Barriers Brake the Spot

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In my classes on FX Options, I have been teaching delegates about how large barrier option contracts that are delta hedged by banks can impact the spot movement. It has always been rumors that option traders with similar positions in their books would meet in the pub and discuss at which spot level right before the barrier they would decide to stop delta hedging. When delta hedging is stopped, the barrier is hit, large hedge positions are unwound and lead to the spot zipping right through the barrier.

Hedge funds would like to know about this before, and guess what: we don't need to go to the pub anymore (what a pity) but can consult market data. And the speculative stories I have been telling can now be confirmed with actual OTC trade data sourced from DTCC and visualized in the Enterprai platform. In detail:

Step by Step Delta Hedging

First, one will ask an analyst to tell us some critical spot levels, and the analyst will run his economic and maybe chart analysis to come up with a critical *resistance level*. The client will then, based on the trader's advice, set the barrier at this resistance level or slightly beyond. As time passes, the option maturity will decrease and Greeks take large values for spot levels near the barrier, see Figure 1, Figure 2, Figure 3 and Figure 4.

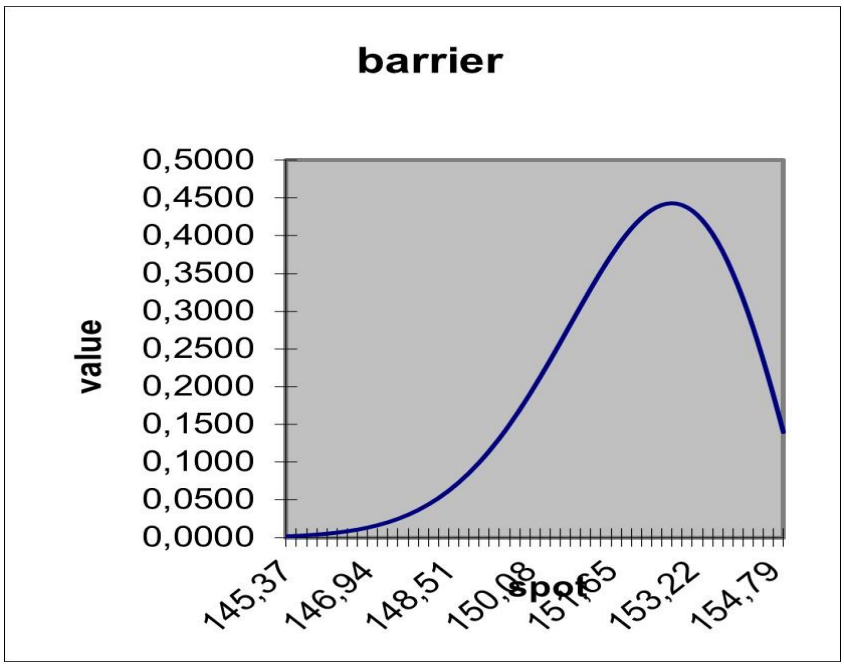

Figure 1: USD-JPY Up-and-out Call Option Value on 26 April 2024. Maturity 1 May 2024, Strike 152, Barrier 155.5, Volatility 12.755%, USD Rate 5,31%, JPY Rate -0,252%

Example

- A market maker sells a reverse up-and-out (RKO) USD-call=JPY-put with strike 152 and barrier 155.5. The value function is displayed in Figure 2.

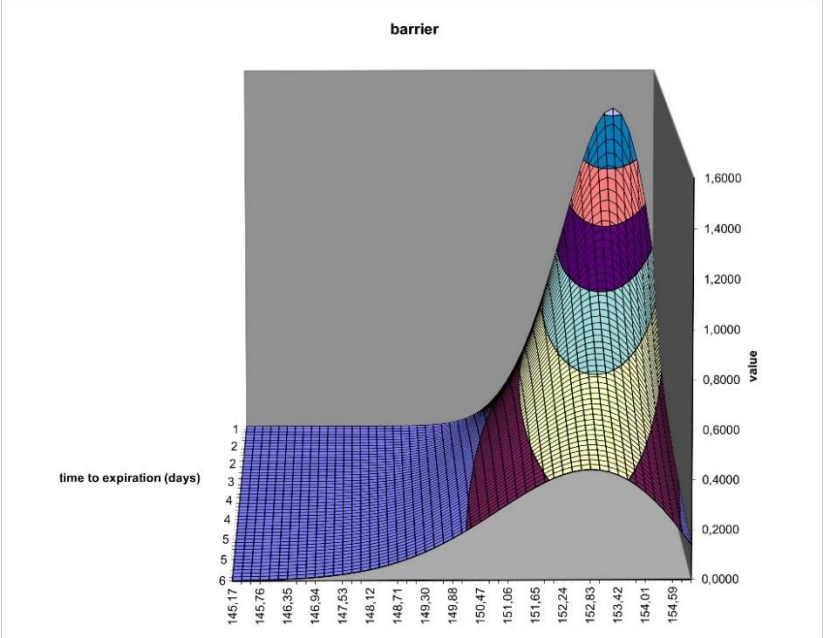

Figure 2: USD-JPY Up-and-out Call Option Value Function on 26 April 2024.

