Money Markets after QE and Basel III

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DISCLOSURE APPENDIX AT THE BACK OF THIS REPORT CONTAINS IMPORTANT DISCLOSURES AND ANALYST CERTIFICATIONS.
Agenda

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- Part 2 – The Hierarchy of Money
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Part 1 – Monetary Pointillism
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Each participant issues liabilities on a different spectrum of tenors: the Fed and money funds issue only overnight (o/n) liabilities*; the Treasury and the GSEs issue only term liabilities; and banks and primary dealers issue the full spectrum, from o/n up to one year.

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Money dealers are market makers between cash pools and the Fed: what they borrow from the former they lend back to the latter one way or another. Market-making gives rise to **matched books** – matched in the sense that the cash raised in the money market stays in the money market when it is lent out. Money dealing is thus “money market funding of money market lending” (see Mehrling, 2012).

Money dealing as a function has been around forever but QE and Basel III have re-shaped its nature and instrumentality to the core.

Money dealers used to lend to each other before the Great Financial Crisis of 2007-09, but today they lend mostly to the Fed.

Money dealers’ matched books used to be private on both sides, but now they are half public, half private.

Money is now less “inside” and more “outside” and finance more repressed than liberal.

Part 1 explains how each money dealer’s balance sheet links up with the Fed’s in the new normal; which money market segment each money dealer typically taps for funding (sovereign, secured or unsecured); and if they are present in more than one market segment.

Let’s start with the Fed’s balance sheet…

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On the *liability side*, the Fed issues four core liabilities, each of which is an o/n money market instrument. Each liability provides liquidity at par on demand, yet each pays a different rate of interest (see exhibit; all rates in the deck are as of April 8th, 2016):

1. the deposit accounts of the Treasury (the Treasury General Account, or TGA) and the FHLBs pay zero, as does currency*;
2. the reverse repo facility (o/n RRPs) pays 25 basis points (bps);
3. the foreign repo pool pays more than o/n RRPs; and...
4. the deposit accounts of banks pay 50 bps – required and excess reserves both pay 50 bps (the IORR and IOER, respectively).

↑

On the *asset side*, the Fed’s bond portfolio – the SOMA – earns ~2.65%. With a weighted average cost of funding of 0.3%, the Fed is a profitable bank, earning a net interest margin of ~2.35% which translates into annual remittances to the Treasury of ~$100bn.

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Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse

*Fannie Mae and Freddie Mac also have access to checking accounts


**Monetary Authority:**

Of the o/n interest rates paid by the Fed, the RRP, IORR and IOER rates are “administered” (i.e. exogenous to money markets) and the rate on the foreign repo pool is market-determined (i.e. endogenous to markets; we’ll explain the significance of this in Part 5).

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The o/n RRP and IOER rates set the upper and lower bounds (respectively) of the Fed’s **target range** for the overnight rates complex (the dashed lines): the range where all interest rates (secured and unsecured, onshore and offshore) are meant to trade.

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In other words, the target range represents the range in which the Fed (as a matter of monetary policy) would like to see consistently the rates at which **money dealers** stand ready to make markets on an **overnight** basis on either side of their **matched books**.

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Let’s next turn to the question of who has access to which Fed liabilities (overleaf).
Monetary Authority:
Money markets are hierarchical (see Mehring, 2010 and Pozsar, 2014) – access to various Fed liabilities are not uniform, but tiered.
(1) The U.S. Treasury and the FHLBs have access to deposit accounts (which pay zero)*.

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse

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Only foreign banks have access to IOER at the full 50 bps, not U.S. banks. This is because U.S. banks have to pay a surcharge to the FDIC which reduces their take to an effective or “shadow” IOER rate of only 43.5 bps. The surcharge is currently about 6.5 bps, down significantly from the 10 bps when it was first introduced four years ago (think of the FDIC surcharge as an incremental step toward negative rates).
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Now that we know which money dealers hold which Fed liabilities as assets and the corresponding rates at which they lend to the Fed, we next turn to the question of what liabilities money dealers issue to fund their matched books. We start with the U.S. Treasury (overleaf).
Money Dealers – U.S. Department of the Treasury:

On the asset side of its balance sheet, keeping cash at the Fed – lending to the Fed – is a negative carry trade for Treasury because TGA balances pay zero and even the shortest-dated bills funding them yield more. This makes Treasury unique among money dealers in that Treasury is making a loss in real time – money dealers typically lend at rates higher than the rates at which they borrow, earning a profit.

But this does not keep Treasury from money dealing because real time negative carry turns into positive carry when the Fed remits its net income (currently ~$100bn) to the Treasury. Furthermore, just as banks need liquidity buffers to self-insure against runs, the Treasury needs a liquidity buffer to self-insure against debt ceiling crises, which are the government’s own version of a liquidity run. Treasury recently boosted its cash balances from token amounts to $300 billion (and potentially as much as $500 billion, see here), simply because bargaining power during debt ceiling debacles matters, and more cash means more time and more power to bargain.

The rising prominence of this liquidity buffer going forward will push Treasury deeper into the business of matched-book money dealing – issuing structurally more Treasury bills to fund structurally larger cash balances at the Fed, negative carry or not (also see Pozsar, 2011).

On the liability side, Treasury taps the money market with 1, 3, 6 and 12-mo bills. Each segment engages a distinct buyer base (overleaf).
**Money Dealers** – U.S. Department of the Treasury:

One- and three-month bills are attractive as assets only to money funds and private cash pools. Other investors have higher yielding alternatives: public cash pools have access to the foreign repo pool, and banks have access to IOER (clean or shadow, see above).

In other words one- and three-month Treasury bills are attractive only for those investors that don’t have access to anything better: investors with a preference to keep cash with the sovereign but without access to interest-bearing liabilities issued by the Fed (money proper) settle for the next best alternative which are money market liabilities issued by the Treasury.

This bid explains the so-called “money-ness” of Treasury bills (see Pozsar, 2011 and 2014 and Greenwood et al, 2010 and 2015).

That said, even money funds with access to o/n RRPs hold Treasury bills that yield less than the o/n RRP rate, and they do so despite the fact that their RRP counterparty limits are under-utilized. Why? Because in the wake of tri-party repo reform cash from a repo loan is returned only after 3:30 PM, which is too late for repo (private or with the Fed) to be a source of intraday liquidity. As such, U.S. Treasury bills of the shortest maturity increasingly serve as a key source of intra-day liquidity for money funds, and for this liquidity money funds are willing to forgo some yield (a theme which we will return to in the context of inter-dealer repos below).
**Money Dealers** – U.S. Department of the Treasury:

Six-month Treasury bills are attractive as assets for a marginally broader buyer base: public cash pools join private cash pools and money funds but only if six-month bills yield more than the rate offered by the foreign repo pool (if not, why bother).

But banks will still *not* be interested unless six-month bills they yield more than IOER. The fact that banks prefer reserve balances at the Fed over 1, 3 and 6-mo Treasury bills is an important point to highlight as conventional wisdom has it that banks have been hoarding bills as HQLA to get in compliance with the Liquidity Coverage Ratio (LCR). They have *not*, as excess reserves yield better.

Banks’ interest in Treasury bills only starts at the 12-month point…
Money Dealers – U.S. Department of the Treasury:

...because that is the first point on the Treasury bill curve that typically yields better than IOER. But even then, it yields only basis points more and considering the mark-to-market volatility of 12-mo bills, an o/n par instrument (reserves) yielding nearly as much as 12-mo bills is hard to beat. Banks’ real interest in Treasuries as HQLA is on the 2 to 5-year segment of the curve (not shown).

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As an interesting side-note, the 12-mo point of the Treasury curve is the last point before we leave the domain of money markets, but also the first point where all money market participants (both money dealers and cash pools) are present as potential buyers.

