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RESEARCH ARTICLE

Financial decisions and taxes

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Abstract

In the present paper we examine whether investment decisions and financial decisions can be separated. Our assumption is that if the amount of debt cannot cause any change of shareholder's value, then the two kinds of decisions can be separated. But the effect of borrowing money is so arborescent, that the specifics could only be cached, represented in the Capital Asset Pricing Model's (CAPM) word. With our novel approach we would also like to show a simple and widely useable tutorial method.

Keywords

capital budgeting · taxation · tax shield · financial distresses · leverage · CAPM

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1 Introduction

In corporate economic analyses it is assumed that the financial and the investment decisions are independent (from each other). Mostly it is an inartificial assumption, because there is no argument allying a specific source of money to a definite project. Accordingly, decision makers think about which investment to realize, and then how to finance it.

In this article we examine the changes of shareholder value when the capital structure is reconditioned. We indicate only three kinds of source: equities, debts and bank loans. Moreover, in the long run bank loans and debt make no difference, and we reduce only two kinds of source: equities and debts. In our discussion we examine the changes of expected return and risk of equities and debts besides the value of the whole company, although the keyquestion is the contingent change of shareholder value.

We note, usually corporates can change their capital structure easily. If they pay dividends or by their own equities, they decrease the amount of shareholders' equity, and when they issue new equities they increase it. The change of the amount of debt is even easier: they can issue bonds, or pay back their liabilities.

2 Tax Saving

In order to understand the possible value-changing effect of capital leverage, we need to adjust our mini-firm concept. For this reason we distinguish between mini-firms before and after corporate taxes. The cash-flow of mini-firm before taxation can be divided among shareholders, creditors and the government, while the one after taxation can only be divided between shareholders and creditors.

We used V_{BT} to mark the value of a mini-firm before taxes, which is broken down to shareholder capital (E), total creditor capital[1] (D) and total corporate taxes (T_{cE}). When marking

[1] *We refer to the British-American economic model, where share and bond issues play dominant role, and credits have some importance rather in the short-term availability of resources (which we do not discuss this time). Anyway, we use the term "credit" as a "common category", because sourcing through a bond issue is so rare in Hungary that the use of this category would be rather confusing. (There is not too much difference between them anyway: both rep-*

taxes we use "E" together with "c" (marking "corporate") to highlight that on the corporate level interest income (i.e. income of "D") is not taxable, but only shareholders' income ("E") is. T_{cE} is to be considered as if the government also had some share in the business of mini-firm – actually this is the real situation – and we specify the value of this share by that mark. It follows from the above that E and $D$are considered after corporate taxes but before personal income taxes.

$$\begin{aligned} V_{BT} &= E + D + T_{cE} = V + T_{cE} \\ V &= E + D \end{aligned} \tag{1}$$

It is worth stressing that the growth of share prices (which we consider as the main target) is quite different from the increase of E, since E is the total value of corporate shares. This obviously changes if E is „replaced" with D, but this will not change a share price (P) by any means.

We know that

$$\begin{aligned} T_{cE} &= (E + T_{cE})t_{cE} \\ T_{cE} &= t_{cE}E + t_{cE}T_{cE} \\ (1 - t_{cE})T_{cE} &= t_{cE}E \\ T_{cE} &= \tfrac{t_{cE}}{1-t_{cE}}E \end{aligned} \tag{2}$$

Since we can express T_{cE} by means of E and t_{cE} tax rate, we will be able to express V_{BT} as a function of E, D and t_{cE} :

$$\begin{aligned} V_{BT} &= E + D + T_{cE} \\ V_{BT} &= E + D + \tfrac{t_{cE}}{1-t_{cE}}E \end{aligned} \tag{3}$$

Consider now V_{BT} as a constant independent from D/E ratio. If we increase D/E ratio in this case (i.e. replace some dE with the same value of dD), T_{cE} will obviously decrease, thus we can save tax. If we stand by the assumption of perfect credit markets, then the „excess value" coming from the fall of T_{cE} will obviously be transferred to shareholders – in accordance with the value conservation law.

