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Singularity

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In astrophysics, singularity refers to infinite density at the center of a black hole, and the earliest state of the universe – before the Big Bang. In money markets, we define singularity as an "infinite" tightness of spreads at the zero bound.

Singularity is nigh, and its gravitational pull can drive the U.S. dollar Libor-OIS spread tighter from its current level, to the 10-20 bps range by the end of June.

The dollar swap lines, together with strong inflows to prime money funds continue to pull unsecured funding rates and hence U.S. dollar Libor lower, and we don't share the market's concerns over the coming supply of Treasury bills and we don't think that bill supply will push U.S. dollar Libor-OIS spreads wider.

While $1.25 trillion of Treasury bills over the next two months sounds like a lot, it's actually not that much relative to the scale of the Fed's liquidity injections, and the availability of a standing repo facility and dollar swap lines at low rates.

We see three pools of liquidity that will easily absorb $1.25 trillion in bill supply:

First, QE will add $300 billion of reserves, and the Treasury bringing down its cash balances by $400 billion will add that many reserves by the end of June. Both will increase inflows to government money funds which will recycle inflows into bills directly, or indirectly by funding dealers and hedge funds through repos.

Second, the exemption of reserves and U.S. Treasuries from the leverage ratio and corresponding adjustments to the calculation of G-SIB scores will free up $200 billion of balance sheet for dealers to run larger Treasury bill inventories. If there won't be sufficient funding for this from money funds in the repo market, the Fed will be glad to provide funding through the repo facility at just 10 bps.

Third, if bill yields were to go as high as 25 bps, there is a deep pool of dollars in the global FX swap market that would trade out of German and French bills and buy U.S. bills instead – let's assume at least $200 billion on the margin. If these outflows stress the FX swap market, the Fed's dollar swap lines will soothe it at OIS+25 bps… and just like that, we absorbed $1.1 trillion of bills.

The rest can be bought by the Fed, if necessary.

Governor Quarles' recent letter to Senator Crapo suggests the Fed wants to make carrying reserves less punitive for banks. Negative rates would do the opposite; yesterday, Chair Powell left the question of negative interest rates at that…

This issue of Global Money Notes has four parts.

Part one reviews the main factors that drove U.S. dollar Libor-OIS wider and then tighter. Part two estimates the upper bound for U.S. dollar Libor-OIS at the zero lower bound. Part three looks at the inner workings of war finance and explains why the financial system will be able to absorb $1.25 trillion of Treasury bills fairly easily. Finally, part four concludes.

Part I – A Morbidity Review of U.S. Dollar Libor-OIS

Prime money funds suffered outflows of $150 billion during the last two weeks of March, and reversed about a half of those outflows since the middle of April (see Figures 1 and 2).

Over these two months, foreign banks toggled between three private funding channels:

First, during the last two weeks of March, they relied on U.S. primary dealers to issue short-term U.S. dollar unsecured debt (CD/CP), while prime funds struggled with outflows.

Second, during the first half of April, they raised local currency and swapped it for dollars, enabled by the rapid normalization of the FX swap market thanks to the dollar swap lines.

Third, from mid-April, they started to issue CD/CP in volume to prime money market funds once again, using rapidly falling FX swap implied funding rates to lock in low CD/CP rates.

These three funding phases correspond to the rapid widening, the inflection point and the equally rapid tightening of the U.S. dollar Libor-OIS spread during the past two months.

During the first phase, during the last two weeks of March, the three-month U.S. dollar Libor-OIS spread widened by 120 bps, and dealers' CD/CP inventories rose by $20 billion. Foreign banks without a dealer arm in the U.S. rely on U.S.-headquartered dealers to underwrite and distribute their short-term debt, and as prime funds stopped buying, dealers went from "underwrite and distribute" to "underwrite and hold" – for a spread: dealers were underwriting CD/CP at rates as high as 2.5% the last two weeks of March, while the Primary Dealer Credit Facility (PDCF) – the discount window for primary dealers – became operational on March 17th, offering primary dealers secured funding at 25 bps. Figure 3 shows primary dealers' holdings of CD/CP alongside their usage of the PDCF: dealers were basically buying CD/CP from foreign banks at 2.5% and funded at 25 bps.

During the second phase, during the first half of April, Libor-OIS peaked and began to fall. Libor-OIS peaked on April 1st, and this peak happened around the same time when FX swap implied yields at the three-month point started to show material improvement: while the Fed switched to daily U.S. dollar swap operations on March 20th with an expanded list of central banks, the Japanese fiscal year-end kept the FX swap market stressed for all major currencies through the end of March, as lenders of U.S. dollars shifted their lending to earn higher FX swap implied yields in yen and lent less elsewhere. But by the first week of April, the Japanese year-end turn was over, and Figure 4 shows that the Fed's lending of U.S. dollars through the swap lines reached some critical mass – these developments pulled FX swap implied yields for most major currencies lower. In turn, lower FX swap implied yields opened a new funding channel for foreign banks – raising local currency funding and swapping it for U.S. dollars – which helped them diversify their funding away from dealers' exorbitant rates starting the first week of April.

During this phase, Libor-Libor cross-currency bases went sharply positive for the euro, the Swiss franc, sterling and yen, which started to put pressure on EURIBOR-OIS and Libor-OIS spreads (see Figures 5 and 6) – effectively, as the Fed flooded the world with dollars through the swap lines, it exported unsecured funding pressures as a byproduct. These flows were the key reason behind our conviction that U.S. dollar Libor-OIS spreads were about to rapidly normalize during April as discussed in our previous issue (see here).

During phase three, which began mid-April, just when we published our previous issue, Libor-OIS went into a freefall: during the last two weeks of April Libor-OIS fell 62 bps. The freefall had two drivers: the dynamics from the second phase gathering momentum – as expected – and big inflows to prime money market funds – which came unexpected.

Falling FX swap implied costs of dollar funding – a combination of small increases in local EURIBOR-OIS and Libor-OIS spreads and big declines in FX swap implied yields – combined with big inflows to prime money market funds quickly changed the dynamics in U.S. unsecured funding markets. Inflows to prime funds during the last two weeks of April brought marginal liquidity back to the U.S. dollar CD/CP markets, and foreign banks used falling FX swap implied costs of dollar funding as leverage to extract low rates from prime money market funds – foreign banks went from being price takers in late March, to being price makers by mid-April. Over the course of one month, the CD/CP market went from trading around 2.5% in late March to trading around 50 bps by the end of April.

Figures 7, 8 and 10 show how the constellation of U.S. dollar funding/lending rates changed as we transitioned from the first to the second phase, and where we are today.

Figure 7 shows the global dollar funding market in a state of disarray on March 31st – the day that marks the end of phase one, and the apex of U.S. dollar Libor at 145 bps.

The figure shows the full range of borrowing/investment options involving U.S. dollars: the blue, brown and orange square-shaped markers show onshore and FX swap-based OIS, generic government bill and Libor yields; the lone green marker shows where foreign banks issued short-term unsecured debt in the onshore U.S. dollar CD/CP market; and, the red dashed lines show the maximum level for each FX swap-based category. We show these yields at the three-month point for all the major countries/currencies where the list of U.S. dollar Libor panel banks are headquartered, plus the Australian dollar.

The Fed's cuts brought onshore OIS and Treasury bill yields to zero, but U.S. dollar Libor was still in the stratosphere, and foreign banks raised short-term U.S. dollar funding from U.S. primary dealers at Libor-like levels on average, and some high as 2.5% (see above).

Looking at FX-swap implied yields, lending U.S. dollars and reinvesting foreign currency in central bank deposits or government bills – depending on one's place in the hierarchy – yielded significantly more than leaving cash at the Fed or buying U.S. Treasury bills; this yield pickup was close to 150 bps for the yen and at least 50 bps for other currencies.

FX swap-implied yields in bank funding markets were also high, and in some countries, for example in Canada and Japan, they were even higher than U.S. dollar Libor fixings.

For European financial centers – London, Frankfurt, Paris, and Zurich – FX swap-implied funding costs were lower than U.S. dollar Libor fixings, but this was a risk off environment and most institutional lenders of U.S. dollars in the FX swap market were only willing to reinvest local currency collateral in deposits at central banks or generic government bills…

…but not unsecured bank debt. As such, foreign banks could not get around funding at exorbitant rates with U.S. primary dealers and at U.S. dollar Libor-like levels on average – foreign banks were still price takers of U.S. dollar funding in unsecured funding markets.

Figure 8 shows the state of dollar funding markets on April 14th – the end of phase two.

