

*Principles of  
Corporate  
Finance*

Seventh Edition

**Richard A. Brealey**

**Stewart C. Myers**

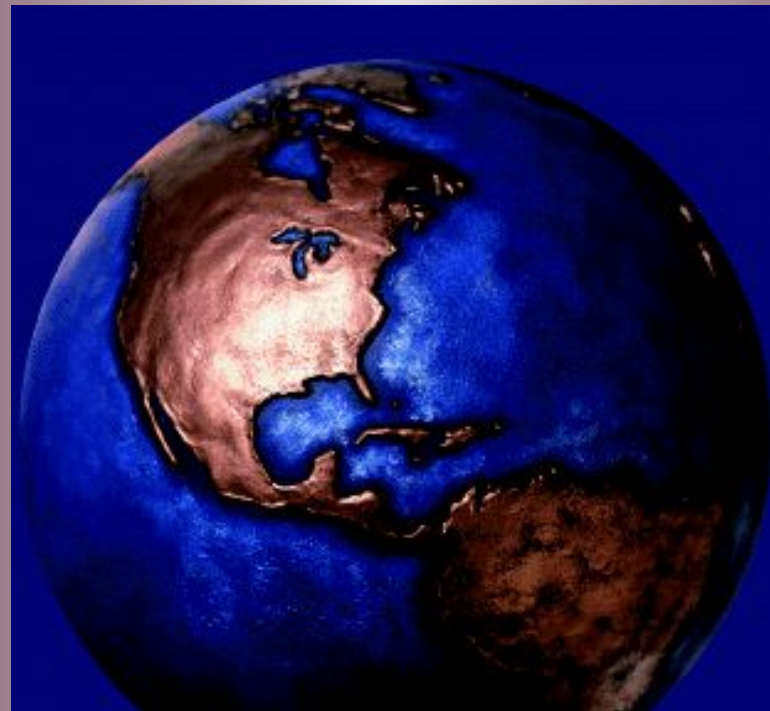
**Slides by**

**Matthew Will**

*McGraw Hill/Irwin*

# Chapter 8

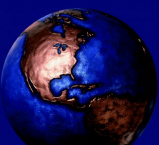
## Risk and Return



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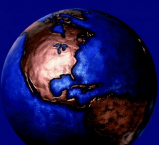
# Topics Covered

- ◆ Markowitz Portfolio Theory
- ◆ Risk and Return Relationship
- ◆ Testing the CAPM
- ◆ CAPM Alternatives



# Markowitz Portfolio Theory

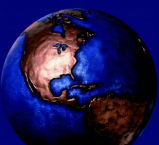
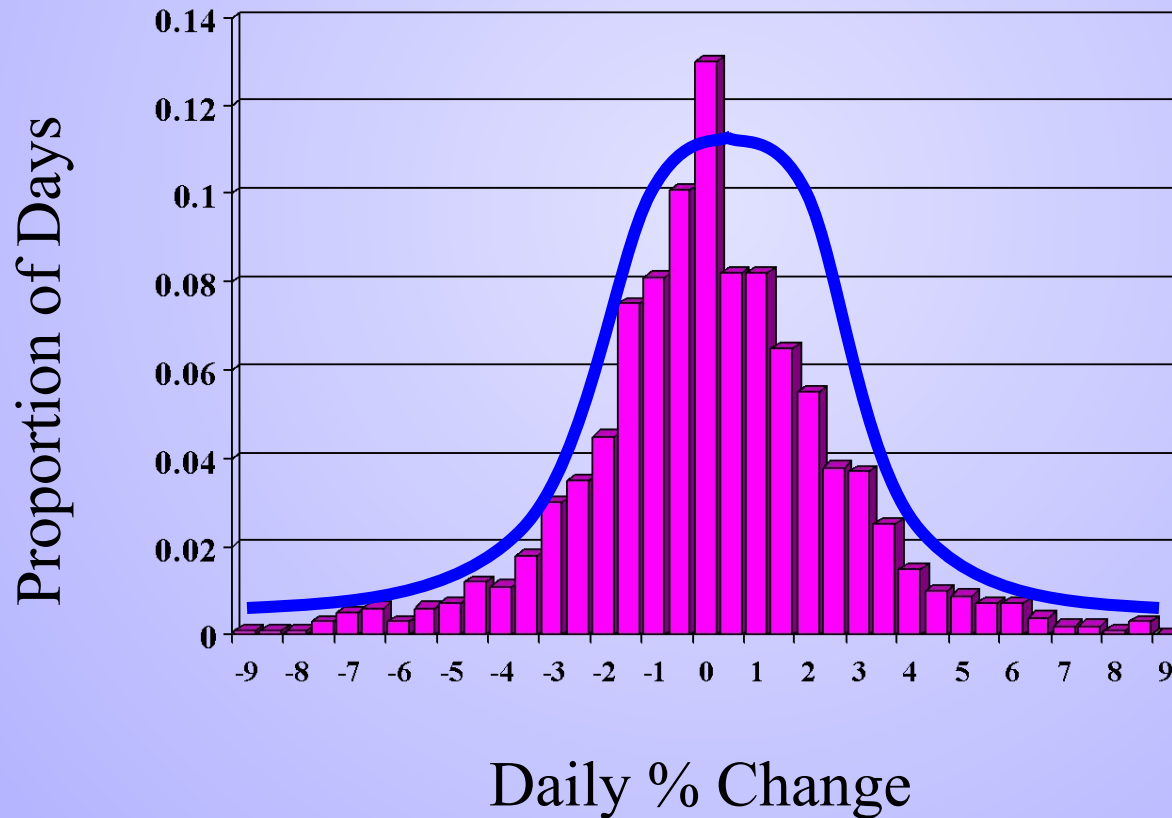
- ◆ Combining stocks into portfolios can reduce standard deviation, below the level obtained from a simple weighted average calculation.
- ◆ Correlation coefficients make this possible.
- ◆ The various weighted combinations of stocks that create this standard deviations constitute the set of *efficient portfolios*.



# Markowitz Portfolio Theory

Price changes vs. Normal distribution

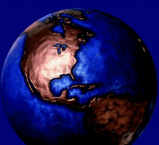
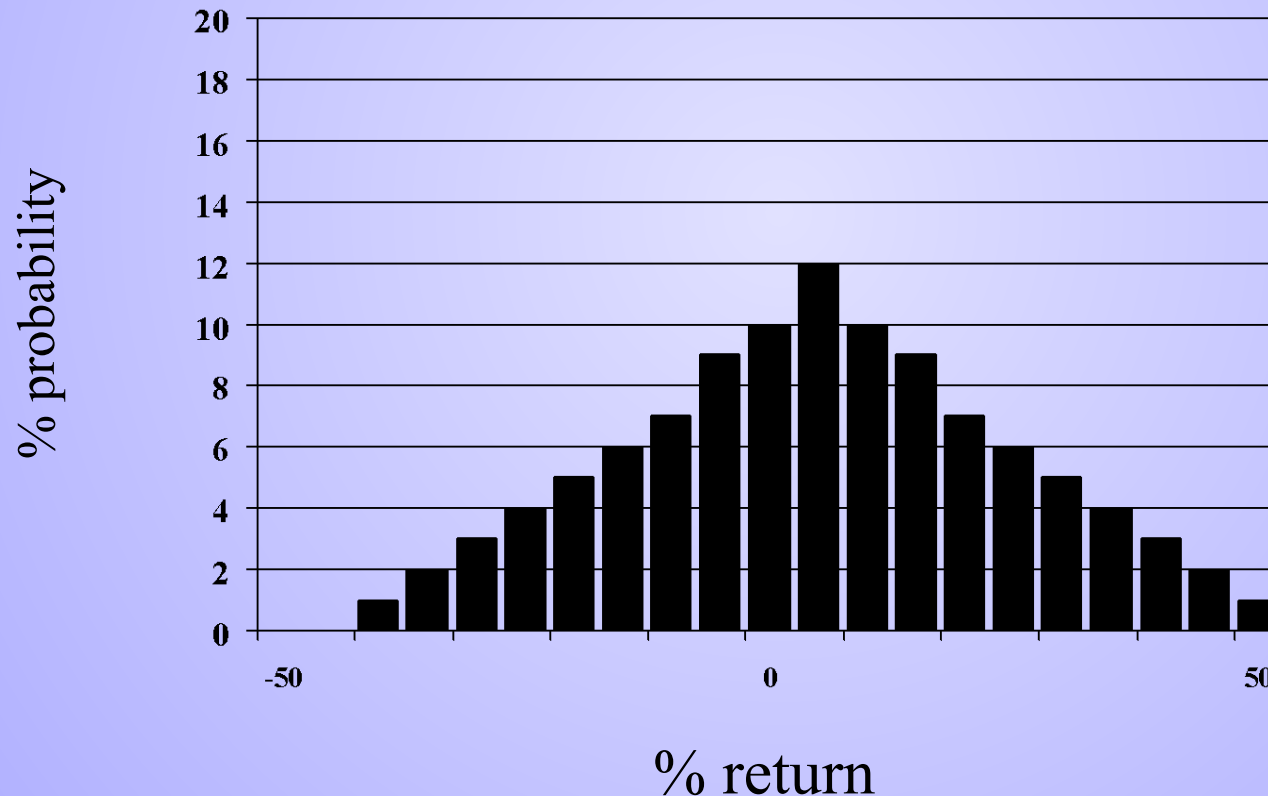
*Microsoft - Daily % change 1990-2001*



