

Asia FI & FX Strategy Viewpoint

Elasticity and discipline: the intra-day fluctuations in aggregate balance

A trip down the rabbit-hole of HKD payments

Our US economists have now switched their baseline forecast for US growth from 'mild recession' to 'soft-landing'. The implications are the Fed will be higher-for-longer and we can expect fewer Fed cuts in 2024. The design of the LERS provides the market incentives to move Hong Kong rates to the level of US rates.

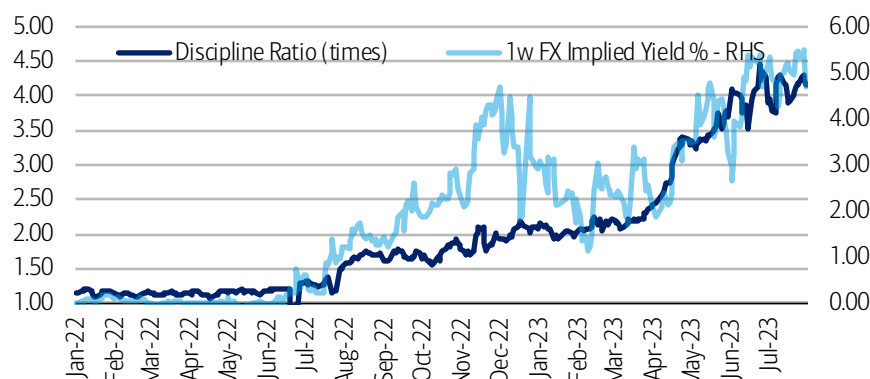
Given the expectation that Hong Kong and US rates will remain higher-for-longer, we take this opportunity to review precisely how Hong Kong rates will converge to US rates. The bridge that connects the Hong Kong monetary system, the LERS and the US rates is through the size of the aggregate balance, the key component in Hong Kong's payment system. It is through the payment system that Hong Kong's interest rate environment is tied to the US, and this piece will outline in detail how that payment system works.

Introducing the concept of the 'Discipline Ratio'

This piece introduces the concept of the 'Discipline Ratio' which we see as a helpful gauge for where the fair price of HKD funding should be. Central to understanding how a payment system works is understanding the concepts of elasticity (credit expands) and discipline (credit contracts) of credit. We take these concepts and apply them to Hong Kong's situation. We find the Discipline Ratio can show when the market rate of HKD funding has deviated too far from the fundamentals tied to needs of the domestic payment system. With payment needs relatively stable while the ending level of aggregate balance is low, we like to pay Hong Kong rates upon any corrections lower.

Exhibit 1: The Discipline Ratio and front-end funding in HKD

The Discipline Ratio provides a fundamental framework to understand where the level of HKD funding should be



Source: Bloomberg

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07 August 2023

GEM FI & FX Strategy
Asia

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LERS – Linked Exchange Rate System

HKMA – Hong Kong Monetary Authorities

EFB – Exchange Fund Bills

Agg bal – aggregate balance

HIBOR – Hong Kong Interbank Offered Rate

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Timestamp: 06 August 2023 06:15PM EDT

Elasticity and discipline: the intra-day fluctuations in aggregate balance

BofA now calls for soft-landing in the US. As US economic data remains strong, our US economists have raised their US base case for 2023 and 2024 from mild recession to a soft-landing (no recession). This means, absent any major economic shock, the Fed will remain higher-for-longer.

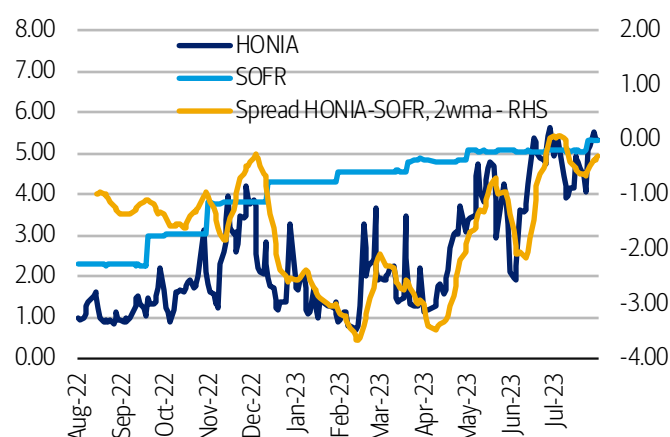
Our US economists now expects the Fed to remain higher-for-longer. As a consequence of the stronger-than-expected US growth profile, our economists are: 1) maintaining their expectation for the Fed terminal rate at 5.50%-5.75%; 2) delaying the timing of the first Fed cut from May 2024 to June 2024; and 3) reducing the extent of Fed cuts in 2024 to 75bp, from 150bp previously. In other words, because of the stronger growth profile, the Fed will remain higher for longer, see [US Economic Viewpoint: US outlook: Imagine no recession, it's easy if you try 02 August 2023](#).

