Lecture 8
Risk and Return: Capital Asset Pricing Model (CAPM)

Chapter 12/350

Topics Covered

- Different Types of Risk: Review
- Measuring Market Risk
  - Beta
- Risk and Return
  - CAPM: Capital Asset Pricing Model
- Capital Budgeting and Project Risk

Different Types of Risk

- Unsystematic risk (Unique risk) – is portion of an asset's risk which is firm specific and can be eliminated through the process of diversification.
- Systematic risk (Market risk) – is portion of an asset's risk attributed to the market factors that affect all firms and cannot be eliminated through the process of diversification.
- Total Risk = Diversifiable Risk + Non-Diversifiable Risk.

12.1.Measuring Market Risk

- Market Portfolio - Portfolio of all assets in the economy. In practice a broad stock market index is used to represent the market.
- Beta - Sensitivity of a stock's return to the return on the market portfolio. Beta is a measure of systematic risk.

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Relation between stock return and market return

(Securities market Line)

	Economy	Market return	Remico return
I	Boom	15%	25%
II	Boom	15%	15%
III	Bust	-5%	-5%
IV	Bust	-5%	-15%

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Relation between stock return and market return

Economy	Market return	Remico return
Boom	15%	25 x 0,5 + 15 x 0,5 = 20%
Bust	-5%	-5 x 0,5 + (-15 x 0,5) = -10%

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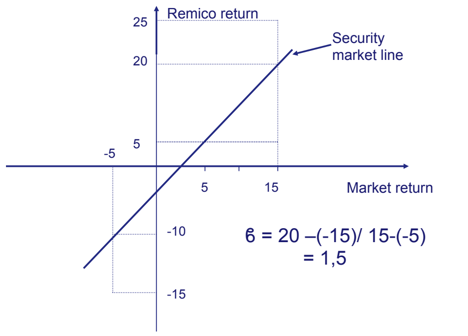
Relation between stock return and market return



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- What does beta tell us?
  - A beta = 1 implies the asset has the same systematic risk as the overall market.
  - A beta < 1 implies the asset has less systematic risk than the overall market.
  - A beta > 1 implies the asset has more systematic risk than the overall market.

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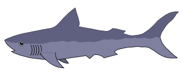
Measuring Market Risk (Contd)

<u>Example</u> – Turbo Charged Seafood has the following % returns on its stock, relative to the listed changes in the % return on the market portfolio. The beta of Turbo Charged Seafood can be derived from this information.



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Measuring Market Risk (Contd)

Example (Contd)

Month	Market Return %	Turbo Return %
1	+ 1	+ 0.8
2	+ 1	+ 1.8
3	+ 1	- 0.2
4	- 1	- 1.8
5	- 1	+ 0.2
6	- 1	- 0.8

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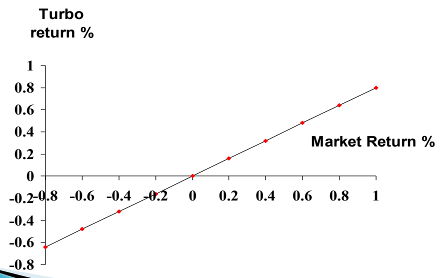
Measuring Market Risk (Contd)

Example (Contd)



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Beta

- Diversification decreases variability from unique risk, but not from market risk.
- The beta of your portfolio will be an average of the betas of the securities in the portfolio.

$$\boxed{\beta_{port} = \Sigma\, w_i \beta_i}$$

Wi: fraction of portfolio in asset I
Bi: Beta on asset i

- If you owned all of the S&P Composite Index stocks, you would have an average beta of 1.

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Ex1

Share (1)	Amount Invested (2)	Portfolio Weights (3)	Beta (4)	(3) × (4)
ABC Company	$6 000	50%	0.90	0.450
LMN Company	4 000	33%	1.10	0.367
XYZ Company	2 000	17%	1.30	0.217
Portfolio	$12 000	100%		1.034

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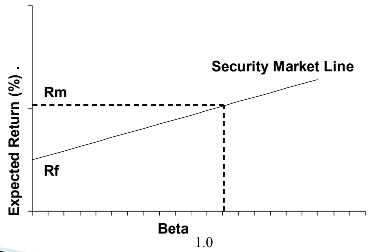
Security Market Line(SML) – The graphic representation of the CAPM.



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Beta (Contd)

Stock	Beta
Amazon	2.49
DellComputer	1.64
Ford	1.34
GE	.97
McDonald's	.90
Boeing	.76
Wal - Mart	.51
Pfizer	.46
ExxonMobil	.41
H.J.Heinz	.30

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Betas calculated with price data from January 2001 through December 2004.

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Stock Beta

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Beta of Maket Portfolio

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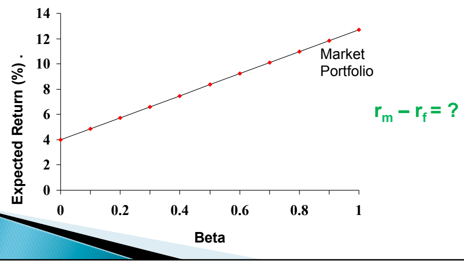
12.2.Risk and Return: CAPM

- <u>Market Risk Premium</u> – Risk premium of market portfolio. Difference between market return and return on risk-free Treasury bills: $r_m - r_f$



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CAPM (Contd)

- CAPM – Theory of the relationship between risk and return which states that the expected risk premium on any security equals its beta times the market risk premium.

$$\text{Market risk premium} = r_m - r_f$$

$$\text{Risk premium on any asset} = r - r_f = \beta(r_m - r_f)$$

$$\text{Expected Return} = r_f + \beta(r_m - r_f)$$

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CAPM (Contd)

$$ER_i = r_f + \beta_i\ (r_m - r_f)$$

Where:

ER_i: Expected return on $Stock_i$

r_f: Risk-free rate

β_i: Beta of $Stock_i$

r_m: Market Return

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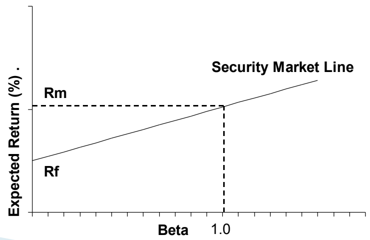
CAPM (Contd)

- Security Market Line (SML) – The graphic representation of the CAPM.



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CAMP

Example 1

Share (1)	Amount Invested (2)	Portfolio Weights (3)	Beta (4)	(3) × (4)
C Company	$16 000	50%	0.90	
N Company	14 000	20%	1.10	
Z Company	2 000	30%	1.30	
		100%		

Portfolio 6p, R_p? r_f :6%; r_m :12%

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12.3.Capital Budgeting and Project Risk

- The project cost of capital depends on the use to which the capital is being put. Therefore, it depends on the risk of the project and not the risk of the company.

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Capital Budgeting and Project Risk (Contd)

- *Example – Based on the CAPM, ABC Company has a cost of capital of 17%. [4 + 1.3(10)]. A breakdown of the company's investment projects is listed below. When evaluating a new dog food production investment, which cost of capital should be used?*

  1/3 Nuclear Parts Mfr. Beta=2.0

  1/3 Computer Hard Drive Mfr. Beta=1.3

  1/3 Dog Food Production Beta=0.6

  Average Beta of assets = 1.3

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END OF LECTURE

THANKS FOR YOUR ATTENTION!