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We next turn to the Federal Home Loan Banks (FHLBs) as money dealers.

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
**Money Dealers** – Federal Home Loan Banks:

Just like banks (which are told by the Fed to self-insure against runs) and the Treasury (which chose to self-insure against “runs”) the FHLBs self-insure too. They run cash portfolios of about $100 billion in order to comply with guidelines set by their own regulator (the FHFA) which is to hold enough liquidity to survive a two-week stress period without access to funding markets. Survival here means having enough cash on hand to pay off maturing liabilities without calling in the advances extended to banks.

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Just like the Treasury, which *lends* its cash balances to the Fed and *funds* those balances in the money market (with Treasury bills), the FHLBs *lend* their balances in the money market and *fund* them in the money market – this makes FHLBs **money dealers** as well

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On the **liability side** of their **matched books** the FHLBs issue agency discount notes (discos) at 1-wk and 1, 3 and 6-mo maturities…

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Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
**Money Dealers** – Federal Home Loan Banks:

...to a buyer base that include mostly money funds and some private cash pools as well. Public cash pools typically do not buy discos. Neither do banks, for reasons similar to why they don’t buy Treasury bills – discos yield little relative to IOER at the Fed.

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On the asset side of their matched books, the FHLBs have access to both a deposit account at the Fed (which pays zero interest) and the o/n RRP facility (which pays 25 bps interest), but there are problems with both instruments:

(1) Unlike the Treasury, the FHLBs are publicly owned, for-profit entities and hence cash portfolios with a negative carry are a no go; this will systematically keep the FHLBs from parking cash in their Fed accounts (except on month-ends and quarter-ends).

(2) o/n RRPs give cash back after 3:30 PM which is too late to be of any use during a liquidity crisis (the scenario for which the FHLBs hold cash in the first place). This is an issue with all repos (including tri-party and GCF repos), not just o/n RRPs.

What are the other investment options? Perhaps they would buy Treasury bills, as do money funds? Not likely, because...

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Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
**Money Dealers** – Federal Home Loan Banks:

...bills yield not much more than what the FHLBs have to pay on discos (see the data labels below), implying a carry that is just barely positive – not negative like it would be if the FHLBs left their cash in their deposit accounts at the Fed, but barely positive still.

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Because FHLBs’ cash balances are insurance against liquidity crises, early return of cash (at a reasonable yield) is paramount. But with o/n RRPs, Treasury bills and (almost all) secured money market investments (repos) off the table, where else could FHLBs go?

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You guessed it…

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**Source:** the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
**Money Dealers** – Federal Home Loan Banks:

...to the unsecured markets and in particular the fed funds (FF) market where the timing of cash return can be negotiated bilaterally and where they lend mostly to foreign banks who play the FF - IOER arbitrage game (see chart below).

Why not U.S. banks? Because arbitrage trades inflate balance sheets and U.S. banks have to report balance sheet every day and so the SLR bites every day, and also because U.S. banks only earn a relatively low “shadow” IOER rate (see above). Foreign banks on the other hand report balance sheet only on month-ends and earn the full IOER rate: for them the return on the arbitrage is better.

As we discussed before (see here) the FHLBs are bound by strict counterparty credit risk requirements when it comes to lending in unsecured markets (FF is unsecured). And with the number of highly rated foreign banks limited, the number of active participants that trade FF in volume is also limited: the 10 of the 11 FHLBs that are active lenders of FF today usually face the same 12 foreign banks as borrowers. Since January 2015 the FF rate has been printing smack in the middle of the Fed's target range and has been trending along a straight line. The 10 lenders and 12 borrowers who make up the FF market today seem to be “splitting the bounty”.

We next turn to banks as money dealers…

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
**Money Dealers** – U.S. Banks and the New York Branches of Foreign Banks:

…which just like the U.S. Treasury and the FHLBs have to hoard liquidity to self-insure against runs. But what is self-imposed for the Treasury and what is imposed by the FHFA for the FHLBs is imposed by Basel III’s Liquidity Coverage Ratio (LCR) for banks.

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On the **asset side**, banks (under the LCR) are required to hold high-quality liquid assets (HQLA) against money market liabilities that mature in 30 days or less. The concept of HQLA spans both money and bond markets and when it comes to money markets, excess reserves at the Fed (or rather “excess” reserves, see here) are the most prominent instrument banks hold as HQLA today.

HQLA (in this context reserves, i.e. lending cash to the Fed) must be unencumbered, which means that the funding of HQLA can’t be done in secured markets, only in **unsecured** markets. Here we have the third set of **matched books** (funding reserves unsecured).

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On the **liability side**, fed funds are one source of **unsecured** funding for banks. Others include either onshore or Eurodollar operating deposits, non-operating deposits or commercial paper (CP) at tenors ranging from o/n to 1-mo (see below) or longer (not shown).

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
Money Dealers – U.S. Banks and the New York Branches of Foreign Banks:

Non-operating deposits are the cheapest source of unsecured funding for banks. Non-operating deposits refer to the cash balances of private cash pools that are in excess of their typical payment needs (see figure below). They come in many shapes and forms: they can be booked onshore or offshore (Eurodollar) and in the form of a demand deposit, a time deposit or a certificate of deposit.

The worst kind of non-operating deposits (those of asset managers and hedge funds) have to be backed by HQLA to the last penny.

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For banks that run conservative HQLA portfolios this means that non-operating deposits are 100% backed by reserves at the Fed. For banks that run riskier HQLA portfolios this means that non-operating deposits are 100% backed by some mix of reserves, Treasuries and agency MBS. As we have discussed here and here HQLA portfolios are not uniform across the banking system (some banks hold mostly reserves, some mostly Treasuries and some mostly agency MBS) and this means that banks pricing strategies of non-operating deposits are also different. Banks with conservative HQLA portfolios typically pay zero on non-operating deposits (see figure below) and banks with riskier HQLA portfolios pay more, often matching money fund yields (not shown).
**Money Dealers** – U.S. Banks and the New York Branches of Foreign Banks:

Operating deposits are a different matter. Also **unsecured**, their HQLA requirements are lower (about 25%) and hence their yield more attractive: close to the effective FF and OBFR rates. In fact the OBFR is derived from mostly customer-to-bank Eurodollar deposit rates – customers that span money funds and cash pools that range from corporations to asset managers (see chart below).

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The same set of customers fund banks unsecured at longer maturities as well by buying 1-mo Eurodollar CDs or 1-mo financial CP (see chart below), as well as longer-dated unsecured paper – CDs and CP – at 3, 6 and 12-month maturities (not shown). We do not show these points in the chart below as their dynamics and determinants are different from those of o/n to 1-month liabilities. (3, 6 and 12-month unsecured liabilities – that is, the term Libor curve – will be discussed in Part 5 of the slide deck on pages 81-87).

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
Money Dealers – Primary Dealers:

So far we have only discussed the “patricians” of the money market: sovereign and quasi-sovereign entities as issuers of sovereign paper and banks as issuers of unsecured paper (banks can issue unsecured because they have access to the discount window).

Primary dealers are different. They fund exclusively in secured money markets – a reflection of the fact that they don’t have access to the central bank’s discount window and so they have to pledge collateral in order to be able to borrow in money markets on scale.

On the liability side of their balance sheet, primary dealers fund their matched books in the tri-party repo market, which is a market where money market funds and private cash pools lend cash (o/n or longer) against collateral*. Like with ultra-short Treasury bills, public cash pools are not typically active in the tri-party market as the Fed’s foreign repo pool yields better (more on this in Part 5).

