Hi, everyone! Thank you for coming to my final presentation today. My name is Hu Jienan and I am in FX Trading Desk of Shanghai Branch. So, today I would like to talk about the recent trend of onshore 人民币. As Many of our peers and clients are interested in the arbitrage opportunities on the USDCNY pair due to the CIP deviation, including the frequent intervention of PBoC since the fourth quarter of last year. So I think it’s a good idea to have some discussions today.

So today my presentation would consist of three parts. The first one is Forward Basis Arbitrage, and then Basis Trading and last but not least, the analysis of recent USDCNY basis trend.

As Basis Arbitrage and Basis Trading are quite common in FX trading. So I will just give a quick introduction of the arbitrage process.

At the beginning of the period, the arbitrager first borrows USD in the offshore market, for example, making an overnight or other short-term repo to fund the USD and then rolling over the repo at the end of each period till the end of the arbitrage. At the same time, pay a 1 year SOFR OIS to hedge the risk of USD rates and fix the fundin cost. (Next Page pls)

The next step is to sell-buy a 1y USDCNY swap. Let’s assume the notional amount of the swap is one million USD. So u are going to pay million at the end of the year. Also, if the arbitrager wants to get a profit in USD at the end, he needs to buy an additional 1 year USD forward at the beginning.

For the last step, usually there are two different ways. The first approach is to receive a 1year CNY IRS, at the same time, make a short term reverse repo and rolls over at the end of each period. So basically step3 is the mirror of step1. In step1 we make a repo in USD and pay a 1year SOFR OIS to fund USD in a fixed cost. In step3 we make a reverse repo in CNY and receive a 1year CNY IRS to get a fixed lending yield of CNY.

对于最后一步，通常有两种不同的方法。第一种方法是接收 1 年期人民币 IRS，同时进行短期逆回购，并在每期期末进行展期。因此，第 3 步基本上是第 1 步的镜像。在步骤 1 中，我们进行美元回购，并支付 1 年期 SOFR OIS，以固定成本为美元提供资金。在步骤 3 中，我们以人民币进行反向回购，并收取 1 年期人民币 IRS，以获得固定的人民币借贷收益率。

However, there is a problem in practice for approach 1. The most common reference rate for CNY IRS in the onshore market is 7D Fixing Repo rate, and its standard contract for 1-year IRS is paid quarterly, which will result in a certain amount of CNY profit at the end of each quarter during the whole arbitrage period. If the arbitrager wishes to close the FX exposure during the period, it needs to calculate the CNY profit on each payment date and hedge it by buying USD forwards of the corresponding maturity. For example, for a one-year quarterly interest-paying IRS, it needs to make four USDCNY forwards with four different amounts and maturities of 3 months, 6 months, 9 months and 12 months respectively.

但对于方法一来说，在实际操作中存在一个问题。在岸市场的人民币IRS最常见的参考利率为FR007，其1年期IRS的标准合约是季度付息的。因此在套利期间的每个季度末会产生一定的人民币收益。如果希望关闭期间产生的外汇敞口，需要计算出每个付息日的人民币收益并进通过买入相应期限的远期美元进行对冲。例如，对于一年期季度付息的IRS，需要做四笔不同金额、期限分别为3个月、6个月、9个月和12月的USD/CNY远期。

Compared to receiving CNY 1-year IRS, Approach 2 is simpler. Arbitrageurs can buy 1-year maturity zero-coupon CGB directly through Bond Connect or CIBM. Similarly, apart from the principal portion, the FX exposure to the CNY profits generated at the end of the period can be closed by buying additional amounts of forward USD at the beginning of the period, just as shown in Step2. In this case, we can calculate the formula for the arbitrage profit as shown in the slide. Under the assumption of continuous compounding, starting with lowercase t and ending with uppercase t, the arbitrage return for this period can be expressed as basis in the second and third formulas. Actually, if Basis equals 0 here, then the second formula is the covered interest rate parity formula.

The point I want to emphasize here is that the arbitrage profit doesn’t count on the narrowing or widening of Basis in the future, but the absolute value of Basis at the beginning of the arbitrage. As long as the Basis is not zero, Basis Arbitrage can be implemented. The only pressure is that the MtM value of the portfolio may temporarily be negative, but it will be able to make a definite return at the end of the period.