We can thus assume that creditors will not account for the interests received (as expenses), therefore shareholders can keep the tax saved through credits.

$$V_{BT} = const. = (E - dE) + (D + dD) + \left(\frac{t_{cE}}{1 - t_{cE}}E - \frac{t_{cE}}{1 - t_{cE}}dE\right) + \left\{\frac{t_{cE}}{1 - t_{cE}}dE\right\} \tag{4}$$

The tag in braces used in the formula shows the increased rate of the shares „kept" (*E-dE)*.

(Again it can be confusing that the increase of shares' value can be associated with two things. First, one can think of the growth of share-ratio, which naturally decreases with the increase of D/E ratio. On the other hand, one can associate the specific P value of each share as securities. The current formula expresses that the increase of D/E ratio (i.e. the fall of E) will result in the increase of P.)

It is thus clear that leaving the value of mini-firm before taxes intact, the increase of D/E ratio will decrease T_{cE} and E.

resent a simple crediting relation). However in the selection of marks we followed the British-American literature: "E" (Equity) and "D" (Debt), using E for shares and D for credits.

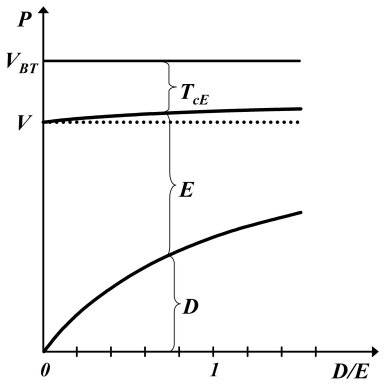

Fig. 1. With increasing of capital leverage the value of a mini-firm before taxes will not change, while the one after taxes will increase, and all this growth will benefit the shareholders.

We can see now that the results of the increase of capital leverage can be experienced, first through the fact that the value of a mini-firm before taxes will not change while the one after taxes will increase, and all this growth will benefit the shareholders.

3 The Decrease of Mini-firm Value before Taxes through the Increase of D/E

The business efficiency of a company does not depend on the structure of the operation sources, since the business activity itself (sales, costs, etc.) has in most cases "nothing to do" with the type of sources (shareholders', or credited money) from which operative devices are purchased.

In case of higher capital leverage, the companies are pushed harder due to the continuous interest payments and installments. As interest payments and installments are prescheduled while corporate business fluctuates and includes risks, liquidity and financial difficulties become more probable and frequent in case of higher capital leverage. The question is how these may influence the "normal" way of corporate business operation, and cause the profitability and efficiency to deteriorate.

The literature cites a number of typical effects of falling business efficiency due to the increase of capital leverage:

- Most typical forms of losses on the sales revenue side due to higher capital leverages may be cases when experiencing the growing dangers of the company's liquidity problem - buyers start to strive for greater safety at the expense of the company. Buyers therefore can require higher guarantees or may simply reduce their business relation with the company and look for another partner.
- A similar cost-side effect is when suppliers demand more securities or shorter payment deadlines due to the danger they see in the company's financial problems. Another typical cost-side loss may be the employees' claim for a wage compensation whenever they experience a higher than normal risk of losing their jobs due to financial problems of the company.

- Managers of companies who are in debt might also prefer investment options that are profitable on short-term (quick-return investments, sales revenue through price-discounts, etc.), which may have negative effects on or even deteriorate the corporate value in the long run. Such decisions are also motivated by the managers' fear of losing their jobs. According to Fama and Miller (1972) [5] as well as Jensen and Meckling (1976)[13] due to the increasing capital leverage shareholders are prone to make decisions that reduce the creditor-value at the expense of shareholder value, while the total corporate value decreases in the meantime. Myers (1977)[16] states that higher capital leverage may finally result in the omission of investments since a larger part of the income of investment is transferred to current creditors.

- Long-term value creating investments may be pushed into the background, R&D activities typically slow down, the company's innovation force diminishes, etc.

We also need to mention the involvement of total risk on corporate investment decisions. As known, in the assessment of corporate investments (*NPV* analysis) it is only the market risk of the investment that is relevant, as specific (diversifiable) risk is eliminated in the shareholders' portfolio. We can thus state that any involvement of total risk in corporate decisions will presumably spoil decisions from the direction of maximizing shareholder value.

The appearance of total risk as decision criteria must be countered for because managers (employees) of companies with higher capital leverage are afraid of losing their jobs. This time they prefer projects of lower risk, because they prevent the company from getting into trouble in the short term, consequently avoiding losing their job. This phenomenon is usually one of he so-called agency costs.

