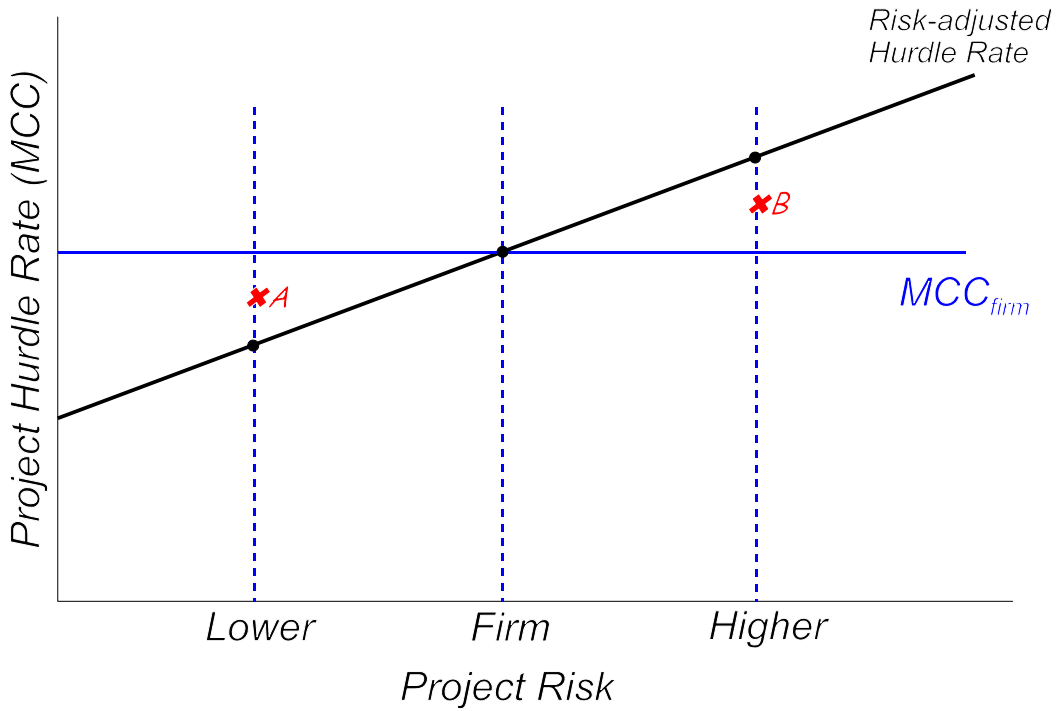
Project Risk

Issue
Which hurdle rate (MCC) to use in project evaluation?

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+\boldsymbol{MCC})^t}$$

Importance
If ignore differential project risk, over time firm will become riskier and its value will decline.



Recognizing Differential Risk

Optimal Policy
Tailor MCC to project's risk.
Use firm's MCC only if project's risk resembles firm's in *all* respects (business and financial).

What Sort of Risk?

Type	Diversification Opportunities Considered
Stand-Alone	None
Corporate	Within firm (firm as portfolio or mutual fund)
Market	All (shareholders' opportunities)

Notes: Maximizing shareholder wealth may conflict with managers' self-preservation (an agency problem).

Sensitivity analysis, scenario analysis and simulation all consider only a project's stand-alone risk.

Project's Market Risk

Investment Decision
Investors determine required rate, *just as for securities*
Project one of many possible investments

Think of project as free-standing mini-firm
Invest if expected return (IRR) $\geq$ required return (MCC)

$$k_{cs,\,proj} = k_{RF} + \beta_{proj}(k_M - k_{RF})$$

$$k_{a,\,proj} = w_{d,\,proj}(1-T)k_{d,\,proj} + w_{cs,\,proj}\,k_{cs,\,proj}$$

Measuring Market Risk
Pure play, if can find proxy firm(s)
(May be necessary to adjust for their varying degrees of leverage.)
Accounting *β*, if can't find proxies