Compared to the second half of March, the first half of April was a "risk on" environment – by mid-April, the S&P500 was up by over 20% from its trough reached in mid-March.

FX swap implied yields in bank funding markets fell considerably and with "risk on", foreign banks could now tap unsecured funding markets in euros, sterling and yen locally and then swap local currency funding for U.S. dollars at rates that were at least 25 bps and at most 50 bps lower than rates that prevailed in U.S. unsecured funding markets.

Canada was the only exception, where the lack of an o/n RRP-like facility to absorb the excess liquidity added by the Bank of Canada and the collapse in oil prices drove the U.S. dollar/Canadian dollar cross-currency basis more negative at the tomorrow-next and three-month points, respectively, which kept U.S. dollar funding costs high in Toronto.[1]

FX swap implied yields involving central bank deposits and generic government bills also fell considerably for the major currencies, as the flood of U.S. dollars flowing through the swap lines worked their way through the system. FX swap implied yields for the Japanese yen remained relatively high, however, as most of the demand for U.S. dollars through FX swaps in Japan – and the world in fact – comes from Japanese life insurers that do not have access to the Fed's U.S. dollar swap lines through the Bank of Japan.

According to the Bank of Japan, life insurers' U.S. dollar needs in the FX swap market exceed $1 trillion, which outweighs the need of banks by a factor of four (see Figure 9). In contrast, in other jurisdictions, banks' U.S. dollar needs in the FX swap market are much bigger than those of life insurers, pension funds or asset managers combined, so bank's access to the Fed's U.S. dollar swap lines through local central banks helped bring down FX swap implied yields for other currencies more than for the Japanese yen.

Figure 10 shows the state of dollar funding markets today – that is, phase three-to-date.

The main theme of phase three is the return of liquidity to the U.S. CD/CP market and foreign banks using the ongoing fall in FX swap implied costs of U.S. dollar funding to extract low rates on CD/CP issued to prime money market funds. The top and bottom green dashed lines show the highest and lowest rates at which foreign banks have issued CD/CP in recent days (based on our conversation with brokers and foreign banks), and the middle green dashed line shows where CD/CP has traded on average in recent days.

CD/CP now trades near the FX swap implied cost for U.S. dollar funding from euros and Swiss francs, and some of the extreme low CD/CP prints have come from foreign banks – predominantly Scandinavian banks – that typically issue only when they can swap the U.S. dollars they raised unsecured back to euros or other currencies at a positive spread.

Unsecured spreads are thus low – they're back to "normal". Where will they go from here?

Provided that the inflows to prime funds continue, low yields on U.S. Treasury bills will continue to drag CD/CP rates lower, as at the zero bound the "laws of physics" change…

…anything with a substantially non-zero yield has strong demand for it. Strong demand from prime funds for CD/CP also coincides with a decline in the structural supply of CD/CP – think of the fact that foreign banks have raised $450 billion through the swap lines, and some of that funding naturally reduces the amount of CD/CP foreign banks need to issue.

Strong inflows into prime funds driving demand for U.S. dollar CD/CP, combined with the decline in the structural supply of U.S. dollar CD/CP as foreign banks use the swap lines points to a perfect storm where U.S. dollar Libor-OIS spreads can compress further still…

…but to what level? 25 bps as implied by the June FRA-OIS contract or tighter still?

To answer that question, we need to have a view on the upper bound of non-U.S. banks' Libor submissions, which is a function of their FX swap-implied cost of U.S. dollar funding.

[1] Growing demand for U.S. dollars in Canada is understandable in the context of collapsing oil prices. In contrast, the link between excess Canadian dollar liquidity and strong demand for t/n U.S. dollars is a bit harder to understand: demand for t/n U.S. dollars was strong not because Canadian pension funds and other non-bank institutional investors needed U.S. dollar funding per se, but rather, because they didn't have a place to put excess Canadian dollar liquidity at home. As a solution, they lent more and more Canadian dollars and borrowed U.S. dollars in the FX swap market, and reinvested these U.S. dollars in a much deeper U.S. Treasury bill and repo market than what Canada has to offer.

Part II – Cakes and Pancakes

Money markets are like a cake…

…most of the time, but they can be like pancakes too when we're at the zero bound and we are using the tools of war finance. For as long as inflows to prime money funds remain strong, we don't see a reason why CD/CP rates and hence U.S. dollar Libor could not fall more from here on the back of strong demand/reduced supply (see above), and why June FRA-OIS could not "pancake" further from here to as low as 10-20 bps.

That's the case if Libor panel banks base their submissions on rates in the CD/CP market. U.S. banks certainly will, and because most of the liquidity that has been and will be added by the Fed has flown and will flow to U.S. banks, their U.S. dollar Libor submissions will be relatively low and falling and so will most likely fall out of the U.S. dollar Libor panel.

But what about foreign banks that may base their submissions on FX swap implied costs of U.S. dollar funding? Because FX swap implied costs typically trade above CD/CP rates, they determine the upper bound for U.S. dollar Libor submissions and Libor-OIS spreads.

In the remainder of this section, we'll try to "forecast" the path of FX swap implied costs of U.S. dollar funding and hence the upper bound of the Libor submission of the group of U.K., eurozone, Swiss, and Japanese banks that make up the U.S. dollar Libor panel.

The FX swap implied cost of dollar funding is a simple concept, with three components: local currency OIS, the local currency Libor-OIS spreads and FX swap implied yields. The path of the last two of these three components is different for each major currency.

Starting with the local currency component, Libor-OIS spreads for the sterling and euro can fall 20 bps and 15 bps from here, respectively, as pressures on local funding markets subside now that the U.S. dollar CD/CP market is open again (see Figures 11 and 12).

Assuming no change in FX swap implied yields, these declines in sterling Libor-OIS and EURIBOR-OIS spreads can bring down U.K. and Eurozone banks' FX swap implied costs of U.S. dollar funding – and hence the upper bound of their U.S dollar Libor submissions – to about 30 bps at the three-month point. In fact, some U.K. banks are issuing CD/CP in the U.S. around 30 bps at the three-month point, and are swapping dollars back to sterling to fund in sterling – these flows are helping to normalize both U.S. dollar and sterling Libor-OIS spreads, as low dollar CD/CP prints are pulling U.S. dollar Libor lower and raising sterling via FX swaps is pulling sterling CD/CP prints and sterling Libor lower.

What about the path of the FX swap component: is there a room for declines here too?

We don't think so.

Consider that for the euro, sterling and the Swiss franc, ultra front-end – that is, tomnext, spotnext and one-week – FX swap implied yields (OIS) trade about one to 10 bps over the U.S. dollar OIS rate, and three-month implied yields trade about 10 and 15 bps over the U.S. dollar OIS rate. These yields are at or below the rate of the dollar swap lines (see Figure 13), and suggest that market makers in the FX swap market make a meager spread of 5 to 10 bps sourcing U.S. dollars at the tomnext, spotnext and one week points and lending them at the tree-month point. That's not a lot of "bang" for a market maker's balance sheet, and so further compression of OIS-OIS cross-currency bases are unlikely for these currencies as market makers need a minimum spread to keep making markets.

This also means that further declines in the FX swap implied costs of U.S. dollar funding from the sterling and the euro will come solely from declines in local Libor-OIS spreads, not FX swaps, and if that happens, the upper bound of U.K. and European banks' U.S. dollar Libor submissions will likely drift down to around 30 bps by the end of June.

The Japanese yen is a different story.

The FX swap implied cost of U.S. dollar funding from yen is high relative to other currencies due to the FX swap component – the Libor-OIS spread for the Japanese yen is small – and the FX swap component is expensive due to non-banks' U.S. dollar needs (see above).

Figure 14 shows that FX swap implied yields (OIS) from yen trade well above those from the euro, sterling and the Swiss franc, and the FX swap implied yield curve for the yen is much steeper than for other currencies, offering market makers much better spreads.

That means that for the Japanese yen, any decline in FX swap implied funding levels will have to come from declines in FX swap implied yields. Three things could bring that about:

(1) the BoJ giving access to U.S. dollar auction to non-banks, which we don't expect;
(2) the Fed lowering the price of FIMA repo facility as discussed previously (see here);
(3) the SLR exemption for reserves and Treasuries getting extended to other assets.

Each of these developments would increase the flow of dollars in the $/¥ segment of the FX swap market: the first by offering dollars cheaper to non-banks than the market; the second by freeing up balance sheet for primary dealers to lend more via FX swaps; the third by excluding repos, repo-style transactions, foreign central bank deposits and foreign sovereign bonds – each an important cog in the global facilitation of FX swaps – from the calculation of the SLR and thereby freeing up more balance sheet for FX swaps.

