

December 2022

FX Market Structure Monthly

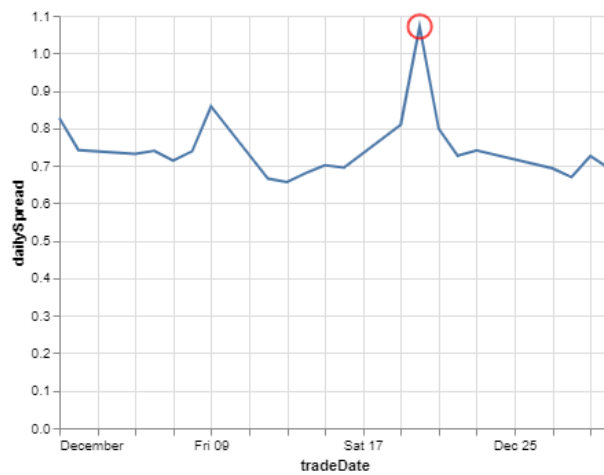
CHANGES IN SPREAD AND VOLATILITY FOR MAJOR MARKET PAIRS

The Bank of Japan’s announcement to widen the band that the ten-year JGB yield could move pushed JPY spreads wider last month. Otherwise, little happened. Twelve of the 23 G-10 pairs recorded an increase in spread during the 12:00-16:00 GMT pre-WMR fixing window, while only three recorded an increase in volatility. Intra-day JPY spreads widened.

Average daily USD/JPY Spreads
0:00-04:00 GMT December 2022

READING THE RESULTS

In the intraday charts, the green line represents the average spread or volatility for the past 12 months, the black line represents the past three months, and the blue line represents the past month. On the daily charts, the green area represents the 95th percentile confidence interval for the spread and volatility, showing the stability of the calculated median value.



SPREADS

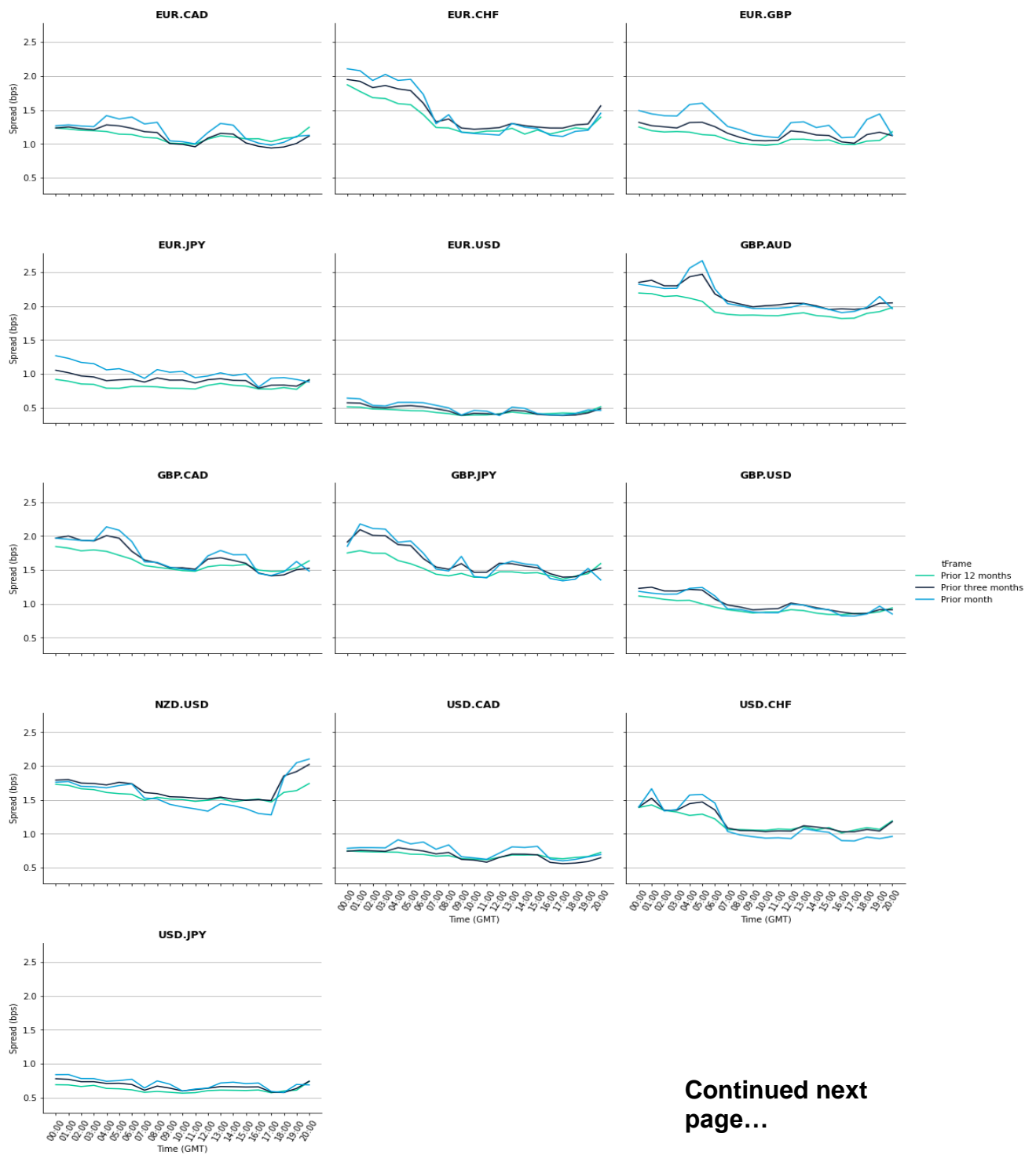
The BOJ’s announcement pushed spreads about 0.3 bps wider during the 0:00-04:00 GMT window surrounding the WMR 10 AM Tokyo fixing.



