Our topics:

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- Events
- Trainings
- Publications
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Newsletter – MathFinance AG

February 2025

The year 2025 started busy with Research in Options in the Emirates, FX Options trainings in India and SLV implementation in London.

Save the date: September 18-19, 2025 don't miss our MathFinance Conference on Reichenstein Castle.

1. Abu Dhabi Research in Options (Adrio)

Prof. Dr. Uwe Wystup

was a plenary speaker at the 2nd Abu Dhabi Research in Options Conference. He talked about current industry models and applications of FX options in practice: who uses which instruments and what can go wrong

Date: January 6 - 8, 2025

Venue: Khalifa University, Abu Dhabi, Emirates

https://ctl.ae/adrio2#/speakers?lang=en

جامعة خليفة
Khalifa University

Prof. Dr. Martin Simon
Martin Simon is an invited speaker at Clifirium 2025: Climate finance, risk and uncertainty modelling organized by the Banque de France and the chair Stress Test, Risk management and Financial Steering at Ecole Polytechnique. Martin will speak about Uncertainty Quantification in Portfolio Temperature Alignment.
Date: April 7, 2025
Venue: Banque de France, Paris

(https://www.banque-france.fr/en/events/clifirium-2025-climate-finance-risk-and-uncertainty-modelling)

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2. EVENTS

Quant Marathon
Starts February 17th, 2025

Register for the entire program or select either the Data Science or Quantitative Finance bundle.
All courses begin on February 17.

information@arpm.co

https://arpm.co/quant-marathon

Vienna Congress on Mathematical Finance (VCMF 2025)
Starts Wed-Fri, July 9-11, 2025

https://fam.tuwien.ac.at/vcmf2025/

The third Vienna Congress on Mathematical Finance (VCMF 2025) will be held July 9-11, 2025, once again at the campus of WU Vienna. The conference will bring together leading experts from various fields of mathematical finance such as:

- Financial Economics
- Green and Sustainable Finance (Electricity, Energy, ...)
- Insurance (Climate Risk, Cyber Risk, ...)
- Mean Field Games and Stochastic Control
- New Technologies in Finance and Insurance

(Computational Methods and Machine Learning, Cryptocurrencies,
Limit Order Book and High Frequency Trading, Algorithmic Trading, ...)
- Optimal Transport (Robust Finance)
- Portfolio Optimisation
- Risk Management (Risk Allocation, Risk Aggregation, Credit Risk and Systemic Risk, ...)
- Rough Analysis in Finance and Insurance (Rough and Stochastic Volatility, ...)
- Statistics for Financial Markets and Large Language Models

The conference program will feature plenary lectures, parallel sessions with invited and contributed talks as well as poster sessions.
Moreover, there will be a panel discussion on the topic "AI in finance and insurance".

The VCMF 2025 follows the successful previous edition, VCMF 2019, with 250 attendees.

The call for contributed talks & posters will be open until February 28, 2025.
Acceptance/rejection letters will be sent until April 15, 2025 at the latest.

For further information including details on plenary and invited speakers, a mailing list, as well as registration, see the conference homepage at https://fam.tuwien.ac.at/vcmf2025/

With kind regards from the VCMF 2025 organisers,

Christa Cuchiero, Julia Eisenberg, Zehra Eksi-Altay, Rüdiger Frey,
Stefan Gerhold, Paul Krühner, Uwe Schmock, Josef Teichmann

Save the date for our

25th MathFinance Conference
September 18.-19, 2025

on Reichenstein Castle.