The third bit is no fairy tale…

…the Fed is already working on it. When the Fed issued the temporary exemption of reserves and U.S. Treasuries from the calculation of the SLR on April 1st, it also asked whether the final rule change – due out on May 15th – should also exclude other assets:

"*Question 2: What additional assets or exposure types should the Board consider to exclude temporarily from the SLR in order to achieve the interim final rule's objectives? For example, should the Board exclude deposits at certain foreign central banks and foreign sovereign debt instruments […]? Should the Board exclude any specific repo-style transactions that would support banking organizations' role as financial intermediaries […]?*"

Why, yes! These are easy questions for a dealer to answer…

…and if granted, these changes will improve the flow of U.S. dollars versus the yen, and bring down the outlier – the FX swap implied cost of U.S. dollar funding from yen. If that happens, all FX swap implied costs of dollar funding would trade around 30 bps, reinforcing our view that the upper bound for U.S. dollar Libor-OIS should be 30 bps. But don't sweat it if these exemptions do not happen, as for calibrating the upper bound for Libor submissions, Japanese banks' high FX swap implied rates will fall out anyway…

That means that 30 bps on June FRA-OIS is an absolute upper bound, and if inflows to prime money funds continue, June FRA-OIS can trade even tighter – to as low as 15 bps.

But what of bill supply?

The U.S. Treasury is about to issue about $1.25 trillion of bills by the end of June and that will surely pressure bill yields and hence Libor-OIS wider, and ruin the pancake party…

Maybe, maybe not.

As we've noted in our previous issue, in the extreme, the Fed has the option of buying bills or to cap bill yields at OIS or thereabouts. At a "macro" funding level, it would not make any sense for the Fed to launch all these new liquidity facilities to bring rates down to zero, and then watch passively as bill supply pushes rates away from zero. The Fed shouldn't, and we think won't let that happen. It will buy bills if it has to. But they may not have to, as there are other avenues that can help absorb the flood of bills over the next two months.

Part III – Inside War Finance

As far as core funding markets like U.S. Treasury repos and FX swaps are concerned, the Fed is demonstrably intent on providing backstops at extremely generous rates. The price of the U.S. dollar swap lines at OIS+25 bps is perhaps the best example of that, as it suggests that the Fed doesn't want the cost offshore dollar funding above OIS+25 bps. Given that the offshore dollar funding market – the FX swap market – is the "outer rim" of funding markets, if the outer rim is backstopped at OIS+25 bps, all other funding markets should trade below that rate too: repos for sure and if prime money fund inflows continue, unsecured funding markets too. Furthermore, the Fed's willingness to backstop banks' and dealers' term funding rates at 25 bps flat through the discount window and the PDCF suggests that the Fed doesn't want to see the cost of onshore funding north of 25 bps.

But then if onshore and offshore U.S. dollar funding markets, and U.S. and foreign banks and dealers are backstopped at 25 bps flat and OIS+25 bps, respectively, why exactly does the market worry about the funding needs of the U.S. Department of the Treasury? Given the above construct, we'd be surprised to see U.S. Treasury bill yields above banks' backstop funding rate, which means that bill yields can go a maximum of 10 bps higher from here before the Fed decides to cap them at OIS or OIS + some small spread.

But outright bill purchases by the Fed may not even be necessary…

Consider the following four pockets of liquidity that could each take a chunk of bill supply: demand from government money funds and some decline in Treasury's cash balances; demand from central banks; demand from dealers; and demand from asset managers.

First, the Fed is still buying $35 billion of U.S. Treasuries a week, which will add around $300 billion of reserves by the end of June. Like the bulk of liquidity injections to date, most of these funds will end up with government money market funds (see Figure 15), which will recycle them into bills or repos. Thus, it's either government funds that will buy $400 billion in bills directly or dealers and relative value hedge funds that fund via repos. Furthermore, consider that according to the U.S. Treasury's latest borrowing estimates (see here), the target for U.S. Treasury's cash balances at the Fed is $800 billion for the end of June, which is about $400 billion lower than its current level of $1.2 trillion (see Figure 16). That's another $400 billon of reserves in the system in addition to the $300 billion from QE, and another $400 billion of inflows for government money funds.

Second, foreign central banks still park $300 billion at the Fed's foreign repo pool, earning the o/n RRP rate, that is, zero rate of interest. While this pool of money has been remarkably sticky, some of it could move into the bill market to earn some positive interest – let's assume $100 billion (maybe the Fed could apply a little bit of incentive here, by imposing counterparty caps or negative rates on the foreign repo pool, for example).

Third, primary dealers were just given more balance sheet through the exemption of reserves and U.S. Treasuries from the calculation of the SLR. This rule change can easily provide $200 billion of balance sheet for running bigger U.S. Treasury inventories, and if funding for these inventories runs out from money funds, the Fed can offer it through the o/n repo facility at 10 bps. Given that dealers barely make 10 bps of carry on their FX swap books, they'll be content with buying bills at 20 bps and funding them at 10 bps.

Fourth, asset managers that lend in the FX swap market could start buying more U.S. bills if their yield exceeds the FX swap implied yield of holding German, French and U.K bills (see Figure 17). If that will stress the FX swap market, the swap lines will soothe it at OIS+25 bps. Let's assume $100 billion of bill demand from this source and *voilà*, the financial system absorbed $1.25 trillion of bills without a penny purchased by the Fed.

That's war finance…

Conclusions

In astrophysics, the concept of singularity refers to infinite density at the center of a black hole, and the earliest state of the universe – before the Big Bang. In money markets, we define singularity as an "infinite" density of funding spreads at the zero lower bound.

Singularity is nigh, and its gravitational pull can drive U.S. dollar Libor-OIS spreads tighter, to 10-20 bps by mid-June. U.S. Treasury bill supply won't stand in the way, in our view.

$1.25 trillion in bill supply over the next two months sounds like a lot, but it's actually not relative to the size of the Fed's liquidity injections and the availability of liquidity facilities…

QE keeps adding reserves to the system at a pre-scheduled, $35 billion a week pace; the U.S. Department of Treasury running a lower cash balance will add reserves too; and foreign central banks "selling" the foreign repo pool and buying bills can add reserves too.

If these additional reserves aren't sufficient to absorb bill supply, the Fed can add more:

the o/n repo facility is there to fund dealers' U.S. Treasury inventories on the margin, and the swap lines are there to lend U.S. dollars to the world at OIS+25 if asset managers decide to buy U.S. bills and lend less in the FX swap market and hold fewer foreign bills.

It's war finance…

…and the Fed appears committed to ensure that collateral supply (U.S. Treasury issuance) does not outpace the supply of reserves by a crushing margin: ongoing QE ensures that; standing liquidity facilities ensure that; and changes to the edifice of Basel III ensure that.

But there is more…

Governor Quarles' letter to Senator Crapo on April 22nd, where he encourages Congress to:

"consider modifying [the Collins Amendment] of the Dodd-Frank Act to allow regulators to ease banks' Tier 1 leverage requirements as banks respond to increased credit demands"

also suggests that the Fed is laser focused on ensuring that there is enough balance sheet and reserves to meet the U.S. government's and everyone else's growing credit needs.

There is all that to absorb the coming wave of U.S. Treasury bill supply before the "nuclear" option – outright purchases of bills and capping bill yields – becomes necessary.

But what's the big deal about bill purchases?