# Markowitz Portfolio Theory

## Standard Deviation VS. Expected Return

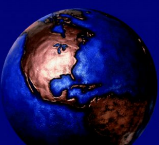
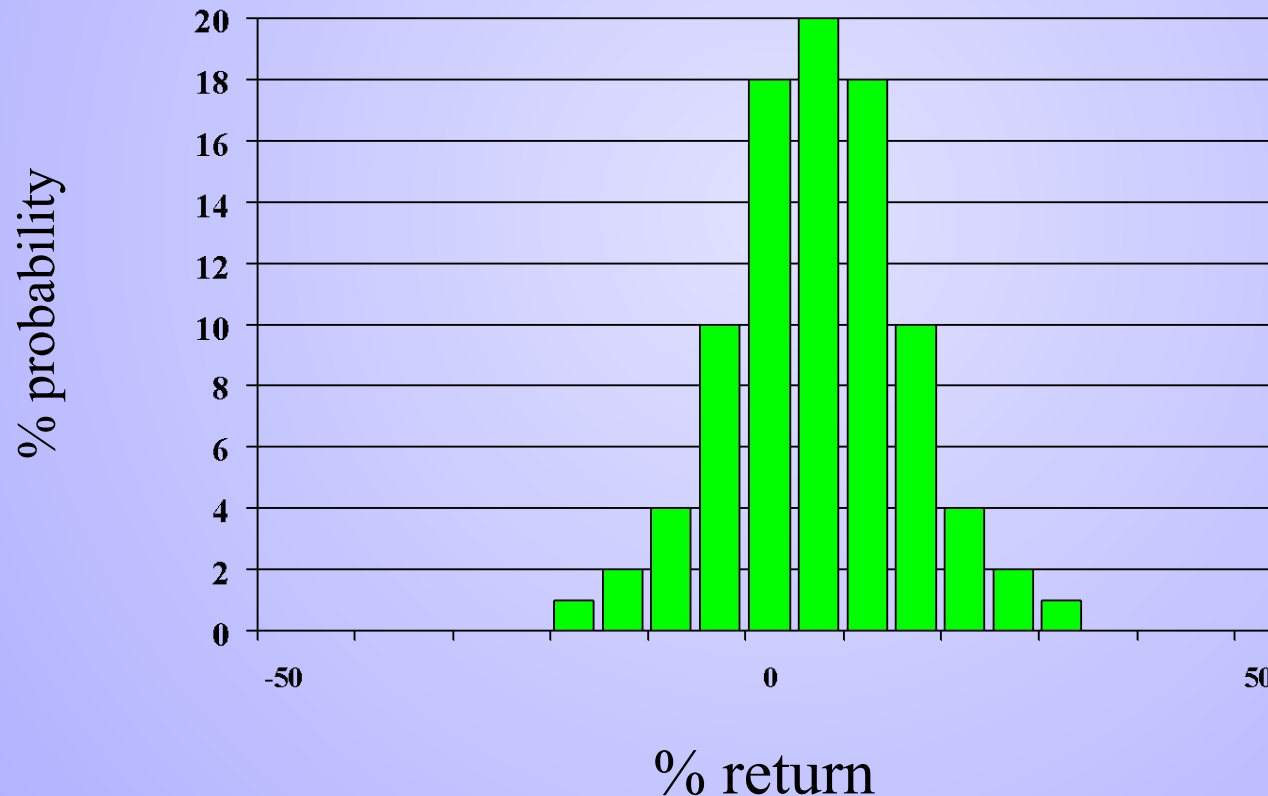
### *Investment A*



# Markowitz Portfolio Theory

## Standard Deviation VS. Expected Return

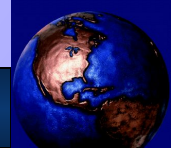
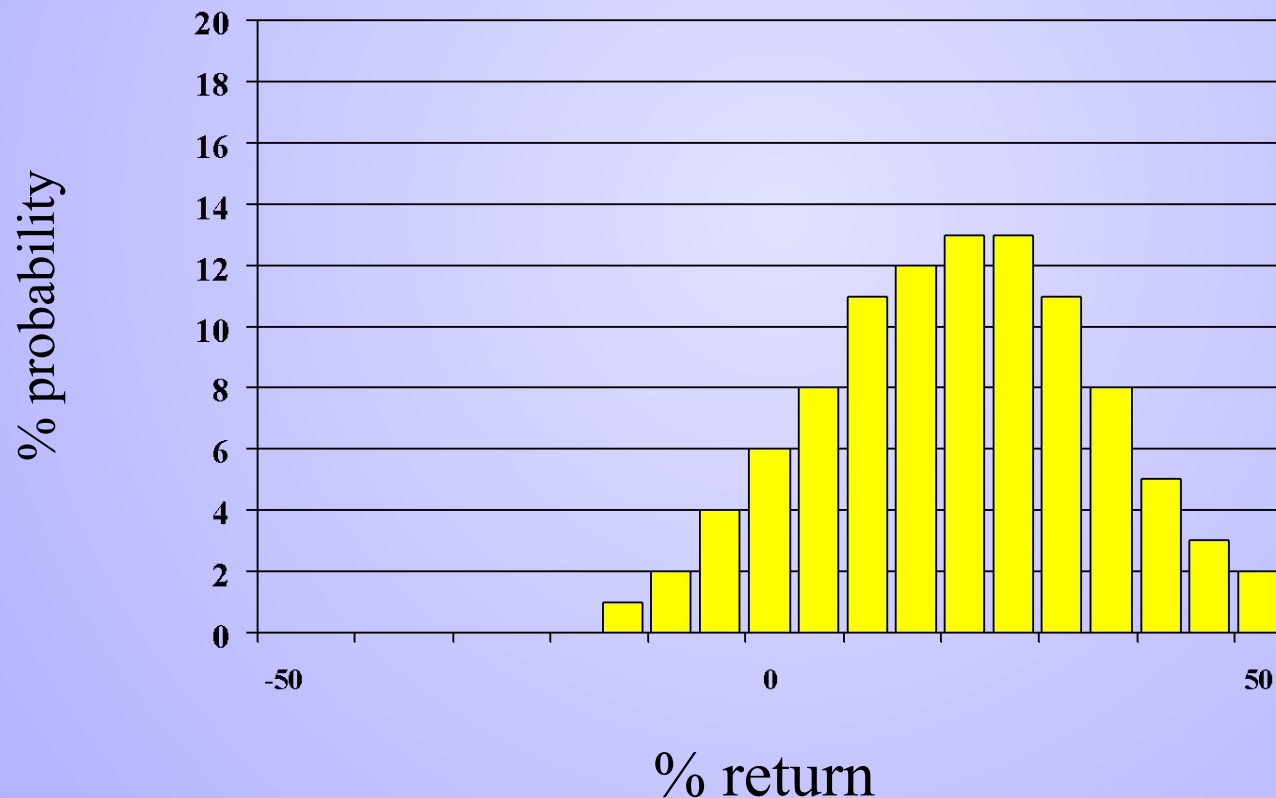
### *Investment B*



# Markowitz Portfolio Theory

## Standard Deviation VS. Expected Return

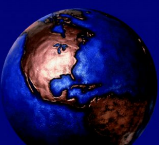
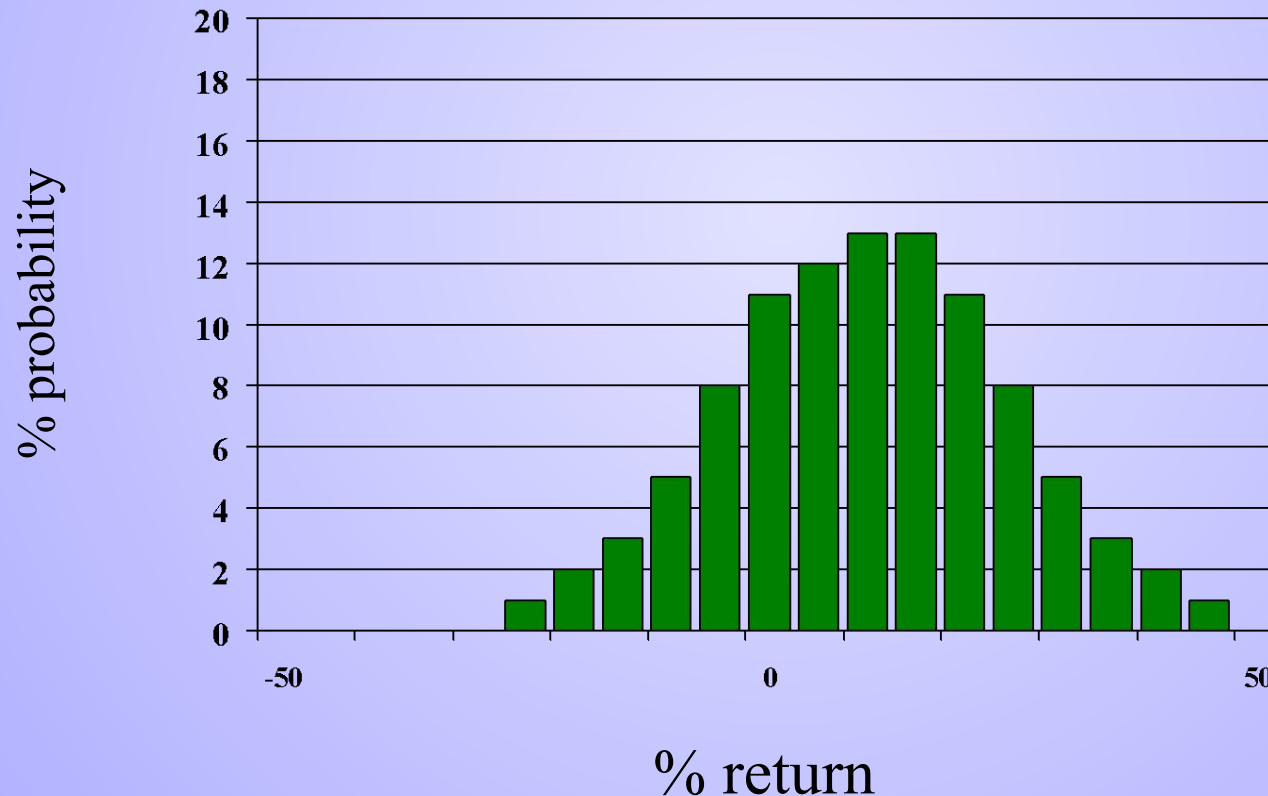
*Investment C*



# Markowitz Portfolio Theory

## Standard Deviation VS. Expected Return

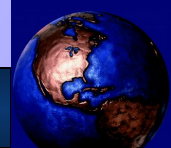
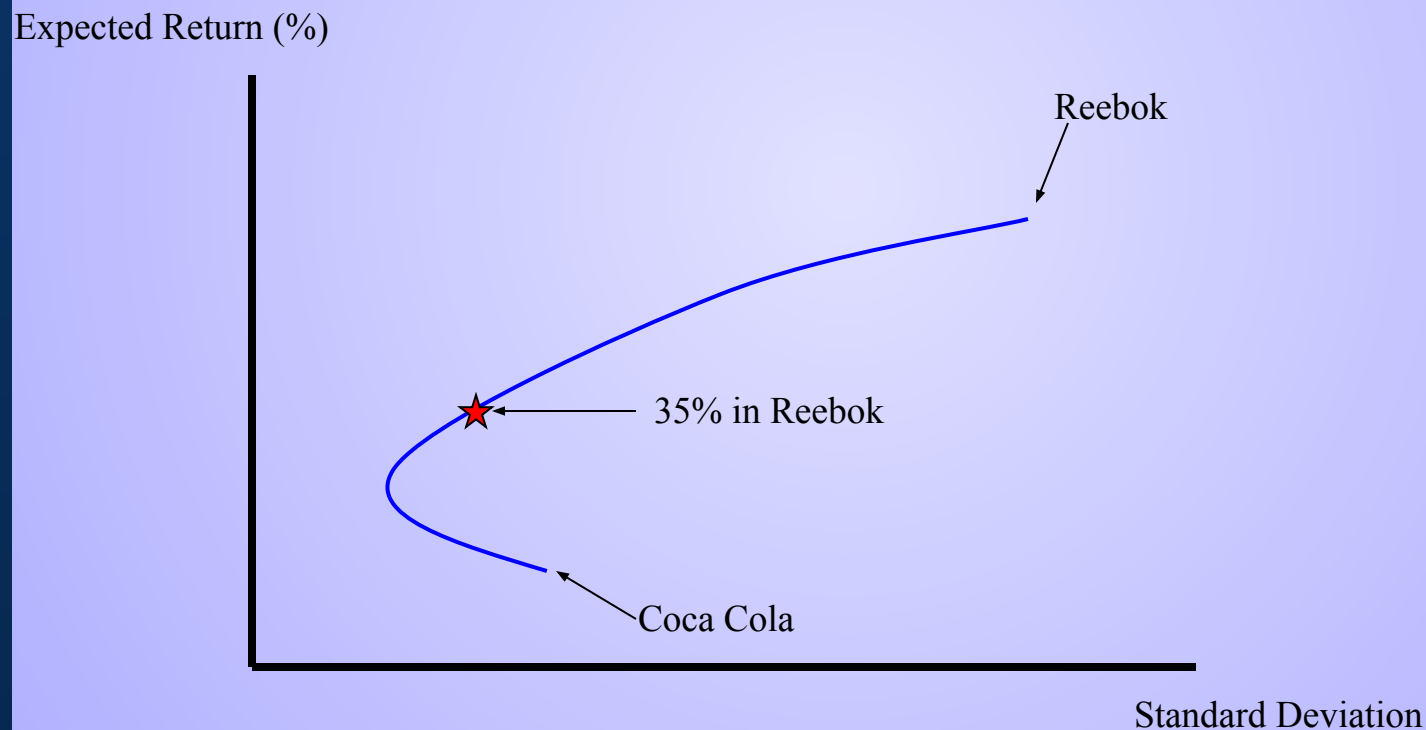
*Investment D*





