

PRICE PATTERN IN FUTURES MARKET

Objective

This part explains the concept of 'Basis' which is the price difference between an underlying asset and its future. How basis can be used for effectively hedging price fluctuation and risk associated with basis has also been included.

Price Pattern in Futures Market

- **Normal Market:** The futures price of gold on the New York Mercantile Exchange and the futures price of wheat on the Chicago Board of Trade increase as the time to maturity increases. This is known as a normal market
- **Inverted Market:** The futures price of Sugar-World is a decreasing function of maturity. This is known as an inverted market
- **Others:** The futures price of Crude Oil first increases and then decreases with maturity

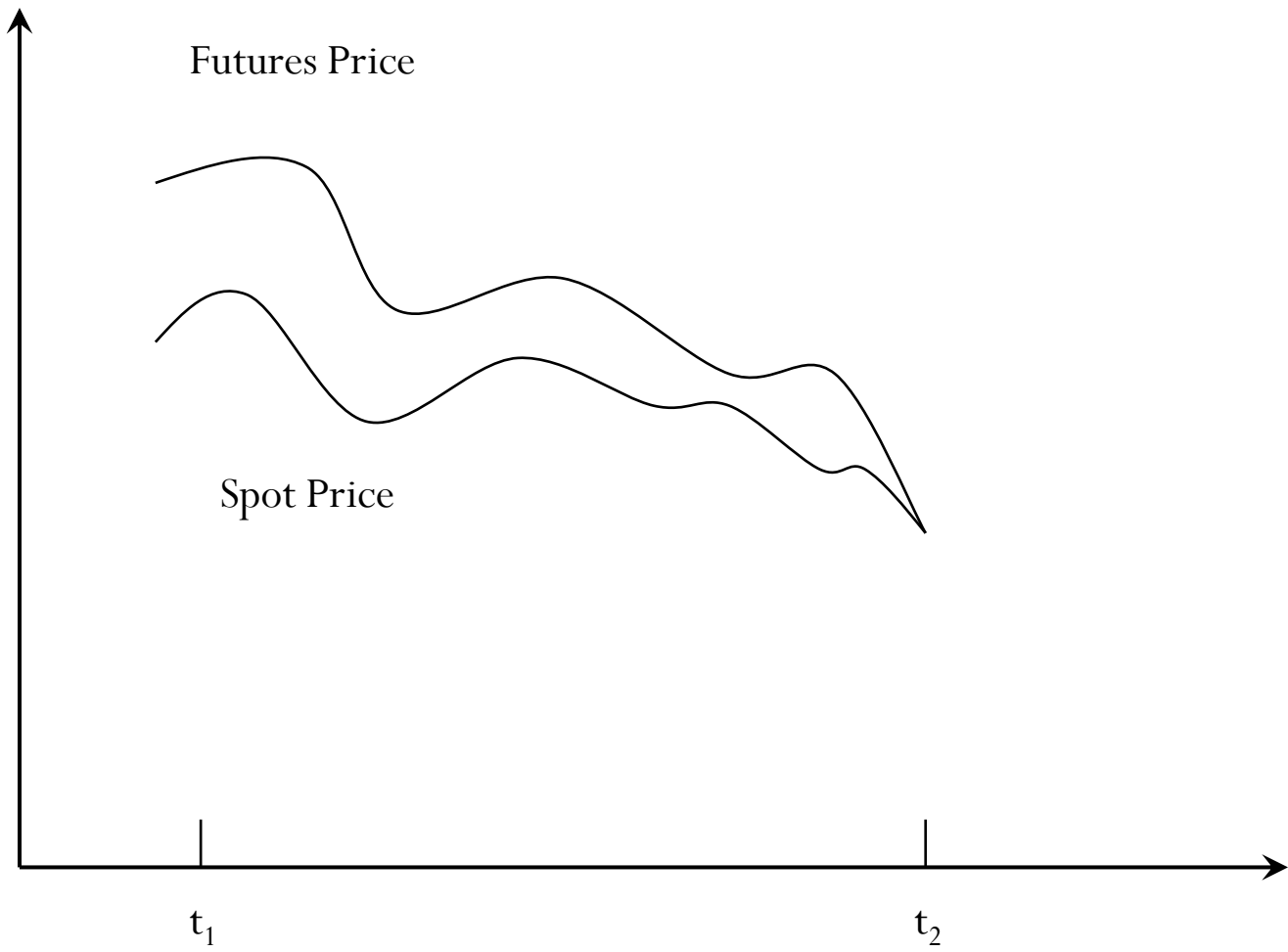
Cash settlement

- Some financial futures, such as those on stock indices, are settled in cash
 - This is because it is inconvenient or impossible to deliver the underlying asset
- When a contract is settled in cash, it is marked to market at the end of the last trading day and all positions are declared closed
- The **settlement price** on the last trading day is the closing spot price of the underlying asset
 - This ensures that the futures price converges to the spot price
- **Example:** All futures traded at NSE are settled in cash