All chart sources: Virtu Financial, 2022. Spread and volatility calculations are derived from sources that Virtu believes to be reliable, but Virtu does not make any claims to its accuracy. USD.NOK, USD.SEK, EUR.NOK and EUR.SEK are shown in the separate exhibits



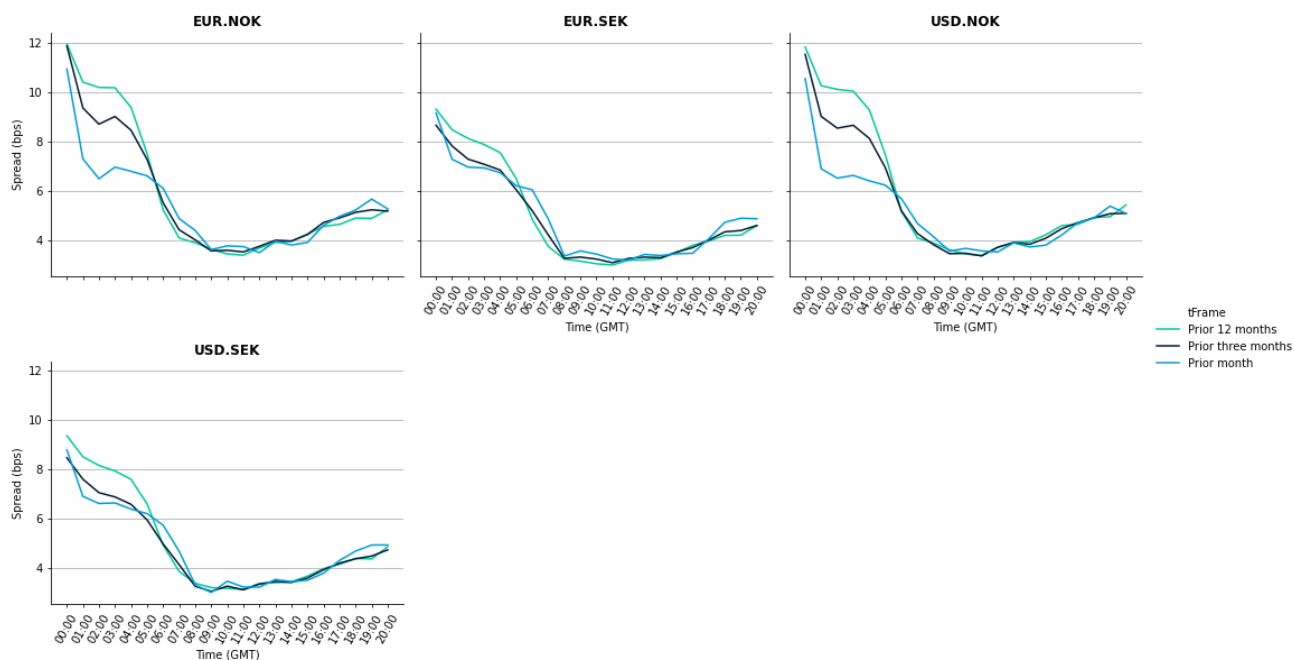
G-10 Currency Pairs: Average Hourly Spread, 00:00-20:00 GMT Comparison over the past month, three months and year