# Markowitz Portfolio Theory

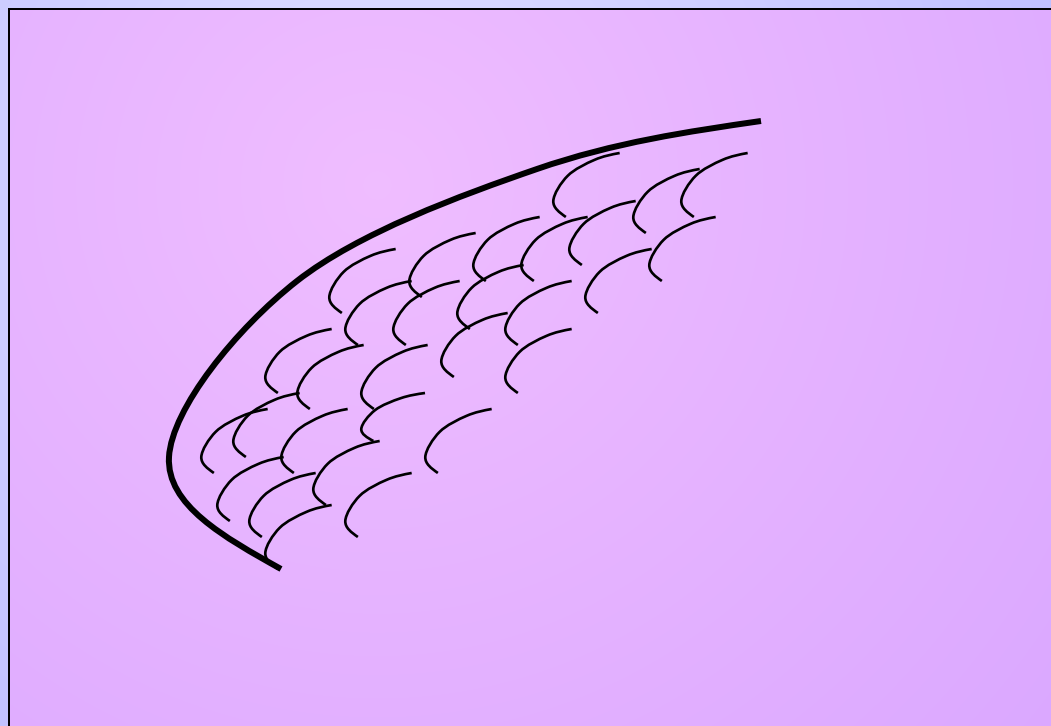
- ◆ Expected Returns and Standard Deviations vary given different weighted combinations of the stocks



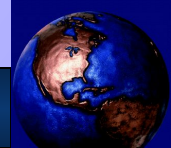
# Efficient Frontier

- Each half egg shell represents the possible weighted combinations for two stocks.
- The composite of all stock sets constitutes the efficient frontier

Expected Return (%)

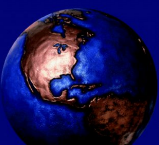
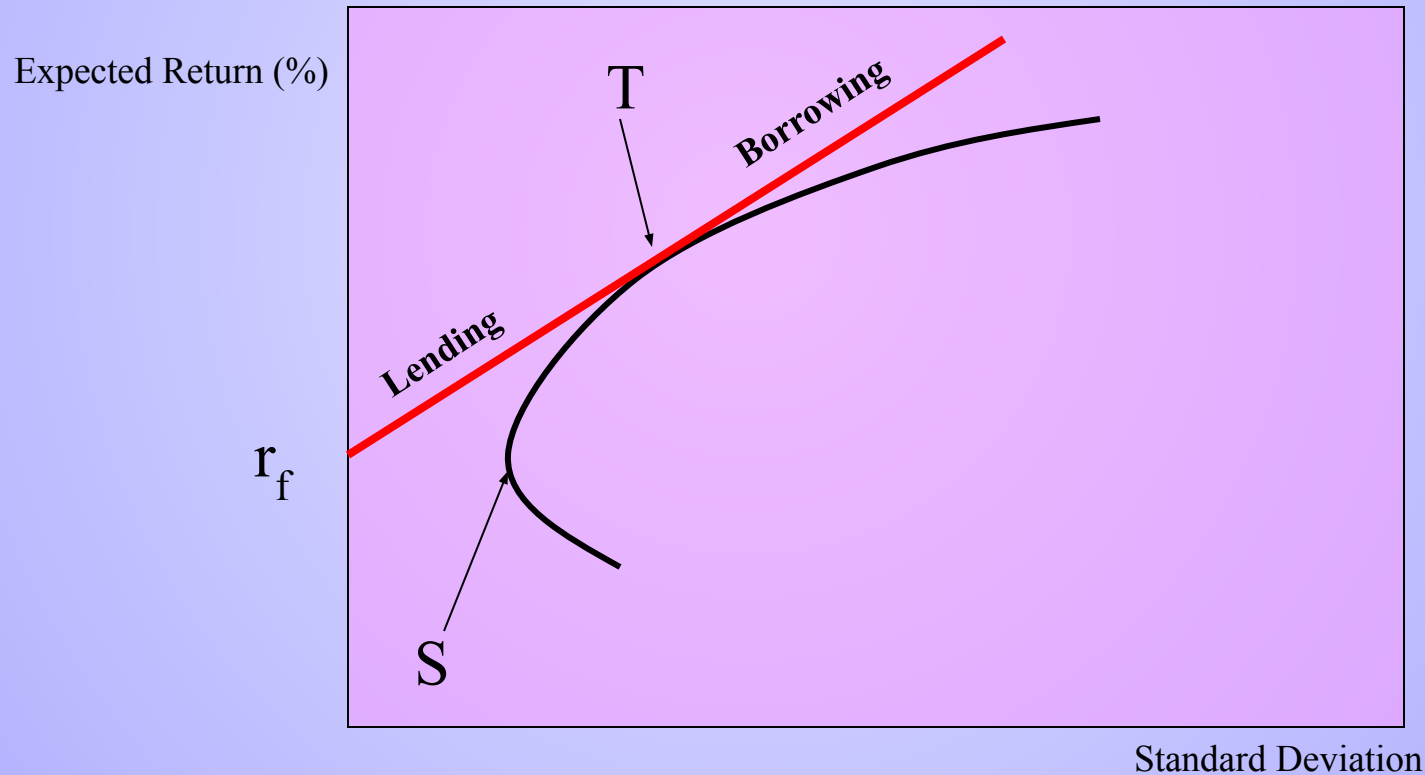


Standard Deviation



# Efficient Frontier

- Lending or Borrowing at the risk free rate ( $r_f$ ) allows us to exist outside the efficient frontier.



# Efficient Frontier

## Example

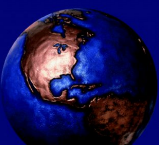
Correlation Coefficient = .4

<u>Stocks</u>	<u><math>\sigma</math></u>	<u>% of Portfolio</u>	<u>Avg Return</u>
ABC Corp	28	60%	15%
Big Corp	42	40%	21%

Standard Deviation = weighted avg = 33.6

**Standard Deviation = Portfolio = 28.1**

**Return = weighted avg = Portfolio = 17.4%**



# Efficient Frontier

## Example

Correlation Coefficient = .4

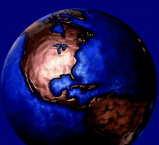
<u>Stocks</u>	<u><math>\sigma</math></u>	<u>% of Portfolio</u>	<u>Avg Return</u>
ABC Corp	28	60%	15%
Big Corp	42	40%	21%

Standard Deviation = weighted avg = 33.6

Standard Deviation = Portfolio = 28.1

Return = weighted avg = Portfolio = 17.4%

Let's Add stock New Corp to the portfolio



# Efficient Frontier

## Example

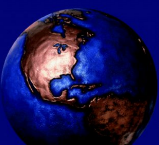
Correlation Coefficient = .3

<u>Stocks</u>	<u><math>\sigma</math></u>	<u>% of Portfolio</u>	<u>Avg Return</u>
Portfolio	28.1	50%	17.4%
<i>New Corp</i>	<i>30</i>	<i>50%</i>	<i>19%</i>

NEW Standard Deviation = weighted avg = 31.80

**NEW Standard Deviation = Portfolio = 23.43**

**NEW Return = weighted avg = Portfolio = 18.20%**



# Efficient Frontier

## Example

Correlation Coefficient = .3

<u>Stocks</u>	<u><math>\sigma</math></u>	<u>% of Portfolio</u>	<u>Avg Return</u>
Portfolio	28.1	50%	17.4%
New Corp	30	50%	19%

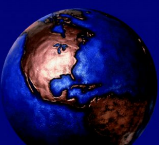
NEW Standard Deviation = weighted avg = 31.80

