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# Review of Tax Shield Valuation and Its Application to Emerging Markets Finance

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## Abstract

Due to the existence of tax-deductible expenses, a tax advantage, called tax shield, arises. The aim of the chapter is to identify and define the well-known approaches associated with tax shield, mainly interest tax shield and to analyze the approaches to quantify the present value of interest tax shields. Finally, we identify those that can be used in the conditions of emerging markets.

**Keywords:** tax shield, valuation, debt, interest, emerging markets

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## 1. Introduction

The issue of tax shields is an increasingly important object of interest for both business managers and academics. Worldwide in recent years, the volume of leveraged buyouts and management buyouts (MBOs) has increased. In this case, debt is an important component of value [1].

Tax expenses generate tax savings (tax shields), which significantly affect business decision-making, especially investment decision-making and capital structure issues. The most important sources of tax savings are interest and depreciation. Therefore, tax shields are divided into two main categories: interest and non-interest tax shields.

More than 50 years of research on tax shield has brought a number of theories to quantify them. The main area of research is the interest tax shield, which has a direct influence on the company's decision about the capital structure, acceptance or non-acceptance of investment projects.

Chapter focuses on the identification and analysis of selected methods for measuring the value of tax shield with an emphasis on the interest tax shield. In Section 2, we define the tax shield and review the main tax shield valuation models. These models are subdivided in accordance with the chosen corporate debt policy. Section 3 is focused on tax shield models when book

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value of debt is assumed. In Section 4, we summarize the findings from the previous sections and examine which models are applicable in emerging markets. We also analyze which factors affect the value of tax shield and how the identified gaps can be addressed. In Section 5 we sum up the previous information.

## 2. Main tax shield valuation theories

Within this section, we will focus on defining the tax shield and the breakdown of tax shield theories according to debt policy that divides the theory into two categories: if debt is fixed or if leverage is constant. For investment decision-making, the present value of tax shield is an important category. The criterion for choosing an appropriate method of quantification is the nature of the debt policy which is part of corporate financial management. Debt policy is the source of differences between theories as it determines what discount rate is chosen to quantify the present value of tax shield.

Among economists, there is no consensus about which theory is correct, a source of disagreement is the discount rate used in calculating the present value of tax shield. Copeland et al. [2] argue: *The finance literature does not provide a clear answer about which discount rate for tax benefit of interest is theoretically correct.*

### 2.1. Definition of tax shield

The tax shield is the result of tax deductibility of business expenses. This is defined as: *A tax shield is a reduction in taxable income for an individual or corporation achieved through claiming allowable deductions such as mortgage interest, medical expenses, charitable donations, amortization and depreciation. These deductions reduce a tax payer's taxable income for a given year or defer income taxes into future years. Tax shields lower the overall amount of taxes owed by an individual taxpayer or a business [3].*

It follows from the previous definition that the source of the tax shield (also called tax benefit or tax advantage or TS) is the different type of business expenses. The most significant sources of expenses include interest and other deductions; therefore tax shields are divided into interest and non-interest. According to Brealey et al. [4], an interest tax shield is defined as: *tax savings resulting from deductibility of interest payments.* According to Damodaran [5], the interest tax shield is expressed in a similar vein: *Interest is tax-deductible, and the resulting tax savings reduce the cost of borrowing to firms.*

The first impulse for the development of different approaches how to quantify tax shield, was the theory of Modigliani and Miller [6]; the authors created the first widely accepted theory of capital structure. The model assumes perfect capital market, risk-free interest rate and zero taxation of corporate income. Capital structure is given by real assets, for example, irrelevant to the value of the business. Therefore, it is not important whether the company is levered or not. The main flaw of this theory, however, was the absence of taxes.

This unrealistic assumption has been removed in the modified model of Modigliani and Miller [7], abbreviated MM model, resulting in the fact that the value of the company increases with

the growth of company's leverage. The newly created value results from tax deductibility of interest and represents the value of tax shield. The value of the levered company is given by Eq. (1) and shown in **(Figure 1)**.

$$V_L = V_U + PV(TS) \quad (1)$$

The value of tax shield is simply given as corporate tax rate times the cost of debt times the market value of debt.