This will mean higher and more volatile rates in Hong Kong. A higher-for-longer regime has material consequences for Hong Kong's overall interest rate environment and HKD funding. As a function of the Linked Exchange Rate System (LERS), Hong Kong's interest rates will broadly follow the general path of US interest rates. However, the timing of convergence will depend on local factors and the global markets' overall incentive to conduct the HKD carry trade.

Venturing down the rabbit-hole of HKD funding. This piece provides a deep-dive into precisely how Hong Kong rates will converge with US rates. Particularly, we will focus on the mechanism in which aggregate balance interacts with the local payment system. Understanding the mechanism of the Hong Kong payment system is foundational to understanding HKD funding and the formulation of front-end (overnight to 3-month) HIBOR. This report should be read as a companion piece to the broader ideas on HKD funding expressed in [Asia FI & FX Strategy Viewpoint: A primer on HKD funding 29 May 2023](#).

Exhibit 2: Overnight rate in US and Hong Kong

A combination of high-demand and low supply has resulted in Hong Kong rates to catch-up to the level of US rates



Source: Bloomberg

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Where the rubber hits the road. The mechanism in which Hong Kong rates follow US rates do not happen by accident but is an explicit design feature of the LERS. The reason that Hong Kong rates caught up to US rates is material contraction on the aggregate tied to the HKD carry trade. The bridge that connects the Hong Kong monetary system, the LERS and the US rates, is through the size of the aggregate balance and the incentives the market have to regulate the size of the aggregate balance.

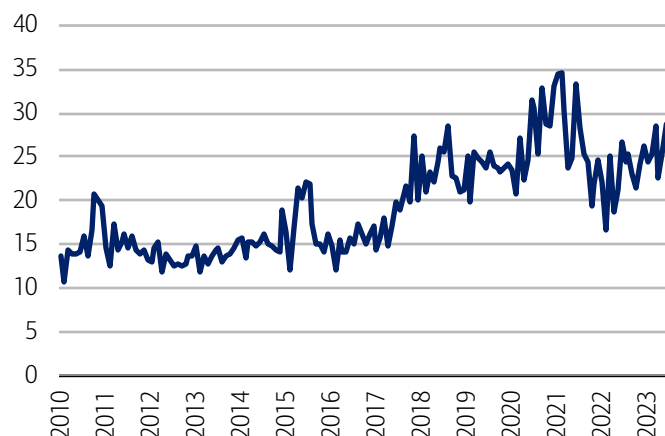
Aggregate balance: The beating heart of Hong Kong's payment system. According to the HKMA, the aggregate balance is defined as the sum of the balances in the clearing accounts maintained by the banks with the HKMA for settling interbank payments and payments between banks and the HKMA. For any payment in HKD to occur, the bank representing the payor (the one sending money) must transfer aggregate balance to the bank presenting the payee (the one receiving money).

The mechanics of interbank transfers in Hong Kong. At a technical level, what occurs is the payor's bank will send a payment order to the Hong Kong Interbank Clearing Limited (HKICL) who will verify whether the payor's bank has sufficient aggregate balance. If this condition is met, then the HKICL will send instructions to the HKD Clearing House Automated Transfer System (CHATS) which will then credit the aggregate balance of the payor's bank while debit the account of the payee's bank. HKD CHATS is the HKMA ledger that tracks which Hong Kong banks hold a positive or negative balance in the aggregate balance account.

In June 2023, average daily volume in HKD payments came in at HK\$1.4tn. As of June 2023, the HKD CHATS was settling HK\$28tn in monthly Hong Kong Dollar payments. This equates to close to HK\$1tn in settlement per calendar day or HK\$1.4tn per business day. This volume of interbank payment is supported by the outstanding level of aggregate balance, which currently stands at close to HK\$45bn. This implies, on average for each business day, each HK\$ in aggregate balance must be turned over 30 times a day to meet the average payment demand in June 2023.

