

Time Extended Exchange Option pricing model

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payoff:

$$\max(S_1(t_1) - S_2(t_2), 0)$$

Exchange option price:

$$C = S_1 e^{Y_1 t_1 - r t_2} N(d_1) - S_2 e^{(Y_2 - r) t_2} N(d_2)$$

with:

$$d_1 = \frac{\ln S_1 / S_2 + Y_1 t_1 - Y_2 t_2 + \frac{1}{2} \sigma^2 t_2}{\sigma \sqrt{t_2}}$$

$$d_2 = d_1 - \sigma \sqrt{t_2}$$

$$\sigma = \sqrt{\frac{t_1}{t_2} \sigma_1^2 + \sigma_2^2 - \rho \sqrt{\frac{t_1}{t_2}} \sigma_1 \sigma_2}$$

This option pricing model is an extension to the Margrabe model for exchange options. The exchange option allows the holder to exchange one asset for another at expiration. This extension exchange option has the extension that the holder can exchange one asset to another at different times.

Symbol list:

- C** Price of the exchange option
- S_1 The value of the first underlying. This is the underlying to which you can exchange.
- S_2 The current underlying, this underlying can be exchanged into the other.
- Y_1, Y_2 Yields of the underlyings.
- σ_1, σ_2 Volatilities of the two underlyings.
- ρ Correlation between the two underlyings.
- t_2 Time till expiration.