According to the research by Barnea, Haugen and Senbet (1980) [2], short-term credits are used where client costs are higher.

In accordance with the statements of Jensen (1986) [12], the increase in capital leverage motivates management to waste less money on bad investments, as costs of interest payments keep the company under continuous pressure. Easterbrook (1984) [3] had similar findings.

Jensen (1986) [12] determined – just opposite to above – effects may also occur in relation to the total risk. If managers or even shareholders start to believe that the company will get into severe financial trouble rather than avoid it, they may prefer larger investments of total risk. This time they feel that the only way out is to make a "big deal", which is prone to risk.

A similar attitude is reflected when shareholders or managers keep the situation hopeless and do not feel that corporate equity needs to grow. This time they miss opportunities having positive *NPV.*

The change of capital structure can be a warning. In accordance to Myers and Majluf's (1984) [18] hierarchy study, if a company is prone to apply for credit, then issues shares, it means that company management may think that shares are currently underpriced, so they do not want to issue new shares [17] Due to asymmetrical information companies prefer internal financing solutions. Such a situation can arise e.g. after a successful R&D program, when internal forecasts promise high income, which managers or shareholders believe in, but the market has not incorporated into prices yet. In such situations, managers turn to operative cash-flows rather than credits.

On the other hand, if managers or shareholders feel that the company is over assessed, then they rather try to issue new shares.

According to Miller and Modigliani (1961) [11] dividend payment decision can include information about the corporate value. It is interesting that these considerations prefer the employment of a lower credit. Credit agreements often include terms that forbid further employment of credits when a certain capital leverage limit is reached. However, managers do not want to approach this level, because they believe they can lose their flexibility in financing, and should they find a good project, they will be forced to finance it through the issue of new shares, and share the success with "new shareholders".

We would like to stress, that such significant effects can only be accounted for at capital markets of lower efficiency.

The growths of controlling or agency costs are usually significant in relation to financial difficulties. This is reasonable, since shareholders – creditors – managers (and somehow government through taxation) conflicts intensify in such cases. Due to this, both shareholders, and creditors want to keep their eyes on what is happening with the company, what naturally results in the increase of costs.

We would like to mention the loss of value between shareholders and creditors. We can generally state that the majority of such losses is coped with by shareholders. Mainly due to the fact that lighter corporate losses do not endanger payment of credits at all. On the other hand, creditors can reasonably be easily protected against such losses, since there are a number of securities that can be incorporated into credit contracts even for the case of a possible bankruptcy.

In case of liquidation the extra loss of shareholders is nearly regular. This time shareholders trail to the end of pay-off orders. The procedure results in the depreciation or deterioration of devices, and lawyer costs and court fees consume the majority of corporate values. Due to the above, it is quite rare that a shareholder can receive anything.

To summarize, we can state that the efficiency of corporate (mini-firm) business activity before taxes normally declines with the increase of capital leverage, i.e. the value of mini-firm before taxes decreases.

It is clear, that the effects of increases in capital leverage (i.e. financing) can be simplified to two effects: the increase of capital leverage results in the growth of mini-firm after taxes, but that of the mini-firm before taxes decreases. In accordance with

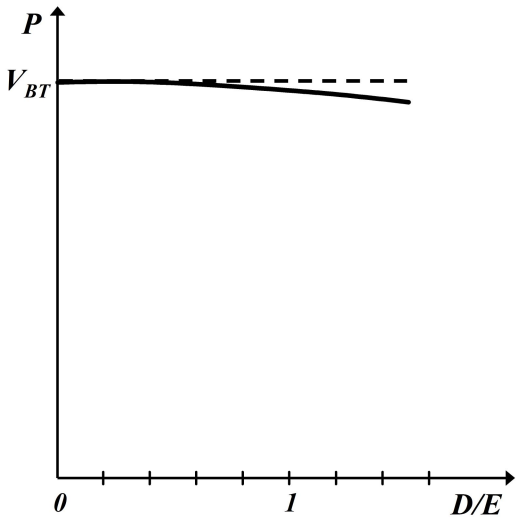

Fig. 2. With the increase of leverage the value of mini-firm before taxes decreases

