Finance 440 - Turbo Finance

Topic 10
Investment and Financing Decisions

Goals for Topic 10

Complete the circle: tie the valuation implications of financing back to project selection
Calculate Adjusted Present Values and Weighted-Average Cost of Capital
Outline of Topics

• Capital Structure and Investment
• Adjusted Present Value
• Debt Capacity
• Adjusted Discount Rates; WACC

I. Capital Structure and Investment

• Previous approach: value projects using discounted cash flows; discount rate is risk-adjusted.
• But… financing can affect valuation.
• So… shouldn’t we take project financing into account when we evaluate projects?
  
  YES!
II. Adjusted Present Value

Principle: Cut valuation into a perfect markets benchmark, plus adjustments for financing.

- With tax adjustments, we used
  \[ V_L = V_U + \text{PV(tax shields)} \]
  \[ - \text{PV(expected finance-related costs)} \]
- More generally, use this method for each project
  \[ \text{APV} = \text{NPV(perfect markets)} \]
  \[ + \text{PV(expected finance-related benefits & costs)} \]

These costs of financing may be direct costs, as in the following example….
Example 10-1: Perfect markets benchmark NPV

A project that costs $7 million returns $1.45 million after-tax cash flow per year for 10 years. Its beta is 1.5, the risk-free rate is 6% and the expected return on the market is 12%. The firm's tax rate is 34%.

*What is the project's base-case NPV?*

Suppose the firm must issue equity to raise cash to fund this project, and suppose investment bankers charge 6% of the gross proceeds. There are no other costs or benefits associated with the financing.

*What is the project's APV?*
III. Debt Capacity

- Most interactions between investment and financing relate to indirect costs and benefits, such as tax shields.

- Given the costs and benefits of debt financing, we refer to the optimal (not maximum) amount of debt that could be carried by a project as its debt capacity.

- In principle, the project’s debt capacity is the amount by which the firm’s debt level is optimally increased as a result of undertaking the new project, given the rest of the firm’s financial structure.

- In practice, this could be very complicated to determine.

- A practical approximation is to view debt capacity as the amount of debt optimally taken on to finance the project as if the project were a mini-firm.
Example 10-2: Corporate Taxes Only

Modify the original project. Ignore the issuing costs and assume that the project costs $7 million and has inflows of $1.45 million after taxes in perpetuity. Assume the project’s debt capacity is 40% of its present value (not its NPV). The company plans to maintain this debt capacity indefinitely. The firm’s tax rate is 34%. Calculate the project’s APV.

Example 10-3: Personal and Corporate Taxes

Same as above, only now τ_{pe} = .14 and τ_{pd} = .28. Then

\( T^* \), the relative tax advantage of debt, is reduced to
III. Debt Capacity and APV

• The APV approach views the project as having two components, the asset component and the financing component;
  – the NPV of the “whole” project is the sum of the NPVs of these components.
• The APV approach is flexible because whatever you believe the financing related cash flows to be (issue costs or debt-tax shields, perpetual or finite), you can discount their value and add it to the project’s base-case NPV. This works every time.

IV. Adjusted Discount Rates

• The adjusted discount rate approach to valuing projects involves adjusting the discount rate to reflect tax benefits, and then discounting the asset component of the project’s after-corporate-tax cash flows at this adjusted rate.
Adjusted Discount Rates: WACC

The weighted-average cost of capital is the most popular of these approaches, WACC is calculated as

\[ WACC = \left( \frac{E}{V} \right) r_E + \left( \frac{D}{V} \right) (1 - T^*) r_D \]

where \( T^* \) is the tax advantage of debt. If only corporate taxes are considered \( T^* = \tau_c \). With corporate and personal taxes, \( T^* \) is smaller (remember why?)

After-corporate tax cash flows of the project are then discounted at the WACC rate.

• There are several other popular formulas for adjusted discount rates which in some cases are equivalent to WACC.
• A useful one is the Modigliani-Miller formula:

\[ r^* = r_{EU}(1 - T^*L) \]

where \( L = \frac{D}{V} \). Since \( r_{EU} = r_A \), this formula can be useful when we know a company's WACC (which can be taken to equal \( r^* \)), but we need to know the required return on their assets, \( r_{A^*} \).
• Remember, the APV approach always works.
• WACC and APV agree only in special circumstances.

(1) the project’s capital structure (debt capacity) is the same as the firm’s;
(2) the debt is perpetual; and
(3) the risk of the project is the same as the risk of the comparison firm’s projects.

Unless these circumstances are true, the WACC approach is only an approximation!

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**Example 10-5: WACC**

A firm has 100,000 shares outstanding, a price per share of $50 and $1 million in riskless debt. The expected return on their equity is 11%, and the riskless rate is 4%. The corporate tax rate is 34% and there are no personal taxes.

(a) **What is the firm's WACC?**
The firm has access to a new project that requires an investment of $200,000 and has an expected before-tax cash flow of $60,000 per year, forever. The new project has the same business risk as the current projects in the firm. However, it cannot support as high a proportion of debt. Suppose that if the project is adopted it will be financed with $180,000 in new equity and $20,000 in new perpetual debt.

What will the share price be?

To find the project value, we cannot use WACC because the capital structure of the project differs from that of the firm.

The right approach is to find \( r_A \), and then use an APV approach to evaluating the project.

Find the return on assets,

The APV of the project is:
Example 10-6

A project costs $700 and produces perpetual before-tax cash flows of $200. The project’s beta-risk-adjusted expected return is \( r_a = 20\% \).
The project provides the firm with $500 perpetual debt capacity; the firm’s tax rate is 35%. Ignore personal taxes. **Compute the project’s NPV using the APV approach.**

Alternatively, suppose you did not know the project’s beta, but instead know of a firm whose assets and capital structure are the same as the project’s. The firm’s capital structure consists of 39.4% equity and 60.6% debt.\(^1\) If the firm’s debt is riskless, then its \( r_D = 10\% \). Using historical data on equity returns or the firm’s equity beta and the CAPM, you could estimate that \( r_{EL} = 29.97\% \).

[I know what this value has to be since I know that \( r_a = 20\% \) for this firm (see equation (7) in the appendix to the notes); in practice, the 29.97% would have to be estimated because \( r_a \) is not known. If \( r_a \) were known, you would simply use the APV approach.]
Compute the project’s NPV using the WACC approach.

V. Summary

- Key Concepts
- Definitions
- Notation
**Key Concepts**

Adjusted Present Value divides valuation into a perfect markets benchmark, plus adjustments for financing:

\[
APV = \text{NPV(perfect markets)} + \text{PV (expected finance-related benefits & costs)}
\]

The Adjusted Discount Rate approach (such as WACC) adjusts the discount rate for financing effects (like taxes) and then discounts cash flows using this adjusted discount rate. This is only equivalent to APV in certain circumstances.

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**Definitions**

The **optimal (not maximum)** amount of debt that could be carried by a project is its **debt capacity**.
Notation

\[ WACC = \left(\frac{E_L}{V_L}\right) r_E + \left(\frac{D}{V_L}\right)(1 - T^*) r_D \]

The Modigliani-Miller formula:
\[ r^* = r_{EU}(1 - T^*L), \text{ where } L = \frac{D}{V_L}. \]

\[ r_{EL} = r_A + \left(\frac{D}{E_L}\right)(1 - T^*)(r_A - r_D). \]