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On the Irrelevance of the Leverage Effect

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Abstract

Financial leverage increases the expected return on equity. We show that this leverage effect is not only irrelevant for shareholders' present wealth but also for the return on their investments. This result is straightforward if we do not only look at the return on equity but at the return on shareholders' total wealth. Any relevance leverage may have is definitely due to market imperfections. These may simply cause differences in market access for firms and individuals or lead to agency problems between investors and management.

Keywords: Leverage, shareholder value, shareholders' return

JEL classification: G32

1. Introduction

Financial leverage leads to an increase in the expected return on equity. We call this the leverage effect.¹ At first glance, one has to trade off this effect against the parallel influence of leverage on risk when it comes to the question of optimal financial structure. But there is no reason at all to consider the leverage effect per se. First, it is straightforward to show, that in the Modigliani/Miller world of perfect markets neither the market value of a firm as a whole depends on leverage nor is the wealth of shareholders affected by financial policy. This holds notwithstanding the fact that the leverage effect is perfectly working in the Modigliani/Miller world. The perhaps more surprising contribution of this note is to show that the leverage effect is also of no interest if shareholders explicitly care for the expected return on their (total) investment.

2. The leverage effect

Let $\bar{r}_A$ be the expected return on the firm's assets, which is

$$\bar{r}_A = \frac{\bar{V}_1}{V_0} - 1 \quad \Leftrightarrow \quad (1 + \bar{r}_A)V_0 = \bar{V}_1 \quad (1)$$

with: V_0 - present value of the firm

$\bar{V}_1$ - expected future value of the firm.

¹ See e.g. Brealey/Myers (2000), p. 480-484, or Bodie/Merton (2000), p. 80.

The expected return on equity, $\bar{r}_S$, is given by

$$\bar{r}_S = \frac{E[\max(V_1 - (1 + i_D)D, 0)]}{S_0} - 1 \quad (2)$$

with: D - present value of the firm's debt

i_D - yield to maturity on debt

S_0 - present value of equity,

and the expected return on debt, $\bar{r}_D$, is

$$\bar{r}_D = \frac{E[\min((1 + i_D)D, V_1)]}{D} - 1 \Leftrightarrow (1 + \bar{r}_D)D = E[\min((1 + i_D)D, V_1)]. \quad (3)$$

Combining (1) and (3) leads to

$$(1 + \bar{r}_A)V_0 - (1 + \bar{r}_D)D = V_1 - E[\min((1 + i_D)D, V_1)] = E[\max(V_1 - (1 + i_D)D, 0)]. \quad (4)$$

By inserting the LHS of (4) for the numerator in (2) and rearranging we get the formal expression for the leverage effect:

$$\bar{r}_S = \bar{r}_A + (\bar{r}_A - \bar{r}_D) \frac{D}{S_0}. \quad (5)$$

As long as the expected return on the firm's assets exceeds the expected return on debt, the expected return on equity rises in the financial leverage, measured by the relation of debt to equity value. This is due to the fact that the firm earns an expected return of $\bar{r}_A$ on every unit of invested capital but debtholders get only $\bar{r}_D$ per unit debt. The (hopefully) positive difference $\bar{r}_A - \bar{r}_D$ per unit debt goes to the shareholders and raises their expected return. Hence,

higher leverage leads to a higher expected return on equity (given a constant and positive difference $\bar{r}_A - \bar{r}_D$).

At first glance, this leverage effect must be taken into concern when designing the financial structure of the firm. At least for risk neutral shareholders a high leverage seems to be advantageous because of the higher expected return on equity. A closer look on market values and total wealth of shareholders shows that this is certainly not the case.

3. Market values and personal wealth of shareholders

In the derivation of the leverage effect we implicitly assumed that the present and future value of the firm are independent of leverage. We know from Modigliani and Miller (1958) that given future cash flows (resulting in an given future value) are necessary to make a firm's present value independent of financial structure (absent discriminating taxes). We can be sure of a given present market value of the firm if markets are perfect such that the value maximizing business strategy will be implemented independently of leverage. Then we have

$$S_0 + D = V_0 \quad \text{with } V_0 \text{ constant.} \quad (6)$$

The value of the equity

$$S_0 = V_0 - D \quad (7)$$

together with other investments determines the shareholders' wealth which they want to maximize. Assume for simplicity that they initially have no other investments so that their wealth W_0 is just

$$W_0 = S_0. \quad (8)$$

If shareholders want a higher leverage (to have a higher expected return on equity) they have to issue new debt with a market value of ΔD . This new capital could be paid out to the shareholders or invested in the firm. In the first case the value of equity drops from $S_0 = V_0 - D$ to

$$S'_0 = V_0 - D - \Delta D. \quad (9)$$

and shareholders' wealth is

$$\begin{aligned} W'_0 &= S'_0 + \Delta D. \\ &= V_0 - D \\ &= W_0 \end{aligned} \quad (10)$$

and hence unchanged. Making use of the leverage effect has no effect on shareholders wealth. Only if the issue of new debt makes old debt more risky, shareholders' wealth is positively affected. With higher risk for the old debtholders D drops and therefore shareholders' wealth rises by the same amount.

If ΔD is invested in the firm, its value as a whole is no longer constant. V_0 rises to V'_0 and shareholders' wealth changes from

$$W_0 = V_0 - D \quad (11)$$

to

$$W'_0 = V'_0 - D - \Delta D \quad (12)$$

Hence, we have an increase in shareholders' wealth iff $V'_0 - V_0 > \Delta D$, that is, if the NPV of the new projects is positive.

