Commodity Forwards and Futures:

Commodity forwards are similar to financial forward contracts. Financial forward prices based on future spot rate minus dividends paid during the holding period. Commodity forwards have additional attributes such as physical qualities like storage and storage costs and leasing rates.

When investor does not have immediate need for a commodity can lend it at appropriate "leasing rate".

Forward Price $F_T = S_0 e^{(R_f - \delta)T}$

R_f = Risk free rate; δ = lease rate.

Contango and backwardation:

When forward price is higher than spot price, then the term $(R_f - \delta) > 0$ implies lease rate is less than risk free rate; the opposite is true in case of backwardation.

Storage Costs:

If a commodity requires storage, then storage costs will be associated with forward price and it must be higher than spot price. If owner of the commodity sells the commodity for future date, it is called cash and carry and will charge storage costs to store the commodity until delivery date.

$F_T \geq S_0 e^{R_F T} + \lambda(0,T)$ where $\lambda(0,T)$ = future value of storage cost during time T

If storage costs are paid continuously then

$F_T \geq S_0 e^{(R_F + \lambda)T}$ where λ = continuous annual storage cost.

Commodity Spread:

Commodity Spread is resulted by holding raw material that has byproducts. Heating oil and Gasoline are byproducts of crude oil. Cracking spread or Crush Spread is achieved by holding long on raw material and short on by products or vice versa. If the sum of by products have higher value than raw input trader may buy raw goods and short byproducts.

Review:

If a commodity was lent and continuous compounded convenience yield is c and storage costs are λ then the forward price $F_T = S_0 e^{(R_F + \lambda - c)T}$.

The price of a commodity is $5 and continuous compounded annual interest rate is 6% and continuous annual convenience yield is 7% then forward price of the commodity is 3 months is equals to:

$$F_T = S_0 e^{(R_F - c)^T}$$

$$= 5 * e^{(0.06-0.07)*3/12} = \$4.987$$