ICA Dubai Conference
Starts November 13th, 2025

Prof Wystup is invited to the Structured Products Panel at the 48th ICA Dubai Conference 13-15 Nov 2025

https://icaconferencedubai.com/

3. TRAININGS

CERTIFIED EXPERT IN TREASURY & MARKETS (CETM)

1 year part-time program at Frankfurt School of Finance & Management:

CETM is tailor made for professionals in a variety of fields. It unbundles a complex subject area - Treasury, Money and Markets and presents it in a holistic and practical format. The program also looks at how conduct and behavior influence the decision-making process. Stressing on the importance of competencies derived on knowledge, skills and values.
CETM answers questions such as – 'How do you manage market risk?', 'How do you manage money?', 'What happens in a banks and corporates treasury division'? 'What is interest rate and foreign exchange risk and how do you manage it'? 'How do you value an asset class?' 'What is ALM?' 'What is market conduct'? and many more in detail, this makes it a comprehensive learning

More information:
www.fs.de/cetm

New course by Uwe Wystup:

- FX vanilla options at Hotel Bristol, May 8-9th, 2025 in Warsaw Poland.

  Contact: https://ceeta.pl

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4. PUBLICATIONS

Uwe Wystup's FX Column on how barriers brake the spot
in Wilmott, January 2025

https://wilmott.com/wilmott-magazine-january-2025-issue/

Martin Simon is co-author of the recent work Uncertainty Quantification in Temperature Portfolio Alignment (https://arxiv.org/abs/2412.14182) jointly with Hendrik Weichel, Alexandr Zinovev and Heikki Haario providing a novel Bayesian framework for quantifying uncertainty in portfolio temperature alignment models, leveraging the X-Degree Compatibility (XDC) metric developed by the Frankfurt based climate tech right°. This approach has recently been used for a pilot study by the European Banking Authority.

(https://www.eba.europa.eu/sites/default/files/2024-11/2e1b1d1d-3cf3-4075-a9fc-899dcf5a8460/Staff%20Paper_Financing%20the%20transition.pdf).

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5. FX COLUMN

FX Column: Barriers Brake the Spot

Uwe Wystup, MathFinance AG, Frankfurt am Main

In my classes on FX Options, I have been teaching delegates about how large barrier option contracts that are delta hedged by banks can have a contingent but material impact on spot prices. It has always been rumored 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 spot zipping right through the barrier and beyond.
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 features engineered by the Enterprai analytics 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.

