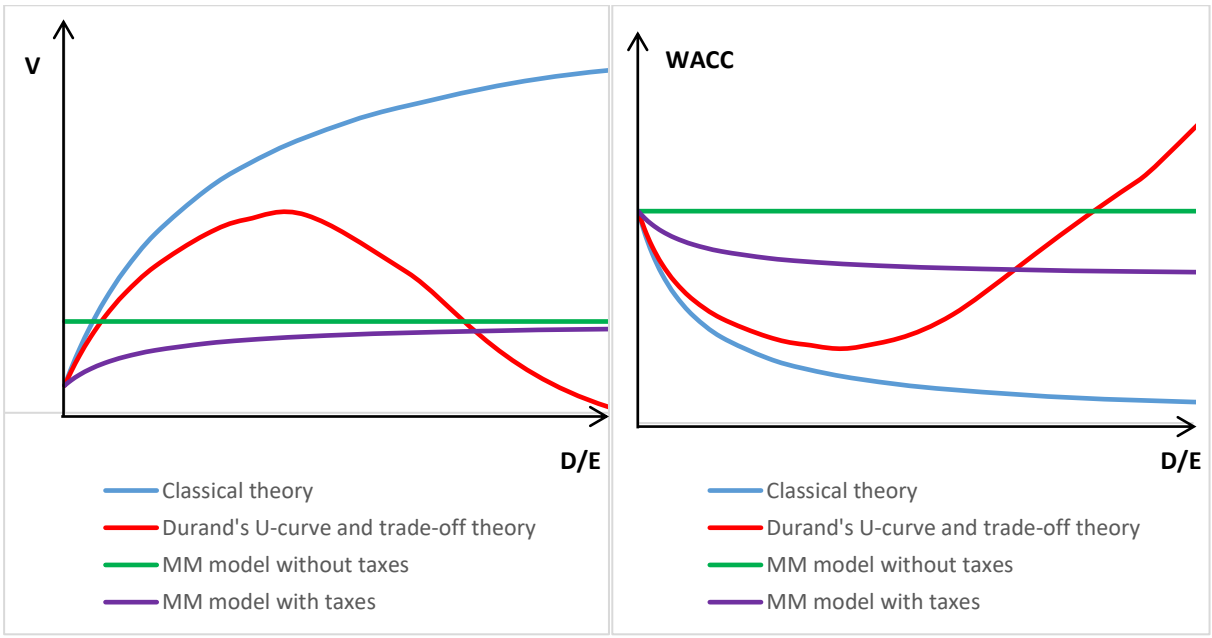
where $WACC$ is original $WACC$ (applied in Equation 1, 3, 4, 5), not $WACC_t$

In fact, firms are motivated to increase interest-bearing debt to profit from the interest tax shield. The higher the corporate income tax rate and EBIT, the higher the motivation. On the other hand, an application of other tax avoidance techniques (such as non-interest tax shield), or minus EBIT (even naturally achieved)

lowers this motivation. Ross (1985), Drobetz and Fix (2003) also discuss "tax exhaustion" (an exhaustion of the tax shields), which means that not all shields and techniques to minimize tax can be or are needed to be used in parallel. While the firms with positive EBITDA but minus EBIT face with the tax exhaustion, thus they consider the non-interest and interest tax shield supplements, the firms with positive EBIT can consider the shields complements.

With reference to some novel views on the MM tax-including model, e.g. Miles and Ezzell's (1980, 1985) model includes the stochasticity of free cash-flows, which are stationary in the MM model (Becker, 2021); Myers (2001) applied the approach of a one-year firm instead of MM's perpetuity; and Filatova et al. (2008) modified the model for any life-time of a firm.

The trade-off theory (Kraus and Litzenberger, 1973; Myers, 1984) links the second MM (tax-including) model (Modigliani and Miller, 1958, 1963) to the bankruptcy theory (Stiglitz, 1969; Scott, 1977; Kim, 1978). It would be risky to a firm and all its creditors, owners, and in some context also for other stakeholders, if a firm maximizes its leverage, because of a bankruptcy risk (which includes both its direct and indirect costs). To eliminate it, a firm should have "some" positive value of equity i.e., the advantages of the interest tax shield must be compared to the disadvantages of a potential bankruptcy. In fact, there is a parallel with Durand's (1952) U-curve. The optimal capital structure is represented by an interior solution of $D/(D+E)$, D/E, respectively, not the corner one i.e., there is a convex function of $WACC \sim D/E$ and a concave function of $V \sim D/E$; $r_e \sim D/E$ is a rising function. One example of all practical implementations of the trade-off theory (especially the bankruptcy theory, but also applicable for Durand's (1952) U-curve) include e.g., possible worsen rating of a firm immediately after a new debt issue.



The classical theory and Durand's (1952) U-curve in the graph include tax effect.

Figure 1. Value of a firm and WACC according to the selected capital structure theories

Source: Authors' compilation based on Durand (1952); Modigliani and Miller (1958, 1963); Kraus and Litzenberger (1973); Myers (1984).

To sum up the selected capital structure theories (see Fig. 1), there are interior, corner, and indifferent solutions of $WACC$ minimization and value of a firm maximization, respectively. V in line with the classical

theory and the MM model with tax effect is a logarithmic function of D/E. It is the reciprocal function of $WACC$, which is limited only by r_d and T in the case of the classical theory, thus

$$\lim_{\frac{D}{E}\to\infty} WACC_{t,classical\ theory} = r_d\ (1-T) \tag{8}$$

In the case of the MM model with taxes, the intersection of the purple line with the axis y represents V_U and increasing V represents the benefit of the interest tax shield. The purple line converges to the line which is equal to value of a firm under the MM model without taxes (green line). This can seem to be against the Equation 6 and against the idea of the tax shield effect, but it is possible, as we apply Equation 4 for computation of V only in the case of the original MM model; as we consider no corporate income tax rate at all, not only no interest tax shield in the original MM model. For other theories, we apply (Farber, 2006)

$$V = \frac{EBIT\ (1-T)}{WACC_t} \tag{9}$$

From that, it can be concluded that the positive effect of the interest tax shield cannot be higher than the overall negative effect of taxes on profits. In other words, if profits were not deducted by taxes ($EBT=EAT$), value of a firm would be higher (at most nearly equal) than its actual value (with a consideration of taxes) even its actual value is increased by the interest tax shield; which can be noted, as follows.

$$\lim_{\frac{D}{E}\to\infty} V_{MM\ model\ with\ taxes} = V_{MM\ model\ without\ taxes} \tag{10}$$

1.2. The changed main aim of a firm and hypotheses development

Ardalan (2017) suggests stock price maximization to be considered the main aim of a firm instead of widely used value of a firm maximization. Actually, the market value of all assets of a firm, which is represented as sum of the market value of equity and the book value of debt can be a kind of "scientific main aim" especially for investors, but also for some managers (similarly it can be with $WACC$ and its minimization). Imagine a firm which issued e.g., new debt, or equity. Its value – measured as $V=E+D$ – is immediately higher according to several theories (especially if a bankruptcy risk is not high). However, is value in widest meaning from the view of investors (both owners and creditors) higher only because of additional money? Can we say that firm increased a wealth of its owners when it e.g., issued new debt, or equity? Has a utility of owners increased? Does rating of a firm often worsen after new debt issues? Equity issue i.e., share dilution is sometimes more criticized than accepted especially by original owners. On the other hand, it can be a positive signal for the market when there is a demand for firm's new shares and bonds. Without answering such questions, we will further deal with stock price maximization as the main aim of a firm especially from equity investors perspective.

Thorough the experiment, Ardalan (2017) – who focused on the validity of the original MM model – showed that capital structure is relevant, unlike the original MM model, when we change the main aim of a firm and consider debt to be risky. In fact, costs of equity and debt in the experiment rise with the rising leverage similarly to Durand (1952)'s theory. Price of stock, as well as ROE are both the concave functions of D/E (see Fig. 2). According to Ardalan's (2017) theory, stock price is maximized (optimal) when the slopes of ROE curve and re curve are the same. The clue fact is the positive leverage effect, which leads to higher ROE, thus also higher earnings-per-share and dividends, but only until leverage reaches its optimum. The price of stock is defined there as dividends in perpetuity (via dividend discount model). Dividends rise

in the model with the rising leverage more than the risk from leverage until leverage reaches its optimum. If a firm increases leverage more than to its optimum, the risk from leverage rises more than earnings-per-share, and dividends (dividend yield can even go down together with a decline of *ROE*), which leads to a decrease of stock price. It is linked to exponential (or parabolic) growth of both cost of equity and cost of debt. Thus, there a paradox occurs that equity investors expect a higher yield from more leveraged firms (rising *re*), but the most leveraged firms offer lower increase of stock price. The highest positive effect of additional leverage is achieved by low-leveraged firms, while this effect continually disappears.