- The market maker delta-hedging a short position with nominal 1 billion must buy 1 billion x delta USD. As the spot moves up, delta becomes negative and is theoretically unbounded, see Figure 3. For RKO barrier options, delta can exceed the notional of the option, other than for vanilla options.

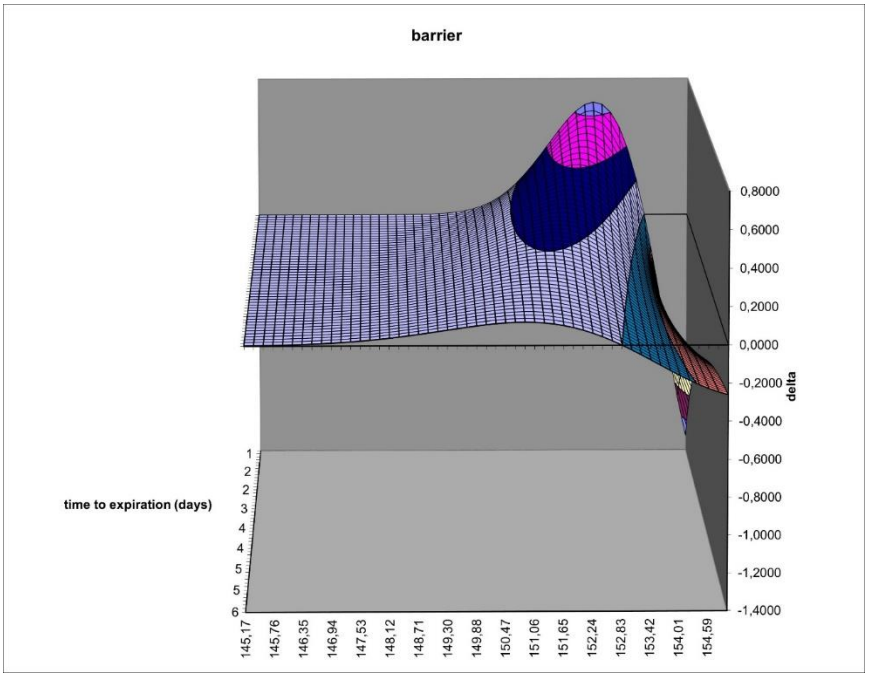

Figure 3: USD-JPY Up-and-out Call Option Delta Function on 26 April 2024.

- As the spot goes up to the barrier, the negative delta becomes larger and larger requiring the hedging institution to sell more and more USD.
- This can influence the market since steadily selling USD slows down the spot movement towards the barrier and can in extreme cases prevent the spot from crossing the barrier. A high (negative) gamma indicates an intense selling of USD if the USDJPY spot rises, see Figure 4

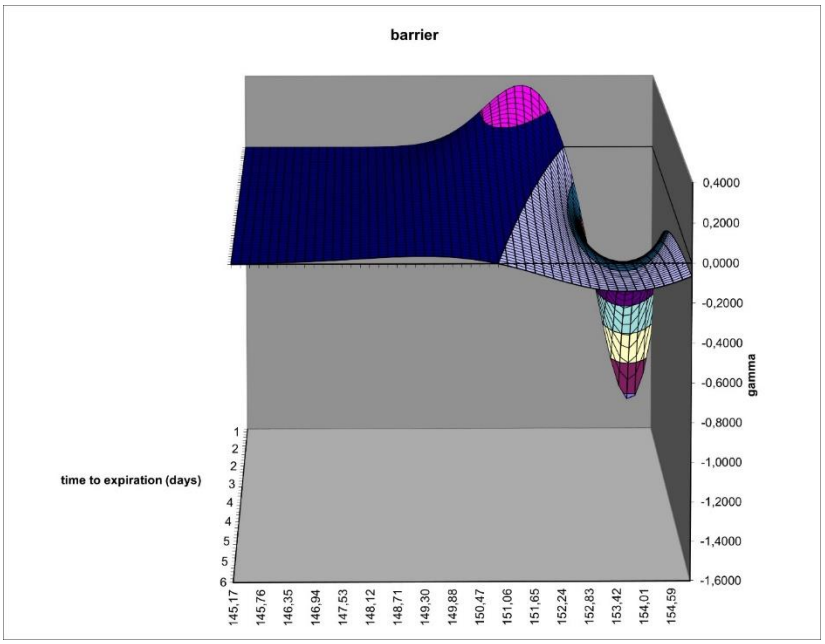

Figure 4: USD-JPY Up-and-out Call Option Gamma Function on 26 April 2024.