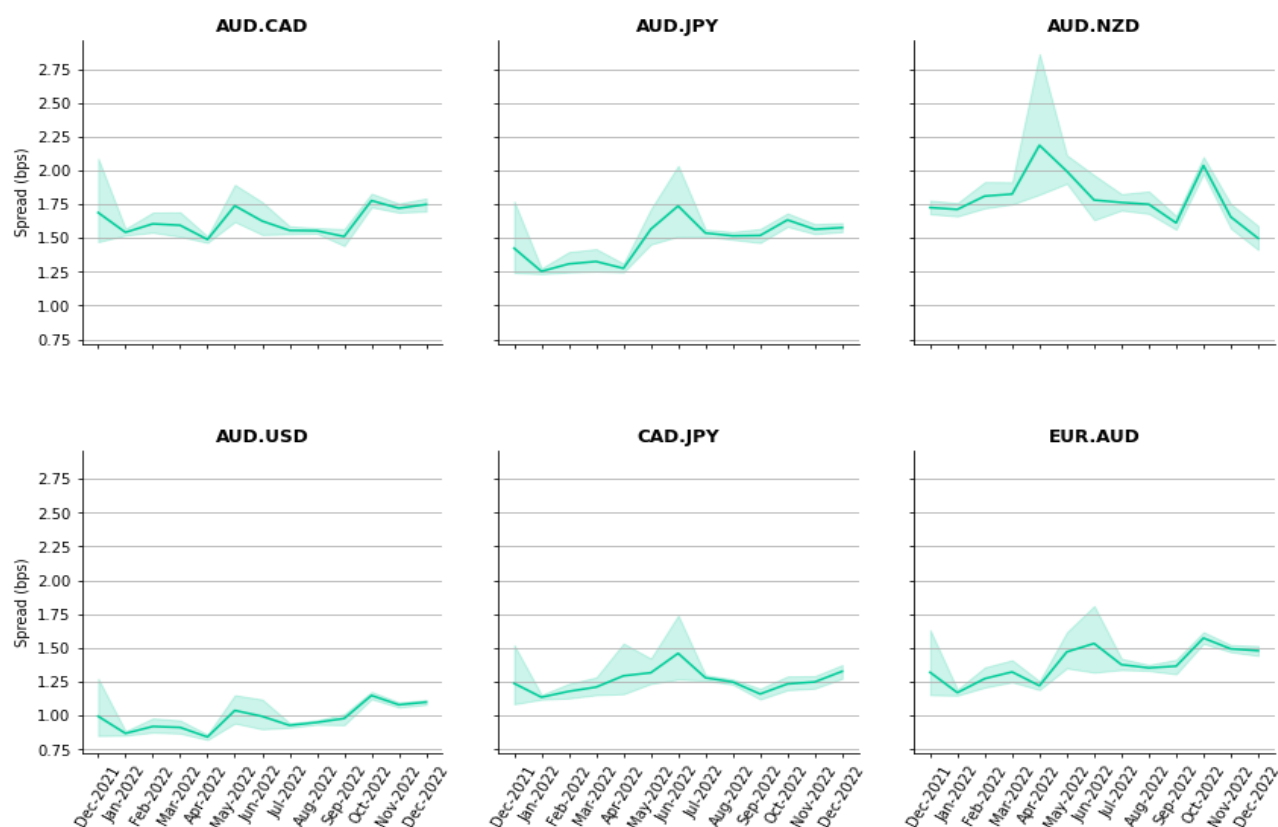
All chart sources: Virtu Financial, 2022. Spread and volatility calculations are derived from sources that Virtu believes to be reliable, but Virtu does not make any claims to its accuracy. USD.NOK, USD.SEK, EUR.NOK and EUR.SEK are shown in separate exhibits.