NEW Standard Deviation = Portfolio = 23.43

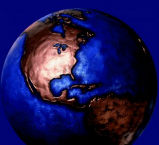
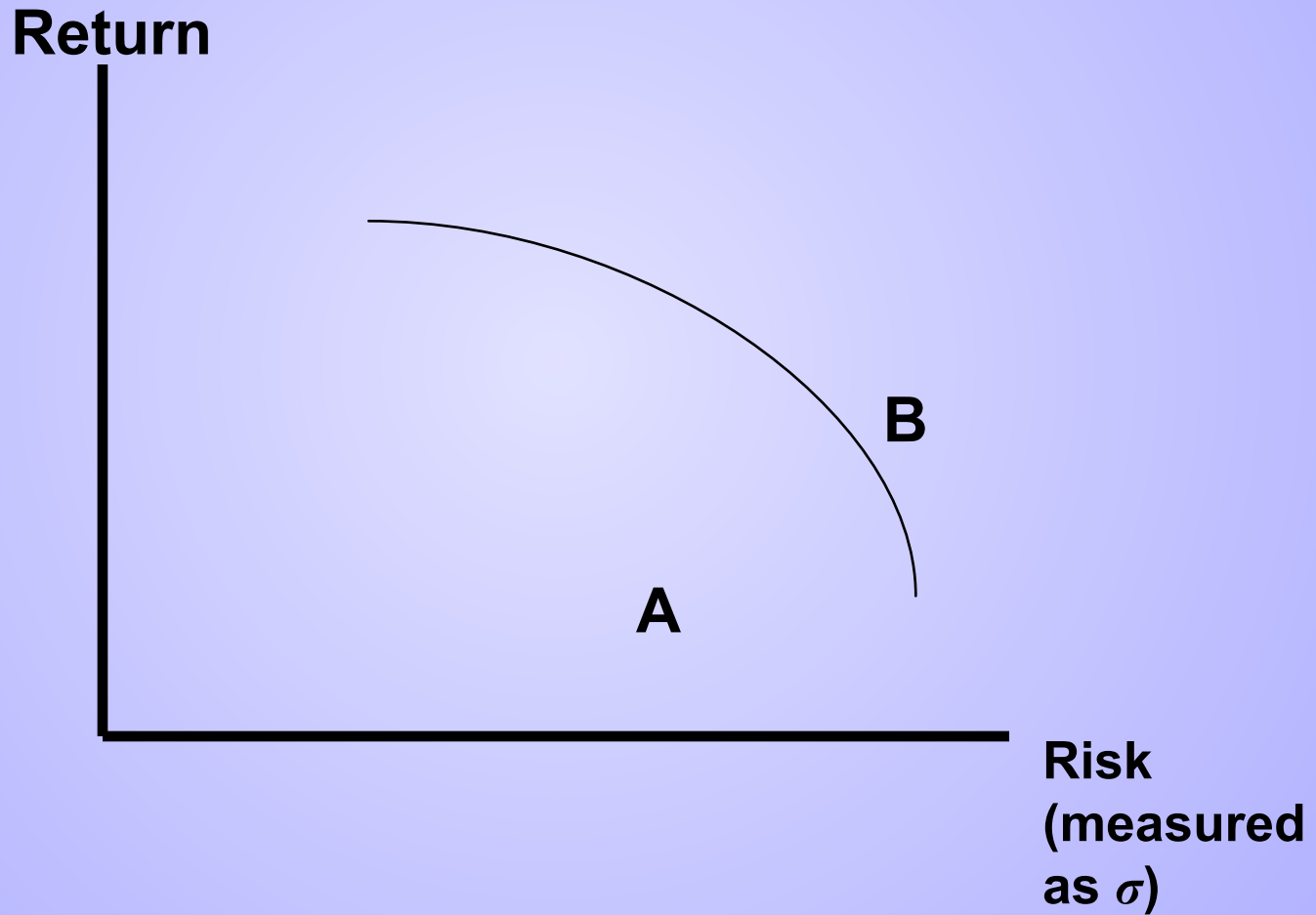
NEW Return = weighted avg = Portfolio = 18.20%

NOTE: Higher return & Lower risk

How did we do that? DIVERSIFICATION

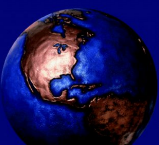
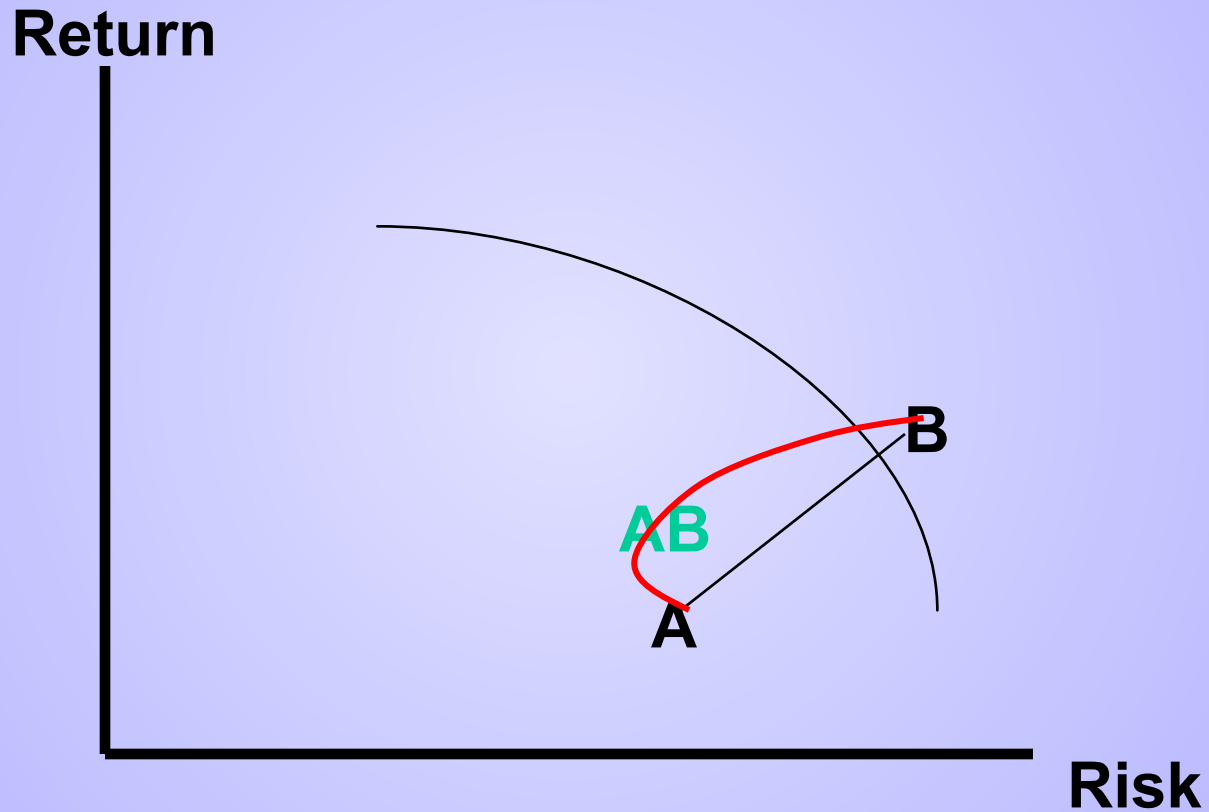


# Efficient Frontier

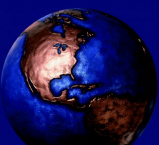
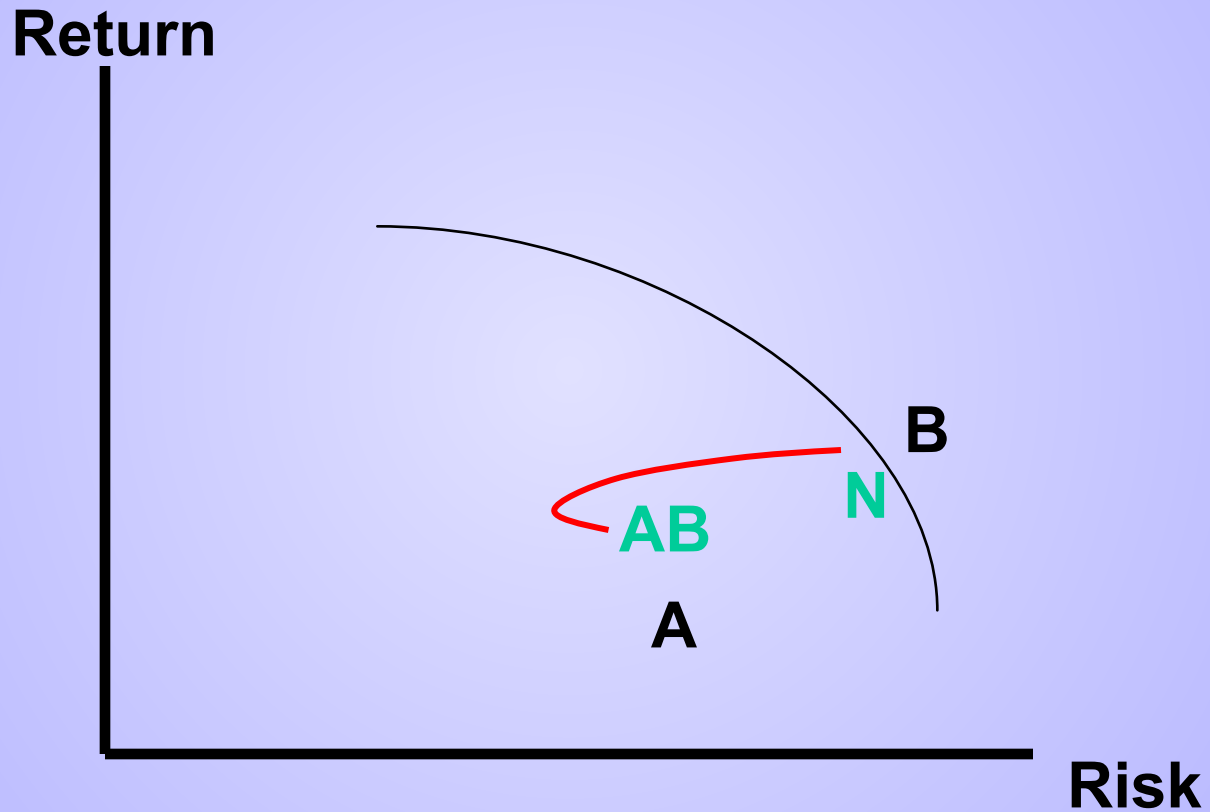