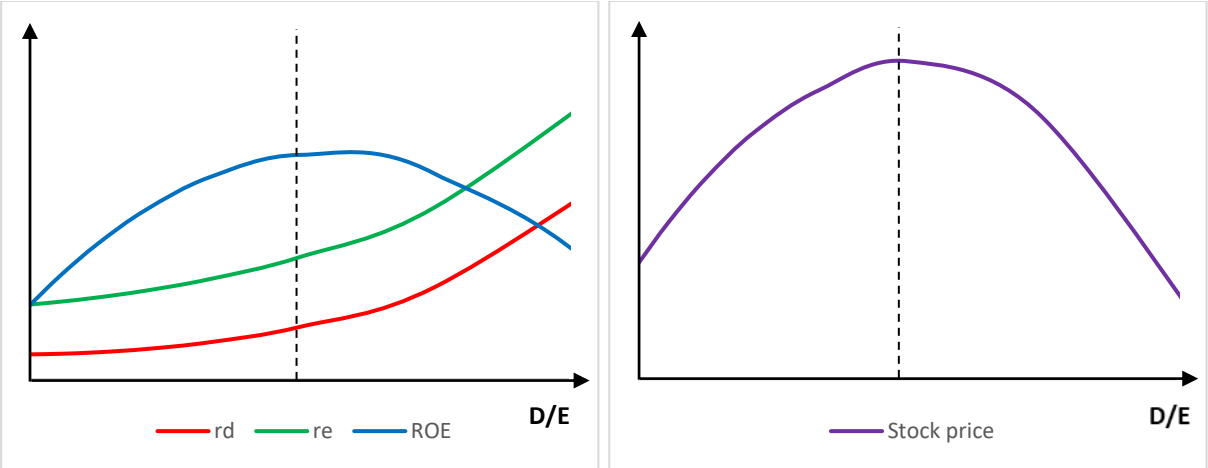


Figure 2. Cost of capital, ROE, and stock price according to Ardalan's theory.

Source: Authors' compilation based on Ardalan (2017).

If the theory focuses on stock price, in reality, it makes a sense to analyse the changes of the price, or more specifically, stock yield as the relative value of the change, not the price (in nominal value) itself. From this adjustment to Ardalan's (2017) theory, there can be derived the stock yield maximization as the main aim of a firm. Following directly the original aim i.e., stock price maximization, capital gain solely should be considered. Dividends determine the stock price in Ardalan's (2017) theory, and thus we can say that their effect is included in stock price. However, both capital and overall (capital plus dividend) yield makes a sense to be analysed, especially from equity investors' view, and in the case of high-dividend yields (moreover, it can serve as a robustness check for an analysis of capital gains).

If we focus on stock price maximization (stock yield maximization, respectively), instead of value of a firm maximization, i.e. we focus rather on equity investors instead of all investors, it seems to be a clue to summarize re and its relation to *D/E* according to the above mentioned theories (in Section 1.1.); in addition re can be identified with an expected stock return (r_e = cost of equity = expected stock return/yield). In such case, the classical theory becomes a bearer of the irrelevancy paradigm, as it assumes r_e to be flat, while both MM models suppose a linear growth. Durand's (1952) theory together with the trade-off theory suppose a non-linear growth (see. Fig. 3).

To sum up all approaches to a firm's main aim (value maximization, *WACC* minimization, stock price maximization, and its adjustment - stock yield maximization) and its relationship to capital structure, this relationship can be linear, non-linear, or even none/irrelevant (see Fig. 1, 2, 3).

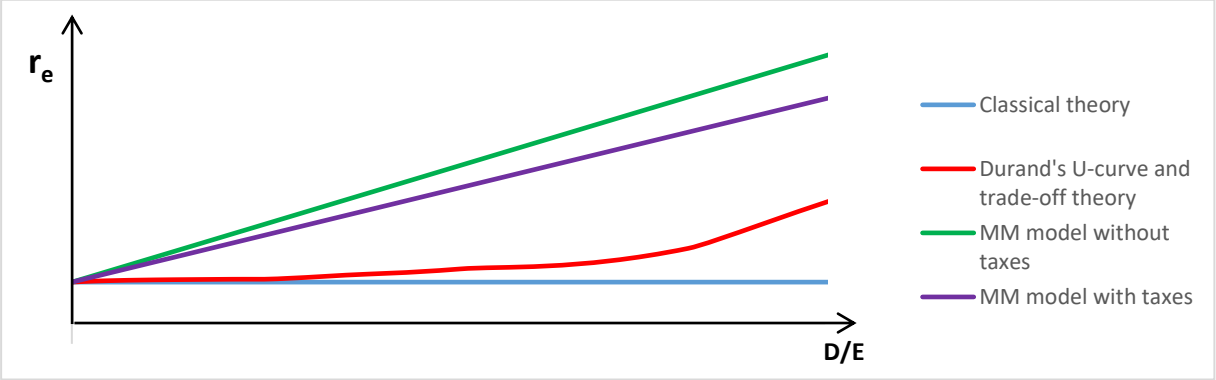


Figure 3. Cost of equity according to the selected capital structure theories

Source: Authors' compilation based on Durand (1952); Modigliani and Miller (1958, 1963); Kraus and Litzenberger (1973); Myers (1984).

From the derivation of Ardalan's (2017) theory, we have set the stock yield maximization as the main aim of a firm. In line with that, the aim of the paper and the hypotheses are as follows.

The aim of the paper is to verify the validity of capital structure theories under the changed main aim of a firm, through the analysis of the relationship between the stock yield (solely capital yield, capital plus dividend yield, respectively) and leverage.

H1. Stock yield and leverage are positively correlated.

H2. Stock yield is a concave function of leverage.

H3. There is no correlation between stock yield and leverage.

H4. The correlation between stock yield and leverage depends on the fact whether dividend yield is included or not.

H5. The correlation between stock yield and leverage differs according to the applied leverage measure, with a focus on the comparison between the standard and adjusted leverage measures.

While the hypothesis H1 is in favour of equity investors' expectations according to Durand's (1952) U-curve, and both MM models (see Fig. 3), the hypothesis H2 supports Ardalan' s (2017) theory (see Fig. 2). Although, it should be stressed that r_e rises (exponentially) also in Ardalan's (2017) theory. Thus, the hypothesis H1 would be in line with equity investors' expectations also according to this theory, but definitely not with the theory's final conclusions. It can be said that the hypothesis H1 represents a requirement or an expectation of equity investors to stock yield, while the hypothesis H2 can represent its real or attainable value. In this light, we can say that H2 is also in line with Durand's (1952) U-curve and the trade-off theory in wider context of their conclusions (not directly r_e relations). The hypothesis H3 confirms the classical theory (or at least expected re according to this theory), even though it is in line with the main idea of the original MM model (not the model itself) i.e., the irrelevance of capital structure regarding the main aim of a firm (however the changed one). The hypothesis H4 theoretically serves as a robustness check for the other hypotheses testing, but in reality, its result can be useful for equity investors. The hypothesis H5 comes especially from the relationship of profitability and stock yield together with Frank and Goyal's (2015) statement (detailly explained in Section 2) that the relationship between leverage and profitability is affected by a calculation of leverage (as profits/retained earnings are part of equity). In fact, this issue depends strongly on dividend policy (which effects whether there are relatively high retained earnings or not), thus, this makes a possible linkage between the hypotheses H4 and H5.

The methodology for the hypotheses testing is described in Section 2.

2. METHODOLOGY

The hypotheses are tested through regression analysis, as is noted in Equation 10-11 (their confirmation is based on p-values of the regression coefficients).

$$Y = \beta_0 + \beta_1 \frac{D}{E} + \varepsilon \quad (10)$$

where Y is stock yield,
D/E is debt-to-equity ratio,
$\beta 0$ is intercept,
$\beta n \neq 0$ is regression coefficient,
ε is error term.