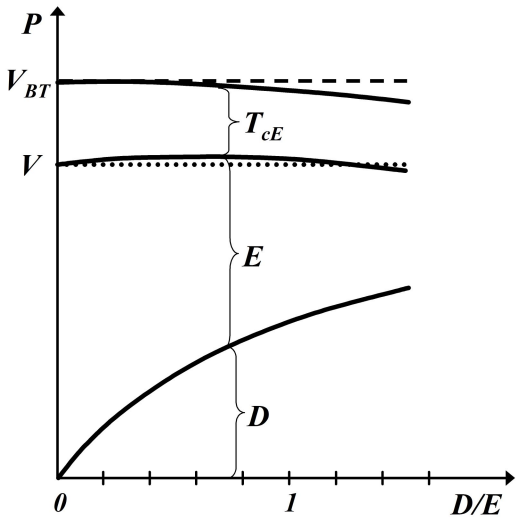

Fig. 3. With the increase of capital leverage the value of mini-firm before taxes decreases while the one after taxes will increase. The two effects roughly neutralize each other.

the assumptions, none of the effects concerns the credits; it influences shareholders (and naturally taxes) only.

Rajan and Zingales (1995) [19] measured among others the leverage in the US countries from 1987 to 1991. In their findings the leverage is – on average – 28%. Graham (2000) measured the debt tax advantages of firms from 1980 to 1994 [6]. Graham estimates that the capitalized tax benefit of debt ($t_c D$) after corporate taxes (D/V=0,28 and t_c=47%) equals to 9,7% of the firm value or 4,3%, net of personal taxes. Kemsley and Nissim (2002) found the same results with an alternative method [8]. They focus on the data from 1963 to 1993 and investigate 2964 firms' 42505 events. Their estimated value for the debt tax shield is 10% of firm value, net of personal disadvantages of debt. These results support the earlier findings of Masulis (1980) [15] and Engel et al (1999)[4] and the estimates of MacKie-Mason (1990) [14], Trezevant (1992)[20] and Graham (1996) [6]. Graham (2000)[7] noted, that the 4,3% could be overestimated because of some simulation factor (e.g. agency costs).

Turning to the costs of financial distresses Andrade and Kaplan (1998) [1] analysed highly levered companies which were in financial but not economic distress. They found that the operating efficiency performance declined with 17% - which they identify the indirect costs of financial distresses – meanwhile the leverage on average increased from 21% to 91%. Amending this with the estimated 3% direct costs of financial distresses by Weiss (1990) [21], the value of the firm declines 20%.

Summing up the empirical data, we can assume that both effects are of the same significance, so they neutralize each other.

$$\begin{aligned} V|_{D/E} &\cong \text{const.} \\ E|_{D/E} &\cong \text{const.} \end{aligned} \tag{5}$$

However, the only thing that stays is the value-neutral capital leverage, i.e. we can ignore financing issues.

4 Leverage

Now let's see the mini-firm's risk and return. First, we have to highlight that this is a totally another kind of nexus than the above-mentioned ones.

$$V = E + D \tag{6}$$

Based on the value additivity principle the project's value after corporate taxes comes from the sum of E and D. With risks and returns the situation is not the same: the business activity's expected return and risk comes form E and D's risk and return weighted average:

$$\beta_V = \frac{E}{E+D}\beta_E + \frac{D}{E+D}\beta_D \tag{7}$$

$$E(r_V) = \frac{E}{E+D}E(r_E) + \frac{D}{E+D}E(r_D) \tag{8}$$

where $E(r_E)$ is the expected return of equities, $E(r_D)$ is the expected return of debts, $E(r_V)$ is the expected return of the corporate activities, and β_E is the risk of equities, β_D is the risk of debts, and β_V is the risk of business activity.

We emphasize that the formulas above are based on the equilibrium called Persistence of Risk and Returns Principle. The business activity (the corporate) can be characterized by a certain expected return and risk. If we disjoin it to E and D, the expected return and the risk of could be disjointed, too.

4.0.1 The risk and return of debt as a function of leverage

Our discussion is based on assuming perfect debt markets. On account of this the expected return of the debt is adjusted by its risk. It is important to understand, on debt markets everybody is a competitor who wants to borrow: not only companies, but also (local) governments, financial institutions, persons from all over the world.