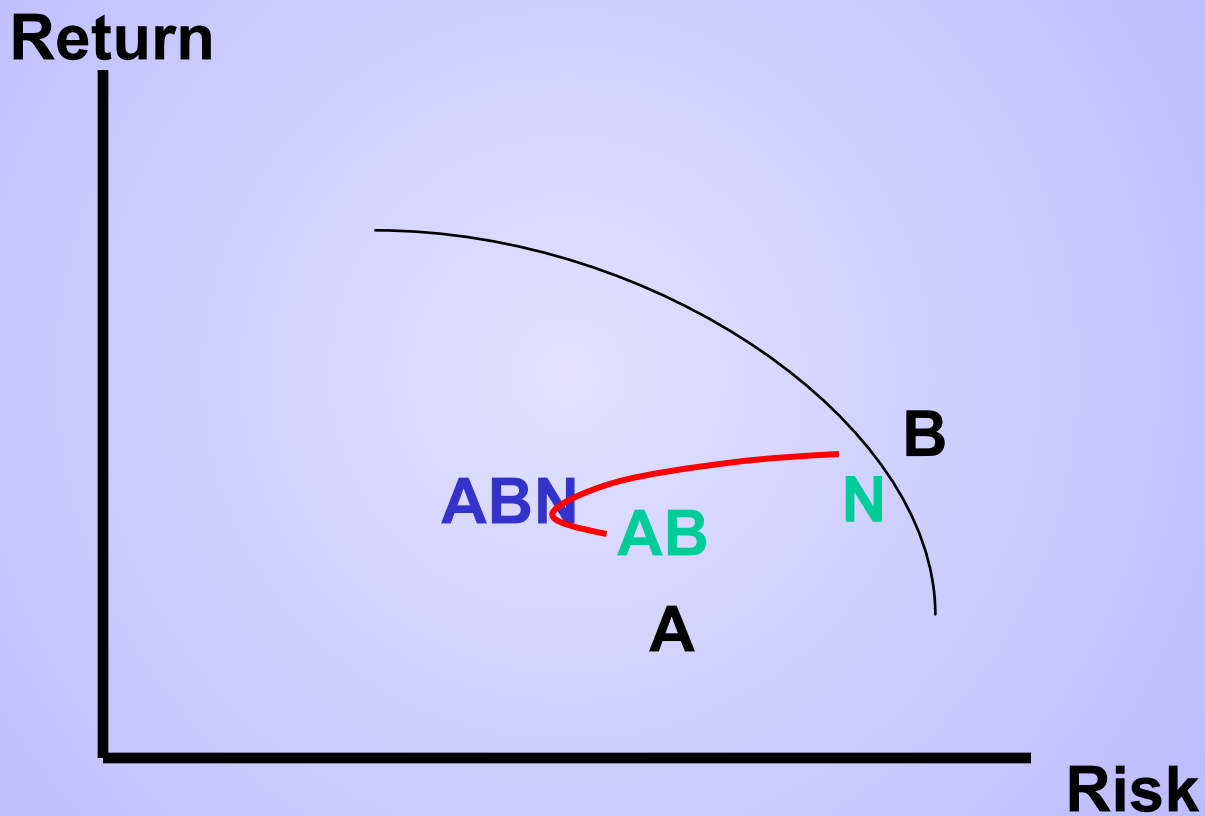
# Efficient Frontier



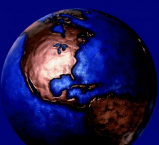
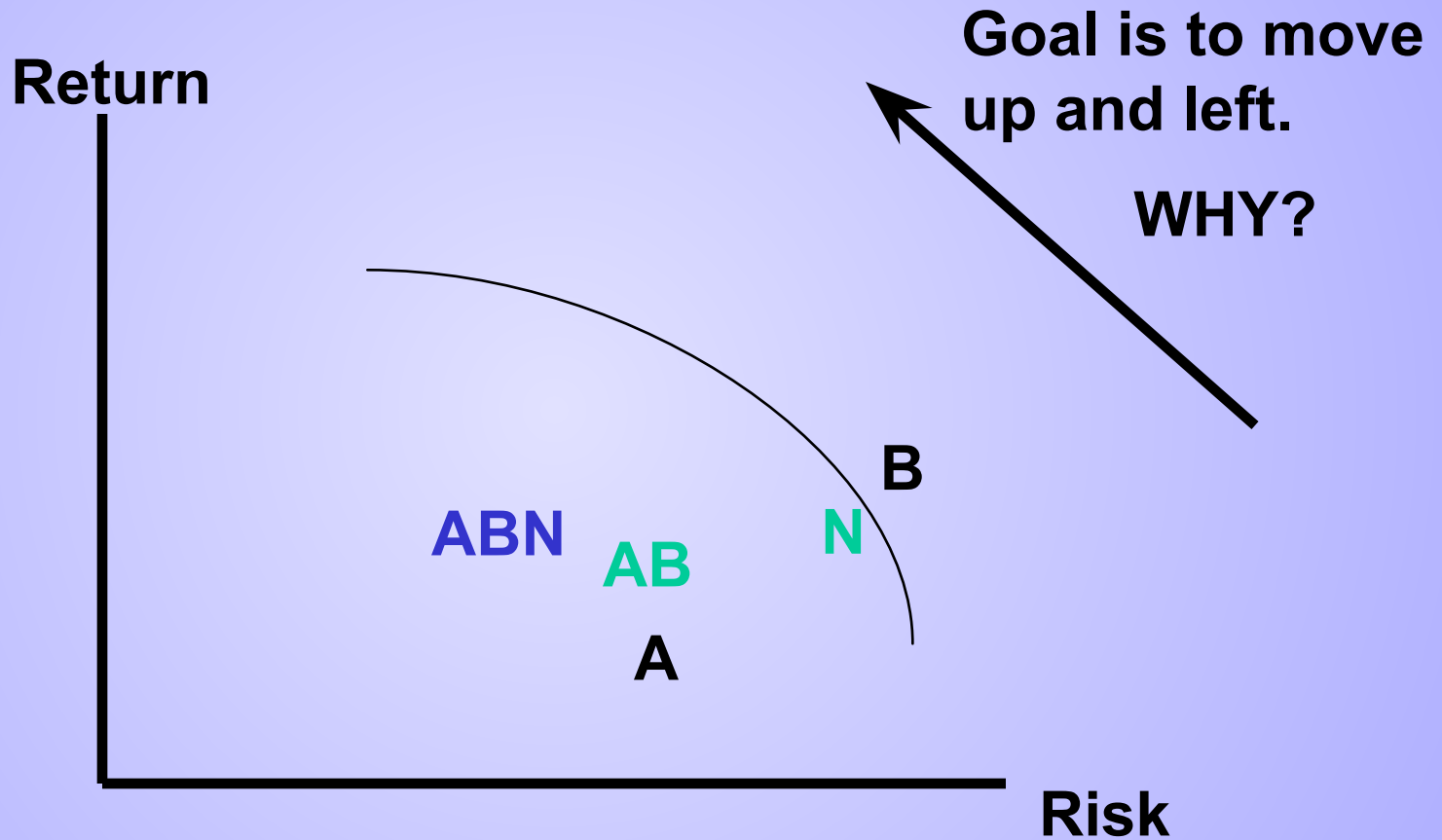
# Efficient Frontier



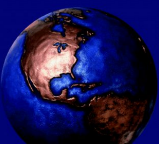
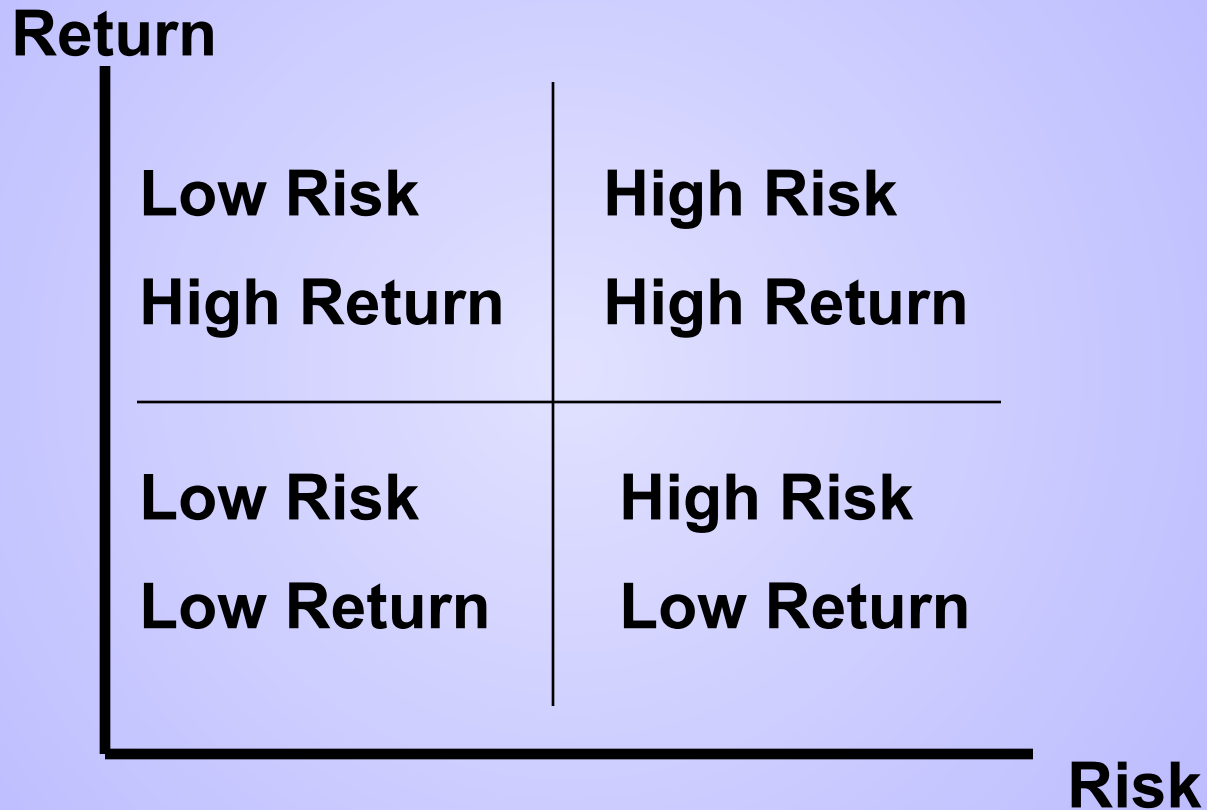
# Efficient Frontier



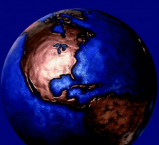
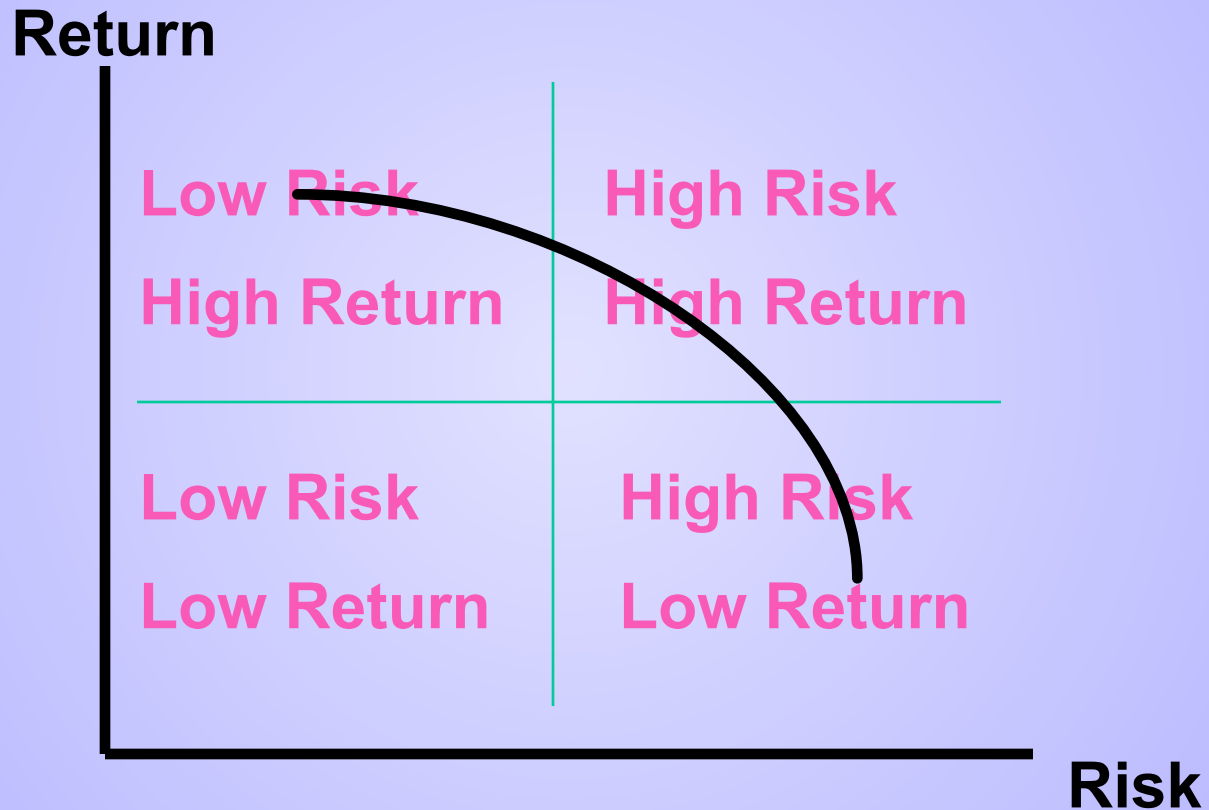
# Efficient Frontier