Exhibit 3: Volume HKD clearing at the HKD CHATS

As of June 2023, HKD CHATS was settling HK\$29tn in monthly settlements of HKD payment

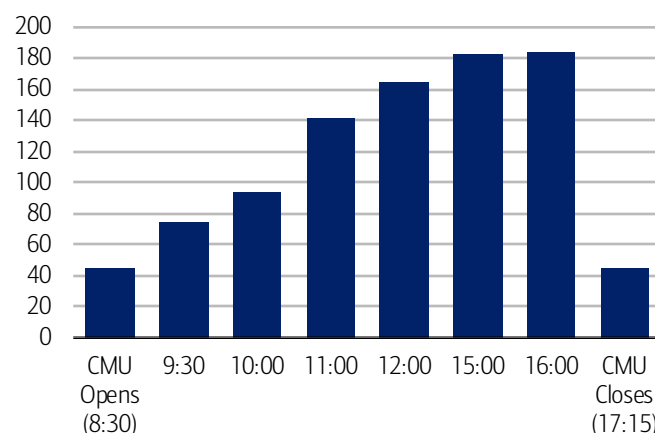


Source: HKMA

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Exhibit 4: Average level of aggregate balance in June 2023 during business hours

In June 2023, the aggregate balance levels tend to be the highest at 3-4pm.



Source: Bloomberg

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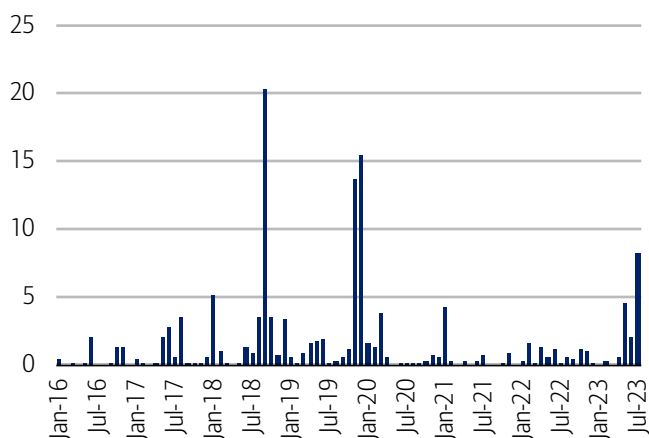
The intricate link between interbank payments, aggregate balance and EFB. One of the lesser-known facts about operations of the Hong Kong payment system is the intricate link between aggregate balance, EFBs and clearing/ settlement in HKD. According to the principles of the LERS, aggregate balance can only change when the HKMA conducts market activities on ensure spot USDHKD stays within the 7.75-7.85 band or when the HKMA changes its net issuance of EFB.

The elasticity and discipline of the aggregate balance. However, for operational practicality, the level of aggregate balance is elastic during the business day. **Exhibit 4** shows the average daily levels for aggregate balance during different hours in the business day. The principles of LERS require that outside market operations of the HKMA, the aggregate balance must start and end the business day at the same level - this is where the discipline is enforced on the payment system.

EFB allows intra-day elasticity to the aggregate balance. For the purpose of settling intra-day payments, Hong Kong banks can pledge EFB at the HKMA as an intra-day repo to obtain aggregate balance. However, by the end of the business day, the debtor banks who pledged their EFB with the HKMA must return their outstanding aggregate balance back to the HKMA. Failure to do so by 17:15 would result in automatically the triggering of the discount window and represents an overnight increase in aggregate balance. **Exhibit 5** shows, since January 2023, the Hong Kong banking system's reliance on the HKMA's discount window has progressively grown. Throughout July 2023, the Hong Kong banking system collectively borrowed HK\$8.1bn in overnight liquidity from the HKMA through its discount window.