Business and Financial Risk: Concepts

$$Market\ Risk = Business\ Risk + Financial\ Risk$$

Business Risk

Risk of common shareholders' returns, if firm uses *no debt*

Determined on asset (left) side of balance sheet, by investment decisions

- Industry
- Production Technique

Measured by β_U, the unlevered, all-equity or asset beta

Financial Risk

Extra risk of common shareholders' returns, if firm finances with debt

Determined on claims (right) side of balance sheet, by financing decisions

- Financial Leverage, i.e., *fixed-cost* financing (e.g., debt, leases)

Measured by effect it has on beta ($\beta - \beta_U$)

Business and Financial Risk: Measurement

$$Market\ Risk = Business\ Risk + Financial\ Risk$$

$$\beta = \beta_U + (\beta - \beta_U)$$

$$\beta = \beta_U + \beta_U(1 - T_C)\left(\frac{D}{E}\right)$$

$$\beta = \beta_U\left[1 + (1 - T_C)\left(\frac{D}{E}\right)\right]$$

Notes

- β is actual, observed β. If investment all equity, $\beta = \beta_U$; otherwise $\beta > \beta_U$.
- D and E are market values of debt and equity, respectively, not book values.
- This can be simplified to

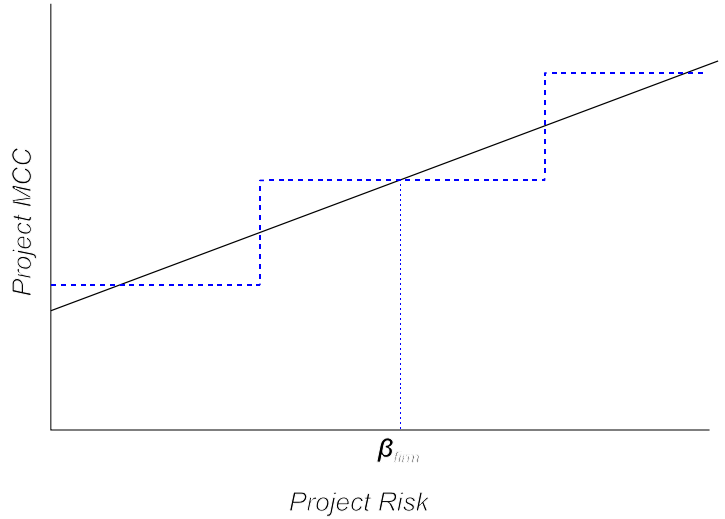
$$\beta_U = \left(\frac{E}{D+E}\right)\beta$$

What if Can't Estimate Project's β?

Approximate Project MCC (based on firm's)
Compare project risk to risk of firm's typical project
Add/subtract (ad hoc) risk premium

$$MCC_{proj} = MCC_{firm} \pm RP_{proj}$$

Project's Risk compared to Firm's	**Lower**	**Similar**	**Higher**
Project's MCC	$MCC_{firm} - RP_{proj}$	MCC_{firm}	$MCC_{firm} + RP_{proj}$



Extension: Divisional Cost of Capital

Approximate Division and Project MCCs

1. Compare division's risk to firm's, determine MCC_{div}
2. Compare project's risk to division's, determine MCC_{proj}

$$MCC_{div} = MCC_{firm} \pm RP_{div}$$

$$MCC_{proj} = MCC_{div} \pm RP_{proj}$$

		Project's Risk compared to Division's		
		Lower	**Similar**	**Higher**
Division's Risk compared to Firm's	**Higher**	$+RP_{div}$ $-RP_{proj}$	$+RP_{div}$	$+RP_{div}$ $+RP_{proj}$
	Similar	$-RP_{proj}$	MCC_{firm}	$+RP_{proj}$
	Lower	$-RP_{div}$ $-RP_{proj}$	$-RP_{div}$	$-RP_{div}$ $+RP_{proj}$