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But what do dealers do with the money they raise? Something very different from what other money dealers do. Others typically…

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse

*the repo price points in the chart above reflect repos with Treasury collateral
Money Dealers – Primary Dealers:

…lend either to the Fed or to banks on the asset side and fund themselves in sovereign or unsecured money markets on the liability side:

(1) …the U.S. Treasury lends to the Fed and funds in the (sovereign) bill market;

(2) …the banks lend to the Fed and fund in (unsecured) FF markets; and…

(3) …the FHLBs lend to banks and fund in the (sovereign) disco market.

Not primary dealers. On the asset side, they lend to a completely different client-base: to other primary dealers, to dealers that are not primary dealers, and to the levered buy-side (hedge funds and total return funds; see Section IV of How the Financial System Works (Pozsar, 2014)).

Primary dealers fund each other and non-primary dealers at the so-called inter-dealer GCF repo rate (or at rates lower than the GCF repo rate) and they fund the buy-side bilaterally at the GCF repo rate plus a spread (see figure below*; we discuss repo markets in more detail in Part 4).

Primary dealers are thus market makers in secured money markets, funding mostly in the tri-party repo market and lending mostly in the GCF and bilateral repo markets. Here is the fourth set of matched books: lending cash secured and borrowing cash secured (matched repo books).

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse

*the repo price points in the chart above reflect repos with Treasury collateral
**Money Dealers** – Money Funds:

The final set of money dealers to talk about are the money funds.

On the liability side, all of the money dealers discussed above issue debt claims (money market instruments) to fund their money market assets. Not money funds. They issue equity claims to fund their assets, which makes them “one-sided” money dealers.

The business model of money funds – like that of any money dealer – is to earn a spread on their matched books. For money funds this spread is captured by a fee. Fees reduce gross portfolio yields to a net yield. The net yield is the return cash pools earn on money fund shares. The gross yield represents where money funds lend (on average) and the net yield represents where they fund.

On the asset side, the spectrum of assets money funds hold (ranging from sovereign to unsecured and secured) correspond to various fund types: government funds hold mostly guaranteed and secured paper, and prime funds hold mostly unsecured paper. Different assets generate different yields, with those on prime funds typically higher than those on government funds (not shown).

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
Cash Pools:
We next review which types of cash pools have access to what kind of money market instruments.

Private cash pools have access to every instrument above except for the liabilities of the Fed, fed funds (FF) and GCF repo. Private cash pools’ lack of access to these instruments is testament to the hierarchical nature of money markets – only money dealers have access to the Fed, not cash pools; only banks have access to interbank (FF) rates, not cash pools; only dealers have access to interdealer (GCF) rates, not cash pools.

Public cash pools have access to the same instruments as private cash pools plus the Fed’s foreign repo pool. That said most public cash pools have only a limited list of counterparties they can face, which typically include sovereign governments and/or central banks. As a result public cash pools typically do not hold money market instruments issued by the FHLBs, banks, primary dealers or money funds. And even the ones that do are now being pushed out by banks because their balances are considered low-quality non-operating deposits under Basel III.

Finally, money funds have access to the same instruments that private cash pools do plus o/n RRPs at the Fed. As the below chart implies all that money funds do is serve as an outsourced liquidity function for cash pools: converting portfolios of term money market claims into par on demand claims. Of course this is possible only on a macro, but not a micro level – hence the need to outsource/mutualize in the first place!

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<td>L</td>
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Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
Part 2 – The Hierarchy of Money
The Hierarchy of Money Post-QE and Post-Basel III:
The below picture – “monetary pointillism” – is comprehensive. We are unaware of any balance sheet or price that should be on it but is not. 
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The next step is to identify some hierarchical relationships that emerged between various money market rates post-QE and post-Basel III. 
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The Hierarchy of Money Post-QE and Post-Basel III:

The below picture – “monetary pointillism” – is comprehensive. We are unaware of any balance sheet or price that should be on it but is not.

The next step is to identify some hierarchical relationships that emerged between various money market rates post-QE and post-Basel III.

To do so, we simplify the picture and drop all interest rates (price points for money) but those of the shortest tenor for each money dealer. These will be o/n price points for banks, dealers and money funds and 1-mo and 1-wk price points for Treasury and the FHLBs, respectively.

The following hierarchical relationships (rules of thumb) emerge…

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
The Hierarchy of Money Post-QE and Post-Basel III:

(1) only money fund shares, non-operating deposits and the shortest-dated Treasury bills and discount notes trade below the o/n RRP floor;

Does the Fed care about these “leaks”? No…

The Fed does not care about where net yields on money fund shares trade. Net money fund yields are driven mostly by fees which in turn are driven by industry-specific factors which tend not to be of monetary relevance. The Fed cares more about the yields on the instruments that make up money funds’ portfolios, and especially the yields on o/n instruments issued by the core money dealers – banks and primary dealers.

The Fed also does not care about where rates on the worst kind of non-operating deposits (those of asset managers and hedge funds) trade. That is because the whole point of the Liquidity Coverage Ratio is to “exorcise” these non-operating deposits from the banking system. The LCR (by design) forces banks to hold so much liquidity against these deposits that they have no choice but to “price them to leave.”

The Fed also does not care about where the shortest-dated Treasury bills and agency discount notes trade. For one, the fact that they trade below the floor of the Fed’s target range (the o/n RRP rate) is partly a reflection of the above point – namely that banks are pushing some deposits off their books and these outflows underwrite the strong bid for bills and discos. So far the system managed to source enough of these instruments (with some unexpected policy help, see here) but if we were to hit a brick wall – well, that’s what the o/n RRP facility is there for.

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
The Hierarchy of Money Post-QE and Post-Basel III:

(1) only money fund shares, non-operating deposits and the shortest-dated Treasury bills and discount notes trade below the o/n RRP floor;
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(3) primary dealers’ core funding rate generally trades below unsecured o/n bank funding rates such as FF and OBFR;

hard floor under o/n tri-party Treasury repo rates

secured (cash pool to dealer) < unsecured ↑

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(5) primary dealers’ core lending rate (the o/n GCF Treasury repo rate) generally trades above unsecured o/n bank funding rates; and…
(6) …IOER is a soft ceiling for o/n GCF Treasury repo rates as banks will generally be lending into the GCF market if o/n GCF repo > IOER.

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
The Hierarchy of Money Post-QE and Post-Basel III:

The previous chart showed what the hierarchy of money market rates was on April 8th, 2016.

The chart below shows how the hierarchical relationships identified on the previous page held up over time. In short: very persistently (the series below exclude month-end dips in FF and OBFR rates and quarter-end spikes in GCF rates; we’ll discuss these separately).

The picture that emerges here as well (at the risk of being repetitive) is the following:

1. the o/n RRP rate is a hard floor under the o/n tri-party Treasury repo rate (which is primary dealers’ core funding rate);
2. the o/n tri-party Treasury repo rate is generally below o/n unsecured bank funding rates;
3. the o/n GCF Treasury repo rate (which is primary dealers’ core lending rate) is generally above unsecured bank funding rates; and…
4. the IOER rate is a soft ceiling for the o/n GCF Treasury repo rate (excluding quarter-ends which are not shown).

There are four important themes in the chart below. These are:

1. the target range for the o/n secured rates complex
2. the difference between the instrumentality of banks’ and primary dealers’ matched books;
3. the difference between what is HQLA for banks and what is HQLA for primary dealers;
4. the volatility of inter-dealer repo rates vs. the relative stability of all other rates.

We turn to each of these below…

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
First, the target range for the o/n secured rates complex:

When it comes to discussing the Fed’s target range, the attention instinctively turns to the question of where FF trades within that range. This is perhaps because FF has always been the Fed’s target rate and so everyone seems to care about where it trades within the target range regardless of whether the FF rate is still relevant or not and regardless of whether other rates have become more appropriate to target or not.