Exhibit 5: Cumulative monthly use of the HKMA's discount window (HK\$ Bn)

Throughout July 2023, the Hong Kong banking system cumulative borrowed HK\$8.1bn from the HKMA's discount window

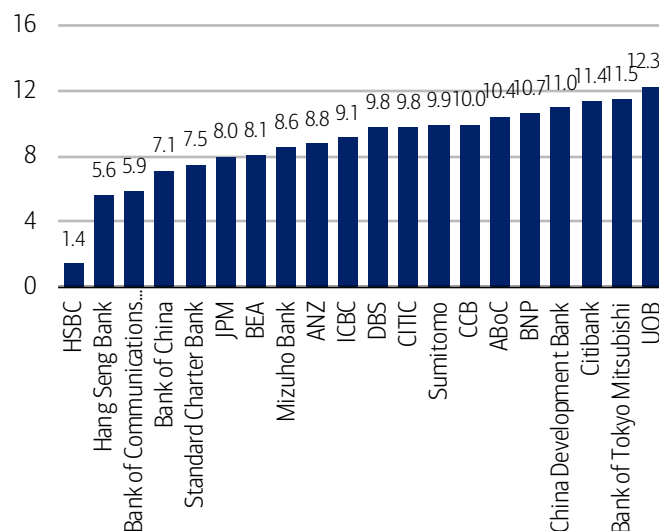


Source: Bloomberg

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Exhibit 6: Average rank of overnight HIBOR submission in July 2023 (lower rank means a lower submission)

Throughout July 2023, HSBC had on average the lowest overnight HIBOR submission



Source: Bloomberg

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Aggregate balance is not evenly distributed. As first introduced in [Asia FI & FX Strategy Viewpoint: A primer on HKD funding 29 May 2023](#), we noted that the interbank liquidity between different Hong Kong banks is not even distributed. We can get a glimpse of this inequality by observing the overnight HIBOR submissions of the 20 members banks in the HIBOR panel. **Exhibit 6** shows, on average, HSBC has the lowest overnight HIBOR submission in the system. This is reflective of the size of the HSBC franchise and funding in the HKD funding system. After HSBC, we see other large local banks with large deposit base such as Hang Seng Bank, Bank of Communication and Bank of China also have relatively low HIBOR submission. The tail-end of the submission panels are foreign banks that lack a stable deposit base in Hong Kong and would be more reliant on interbank funding to fund their HKD assets. These banks include Citibank, Bank of Tokyo Mitsubishi and UOB.

The HIBOR panel is just a small subset of banks in the system. **Exhibit 6** is a small sample of the inequality of the aggregate balance in the interbank market. According to the HKICL, as of end-July 2023, there are 136 clearing banks in Hong Kong. Given that the banks on the HIBOR submission panel tend to be larger banks within the network, the inequality in terms of access to aggregate balance for the entire system is likely even more severe than **Exhibit 6** suggest. Thus, on average, for many clearing banks in Hong Kong, despite aggregate balance remaining at HK\$45bn, it is possible many banks in the system struggle to secure funding by 17:15. This helps explain why

funding has remained tight, HIBOR is high and the HKMA's discount window is increasingly used.

Introducing the concept of the 'Discipline Ratio'. As mentioned above, intra-day, the aggregate balance is elastic while the end of business day (at 17:15) brings about the discipline. If Hong Kong banks fail to fund their payments by day's end, the discipline comes about from triggering the discount window which charges the base rate (Fed's Lower Rate +50bp, which is currently 5.75%).

It is important to understand why the aggregate grows the business day.

Exhibit 6 shows aggregate balance is not evenly distributed and if a small Hong Kong bank lacks aggregate balance but has to process payments for its clients, it can either: 1) borrow aggregate balance from the market or; 2) repo its holdings of EFB with the HKMA. As such, the growth in intra-day aggregate balance represents payment which were not funded by outstanding aggregate balance but funded through repo of EFB. For the banks which rely on EFB to fund their intra-day payments, they delay the time of settlement from time of the transaction time to day's end and accepted the trade-off of completing their clients' payment but at an increased the risk of triggering the discount window.

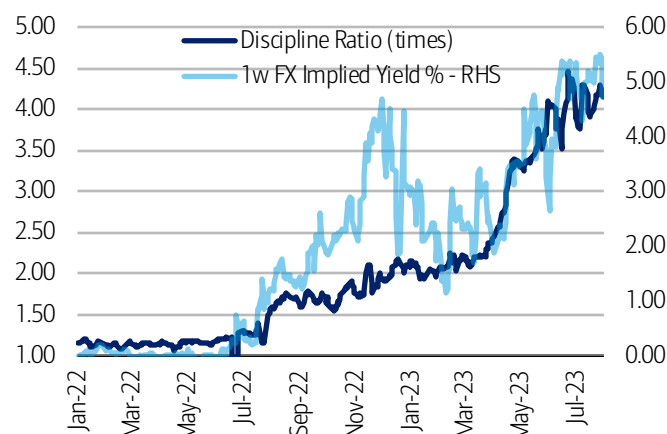
During the business day, Hong Kong banks can process payments which are not funded by aggregate balance. As such, the difference in aggregate balance at 4pm until the close of the business day at 17:15 represents the outstanding amount of unfunded payment that has accumulated throughout the day. To fund this deficit, Hong Kong banks which have repo EFB with the HKMA must raise aggregate balance by receiving inflows before day's end or obtain aggregate balance through borrowing or selling HKD assets. Failure to do should result in triggering the discount window.