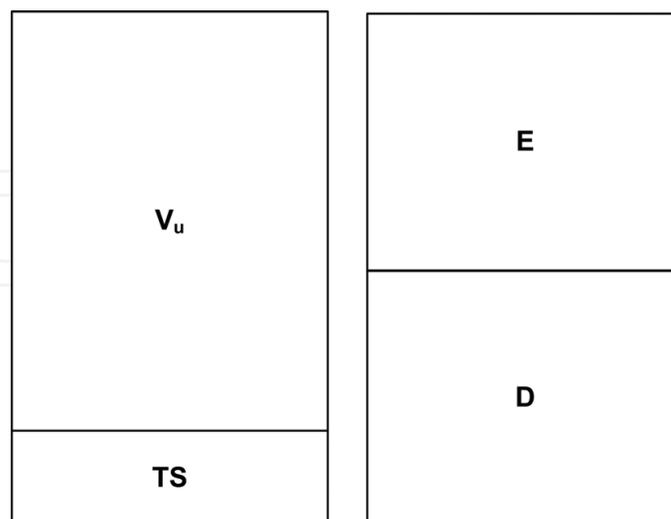
$$TS = Tk_D D \quad (2)$$

If the debt is constant and perpetual, the company's tax shield depends only on the corporate tax rate and the value of debt. Then the present value of tax shield equals the discounted value of Eq. (2).

$$PV(TS) = \frac{Tk_D D}{k_D} = TD \quad (3)$$

Eq. (2) is the formula for calculating the interest tax shield based on the Modigliani and Miller theory [7], Eq. (3) is the formula of its present value.<sup>1</sup> It is based on the assumption that the main source of tax shields (hereinafter *TS*) is the interest accruing from the company's leverage.

It should be noted that the tax shield is influenced by three variables: the tax rate, cost of debt and the value of debt. Liu [8], in contrast to the previous formulae, considers tax shield as a variable influenced by four variables: *Tax shield is a function of four variables "net income, interest rate, debt, and tax rate."* However, the value of the MM tax shields only includes two variables *"debt and tax rate,"* is independent of interest rate, and cannot be true.



**Figure 1.** Value of levered company according to Modigliani and Miller [7].

<sup>1</sup>If it is assumed that debt is risky.

Tham and Velez-Pareja define two different methods of calculating the present value of tax shields: *There are two ways to define the present value of tax shield (PVTS). First, the PVTS is simply the tax shield (TS), discounted by the appropriate discount rate for the tax shield  $\psi$ . Second, the PVTS is the difference in the taxes paid by the unlevered and levered firms [9].*

Fernandez, on the other hand, argues that only one definition is true: *the value of tax shields is the difference between the present values of two different cash flows, each with their own risk: the present value of taxes for the unlevered company and the present value of taxes for the levered company [10].*

These definitions are ambiguous and suggest that the value of tax shield is a function of multiple quantitative and qualitative variables, one of the key variables is debt policy of the company.

## 2.2. Tax shield valuation theories if debt is constant

### 2.2.1. Modigliani-Miller model

The first of the analyzed theories is the model of Modigliani and Miller [7] (hereinafter MM), which is outlined in the previous section. According to the assumptions of the model, the company can borrow and lend money on perfect capital markets at risk-free rate and market value of debt is constant. For this reason, the tax savings (tax shield) are risk-free and the appropriate discount rate is risk-free rate. Eq. (4) is similar to Eq. (3).

$$PV(TS) = \frac{Tr_f D}{r_f} = TD \quad (4)$$

The previous model is based on the conditions of an efficient capital market, so its use is limited. Given that the MM model predicts zero cost of financial stress, the enterprise could be funded theoretically only by debt. If the tax rate would not change, then the marginal benefit resulting from the debt is equal to the tax rate, and the value of company changes in proportion to the value of debt.

This model is being criticized for unrealistic and very restrictive assumptions. Nevertheless, the model is known as the basis for the theory of corporate finance, it clearly defines the upper limit of business value.

### 2.2.2. Other tax shield theories if debt is constant

Similar to the model of Modigliani and Miller, there are other approaches that assume fixed debt. The risk of debt determines the discount rate and its choice varies according to the authors' opinion.

Myers [11] first suggested the adjusted present value (APV) method, which is used for the valuation of investment projects. The model is based on several assumptions: the first one is to determine the value of a company as the sum of the unlevered business value and the value of tax shield. Dividend policy impact is neglected. Company generates perpetual cash flow which is known with certainty at time  $t = 0$ .