Relying upon the above the risk of debts must be zero when D/E is low, because there is enough asset and legal warranty

behind the payback of the principal and interests. By increasing leverage debts will be growingly risky. Assuming creditors are holding efficient portfolios the risk of debts can be characterized by their betas. The higher the leverage, the higher the slope of the curve.

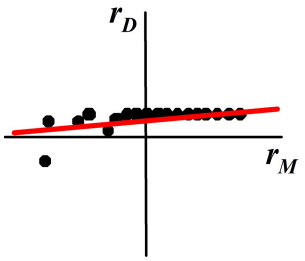

Fig. 4. Characteristic curve of risky debt.

Now let's examine the risk and return of debts. Remember, in a perfect world the return of debt is equal with interest of debt.

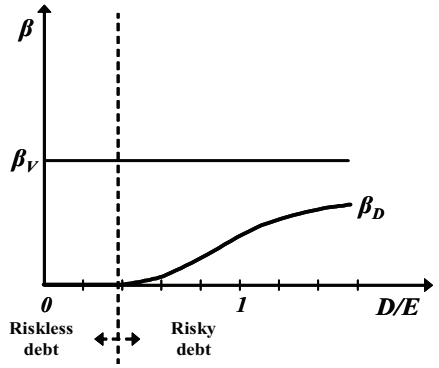

Fig. 5. Risk (beta) curve of debt as a function of leverage.

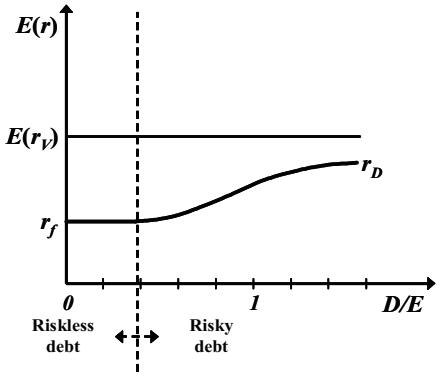

Fig. 6. Expected return of debt as a function of leverage.

At the beginning risk of debt is zero, so the expected return will be the riskfree interest rate. By increasing leverage the risk and return of debt begin to rise, because of the chance of default. At last the increment declines, because creditors begin to absorb the whole risk of the company.

4.1 The Risk and Expected Return of Equities as a Function of Leverage

Now let's deduce the most important formulas concerning to the shareholders:

$$\beta_V = \frac{E}{E+D}\beta_E + \frac{D}{E+D}\beta_D \tag{9}$$

$$\beta_E = \beta_V + \frac{D}{E}(\beta_V - \beta_D) \tag{10}$$

$$E(r_V) = \frac{E}{E+D}E(r_E) + \frac{D}{E+D}E(r_D) \tag{11}$$

$$E(r_E) = E(r_V) + \frac{D}{E}(E(r_V) - E(r_D)) \tag{12}$$

The formulas above show that the risk and expected return of equities are continuously increasing as a function of D/E. This phenomenon is called financial leverage.

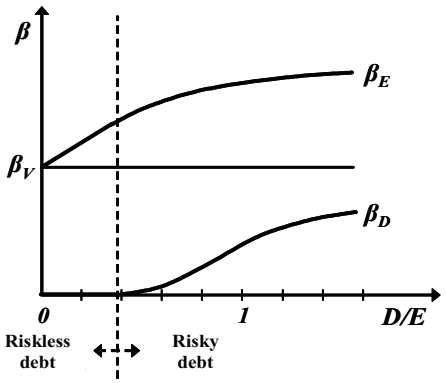

Fig. 7. The risks of business activity, debt and equity.

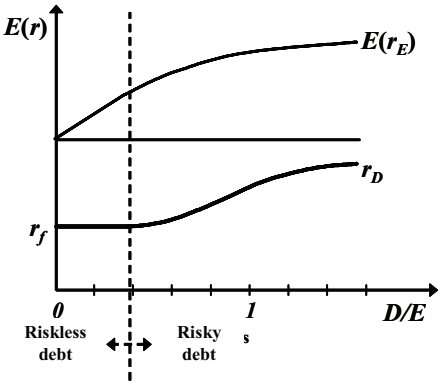

Fig. 8. The expected values of business activity, debt and equity.

