Financial Risk Management

Derivatives

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What are derivatives

A derivative is

- a financial security or contract whose value **derives** from the value of another asset / assets, known as the **underlying** (UL)
- an instrument for **transferring risk** and can therefore be used for
  - **hedging**: alter the exposure to an asset / risk you already have
  - **investment / speculation**: take on an exposure to an asset / risk

Forward

A forward is

- an OTC (over-the-counter) contract in which two counterparties agree, with zero money down, to buy / sell the UCL at a pre-agreed *forward price* at a given *delivery date* in the future

Example

a forward contract to exchange 1m barrels of crude oil in 3 months at a forward price of USD 95/barrel

At the *delivery date*:

- The buyer (Long) delivers: forward price USD 95m
- The seller (Short) delivers: UL 1m barrels of crude oil

Payoff of a forward

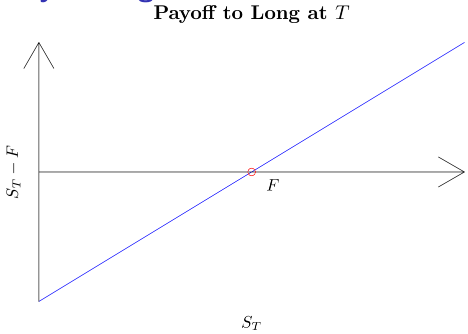
Notations

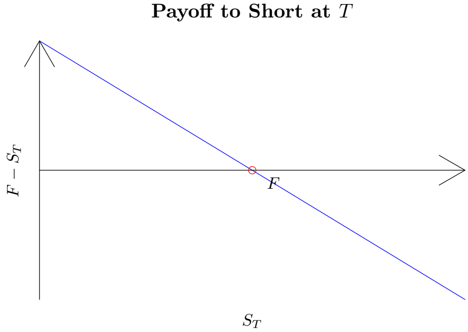
F: forward price

T: delivery date

S_T: the spot price of the underlying on the delivery date

Payoff diagrams





Forwards vs Futures

Futures are **exchange-traded** version of forwards

	Forwards	**Futures**
Buyer-seller interaction	Direct	Via exchange
Default-risk borne by	Individual parties	Exchange
Default controlled by	Collateral	Margin accounts daily “marking to market”
Contract terms	Tailored	Standardized
Unilateral reversal	Difficult	Easy

E-mini S&P 500 Index Futures Contract

Most popular equity index futures contract in the world

- **Contract size**: \$50 $\times$ S&P 500 Index price (0.2 of the standard S&P 500 futures contract)
- **Contract month**: March quarterly expiration cycle (Mar, Jun, Sep, Dec)
- **Trading hours**: CME Globex (essentially around the clock from Sunday evening to late Friday afternoon)
- **Trading termination**: 8.30am on the Settlement Date (3rd Friday of the contract month)
- **Settlement procedure**: Cash settlement based on the Special Opening Quotation on Friday morning of the S&P500 Index
- **Position limits**: 20,000 S&P500 contracts or equivalent net long or short in all contract months combined

Futures contracts - marking to market

- Similar economic effect to forwards, but, due to **marking to market**, gains and losses on futures positions are settled each day
- After **marking to market**, both sides have a zero value position with the new (end of day) futures price.
- The long receives from (pays to) the short any increase (decrease) in the futures price from the previous day

Date	0	1	2	3	$T = 4$
Future price	106	108	104	105	$S_T = 107$
Long receives	0	108-106=2	104-108=-4	105-104=1	107-105=2

- Note that $\sum$(cash flow long receives) $= 1$, equal to the payoff on a forward position where the forward price is the original futures price $S_T - F = 107 - 106 = 1$

Thank you!

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References I