

## Beta Factor - Levered and Unlevered

**The degree of synchronicity between the return of a share and that of the overall market is defined by a stock's beta. Whereby this factor is significantly influenced by a firm's capital structure, with higher leverage making its performance also more volatile. – Therefore, one has to distinguish between a firm's levered and its unlevered beta.**

Assuming debt – up to a certain level, at least - can be beneficial and lower a firm's average cost of capital, as Cost of Equity (CoE) is higher than Cost of Debt (CoD). However, along with higher leverage (i.e. increasing debt burden) both, CoE and CoD will increase as well, and along with them also a firm's average cost of capital. - In regards to CoD, this is easy to understand, as creditors fear a debtor's enhanced default risk. – However, also CoE increases along with a higher debt burden: Whilst the CoE components of the risk-free rate and the market risk premium are set, in essence determined by the market (i.e. they are fixed input parameters), the variable which actually does change along with a firm's in- or decreasing leverage is: the beta factor.

To start with, beta factors disclosed in financial publications usually refer to levered betas: Therefore, betas published for a certain stock are almost always based on that firm's current capital structure. And, as most companies do have (some) debt on their respective balance sheets, the derived beta is referred to as levered or equity beta.

The concept of the unlevered beta is a theoretical one and based on the assumption that the underlying company had no debt. It is also referred to as asset beta. (Naturally, if a specific company had indeed no debt on its balance sheet, then the levered beta would equal the unlevered beta).

Now, with a firm assuming (additional) debt, funds raised will typically be used for investments, such as an expansion of its operating capacity. Consequently, this will increase the firm's total assets, and lengthen

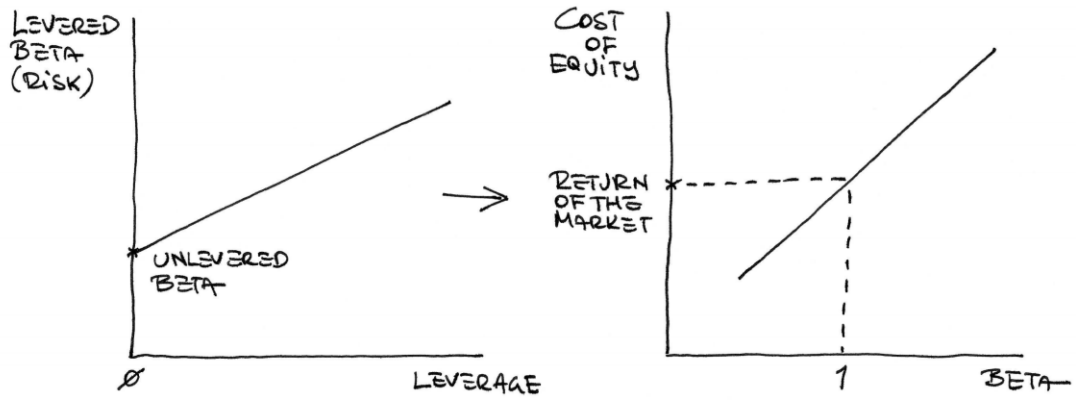
its balance sheet. – With a firm's increased capacities, its revenues are expected to increase as well. However, amid a higher debt burden, so will interest expenses. Now, provided the investment goes well, then interest expenses will increase less than revenues, ultimately boosting a firm's bottom line, its net profit.

The worrying consequences of an aggressive capital structure (i.e. excess leverage) actually do come to light during an economic downturn: In this context, one has to keep in mind that in most cases the vast majority of a firm's interest-related expenses are fixed cost items. Therefore, as a firm's leverage increases, so will interest expenses, and so will the block of fixed cost.

In an up- as well as downturn, revenues and variable costs will more or less float in parallel, with margins not being impacted much. – Once fixed costs are involved, however, this is a different matter, as they will remain (stubbornly) constant. Therefore, in a downturn a firm's net income will in all likelihood get squeezed, possibly even to the extent of (severe) losses. And as the (vast) majority of interest expenses are fixed (and not variable) costs, leverage will increase a firm's earnings volatility.

Identifying a firm's optimal capital structure is therefore a balancing act between adding lower-cost debt, whilst along with increasing leverage both, CoD as well as CoE will be increasing: CoD due to an increasing default spread, CoE due to an increasing beta factor.

The calculation of unlevered betas is - among others - required as an interim step in assessing the impact of different leverage structures on a firm's CoE: Thereby, in a first step beta is de-levered and subsequently re-levered according to the new target capital structure. – The concept may also be used when comparing the volatilities of different companies, as comparable firms may have significantly different capital structures: Else, comparing them would not be fair or appropriate.



$$\text{BETA}_{\text{UNLEVERED}} = \frac{\text{BETA}_{\text{LEVERED}}}{[1 + (1 - \text{TAX}) \times (D/E)]}$$

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