The market value of debt is known and debt is perfectly correlated with the value of interest tax savings. Therefore, debt and tax shield are equally risky; both components should be discounted at the same discount factor (cost of debt). The value of tax shield is quantified according to Eq. (5).

$$PV(TS) = \sum_{i=1}^N \frac{Tk_d D_{i-1}}{(1+k_d)^i} \quad (5)$$

The Ruback model [12] is based on the assumption that debt is risky because the debt value changes due to the change in the cost of debt. The default option is disregarded. The debt has a constant value (book value) known at  $i = 0$ . Appropriate discount rate is given by Eq. (6) and cash flow from tax benefits is quantified according to Eq. (7).

$$\rho = r_f + \beta_D r_P \quad (6)$$

$$CF_{TS} = Tk_d B \quad (7)$$

If book value of debt is fixed, the Beta of tax shield is equal to the Beta of debt ( $\beta_D$ ). It implies that both the debt and the tax shield share the same systematic risk and therefore the tax shield is discounted at cost of debt. The value of the levered company is measured by APV method as the sum of the value of unlevered company and the value of tax shield. Each component of the value is discounted at appropriate discount rate, as follows

$$V_L = \sum_{i=1}^N \frac{E(FCF)}{(1+\rho)^i} + \sum_{i=1}^N \frac{k_d D T}{(1+k_d)^i} \quad (8)$$

Kaplan and Ruback [13] have logically pursued the previous model. They compared the market value of MBOs (management buyouts) and leveraged recapitalization to the discounted value of their corresponding cash flow forecasts. To estimate the present value of these cash flows, they used the discount rate based on capital asset pricing model (CAPM). Cost of capital is measured by weighted average cost of capital before tax according to Eq. (9), which is CAPM model for unlevered company.

$$WACC_{BT} = k_u = r_f + \beta_U r_P \quad (9)$$

Business value is measured by discounting capital cash flow using the discount rate for unlevered company. Authors used so-called method "compressed APV" ( $APV_C$ ) which, unlike standard adjusted net present value, assumes that tax shields and cash flow share the same systematic risk. Both are discounted at the same discount rate  $k_e = k_u$ . The tax shield is more risky than previous models, which indicates the discount rate used.

$$PV(TS) = \sum_{i=1}^N \frac{Tk_d D}{(1+k_u)^i} \quad (10)$$

Luehrman [14] focused his work on analyzing the use of APV method for business valuation. He criticized using weighted average cost of capital (WACC) for evaluating the company because the method is inconsistent in use (the cost of each type of capital is calculated on the basis of

the book values instead of the market values and vice versa). Another critical point is leverage, the change of which necessitates a periodic revaluation of WACC.

The author suggested using Myers model, two types of cost of capital are used as a discount rate: cost of equity of a comparable company and cost of debt. The condition for this assumption is the existence of debt with the constant value over the entire estimated period.

### 2.3. Tax shield valuation theories if market leverage ratio is constant

The assumption of fixed debt is simple and unrealistic since the company should know future debt. This financial strategy is relatively binding because it does not reflect sufficiently the economic conditions and the emergence of favorable market conditions (e.g. a fall in interest rates). Therefore, the company should choose a less strict financial strategy.

More realistic debt policy is based on the constant leverage (debt-to-equity and debt-to-value ratio). In the case of constant debt, future interest tax shields have deterministic nature because their future levels are known with certainty at time  $i = 0$ . The present value of these cash flows may change only in accordance with a change in tax rate or discount rate reflecting both microeconomic and macroeconomic indicators. In the case of constant leverage, future interest tax shields are stochastic and their future values should be estimated only with probability. From the point of view of the discount rate used in this approach, there is a split, as individual authors variously estimate the risk of tax shield.

#### 2.3.1. Miles-Ezzell model

Miles and Ezzell [15, 16], assuming perfect capital market, state that the discount rate for unlevered company, the cost of debt, the tax rate and the market leverage are constant during the existence of the investment project (or the company).

The company value, as well as free cash flow, is stochastic and the company rebalances its capital structure regularly (most frequently every year) to maintain the target leverage. Therefore, the value of debt is known only in the first period; this cash flow is deterministic. In other periods, the value of debt is unknown, so the key component (debt) is stochastic. The tax shield also has deterministic nature in the first period, and in other periods it is stochastic.