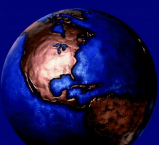
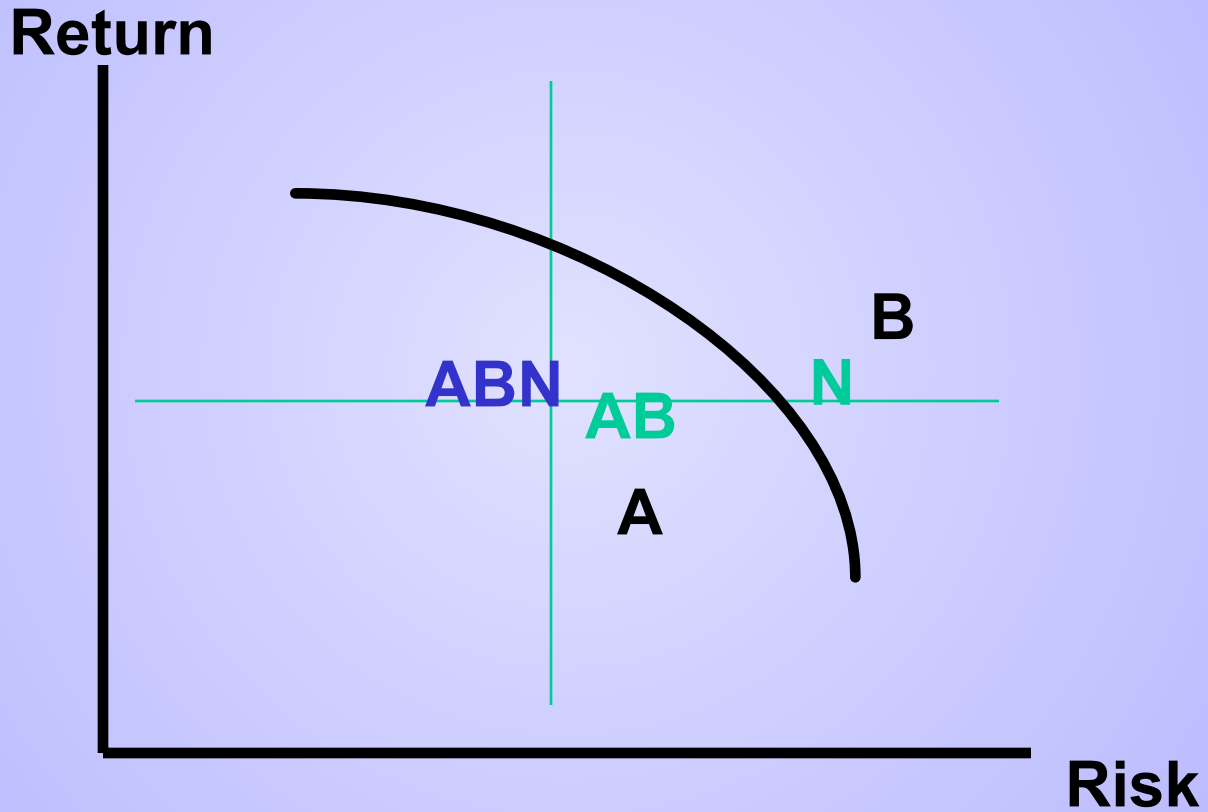
# Efficient Frontier



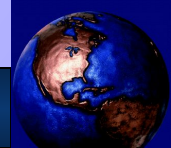
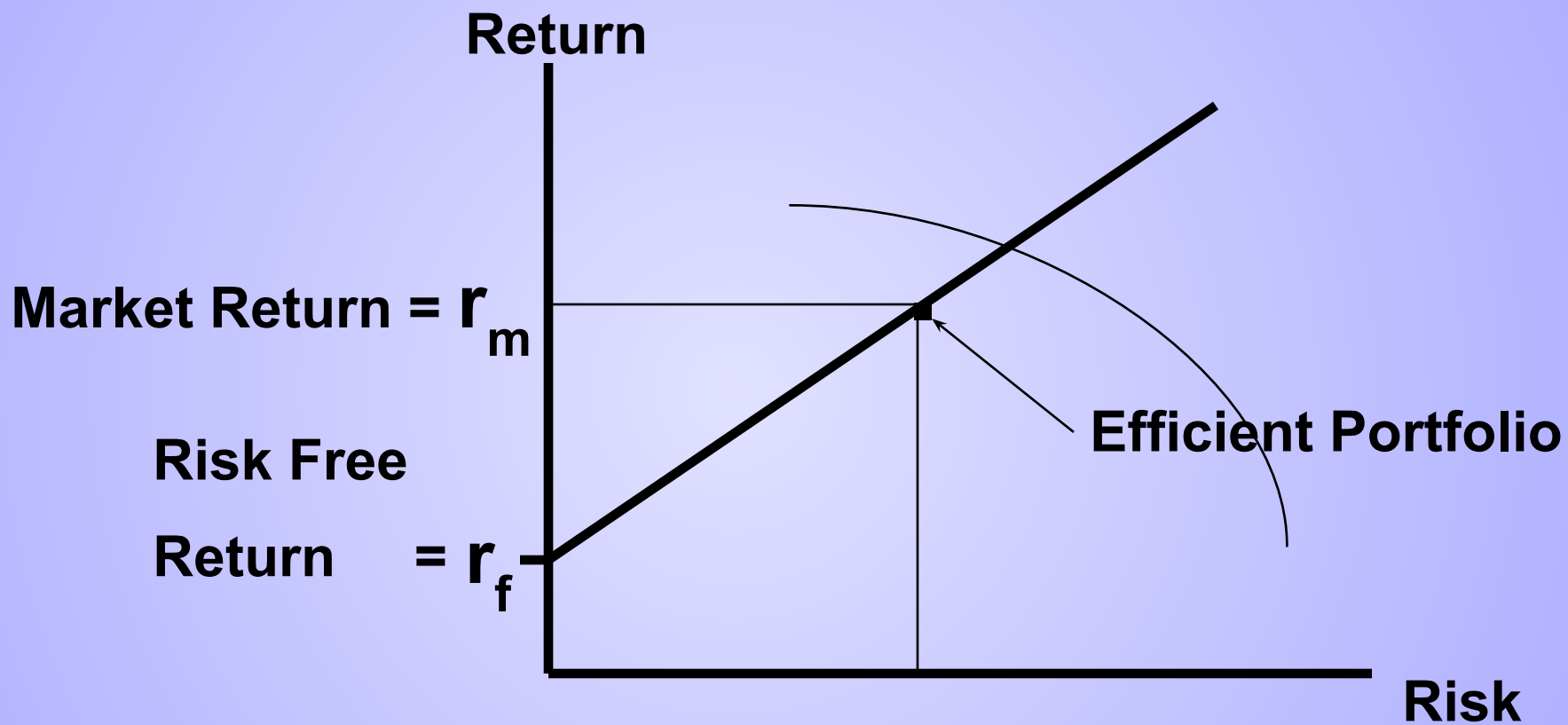
# Efficient Frontier



# Efficient Frontier

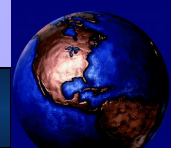
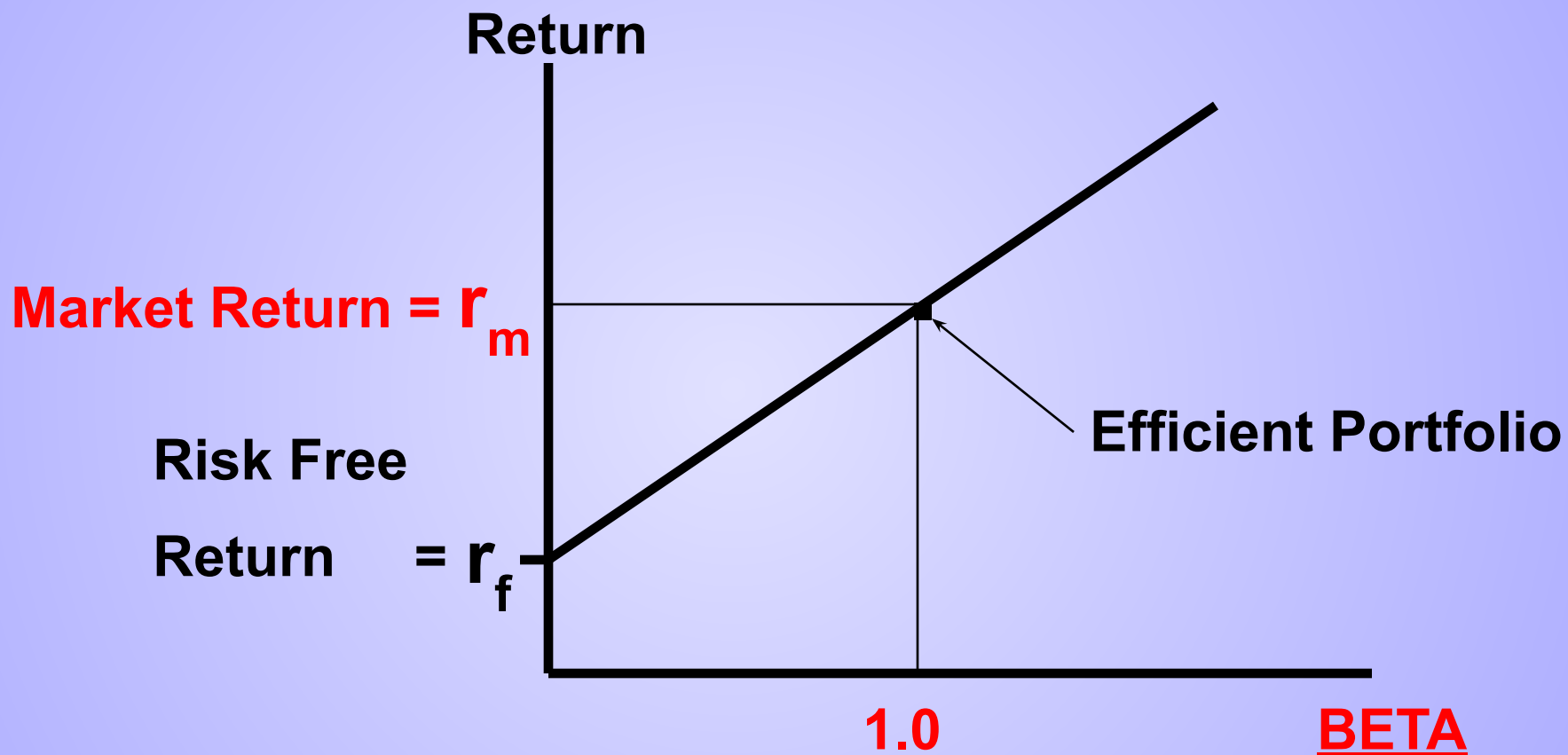


