

FINA 3070 Notes 3B

Ian Y.E. Pan

2020

1 r v.s. WACC

- $r = \text{WACC}$ if new project is 'similar' to 'existing' projects of the firm. I.e. if new project's beta and financial leverage are similar to the average of existing project's beta and financial leverage.

1.1 Betas & Operating Leverage

- If new project's "asset beta" differs from existing project's "asset beta": use formulae (later chapters) to calculate r .
- Average existing project's equity beta = firm's common stock beta. We can calculate average existing project's "asset beta" using company's financial leverage and the formulae.
- After we get average existing asset beta, we estimate new project's "asset beta" by comparing new and exiting projects for:

1.1.1 Cyclicality

- the higher sensitivity of CF or revenue to the economy, the higher the revenue beta. We should demand a higher rate of return from investments whose performance is strongly tied to the performance of the economy.

1.1.2 Operating leverage

- High operating leverage means: high fixed costs (e.g. property taxes, contract worker wages) relative to variable costs (e.g. raw materials, labour/maintenance cost).
- $\text{CF} = \text{revenue} - \text{fixed cost} - \text{variable cost}$

- $PV(\text{asset}) = PV(\text{revenue}) - PV(\text{fixed cost}) - PV(\text{variable cost})$
- By rearranging, we get $PV(\text{revenue}) = PV(\text{asset}) + PV(\text{fixed cost}) + PV(\text{variable cost})$

1.1.3 More on betas

- Thus, the beta of $PV(\text{revenue})$ is just the weighted average of its 3 components:
- $$\beta_{\text{revenue}} = \beta_{\text{fixed cost}} \cdot \frac{PV(\text{fixed cost})}{PV(\text{revenue})} + \beta_{\text{variable cost}} \cdot \frac{PV(\text{variable cost})}{PV(\text{revenue})} + \beta_{\text{asset}} \cdot \frac{PV(\text{asset})}{PV(\text{revenue})}$$
- Debtholders receive fixed cost, and shareholders receive NCF (what's left after payment of fixed cost).
- We can assume that the beta of fixed-cost should be close to zero (no risk for debtholders). We can also assume that betas of the revenues and variable costs should be approximately the same.
- Therefore, we can rearrange and substitute and get: $\beta_{\text{asset}} = \beta_{\text{revenue}} \cdot \left(1 + \frac{PV(\text{fixed cost})}{PV(\text{asset})}\right)$

1.2 Two Different Discount Rates

- So far, we've used one r to discount net cash flows: so costs and revenues are discounted with same rate.
- But, if operating costs have lower systematic risk than revenues, we should use 2 different r 's.

2 Decision Trees

- Previously, we assume we have same risk per year throughout project's life. But the risk may vary 'within' a year. (A time-varying discount rate.)
- E.g. testing phase (high systematic + normal diversifiable risk, or normal systematic + high diversifiable risk) followed by a normal phase (normal systematic and diversifiable risk).

- Good airplane example in lecture (fully understood, including options to expand/abandon).