Indeed, focus of the FF rate risks missing the bigger picture: that the Fed’s target range is a de facto corridor for the o/n secured rates complex.

Recall that the o/n RRP rate (the bottom of the Fed’s target range) is a hard floor to customer-to-primary dealer o/n tri-party Treasury repo rates (which is primary dealers’ core funding rate), and that the IOER rate is a soft ceiling for the inter-dealer o/n GCF Treasury repo rate (which is primary dealers’ core lending rate). Thus, what we effectively have is a corridor that keeps o/n repo markets range-bound and which sets the lows and highs for the rates at which primary dealers can borrow and lend, respectively, on the two sides of their matched repo books.

In effect, the o/n RRP and IOER rates form the “outside spread” (see Mehrling, 2015) for the o/n repo market, where the Fed stands ready to borrow at the o/n RRP rate if primary dealers won’t borrow (due to balance sheet constraints), and banks stand ready to lend at the o/n GCF rate (if o/n GCF repo rates > the IOER rate) which typically happens when primary dealers won’t lend (due to balance sheet constraints).

Within the target range, primary dealers make (two-way) markets at the “inside spread” (also see Mehrling, 2015).

The ability of the Fed’s target range to control primary dealers’ core funding and lending rates is a much bigger deal than where in the range the FF rate trades. But the Fed has completely avoided talking about this to date (whether by choice or some other reason we do not know).

The success of the o/n RRP facility should not be judged by whether it helps the FF rate trade in the middle of the Fed’s target range, but by its ability to provide a hard floor under o/n tri-party Treasury repo rates. As we said before, the FHLBs would rather keep cash earning zero in their checking accounts at the Fed than be locked up until 3:30 PM for earning the o/n RRP rate; the o/n RRP facility is irrelevant for determining where FF trades.
Second, the difference between the instrumentality of banks’ and primary dealers’ matched books:

The hierarchical nature of money markets is also evident in how the instrumentality of matched books varies from one money dealer to another:

1. the red line (IOER) represents the asset side of banks’ matched money market books, which banks fund on the green or blue lines (representing FF and OBFR, respectively). In other words, banks hold the red line as assets (reserves as HQLA earning IOER) and issue the blue and green lines as liabilities, for a spread of ~12.5 bps (apparently the minimum spread required on an o/n HQLA portfolio); and…
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The point is that when we talk about money markets and “banks” (G-SIBs) as market makers, we need to be mindful of the fact that the instrumentality of o/n matched money market books varies from one operating subsidiary (say a bank) to another (say a primary dealer).

Thus, in the case of Credit Suisse Group AG (the holding company one can buy shares in), the matched book of the New York bank branch (Credit Suisse AG New York Branch) consists of o/n reserves earning IOER on the asset side and o/n unsecured liabilities paying OBFR on the liability side; the matched book of the primary dealer (Credit Suisse Securities (USA) LLC) consists of o/n GCF repos on the asset side and o/n tri-party repos on the liability side.

It is important to note that only bank subsidiaries have access to reserves at the Fed; primary dealer subsidiaries do not. This is true for all U.S. G-SIBs. This takes us to the next theme...

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
Third, the difference between what is HQLA for banks and primary dealers:

...which is that “base” HQLA for banks is not the same as it is for primary dealers (we define “base” HQLA as the highest yielding o/n trade that helps banks and primary dealers source HQLA). This is yet another example of the hierarchical nature of money markets. Thus:

[1] for banks “base” HQLA are reserves at the Fed earning IOER, but...
[2] for primary dealers (who don’t have access to reserves) “base” HQLA are Treasuries reversed in o/n from other dealers via reverse repos;
[3] opportunistically, banks can also lend to dealers instead of the Fed if o/n GCF repo > IOER (this would be an LCR-neutral HQLA swap).

In such instances, U.S. Treasuries reversed in o/n from dealers replace reserves as “base” HQLA for banks (see spikes above IOER below)

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To drill further into point [2], a primary dealer wishing to assemble a short-dated HQLA portfolio would never hold (term) Treasury bills outright as term bills pay little relative to lending o/n in the GCF repo market and reversing in Treasury securities instead (see figure below).

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![Diagram showing the difference between base HQLA for banks and primary dealers.](image-url)
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One of the criteria for an asset to qualify as HQLA is that it cannot be encumbered. In English, this means that HQLA can only be funded in unsecured funding markets, but not in secured funding markets. So the relevant price pairs are...

(1) ...IOER and unsecured rates (FF and OBFR) for banks; and...
(2) ...inter-dealer repo and unsecured rates for primary dealers.

The fact that inter-dealer repos are a source of HQLA and that HQLA must be funded unsecured explains why o/n unsecured rates are a soft floor to o/n GCF repo rates (with o/n GCF repo dipping only occasional below; we will explain these dips in Part 4 of the deck).
Fourth, the volatility of inter-dealer repo rates vs. the relative stability of all other rates:

One side effect of Basel III is that it completely changed the trading pattern/behavior of one market segment versus another. In particular:

(1) Unsecured customer-to-bank funding rates (OBFR and FF – the blue and green lines – respectively) trade in a remarkably stable manner – practically along a straight line. This is because OBFR is based on a survey of where rates trade on o/n Eurodollar operating deposits. By definition, operating deposits are stable sources of funding, and this is what the stability of o/n Eurodollar deposit rates (as measured by the OBFR) reflect. Think of cash pools’ operating deposits as a core funding source of banks (core = stable). On the stability of FF see here.

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2. Secured customer-to-primary dealer funding rates (o/n tri-party Treasury repo rates – the orange line) are a bit less stable than unsecured customer-to-bank rates, but they are very stable still. o/n tri-party Treasury repos are primary dealers’ core source of funding. Importantly however, none of this funding is coming from cash pools’ operating balances; rather it comes from cash pools’ non-operating balances. Because these balances are non-operating they tend to be opportunistic, yield seeking, unstable and fast (hence the deliberate design of Basel III to reduce banks’ reliance on cash pools’ non-operating balances as a source of short-term wholesale funding) and tend to toggle between various balance sheets and money market instruments depending on the yield, availability and relative value of products. Indeed…

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3. …sovereign bills (see the brown series below) and repos (see the orange series below) are substitutes (see Pozzar, 2011 and on the substitution between public and private shadow money see Pozzar, 2014). Under normal circumstances, the supply of Treasury bills puts upward pressure on o/n tri-party Treasury repo rates and vice versa. In other words, cash pools’ non-operating balances are invested either in more Treasury bills or more primary dealer repo, and if substitution between the two instruments is not perfectly elastic (perhaps because the U.S. Treasury is unwilling to issue more bills for some reason or because primary dealers are bound by their SLR constraints) the Fed’s fixed price, full-allotment o/n RRP facility will always save the day.

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4. Secured inter-dealer funding rates (the o/n GCF Treasury repo rate – the purple line) are highly volatile in contrast. This is because as GCF repos happen between intermediaries, not between dealers and customers (cash pools) and inter-intermediary trades are inherently more volatile than customer to dealer rates (more on this in Part 4 below).
On “Secured < Unsecured”:

Finally, regarding the wide-held view that secured rates are always below unsecured rates, simply because secured is safer than unsecured: this urban legend first appeared in Stigum’s Money Market and lived on in academic works ever since.

To set the record straight:

In money markets you either lend or you don’t; collateral won’t make you feel safer if you would not lend unsecured; and you would never lend to a bad counterparty even against good collateral. To get to the bottom of the “secured < unsecured” issue…

…one needs to start with the question of which secured interest rate is where relative to unsecured interest rates. As the chart below shows, o/n tri-party Treasury repo rates are always below unsecured rates, but o/n GCF Treasury repo rates are typically above unsecured rates. So the “safety” argument clearly makes no sense. Why would one repo rate be safer than unsecured and another repo rate less safe?