As a robustness check (and for the hypothesis H2 testing), non-linear correlation is also considered.

$$Y = \beta_0 + \beta_1 \left(\frac{D}{E}\right)^2 + \beta_2 \frac{D}{E} + \varepsilon \quad (11)$$

The yield is defined as capital yield, capital plus dividend one, respectively.

$$Y = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (12),$$

where Pt is average stock price in the selected period (i.e., year 2020, 2022, respectively),
$Pt\text{-}1$ is average stock price in the previous/historical period (i.e., year 2017)

$$Y = \frac{P_t - P_{t-1}}{P_{t-1}} + \frac{\sum D}{P_{t-1}} \quad (13),$$

where $\sum D$ is sum of dividends paid between the periods,
$\frac{\sum D}{P_{t-1}}$ is dividend yield.

The Equation 12 solely study the capital gain which is in accordance with Ardalan's (2017) assumptions focusing on stock price, while the Equation 13 widely covers any profit for equity holders. An averaging of (daily) stock prices is applied there to disregard a short-term volatility, but can also be linked to the real approach used by investors - dollar-cost-averaging (DCA). Actually, DCA applies especially for purchases, usually not for sales. Moreover, it is not usually applied daily. Therefore, practical implementation of our computation is limited.

Leverage is defined variously, as well. Firstly, two standard measures are applied:

$$\frac{D}{E} = \frac{LTD}{E} \quad (14)$$

where LTD is long-term debt,

$$\frac{D}{E} = \frac{LIAB}{E} \quad (15)$$

where $LIAB$ is total liabilities.

Long-term debt (including its short-term part) consists of issued bonds, long-term loans, and financial leases i.e., long-term interest-bearing debt; while e.g., provisions, pension benefits liabilities, deferred tax liabilities, and all short-term liabilities (such as trade payables) are disregarded, as there are different determinants of their creation and value. On the other hand, for an overall view, we apply total liabilities i.e., all non-equity items. This approach follows many studies e.g., Rajan, Zingaless (1995), Drobetz and Fix (2003) applied both interest-bearing debt and total debt, Bevan and Danbolt (2002, 2004) pointed to the impact of leverage definitions and applied methods to the results of capital structure studies, Akdal (2010) applied both long-term and short-term leverage, as well as, both book and market price of equity.

Secondly, we apply adjusted versions of the mentioned variables to address a critical issue identified by Frank and Goyal (2015): the relationship between leverage and profitability is significantly influenced by the method of leverage calculation. Specifically, profits (retained earnings) are included in equity, which causes leverage to decrease as profitability increases, purely due to the accounting treatment of retained earnings. Recognizing the long-term relationship between profitability and stock yield, we hypothesize that a similar issue arises when analysing the relationship between stock yield and leverage. This potential negative correlation is a result of the conventional leverage calculation. Our motivation is to refine this understanding by employing adjusted leverage measures, ensuring a more accurate assessment of the impact of leverage on stock yield. This adjustment is crucial for verifying capital structure theories under the revised primary aim of stock yield maximization. Medzihorský et al. (2022) presented the adjusted leverage measures, where retained earnings are deducted, and confirmed their suitability for validation of capital structure theories in the case of European listed firms; although studying the different issue. Based on that, we apply debt-to-adjusted-equity ratios, as follows.

$$\frac{D}{E_{adjusted}} = \frac{LTD}{E-RE} \tag{16}$$

where RE are retained earnings

$$\frac{D}{E_{adjusted}} = \frac{LIAB}{E-RE} \tag{15}$$

Although it seems that the ratios serve only as a mathematical adjustment to solve the issues with RE, their practical interpretation is represented by the consideration of an identical company which, however, have fully used its retained earnings to pay dividends; fully compensated losses from previous years from deposits in equity (in the case of minus RE), respectively. As a result, we apply four different leverage measures alongside two different yield measures. The important limitation of the adjusted leverage measures is their very high values in the case of very small denominator. This situation occurs when the values of E and RE are similar. The most important limitation of the analysis is also linked to the adjusted leverage measures. It lies in the absence of control variables, which should – in the case of stock yield – include the same control variables as are usually used for profitability, or even profitability itself. That can affect the issue regarding profitability/retained earnings and leverage computation which we, however, would like to fix different way – with the adjustment to the standard ratios.

Data are collected from Investing (2023) and cover 346 non-financial firms from STOXX Europe 600 index – representing the market of European listed firms (financial firms, firms with minus equity, firms

with the significant changes in number of shares outstanding1, and with not available data have been disregarded). This study examines the midterm period of 2017-2020 and extends to 2017-2022 for robustness checks. By analyzing both midterm and longer-term periods, alongside averaging stock prices annually, we aim to mitigate the effects of short-term volatility. This approach encompasses both crisis and non-crisis periods, thereby enhancing the robustness and significance of our findings. However, an important limitation of this method is the potential loss of information due to averaging daily stock prices and annual leverage ratios, which might obscure finer details. Additionally, the chosen period lengths are constrained by the availability of data in the selected database. Despite these limitations, the inclusion of a varied economic landscape within the selected timeframe strengthens the relevance and applicability of the results to real-world scenarios.

3. EMPIRICAL RESULTS AND DISCUSSION

3.1. Capital stock yield and standard leverage measures

Firstly, we have focused on the capital yield (see Equation 12), and its relationship with leverage defined as LTD/E and $LIAB/E$ in the midterm period of 2017-2020.

There is the negative relationship between the capital yield and leverage in both cases that does not support any hypotheses and do not meet with the theories (compare Fig. 2, and 3 with Fig. 4, and see Table 1). The higher the leverage, the lower the stock yield. Moreover, the most profitable stocks are all linked to low-leveraged firms, while the most leveraged firms usually achieve low or minus stock yield. If equity investors would expect higher stock yield from more leveraged (thus riskier) firms – which is in line especially with Durand's (1952) U-curve, trade-off theory and both MM models – such expectation is not fulfilled in the selected sample. The optimal leverage is represented by zero debt (equity financing solely) which is not supported by any theory even regardless of whether we consider the changed or original main aim of a firm (maximization of V). It is the perfect opposite of the MM model with taxes and classical theory if the original main aim is considered (see Fig. 1). In comparison to some more recent empirical studies, it is not line e.g., with Choi and Park (2022) who found that firms with zero leverage have higher probability of stock price crash. These results support the need of some additional calculations based on the adjusted leverage measures, which will be presented in Section 3.3.

Such an issue, when capital structure theories are rejected occurs also in the case of leverage and profitability. The negative relationship was confirmed by plethora studies e.g., by Drobetz and Fix (2003), Chen and Zhao (2006), Viviani (2008), Akdal (2010), Mateev et al. (2013), Islam and Khandaker (2014), Faccio and Xu (2015), M'ng et al. (2017), Jermias and Yigit (2019), Mangesti Rahayu et al. (2019), Jaworski and Czerwonka (2021), Krištofík and Medzihorský (2022), while there is a little evidence for the opposite relationship (e.g., Režňáková et al., 2010; Bandyopadhyay and Barua, 2016; Rahimian, 2016). That leads to the preference of the pecking-order and life-cycle theory, over the MM model with taxes and the trade-off theory (which are then usually not confirmed). It seems that the calculation issue regarding leverage and retained earnings which causes the rejection of some capital structure theories in the case of studying profitability and leverage can lead to the result which is not in line with any theory when focusing on stock yield and leverage. This will be further studied in Section 3.3.

[1] Defined as more than 20% year-to-year change in any year during the studied period (2017-2020, 2017-2022, respectively).

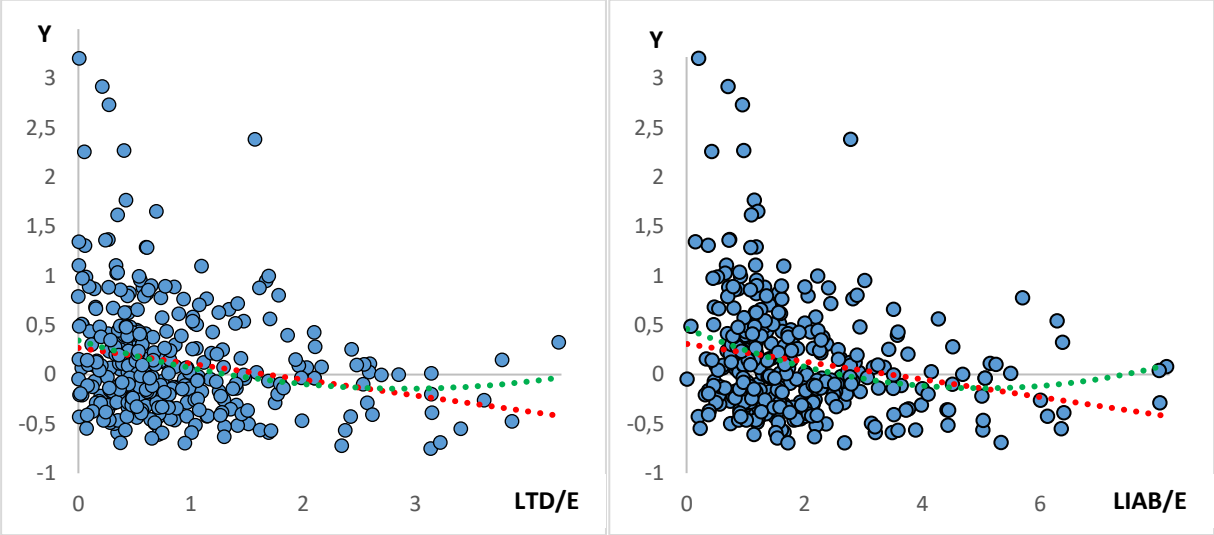


Figure 4. The correlation between the capital stock yield and leverage (standard measures)
Source: Authors' results; Investing (2023).