当然，相比接收CNY1年期的IRS，更简单和直接的方法是直接购买1年期到期零息的CGB。同样，除了本金部分，期末产生的人民币收益也可以通过在期初购买远期美元来消除外汇风险敞口。在这种情况下，我们可以计算出套利收益的公式如PPT所示。在连续复利的假设下，从小写的t开始到大写的t结束，这一期间的套利收益可以表示为第二和第三个公式中的basis.事实上，如果这里的Basis等于0，那么第二个公式就是利率平价公式。在这里我要强调的一点是，套利利润并不取决于未来Basis的缩小或扩大，而是取决于套利开始时Basis的绝对值。只要Basis不为零，就可以实施Basis套利。唯一的压力是，投资组合的MTM值可能暂时为负，但在期末可以获得确定的回报。

But in practice, the basis arbitrage cannot be implemented by onshore institutions because we don’t have direct access to USD funding for the arbitrage purpose. If there is no USD funding, the Basis arbitrage cannot be carried out. But still we can bet on the basis narrowing by conducting basis trading. The first step is to sell-buy a long term swap, still we assume it as one year. The second step is to buy-sell a short-term swap with 1 million USD nominal amount and roll over at the end of each swap with the same notional principal, so that the cash flow of USD at the beginning and ending of each swap can be just completely hedged, while for CNY, the difference between the far leg of the old swap and the near leg of the new one just would become the profit and loss during the process of basis trading.

但在实践中，在岸机构无法实施基差套利，因为我们无法直接获得用于套利的美元资金。如果没有美元资金，基差套利就无法进行。但我们仍然可以通过基差交易来押注基差收窄。第一步是卖出-买入一个长期掉期，我们仍然假设为一年。第二步是买入-卖出一个名义金额为 100 万美元的短期掉期，并在每个掉期结束时以相同的名义本金进行展期，这样每个掉期开始和结束时的美元现金流正好可以完全对冲，而对于人民币来说，旧掉期的远端和新掉期的近端之间的差额正好成为基差交易过程中的损益。

However, in order to conduct a basis trading, there is still a step that we need to do. That is to hedge the rates risk of both USD and CNY by paying a USD IRS and receiving a CNY IRS.

Let me just show you the result of cash flow calculation. You can just see third line, the total cash flow in . So basically, considering the current basis is negative, so if the Basis will narrow in the future, otherwise, we may encounter a loss with the Basis widen further. And although the double IRS has largely reduced the rates risk of USD and CNY, as shown in the blue terms, the risk exposure rates cannot be perfectly hedged. There is still a residual term associated with the floating rate.

As for the unhedged spot risk, if we ignore the effect of discounting factor and sum the total cash flows for each period, then the last term will be just minus , which is equal to the opposite of the swap point at the beginning of the period. (next page pls)

不过，要进行基差交易，我们还需要做一个步骤。那就是通过支付美元 IRS 和收取人民币 IRS 来对冲美元和人民币的汇率风险。让我向大家展示一下现金流的计算结果。你可以看到第三行，t\_i 中的总现金流。所以，基本上，考虑到目前的 Basis 是负数，所以如果 Basis 在未来会缩小，否则，我们可能会遇到 Basis 进一步扩大的损失。虽然双 IRS 在很大程度上降低了美元和人民币的汇率风险，如蓝色项所示，但汇率风险并不能完全对冲。仍然有残留的项和浮动利率风险相关。至于未对冲的即期风险，如果我们忽略贴现因子的影响，将每期的总现金流相加，那么最后一项将只是 S\_0 减去 F\_（t\_0,t\_n），等于期初掉期点的相反值。（下一页）

Ok, let’s move to the last section—the Basis Analysis. This plot is the time series of USDCNY forward basis since 2015. The difference between the blue line and the red one is the selection of CNY real rate. The former one used the 7D Fixing Repo rate and the latter one used the 1 year CGB yield to maturity. (next page). This plot is the trends of basis in different terms. The plot below zooms up the movement of Basis after it entered the sub-zero range starting in March 2023. It can be noticed that since September last year, the 1-year basis has been at the bottom of all maturites, and it has widened more than the basis of maturities longer and shorter than it. Therefore, it is reasonable to assume that this could be caused by the PBoC's intervention in the FX market through 1-year forwards. The market believes that it has been constantly selling 1-year USD forwards to the market through agent banks since September last year. We can see more evidence by comparing the trend of CNH