5 Conclusion

We examined three significant effects:

- We demonstrated that by subservient debt taxation debt financing causes tax saving, which is gained by the shareholders. As a consequence, the price of the shares increases with leverage.
- With the increase of leverage such procedures come into play (e.g. agency problems) that the value of the mini-firm before taxes begins to decrease and so does the price of the shares.

From the aspect of the shareholders, the two effects roughly neutralize each other. Accordingly, leverage causes no change in shareholder's value.

- With the increase of leverage β_E *and* $E(r_E)$ is also increasing.

See what happens in connection to leverage in the *CAPM* below. Without financial distresses and tax savings the following would happen (index 0,1 and 0,8 mean the ratio of D/E), so we can follow the increment of leverage:

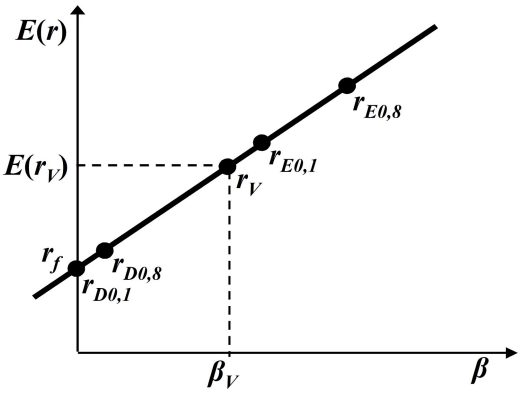

Fig. 9. Leverage in the CAPM.

(The increase of r_D is because the debt becomes risky, r_E because of financial leverage.)

If we consider financial distresses:

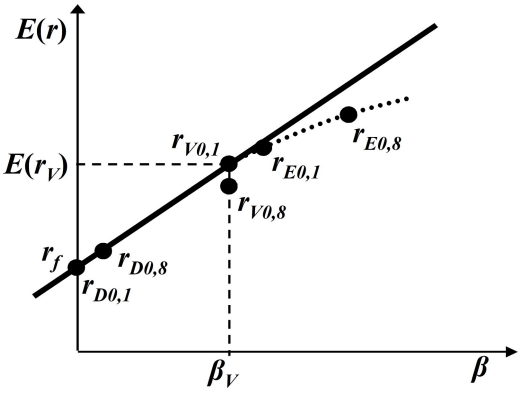

Fig. 10. Declining value because of financial distresses.

Remember, the security market line gives situations where there is equilibrium, if a security diverges from it, it shows value changing. If the security moves on the security market line, its value will not change, because it stays in equilibrium (its risk and return changed in balance). Indeed, securities cannot diverge from the security market line, because its value changes immediately and it is forced back to the line. Now let's look at the effect of tax savings (without financial distresses):

Now, the effects of the two phenomena roughly neutralize each other. We cannot see significant change in value, but the balanced increase of risk and expected return of equity could be certainly observed:

About financing decision we can declare that the effects increasing the shareholder value – even by gentle market imperfection (taxation biases, agency problems) – are evanescent, to be more precise the aggregate of these effects connected financing decisions becomes particularly moderate, negligible. On account of this investment decisions generally can be separated from investment decisions (so as dividend decisions). This is one of the fundamental approaches of corporate finance: considering investment decisions we assume that the project (mini-firm) is financed by pure equity. These results meet with Modigliani and Millers propositions (Modigliani and Miller (1958, 1969)[9, 10]).

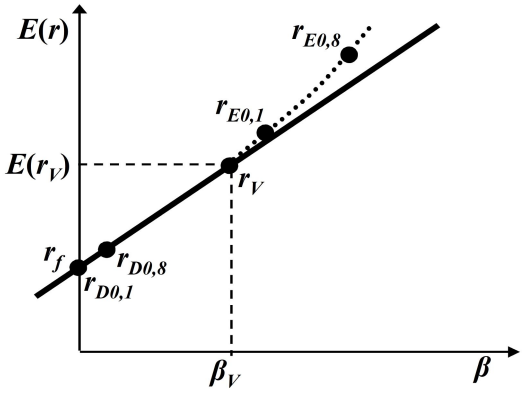

Fig. 11. Increasing value because of tax savings.

