FX Touch Option Explained

FX Touch

- A touch option is a contract with one or two barriers. The buyer of the option will get a cash amount if the price of an underlying asset reaches or passes a predetermined level.
- The European style touch option pays a cash rebate if the underlying price is located outside of the two barriers during the option's lifetime. The cash is paid when the option contract expires.
- The American style touch option pays a cash rebate if the underlying price is located outside of the two barriers during the option's lifetime. The cash is paid at the time the barrier is reached.
- There are only two possible outcomes. If the barrier is broken a trader will receive the agreed full payout. If the barrier isn't broken, the trader will lose the premium paid to the broker.

FX Touch

- The no touch option pays a fixed cash amount if the underlying price stays between the two boundaries for the entire lifetime of the option.
- This type of option is useful for traders who believe the price of an underlying asset will pass a certain level in the future.
- Speculative market participants like to use touch options as bets on a rising or falling exchange rate.
- Investors trade touch options as a rebate in order to secure themselves compensation in case their strategy doesn’t work out.

FX Touch

- There are several different types of touch options:
- Cash-or-nothing binary one-touch option pays a cash rebate if the barrier is breached. The payoff is paid at the breach time or expiry.
- Asset-or-nothing binary one-touch option pays the asset if the barrier is breached. The payoff is paid at the breach time or expiry.
- Cash-or-nothing binary no-touch option pays a cash rebate at maturity if the barrier is not touched.
- Asset-or-nothing binary no-touch option pays the asset at maturity if the barrier is not touched.

FX Touch

- Cash-or-nothing digital one-touch option is a standard Digital type option except that it pays a digital cash value at maturity if the barrier is touched.
- Asset-or-nothing digital one-touch option is a standard Digital type option except that it pays a digital asset value at maturity if the barrier is touched.
- Cash-or-nothing digital no-touch option is a standard Digital type option except that it pays a digital cash value at maturity if the barrier is not touched.
- Asset-or-nothing digital no-touch option is a standard Digital type option except that it pays a digital asset value at maturity if the barrier not touched.

FX Touch

- Barrier conditions for different types of touch options
  - No touch up: $S_t < B$
  - One touch up: $S_t \geq B$
  - No touch down: $S_t > B$
  - One touch down: $S_t \leq B$
  - Double no touch: $B_l < S_t < B_h$
  - Double one touch: $S_t \leq B_l$ or $S_t \geq B_h$
  - One touch down no touch up: $S_t \leq B_l$ or $S_t < B_h$
  - One touch up no touch down: $S_t > B_l$ or $S_t \geq B_h$

FX Touch

where

B	the barrier
B_l	the low barrier
B_h	the high barrier

- The payoff currency could be either the cash (base) or the asset (underlying).

$payoff = Nominal \times S \times 1_{condition}$ if the payout currency is asset

$payoff = Nominal \times 1_{condition}$ if the payout currency is cash

FX Touch

- The present value of a one touch option is given by

$$P = R \cdot e^{-wrT_d} \cdot [(\frac{L}{S})^A \cdot N(-\varepsilon \cdot d_1) + (\frac{L}{S})^B \cdot N(\varepsilon \cdot d_2)]$$

where

$$\theta = \frac{r - r_f}{\sigma} \cdot \frac{T_d}{T_e} - \frac{\sigma}{2}$$

$$\nu = \sqrt{\theta^2 + 2 \cdot (1 - w) \cdot r \cdot (\frac{T_d}{T_e})^2}$$

$$d_1 = \frac{\log(S/L) - \sigma \cdot \nu \cdot T_e}{\sigma \cdot \sqrt{T_e}}$$

$$d_2 = \frac{\log(L/S) - \sigma \cdot \nu \cdot T_e}{\sigma \cdot \sqrt{T_e}}$$

$$A = \frac{\theta + \nu}{\sigma}$$

$$B = \frac{\theta - \nu}{\sigma}$$

FX Touch

where

S	the spot exchange rate
σ	the annualized volatility of the underlying rate
r	the domestic interest rate between spot date and delivery date
r_f	the foreign interest rate between spot date and delivery date
T_e	the expiry date
T_d	the delivery date
ε	1 for a lower barrier, -1 for an upper barrier.
$N(x)$	the standard normal cumulative distribution function
L	the barrier level
R	the domestic cash amount
w	the rebate value

Thank You

You can find more details at

https://finpricing.com/lib/EqRainbow.html