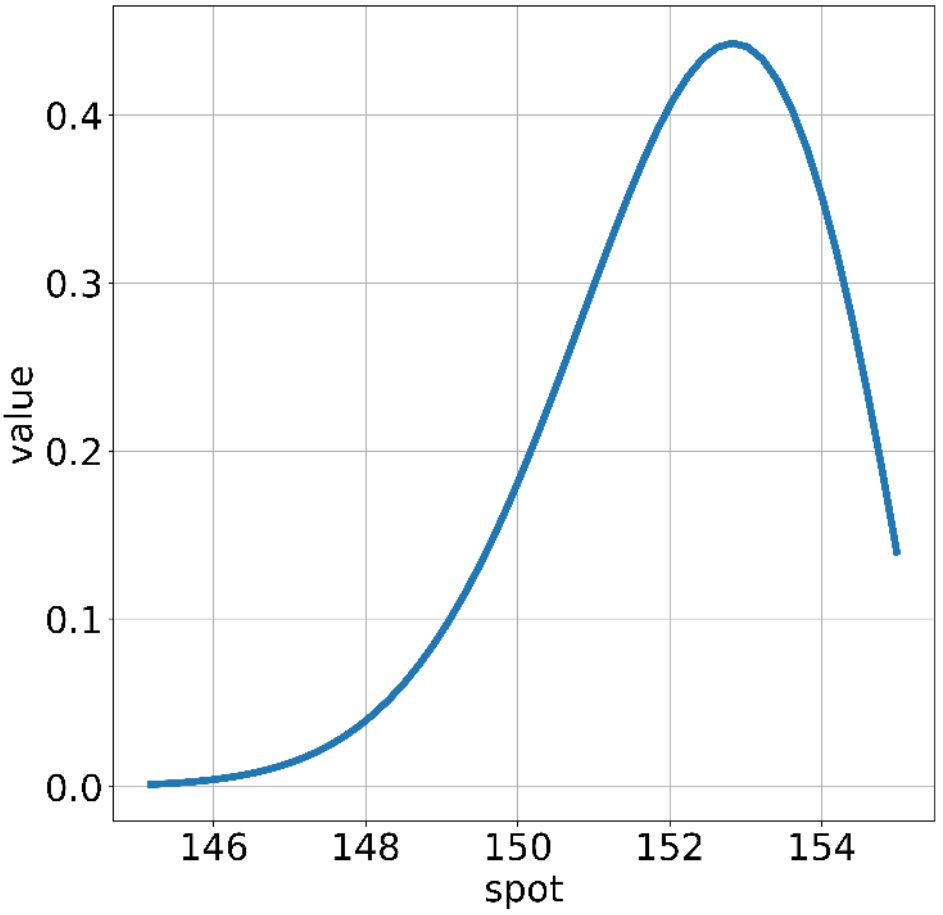

Figure 1: USD-JPY Up-and-out Call Option Value on 26 April 2024. Maturity 1 May 2024, Strike 152, Barrier 155.5, Volatility 12.755%, USD Rate 5,31%, JPY Rate -0,252%

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.

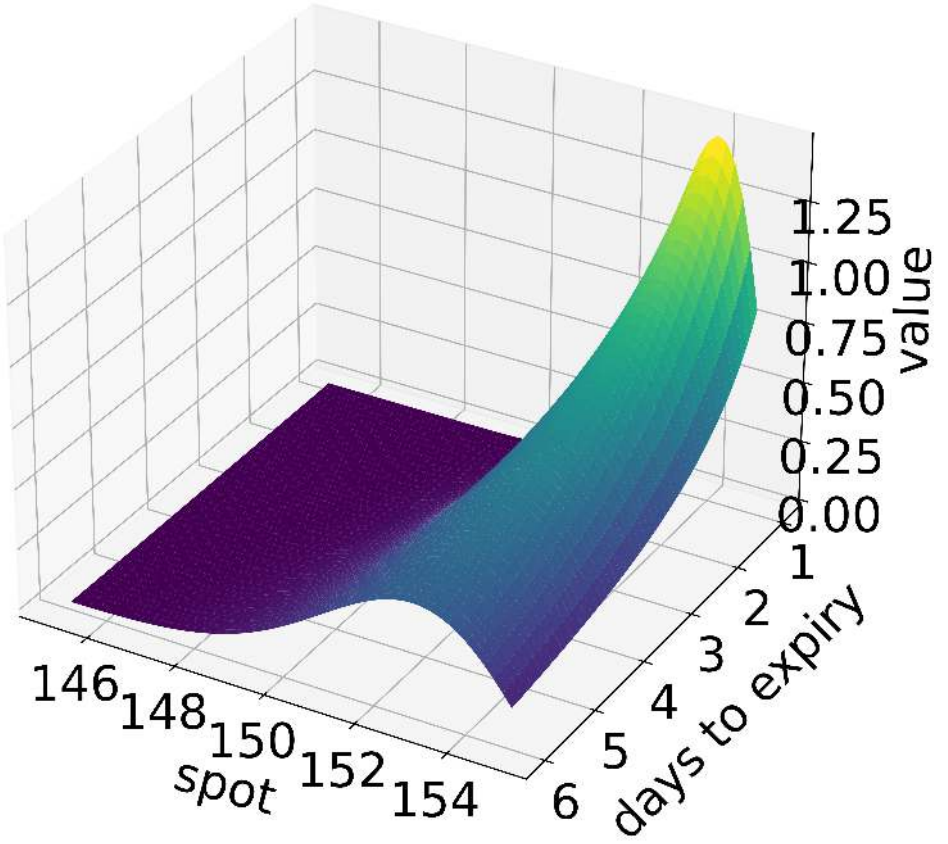

Figure 2: USD-JPY Up-and-out Call Option Value Function on 26 April 2024

- 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. Unlike vanilla options, for RKO barrier options delta can exceed the notional of the option.

