

Futures Contracts: Concepts, Structure, and Risk Considerations

1. What is a Futures Contract?

A futures contract is a standardized, exchange-traded agreement between two parties to buy or sell an asset at a predetermined price on a specified future date. Unlike forward contracts, futures are traded on organized exchanges and subject to daily mark-to-market settlement.

$$\text{Futures Price} = F_t = S_t e^{r(T-t)}$$

Where:

- S_t : Spot price of the asset at time t
- r : Risk-free interest rate
- $T - t$: Time to maturity

2. Key Elements of a Futures Contract

1. **Underlying Asset:** The item being traded—e.g., commodities (oil, wheat), financial assets (bonds, indices, currencies).
2. **Contract Size:** Specifies the quantity of the underlying asset per contract.
3. **Expiration Date:** The specific future date when the contract is settled.
4. **Settlement:**
 - *Physical Delivery:* Actual delivery of the asset.
 - *Cash Settlement:* Difference in value paid at settlement date.
5. **Tick Size:** Minimum price movement allowed per contract.
6. **Margin Requirements:**
 - *Initial Margin:* A deposit to open a position.
 - *Maintenance Margin:* Minimum equity that must be maintained.

7. **Mark-to-Market:** Daily revaluation of the contract based on market price.
8. **Clearinghouse:** Intermediary that guarantees performance and reduces counterparty risk.

3. How Futures Contracts Work

- Trader enters into a long (buy) or short (sell) futures position.
- Trader posts initial margin and must maintain it daily.
- Daily profit or loss is calculated via mark-to-market.
- Position is closed before or at expiration by taking an offsetting position or settling the contract.

4. Uses of Futures

4.1 Hedging

Used to lock in future prices and reduce price risk.

- *Example:* An airline hedging against rising fuel prices by taking long positions in jet fuel futures.

4.2 Speculation

Traders bet on the direction of future price movements to earn profit.

4.3 Arbitrage

Exploiting price differences between spot and futures markets to lock in riskless profit.

$$\text{Cash-and-Carry Arbitrage: } F_t > S_t e^{r(T-t)}$$

5. Advantages of Futures Contracts

- **Liquidity:** Futures markets are highly liquid with standardized contracts.
- **Low Counterparty Risk:** Guaranteed by a clearinghouse.
- **Transparency:** Prices are publicly available and regulated.
- **Leverage:** Small margin requirements allow control of large positions.
- **Diversification:** Available across commodities, currencies, indices, etc.

6. Risks Associated with Futures

6.1 Market Risk

Losses due to adverse price movements in the underlying asset.

6.2 Liquidity Risk

Inability to enter/exit positions at desired prices due to thin market.

6.3 Basis Risk

Mismatch between the hedged asset and futures contract, causing imperfect hedging.

6.4 Leverage Risk

Amplified losses due to leveraged positions.

6.5 Margin Risk

Margin calls occur if account value falls below maintenance margin, requiring additional capital.

6.6 Operational Risk

Errors in trade execution, clearing, or settlement processes.

7. Example: Equity Index Futures

Suppose a portfolio manager wants to reduce equity exposure temporarily.

- S&P 500 Index at 4000; futures trading at 4020
- Each contract value: $\$250 \times \text{Index Level}$
- Portfolio Value: \$2.5 million
- Number of contracts to short: $\frac{2,500,000}{250 \times 4020} \approx 2.49 \Rightarrow 2 \text{ or } 3 \text{ contracts}$

8. Conclusion

Futures contracts are essential tools in modern financial markets. Their standardization, liquidity, and versatility make them attractive for hedging, speculation, and arbitrage. However, the leveraged nature of futures trading requires careful risk management to prevent excessive losses.

9. CQF/CFA-Style Multiple-Choice Questions on Futures

MCQ 1

Which of the following is true about futures contracts?

- (A) They are customized and traded OTC
- (B) They are settled only at expiration
- (C) They are standardized and exchange-traded
- (D) They are not subject to margin requirements

Answer: (C)

MCQ 2

Which factor does NOT directly affect futures pricing under the cost-of-carry model?

- (A) Storage costs
- (B) Interest rates
- (C) Dividend yield
- (D) Credit rating of counterparty

Answer: (D)

MCQ 3

Mark-to-market in futures trading means:

- (A) Physical delivery is mandatory
- (B) Contracts are renewed daily
- (C) Gains/losses are settled daily
- (D) Futures prices are reset weekly

Answer: (C)

MCQ 4

An investor long in equity futures will profit if:

- (A) Equity prices fall
- (B) Equity prices stay constant
- (C) Equity prices rise
- (D) Volatility decreases

Answer: (C)

MCQ 5

Which of the following is a key advantage of futures trading?