Both possible effects on shareholders wealth (dilution of existing debt or investing in non zero NPV projects) can not be put down to the leverage effect. This effect *per se* is irrelevant.

4. Striving for returns

The irrelevance of financial leverage for shareholders' present wealth might not convince those investors who care, for some reasons, only for future income. Since the return on equity depends on leverage, they might wonder how the firm's financial structure influences their utility. We can answer this question if we assume that shareholders care about the expected value of the return on their *total* investment and the inherent risk. The basis on which we calculate the return is just a matter of scale. Since we know from chapter 3 that the total wealth is not affected by leverage *per se* we can use this quantity as a constant denominator for calculating returns.

Again we assume for simplicity that the total wealth of the shareholders initially equals the value of equity:

$$W_0 = S_0. \quad (13)$$

Then, the expected return on shareholders' total wealth is

$$\begin{aligned} \bar{r}_W &= \frac{(1 + \bar{r}_S)S_0}{W_0} - 1 = \bar{r}_S \\ &= r_A + (r_A - r_D) \frac{D}{S_0}. \end{aligned} \quad (14)$$

Can they improve this return by altering the firm's leverage?

If new debt is issued and the proceeds are paid out to the shareholders their wealth is unchanged as long as we abstract from any changes in V_0 or D which could not be directly traced back to the financial transaction:

$$W'_0 = S'_0 + \Delta D = V_0 - D - \Delta D + \Delta D = S_0 = W_0. \quad (15)$$

The return on this total wealth is now a mix of the return on equity (dropped to $S'_0 = V_0 - D - \Delta D = S_0 - \Delta D$) and the return on investing ΔD outside the firm. With respect to this additional investment we can analyze two cases.

First, consider the case where the investment of ΔD generates the same expected return which debtholders get, i.e. $\bar{r}_D$. Then, the expected return on shareholders' total wealth is

$$\begin{aligned}\bar{r}'_W &= \frac{(1 + \bar{r}'_S)S'_0 + (1 + \bar{r}_D)\Delta D}{W_0} - 1 \\ &= \bar{r}'_S \frac{S'_0}{W_0} + \bar{r}_D \frac{\Delta D}{W_0} .\end{aligned}\tag{16}$$

Since $W_0 = S_0$, $S'_0 = S_0 - \Delta D$ and $\bar{r}'_S = \bar{r}_A + (\bar{r}_A - \bar{r}_D) \frac{D + \Delta D}{S_0 - \Delta D}$ we have

$$\bar{r}'_W = \bar{r}_A + (\bar{r}_A - \bar{r}_D) \frac{D}{S_0} = \bar{r}_S = \bar{r}_W .\tag{17}$$

Hence, there is no change in shareholders' expected return. Furthermore, if the investment of ΔD outside the firm has not only the same expected return as the firm's debt but also the same risk we also have no change in total risk for shareholders. Then, the risk inherent in $\bar{r}'_W$ is the same as in $\bar{r}_W$. Only if shareholders have to bear more (less) risk on their investment of ΔD than the firm's debtholders they would realize a worse (better) risk-return-combination. But this would not be due to the leverage effect but comes from market imperfections resulting in different risk-return combinations accessible for the firm's debtholders on the one side and the shareholders on the other.

Second, shareholders could invest ΔD in assets with an expected return $\bar{r}_X$ exceeding $\bar{r}_D$ to increase their total expected return. (Normally this implies that they also have to bear more risk.) The expected return on total wealth is then

$$\begin{aligned}
\bar{r}_W' &= \frac{(1 + \bar{r}_S')S_0' + (1 + \bar{r}_X)\Delta D}{W_0} - 1 \\
&= \bar{r}_S' \cdot \frac{S_0'}{W_0} + \bar{r}_X \frac{\Delta D}{W_0}.
\end{aligned} \tag{18}$$

Now we obviously have a dependence of $\bar{r}_W'$, the expected return after leveraging up the firm, on $\bar{r}_X$ and the amount of newly issued debt, ΔD .

But increasing the firm's leverage is not the only way to raise the expected return on total wealth. Alternatively shareholders could raise private debt and invest it the same way as analyzed before. With private debt of ΔD their total expected return is

$$\bar{r}_W'' = \frac{(1 + \bar{r}_S')S_0 - (1 + \bar{r}_D)\Delta D + (1 + \bar{r}_X)\Delta D}{W_0} - 1, \tag{19}$$

if we assume that they have to pay the same expected return for the debt as the firm would.

With $S_0 = S' - \Delta D$, (5) and $\bar{r}_S' = \bar{r}_A + (\bar{r}_A - \bar{r}_D)\frac{D + \Delta D}{S_0 - \Delta D}$ we can show that

$$\bar{r}_W'' = \frac{(1 + \bar{r}_S')S_0' + (1 + \bar{r}_X)\Delta D}{W_0} - 1 = \bar{r}_W' \tag{20}$$

Hence, there is no difference in the expected returns. Under the given assumptions that shareholders can borrow at the same conditions as the firm, nothing can be gained by leveraging up the firm's capital structure which cannot be gained by private leverage as well.

If there is any advantage in leveraging the firm it results from the fact that the firm can possibly raise debt at better conditions than its shareholders. Then, we would have a higher expected return in case of leveraging up the firm than by private borrowing. But this difference would be due to some market imperfections and not to the leverage effect.

5. Conclusion

We have shown that neither shareholders' wealth nor their expected total return can be increased by making use of the fact that expected return on equity rises with financial leverage. Therefore we have to conclude that the leverage effect *per se* is definitely irrelevant for financial policy of any firm. Any relevance of capital structure decision results from market imperfections, to which the leverage effect does not belong.

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