
THE FED'S CENTRAL BANK SWAP LINES AND FIMA REPO FACILITY

Mark Choi, Linda Goldberg, Robert Lerman, and Fabiola Ravazzolo

OVERVIEW

- The onset of the COVID-19 pandemic in early 2020 led to simultaneous supply and demand shocks in global U.S. dollar funding markets, with banks and nonbanks cutting back on dollar intermediation just as market participants rushed to build up precautionary cash balances.
- Toward the same end, some foreign official sector investors sold off large volumes of U.S. Treasury securities, exacerbating liquidity strains in that market as well.
- To address these pressures, in March 2020 the Federal Reserve eased the terms on its standing swap lines in collaboration with other central banks, reactivated temporary swap agreements, and introduced the Foreign and International Monetary Authorities (FIMA) Repo Facility.
- This article provides key insights into the design and operation of the swap lines and FIMA Repo Facility, highlighting evidence that they can reduce strains in global dollar funding markets and the U.S. Treasury market during extreme stress events.

The severe global economic impact of the rapid spread of COVID-19 in early 2020 prompted a quick and broad policy response from fiscal authorities and central banks. This article focuses specifically on the policy actions taken by the Federal Open Market Committee (FOMC) in March 2020 to address pressures in offshore dollar funding markets and U.S. Treasury market dislocation.¹ These actions included expanding and enhancing dollar liquidity swap line arrangements with selected foreign central banks (hereafter CB dollar swaps) and establishing a new repurchase operation (repo) facility with foreign and international monetary authorities (FIMA) that hold accounts at the Federal Reserve—the FIMA Repo Facility.

This article provides details on the conditions that spurred the creation and use of these facilities, descriptions of their operational elements, and evidence of their effectiveness in containing strains in credit and offshore dollar funding markets. We begin with a review of developments in the offshore dollar funding market and their effects on broader markets, such as the U.S. Treasury market and foreign exchange (FX) swap market. We then discuss the details of the Federal Reserve's CB dollar swaps and FIMA

Linda Goldberg is a financial research advisor for Financial Intermediation Policy Research in the Federal Reserve Bank of New York's Research and Statistics Group. Mark Choi, Fabiola Ravazzolo, and Robert Lerman are policy advisors in the Bank's Markets Group. Emails: mark.choi@ny.frb.org, linda.goldberg@ny.frb.org, robert.lerman@ny.frb.org, fabiola.ravazzolo@ny.frb.org.

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Repo Facility actions, measures aimed at enhancing the provision of U.S. dollar liquidity internationally to address strained market conditions and support credit provision abroad and in the United States. Historically, CB dollar swaps have been a means of facilitating the flow of dollars through foreign central banks to financial institutions in their respective jurisdictions. The new FIMA Repo Facility provides broader access to a dollar liquidity backstop than CB dollar swaps, enabling foreign official institutions to temporarily exchange their U.S. Treasury holdings in custody at the Federal Reserve for short-term dollar liquidity.

The article also provides perspective on the efficacy of these backstop facilities. Dollar settlements through these facilities helped stabilize financial markets and sustain the flow of credit to borrowers, thus dampening the amplification effects of the pandemic shock. The new FIMA Repo Facility, still not broadly used as of this publication, should likewise provide stabilizing effects in future periods of turmoil, whether they center on specific countries or affect funding markets more broadly. The article concludes by highlighting lessons learned about the design of such facilities. Operational readiness, agility, and a network of strong central banking relationships continue to be important features given the ever-changing dollar funding landscape.

1. GLOBAL U.S. DOLLAR FUNDING MARKETS

Offshore dollar funding markets are one element of the extensive global use of the U.S. dollar in international trade and financial transactions (Goldberg and Lerman 2019). A large amount of dollar funding flows through different types of financial intermediaries and a variety of market instruments.² The interconnectedness of markets worldwide can quickly transmit both favorable conditions and strains across financial markets and institutions, affecting financial conditions, credit provision, and monetary policy transmission in the United States and around the world.³

Under normal conditions, the broad participation and high volume of activity in U.S. dollar funding markets mean that borrowers incur relatively low funding rates. International capital flows and global dollar liquidity respond relatively smoothly to changes in risk and returns across markets, without excessive price impact. When conditions are stressed, price dispersion occurs, as gaps widen between the cost of funds for some market participants and the price that other market participants are willing to pay. Global liquidity flows, the more volatile part of international capital flows, can retrench and redirect, particularly as global banks and financial institutions realign and redeploy scarce funds via their internal capital markets.