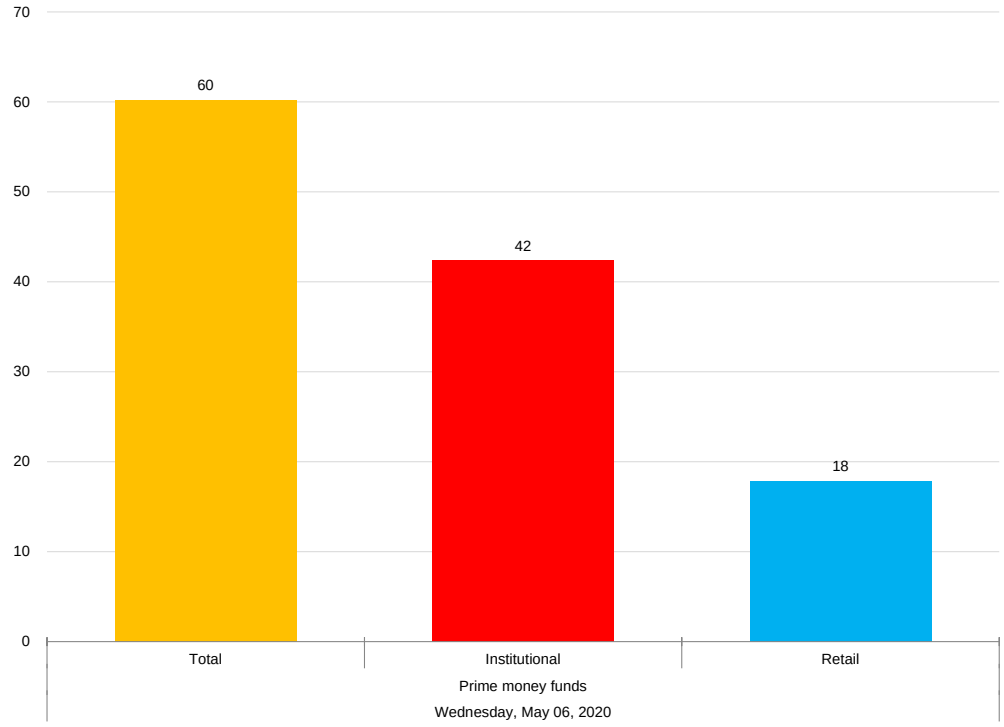
U.S. Treasury bills are the easiest asset for the Fed to buy – it's the Fed's natural habitat (and for money-fundamentalists, it should be the Fed's only habitat). If bills are in excess, and this excess were to push global dollar funding rates up and away from the zero bound, the Fed will simply buy the excess. If the Fed is backstopping the credit market, why wouldn't it backstop its natural habitat? So don't sweat the tsunami of Treasury bills:

U.S. dollar Libor-OIS spreads will continue to tighten through June and will stay low beyond.

Prepare for singularity…

Figure 1: Prime Money Fund Inflows

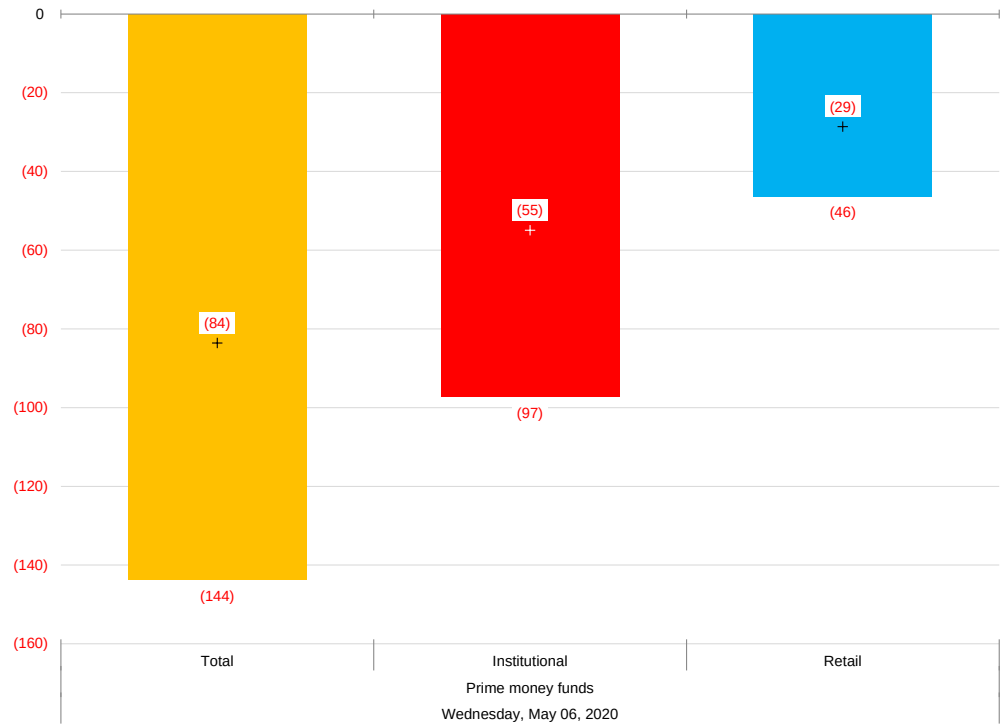
$ billions, inflows to prime money market funds since April 1st, 2020



Source: ICI, Credit Suisse

Figure 2: Prime Money Fund Outflows

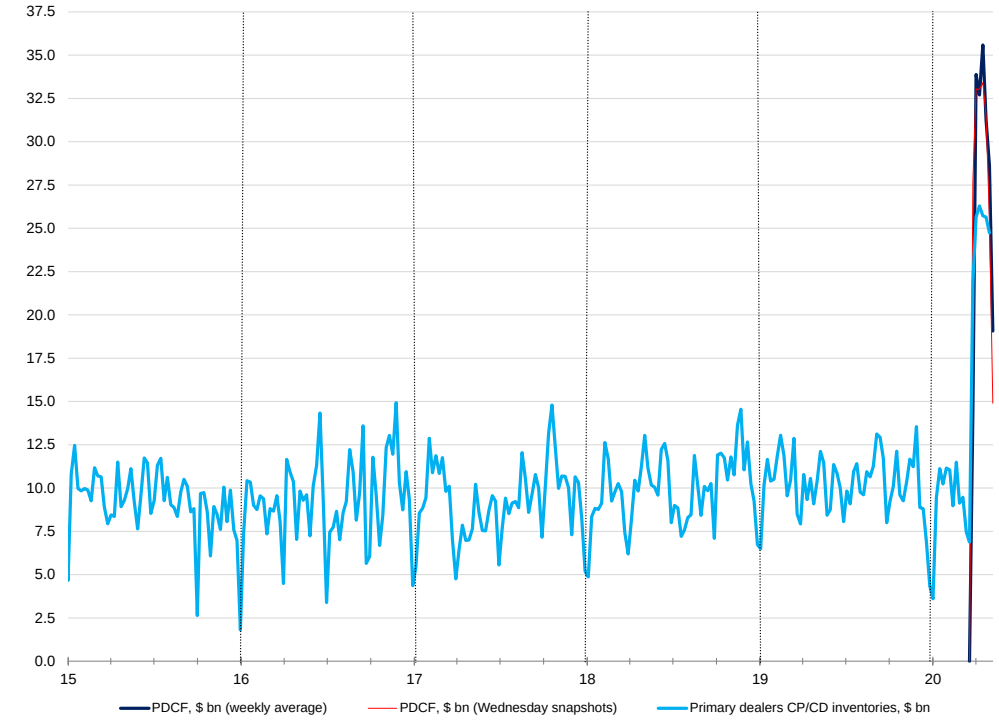
$ billions, prime money funds' peak outflows during March [bars]; peak outflows minus inflows since April 1st, 2020 ["+" markers]



