Andreas Krause

Forwards and futures

Definitions

- A Forward is a contract in which the buyer agrees to purchase the underlying asset at a future date (time to maturity) for a given price (strike price)
- In return the seller agrees to sell the underlying asset at this future date
- A Futures contract is similar to a forward, but has standardised times to maturity and strike prices
- Futures have usually short times to maturity, while forwards may have longer times to maturity
- In addition, purchasers and sellers have to provide collateral for their commitments, the margin

Forward value

- At maturity of the forward, the profits are the value of the underlying asset, less the strike price, and the price paid for the forward
- $\Pi_T = S_T - K - F_t$
- If buying the underlying asset directly, the profits are the value of the underlying asset, plus any returns on that asset, less the costs of financing the asset
- $\hat{\Pi}_T = S_T + r_S T S_t - (1 + r_L T) S_t$
- To prevent arbitrage, these profits have to be equal, $\Pi_T = \hat{\Pi}_T$

$\Rightarrow$ $F_t = S_t - K + (r_L - r_S) T S_t$

- The value of a future consists of the profits to be made and the cost of carry (basis)
- The value of forwards can be positive or negative

Forward rate

- Forwards are commonly set such that no initial premium is to be paid: $F_0 = 0$

$\Rightarrow$ $K = S_0 + (r_L - r_S)\,T S_0$

- This is known as the forward rate
- For futures the strike prices are given and they will have an initial premium to pay

Types of forwards

	Financing rate r_L	**Yield on underlying asset r_S**
Stock index	risk-free rate	dividend yield
Currency	interest rate domestic currency	interest rate foreign currency
Interest rate	risk-free rate	bond yield
Commodities	risk-free rate	negative of storage costs

Properties of forwards and futures

- Forwards and futures are valued based on the current value of the underlying asset, adjusted for the benefits of purchasing the asset later (cost of carry)
- Forward rates can be lower than the current price if the yield of the underlying asset is higher than the financing costs
- Forwards and futures can have a negative value

Picture credits:
Cover: Premier regard, Public domain, via Wikimedia Commons, https://commons.wikimedia.org/wiki/File:DALL-E_-_Financial_markets_(1).jpg
Back: Rhododendrites, CC BY-SA 4.0 https://creativecommons.org/licenses/by-sa/4.0, via Wikimedia Commons, https://upload.wikimedia.org/wikipedia/commons/0/04/Manhattan_at_night_south_of_Rockefeller_Center_panorama_(11263p).jpg

Andreas Krause
Department of Economics
University of Bath
Claverton Down
Bath BA2 7AY
United Kingdom

E-mail: mnsak@bath.ac.uk