Table 1

The regression models of the capital stock yield

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.2701	<0.001***	0.3453	<0.001***	0.3099	<0.001***	0.4634	<0.001***
LTD/E	-0.1607	<0.001***	-0.3361	0.0037**				
(LTD/E) ^{2}			0.0579	0.1042				
LIAB/E					-0.0898	<0.001***	-0.2403	<0.001***
(LIAB/E) ^{2}							0.0239	0.0147*

Source: Authors' results; Investing (2023)

Focusing on a non-linear relationship, the quadratic function for ***LTD/E*** is not more suitable than the linear function, as the regression coefficient for the quadratic term is insignificant. This is not case for ***LIAB/E***, but the quadratic functions mostly merge with the linear functions, except for some high-leveraged firms. They also are uninterpretable, as these functions are convex. Optimal leverage would be represented by both low-leveraged and high-leveraged firms, while the lowest stock yield (the worst leverage level) would be represented by middle-leveraged firms, which does not make a sense, and cannot be theoretically accepted. It represents the perfect opposite of Ardalan's (2017) theory. The only possible interpretation of a convex function would be if it matches r_e according to Durand's (1952) U-Curve (see Fig. 3) that, however, is not this case (see Fig. 4).

3.2. Overall stock yield and standard leverage measures

For many equity investors, dividend yield plays an important role in their portfolios. Therefore, we can consider the main aim of a firm is not only the capital yield (stock price) maximization, but the overall yield maximization. Such aim can also be reformulated, as follows. The main aim of a firm is to maximize any

financial profits for its owners. This means that owner's wealth (utility[2], respectively) from their investment should be maximized.

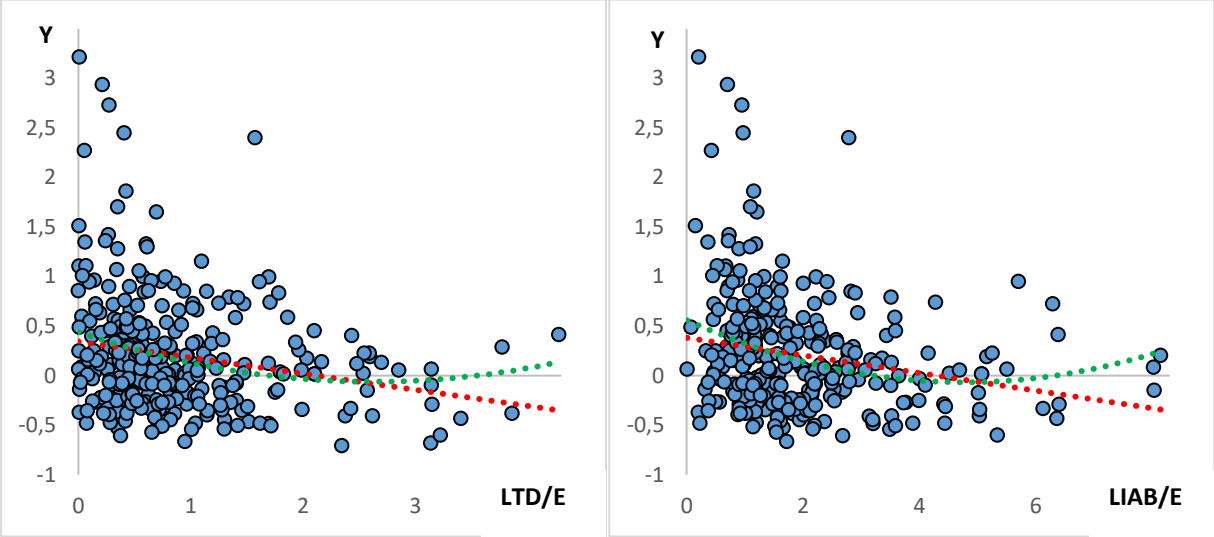


Figure 5. The correlation between the overall stock yield and leverage (standard measures applied).

Source: Authors' results; Investing (2023)

We can expect a different result than in the case of capital yield; in line with the hypothesis H4. While capital yield is related to demand and supply in a market, dividend policy is related to a firm's decision. Thus, the dividend yield and partially also overall yield should better fit to the expectations of equity investors, including e.g., the rising cost of equity with the rising leverage (in line with several theories). As we have measured the negative correlation in the case of capital yield and leverage, we can expect at least less significant negative correlation in the case of the overall yield and leverage.

Table 2

The regression models of the overall stock yield.

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.3444	<0.001***	0.4378	<0.001***	0.3820	<0.001***	0.5604	<0.001***
LTD/E	-0.1627	<0.001***	-0.3811	0.0015**				
(LTD/E) [2]			0.0726	0.0503				
LIAB/E					-0.0890	<0.001***	-0.2630	<0.001***
(LIAB/E) [2]							0.0276	0.0058**

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively.

However, the hypothesis H4 must be rejected, as the results for capital and overall yield are very similar (see Table 1, and 2), especially according to p-values of the particular variables; and according to the values

[2] $u = \sqrt{w}$, where u is utility and w is wealth

of some beta coefficients as well. Only the quadratic term in the case of total leverage is more significant (at 1% level, not only at 5% one). This means that both investors focusing on capital yield, and investors focusing on the combination of capital and dividend yield, can consider debt-to-equity ratio of the firms, they invest in, in a similar way. The analysis of dividend yield solely is needed to answer the question whether it is caused by the limited impact of the dividend yield on overall yield or by the dividend policy which does not reflect the theoretical relationship between r_e and leverage (such as a stable dividend yield, stable dividend (in nominal value), stably growing dividend, stable dividend payout ratio, a comparison of possible investment opportunities with retained earnings, the zero dividend policy etc.).

The separate analysis of dividend yield is presented in Fig. 6 and Table A.1. There is the positive correlation between the dividend yield and leverage when the standard leverage measures are applied (although only at 5% level of significance). Higher expectations of equity investors to r_e with the rising leverage are fulfilled when the dividend yield is considered. This is in line with several theories – the classical theory, and both MM models. As quadratic terms are insignificant, we are unable to confirm Durand's (1952) U-Curve, the trade-off theory, and Ardalan's (2017) model, although we observe concavity. We can conclude that the yield for equity investors respects the theoretical expectations only if firms can influence it directly, which is the case of the dividend yield.