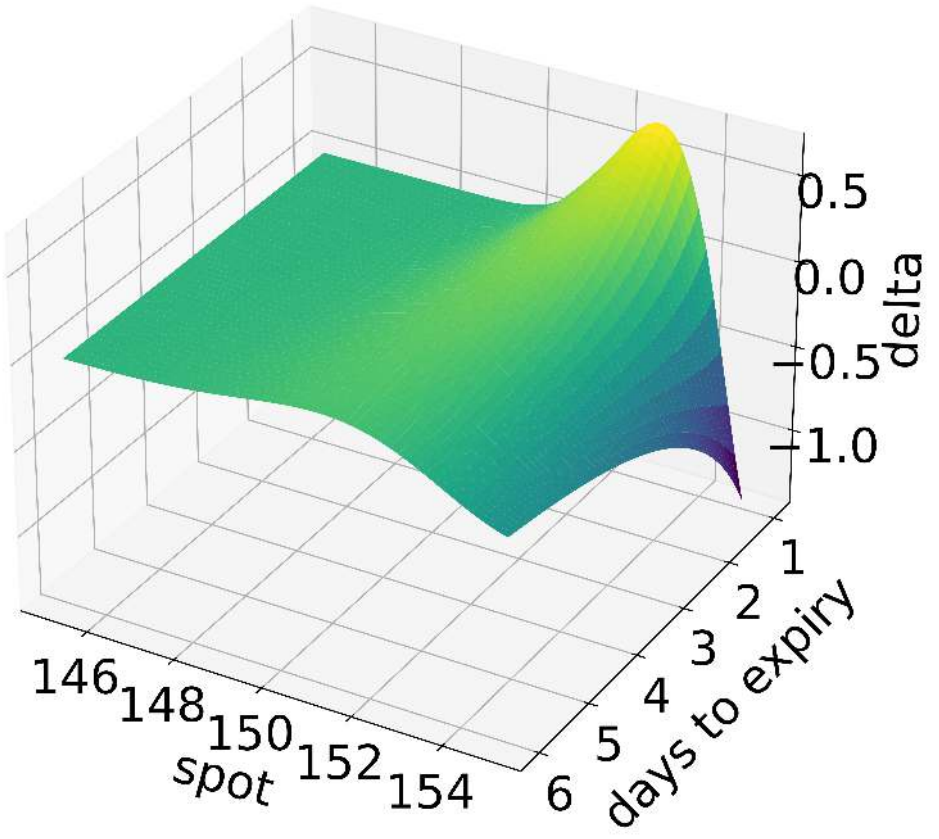

Figure 3: USD-JPY Up-and-out Call Option Delta Function on 26 April 2024

- 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. Figure 4 shows the sensitivity of gamma with respect to spot and time to expiration – from the client's perspective, which is opposite that of the delta-hedging market maker. A high (negative) gamma indicates an intense selling of USD by the delta-hedging market maker if the USDJPY spot rises.

