Chapter 3
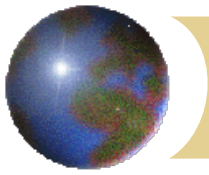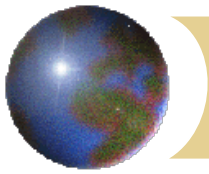# *Hedging Strategies Using Futures*

Long & Short Hedges

- A long futures hedge is appropriate when you know you will purchase an asset in the future and want to lock in the price

- A short futures hedge is appropriate when you know you will sell an asset in the future and want to lock in the price

Arguments in Favor of Hedging

⊕ Companies should focus on the main business they are in and take steps to minimize risks arising from interest rates, exchange rates, and other market variables
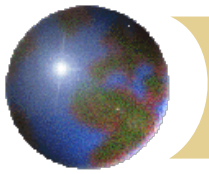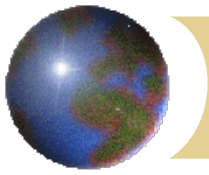
Arguments against Hedging

- Shareholders are usually well diversified and can make their own hedging decisions
- It may increase risk to hedge when competitors do not
- Explaining a situation where there is a loss on the hedge and a gain on the underlying can be difficult
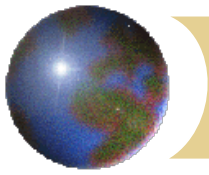
Basis Risk

- Basis is usually defined as the spot price minus the futures price

- Basis risk arises because of the uncertainty about the basis when the hedge is closed out
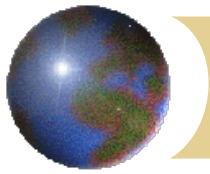
Long Hedge for Purchase of an Asset

- Define

  F_1 : Futures price at time hedge is set up

  F_2 : Futures price at time asset is purchased

  S_2 : Asset price at time of purchase

  b_2 : Basis at time of purchase

Cost of asset	S_2
Gain on Futures	$F_2 - F_1$
Net amount paid	$S_2 - (F_2 - F_1) = F_1 + b_2$

Short Hedge for Sale of an Asset
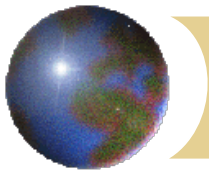
◆ Define

F_1 : Futures price at time hedge is set up

F_2 : Futures price at time asset is sold

S_2 : Asset price at time of sale

b_2 : Basis at time of sale

Price of asset	S_2
Gain on Futures	$F_1 - F_2$
Net amount received	$S_2 + (F_1 - F_2) = F_1 + b_2$

Choice of Contract

- Choose a delivery month that is as close as possible to, but later than, the end of the life of the hedge

- When there is no futures contract on the asset being hedged, choose the contract whose futures price is most highly correlated with the asset price. This is known as cross hedging.
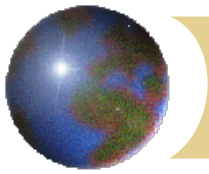
Optimal Hedge Ratio *(page 57)*

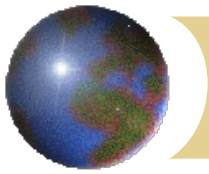Proportion of the exposure that should optimally be hedged is

$$h^* = \rho \frac{\sigma_S}{\sigma_F}$$

where

σ_S is the standard deviation of ΔS, the change in the spot price during the hedging period,

σ_F is the standard deviation of ΔF, the change in the futures price during the hedging period

ρ is the coefficient of correlation between ΔS and ΔF.

Optimal Number of Contracts
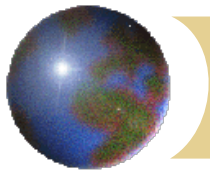
Q_A Size of position being hedged (units)

Q_F Size of one futures contract (units)

V_A Value of position being hedged (=spot price time Q_A)

V_F Value of one futures contract (=futures price times Q_F)

Optimal number of contracts if no tailing adjustment

Optimal number of contracts after tailing adjustment to allow or daily settlement of futures
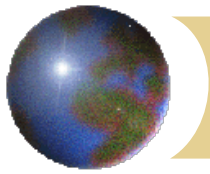
$$= \frac{h^* Q_A}{Q_F}$$

$$= \frac{h^* V_A}{V_F}$$

Example *(Pages 59-60)*

- Airline will purchase 2 million gallons of jet fuel in one month and hedges using heating oil futures

- From historical data $\sigma_F = 0.0313$, $\sigma_S = 0.0263$, and $\rho = 0.928$

$$h^* = 0.928 \times \frac{0.0263}{0.0313} = 0.7777$$

Example *continued*

- The size of one heating oil contract is 42,000 gallons
- The spot price is 1.94 and the futures price is 1.99 (both dollars per gallon) so that

$$V_A = 1.94 \times 2,000,000 = 3,880,000$$
$$V_F = 1.99 \times 42,000 = 83,580$$

- Optimal number of contracts assuming no daily settlement $= 0.7777 \times 2,000,000/42,000 = 37.03$
- Optimal number of contracts after tailing

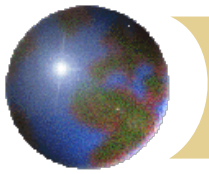$$= 0.7777 \times 3,880,000/83,580 = 36.10$$
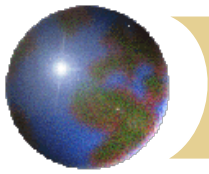
Hedging Using Index Futures

(Page 61)

To hedge the risk in a portfolio the number of contracts that should be shorted is

$$\beta \frac{V_A}{V_F}$$

where V_A is the value of the portfolio, β is its beta, and V_F is the value of one futures contract
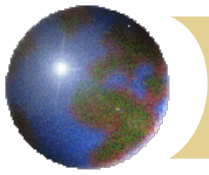
Example

S&P 500 futures price is 1,000
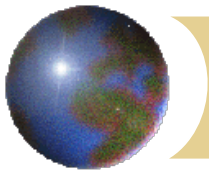
Value of Portfolio is $5 million

Beta of portfolio is 1.5

What position in futures contracts on the S&P 500 is necessary to hedge the portfolio?

Changing Beta

- What position is necessary to reduce the beta of the portfolio to 0.75?

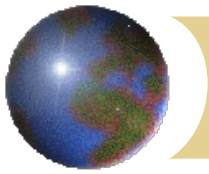- What position is necessary to increase the beta of the portfolio to 2.0?

Why Hedge Equity Returns

- May want to be out of the market for a while. Hedging avoids the costs of selling and repurchasing the portfolio

- Suppose stocks in your portfolio have an average beta of 1.0, but you feel they have been chosen well and will outperform the market in both good and bad times. Hedging ensures that the return you earn is the risk-free return plus the excess return of your portfolio over the market.
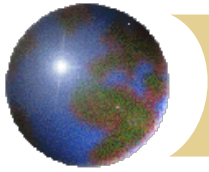
Stack and Roll *(page 65-66)*

- We can roll futures contracts forward to hedge future exposures
- Initially we enter into futures contracts to hedge exposures up to a time horizon
- Just before maturity we close them out an replace them with new contract reflect the new exposure
- etc

Liquidity Issues *(See Business Snapshot 3.2)*

- In any hedging situation there is a danger that losses will be realized on the hedge while the gains on the underlying exposure are unrealized

- This can create liquidity problems

- One example is Metallgesellschaft which sold long term fixed-price contracts on heating oil and gasoline and hedged using stack and roll

- The price of oil fell.....