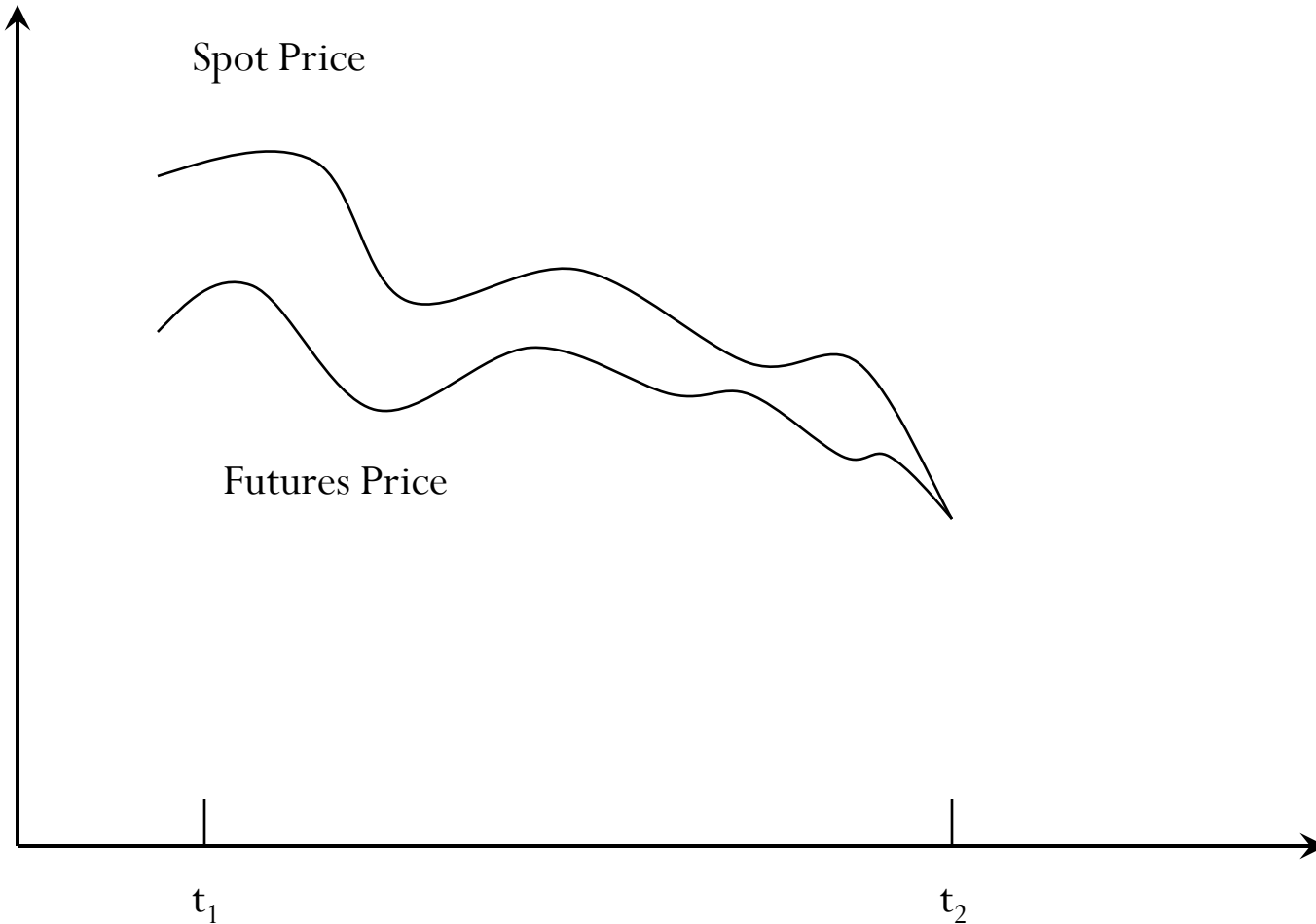
Basis

- **Basis = Spot price of asset to be hedged**
 - **Futures price of the contract used**
- If the asset and asset underlying futures contract are same then the basis should be zero at the expiration of the futures contract
- **Strengthening of the basis:** If the spot price increases by more than futures price the basis increases
- **Weakening of the basis:** If the futures price increases more than the spot price the basis declines
- Basis risk implies the **uncertainty in the amount of basis** when the futures contract is closed out in a hedge

Variation of Basis over time: Contango



Variation of Basis over time: Backwardation



Impact of Basis on Net Buying/Selling Price

Notations:

S_1 = Spot Price at time t_1

S_2 = Spot Price at time t_2

F_1 = Futures Price at time t_1

F_2 = Futures Price at time t_2

b_1 = Basis at time t_1

b_2 = Basis at time t_2

Impact of Basis on Net Buying/Selling Price

- Assume a hedge is put in place at time t_1 and closed out at time t_2
- Now $S_1 = 3.5$; $S_2 = 2.8$; $F_1 = 3.2$; $F_2 = 2.7$
- Hence $b_1 = S_1 - F_1 = 0.3$
 $b_2 = S_2 - F_2 = 0.1$
- The effective price obtained with hedging is
= Price realized/ paid + profit/ loss on hedge
= $S_2 + F_1 - F_2 = F_1 + b_2 = 3.3$
- F_1 is known at time t_1
- The hedging risk is the uncertainty associated with b_2 and known as Basis Risk

Basis Risk and Hedging

- For a short hedge if basis strengthens unexpectedly the hedger's position improves or vice-versa
- For a long hedge if basis strengthens unexpectedly the hedger's position worsens or vice-versa

Cross Hedging