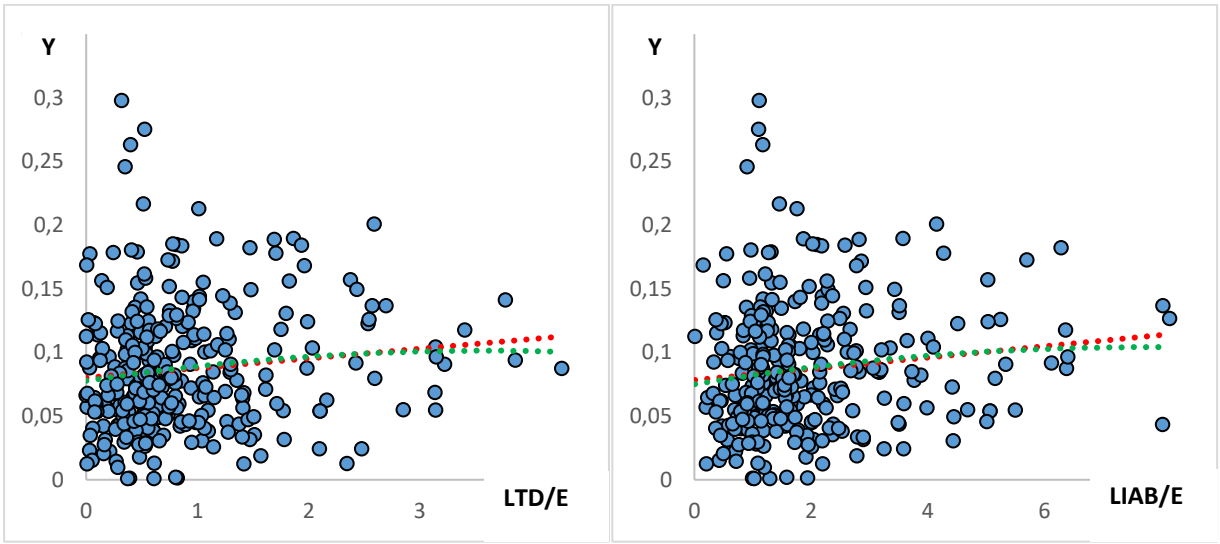
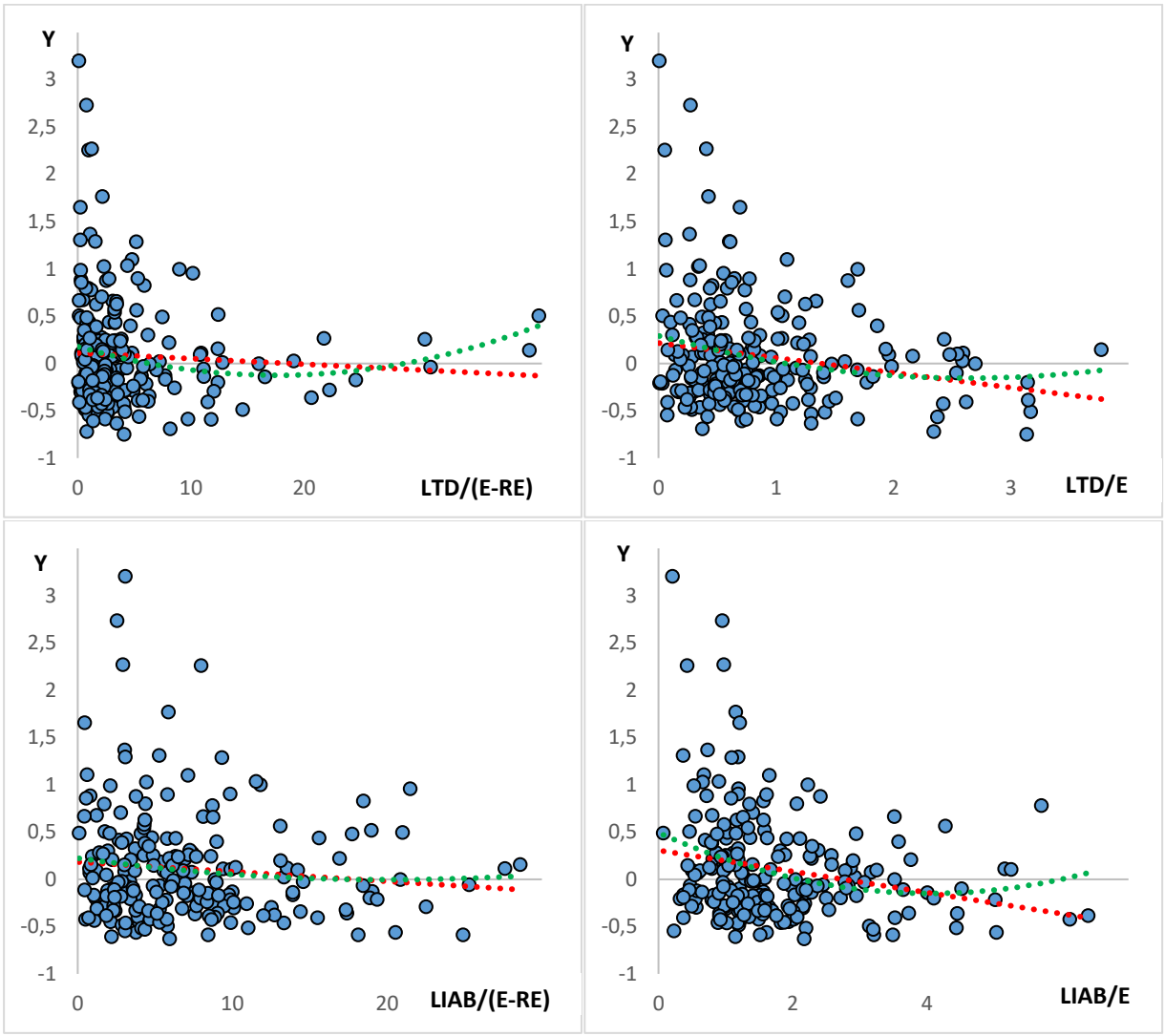


Figure 6. The relationship between the dividend yield and leverage (standard measures applied).
Source: Authors' results; Investing (2023)

The important limitation of the analysis is non-inclusion of the income taxes, which can be different for capital and dividend yields; depending on a tax legislature in a particular country.

3.3. Adjusted leverage measures and stock yield

Based on Frank and Goyal (2015), who pointed to the calculation problem of leverage, which leads to the negative relationship between profitability and leverage (in our case can analogically lead to similar relationship between stock yield and leverage), we have applied the adjusted leverage measures (described in Section 2). As they exclude retained earnings, which cause the calculation problem, we can expect 'clearer' results; which can be different than the previous ones, in line with the hypothesis H5. Firstly, we will look at the results regarding the capital yield.



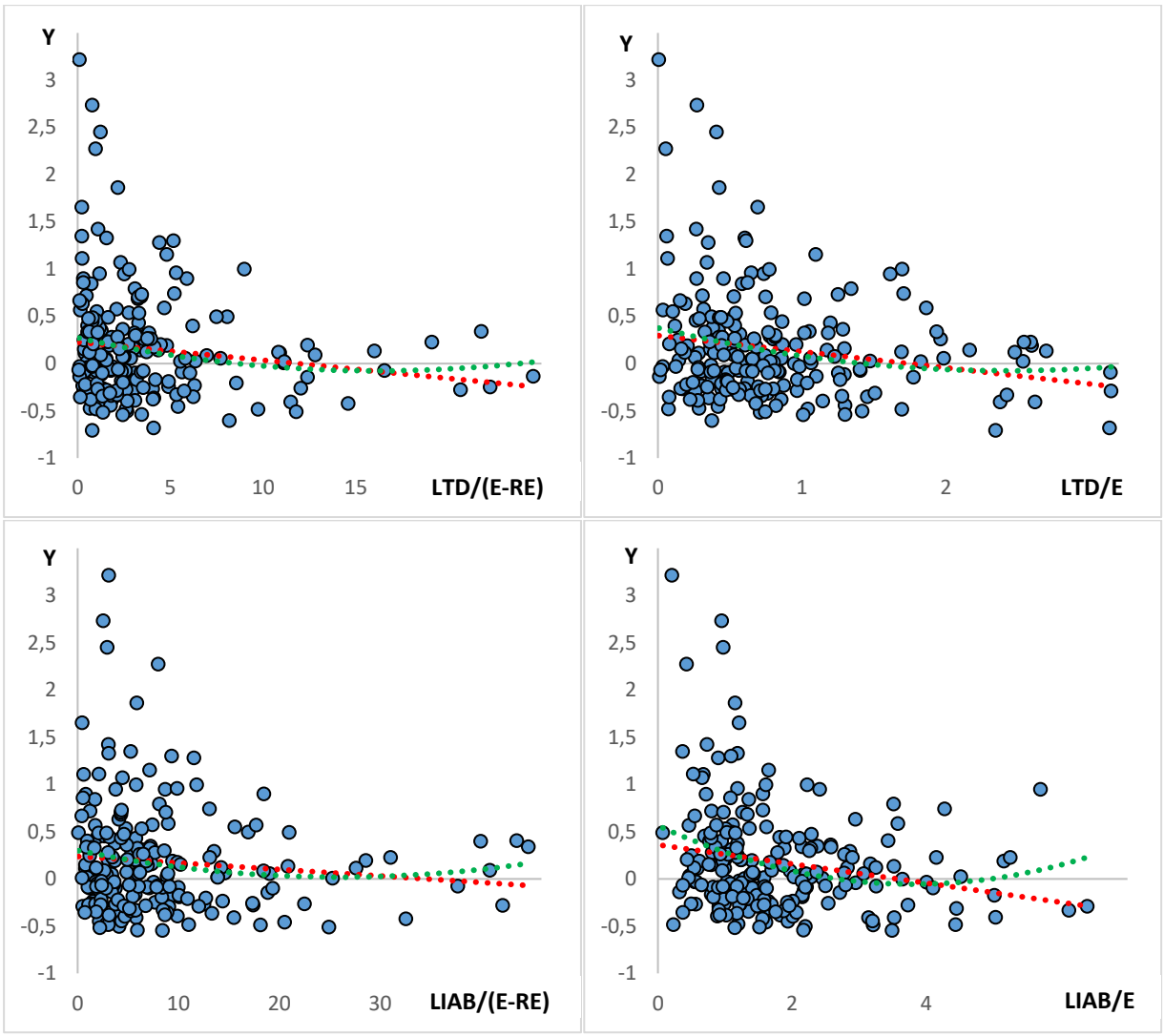
*The same data sample (firms with positive **E-RE**) is applied both for the standard and adjusted leverage measures in this graph.*

Figure 7. Comparison of the results for the adjusted and standard leverage measures (capital yield applied).