An appropriate discount rate for interest tax shield is cost of debt in the first year, it is the unlevered cost of capital in the following years.

$$PV(TS) = \frac{1 + k_u}{1 + k_d} \sum_{i=1}^N \frac{Tk_d D_{t-1}}{(1 + k_u)^i} \quad (11)$$

The basic difference among MM approach, the theory of Myers and Miles-Ezzell (hereinafter ME) model is estimated riskiness of tax shield which determines its present value. MM and Myers model are characterized by the discount rate  $k_d$ ,<sup>2</sup> the risk of tax savings are the same as

<sup>2</sup>Originally the model, MM (1963) involves the use of risk-free interest rate, but Myers model extends this theory to risky debt.

the riskiness of debt. The *ME* approach uses the cost of debt in the first year. Tax savings in the first year are deterministic, as in the *MM* approach (Myers model), which corresponds to the discount factor. In the next years, the cash flow resulting from tax benefits is stochastic and the risk of this flow corresponds to the operational risk of the company.

### 2.3.2. Harris-Pringle model

Harris and Pringle [17] model (hereinafter *HP* model) is based on the previous model while the constant leverage is assumed. The company continuously rebalances its capital structure to achieve the fixed debt-to-equity ratio. Therefore, debt has a stochastic character because its value is estimated only with some probability and is unknown in all periods, including the first one.

If the value of debt is unknown, tax shield is stochastic, too. An appropriate discount rate is the unlevered cost of capital that takes into account the risk of tax benefit. The present value of the interest tax shield is therefore equal to the formula in Eq. (12).

$$PV(TS) = \sum_{i=1}^N \frac{Tk_d D}{(1 + k_u)^i} \quad (12)$$

The authors clarify the benefits of the model as follows: “the *MM* position is considered too extreme by some because it implies that interest tax shields are no more risky than the interest payments themselves. The *Miller* position is too extreme for some because it implies that debt cannot benefit the firm at all. Thus, if the truth about the value of tax shields lies somewhere between the *MM* and *Miller* positions, a supporter of either *Harris and Pringle* or *Miles and Ezzell* can take comfort in the fact that both produce a result for unlevered returns between those of *MM* and *Miller*. A virtue of either *Harris and Pringle* compared to *Miles and Ezzell* is its simplicity and straightforward intuitive explanation.” [17].

### 2.3.3. Another models assuming constant leverage

The *Miles and Ezzell* and *Harris and Pringle* models are the most commonly applied approaches while the constant leverage is assumed. In addition to constant debt, *Ruback* [12] also developed another model based on fixed leverage. The formula for calculating the present value of interest tax shields is consistent with the *Harris and Pringle* model.

On the other hand, *Lewellyn and Emery* [18] suggested three different methods for calculating tax shields. In their view, the *Miles and Ezzell* method is the most consistent and correct.

*Myers*, except from model in Section 2.2.2, in Ref. [4], extended its model on the condition of constant leverage (debt to equity ratio): *the risk of interest tax shields is the same as the risk of the project. Therefore, we will discount the tax shields at the opportunity cost of capital (r)*. The appropriate discount rate is unlevered weighted average cost of capital.

Other authors combine both approaches (*Miles and Ezzell*, *Harris and Pringle*) as well as the *Myers* model if the company assumes fixed debt. *Taggart* [19] summarized the valuation models according to impact on personal taxes and suggested using *ME* model if company rebalances debt annually. If the company rebalances debt continuously, then *HP* model is suitable.

Inselbag and Kaufold [20] recommend using the Myers model if the value of debt is constant; in the case of fixed leverage, the Miles and Ezzell model is suitable.

Damodaran [21] did not mention the formula for the value of tax shield, but Fernandez [22] derived, according to the Damodaran equation (30), the present value of tax shield that is equal to Eq. (13).

$$PV(TS) = \sum_{i=1}^N \frac{(k_U DT - (k_D - r_f)D(1 - T))}{(1 + k_U)^i} \quad (13)$$

Fernandez, in relation to the cost of capital, mentioned *Practioner's method*. It is used by consultants and investment banks. He derived the formula for the present value of tax shield based on the formula for leveraged Beta.

$$PV(TS) = \sum_{i=1}^N \frac{(k_U DT - (k_U - r_f)D)}{(1 + k_U)^i} \quad (14)$$

Eq. (14) should be always lower than Eq. (13).

Arzac and Glosten [23], based on the approach of Miles and Ezzell, developed a unique method which eliminates the discount rate. They used "*pricing kernel*", a stochastic discount factor. They derived the formula for the company market value, for the market value of equity and for market value of tax shield using an iterative process.

$$VTS = TD - T \sum_{i=1}^{\infty} E[M_i PP_i] = TD - TL \sum_{i=1}^{\infty} E[M_i (S_i - S_{i-1})] \quad (15)$$

The authors then mentioned: "*The value of tax shield depends upon the nature of the equity stochastic process, which, in turn, depends upon the free cash flow process.*" [23] If the second part of Eq. (15) is equal to zero, the model is identical to the Modigliani and Miller model.