Source: ICI, Credit Suisse

Figure 3: Primary Dealers' Inventories of CD/CP and the PDCF

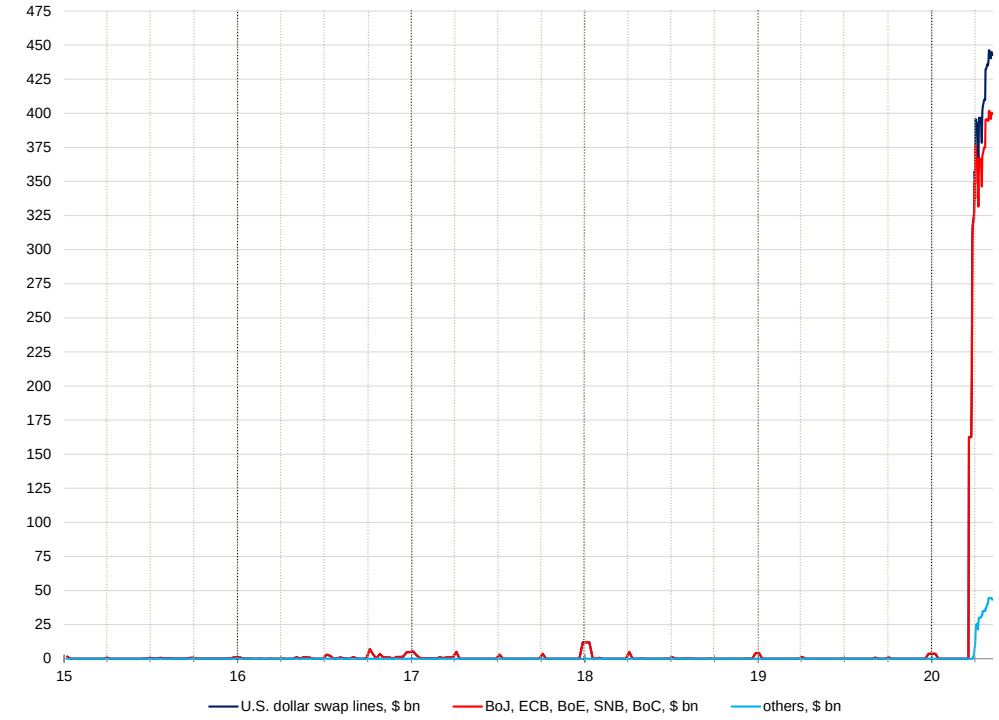
$ billions



Source: Federal Reserve, Credit Suisse

Figure 4: The U.S. Dollar Swap Lines

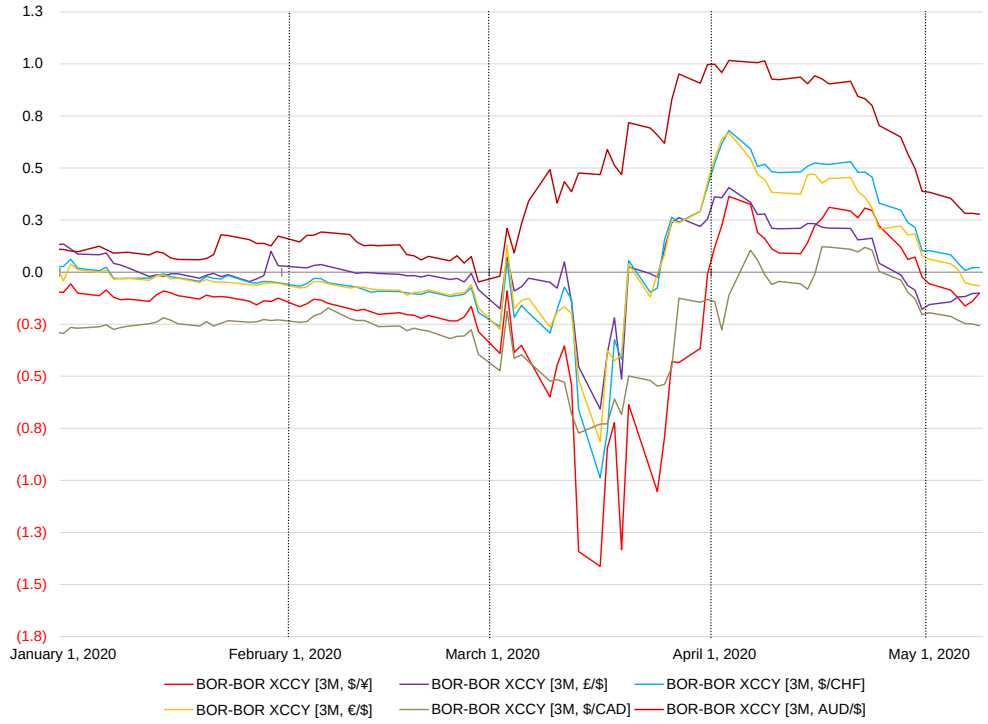
$ billions



Source: Federal Reserve, Credit Suisse

Figure 5: Less Stress in the FX Swap Market…

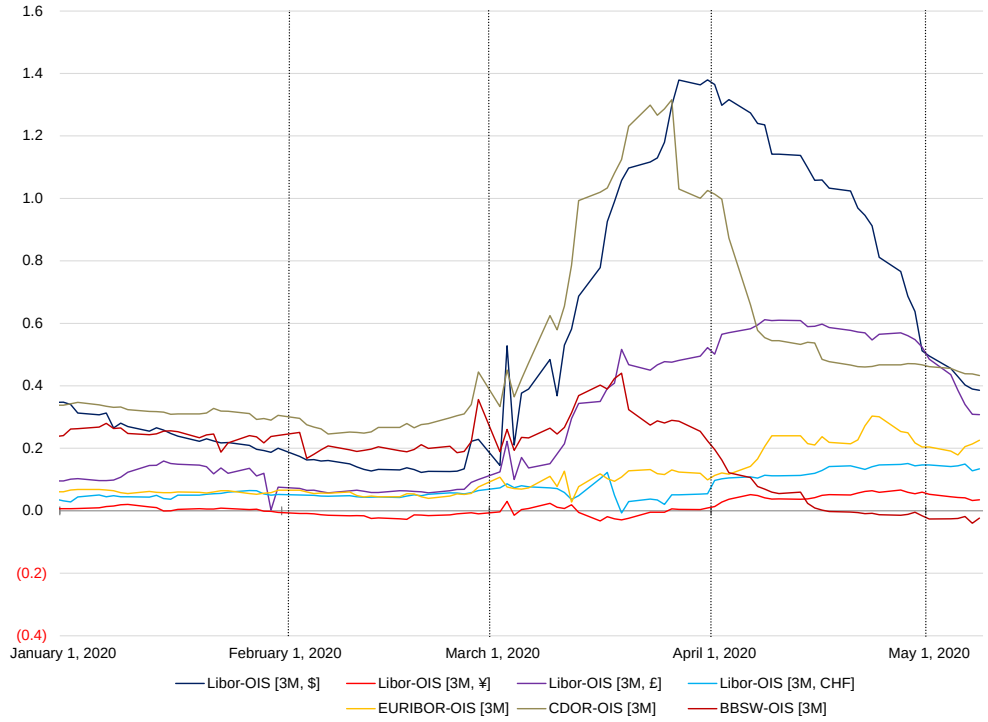
percent, three-month Libor-Libor cross-currency bases



Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

Figure 6: …More Stress in Local Currency Funding Markets

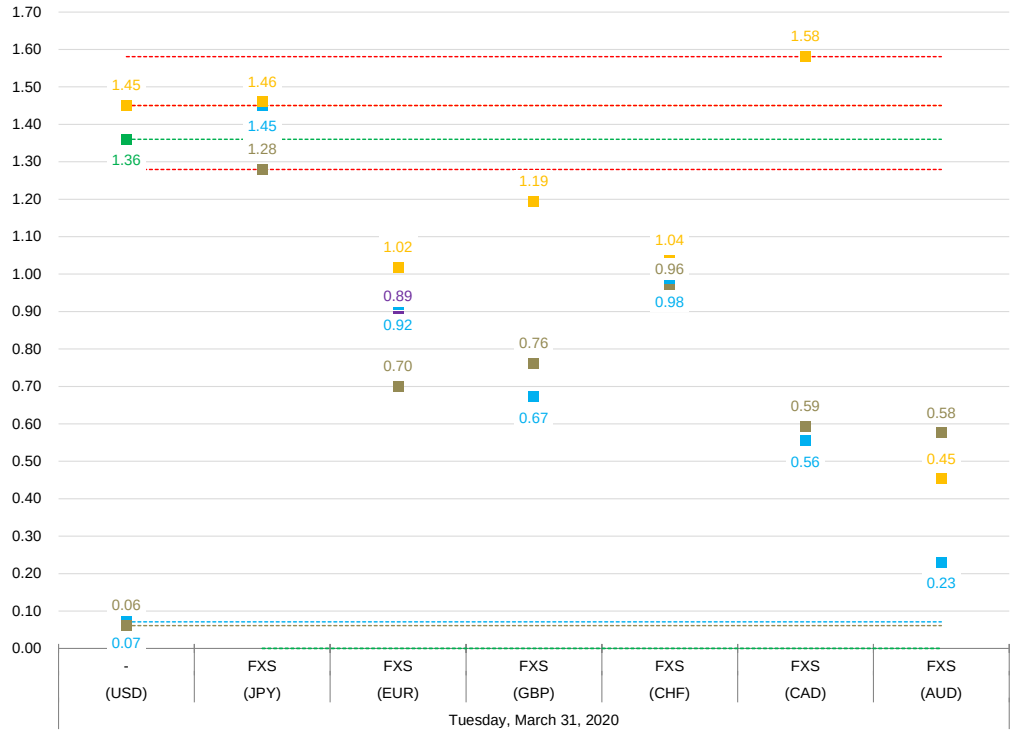
percent, three-month Libor-OIS bases



Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

Figure 7: The View from the Eye of the Storm (Phase 1)