Rather, what the “secured < unsecured” relationship comes down to is the fact that the two sides of primary dealers’ secured matched books (matched repo books) structurally trade within the o/n IOER and o/n RRP range (not above, not below, but within), while the lending side of banks’ unsecured matched books trade at IOER (not within) and so their funding rates can be higher (relative to secured tri-party repo rates). Put differently, with primary dealers o/n lending rate (o/n GCF repo) below that of banks (IOER), their secured funding rates must also be structurally lower than banks unsecured funding rates (for o/n NIM targets similar to those of banks).

Furthermore, because base HQLA for primary dealers is Treasuries reversed in through o/n GCF repo trades, o/n GCF repo rates will structurally always have to be above o/n unsecured rates. This is because primary dealers (as for profit money dealers) must fund their assets at a positive spread, and since HQLA can only be funded unsecured (but not secured) it must always be the case that secured (GCF) rates are above unsecured rates.
Part 3 – Which Rate to Target?
Which Rate to Target?
Which rate should the Fed target going forward?

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(1) The unsecured FF rate? Unlikely as the unsecured, inter-bank FF market is “defunct” post-QE and post-Basel III and what’s left of it is prone to manipulation (see here). The Fed will likely never return to a regime where it manages the FF rate with open market operations.

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(2) The unsecured OBFR? Likely, as it’s based on a deeper market than FF. But the Fed would switch only reluctantly, as OBFR is a customer-to-bank rate, not an inter-bank rate, and it is a global rate, not a local rate. The Fed never targeted a global customer-to-bank rate before!
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(3) The secured o/n tri-party Treasury repo rate? Unlikely as it is a customer-to-dealer rate and with primary dealers unable to access the discount window, there is no ex-ante mechanism in place that would cap these rates in a crisis. And if you can’t cap it, you can’t target it…
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President Dudley’s recent speech (arguing for LoLR access for primary dealers) should be understood in this context.
At the moment, the Fed does not have anything better than the OBFR as an alternative to the FF rate (see here).
However, were primary dealers to gain access to the LoLR at some future date that may well change.
And if it does change, finding the appropriate repo rate to target will be crucial.
This is the topic we will next turn to in Part 4 of the deck...

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
Part 4 – RIPO
**Matched Repo Books:**

There are no less than seven repo rates an informed market participant needs to keep in mind:

1. The o/n tri-party Treasury repo rate (primary dealers’ core funding rate) is the rate at which primary dealers raise the bulk of their funding from private cash pools directly or indirectly through money market funds (both government-only and prime).

2. The o/n RRP rate sets a floor under o/n tri-party Treasury repo rates (see above). If primary dealers were to try to bid for cash at rates less than the Fed’s o/n RRP rate, money funds would fund the Fed instead. Structurally, primary dealers will always have to pay more than the o/n RRP rate going forward, simply because the Fed is the best counterparty in the world (literally) and everyone else must borrow at a mark-up relative to the Fed (this mark-up is the o/n tri-party Treasury repo - o/n RRP spread).

3. The o/n GCF Treasury repo rate is primary dealers’ core lending rate. This is the rate on which primary dealers base all of their lending to other dealers and their clients. The IOER rate serves as a soft ceiling for the o/n GCF Treasury repo rate.

All three rates correspond to trades executed on the tri-party repo platform. This means that cash lent o/n to the Fed (via o/n RRPs), to primary dealers (via o/n tri-party repo), or interdealer (via o/n GCF repo) gets returned at the same time – at 3:30 PM the next day.

The o/n GCF Treasury repo rate (published by DTCC) is a uniform price for everyone – anyone who borrows or lends in the GCF market on an o/n basis and against Treasury collateral gets that rate (GCF repo is blind-brokered, FICC cleared and nettable).

The o/n tri-party Treasury repo rate (published by BoNY) is different. It is a volume weighted average of all o/n Treasury repo trades that were executed on BoNY’s tri-party repo platform. Even though these trades are all o/n and backed by Treasury collateral, each of them were made at different interest rates as borrowers have different credit rating and risk profiles (counterparty risk is thus a factor in pricing tri-party repos, but not GCF repos as with GCF everyone faces FICC). Unlike GCF, tri-party repos are not nettable.

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- **IOER**
  - [3] GCF (interdealer, FICC cleared, 3:30 PM cash return)

- **Tri-party (cash pool to dealer, 3:30 PM cash return)**
  - [1]

- **o/n RRP**
  - [2]
Primary dealers fund not only in the tri-party repo market, but also in the bilateral repo market (see price points [4] and [5] below).

Similar to tri-party repo rates, bilateral repo rates are not uniform, but tiered. Similar to the way each money dealer’s access to the Fed’s menu of liabilities is tiered (see Part 1, pages 11 to 14), cash pool’s access to bilateral repos is also tiered. And similar to how some Fed liabilities pay more and some pay less, bilateral repos with some counterparties pay more and some pay less. Thus:

[4] Some bilateral repos (o/n Treasury collateral) pay less than the o/n tri-party Treasury repo rate. In general these reflect trades where a smaller institutional cash pool (say a municipality) wants to invest cash secured but is too small to qualify for access to the tri-party repo market (where the size of transactions are typically very large; too large for smaller accounts to qualify). Because small accounts (small fish) do not have bargaining power, they only get rates lower than rate [1] (crumbs from the table).

[5] Some bilateral repos (o/n Treasury collateral) pay more than the o/n tri-party Treasury repo rate. In general these reflect trades where a larger institutional cash pool (say a large asset manager (think PIMCO) or a large foreign central bank (think SAFE)) wants to invest cash secured and has so much bargaining power (due to other businesses it does with primary dealers) that it can extract rates that are close to inter-dealer GCF rates. Think “hierarchies just don’t apply to you if you are big enough.” Think “pounds of flesh for big fish.”

To top things off, some cash pools may be able to extract terms where their bilateral repo investments return cash back early in the morning, while everyone else who invests in tri-party repos gets their cash returned at 3:30 PM. Those that can negotiate early return of cash do not have to buy Treasury bills at yields below the o/n RRP rate for intraday liquidity purposes (see Part 1, page 17). This in turn helps the big fish solidify their position as yield leaders and award winners in their product segments. Money markets are hierarchical indeed: all money dealers and cash pools aren’t created equal.
**Matched Repo Books:**

On the lending side, the o/n GCF Treasury repo rate serves as a pricing benchmark for **bilateral** reverse repo trades, or “reverses” (see price points [6] and [7] below).

[6] Some bilateral reverses (o/n Treasury collateral, where primary dealers are cash **lenders** as opposed to **borrowers** as before) trade at a negative spread to the o/n GCF Treasury repo rate. These bilateral repo trades are interdealer and FICC cleared too. Their lower yield reflects the fact that dealers are willing to forgo some yield in exchange for early return of cash. Keep in mind that every trade that gets executed on a tri-party platform (o/n RRPs with the Fed, tri-party repos with primary dealers and GCF repos between dealers) returns cash back at 3:30 PM the next day. Primary dealers that wish to get their cash back sooner than that (or more precisely, primary dealers that wish to have the ability to be in **control** of when they get their cash back) are willing to forgo some yield for that **privilege**. This put option is the flip side of the put option of the big fish discussed previously: if a primary dealer writes a large cash lender a liquidity put, the dealer also has to buy one on the other side of its **matched book**. It does so in the interdealer, bilateral reverse repo market. Being interdealer, these trades are also FICC cleared and so nettable.