Scandinavian G-10 Currencies: Average Hourly Spread, 00:00-20:00 GMT Comparison over the past month, three months and year



G-10 Currencies: Average Daily Spread, 12:00-16:00 GMT December 2021- December 2022



Continued next page ...



All chart sources: Virtu Financial, 2022. Spread and volatility calculations are derived from sources that Virtu believes to be reliable, but Virtu does not make any claims to its accuracy. USD.NOK, USD.SEK, EUR.NOK and EUR.SEK are shown in separate exhibits.



Scandinavian G-10 Currencies: Average Daily Spread, 12:00-16:00 GMT December 2021-December 2022



All chart sources: Virtu Financial, 2022. Spread and volatility calculations are derived from sources that Virtu believes to be reliable, but Virtu does not make any claims to its accuracy. USD.NOK, USD.SEK, EUR.NOK and EUR.SEK are shown in separate exhibits.

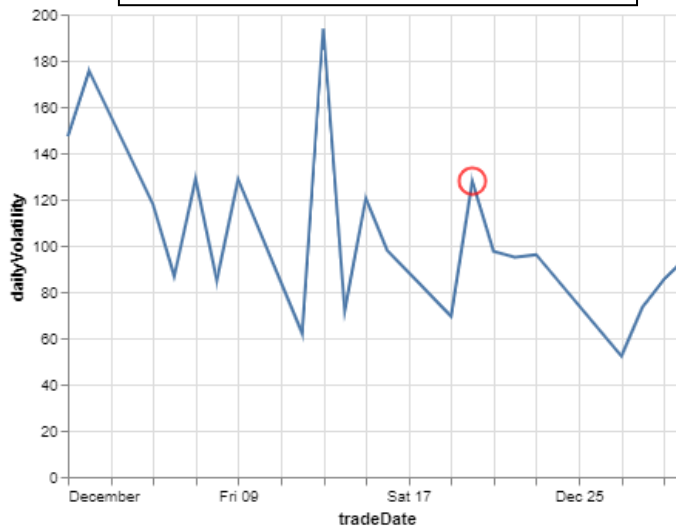


VOLATILITY

As might be expected, volatility was very quiet in December, except for JPY rates. Only three of the 23 pairs that we track recorded higher pre-WMR fixing volatility CAD.JPY, EUR.JPY and EUR.SEK. Intra-day volatility was lower for all non-JPY pairs.