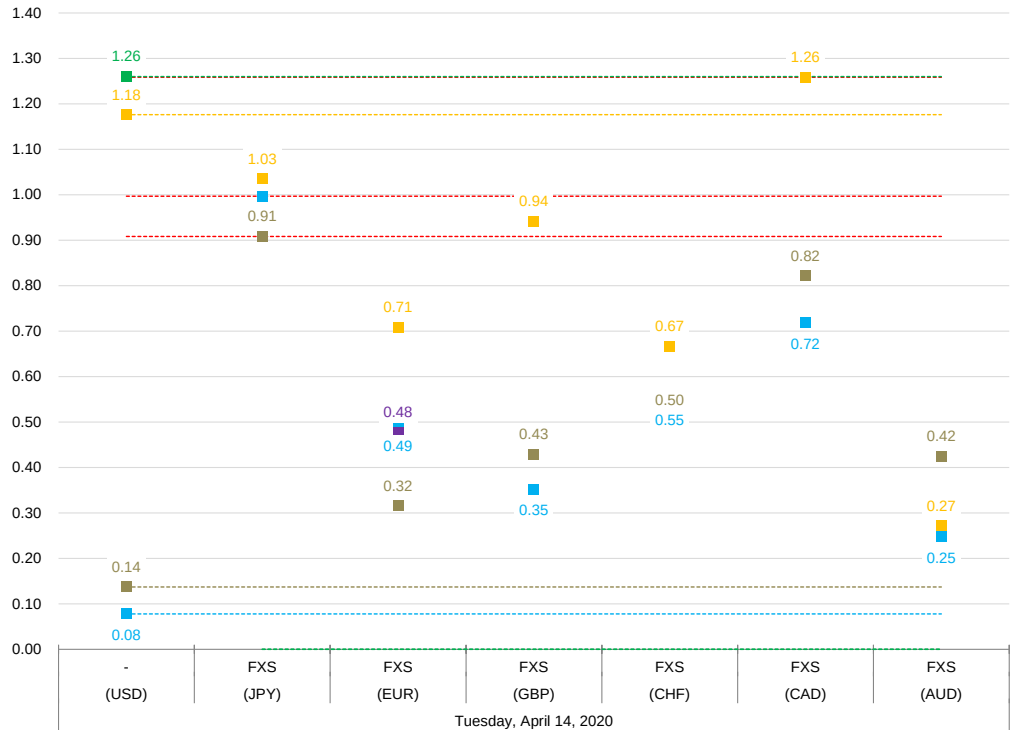
percent, three-month; blue, brown, orange and green markers refer to U.S. dollar OIS, bill, Libor and CD/CP yields, respectively



Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

Figure 8: The Storm Subsiding (Phase 2)

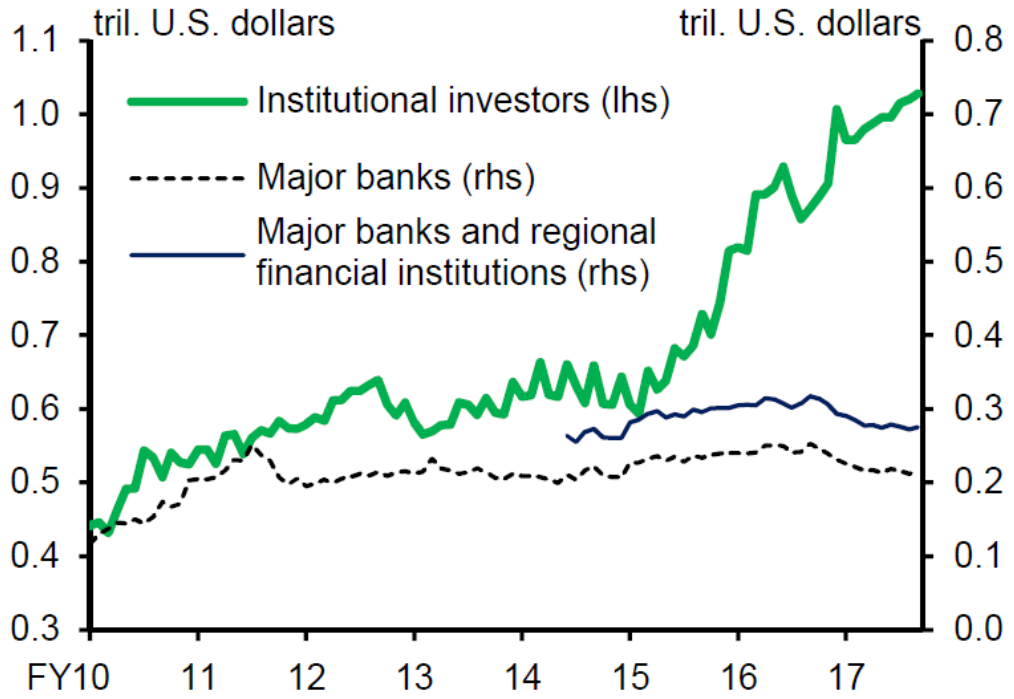
percent, three-month; blue, brown, orange and green markers refer to U.S. dollar OIS, bill, Libor and CD/CP yields, respectively



Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

Figure 9: The Non-Bank vs. Bank Bid for U.S. Dollars in Japan

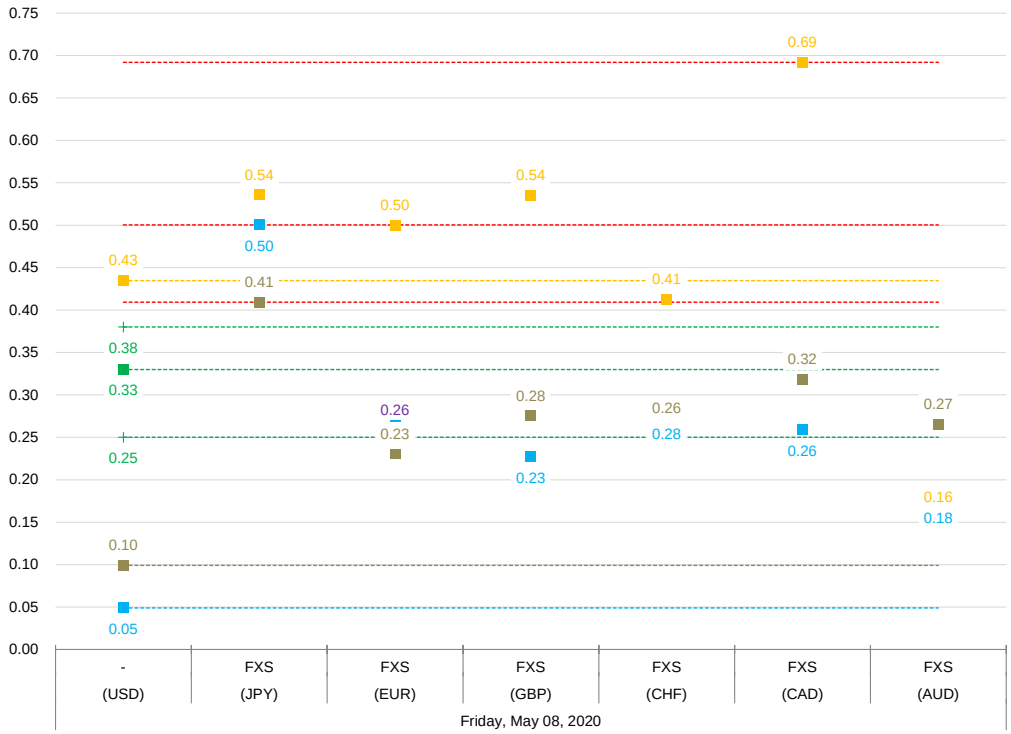
$ trillions



Source: Bank of Japan

Figure 10: The Storm is Over (Phase 3)