[7] Some bilateral reverses (o/n Treasury collateral, where primary dealers are cash lenders) trade at a positive spread to the o/n GCF Treasury repo rate. These trades are done mostly with leveraged fixed income investors on the buy-side: total return, risk parity and hedge funds. Because these trades are done with the buy-side and not with other dealers (like the trades above), they are **not** FICC cleared and hence not nettable. Spreads over GCF rates are determined by a counterparty’s credit risk.
We can highlight four important themes in the figure below.

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First, as shown by the figure below, the IOER rate and the o/n RRP rate are a de facto corridor only for dealers’ core lending and funding rates, respectively, but not their non-core lending and funding rates. Thus, the o/n RRP rate is a hard floor only under o/n tri-party Treasury repo (funding) rates, not o/n bilateral Treasury repo rates with small(ish) cash pools. And the IOER is a soft ceiling only for o/n GCF Treasury repo (lending) rates, not o/n bilateral Treasury repo rates with buy-side customers (which are typically priced at a spread over o/n GCF rates).

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Second, primary dealers’ secured lending rates (on the asset side of their matched repo books) are always higher than their secured borrowing rates (on the liability side of their matched repo books). This positive spread is their source of profits from matched book money dealing.

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Third, for most market participants (anyone that is not a bank or a primary dealer) only rates [1] and [3] are known at any given point in time. Rate [1] (the o/n tri-party Treasury repo rate) is published by BoNY, and rate [3] (the o/n GCF Treasury repo rate) is published by DTCC. Where bilateral repos and reverse repo markets trade we do not know presently. This is the so-called data gaps issue with repo markets.

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Fourth, the data gaps issue is partly a non-issue really and partly an issue that is about to get resolved soon. On the former, the New York Fed has been collecting data about where each primary dealer funds itself on an o/n basis (both in terms of rates and volume) using various collateral types (ranging from U.S. Treasuries to junk bonds). This data series (unpublished), coupled with publicly available rates and volume data on tri-party repo transactions already gives the Fed a good sense of where rates print on bilateral repo trades (where primary dealers are borrowers). So one part of the data gap issue is really a transparency gap. The data exists, it’s just that the Fed does not publish it. The other part of the data gap issue (our lack of knowledge about where primary dealers fund the buy-side) is being resolved as we speak. This bit is being addressed by the bilateral repo survey that’s jointly run by FRBNY and the U.S. Treasury. Its results will be published soon and regularly.

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Source: Credit Suisse
For the day-to-day trading of repo markets (and cash and synthetic rates markets in general) two questions are of particular importance:

[1] What drives the volatility of the o/n GCF repo rate (the rate in the red circle in the figure below) on days other than quarter-ends?

[2] What drives the structural widening of the spread (see the red arrow below) between o/n GCF repo rates and o/n tri-party repo rates?

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Source: Credit Suisse
First, what drives the day-to-day volatility of o/n GCF Treasury repo rates? To answer that question we have to come to terms with the fact that calling the GCF repo market an interdealer market is imprecise and a misnomer. Labels often frame the way we think about things and the imprecise “interdealer” label in the case of the GCF repo market weakens our ability to frame and interpret day-to-day price action correctly.

To set the record straight, the GCF repo market is made up of four types of participants: banks (small and large, U.S. and foreign), primary dealers, broker-dealers other than primary dealers and one of the GSEs – Fannie Mae (for a list of key participants see Appendix, pp. 95-99).

Thus, the GCF repo market is not really an interdealer repo market, but rather an “inter-system” repo market, where…

…broker-dealers other than primary dealers are structural borrowers in the GCF repo market and Fannie Mae and primary dealers are structural lenders. Banks are lenders too, but opportunistic lenders as opposed to structural lenders (lending only if o/n GCF repo > IOER).

Thus, the o/n GCF repo rate on our stylized matched book of a primary dealer corresponds to the lending side of the GCF market (see below).
Mapping the lending and borrowing sides of the GCF repo market onto the balance sheet of each market participant yields the following image:

[1] Broker-dealers other than primary dealers typically borrow in the GCF repo market to fund their securities inventories (they borrow in the GCF market and not the tri-party repo market because they are too small and too infrequent a borrower to be eligible for tri-party trades).

[2] Fannie Mae is structurally long cash and its cash balances are funded with equity (Fannie is more like a cash pool than a money dealer). The source of Fannie’s cash balances are the principal and interest payments households make on their mortgages. Fannie accumulates these payments during the month until it makes coupon payments at the end of each month. During the accumulation phase, Fannie lends its balances in the GCF repo market and broker-dealers other than primary dealers (henceforth broker-dealers) borrow these balances. But Fannie’s cash lending volumes only cover a part of broker-dealers’ structural borrowing needs. This is where the primary dealers come in.

[3] Primary dealers bridge the gap between broker-dealers structural borrowing needs and Fannie Mae’s structural lending volumes. They do so by borrowing in the tri-party repo market and passing on the cash raised to broker-dealers (the matched repo book in action). In that sense primary dealers work as middle-men between broker-dealers too small to borrow from money funds and money funds too risk averse to lend to standalone broker-dealers. This by the way is the same "service" primary dealers provide between hedge funds and money funds.

[4] Banks will lend into the GCF market only if primary dealers won’t and if that lack of lending pushes o/n GCF repo rates above IOER.
We can track these dynamics on the chart below (the series below exclude quarter-end repo rate dynamics which we will discuss separately):

[1] Broker-dealers (other than primary dealers) **borrow** at the purple line (the o/n GCF Treasury repo rate).
[2] Fannie Mae **lends** at the purple line. The gap between broker-dealers’ structural borrowing needs and Fannie’s structural lending volumes...
[3] …is filled by primary dealers, who **borrow** at the orange line to **lend** at the purple line (the core borrowing and lending rates, respectively).
[4] Banks only **lend** into the GCF repo market opportunistically, if and only if o/n GCF Treasury repo rates are above IOER.

---

[4] Banks **lend** only if GCF > IOER →
[1] Broker-dealers **borrow** at this rate →
[2] Fannie Mae **lends** at this rate →
[3] Primary dealers **lends** at this rate… → …and **borrow** at this rate↓

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
We can track these dynamics on the chart below (the series below exclude quarter-end repo rate dynamics which we will discuss separately):

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[4] Banks only lend into the GCF repo market opportunistically, if and only if o/n GCF Treasury repo rates are above IOER.

To get back to the question we started out from, the intra-month volatility of GCF repo rates has to do with the following:

o/n GCF repo rates collapsing are a sign that Fannie Mae (as a structural cash lender) is in cash accumulation phase. It’s flooding the GCF market with cash and there is less of a need for primary dealers to step in to finance broker-dealers.

o/n GCF repo rates spiking are a sign that Fannie Mae just paid a coupon and has no cash to lend to broker-dealers. That’s when primary dealers need to step in to finance broker-dealers. But that costs balance sheet…
…because under Basel III only centrally cleared repo trades are nettable and not much else. In the U.S. this means that only trades where a primary dealer is both a lender and a borrower in the GCF repo market is eligible for netting. However, as we have seen on the previous pages primary dealers tend to lend in the GCF repo market and borrow in the tri-party repo market and as it happens these trades are not nettable.

This brings us to our second initial question: what drove the structural widening of the spread between o/n GCF and o/n tri-party repo rates?

Balance sheet famine unleashed by the supplementary leverage ratio (SLR) – with an effective date of January 1st, 2015 (see here).

Virtually all of the widening between o/n GCF and tri-party Treasury repo rates have been driven by U.S.-based primary dealers that are big enough to be subject to Basel III (and that list is just six names from the 23 primary dealers listed here, namely Citigroup Global Markets Inc., Goldman Sachs & Co., J.P. Morgan Securities LLC, Morgan Stanley & Co. LLC, Merrill Lynch Incorporated and Wells Fargo Securities, LLC).