The end of the business day imposes discipline to the Hong Kong banking system. Thus, the difference in the level of the 4pm aggregate versus at close can be understood as the level in which credit must contract in the last hour of the Hong Kong business day. Put in other words, the end of the business day represents a type of soft discipline that is imposed on the Hong Kong banking system. For eg, throughout July 2023, the aggregate balance at 4pm averaged at HK\$184bn, and this is compared to the average closing value at HK\$44.6bn. Thus, on average, the discipline ratio for July 2023 is 4.1 times. The higher the discipline ratio, the more funding pressure there would be as a greater amount of unfunded payment would need to be covered by day's end.

The discipline ratio is useful guide where the equilibrium level of HKD funding should be. **Exhibit 7** shows that over the cycle, the Discipline Ratio and the front-end HKD funding (using 1-week FX implied yield as a proxy) are cointegrated. The usefulness of the Discipline Ratio is most clear when the market price of HKD funding has meaningfully deviated from the fundamentals of elasticity versus discipline in the domestic payment system. Ultimately, the true cost of HKD funding should be the interaction between expansion (the need to facilitate payment) and contraction of the aggregate balance (the need to fund the payment).

Exhibit 7: The discipline ratio and front-end funding in HKD

The discipline ratio showed the concerns in HKD funding in November 2022 were unfounded

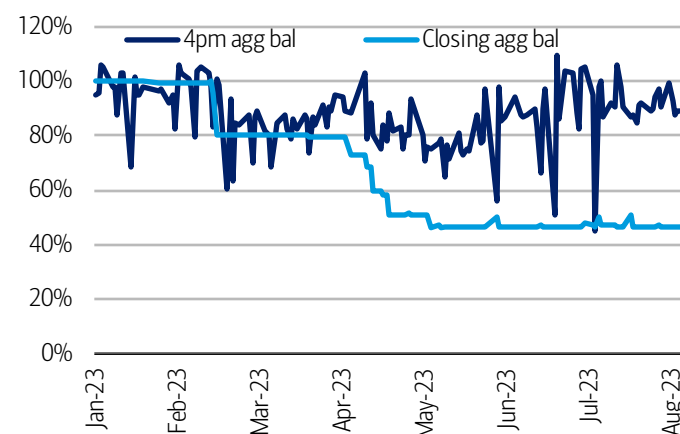


Source: Bloomberg

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Exhibit 8: Decomposing the Discipline Ratio (versus Jan 2023)

Since the start of 2023, level of unfunded payments has been broadly the same but closing level of aggregate balance has declined by more than 50%



Source: Bloomberg

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The November-2022 case provides a clear example. In hindsight, the HKD funding scare in November 2022 was irrational. At the time, there was genuine concern in the Hong Kong banking system that the outstanding level aggregate balance would be insufficient to meet the demands of the system given China's surprised announcement of reopening and the very high equity volumes tied to bullish Hang Seng sentiments. However, at the time, the closing level of aggregate balance remained at almost HK\$100bn and was large relative to the intra-day credit creation needed to service the payment system. Subsequently, once the fear subsided, we saw the cost of HKD funding collapsed. Similarly, there was a sharp increase in March 2023 which also appeared unjustified versus the underlying patterns of payment.

The situation now. Exhibit 8 breaks down Discipline Ratio between its numerator and denominator. We note that the sharp rise in the ratio was mainly driven by the large drains in aggregate balance in April 2023. Year-to-date, the closing level of aggregate balance is down by more than 50% (from HK\$96bn to HK\$45bn), while the level of unfunded payments has stayed broadly the same. As long as payment levels stay high, then structurally, we expect the levels of HKD funding to remain tight. Thus, the incentives to receive HKD rates are not high. The market implication of this is to pay HKD rates upon dips as the Discipline Ratio is unlikely to decline from current levels.

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