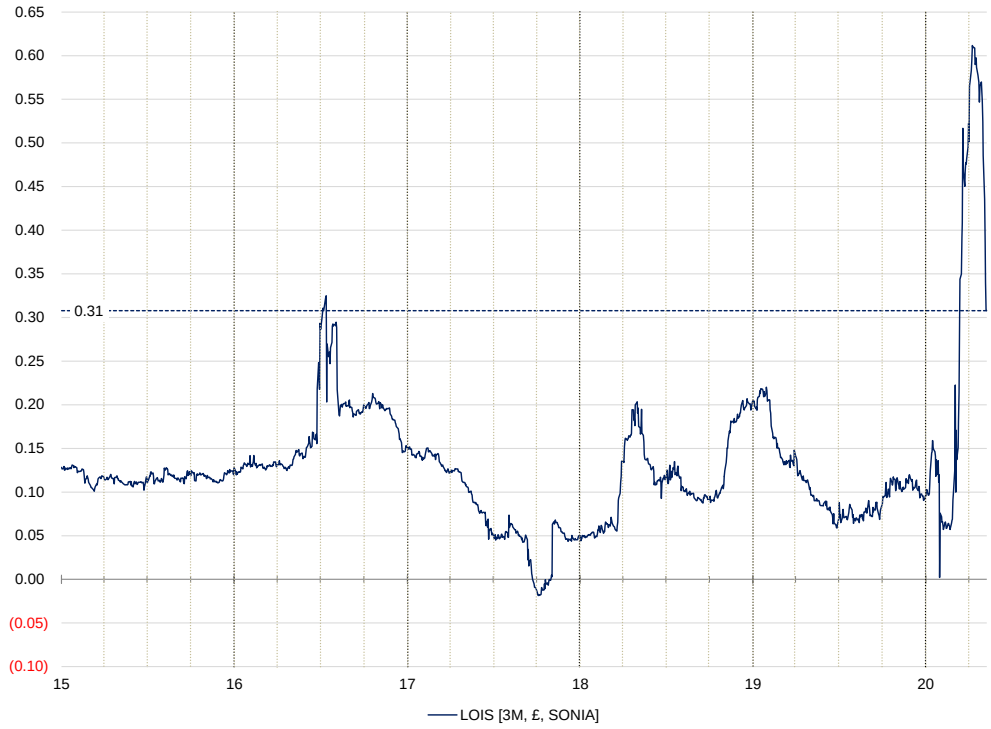
percent, three-month; blue, brown, orange and green markers refer to U.S. dollar OIS, bill, Libor and CD/CP yields, respectively



Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

Figure 11: The Libor-OIS Spread for Sterling

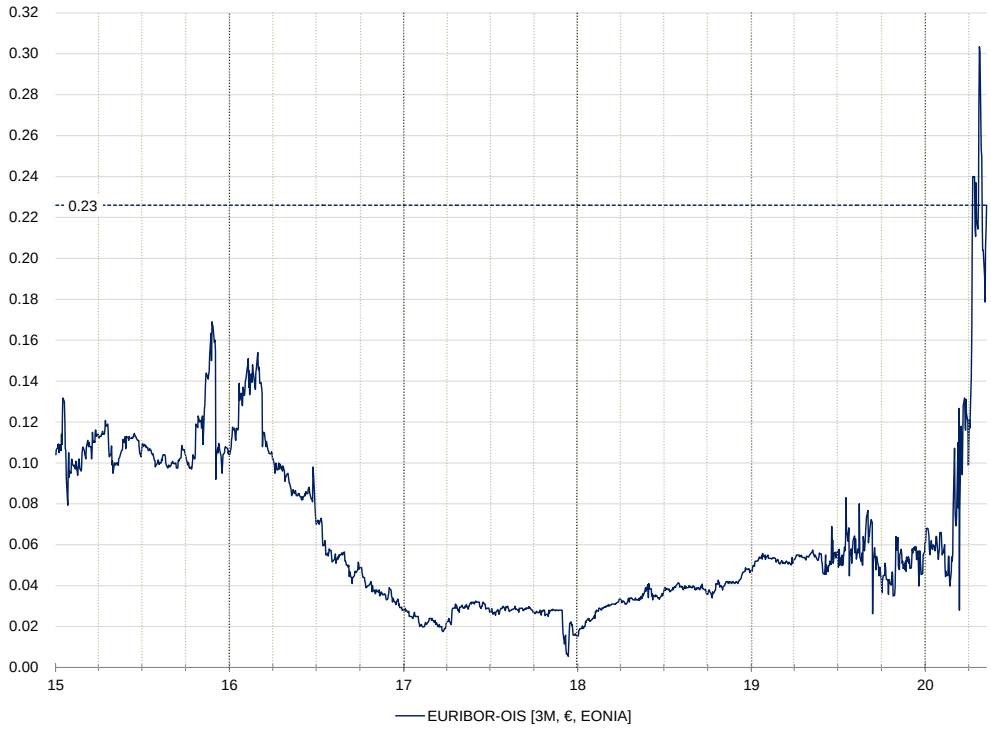
percent, three-month



Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

Figure 12: The "Libor-OIS" Spread for the Euro

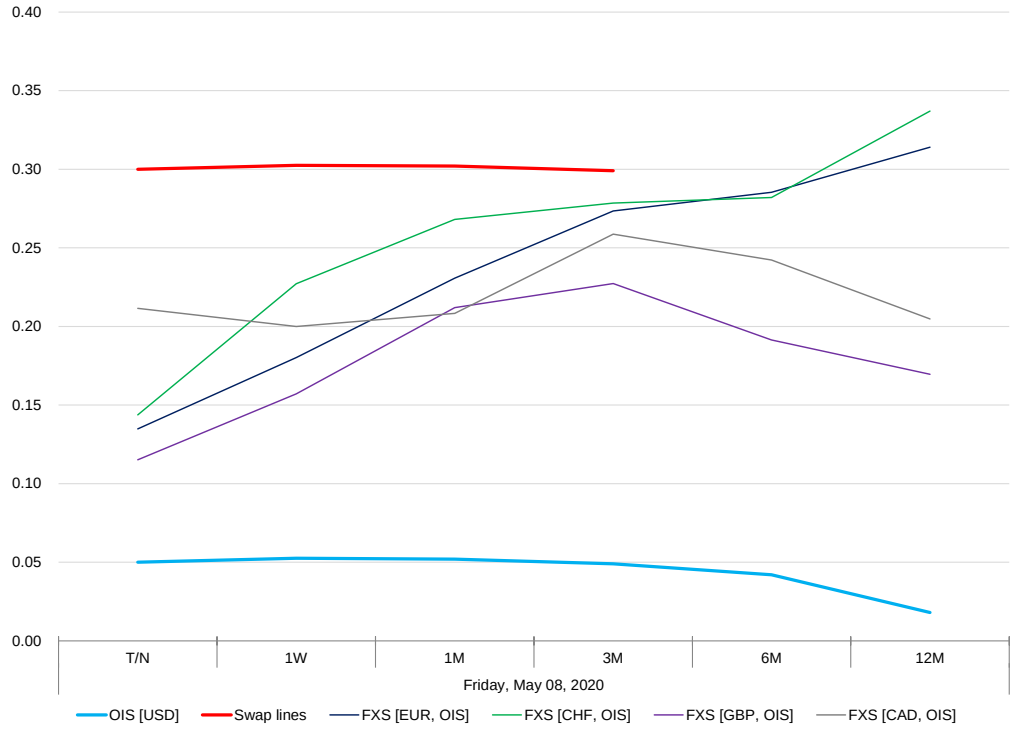
percent, three-month



Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

Figure 13: FX Swap Implied Yield Curves

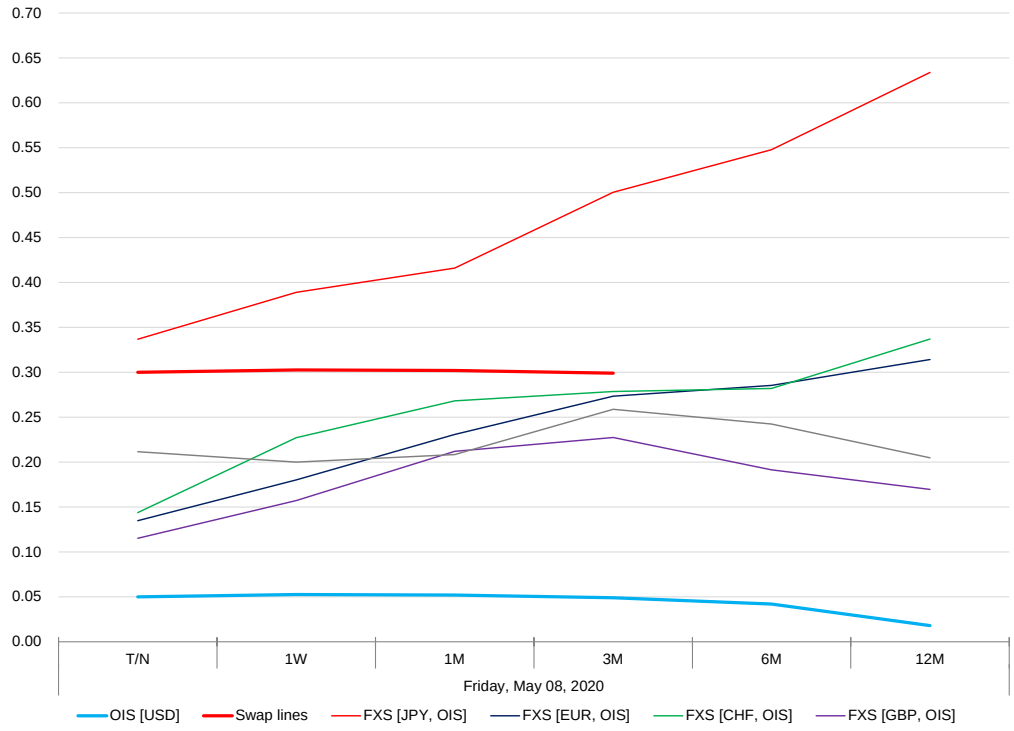
percent, local currency collateral reinvested at OIS



Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

Figure 14: The "Mount Fuji" of FX Swaps

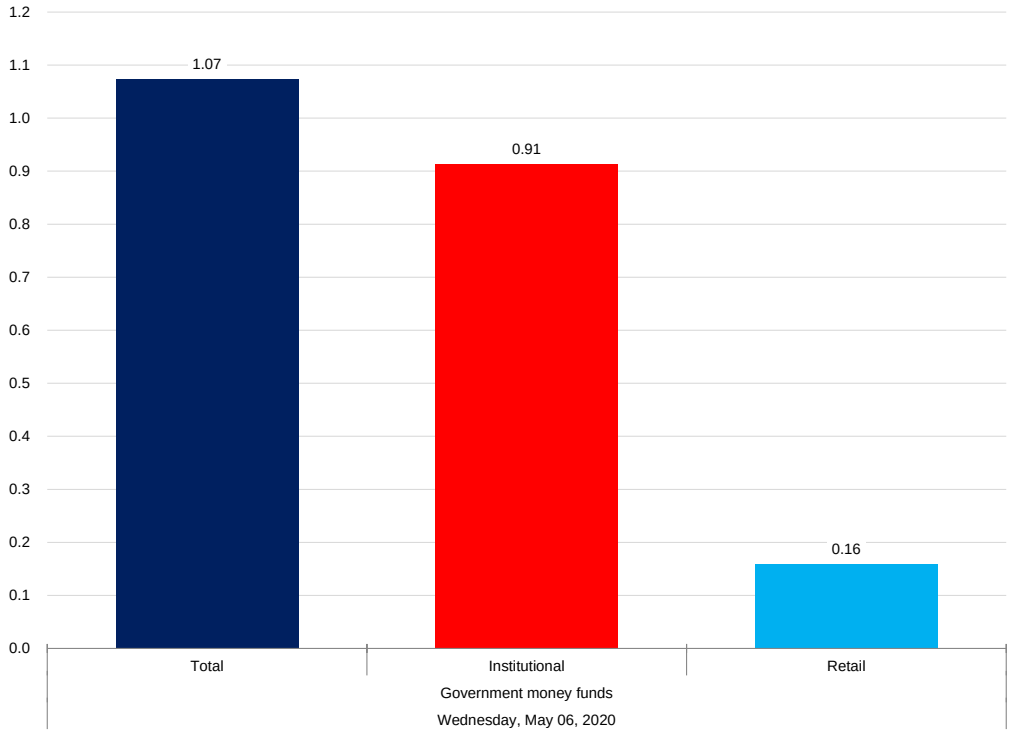
percent, local currency collateral reinvested at OIS



Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

Figure 15: Government Money Fund Inflows

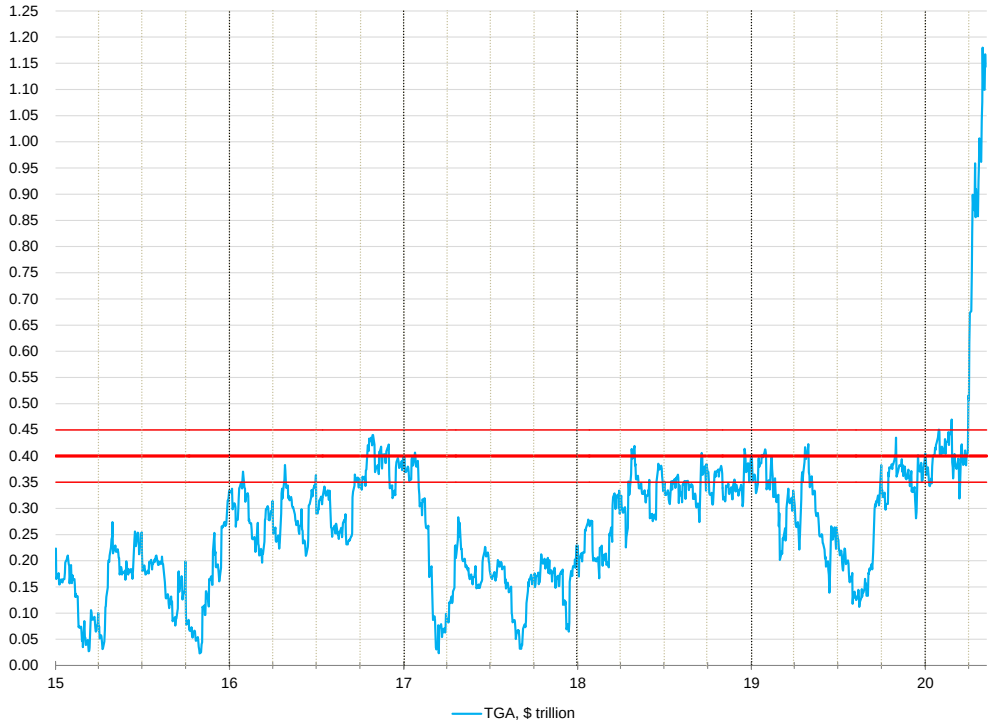
$ trillions, inflows to government money funds since March 11th, 2020



Source: ICI, Credit Suisse

Figure 16: U.S. Treasury's Cash Balances

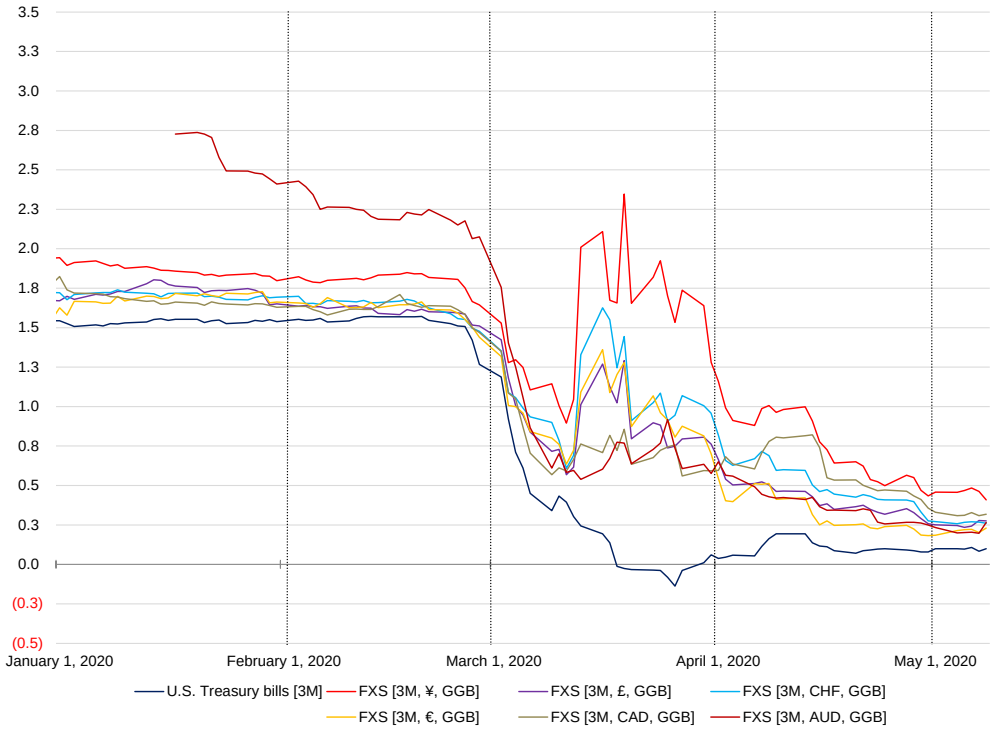
$ trillions



Source: U.S. Treasury, Credit Suisse

Figure 17: U.S. Treasury Bill Yields and "Synthetic" U.S. Treasury Bill Yields

percent, three-month, synthetic U.S. Treasury bills refers to U.S. dollars lent via FX swaps and local currency collateral reinvested in local government bills



Source: Credit Suisse, the BLOOMBERG PROFESSIONAL™ service

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