Source: Authors' results; Investing (2023)

As we can see in Fig. 7, and Table 3, there is no significant correlation between the capital yield and leverage, when the adjusted measures are applied. This is in line with the classical theory, where the cost of equity is flat, as well as with the main idea of the original MM model i.e., the capital structure irrelevancy (note: not the MM model itself). From the comparison of this and our previous results, we can conclude that the measurement of leverage which leads to the negative correlation between profitability and leverage is also connected to the negative correlation between stock yield and leverage; while the adjusted measures for leverage can fix this issue. The similar results were presented by Medzihorský et al. (2023) for the same sample of European listed firms, but in the case of the relationship between profitability and leverage. The questionable role of standard leverage measures regarding predictability power to stock yield is also discussed by Akron and Taussig (2022) who created the new measure – income statement leverage (measured as interest expenses to revenues, representing an adjustment to interest coverage ratio), and

confirmed concave relationship between stock yield and this leverage measure. Their results are in line especially with Ardalan' (2017) theory; in wider context with the trade-off theory, and Durand's (1952) U-curve.



*The same data sample (firms with positive **E-RE**) is applied both for the standard and adjusted leverage measures in this graph.*

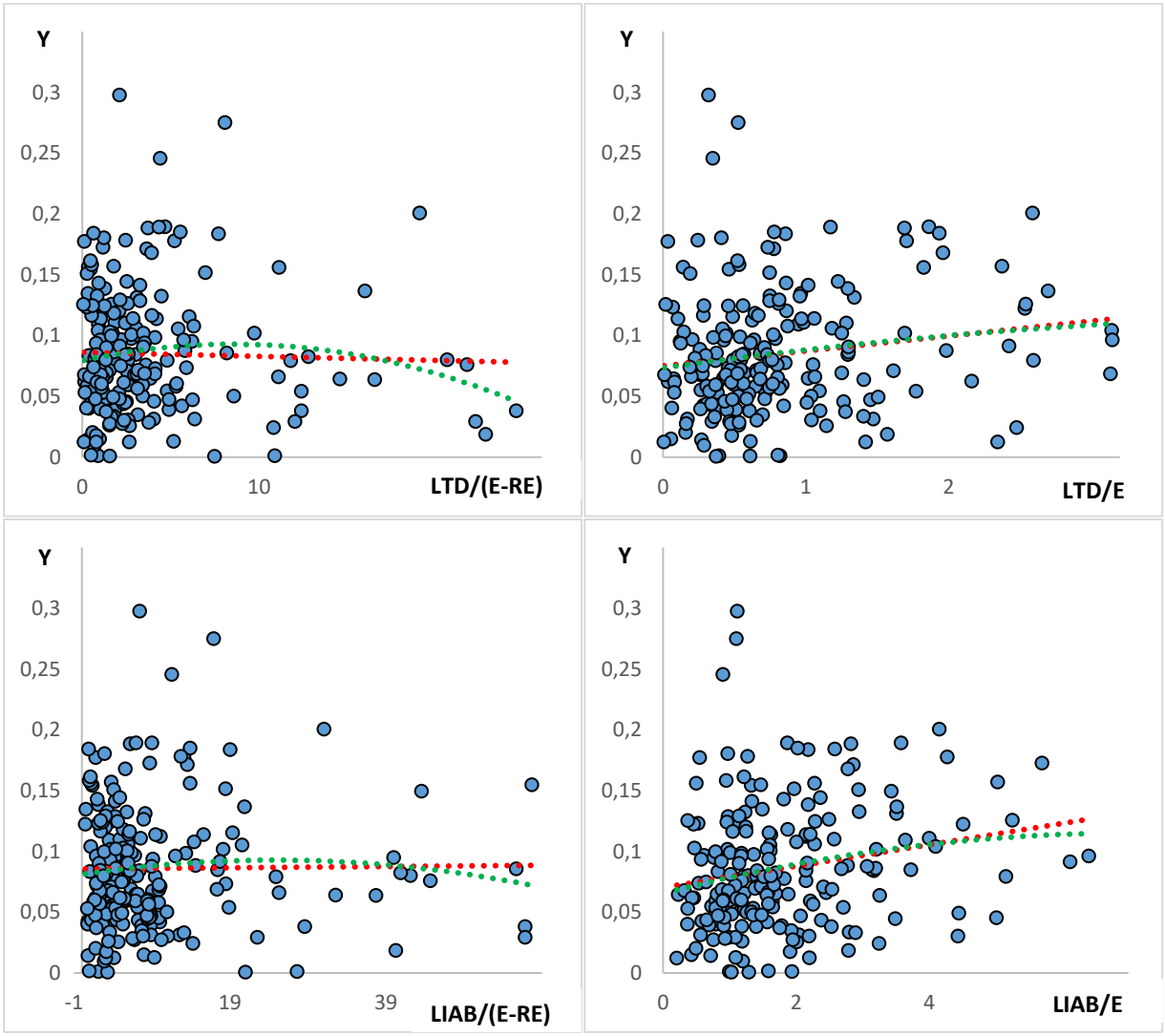
Figure 8. Comparison of the results for the adjusted and standard leverage measures (overall yield applied).

Source: Authors' results, Investing (2023)

The comparison between the results for *LTD/(E-RE), LIAB/(E-RE),* respectively with the results for *LTD/E, LIAB/E*, which were presented in the previous subchapters, is limited by the partially different data samples. In fact, only the firms with nonnegative *E-RE* have been studied in this part of the analysis i.e., subchapter 3.3. (241 firms, not full sample of 346 firms with nonnegative *E*). Therefore, we have applied the analysis of the correlation between stock yield and the standard measures *LTD/E, LIAB/E*, respectively for this changed data sample. Such a comparison is presented in Fig. 7, Table 3, and Table A.2, which supports our conclusions.

The regression coefficients before the quadratic terms are insignificant in all situations except for the *(LIAB/E)²*, which means that the linear functions are more suitable. The exception (the significant *(LIAB/E)²*) supports the previous conclusions, as *[LIAB/(E-RE)]²* is strongly insignificant. Moreover, all quadratic functions are convex, thus they do not meet the theoretical expectations.

Secondly, we have analysed the relationship between the overall yield and the adjusted leverage the same way. When dividends are included into the calculation, we can expect less significant differences between the results for the standard and adjusted measures, as the adjusted measures precisely represent the distribution of all retained earnings. The limitation of this expectation lies in a negative *RE*. In this case, the adjusted leverage measures represent an increase of equity e.g., by capital deposits, or capitalisation of debt to related parties, not the distribution of equity.



The same data sample (firms with positive E-RE) is applied both for the standard and adjusted leverage measures in this graph.

Figure 9. Comparison of the results for the adjusted and standard leverage measures (dividend yield applied).

Source: Authors' results, Investing (2023)

However, the results for the overall yield support the conclusions for the capital yield (see Table 4, Table A.3, and Fig. 8). This is against the hypothesis H4, but in line with the hypothesis H5. While the application of the adjusted leverage measures significantly changes the results, this is not the case for the non-inclusion / inclusion of the dividend yields. The exception for these conclusions is represented by ***LTD/(E-RE),*** which is significant at 5% level, and supports H4. On the other hand, ***LTD/E*** is significant at 1%. Thus, its stronger significance is in line with the hypothesis H5.