Grinblatt and Liu [24] developed one of the most general approaches to determine the value of tax shield. Their approach is different from all other models, since the Black-Scholes and Merton option models are applied. The model assumes that the information follows Markov diffusion process; the market is dynamically complete. The model also quantifies any cash flow and tax shield. The approach is mathematically correct, but practically difficult to apply due to many abstract assumptions.

Liu [8] developed the model assuming a dependence of the value of tax shield on four variables: net income, interest rate, debt and tax rate. Tax shield is divided into two parts: *earned tax shield* and *unearned tax shield* depending on whether the interest rate is higher or lower than return on investment (ROI). The author himself noted that his theory is inconsistent with other approaches.

#### 2.4. Fernandez model

Fernandez model for calculating the value of tax shield is different than those in previous cases. He argued that his approach is independent of debt policy [10]. The basic idea is that the

value of tax shield is not equal to the present value of tax shields, but the value of tax shields (VTS<sup>3</sup>) is the difference between the present value of two cash flows of each with different risk: the present value of taxes paid by unlevered company and the present value of taxes paid by levered company.

$$VTS = G_U - G_L \tag{16}$$

Figure 2 shows the business value according to Ref. [25].

The tax paid by unlevered company is proportional to the free cash flow; they are equally risky. An appropriate discount rate is the unlevered cost of capital in the case of perpetuity. The tax paid by levered company is proportional to the equity cash flow (ECF). The appropriate discount rate for estimating the present value of taxes paid by levered company is the cost of equity, since the risk of both flows is consistent in the case of perpetuity. The value of tax shield is equal to the difference between the present values of these cash flows, as follows

$$VTS = G_U - G_L = \frac{E(T_U)}{k_u} - \frac{E(T_L)}{k_e} = \frac{TV_U}{(1-T)} - \frac{T(E_L)}{(1-T)} = TD \tag{17}$$

Eq. (17) is identical to the MM model [7] but Fernandez claimed it could be valid irrespective of debt policy. In the case of constant growth, Eq. (17) is derived to the form of Eq. (18).

$$VTS = G_U - G_L = \frac{T_U}{(k_{T_U} - g)} - \frac{T_L}{(k_{T_L} - g)} = \frac{TDk_U}{(k_u - g)} \tag{18}$$

Despite the revolution of this model, it is criticized. It should be noted that, that equity cash flow is not equal to the taxable income, since any new debt makes equity cash flow increasing without tax increasing. The book value of debt is stochastic and positively correlated with the unlevered equity. Taxes paid by unlevered companies have a lower risk than ECF (hence a different discount rate). There is further criticism on the combination of two different approaches (zero growth and non-zero growth) [26].

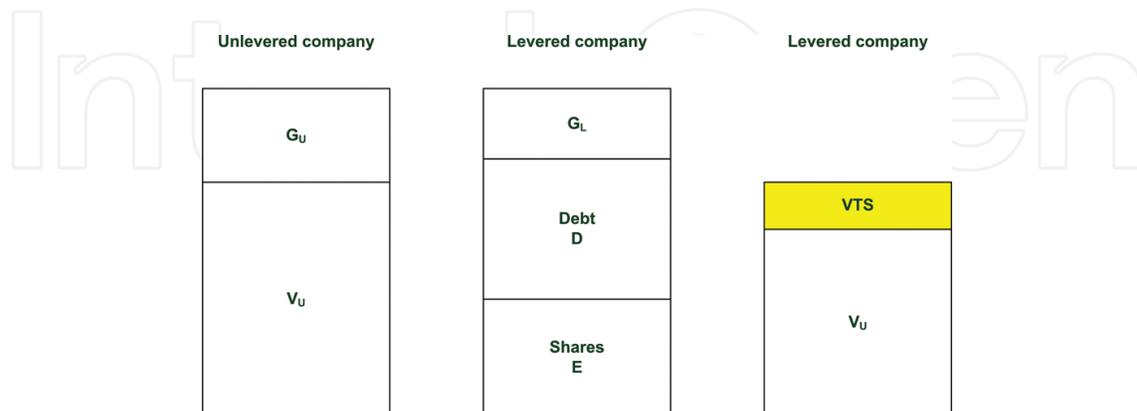


Figure 2. The value of unlevered and levered company according to Fernandez [25].

<sup>3</sup>Fernandez suggested using the term value of tax shield instead of present value of tax shield due to different definitions of the terms.