The SLR forced these primary dealers to shrink their repo books and with quantities restricted, prices had to adjust. What once used to be a high-volume, low margin matched book money dealing business in the repo market became a lower-volume, wider margin business. But with the o/n tri-party repo rate floored by the o/n RRP rate, all of the adjustment to margins had to come from o/n GCF repo rates drifting higher.

We went from having this (narrow spreads)…

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...to having this (structurally wider spreads):

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This is the way we ended up with o/n GCF Treasury repo to o/n tri-party Treasury repo spreads (on days other than quarter-ends) going from under 5 bps on average in 2014 to about 15 bps on average 2016 to date and at times even wider than 25 bps (overleaf).

Source: Credit Suisse
SLR go live date January 1st, 2015 →

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
Were the ARRC or the Fed to choose a secured reference and target rate, respectively, which of the below repo rates should they choose?

2. …the volume-weighted average of repo rates [3] and [6]? Or rather…
3. …the volume-weighted average of repo rates [1], [4] and [5]?

Conceptually, should the alternative rate be a…

4. …customer-to-dealer rate (as measured by some volume-weighted average of rates [1], [4] and [5]), or an…
5. …inter-system rate (as measured by some volume-weighted averages of rates [3] and [6]) which reflects the o/n funding needs of shadow banks (broker-dealers, both primary and non-primary)?

Frankly, this question does not matter for as long as broker-dealers do not have access to the discount window.

Why?

Because you can’t pick a rate as a reference or target rate that you cannot cap in a crisis. And at present, the Fed cannot cap secured rates in a crisis unless all broker-dealers get access to the discount window like banks.

The fact that banks (which do have discount window access) are also active in the repo market is not a relevant point here. Banks are present mostly in the GCF repo market and mostly as lenders, not borrowers (banks don’t borrow on a secured basis as that would encumber HQLA and hence worsen their LCR). And banks lending into the GCF market tend to be opportunistic, which means that IOER is a soft ceiling to GCF repo rates only in normal times, not crisis times. Presently there are no mechanisms in place that would cap repo rates in a crisis…

…and that means that there is no point entertaining the idea of a secured rate as a reference rate until dealers get discount window access. Does President Dudley’s recent bid for discount window access for broker-dealers suggest that the Fed prefers to have a secured target rate?

In specific (see overleaf)…

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<td>o/n RRP [2]</td>
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Source: Credit Suisse
“An important issue is to identify and address gaps in the lender-of-last-resort function. […] For example, the Federal Reserve has a very limited ability to provide funding to a securities firm, even on a fully collateralized basis. The Discount Window is only available to depository institutions, and Section 23A of the Federal Reserve Act severely constrains the ability of a depository institution to pass Discount Window funding along to its securities affiliate. Although the Federal Reserve may be able lend to a securities affiliate under its emergency lending authority under Section 13(3) of the Federal Reserve Act, this is not a standing facility—it can only be established if “unusual and exigent” circumstances exist and the program or facility must have broad-based eligibility, among other requirements. […] If all of the requirements for Section 13(3) are met, the central bank could provide liquidity support. However, since this is not a certainty, it is worth considering possible alternatives. Now that all major securities firms in the U.S. are part of bank holding companies and are subject to enhanced prudential standards as well as capital and liquidity stress tests, providing these firms with access to the Discount Window might be worth exploring. To me, this is a more reasonable proposition now than it was prior to the crisis when the major dealers weren’t subject to those safeguards.”

William C. Dudley, President and CEO, FRBNY, Amelia Island, FL, May 1st, 2016
Trading Basel III
Forget the U.S. Treasury yield curve…

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
…and meet the HQLA curve.

For banks (with access to reserve accounts earning the IOER rate) the HQLA curve is IOER up to the point where Treasuries start yielding more.

Banks today do not hold Treasury bills (Treasuries shorter than one year), as anything on the Treasury bill curve yields less than IOER.

Banks’ interest in Treasuries typically extends out to the 5-year point on the curve but not beyond.

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
The HQLA curve is not the same for banks and broker-dealers.

For broker-dealers the HQLA curve is the GCF repo curve up to the point where Treasuries held outright start yielding more. In general, broker-dealers reverse in their HQLA portfolios and do not hold them outright.

This is simply because sourcing collateral through reverse repos always pay better than accumulating Treasuries outright.

Similar to banks, broker-dealers do not hold anything along the Treasury bill curve and typically venture out to the 5-year point on the curve, not beyond.
Basel III effectively broke the LIBOR curve into two parts:

The curve is flat(ish) between the o/n and 30 day point. That is because funding that is less than 30 days has an HQLA requirement and that requirement is the same whether funding is o/n, 30-day or in-between.

The curve is steep beyond the 30-day point. That is because funding that is longer than 30-days has no HQLA requirement and so banks can put to work 100% of the funds they raise however they see fit (the LCR does not interfere).

In other words, with money longer than 30-days banks are free to do as they please – and the price of that freedom is the steepness of the LIBOR curve.
HQLA curves and the o/n to 30-day segment of the LIBOR curve are interrelated in two ways.

First, funding (deposits, etc.) that is less than 30-days has an HQLA requirement (these requirements vary from one type of funding to another).

Second, HQLA held against liabilities that mature in less than 30-days can only be funded unsecured, and never secured.

This means that HQLA curves are always funded unsecured and the average between the o/n and 30-day points on the LIBOR curve is a rough proxy for what a bank or broker-dealer will pay most to fund an HQLA portfolio....
Money dealing for banks is taking in short-term funds unsecured and parking it at the Fed in the form of excess reserves earning IOER. Banks that serve as money dealers today (with JPM as the primary example, see here) use these reserves opportunistically to lend into the GCF market if o/n GCF repo > IOER.

Thus, day-to-day money dealing today involves the unsecured - IOER rate pair (and the unsecured o/n GCF repo rate pair in special circumstances) for banks and the full spectrum of the tri-party – GCF repo curve for broker-dealers.
O/n GCF Treasury repo rates will tend to trade between IOER and o/n unsecured rates. The market is learning this still…

In general o/n GCF rates won’t settle above IOER in normal times because banks will push the rate back down (see page 81).

Similarly, o/n GCF rates won’t settle below o/n unsecured rates because that would mean that funding HQLA reversed in o/n would be a negative carry trade. That said, at times o/n GCF rates can temporarily dip below o/n unsecured rates – in other words, o/n unsecured rates are a “soft” floor.

O/n tri-party Treasury repo rates will never go below the Fed’s o/n RRP rate (Treasury collateral) as long as the o/n RRP facility remains full allotment…

Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse
Private cash pools have three curves to choose from: the Treasury bill curve, the tri-party repo curve (here we show the Treasury collateral curve but know that there are separate curves for MBS, credit and equity collateral) and the unsecured credit curve (the bank funding curve, i.e. the LIBOR curve).

Private cash pools don’t invest and banks don’t issue much paper beyond the 6-month point on the LIBOR curve.

Now more than ever, private cash pools have the entire Treasury bill curve to themselves (keep in mind: banks and broker-dealers have better alternatives).

And to make up for the bills private cash pools cannot get, they will opt for tri-party repos with primary dealers as a first resort and for o/n RRPs with the Fed as a last resort. In this sense, the Fed’s o/n RRP facility is a safe, short-term asset buffet of last resort for private cash pools…
Public cash pools have access to something much better than bills and that is the Fed’s foreign repo pool.

This facility returns cash at 8:30 (when everything else, including the o/n RRP facility returns cash at 3:30) and offers rates much better than the o/n RRP rate. Our best guess is that it pays the volume weighted average of o/n interdealer repo trades (executed both on a tri-party and bilateral basis).

