Futures and Forward Contracts

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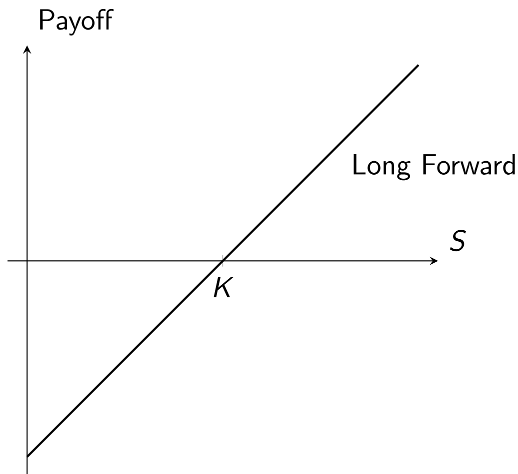
Definitions

- A **derivative** is an instrument whose value depends on, or is derived from, the value of another asset.
- **Futures** and **forwards** are derivatives that allow traders to fix the price at which an asset will trade at a given date in the future.
- Trading:
  - Futures: On exchanges such as the Chicago Board Options Exchange
  - Forwards: In the over-the-counter (OTC) market where traders working for banks, fund managers and corporate treasurers contact each other directly
- The futures or forward price is the delivery price that would be applicable to the contract if it were negotiated today so that its value is zero.

Futures and Forward Positions

- The party that has agreed to buy has a **long** position whereas the party that has agreed to sell has a **short** position.
- A long futures requires the buyer to purchase the asset at expiration for the futures price prevailing when the contract was first bought, which we denote by K.
- If the spot price at maturity is S, then the payoff of the long position is $S - K$, whereas the payoff of a short position is $K - S$.

Payoff of a Long Forward

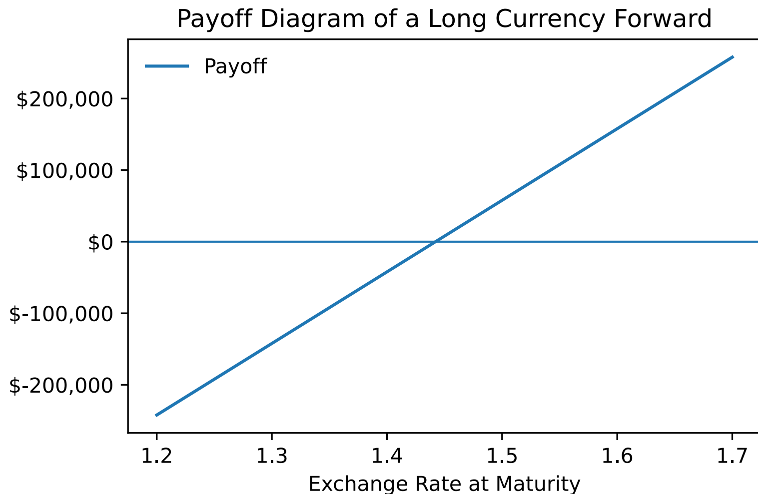


Example: Forward Contract Payoff

- On May 24, 2010, the treasurer of a corporation enters into a long forward contract to buy £1 million in six months at an exchange rate of $1.4422 per British pound.
- This obligates the corporation to pay $1,442,200 for £1 million on November 24, 2010.
- The payoff of this contract is $1{,}000{,}000 \times (S_T - 1.4422)$.
- The table below shows the payoff for different values of the exchange rate in six months.

S_T	1.2000	1.3000	1.4000	1.5000	1.6000
Payoff	-242,200	-142,200	-42,200	57,800	157,800

