Chp 3: Hedging Strategies using Futures

- Futures are most typically used to hedge
- This chapter focuses on when it is advantageous to be in short/long futures

§3.1 Basic Principles

- Typically done to neutralize risk in another position
- Def: A short hedge is one in which one takes a short position (i.e. agree to buy at a future price)
- Long hedges are defined similarly (e.g. when a company knows it must purchase an asset in the future and wants to lock in a price)

§3.2 Arguments for and against Hedging

- Advantage: "Removing" as much volatility from trades is good for most participants
- Why risks are (possibly) not hedged
  - Diversified Shareholders can hedge themselves
  - If hedging is not a norm, prices may not fluctuate so hedging can be more volatile
  - Use of futures contracts can neutralize both loss and gains

§3.3 Basic Risk

- Hedging is typically complicated in practice by
  - Assets may alter slightly
  - Variable end date
  - Hedge may require the contract to be closed prematurely

Def: The **Basis** is defined by

$$\text{Basis} = \text{Spot Price} - \text{Futures Price}$$

As $t \to T$, Basis $\to 0$.

- Suppose the basis, spot price, and futures price is modeled as

$\{S_t, F_t\}_{t=1}^{T}$ where $b_t = S_t - F_t$.

- The effective price of the asset

- Short Futures position: $S_2 + (F_1 - F_2) = F_1 + b_2$

(S_2: price sold at t_2; $(F_1 - F_2)$: futures profit)

- Long hedge: $S_2 + F_1 - F_2 = F_1 + b_2$

(S_2: price paid; $F_1 - F_2$: hedge loss)

§ 3.4 Cross Hedging

Def: **Cross hedging** is the action of hedging correlated assets

Def: **Hedge Ratio** Size of pos. in futures / Size of exposure

- When you hedge directly HR = 1.0 when cross hedging H.R < 1.0
- instead choose HR that minimizes variance of the asset
- Let $\Delta S = S_T - S_t$ $\Delta F = F_T - F_t$

$h^* = \rho \frac{\sigma_S}{\sigma_F}$ [OLS of $\Delta S \sim \Delta F$]

- Optimal # of contracts Q_A = Size of Position

Q_F = Size of one Futures contract

N^* = optimal # of contracts

- Sol: $N^* = h^* Q_A / Q_F$

- Similar expressions exist for the futures (not forward) contracts

§3.5 Stock Index Futures

Def: A stock index is a number that tracks the price of a theoretical portfolio

- These include things like the DOW, S&P500, Nasdaq-100

- Hedging: V_A = current value of portfolio

V_F = current value of one futures contract

- The portfolio mirrors the index so the optimal position is $N^* = V_A / V_F$

- When the portfolio doesn't mirror $N^* = \hat{\beta} \frac{V_A}{V_F}$ where $\hat{\beta}$ is from the OLS. of excess return of portfolio ~ excess return of index

Summary

- When to short: Company gains when price increases

- When to long: Company gains when price decreases

- Hedging is a way to reduce risk.