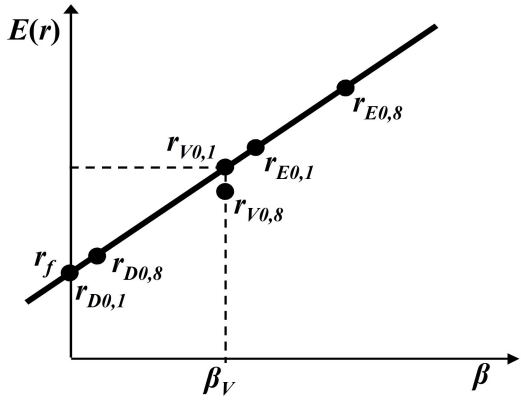

Fig. 12. Aggregate effects of financing in the CAPM.

We note that these approaches are valid only when debts can be obtained on market interest rate predicted by *CAPM*. In case of lower (preferential debts) or higher (e.g. temporarily restricted amount of debt) interests, we follow the above mentioned methods, but we have to amend the *NPV* calculation. We discount the cash-flow of the debt with the market interest predicted by *CAPM,* then we complete the "basic *NPV*" with this calculation:

$$NPV = NPV_{\text{basic}} + NPV_{\text{debt}} \tag{13}$$

References

1 **Andrade G, Kaplan SN**, *How costly is financial (not economic) distress?: Evidence from highly leveraged transactions that became distressed*, Journal of Finance **53** (1998), 1443-1493.

2 **Barnea A, Haugen RA, Senbet LW**, *A Rationale for Debt Maturity Structure and Call Provisions in the Agency Theoretic Framework*, Journal of Finance **35** (1980), 1223-1234.

3 **Easterbrook FH**, *Two agency-cost explanations of dividends*, American Economic Review **74** (1984), 220-230.
4 **Engel E, Galetovic A, Raddatz C**, *Taxes and income distribution in Chile: some unpleasant redistributive arithmetic*, Journal of Development Economics **59** (1999), 155–192.
5 **Fama EF, Miller MH**, *The theory of finance*, Hinsdale, Ill: Dryden Press, 1972.
6 **Graham JR**, *Debt and the marginal tax rate*, Journal of Financial Economics **41** (1996), 41-73.
7 _____, *How big are the tax benefits of debt?*, Journal of Finance **55** (2000), 1901-1941.
8 **Kemsley D, Nissim D**, *Valuation of the debt tax shield*, Journal of Finance **57** (2002), 2045-2073.
9 **Modigliani F, Miller MH**, *The Cost of Capital, Corporation Finance and the Theory of Investment*, American Economic Review **48** (1958), no. 3, 261-297.
10 _____, *Reply to Heins and Sprenkle*, American Economic Review **59** (1969), no. 4, 592-595.
11 **Modigliani F, Merton HM**, *Dividend policy, growth, and the valuation of shares*, Journal of Business **34** (1961), 411-433.
12 **Jensen MC**, *Agency costs of free-cash-flow, corporate finance, and takeovers*, American Economic Review **76** (1986), 323-329.
13 **Jensen M, Meckling W**, *Theory of the firm: Managerial behavior, agency costs and ownership structure*, Journal of Financial Economics **3** (1976), 305-360.
14 **Mackie-Mason J**, *Do taxes affect corporate financing decisions?*, Journal of Finance **45** (1990), 1471-1495.
15 **Masulis R**, *The effect of capital structure change on security prices: A study of exchange offers*, Journal of Financial Economics **8** (1980), 139-177.
16 **Myers SC**, *Determinants of corporate borrowing*, Journal of Financial Economics **5** (1977), 147-175.
17 **Miller MH, Rock K**, *Dividend policy under asymmetric information*, Journal of Finance **40** (1985), 1031-1051.
18 **Myers SC, Majluf NS**, *Corporate financing and investment decisions when firms have information the investors do not have*, Journal of Financial Economics **13** (1984), 187-221.
19 **Rajan R, Zingales L**, *What do we know about capital structures? Some evidence from international data*, Journal of Finance **50** (1995), 1421-1460.
20 **Trezevant R**, *Debt Financing and Tax Status: Test of the Substitution Effect and the Tax Exhaustion Hypothesis Using Firms' Responses to the Economic Recovery Tax Act of 1981*, Journal of Finance **47** (1992), 1557–1568.
21 **Weiss LA**, *Bankruptcy Costs and Violation of Claims Priority*, Journal of Financial Economics **27** (1990), 285-314.