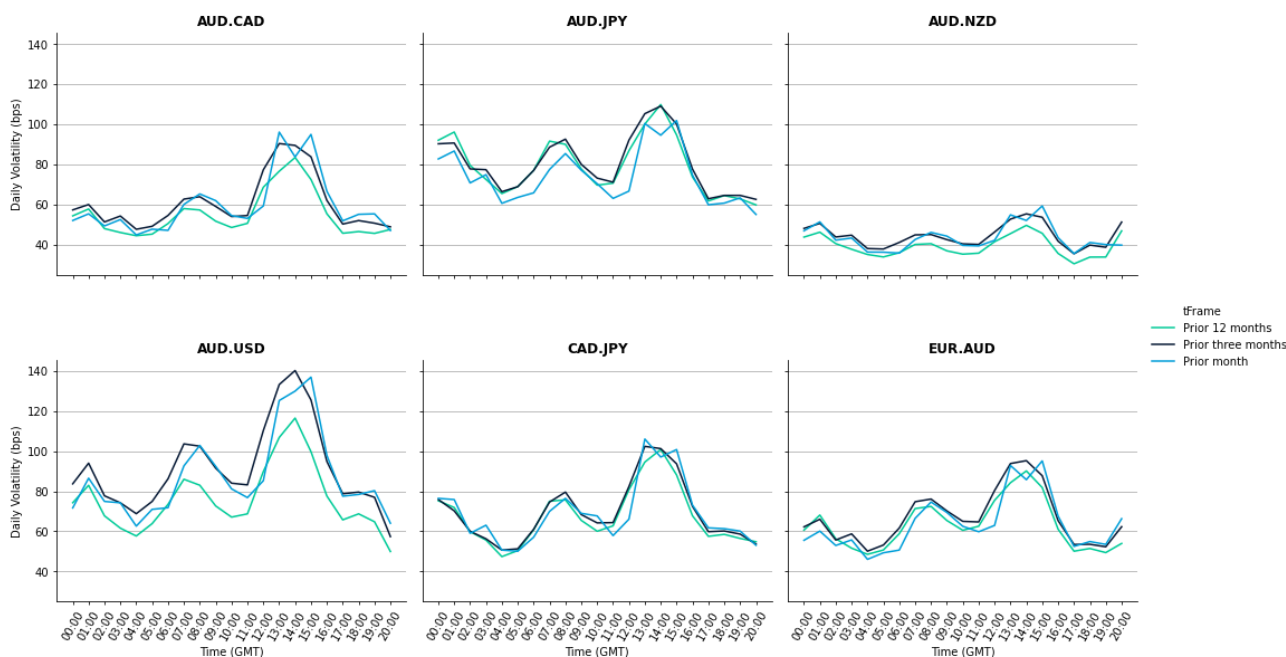
When the BOJ announced its policy change, the USD/JPY volatility spiked but not nearly as noticeably as the spread.