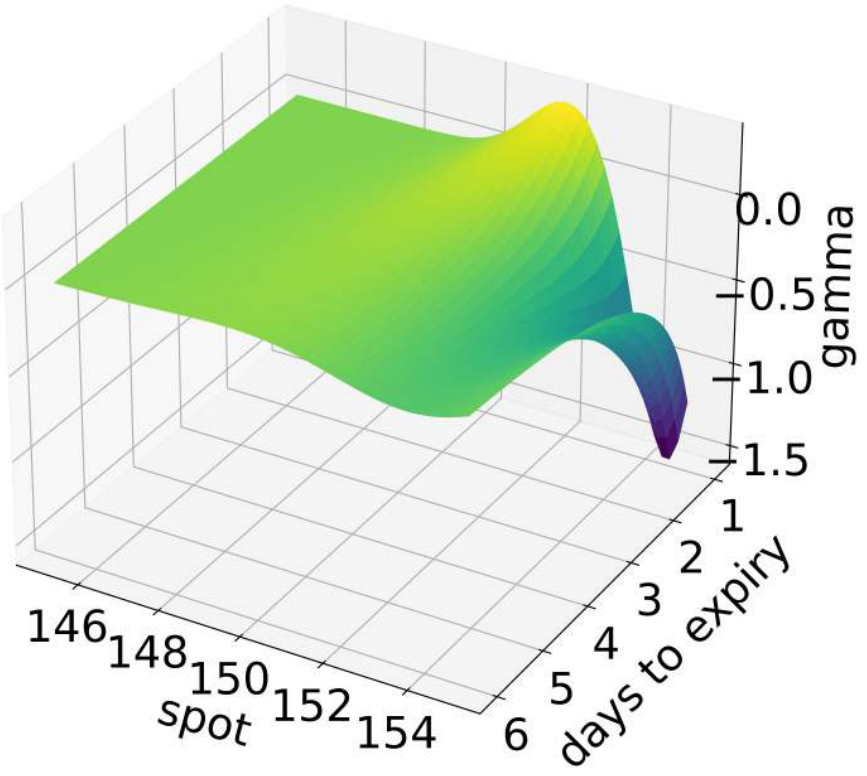

Figure 4: USD-JPY Up-and-out Call Option Gamma Function on 26 April 2024.

- However, once the barrier is breached, the market maker is typically forced to unwind the delta hedge, which results in large and price-insensitive buy orders for USD. Consequently, the spot goes up exponentially and explodes right through the barrier and beyond.

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 shine a light on the FX derivatives market. By marking to market all trades and enhancing the DTCC dataset using proprietary algorithms, users can now see Greeks and other trade-relevant information for any types of open positions in the market – including RKOs. Some of the open RKO positions that were active as of 17 April 2024 are listed in Figure 5.

Notionals for USD-JPY RKOs with strike=152, knock-out=155.5-157.5	
2024-04-18	1,249,114,787
2024-04-23	200,000,000
2024-04-24	365,131,579
2024-04-25	90,263,158
2024-04-29	0
2024-05-01	1,050,082,098

Figure 5: USD-JPY RKO Barrier Options with Notionals Expiring by May, Including $1.2bio on 18-Apr and $1bio on 1-May; source: Enterprai.

The Enterprai platform reports: during the Tokyo trading session on 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 barriers between 155.5 and 157.5. The KO levels started to be breached around 03:33 UTC/12:33 p.m. JST, and USD-JPY spot rate proceeded to explode upwards by 4 big figures in the next few days, moving from 155.50 to 159.50. The risk presented by these barriers had already been broadcast by Enterprai to its clients the previous week.

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 rising higher still. 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) during this time, indicating that the move was primarily a JPY move driven by idiosyncratic market technicals,

How a Prop Trader Looks at it

As of 17 April 2024, there was a huge concentration of topside USDJPY RKO structures outstanding, knocking out between 155.50 and 157.50, shown in Figure 5. This meant that RKO gamma positions were likely to become large resistance for spot below this knock-out range. 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 pushed RKO gamma to over $7.6bio eclipsing even vanilla gamma by a big margin. The lower end of knock-out range, 155.50, has now become USDJPY's line in the sand for spot, see Figure 6.

There was now a strong resistance at 155.50: Market makers hedging a short RKO position are expected to sell spot USDJPY before the level 155.50 is reached, creating a headwind for spot price. Owners of RKOs also had a very large incentive to defend this level. Most of these RKO calls had a strike at 152, see again Figure 5.

We expected a melt-up if the lower-end of the knock-out range, 155.50, breached. Once these barrier options got knocked out, dealers were expected to buy back USD spot creating significant buying flow for USDJPY higher. Additionally, if options had been used to hedge the RKOs, one could have expected USDJPY-volatility and topside skew to spike.

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.

