Corporate Finance, Module 18: Financing and valuation: weighted average cost of capital

Required reading:

(The attached PDF file has better formatting.)

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{The Brealey and Myers textbook is excellent. We say to read certain sections and to skip others. This does not mean that certain sections are better; it means that the homework assignments and exam problems are based on the sections that you must read for this course. Some of the skipped sections are fascinating, but they are not tested.}

Read the boxed introduction on page 523 from the top to the end of bullet point 1 ("… via the after-tax weighted average cost of capital or WACC"). Module 18 covers the weighted average cost of capital, and module 19 covers the adjusted present value approach.

Read section 19.1, "The After-tax Weighted Average Cost of Capital," on pages 524-527. We skipped section 17.3 in Module 16 (on the traditional approach), which also uses the weighted average cost of capital, but we cover the WACC approach to capital structure.

Know the equation on the top of page 525; don't forget the tax adjustment ("$1 – T_c$") that affects the return on debt, not the return on equity. Work through the Sangria Corporation example on pages 525-527; the final exam problems are similar. We can use the *returns* on debt and equity, giving the return on assets, or the *betas* of debt and equity, giving the beta of assets. The formulas are the same; we covered them in a previous module.

The last paragraph on page 527 mentions the Miles-Ezzell formula and the valuation assumptions (constant debt levels or constant debt to equity ratio). Skip this paragraph; Brealey and Myers mention the Miles-Ezzell result but don't explain it thoroughly. (If they explained it thoroughly, they would lose many readers.) The final exam does *not* test how the assumption regarding debt to equity levels affects the weighted average cost of capital approach. Know the two assumptions used in the WACC approach in the two bullet points at the beginning of this sub-section; don't worry about the effects of changing the second assumption on the WACC formula.

Read section 19.2, Using WACC – Some Tricks of the Trade," on pages 528-530; skip the sub-section "Industry Costs of Capital" along with its illustration (railroad industry) on pages 530-531; read the subsections "Valuing Companies: WACC vs the Flow to Equity Method" on pages 531-532 and "Mistakes People Make Using the Weighted Average Formula" on page 532. Focus on the tricks of the trade, which the final exam covers: know how to deal with multiple sources of financing, short term debt, and high yield bonds. The final exam specifies whether to include short-term debt or not, since both methods are valid. The final exam does *not* cover convertible debt, which is covered in a section not in the readings for this course. (It is covered after option pricing, since the conversion to stock is an option.)

Read section 19.3 from the bottom of page 532 through the bottom of page 534. Know the effects on the cost of equity and the WACC as the debt ratio increases on page 533. Skip the rest of section 19.3 (pages 535-536). Unlevering betas is an advanced technique to estimate the weighted average cost of capital when the debt ratio changes; the final exam does not test this subject.

Read the summary on page 551 from the top to the end of the paragraph "… between project and company debt ratios." The rest of the summary deals with adjusted present value, which we cover in the next module.

{Note to candidates: Brealey and Myers have three valuation methods:

A. Unlevering the weighted average cost of capital formula
B. Adjusted present value, assuming debt remains fixed
C. Adjusted present value, assuming debt is re-balanced to the debt-equity ratio

For the corporate finance on-line course, we use weighted average cost of capital when the returns on debt and equity are given in the exercise and the adjusted present value method assuming debt is fixed when the tax shields are given. The methods do not give the same answer, which depends on the financing rule. The Miles-Ezzell formula is used with the adjusted present value method to give a more exact answer when the debt-to-equity ratio is kept constant. If the debt-to-equity ratio is constant instead of the debt being fixed, the yield on the debt affects the value of the firm. The final exam does *not* cover these items, but you should be aware of them if you deal with capital structure at work.}

Jacob: If I take the CAS transition exam, what should I know about this subject?

Rachel: This subject is difficult. For items that have a market value, we need a valuation method that supports the market value.

- The Black-Scholes formula gives market values that accord with empirical trading of options; this gives us confidence that the Black-Scholes formula is correct.
- Stocks with high unique risk but low systematic risk do not seem to have high returns; this supports the modern portfolio theory perspective on systematic risk.
- The effect of interest rate movements on bond prices is worked out by discounted cash flow procedures; the bond markets support the theory.

Some subjects are clear. We may not have empirical evidence supporting the theory, but few theorists dispute the theory.

- The dividend growth model gives the value of a stock. We rarely know the dividend growth pattern or the market capitalization rate, so we can't test the theory. But the capitalization rate, by definition, is the rate that gives the observed stock price, so we assume the formula is correct.
- Some assumptions about the effects of taxes on investment strategy are hard to test, since tax rates vary by investor and by type of investment. But the theory is not

disputed; taxes paid to the government are not received by the investor, so the value of the investment is reduced by the cost of the taxes.

Capital structure in the presence of positive corporate taxes, costs of bankruptcy, principal agent problems, and other market imperfections are difficult to explain or to justify. The empirical evidence does not support any one theory, reflecting both the uncertainty in our understanding and the lack of good data. Brealey and Myers posit that the adjusted present value depends on the firm's financing position: is the debt fixed or does it vary with the value of the project? In practice, neither assumption is correct: a firm has dozens or hundreds of projects, and it deals with each financing issue as it comes up.

Illustration: General Motors produces dozens of vehicles; at any time, it has hundreds of projects that are financed partly by debt and partly by equity. Debt issues are not tied to specific projects. Each project has a finite life, but we don't know whether it is five years or fifty years. We do not know if GM intends its debt financing for a given project to be fixed or to vary with the value of the project, since GM doesn't think of its debt in this fashion. Its debt strategy is a corporate decision, based on its views of the optimal mode of financing at that time.

For the Brealey and Myers theory, the adjusted present value depends on the financing rule. It might seem that we can evaluate the financing perspective by seeing which projects GM accepts.

- Before the project is accepted, GM has only a vague idea of the probable cash flows. Outside academicians, like Brealey and Myers, do not even know what projects GM is considering; they surely have no idea of the probably cash flows.
- Some academicians use hind-sight measures, assuming that the realized cash flows are good proxies for the expected cash flows. But we don't know the realized cash flows for a specific project even in hind-sight. Cash flows are not shown separately by project in GM's financial statements, and most cash flows can't be separated by project even if we are given more data. Research, marketing, overhead, and most expenses cannot be easily separated by project.

The empirical evidence does not seem to support the aggregate theory, since firms seem to have too little debt and too much equity to optimize their operations. The uncertainties in principal agent problems and other capital market imperfections are so great that we don't know that the empirical evidence says.

We remain with theory, and the theory is disputed. We might say: "Given certain assumptions and modes of corporate behavior, firms will do the following." But we don't know if the assumptions are correct, and we don't know if firms behave as we posit, so the predictions are often guesses.

Jacob: Do you mean that the capital structure modules are not important?

Rachel: Just the opposite. The CFO must say whether a particular financing method is good. With just equity financing, we say: "Check the net present value." With both debt

and equity financing, we must say: "Examine the present value adjusted for taxes, costs of bankruptcy, principal agent problems, and other capital market imperfections." We may not know the proper method to derive the adjusted present value, but we have theories. Theories that are closer to the truth make more successful firms.

Brealey and Myers do not wish to give an impression that they know the answer. They know more than most other analysts, but they are not arrogant. They say: "Here are several theories and several methods."

A good examiner, who understands the subject well, carefully states the assumptions. Most examiners are recent Fellows, who read the text and compose an exam problem. They do not always couch the problem as Brealey and Myers would, and some of the past Course 2 problems on capital structure are ambiguous. We show some past problems on the discussion forum, but we do not know what future examiners will ask.