

Pricing Forwards and Futures

Arbitrage-free (USD) prices for Forwards and Futures are given by the following equation:

$$F(t, T) = V(t)e^{r(T-t)},$$

where

$F(t, T)$ = date t price for a forward contract that matures at date T ;

r = annualized risk-free interest rate; and

$V(t)$ = date t value of the underlying asset.

$V(t)$ for non-dividend paying stock:

$$V(t) = S(t),$$

where $S(t)$ corresponds to the “spot” (date t) price of the stock.

$V(t)$ for stock with discrete dividends D paid at date t_D :

$$V(t) = S(t) - De^{-r(t_D-t)}.$$

$V(t)$ for stock with continuous dividend yield δ :

$$V(t) = S(t)e^{-\delta(T-t)}.$$

$V(t)$ for foreign currency:

$$V(t) = S(t)e^{-r_{\text{foreign}}(T-t)},$$

where $S(t)$ corresponds to the foreign currency “spot” rate, and r_{foreign} corresponds to the annualized foreign (non-U.S.) risk-free interest rate.

$V(t)$ for commodities: Commodities typically generate negative “income” in the forms of storage and insurance costs. Thus, the $V(t)$ formulas for commodities are similar to those for discrete and continuous dividend-paying stocks, where costs are added rather than income subtracted.