***WACC Issues: Project versus Business Systematic Risk***

Discounting a project's cash flows by the firm's WACC only works if the project is of similar systematic risk to the firm's other projects.

**Example question**: A low-systematic-risk supermarket chain is evaluating a project to make computers which is a high-systematic-risk industry. What WACC should it use?

**Answer**: The supermarket should not use its own WACC to discount the computer project cash flows, otherwise the project value will be overstated. Instead, the WACC of a 'pure-play' computer company should be used. Alternatively, the CAPM should be used to estimate the beta of a computer firm's assets which will also equal the weighted average beta of its equity and debt.

***WACC Issues: Funding Source is Irrelevant***

The choice of funding for the project is irrelevant to calculating the WACC. The WACC (also called the required return on assets) is supposed to reflect the systematic risk of the project’s or business’s assets, not the source of funding.

Since the cost of debt is always cheaper than the cost of equity, managers are tempted to trick themselves into thinking that if a project is funded with debt then the discount rate will be lower which makes their project appear to have a higher NPV. But this is false. The financing decision (D + E) is independent of the investing decision (V). The choice of funding should have no effect on value.

***WACC Issues: Debt-to-Assets Ratios and the WACC after tax***

Whenever the firm's debt-to-assets ratio (D/V) changes, the WACC **after** tax needs to be recalculated since the amount of interest tax shields has changed. Of course, this depends on what is assumed about Miller and Modigliani's theory of 'home-made leverage'.

On the other hand, the WACC **before** tax will not change and doesn’t need recalculation since it doesn't take tax shields into account. It only accounts for the time value of money and systematic risk of the assets which is independent of leverage (how the assets are funded, debt versus equity).

***WACC Issues: Weights Should Use Market Values, Not Book Values***

The WACC is supposed to use market values rather than book values. This is particularly problematic when using pro-forma balance sheets since the book value of equity (retained profits plus contributed equity plus reserves) is usually much smaller than the market value of equity (number of shares times share price) if the firm has performed well since it first listed.

Pro-forma balance sheets and income statements are commonly used to find FFCF and the WACC. These can be used to find the market share price. But the WACC depends on the market share price which in turn depends on the WACC, creating a circularity problem. This can be resolved algebraically or by setting up a circular reference in the spreadsheet with iterative calculation. But practitioners rarely do this. They tend to:

* Use the current market stock price to calculate the weights in the WACC, if the firm is listed;
* Use the WACC of similar companies operating in the same industry, if it is known;
* Estimate the WACC to be approximately equal to the expected return on the market portfolio. Remember that the average firm has a beta equal to the market’s (one);
* Assume that book equity approximates market equity (which is usually not the case).

***WACC Issues: Expected Future WACC over Past Historical WACC***

The WACC is used to find the current price which equals the discounted **future** cash flows, not past cash flows. Therefore the WACC that is expected to apply in the future is more important than the WACC that applied in the past. The problem of course is that the future is unknown, so usually the best guide to the future is the past. So in most cases, using the past WACC is usually best practice.

When using historical betas to proxy for future expected betas, be careful that they are within a reasonable range. For example, some stocks with short histories of returns less than one business cycle will show extreme historical betas that are very large (more than 4) or very low (less than zero). These are unreasonable and would not be expected to occur in the future so they should be made closer to one.

Practitioners commonly assume that firms should become more 'average' or similar to the market portfolio in the future. They calculate the future expected beta of returns as 1/3 plus 2/3 multiplied by the historical beta. This makes the beta closer to one, the beta of the market portfolio. Note that the weighting of 2/3 and 1/3 is completely arbitrary, but commonly used.

$$β\_{estimated future}=\frac{2}{3}.β\_{past}+\frac{1}{3}$$

This adjustment makes sense if the firm had a high level of systematic risk (beta > 1) in the past but is likely to have less systematic risk in the future. Or conversely, if the firm had a low level of systematic risk (beta < 1) in the past but will increase in the future.

***Cash Flows and Discount Rates***

Low cash flows and high discount rates reduce valuations.

Sensitivity analysis is commonly used to visualise how changes in discount rates and cash flows (for example revenue growth or COGS as % of sales) affect the valuation. Sensitivity analysis is best done in a spreadsheet program, for example in MS Excel using data tables.

Practitioners often devote more time to correctly forecast cash flows than discount rates because cash flows are usually the more important determinant of value.