The Fed does not disclose much about this facility but given that it exerts a strong gravitational pull on bill rates and affects the way bill trade the Fed should disclose more about it (for everything we know see [here](#) and [here](#)).

A black dot marks the foreign repo pool in the figure below – an allegory for the foreign repo pool as they U.S. money market’s wandering black hole…
Basel III represents a revolution in money markets. Matched books are no longer private on both sides, but half private, half public. Banks no longer fund each other, but rather the sovereign. Banks’ liquidity is stored not inside the system, but outside. Money is less “inside” and more “outside”… and money markets more repressed than liberal.

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<table>
<thead>
<tr>
<th>…reversed in or held outright…</th>
<th>Assets</th>
<th>Liabilities</th>
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<tr>
<td>Reserves (Fed)</td>
<td>MMF (private)</td>
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<tr>
<td>Reverses (GCF)</td>
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<tr>
<td>Treasuries</td>
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<table>
<thead>
<tr>
<th>…and funded unsecured.</th>
<th>Assets</th>
<th>Liabilities</th>
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<tr>
<td>Reserves (Fed)</td>
<td>Unsecured (customer)</td>
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<tr>
<td>Reverses (GCF)</td>
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<tr>
<td>Treasuries</td>
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Source: Credit Suisse
Appendix
<table>
<thead>
<tr>
<th>Country</th>
<th>Broker-Dealers (small, non-primary dealers)</th>
<th>G-SIB</th>
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</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>Amherst Pierpont Securities LLC</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>AVM, L.P.</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>Banca IMI Securities Corp.</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>CRT Capital Group LLC</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>E D &amp; F Man Capital Markets Inc.</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>First Clearing, LLC</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>Guggenheim Securities, LLC</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>Hilltop Securities Inc.</td>
<td>-</td>
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<tr>
<td>U.S.</td>
<td>Interactive Brokers LLC</td>
<td>-</td>
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<tr>
<td>U.S.</td>
<td>KCG Americas LLC</td>
<td>-</td>
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<tr>
<td>U.S.</td>
<td>KGS - Alpha Capital Markets, L.P.</td>
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<tr>
<td>U.S.</td>
<td>Maple Securities USA Inc.</td>
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<tr>
<td>U.S.</td>
<td>National Financial Services LLC</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>Oppenheimer &amp; Co., Inc.</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>Palafax Trading, LLC</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>Pershing LLC</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>Piper Jaffray &amp; Co.</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>RCap Securities, Inc.</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>Robert W. Baird &amp; Co. Incorporated</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>Ronin Capital LLC</td>
<td>-</td>
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<tr>
<td>U.S.</td>
<td>Rosenthal Collins Group, LLC</td>
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<tr>
<td>U.S.</td>
<td>South Street Securities LLC</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>Stifel Nicolaus &amp; Company Incorporated</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>SunTrust Robinson Humphrey, Inc.</td>
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<tr>
<td>U.S.</td>
<td>U.S. Bancorp Investments, Inc.</td>
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<tr>
<td>U.S.</td>
<td>Wedbush Securities Inc.</td>
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<tr>
<td>U.S.</td>
<td>Zions First National Bank-Capital Markets</td>
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<tr>
<td>Country</td>
<td>Broker-Dealers (primary dealers)</td>
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<td>U.S.</td>
<td>J.P. Morgan Securities LLC</td>
<td>2.5%</td>
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<tr>
<td>U.S.</td>
<td>Citigroup Global Markets Inc.</td>
<td>2.0%</td>
</tr>
<tr>
<td>U.S.</td>
<td>Goldman, Sachs &amp; Co.</td>
<td>1.5%</td>
</tr>
<tr>
<td>U.S.</td>
<td>Merrill Lynch Pierce, Fenner &amp; Smith, Inc.</td>
<td>1.5%</td>
</tr>
<tr>
<td>U.S.</td>
<td>Morgan Stanley &amp; Co. LLC</td>
<td>1.5%</td>
</tr>
<tr>
<td>U.S.</td>
<td>Wells Fargo Securities LLC</td>
<td>1.0%</td>
</tr>
<tr>
<td>U.S.</td>
<td>Cantor Fitzgerald &amp; Co.</td>
<td>-</td>
</tr>
<tr>
<td>U.S.</td>
<td>Jefferies LLC</td>
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<tr>
<td>Switzerland</td>
<td>Credit Suisse Securities (USA) LLC</td>
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<tr>
<td>Switzerland</td>
<td>UBS Securities LLC</td>
<td>1.0%</td>
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<tr>
<td>Japan</td>
<td>Mizuho Securities USA Inc.</td>
<td>1.0%</td>
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<tr>
<td>Japan</td>
<td>Daiwa Capital Markets America Inc.</td>
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<tr>
<td>Japan</td>
<td>Nomura Securities International, Inc.</td>
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<tr>
<td>E.U.</td>
<td>HSBC Securities (USA) Inc.</td>
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<td>E.U.</td>
<td>Barclays Capital Inc.</td>
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<td>E.U.</td>
<td>RBS Securities Inc.</td>
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<td>France</td>
<td>BNP Paribas Securities Corp</td>
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<tr>
<td>France</td>
<td>SG Americas Securities, LLC</td>
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<tr>
<td>Germany</td>
<td>Deutsche Bank Securities Inc.</td>
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<tr>
<td>Canada</td>
<td>BMO Capital Markets Corp.</td>
<td>-</td>
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<tr>
<td>Canada</td>
<td>RBC Capital Markets, LLC</td>
<td>-</td>
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<tr>
<td>Canada</td>
<td>TD Securities (USA) LLC</td>
<td>-</td>
</tr>
<tr>
<td>Canada</td>
<td>The Bank of Nova Scotia, New York Agency (branch)</td>
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Source: Credit Suisse
<table>
<thead>
<tr>
<th>Country</th>
<th>G-SIB</th>
<th>Banks</th>
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<tbody>
<tr>
<td>U.S.</td>
<td>2.5%</td>
<td>JPMorgan Chase Bank, NA (and separately the CIO too)</td>
</tr>
<tr>
<td>U.S.</td>
<td>2.0%</td>
<td>Citibank, N.A.</td>
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<tr>
<td>U.S.</td>
<td>1.5%</td>
<td>Bank of America, N.A.</td>
</tr>
<tr>
<td>U.S.</td>
<td>1.0%</td>
<td>State Street Bank &amp; Trust Company</td>
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<tr>
<td>U.S.</td>
<td>1.0%</td>
<td>Wells Fargo Bank, N.A.</td>
</tr>
<tr>
<td>U.S.</td>
<td>1.0%</td>
<td>The Bank of New York Mellon</td>
</tr>
<tr>
<td>Japan</td>
<td>1.5%</td>
<td>Mitsubishi UFJ Trust and Banking Corporation (HK, LD, NY, SG branches)</td>
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<td>Japan</td>
<td>1.0%</td>
<td>Mizuho Bank, LTD., New York Branch</td>
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<td>Japan</td>
<td>1.0%</td>
<td>Sumitomo Mitsui Banking Corporation, New York Branch</td>
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<td>E.U.</td>
<td>2.5%</td>
<td>HSBC Bank USA, N.A.</td>
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<td>E.U.</td>
<td>1.0%</td>
<td>Standard Chartered Bank, New York Branch</td>
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<tr>
<td>France</td>
<td>2.0%</td>
<td>BNP Paribas SA</td>
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<td>France</td>
<td>1.0%</td>
<td>Credit Agricole Corporate and Investment Bank, New York Branch</td>
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<td>France</td>
<td>1.0%</td>
<td>Societe Generale, New York Branch</td>
</tr>
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</table>
Disclosure Appendix

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