Cooper and Nyborg argued that Fernandez developed the model based on the combination of two different approaches (*MM* and *ME*) and therefore the value of tax shield is equal to the present value of tax shield. Based on Fernandez approach, the authors found out that the value of tax shield is identical to the Harris and Pringle model in the case of perpetuity [27].

Fernandez [28] subsequently modified the original model. The present value of taxes paid by levered company is, as follows

$$G_L = \frac{T(E_L - PV[\Delta D])}{(1 - T)} \quad (19)$$

Eq. (20) expresses a difference between the present value of taxes paid by unlevered and levered company.

$$VTS = G_U - G_L = TD_0 + TPV[\Delta D] \quad (20)$$

The previous equation indicates that the value of tax shield should depend only on the nature of the stochastic process of the net increase of debt and should not depend on the nature of the stochastic process of the free cash flow. The issue is to estimate the present value of  $\Delta D$  which requires estimating the discount rate. It depends on the nature of stochastic process of the net increase of debt, it may be:

- fixed debt,
- debt is proportional to the equity value,
- debt increases are as risky as the free cash flow,
- debt of one-year maturity but perpetually rolled over [29].

### 3. Tax shield valuation theories with book value of debt

There are alternative models based on the book value. Book values are important when deciding on debt policy. Market values better reflect the current value and stock market volatility, nevertheless unreliability of market values highlighted particularly during the financial crisis of 2009.

Another important fact is the use of book values to measure the creditworthiness of businesses. Credit rating agencies (*CRAs*) take into account financial and non-financial factors. Leverage and interest coverage ratio are considered as key determinants of the credit rating and they are quantified by book values.

The last important factor is the weak development of some capital markets, for example, emerging markets. There are relatively few listed companies in Central and Eastern Europe as well as in other emerging markets. The capital market does not provide enough relevant information needed for application of market-based models. Moreover, in these countries, a

large number of small and medium enterprises, often family owned, meets the conditions for achieving tax savings, but previous models are not relevant to them.

### 3.1. Fernandez model for book leverage ratio

Fernandez, in this model, assumed that the company set its debt policy on the basis of target book leverage [30]. Debt is the product of book leverage ratio and book value of equity. The value of unlevered company is equal to, if perpetuity and non-zero growth are assumed, as follows

$$V_U = \frac{FCF(1 + g)}{k_u - g} = \frac{EAT(1 + g) - gA}{k_u - g} \quad (21)$$

The present value of the debt change  $\Delta D_t$  is important to know for estimating the value of tax shield.

$$\sum_{i=1}^{\infty} PV[\Delta D_i] = \frac{gD}{k_u - g} \quad (22)$$

If the company estimates the present value of the debt change according to Eq. (22), the value of tax shield with a constant book leverage ratio is equal to Eq. (23).

$$VTS^{BV} = \frac{Tk_u D}{k_u - g} \quad (23)$$

Fernandez highlighted several advantages of using constant leverage instead of market leverage:

- CRAs focus on book value leverage ratios,
- the value of debt does not depend on the movements of the stock markets,
- it is easier to follow for non-quoted companies,
- the empirical evidence provides more support to the fixed book leverage ratio hypothesis [30].

### 3.2. Velez-Pareja model

Velez-Pareja defined tax shield similar to other authors: *“Tax shields or tax savings TS, are a subsidy that the Government gives to those who incur in deductible expenses. All deductible expenses are a source of tax savings. This is, labour payments, depreciation, inflation adjustments to equity, rent and any expense if they are deductible.”* [31].

If it is assumed that the main source of tax savings is interest, the company achieves the tax advantage if *earnings before interest and taxes (EBIT)* plus *other income* are sufficient to offset the interest paid by the company. In this case, the value of tax shield is equal to the tax rate multiplied by *financial expenses (FE)*. If the value of *EBIT* and *other income (OI)* is less than the amount of *financial expenses*, the company does not pay corporate income tax. Nevertheless it

generates the tax shield; its value is equal to corporate tax rate times *EBIT* plus *other income* according to Eq. (24).

$$TS = T \times (EBIT + OI) \text{ if } 0 < EBIT + OI < FE \quad (24)$$

Another possible scenario occurs if the sum of *EBIT* and *OI* is negative. Tax savings do not arise because the company does not pay any tax. In sum, all possible cases are given in Eq. (25).

$$TS = \begin{cases} T \times FE & \text{if } EBIT + OI \geq FE \\ T \times (EBIT + OI) & \text{if } 0 \leq EBIT + OI \leq FE \\ 0 & \text{if } EBIT + OI < 0 \end{cases} \quad (25)$$

This is significant for further research; most of the literature dealing with the issue of tax shields is based on Eq. (2). It also means that both new businesses and start-ups can achieve partial tax savings, despite the fact that *EBIT* and *OI* cannot cover the value of financial expenses. Eq. (25) indicates that the value of tax shield should be a function of *EBIT* plus *OI* and not a function of the net income as Liu [8] argued in his theory. Eq. (26) expresses the relation between the dependent and independent variables.