Average daily USD/JPY Volatility
0:00-04:00 GMT December 2022

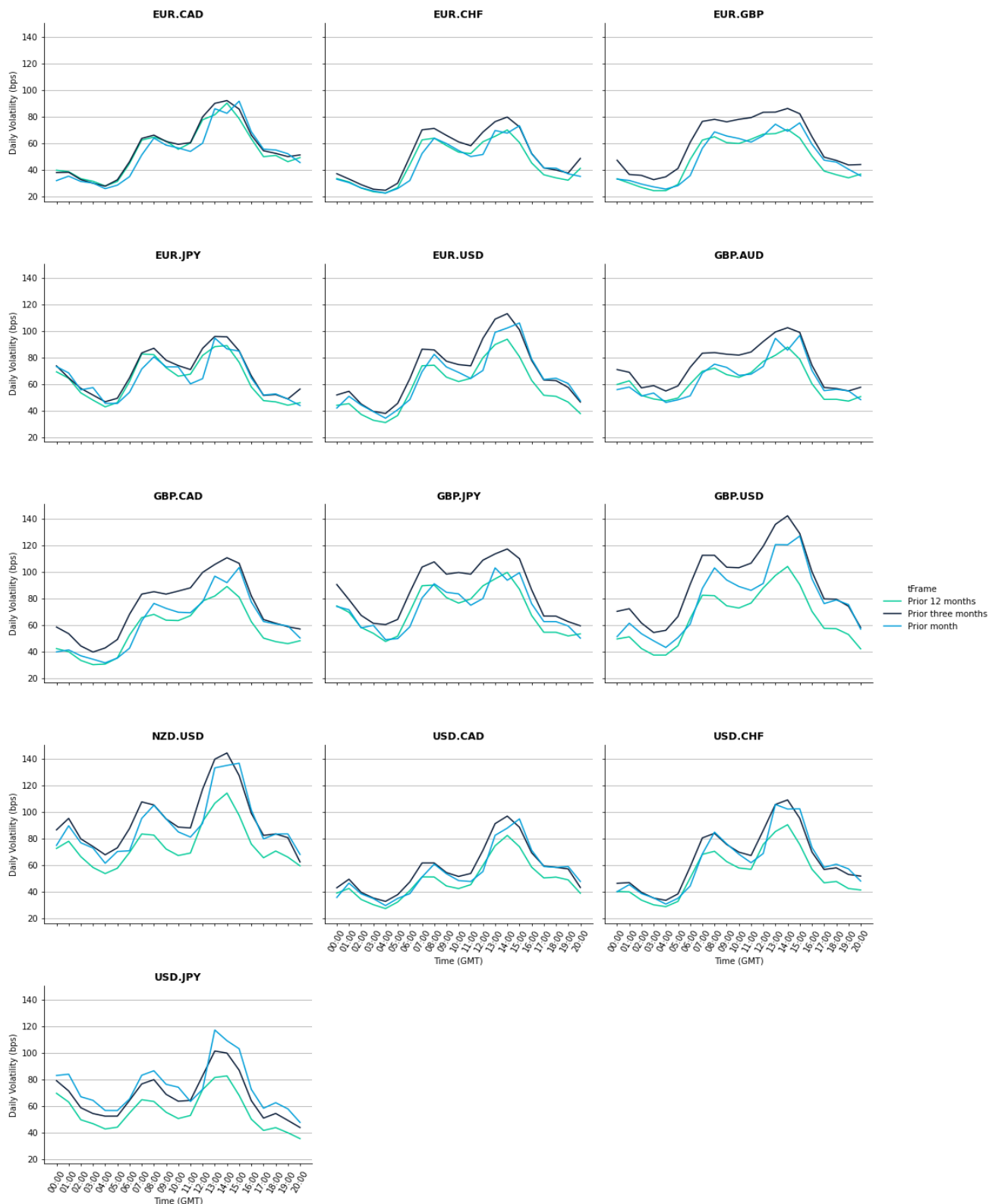


G-10 Currencies: Average Hourly Volatility, 00:00-20:00 GMT

Comparison over the past month, three months and year



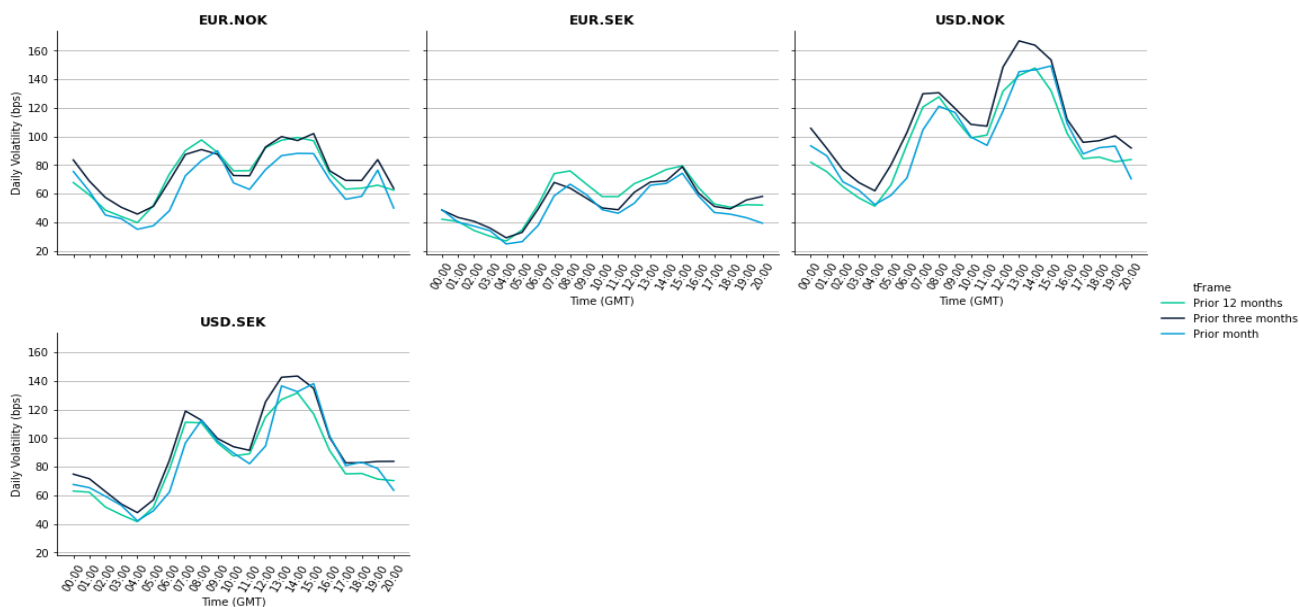
Continued next page...