Table 3

The linear regression results for the capital yield, while both standard and adjusted leverage measures are applied

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.1108	0.0171*	0.1834	0.0032**	0.2168	<0.001***	0.3066	<0.001***
LTD/(E-RE)	-0.0059	0.3543						
LIAB/(E-RE)			-0.0102	0.1386				
LTD/E					-0.1571	0.0039**		
LIAB/E							-0.1116	<0.001***

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively. The same data sample (firms with positive ***E-RE***) is applied both for standard and adjusted leverage measures in this table.

Table 4

The linear regression results for the overall yield, while both standard and adjusted leverage measures are applied

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.2274	<0.001***	0.2379	<0.001***	0.2963	<0.001***	0.3611	<0.001***
LTD/(E-RE)	-0.0192	0.0428*						
LIAB/(E-RE)			-0.0069	0.1465				
LTD/E					-0.1707	0.0051**		
LIAB/E							-0.1013	0.0025**

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively. The same data sample (firms with positive ***E-RE***) is applied both for standard and adjusted leverage measures in this table.

The different results are observed when the dividend yield solely is studied (see Table 5, and Fig. 9). While the results for the standard leverage measures show the positive correlation between the dividend yield and leverage, there is no correlation in the case of the adjusted leverage measures. We can deduce that firms apply the dividend policy which respect rising r_e with the rising leverage, and at the same time they consider standard leverage measures. Actually, there is no reason for a consideration of the adjusted ratios by firms.

Table 5

The linear regression results for the dividend yield, while both standard and adjusted leverage measures are applied

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.0862	<0.001***	0.0856	<0.001***	0.0750	<0.001***	0.0703	<0.001***
LTD/(E-RE)	-0.0003	0.6877						
LIAB/(E-RE)			0.0001	0.8779				
LTD/E					0.0123	0.0277*		
LIAB/E							0.0088	0.004**

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively. The same data sample (firms with positive *E-RE*) is applied both for standard and adjusted leverage measures in this table.

3.4. Robustness check

Alongside to the application of several leverage measures, and both capital and overall yield, the robustness of the results is also tested according to the used period. So far, we have studied the midterm period of 2017-2020. The results for the period of 2017-2022 (the robustness check) are presented in Table A.5 - A.10. All quadratic functions are convex, except for two cases when they are concave, but insignificant at all levels, which means that we will focus on the linear functions. The results presented in previous subchapters are also confirmed in the longer period with some exceptions, which, however, does not change the conclusions form the analysis. E.g., *LTD/E* (see Table A.8) is not significant, as before (see Table 4), but the same results are proved for *LTD/(E-RE)*. Moreover, at 10% level *LTD/E* would be significant, which is not the case for *LTD/(E-RE).* Other exceptions also lie in a level of significance (not 1%, but 5% etc.). According to the 3-year data and 5-year data, there is no support for the hypotheses H1 to H3, when standard leverage measures are applied, but the hypothesis H3 is confirmed when the adjusted leverage measures are applied; that leads to the support of the hypothesis H5. The hypothesis H1 can be unequivocally rejected (except for the dividend yield solely), while the hypothesis H4 is supported only by some of the results.

4. DISCUSSION

Several capital structure theories have been developed including the well-known irrelevance theory (Modigliani and Miller, 1958), which has resulted in different views on the relationship between the main aim of a firm and leverage. Ardalan (2017) suggested stock price maximization to be the main aim of a firm, instead of the commonly used value of a firm maximization, *WACC* minimization, respectively. Nominal stock prices are not as suitable for comparison and analysis as the relative value of their changes i.e., yields on stocks. Therefore, we have suggested the adjusted main aim of a firm in accordance with Ardalan's (2017) theory – the main aim of a firm is stock yield maximization (capital yield, overall yield, respectively), taking the equity investors' view into consideration. Thus, this aim can be reformulated as the maximization of any financial profit for owners (even maximization of their wealth, or utility). We can go as far as claiming that it should be the maximization of any profit for owners – both financial and non-financial, including e.g., socially responsible investments, and sustainable growth (Khan et al., 2023). However, this aspect has not been analysed in this paper.

Thorough the analysis of European listed firms, we have observed the negative correlation between the stock yield and leverage, when standard leverage measures (both long-term and total leverage) are applied. These results would be against both MM models, Durand's (1952) U-curve, and the trade-off theory, which expect the opposite relationship; however, they would not be in line with the classical theory (flat r_e), and Ardalan (2017), as well. Equity investors' expectations that their yield should be higher when a firm is more leveraged and thus riskier were not fulfilled in the studied sample. The results did not significantly change for the overall yield, which means that both the equity investors focusing on the capital yield, as well as the equity investors focusing on the overall yield can similarly consider leverage of the firms they invest in. However, the results changed for the dividend yield, as there is a positive correlation between the dividend yield and leverage, since dividends should meet the investor's expectations rather than the capital yield, which is affected by demand and supply. To sum up these results, leverage would surprisingly not have a positive effect, but it would have a negative effect with regard to a firm and equity investors (except for the dividend yield). This is not in compliance with capital structure theories as a positive effect of leverage is excepted at least until some (optimal) level of leverage, or its effect is neutral.

We have addressed the issue of Frank and Goyal (2015) regarding the (negative) relationship between leverage and profitability, which is affected by a calculation of leverage, as retained earnings are counted in equity. Considering existence between a long-term relationship and the stock yield and profitability, the negative correlation between the stock yield and leverage can be caused by analogical calculation issues. Applying the adjusted leverage measures – which should fix this issue – we have observed no correlation between the stock yield and leverage. This is in line with the classical theory and the main idea of the original MM model (not the model itself) i.e., the irrelevance of capital structure regarding the main aim of a firm.

We can conclude that there is an observable negative relationship between the stock yield and leverage when we apply standard leverage measures. However, they are uncorrelated if we fix the issue regarding the accounting of retained earnings and the calculation of leverage, meaning that higher debt is not itself a reason for a lower stock yield. Obviously, more profitable firms have higher equity (through retained earnings), which however does not mean that debt and leverage really have a negative impact on profitability and stock yield. Therefore, we suggest the following relationships for the changed main aim of a firm and leverage – only as a 'computable correlation' in the case of *D/E* (see Fig. 9 – left side), while the capital structure irrelevancy should be considered as the 'winner' (see Fig. 9 – right side).

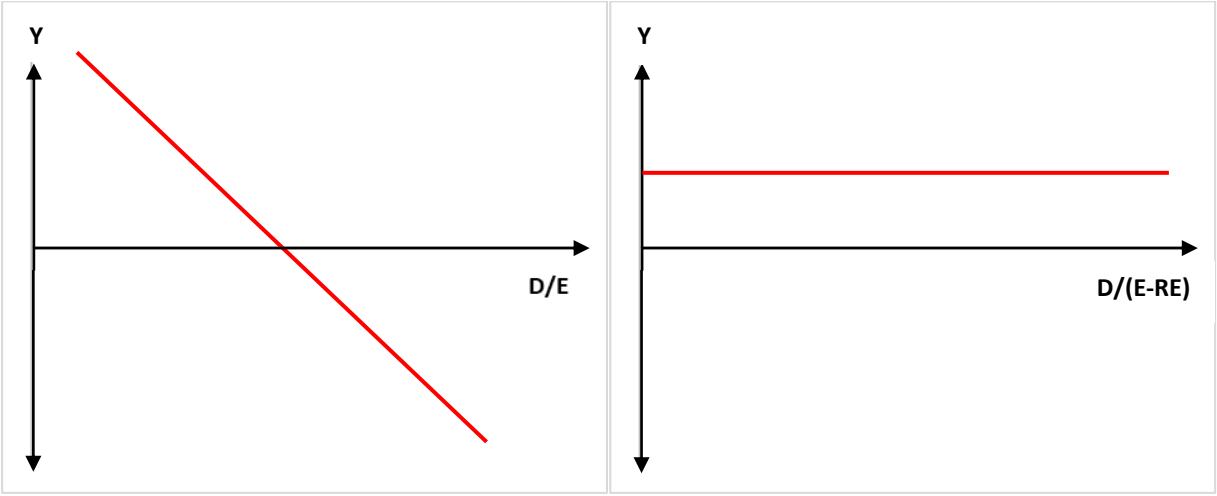


Figure 10. The suggested relationship between the stock yield and leverage (standard, adjusted, respectively)

Source: Authors' results

CONCLUSION

From a theoretic view, this paper has reformulated the main aim of a firm; secondly, we have shown that the leverage calculation issues which leads to the preference of some capital structure theories over others – when the relationship between profitability and leverage is studied – can lead to the results which are not in line with any theory – when the stock yield and leverage are studied; thirdly, the adjusted leverage measures to fix this issue have been presented. From a practical perspective, equity investors can view the capital structure of firms as largely irrelevant to stock yield, with the exception of the inclusion of retained earnings in equity, which underscores profitability as the key factor rather than capital structure. This insight allows investors to focus more on a firm's profitability metrics when making investment decisions. Additionally, investors need not differentiate between capital and overall yield concerning their relationship with capital structure, as our findings indicate no significant connection, especially given the limited impact of dividend yield on this relationship. However, it is crucial to note that the dividend yield positively correlates with leverage when using standard leverage measures. This implies that investors might expect higher returns from dividends in more leveraged firms, aligning their expectations with the firm's capital structure decisions. These insights provide valuable guidance for investors seeking to optimize their portfolios based on a firm's financial strategies and performance metrics.

