

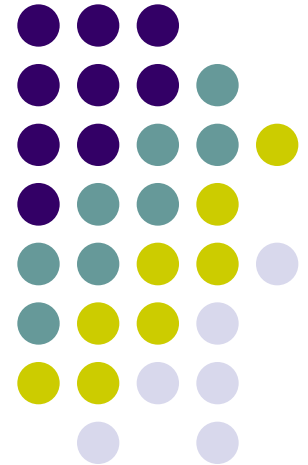
Corporate Finance

Lecture 10: Valuation & Capital Budgeting for Levered Firms

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Outlines

Three approaches to value levered firms/projects

Applicational details of the WACC approach

- Unlever-Lever

Divisional cost of capital

- Pure play



Valuation for Levered Firms

Valuation in presence of debt financing:

- **Adjusted Present Value Approach**
- **Flows to Equity Approach**
- **Weighted Average Cost of Capital Approach**

Same foundation: *Discount Cash Flow*

- Match cash flows with the proper discount rate

Same valuation approaches apply to capital budgeting.



1. Adjusted Present Value

$$APV = NPVU + NPVF$$

- The value of a project to the firm can be thought of as *the value of the project to an unlevered firm (NPVU)* plus the *present value of the financing side effects (NPVF)*.
- There are four **side effects of financing**:
 - The *Tax Shield* of Debt
 - The Costs of *Issuing* New Securities (flotation costs)
 - The Costs of Financial *Distress*
 - *Subsidies* to Debt Financing (borrow at tax-free rate from government)



2. Flow to Equity Approach

- Discount the *cash flow* from the project to the equity holders of the levered firm at the cost of levered equity capital, r_E .
- There are three steps in the FTE Approach:
 - Step One: Calculate the levered cash flows (LCFs)
 - $LCF = PCF - \text{After-tax Interest Expenses}$
 - Recall: $PCF = (S - C - D) \times (1 - t) + D - \text{Capex} - \Delta NWC$
 - Step Two: Calculate r_E .
 - Step Three: Value the levered cash flows at r_E .



3. WACC Approach

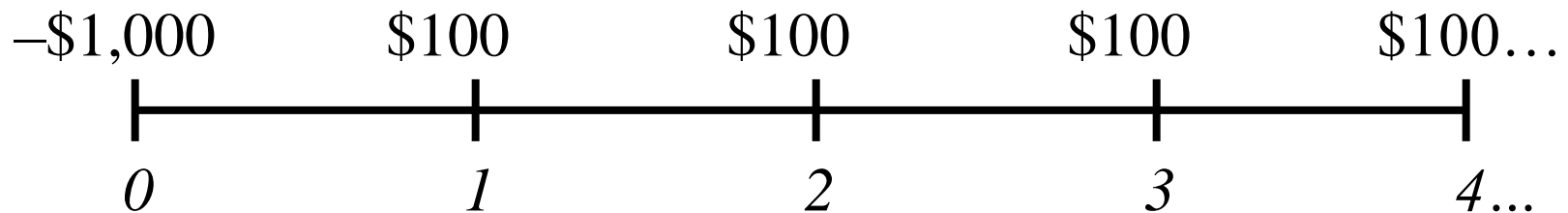
$$WACC = \frac{D}{V} \cdot (1 - \tau) \cdot r_D + \frac{E}{V} \cdot r_E$$

- To find the value of the project, discount the unlevered cash flows (free cash flow) at the weighted average cost of capital.
- In practice, the WACC Approach, by far, is the most widely used valuation method.



Example: Three Approaches

Consider a project of the Pearson Company. The timing and size of the incremental *after-tax cash flows* for an all-equity firm are:



The *unlevered cost of equity* is $r_A = 10\%$.

Project NPV for all-equity firm is $-\$1,000 + \frac{\$100}{10\%} = \$0$.



Example: 1. APV Approach

- Now, imagine the firm finances the project with \$600 of permanent debt at $r_D = 8\%$.
- Pearson's tax rate is 40%, so they have an interest tax shield worth $\tau D = 0.4 \times \$600 = \240 .
- The net present value of the project under leverage is:
- $APV = NPVU + NPVF = \$0 + \$240 = \$240$.
- So, Pearson should accept the project *with debt*.



Example: 2. FTE Approach

Step One: Calculate the levered cash flows (LCFs)

- Since the firm is using \$600 of debt, the equity holders only have to provide \$400 of the initial \$1,000 investment.
- Thus, the initial cash flow to equity holders is $CF_0 = -\$400$.
- Each period, the equity holder must pay interest expense. The *after-tax interest expense* is $\$600 \times 8\% \times (1 - 0.4) = \28.8 .
- Thus, the levered cash flow of each period is $\$100 - \$28.8 = \$71.2$



