### Chapter 6 - Commodity Forwards and Futures

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### Section 6.1 Introduction to Commodity

**Forwards** 

### Introduction to Commodity Forwards

 Commodity forward prices can be described by the same formula as that for financial forward prices

$$F_{0,T} = S_0 e^{(r-\delta)T}$$

### Introduction to Commodity Forward (Cont'd)

- $\blacktriangleright$  For financial assets,  $\delta$  is the dividend yield
- lacktriangle For commodities,  $\delta$  is the commodity lease rate
  - ► The lease rate is the return that makes an investor willing to buy and then lend a commodity
  - ► The lease rate for a commodity can typically be estimated only by observing the forward prices

### Introduction to Commodity Forward (Cont'd)

- ▶ Differences between commodities and financial assets include
  - Storage costs
  - ► Carry markets
  - ► Lease rate
  - ► Convenience yield

### Introduction to Commodity Forward (Cont'd)

- ► The set of prices for different expiration dates for a given commodity is called the **forward rate** (or the **forward strip**) for that date
- ► If on a given date the forward curve is upward sloping, then the market is in **contango**. If the forward curve is downward sloping, the market is in **backwardation** 
  - ► Note that forward curves can have portions in backwardation and portions in contango

# Section 6.2 Equilibrium Pricing of Commodity

**Forwards** 

### Equilibrium Pricing of Commodity Forwards

As with financial forwards, the commodity forward price is a biased estimate of the expected spot price,  $E(S_T)$ , with the bias due to the risk premium on the commodity,  $r - \alpha$ . (**NB**:  $r - \alpha = -(\alpha - r)$ ).

$$F_{0,T} = E_0(S_T)e^{-(\alpha-r)T}$$

### Introduction to Commodity Forwards (Cont'd)

- ► The set of prices for different expiration dates for a given commodity is called the **forward curve** (or the **forward strip**) for that date
- ► If on a given date the forward curve is upward sloping, then the market is in **contango**. If the forward curve is downward sloping, the market is in **backwardation** 
  - ► Note that forward curves can have portions in backwardation and portions in contango

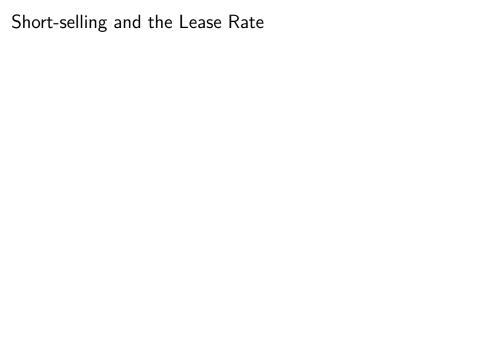
### Equilibrium Pricing of Commodity Forwards

▶ As with financial forwards, the commodity forward price is a biased estimate of the expected spot price,  $E_0(S_T)$ , with the bias due to the risk premium on the commodity,  $r - \alpha$ . (Note that  $r - \alpha = -(\alpha - r)$ )

$$F_{0,T} = E_0(S_T)e^{-(\alpha-r)T}$$

### Equilibrium Pricing of Commodity Forwards (Cont'd)

- ► Different commodities have their distinct forward curves, reflecting different properties of
  - ► Storability
  - ► Storage costs
  - ► Production
  - ► Demand
  - Seasonality



Section 6.3 Pricing Commodity Forwards by Arbitrage

Section 6.4 Gold

Section 6.5 Corn

## Section 6.6 Energy Markets

Section 6.7 Hedging Strategies

Section 6.8 Synthetic Commodities