All chart sources: Virtu Financial, 2022. Spread and volatility calculations are derived from sources that Virtu believes to be reliable, but Virtu does not make any claims to its accuracy. USD.NOK, USD.SEK, EUR.NOK and EUR.SEK are shown in separate exhibits.



Scandinavian G-10 Currencies: Average Hourly Volatility, 00:00-20:00 GMT Past month, three months and year



G-10 Currencies: Average Daily Volatility, 12:00-16:00 GMT December 2021-December 2022



Continued next page...

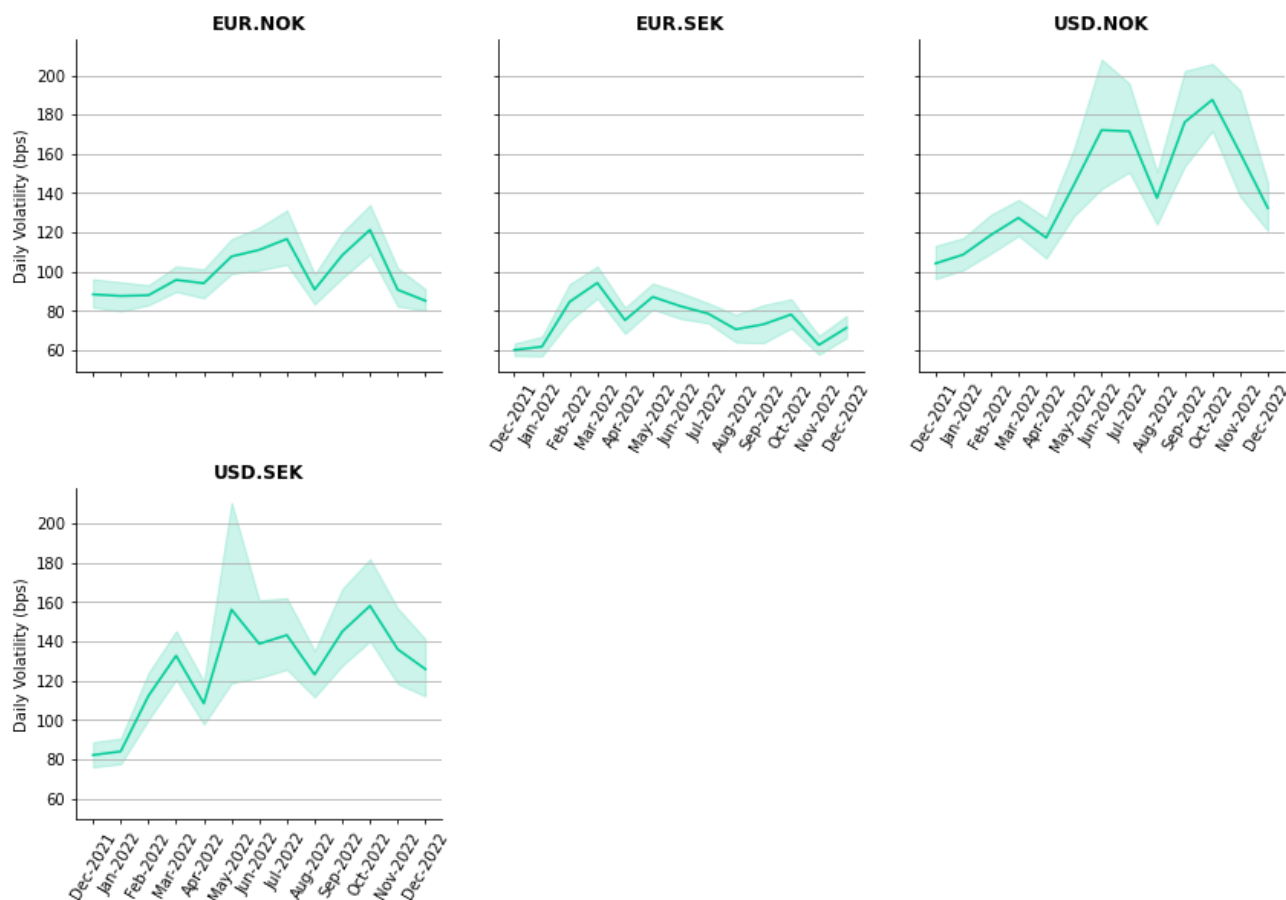
All chart sources: Virtu Financial, 2022. Spread and volatility calculations are derived from sources that Virtu believes to be reliable, but Virtu does not make any claims to its accuracy. USD.NOK, USD.SEK, EUR.NOK and EUR.SEK are shown in separate exhibits.