Example: 2. FTE Approach

Step Two: Calculate r_E

- First, the debt ratio of the project:
 - $V = \frac{\$100}{10\%} + 240 = 1240$;
 - $\frac{D}{E} = \frac{600}{1240 - 600} = 0.9375$
- Then, apply M&M#2: $r_E = r_A + \frac{D}{E}(1 - \tau)(r_A - r_D)$
- $r_E = 10\% + 0.9375 \times (1 - 0.4) \times (10\% - 8\%) = 11.125\%$

Step Three: Value the levered cash flows at r_E

- $NPV = -\$400 + \frac{\$71.2}{11.125\%} = \$240$



Example: 3. WACC Approach

- First, find: $WACC = \frac{D}{V} \cdot (1 - \tau) \cdot r_D + \frac{E}{V} \cdot r_E$.
- $WACC = \frac{600}{1240} \times (1 - 0.4) \times 8\% + \frac{640}{1240} \times 11.125\% = 8.0645\%$
- To find the value of the project, discount the unlevered cash flows at the weighted average cost of capital.
- $NPV = -\$1000 + \frac{\$100}{8.0645\%} = \$240$.



Summary of Three Approaches

- 1. $APV = \sum_{t=1}^{\infty} \frac{UCF_t}{(1+r_A)^t} - I_0 + NPV_F$,
 - where I_0 is the initial investment, and NPV_F is the additional value impact of debt.
- 2. $NPV_{FTE} = \sum_{t=1}^{\infty} \frac{LCF_t}{(1+r_E)^t} - (I_0 - D_0)$,
 - where I_0 is the initial investment, and D_0 is the amount borrowed.
- 3. $NPV_{wacc} = \sum_{t=1}^{\infty} \frac{UCF_t}{(1+wacc)^t} - I_0$



Applications

- Three approaches can also be applied to capital budgeting problems for the projects with non-perpetual cash flows.
 - They might not give the exact same valuation.
- WACC is the most commonly used by far.
- FTE has appeal for a firm deeply in debt.
- APV is used if the level of debt is known over the project's life.
 - APV is frequently used for special situations like LBOs and leases.



Details of Estimating WACC

- For capital budgeting decisions, we care about the expected WACC going forward.
- How to estimate WACC?
 - $$WACC = \frac{D}{V} \cdot (1 - \tau) \cdot r_D + \frac{E}{V} \cdot r_E$$
 - We need to know the expected return on equity, expected return on debt, and expected capital structures.
 - Tax rates:
 - If you are a passive analyst, use firm's current tax rate
 - If you are a decision maker, use *marginal* rather than average tax rate



1. At Target Capital Structure

When the company is close to the target capital structure:

- One can directly plug the *current debt ratios* into the WACC formula.
- For the cost of equity, one can apply the CAPM:

$$E(r_E) = r_f + \beta_E(r_m - r_f)$$

- where β_E is usually estimated from the recent stock returns.



1. At Target Capital Structure

- The **cost of debt** can be represented by the *yield-to-maturity* of corporate bonds outstanding.
- If the company has no bonds trading, one could look for the YTM of a company with *similar default risk* in the same industry.
- *Default risk* could be measured using *Altman's Z-score*, given by the following formula:

$$Z = 0.012 * (\text{Working Capital} / \text{Total Assets}) + 0.014 * (\text{Retained Earnings} / \text{Total Assets}) + 0.033 * (\text{EBIT} / \text{Total Assets}) + 0.006 * (\text{Market Value of Equity} / \text{Book Value of Total Liabilities}) + 0.009 * (\text{Sales} / \text{Total Assets}).$$



2. Changing Capital Structure

- However, if the *recent* capital structure is very *different* from the *target* capital structure, then other methods are needed.
- This is because the *beta of equity that we estimate at today's capital structure* will be very different from its value *at the target capital structure*.
 - Implicit assumption: capital structure converges to the target level in the near future.
 - Thus, the cost of equity we estimate using current beta will be very different than when the debt ratio is at the target level.



2. Changing Capital Structure

- We can adopt the concept of expected return of unlevered equity, $E(r_A)$.
- Recall:

$$WACC = r_A \cdot (1 - \tau \cdot \frac{D}{V})$$

- If we know expected r_A and the target level of $\frac{D}{V}$, we can find out WACC under the target capital structure.



Unlever-Relever Approach

1. Estimate r_E and r_D under current capital structure

- r_E usually by estimating β_E using recent past returns and applying CAPM
- r_D usually using the average interest rate of current debts; if no debt outstanding, using the interest rate of comparable firms

2. **Un-lever**: find r_A according to M&M#2

- $r_E = r_A + \frac{D}{E} (1 - \tau)(r_A - r_D)$
- Note D/E is the current leverage ratio

3. **Re-lever**: find WACC under the new capital structure

- $WACC = r_A \cdot (1 - \tau \cdot \left(\frac{D}{V}\right)')$
- Or, $r_E' = r_A + \left(\frac{D}{E}\right)' (1 - \tau)(r_A - r_D)$ and $WACC = \left(\frac{E}{V}\right)' r_E' + \left(\frac{D}{V}\right)' r_D (1 - \tau)$
- Note (D/E)' or (D/V)' refer to the new capital structure