

## Project Risk

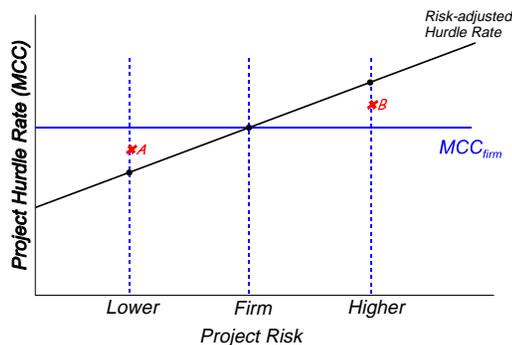
### Issue

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

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

### Importance

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



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## 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)

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

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## 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) > 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)

Accounting  $\beta$ , if can't

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## Digression: Project's Effect on Firm

### Firm as portfolio (mutual fund):

Interesting, but *not* relevant to capital budgeting decision

$$\beta'_{firm} = w_{firm}\beta_{firm} + w_{proj}\beta_{proj}$$

$$k'_{cs,firm} = k_{RF} + \beta'_{firm}(k_M - k_{RF})$$

$$k'_{a,firm} = w_d(1-T)k_d + w_{cs}k'_{cs,firm}$$

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## 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  $\beta_U$

### Financial Risk

*Extra* risk of common shareholders' returns, if firm uses 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  $\beta - \beta_U$

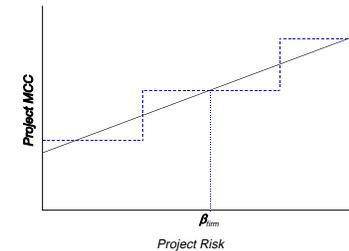
## What if Can't Estimate Project's $\beta$ ?

### 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

- Compare division's risk to firm's, determine  $MCC_{div}$
- 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	$-RP_{div} - RP_{proj}$	$-RP_{div}$	$-RP_{div} + RP_{proj}$

## Divisional Cost of Capital: Practice

### Assumptions

Firm's MCC is 13%  
 Firm adds/subtracts 2% to MCC to adjust for differential risk

Fill it in

		Project's Risk compared to Division's		
		Lower	Similar	Higher
Division's Risk compared to Firm's	Higher			
	Similar			
	Lower			