Key takeaways from this study include the finding that capital structure may be irrelevant to stock yield under the redefined aim of stock yield maximization, with adjusted leverage measures providing a more accurate analysis. This highlights profitability as a crucial factor for equity investors rather than traditional capital structure metrics. Future research should aim to confirm the irrelevance of capital structure with the new primary aim across different datasets, including other time periods, geographical regions, and industry-specific data. Additionally, further exploration of the adjusted leverage measures introduced in this paper is necessary to validate their broader applicability. A continued discussion on the definition of a firm's main aim is also essential, as it could lead to a consensus on an optimal, 'winning' definition that aligns with contemporary financial and investment landscapes.

ACKNOWLEDGEMENT

This research was financially supported by the Slovak Research and Development Agency – Grant Vega No. 1/0382/23 "Dynamic modeling of nonlinear macroeconomic processes" and Vega No. 1/0479/23: Research of circular consumer behavior in the context of STP marketing model.

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APPENDICES

Table A.1

The regression models for the dividend yield in 2017-2020 (standard leverage measures applied)

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable								
Intercept	0.0801	<0.001***	0.0777	<0.001***	0.0783	<0.001***	0.0751	<0.001***
LTD/E	0.0076	0.0442*	0.0131	0.2208				
(LTD/E) ^{2}			-0.0018	0.5829				
LIAB/E					0.0044	0.0281*	0.0075	0.2125
(LIAB/E) ^{2}							-0.0005	0.58526

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively.

Table A.2

The quadratic regression results for the capital yield in 2017-2020, while both standard and adjusted leverage measures are applied.

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.1782	0.0021**	0.2237	0.0132*	0.2936	<0.001***	0.4926	<0.001***
LTD/(E-RE)	-0.0343	0.0310*						
[LTD/(E-RE)] ^{2}	0.001	0.0511						
LIAB/(E-RE)			-0.0226	0.285				
[LIAB/(E-RE)] ^{2}			0.0006	0.5353				
LTD/E					-0.3399	0.0403*		
(LTD/E) ^{2}					0.0645	0.2418		
LIAB/E							-0.3167	0.0034**
(LIAB/E) ^{2}							0.0391	0.045*

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively. The same data sample (firms with positive ***E-RE***) is applied both for standard and adjusted leverage measures in this table.

Table A.3

The quadratic regression results for the overall yield in 2017-2020, while both standard and adjusted leverage measures are applied

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.2725	<0.001***	0.3005	<0.001***	0.3779	<0.001***	0.5643	<0.001***
LTD/(E-RE)	-0.0431	0.0953						
[LTD/(E-RE)] ^{2}	0.0013	0.3187						
LIAB/(E-RE)			-0.0216	0.1055				
[LIAB/(E-RE)] ^{2}			0.0004	0.2374				
LTD/E					-0.3747	0.0493*		
(LTD/E) ^{2}					0.0773	0.2573		
LIAB/E							-0.3245	0.0027**
(LIAB/E) ^{2}							0.0425	0.0291*

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively. The same data sample (firms with positive ***E-RE***) is applied both for standard and adjusted leverage measures in this graph.

Table A.4

The quadratic regression results for the dividend yield in 2017-2020, while both standard and adjusted leverage measures are applied

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.0794	<0.001***	0.0812	<0.001***	0.0735	<0.001***	0.0655	<0.001***
LTD/(E-RE)	0.0031	0.1811						
[LTD/(E-RE)] ^{2}	-0.0002	0.1152						
LIAB/(E-RE)			0.0009	0.3387				
[LIAB/(E-RE)] ^{2}			-0.00002	0.3366				
LTD/E					0.0162	0.3495		
(LTD/E) ^{2}					-0.0015	0.8122		
LIAB/E							0.014	0.1596
(LIAB/E) ^{2}							-0.001	0.5820

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively. The same data sample (firms with positive ***E-RE***) is applied both for standard and adjusted leverage measures in this graph.

Table A.5

The regression models for the capital yield in 2017-2022 (standard leverage measures applied)

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable								
Intercept	0.3172	<0.001***	0.4269	<0.001***	0.3526	<0.001***	0.5526	<0.001***
LTD/E	-0.1759	<0.001***	-0.4354	0.0034**				
$(LTD/E)^2$			0.0944	0.0642				
LIAB/E					-0.0963	<0.001***	-0.3175	0.0031**
$(LIAB/E)^2$							0.0436	0.0320*

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively.

Table A.6

The regression models of the overall stock yield in 2017-2022 (standard leverage measures applied)

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.4520	<0.001***	0.5587	<0.001***	0.4851	<0.001***	0.6769	<0.001***
LTD/E	-0.1643	0.0011**	-0.4158	0.0073**				
$(LTD/E)^2$			0.0913	0.0852				
LIAB/E					-0.0896	0.0023**	-0.3014	0.0069**
$(LIAB/E)^2$							0.0418	0.0484*

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively.

Table A.7

The linear regression results for the capital yield in 2017-2022, while both standard and adjusted leverage measures are applied

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.097	0.0288*	0.1739	0.0024**	0.2307	<0.001***	0.3249	<0.001***
LTD/(E-RE)	0.0031	0.4944						
LIAB/(E-RE)			-0.0073	0.1446				
LTD/E					-0.1389	0.0110*		
LIAB/E							-0.1229	0.0024**

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively. The same data sample (firms with positive ***E-RE***) is applied both for standard and adjusted leverage measures in this table.

Table A.8

The linear regression results for the overall yield in 2017-2022, while both standard and adjusted leverage measures are applied

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.2248	<0.001***	0.314	<0.001***	0.3498	<0.001***	0.4388	<0.001***
LTD/(E-RE)	0.0067	0.1441						
LIAB/(E-RE)			-0.0072	0.1614				
LTD/E					-0.1055	0.0663		
LIAB/E							-0.107	0.0106*

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively. The same data sample (firms with positive ***E-RE***) is applied both for standard and adjusted leverage measures in this table.

Table A.9

The quadratic regression results for the capital yield in 2017-2022, while both standard and adjusted leverage measures are applied.

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.1081	0.0454*	0.1656	0.0423*	0.3003	0.0010**	0.4821	<0.001***
LTD/(E-RE)	-0.0008	0.9477						
[LTD/(E-RE)] ^{2}	0.0001	0.7155						
LIAB/(E-RE)			-0.0052	0.7316				
[LIAB/(E-RE)] ^{2}			-0.0001	0.8869				
LTD/E					-0.3047	0.0775		
(LTD/E) ^{2}					0.0601	0.3102		
LIAB/E							-0.3158	0.0372*
(LIAB/E) ^{2}							0.0437	0.1851

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively. The same data sample (firms with positive ***E-RE***) is applied both for standard and adjusted leverage measures in this table.

Table A.10

The quadratic regression results for the overall yield in 2017-2022, while both standard and adjusted leverage measures are applied

Model	**(1)**		**(2)**		**(3)**		**(4)**	
Variable	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**	**Coef.**	**P-value**
Intercept	0.2381	<0.001***	0.2976	<0.001***	0.3908	<0.001***	0.5872	<0.001***
LTD/(E-RE)	0.0020	0.8678						
[LTD/(E-RE)] ^{2}	0.0001	0.6804						
LIAB/(E-RE)			-0.0031	0.8418				
[LIAB/(E-RE)] ^{2}			-0.0001	0.7842				
LTD/E					-0.2028	0.2637		
(LTD/E) ^{2}					0.0353	0.5714		
LIAB/E							-0.2891	0.0660
(LIAB/E) ^{2}							0.0412	0.2286

Source: Authors' results; Investing (2023)

* represents p-value <0.05, ** p-value <0.01, *** p-value <0.001, respectively. The same data sample (firms with positive ***E-RE***) is applied both for standard and adjusted leverage measures in this table.