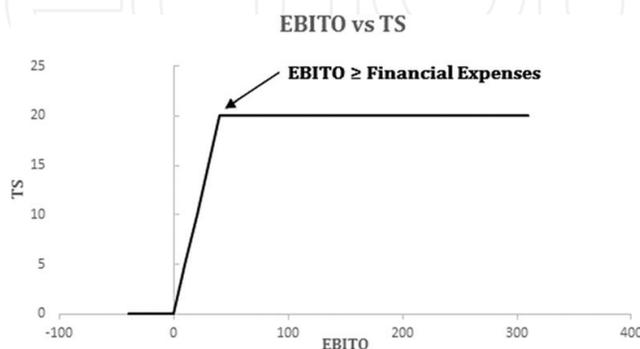
$$TS = \text{Maximum}(T \times \text{Minimum}(EBIT + OI, FE), 0) \quad (26)$$

**Figure 3** shows the course of the function of tax shield with respect to the sum of *earnings before interest and tax* and *other income*.

### 3.3. Marciniak model

Marciniak [33] suggested *decomposition method* for business valuation. The basis of the method is to divide the value into three different effects:

- cash flow from operating and investing activities,
- tax shield and
- financial effect expressed as a difference between cost of equity and cost of debt.



**Figure 3.** Tax shield as a function of *EBIT* plus other income [32].

The first part, operating and investment cash flow (free cash flow) is discounted at cost of equity (instead of weighted average cost of capital). The tax shield is quantified as the sum of taxes paid on interest (corporate tax rate times interest). Financial effect is the product of debt and a difference between the cost of equity and the cost of debt, it is discounted at the cost of equity. Last component of the business value (financial effect) is positive if the required return on equity is higher than the cost of debt and vice versa.

Eq. (27) expresses the value of levered company as a function of the sum of the present values of these three factors.

$$V_L = \sum_{i=1}^N \frac{FCF_i + TI_i + (k_e + k_d)D_{i-1}}{(1 + k_e)^i} \quad (27)$$

Unlike Myers' adjusted present value, decomposition method discounts all cash flows at the same discount rate (the cost of equity). Therefore, this method is similar to the Kaplan and Ruback model. One of the advantages of the model is that it is not necessary to estimate weighted average cost of capital.

Based on the previous method, Marciniak derived the value of tax shield formula expressed in Eq. (28).

$$PV(TS) = \sum_{i=1}^N \frac{k_c BT}{(1 + k_e)^i} \quad (28)$$

This model is similar to Harris and Pringle or Kaplan and Ruback model because the cost of equity is used as a discount factor, assuming book value instead of market value.

#### 4. Emerging markets finance and tax shield valuation

The previous sections show that significant factors of interest tax shield are:

- debt,
- cost of debt (e.g. interest rate),
- corporate tax rate and
- discount factor.

Each of these factors is influenced by other microeconomic and macroeconomic factors. The value of debt determines the capital structure of company and one of the primary objectives is to optimize it. In terms of developed and emerging markets, there are different determinants of capital structure. This issue is a field of research in many studies. Booth et al. [34] investigated capital structure in developing countries. They found that capital structure in developed and developing countries are affected by same firm-specific factors (like debt ratios). Nevertheless,

they found out that there are differences such as GDP growth, capital market development and inflation rates.

Bas et al. [35] also investigated capital structure in emerging markets. They examined the capital structure in 25 countries from different regions. It should be noted that according to their study listed companies that prefer equity financing instead of long-term debt financing. They also investigated the effect of company size. Large companies are more diversified and default risk is reduced as a result of higher leverage. Hence, small and large companies have different debt policies. Also, large and traded companies can easily get access to finance that depends more on the economic conditions of the country.

Jong et al. [36] examined the importance of country and firm-specific factors in the leverage choice of companies from 42 countries. They found that the impact of several firm-specific factors (tangibility, company size, growth and profitability) on cross-country capital structure is significant and consistent with conventional theories.