- Once the barrier is breached, the market maker usually unwinds the delta hedge, buying lots of USD. Consequently, the spot rate goes up fast and looks like it zipped right through the barrier.

And then the analyst will come back and tell you, see this was a critical *resistance level* 😊. That much for the theory.

This RKO Was a Real Trade

The OTC transactions in FX Derivatives that are reported by *Depository Trust and Clearing Corporation* (*DTCC*) are public information and can be obtained from the DTCC website or data providers. Enterprai's mission is to capture such data and visualize the FX derivatives market supported by Greeks and other trade-relevant information using proprietary algorithms. Some of the open RKO positions that were active in April 2024 are listed in Figure 5.

Notionals for USDJPY RKOs with stirke=152 knock-out=155.5		
2024-04-18	$	760,720,037
2024-04-23	$	100,095,577
2024-04-24	$	250,000,000
2024-04-25	$	90,263,158
2024-05-01	$	1,000,082,098
2024-05-13	$	24,983,563

Figure 5: USD-JPY RKO Barrier Options with Notionals Expiring by May, Including $760mio on 18-Apr and $1bio on 1-May; source: Enterprai.

The Enterprai platform reports: during the Tokyo trading session in the morning of April 26, 2024, starting around 03:23 UTC/12:23 p.m. JST, the USDJPY market started to get bid up, eventually triggering the larger barrier at 155.50, which they had flagged the previous week. The KO level was breached around 03:33 UTC/12:33 p.m. JST, and the market has since stayed above 156.00.

USDJPY Spot Market: 17 April: 154.39 - 25 April: 155.65 - 26 April: 158.33

Due to the RKO option disappearing from market maker books, delta hedges were unwound, meaning that market makers bought USD quickly pushing the USDJPY spot up. We would also expect to see market makers buying back short-dated options that were sold to hedge the large time decay on their books. This should lead to front-end volatility levels being higher. Some market makers may have sold Risk Reversals for the purpose of

vanna-hedging that would need to be cleaned up, potentially leading to selling of low strikes and buying back call spreads. It is also worth noting that none of the other currency pairs reacted much (e.g., EUR, GBP, and AUD), and the move remained primarily a JPY move.

How a Prop Trader Looks at it

On 18 April 2024 there is a huge concentration of topside USDJPY RKO structures knocking out at 155.5, shown in Figure 5. This means that RKO gamma positions will become large for spot levels below the 155.5-knock-out level. Figure 4 shows that gamma peaks near the strike at typical vanilla option gamma sizes, and towards the barrier in the opposite sign and higher values. In this case it pushes RKO gamma to over $7.9bio eclipsing even vanilla gamma by a big margin. The spot level 155.5 is now USDJPY's line in the sand, see Figure 6.

There is strong resistance at 155.5: Market makers hedging a short RKO position are expected to sell spot USDJPY between now and the time the level 155.5 is reached, creating a headwind for spot price. Owners of RKOs also have a very large incentive to defend this level. Most of these RKO calls have a strike at 152 and a barrier at 155.5, see again Figure 5.

We expect a melt-up if 155.5 breaches. Once the 155.5-barrier options get knocked out, dealers are expected to buy back USD spot creating significant buying flow for USDJPY higher. Additionally, if options had been used to hedge the RKOs, one can expect USDJPY-volatility spikes and topside skew.

This insight is an example of the service and analytics Enterprai provides as part of their data consulting, where they reverse engineer likely RKO barrier levels from DTCC data on FX options.

Figure 6: USD-JPY $7.9bio of Topside RKO Gamma Exceeds even Vanilla Gamma by big Margin. Note Large Negative Gamma for RKOs around 155.5 Suggesting Large Resistance by Dealers' Delta-Hedging. Source: Enterprai.

Conclusion

1. Large positions in reverse knock-out (RKO) barrier options impact the spot of the underlying, not only in theory, but also in practice.
2. Clever visualization of OTC FX derivatives transactions can now detect such positions in the market looking at gamma positions building up over time.
3. Prop-traders can build a trading strategy based on this information and the view they take about the market makers' hedging strategy.

References

- Wystup: FX Options and Structured Products, Second Edition, Wiley 2017.