Example: Forward Contract Payoff



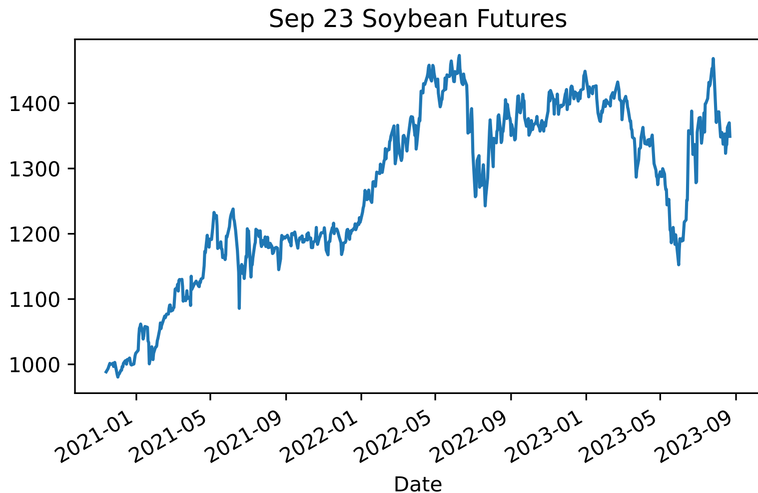
Futures Contracts

- Like a forward contract, it's an agreement to buy or sell an asset for a certain price at a certain time.
- Whereas a forward contract is traded OTC, a futures contract is traded on an exchange such as CME, CBOT, COMEX, NYMEX, etc.
- Available on a wide range of assets such as stock indices, commodities, interest rates, and currencies.
- Contracts are standardized specifying:
  - Underlying asset: quantity and quality
  - Delivery method: location
  - Delivery dates
- Settled daily

Examples of Futures Contracts

- Buy 100 oz. of gold @ US$1400/oz. in December
- Sell £62,500 @ 1.4500 US$/£ in March
- Sell 1,000 bbl. of oil @ US$90/bbl. in April

Example: Evolution of Sep 23 Soybean Futures



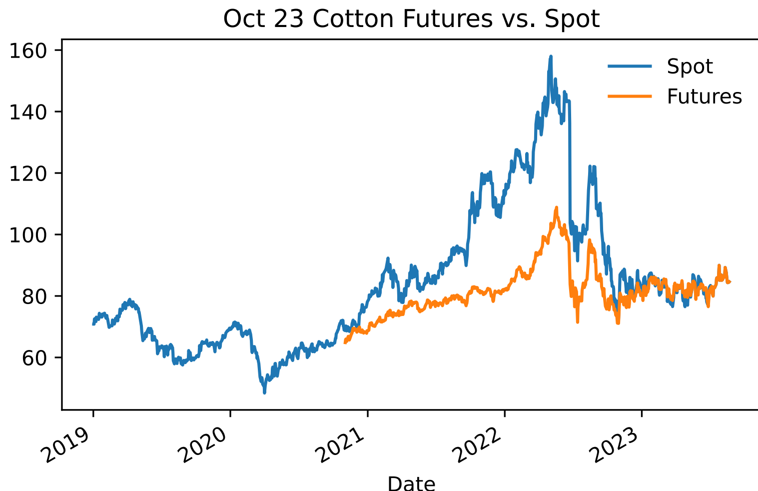
Spot vs. Futures Price

- In futures markets, the spot price is defined as the closest-to-maturity futures price.
- For many commodities, the spot price is close but not the same as the cash price.
  - The delivery method of a futures contract might be different from the typical delivery method of the physical commodity.
- More formally, if we denote by $F(t, T)$ the futures price at time t of a contract expiring at time T, the spot price is defined as:

$$S_t = F(t, t)$$

- In other words, the futures price converges over time to the spot price.

Example: Evolution of Oct 23 Cotton Futures vs. Spot



Margin Account

- A margin account consists in cash or marketable securities deposited by an investor with his/her broker.
- The margin account balance is adjusted daily to account for daily gains or losses.
- Note that futures exchanges require the margin account to be at all times above a certain minimum.
- If the margin account goes below the minimum margin requirement the trader will receive a margin call.
- Margins minimize potential losses that might occur because of a default event.

Example: Margin on S&P 500 E-mini Futures

- The E-mini S&P 500 futures contract is one of the most liquid and actively traded futures in the world.
- The contract value is defined as \$50 $\times$ the value of the S&P 500 Index.
- The way the margin works on this contract is as follows.

Day	Futures Price	Gain/Loss	Margin Account
0	4,645.00		12,000.00
1	4,656.75	587.50	12,587.50
2	4,652.25	-225.00	12,362.50
3	4,658.50	312.50	12,675.00