introduction of the counter-cyclical factor was seen to be increasing the weight of the discretionary part of the fixing by the bank and a step back from making the Yuan exchange rate more market driven (Chi Lo, 2017). Another study highlighted that the volatility of renminbi notably increased since the 2015 Yuan devaluation (Hong Kong Monetary Authority, 2021). Further, volatility has increased in case of Turkish Lira (TRY) and Thai Baht (THB) also, though to a lesser degree vis-à-vis CNY.

While currency volatility generally depends on economic fundamentals or country specific risks, factors such as delta hedging may also exacerbate it (Box 1)

**Box 1: Volatility in currencies due to Delta Hedging**

Traders provide liquidity by being willing to buy or sell options in return for compensation, but they get exposed to the potential large downside associated with short option positions. In this context, delta hedging allows traders to hedge the downside risk of short option positions (delta, one of the option greeks, measures change in the option position *vis-à-vis* change in the underlying asset's price, while gamma is the rate of change in delta *vis-à-vis* change in the underlying's price). However, delta-hedging is imperfect as delta changes with change in underlying asset's price, thus requiring continuous rebalancing of the hedge. For options which are deep in-the-money or out-of-the-money or far from expiry, delta is generally stable (gamma is low), and there is lesser need to rebalance the hedge. However, for at-the-money options and/ or options approaching expiry, delta may fluctuate quickly, resulting in high gamma, making hedge rebalancing very difficult. (Iqbal, 2018).

Traders monitor trend of the implied volatility of the currencies *vis-à-vis* historical volatility, while taking position in options. If the implied volatility for a currency pair (say USD-INR with USD being the base currency) is above historical standards, which results in the ratio of implied to historical volatility to be above 1, it may result in a view that volatility is over-priced.

Thus, traders look to build short vega (vega is the rate of change in an option position *vis-à-vis* change in volatility of the underlying) position by selling options (for instance short straddle) which also results in short gamma position. If the traders' expectations of low volatility are correct and market is confined within a specific range during the duration of the options contract, the strategy of selling options is profitable as the premium can simply be earned. However, if the currency breaks outside the expected range, the strategy exposes traders to unlimited risks. The more the currency moves, the more is the loss. For instance, if USD-INR level moves sharply upwards (*i.e.*, INR depreciates), traders with a short call position will be forced to buy greater amounts of USD to hedge the exposure, whereas if the level moves sharply downwards (i.e., INR appreciates), traders with short put position have to short greater amounts of USD to limit losses. The ripple effect of such actions is that options players are the ones that assist the directional profile of a market (Evan, 2019). This is also the reason why a currency's volatility increases during the expiry of options that have a large open interest.

The spot market volatility increases if the hedge ratio of the trader, who has net short options (and therefore has a negative gamma exposure) is larger than the hedge ratio of the trader who has net long options. Further, typical option market makers (OMMs), *e.g.*, large banks, dynamically hedge their positions, while option market takers (OMTs), *e.g.*, investors, do not hedge their positions dynamically. This results in an asymmetric net delta hedge demand, which leads to an increase in the spot market volatility (if the OMM is short options or negative gamma) and *vice-versa* (Anderegg *et. al.*, 2022). Some of the recent observations corroborate the findings of the above study. JPY's depreciation *vis-à-vis* USD in April 2022 (it touched a 20-year low) intensified due to negative gamma positions (short call), while its 1-month implied volatility rose to highest level since 2017 (barring Covid-19 outbreak). Similarly, Yuan faced increased depreciation pressure due to covering of losses by traders holding short gamma position along with other factors, and its 1-month risk reversals rose to highest levels since March. 2020 on April 20, 2022.