# Security Market Line

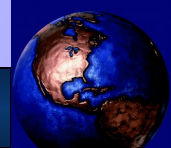
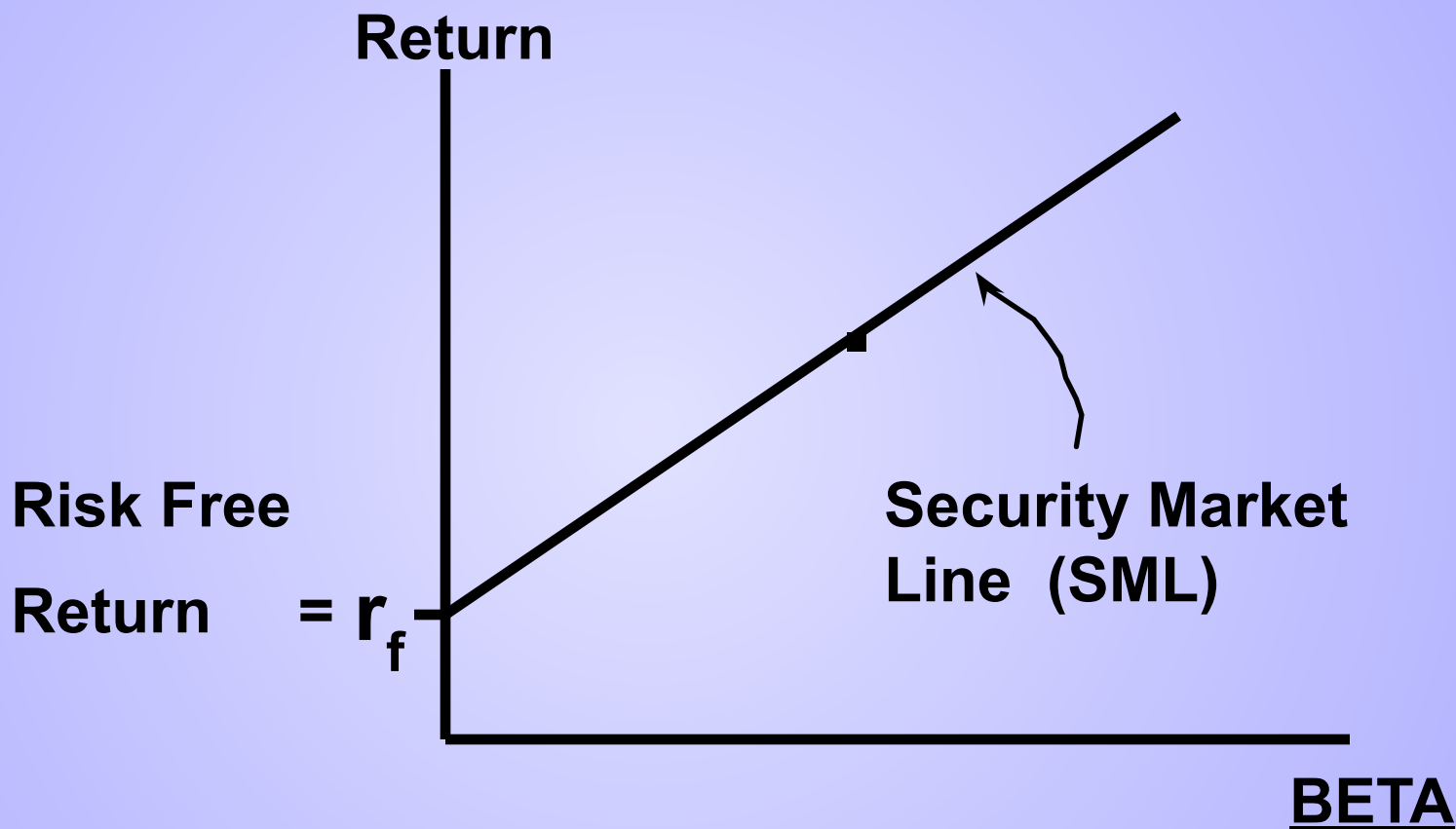




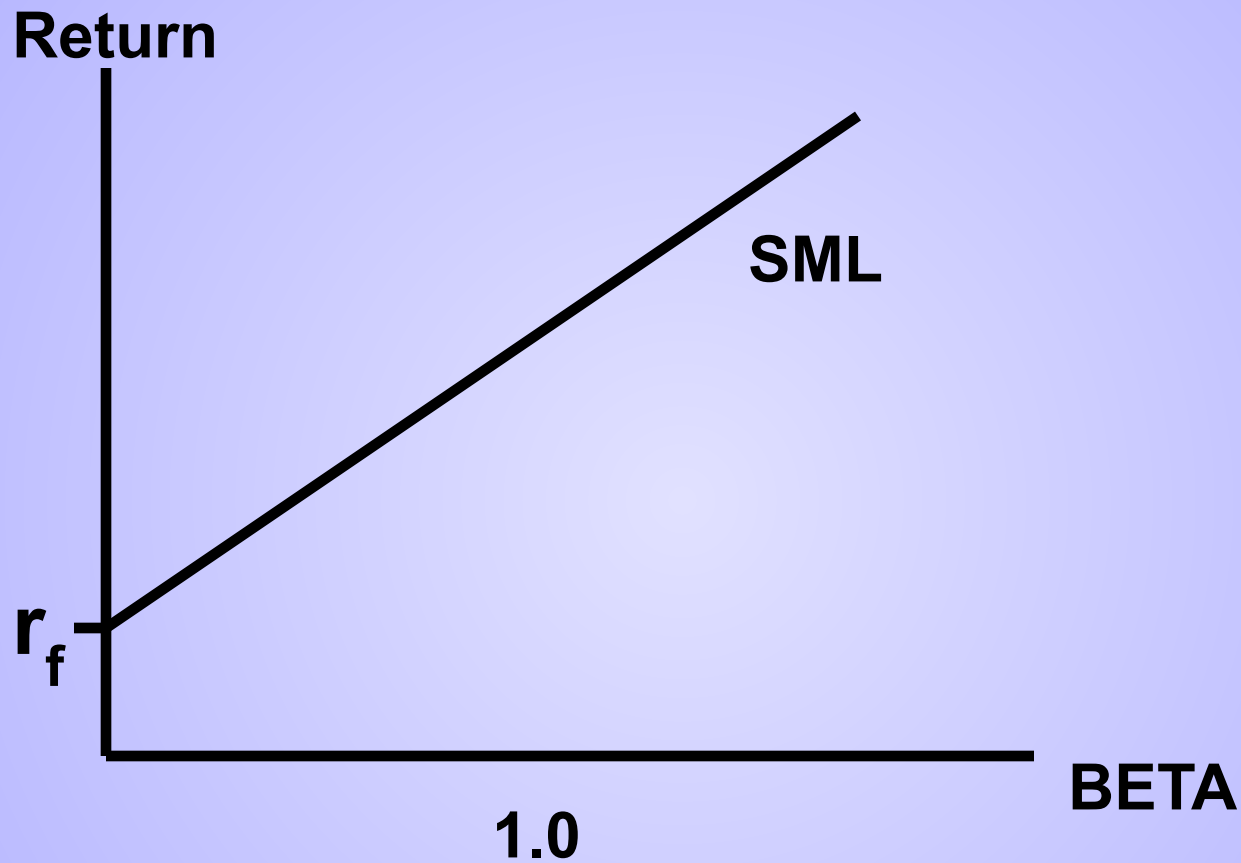
# Security Market Line



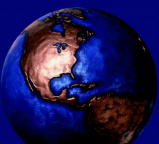
# Security Market Line



# Security Market Line



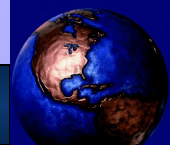
$$\text{SML Equation} = r_f + B ( r_m - r_f )$$