All chart sources: Virtu Financial, 2022. Spread and volatility calculations are derived from sources that Virtu believes to be reliable, but Virtu does not make any claims to its accuracy. USD.NOK, USD.SEK, EUR.NOK and EUR.SEK are shown in separate exhibits.



Scandinavian G-10 Currencies: Average Daily Volatility, 12:00-16:00 GMT December 2021-December 2022



Have questions? To learn more, contact your regional Virtu Analytics representative.
AMERICAS +1.866.265.4519 | **APAC** +852.3405.3755 | **EMEA** +44.20.7670.4000
analytics@virtu.com | www.virtu.com

© 2023 Virtu Financial, Inc. All rights reserved. Not to be reproduced or retransmitted without permission. These materials are for informational purposes and are not intended to be used to make trading or investment decisions, they are not intended as an offer to sell or the solicitation of an offer to buy any security or financial product, and are not intended as advice (investment, tax or legal). The information contained herein includes Virtu proprietary information and/or has been taken from sources we believe to be reliable, but we do not represent or warrant that such information is accurate or complete and it should not be relied upon as such.

Analytics products and services referenced herein may not be subject to oversight by regulatory authorities in one or more jurisdictions, including in Europe, where such products and services are offered by Virtu ITG Ventures Limited, registered in Ireland No. 295549 ("VIVL"). VIVL does not engage in regulated activity.

Securities products and services are offered by the following subsidiaries of Virtu Financial, Inc. In the U.S., Virtu Americas LLC, member FINRA and SIPC; in Canada, Virtu ITG Canada Corp., member Canadian Investor Protection Fund and Investment Industry Regulatory Organization of Canada; in Europe, Virtu ITG Europe Limited, registered in Ireland No. 283940 ("VIEL") (VIEL is authorized and regulated by the Central Bank of Ireland), and Virtu Financial Ireland Limited, registered in Ireland No. 471719 ("VFIL") (VFIL is authorized and regulated by the Central Bank of Ireland). The registered office of VIEL and VFIL is Whitaker Court, Whitaker Square, Sir John Rogerson's Quay, Dublin 2, Ireland; in Asia, Virtu ITG Hong Kong Limited (SFC License No. AHD810), Virtu ITG Singapore Pte Limited (CMS License No. 100138-1), and Virtu ITG Australia Limited (AFS License No. 219582).

All chart sources: Virtu Financial, 2022. Spread and volatility calculations are derived from sources that Virtu believes to be reliable, but Virtu does not make any claims to its accuracy. USD.NOK, USD.SEK, EUR.NOK and EUR.SEK are shown in separate exhibits.