- (A) No counterparty risk
- (B) Unlimited profit with no loss

- (C) Tax-free leverage
- (D) Custom delivery terms

Answer: (A)

12. Additional CQF/CFA-Style Multiple-Choice Questions

MCQ 6

Which of the following best describes the initial margin in a futures contract?

- (A) The total contract value
- (B) A down payment for physical delivery
- (C) A good-faith deposit to ensure contract performance
- (D) The interest rate paid on the futures position

Answer: (C)

MCQ 7

Which of the following causes margin calls in futures trading?

- (A) Decrease in tick size
- (B) Accumulation of dividends
- (C) Movement of contract value below maintenance margin
- (D) Increase in notional value

Answer: (C)

MCQ 8

Which type of settlement is more common in index futures?

- (A) Physical delivery
- (B) Forward settlement
- (C) Rolling forward
- (D) Cash settlement

Answer: (D)

MCQ 9

A trader sells 5 gold futures contracts. What is her market view?

- (A) Bullish on gold prices
- (B) Bearish on gold prices
- (C) Neutral on interest rates
- (D) Expecting no change in gold prices

Answer: (B)

MCQ 10

Which of the following best reduces counterparty risk in futures markets?

- (A) Higher interest rates
- (B) Use of a clearinghouse
- (C) Lower margin requirements
- (D) Customized contracts

Answer: (B)

MCQ 11

What happens to the basis as a futures contract approaches maturity?

- (A) It becomes highly volatile
- (B) It remains constant
- (C) It tends toward zero
- (D) It always increases

Answer: (C)

MCQ 12

Which strategy involves simultaneously buying spot and selling futures?

- (A) Reverse cash-and-carry arbitrage
- (B) Spread betting
- (C) Momentum trading
- (D) Long straddle

Answer: (A)

MCQ 13

The tick value is defined as:

- (A) Minimum contract margin requirement
- (B) Smallest price movement allowed per unit of the contract
- (C) Futures contract value at inception
- (D) Open interest per trading day

Answer: (B)

MCQ 14

Which of the following is a characteristic of forward contracts but not futures?

- (A) Daily mark-to-market
- (B) Standardized terms
- (C) Customization of contract
- (D) Use of clearinghouse

Answer: (C)

MCQ 15

A portfolio manager wants to reduce exposure to equity markets temporarily. The best tool is:

- (A) Buying equity index futures
- (B) Selling equity index futures
- (C) Buying call options
- (D) Buying forward contracts

Answer: (B)

MCQ 16

A short hedger profits when:

- (A) Futures prices rise
- (B) Spot prices rise
- (C) Spot prices fall
- (D) Basis widens

Answer: (C)

MCQ 17

The purpose of maintenance margin is to:

- (A) Eliminate credit risk completely
- (B) Ensure daily liquidity
- (C) Avoid excessive speculation
- (D) Ensure the account has sufficient funds to cover potential losses

Answer: (D)

MCQ 18

Cross-hedging introduces which of the following risks?

- (A) Interest rate risk
- (B) Credit risk
- (C) Basis risk
- (D) Liquidity risk

Answer: (C)

MCQ 19

In a long futures position, your profit increases when:

- (A) Futures price falls
- (B) Spot price rises above entry price
- (C) Interest rate falls
- (D) Futures price remains unchanged

Answer: (B)

MCQ 20

Which of the following is NOT a use of futures?

- (A) Hedging
- (B) Arbitrage
- (C) Insurance
- (D) Speculation

Answer: (C)

11. Basis Risk and Cross-Hedging

11.1 Basis Risk

Basis is defined as the difference between the spot price and the futures price of the asset:

$$\text{Basis} = S_t - F_t$$

Basis risk arises when the hedge is imperfect due to:

- Changes in the relationship between spot and futures prices.
- Mismatches in asset quality, quantity, or delivery date.

At contract expiration, ideally:

$$\text{Basis at } T = S_T - F_T = 0$$

Example: Hedging a corporate bond with a government bond futures contract may introduce basis risk due to credit spread differences.

11.2 Cross-Hedging

Cross-hedging is used when no futures contract exists for the exact underlying asset, so a related asset is used instead.

Optimal Hedge Ratio (OHR):

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

Where:

- ρ : Correlation between spot and futures returns
- σ_S : Standard deviation of spot returns
- σ_F : Standard deviation of futures returns

Number of Contracts:

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

Where:

- V_A : Value of the asset being hedged
- V_F : Value of one futures contract

Example: Hedging a copper mining company's revenues with aluminum futures, using historical correlation data to adjust hedge ratio.