According to the studies mentioned above, the capital structure in emerging markets is determined, in addition to factors similar to those in developed countries, by specific factors. These include the development of the capital market, inflation or the size of businesses [37]. The weak development of the capital market, especially bond market, means that the company cannot take advantage of the possibility of issuing a bond. Therefore, it is not possible to determine the market value of debt, and market value-based theories of the tax shield cannot be applied. Within the models reviewed in the chapter, we can suggest the use of models with a book value of debt because they are suitable for all businesses, regardless of size and tradability of a company on the capital market.

In addition to debt value used (market versus book); it is also questionable to estimate the cost of capital (discount factor). For example, the cost of equity is traditionally estimated by *CAPM* model. However, if the company is non-listed, the model is inappropriate or inaccurate. Also the weighted average cost of capital is difficult to quantify. Damodaran [37] has created the database to help estimate the cost of equity and debt. In addition, a build-up model is often used.

The tax shield is also affected by the tax system and corporate and personal tax rate or loss carried forward, which affects the effective tax rate and tax burden [38–40].

Under the conditions of emerging markets, the tax shield represents a significant source of value and is therefore part of several methods of investment decision analysis. Leasing is a frequent form of financing for small and medium enterprises; net advantage to leasing model includes an analysis of interest and depreciation tax shields; value of tax shield may be a decisive factor for selecting a portfolio of investment projects (using a modified resource-constrained project scheduling problem with discounted cash flows). In addition, other methods of investment decision-making may be adjusted for the existence of a tax shield, like risk analysis [41–44].

## 5. Conclusion

The chapter deals with the analysis and classification of selected approaches to the quantification of tax shields. Theories are based on the premise of the perfect capital market and a clearly

defined corporate debt policy. However, both assumptions cannot be met in the realistic conditions of emerging markets; many businesses in emerging markets are not listed and debt policy is determined based on the book value of debt and not on the basis of a fixed market value of debt or market leverage.

The theories mentioned in this chapter have many gaps that prevent the correct use under conditions of emerging markets. Gradually, new theories are emerging, reflecting real economic conditions, but it makes it difficult to determine which model is correct. In their book, Copeland et al. investigated various models of tax shield, and their opinion on the choice of the appropriate method is: *We leave it to the reader's judgment to decide which approach best fits his or her situation* [2].

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## Nomenclature

$A$	Value of assets
$APV$	Adjusted present value
$APV_C$	Compressed adjusted present value
$B$	Book value of debt
$CAPM$	Capital asset pricing model
$CF_{TS}$	Cash flow from tax saving
$CRAs$	Credit rating agencies
$D$	Market value of debt
$D_{i-1}$	Market value of debt for time $i - 1$
$\Delta D$	Net increase of debt
$EAT$	Earnings after tax
$EBIT$	Earnings before interest and tax
$ECF$	Equity cash flow
$E_L$	Equity of levered company
$FCF$	Free cash flow
$FE$	Financial expense

$g$	Growth rate
$G_L$	Present value of tax paid by levered company
$G_U$	Present value of tax paid by unlevered company
$HP$	Harris-Pringle model
$I_i$	Interest for time $i$
$k_c$	Coupon rate
$k_d$	Cost of debt
$k_e$	Cost of equity
$k_{T_L}$	Required return to tax in the levered company
$k_{T_U}$	Required return to tax in the unlevered company
$k_u$	Unlevered cost of capital
$MBO$	Management buyout
$ME$	Miles-Ezzell model
$M_i$	Pricing kernel for the time $i$
$MM$	Modigliani-Miller model
$OI$	Other income
$PP_i$	Principal payment for time $i$
$PV[\Delta D_i]$	Present value of debt change for time $i$
$PV(TS)$	Present value of tax shield
$r_f$	Risk-free rate
$ROI$	Return on investment
$r_P$	Risk premium
$S_i$	Value of the stock for time $i$
$S_{i-1}$	Value of the stock for time $i - 1$
$T$	Corporate tax rate
$T_L$	Tax paid by levered company
$TS$	Tax shield
$T_U$	Tax paid by unlevered company
$V_L$	Value of levered company

$V_{TS}$	Value of tax shield
$V_{TS}^{BV}$	Value of tax shield if book leverage ratio is assumed
$V_U$	Value of unlevered company
$WACC_{BT}$	Weighted average cost of capital before tax
$\beta_U$	Unlevered Beta
$\rho$	Appropriate discount rate

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