# Capital Asset Pricing Model

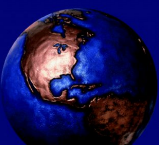
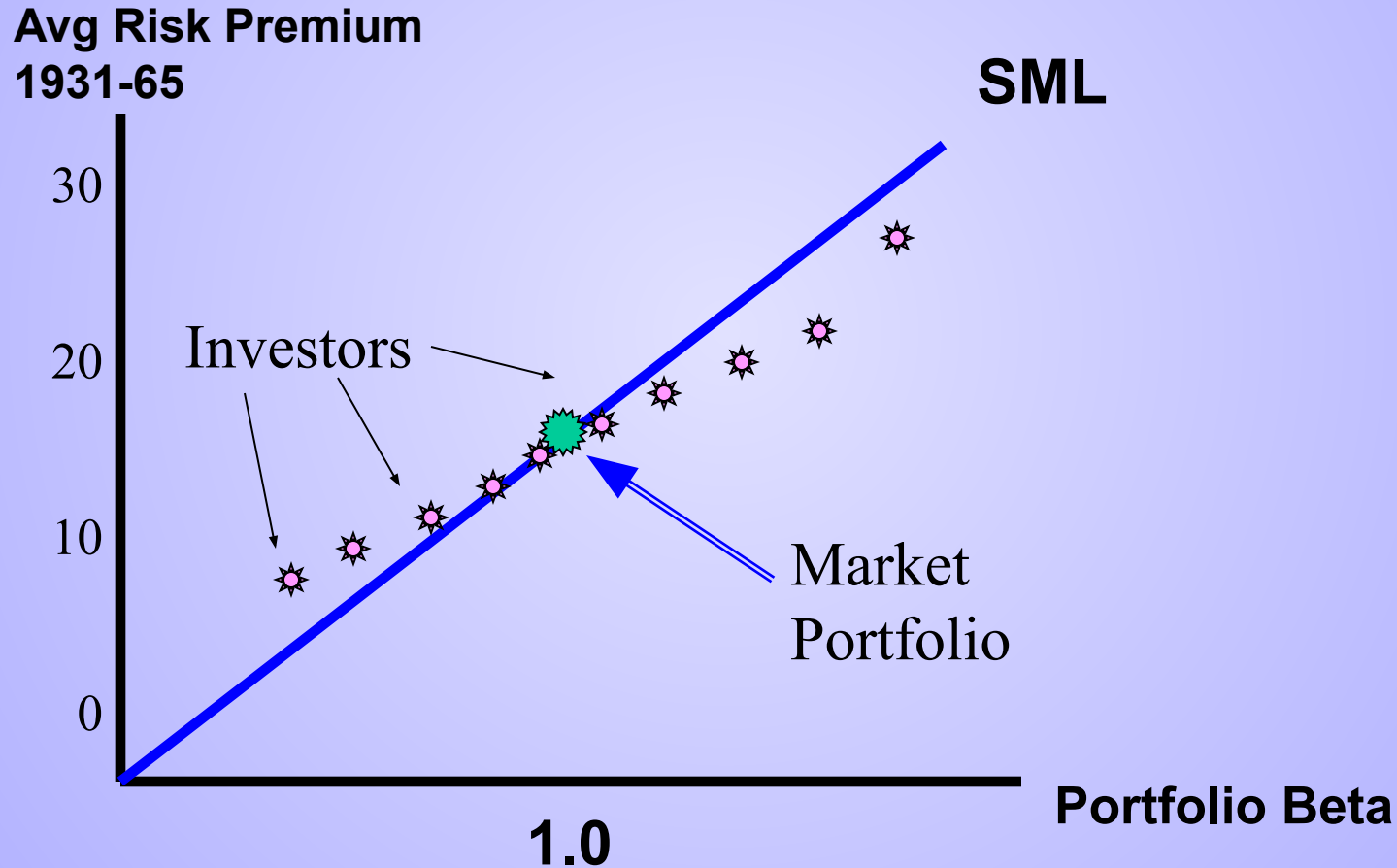
$$R = r_f + B ( r_m - r_f )$$

## CAPM



# Testing the CAPM

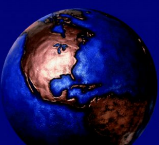
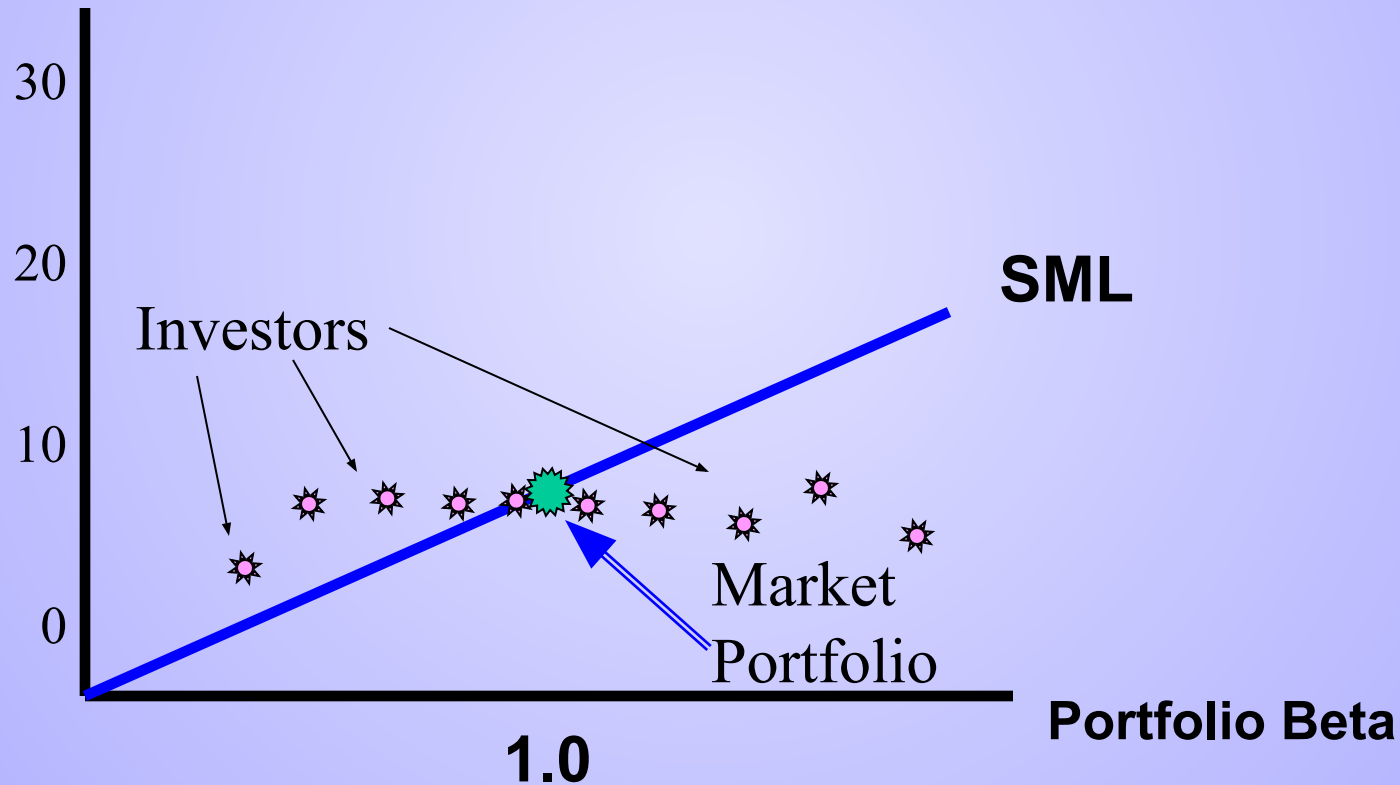
## Beta vs. Average Risk Premium



# Testing the CAPM

## Beta vs. Average Risk Premium

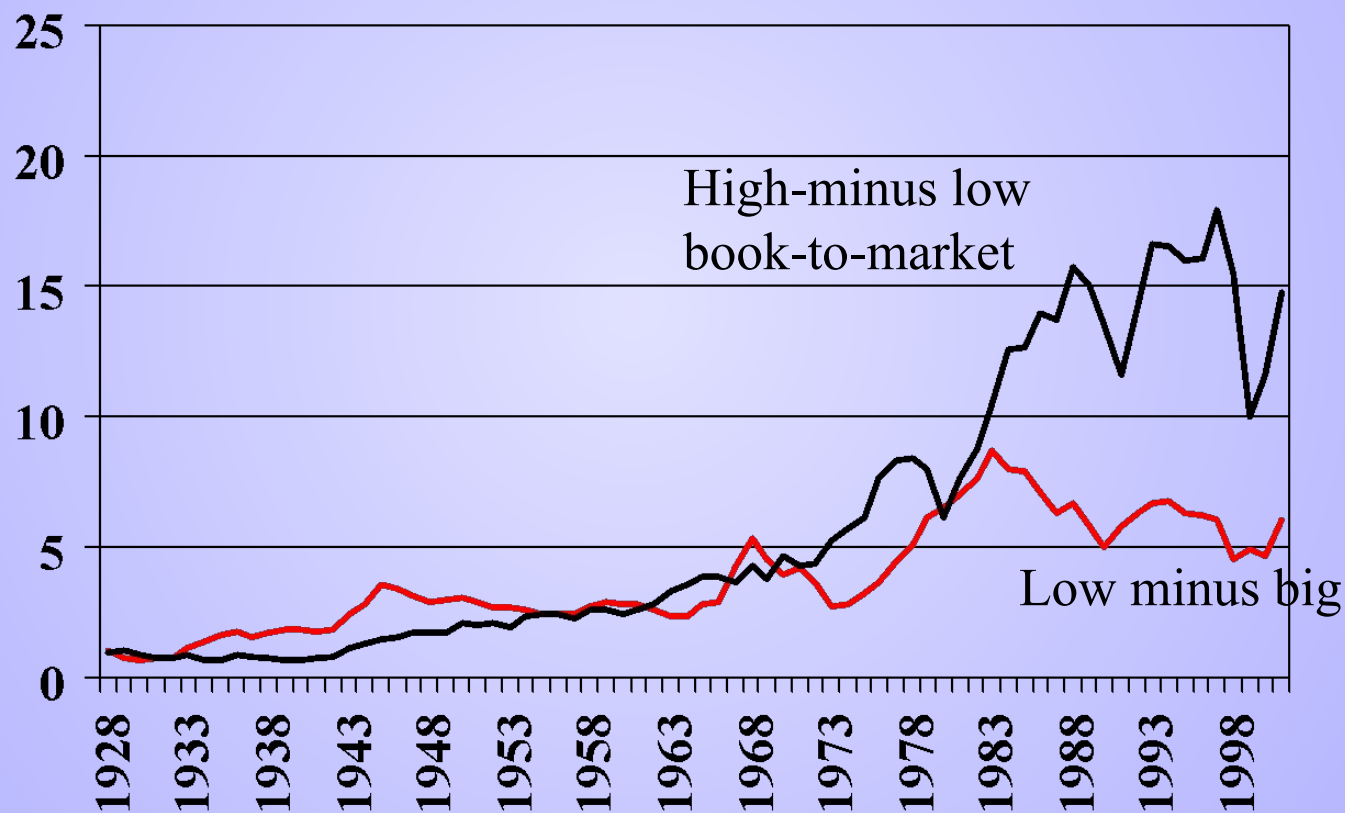
Avg Risk Premium  
1966-91



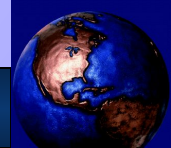
# Testing the CAPM

## Return vs. Book-to-Market

Dollars



[http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)



# Consumption Betas vs Market Betas

Stocks  
(and other risky assets)

Market risk makes wealth uncertain.

Standard CAPM

Wealth = market portfolio

Stocks  
(and other risky assets)

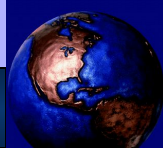
Wealth is uncertain

Wealth

Consumption CAPM

Consumption is uncertain

Consumption





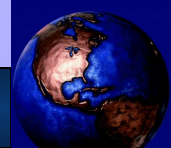
# Arbitrage Pricing Theory

## Alternative to CAPM

Expected Risk

$$\begin{aligned} \text{Premium} &= r - r_f \\ &= B_{\text{factor1}}(r_{\text{factor1}} - r_f) + B_{\text{f2}}(r_{\text{f2}} - r_f) + \dots \end{aligned}$$

$$\text{Return} = a + b_{\text{factor1}}(r_{\text{factor1}}) + b_{\text{f2}}(r_{\text{f2}}) + \dots$$



# Arbitrage Pricing Theory

Estimated risk premiums for taking on risk factors  
(1978-1990)

Factor	Estimated Risk Premium ( $r_{\text{factor}} - r_f$ )
Yield spread	5.10%
Interest rate	-.61
Exchange rate	-.59
Real GNP	.49
Inflation	-.83
Mrket	6.36