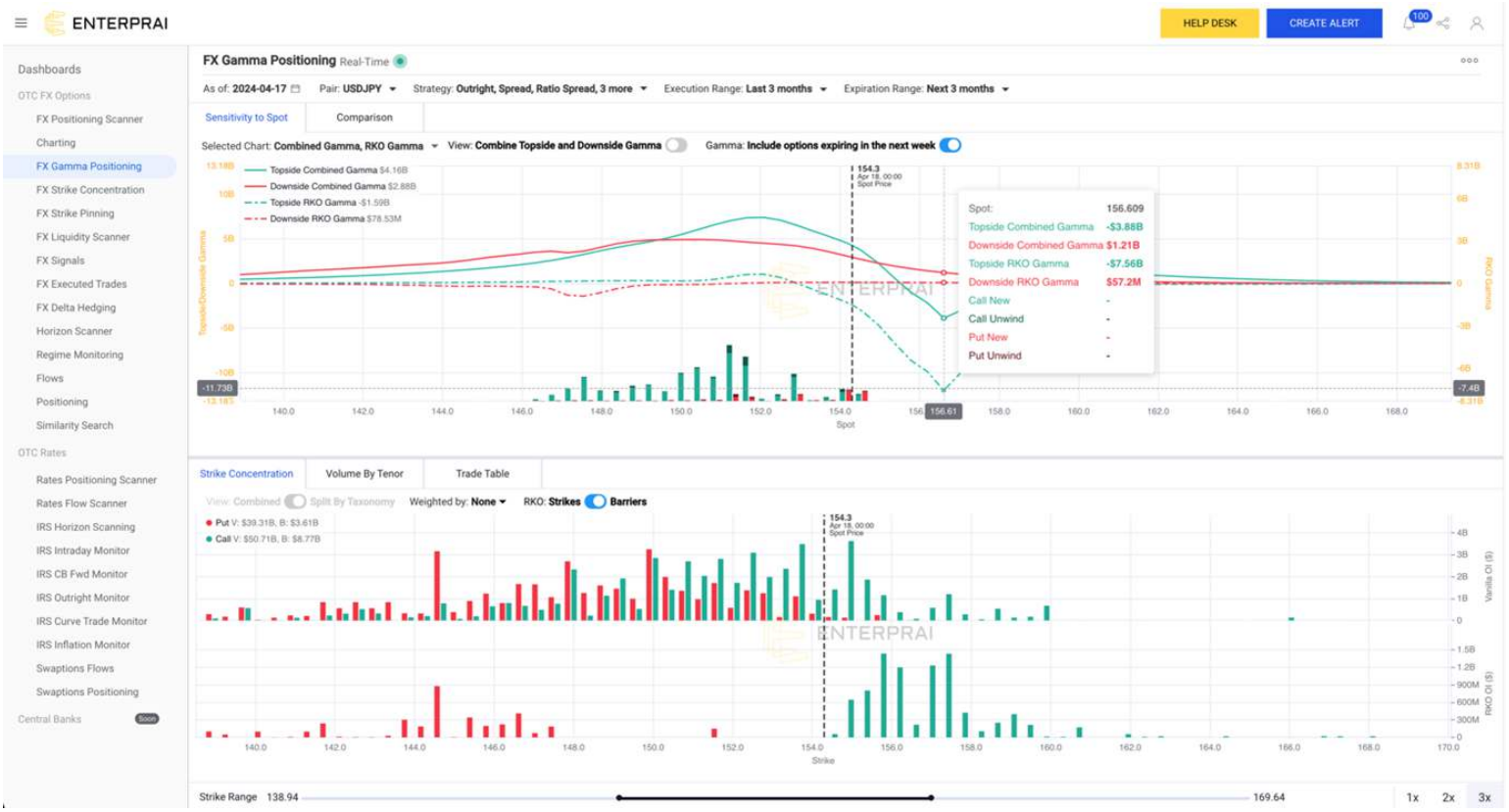

Figure 6: USD-JPY $7.6bio of Topside RKO Gamma Exceeds even Vanilla Gamma by big Margin. Note Large Negative Gamma for RKOs around 155.50-157.50 Suggesting Large Resistance by Dealers' Delta-Hedging. Source: Enterprai.

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.

14 October 2024 – MathFinance AG – Kaiserstraße 50 – 60329 Frankfurt am Main – Germany – www.mathfinance.com

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WE WANT TO

HEAR FROM YOU

Do you have suggestions, questions or comments? Then contact us at: info@mathfinance.com
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You are welcome to forward our newsletter to colleagues, partners and other interested parties.

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