- **Cross hedging:** when two assets in the spot and futures contracts are different
- **Example:**
 - An airline wants to hedge against future price of jet fuel, which has no futures contract
 - It may use heating oil futures contract

Cross Hedging and Basis Risk

- Consider S_2^* as the price of the asset underlying futures contract at time t_2 and S_2 being the price of the asset in the spot market
- By hedging the price paid/received by the company is
 - = $S_2 + F_1 - F_2$
 - = $F_1 + (S_2^* - F_2) + (S_2 - S_2^*)$
- $S_2^* - F_2$ is the part of the basis if asset hedged and asset underlying futures were same
- $S_2 - S_2^*$ is the part of the basis due to difference between two assets

Basis Risk and Choice of Contract

- The choice of futures contract for hedging affects basis risk
- This choice has two components
 - The choice of the asset underlying futures contract
 - The choice of delivery month
- If the asset being hedged does not exactly match the asset underlying
 - Analysis is required to find the asset having futures price most closely correlated with the price of the asset being hedged

Basis Risk and Choice of Contract

- A contract with a **later delivery month** is chosen because
 - Futures prices are in some instance quite erratic during the delivery month
 - A long hedger may have to take delivery of physical asset which can be expensive and inconvenient
- **Basis risk increases** as the time difference between hedge expiration and delivery month increases
- **Rule of Thumb:** choose a delivery month that is as close as possible to, but later than, the expiration of the Hedge