In the decade following the global financial crisis (GFC), the U.S. dollar funding landscape underwent significant structural changes. Largely attributed to post-GFC reforms of banking regulations, these changes included a reduction in currency mismatches, smaller global footprints for weaker banks, and shifts in the business models and geographic reach of different intermediaries (BIS CGFS 2020). Dollar funding flows shifted somewhat from a concentration in Europe toward institutions in Japan and some emerging market economies (EMEs).⁴ Moreover, the capacity of banks to engage in market-making activity appears to have become more constrained because of changes in the regulatory environment, helping drive an increase in participation by nonbanks as providers and users of U.S. dollar funding (BIS CGFS 2021).

Strong global risk appetite and historically low levels of U.S. Treasury yields supported cross-border U.S. dollar investment flows to EMEs and increased demand for dollar-denominated borrowing in those countries. During this period, foreign central banks, particularly those in many EMEs, increased the size of their FX reserves, including U.S. dollars, to better manage local dollar funding needs in the event of sizable capital outflows.

In March 2020, extreme uncertainty amid coronavirus-related lockdowns and expectations of a severe global economic downturn led to simultaneous supply and demand shocks in global U.S. dollar funding markets. Greater risk aversion and a desire to hold precautionary cash balances led banks and nonbank financial institutions to reduce dollar intermediation in funding markets. Corporations, faced with tightened access to U.S. dollar funding markets amid an uncertain economic outlook, drew heavily on their committed credit lines with banks. Some of these committed credit line draws were concentrated in the U.S. branches of foreign banking organizations (FBOs), resulting in significant increases in bank loans and new dollar funding needs. Some non-U.S. banks and corporations sought to build extra liquid dollar balances. Non-U.S. asset managers with sizable U.S. securities holdings, particularly Japanese insurance companies, increased hedging demand for U.S. dollars in light of the significant volatility in the FX market and some U.S. financial markets, especially U.S. Treasury and agency MBS markets.⁵ Some countries, including EMEs, experienced capital outflows as international investors decreased holdings of local currency and dollar-denominated sovereign assets (FSB 2020) and sold U.S. dollar-denominated assets out of their FX reserves.

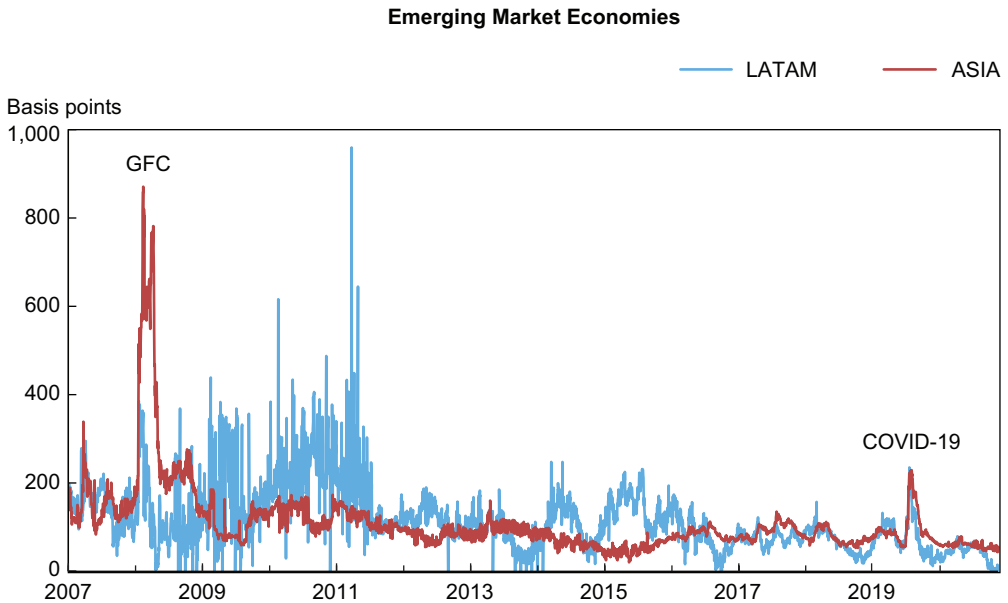
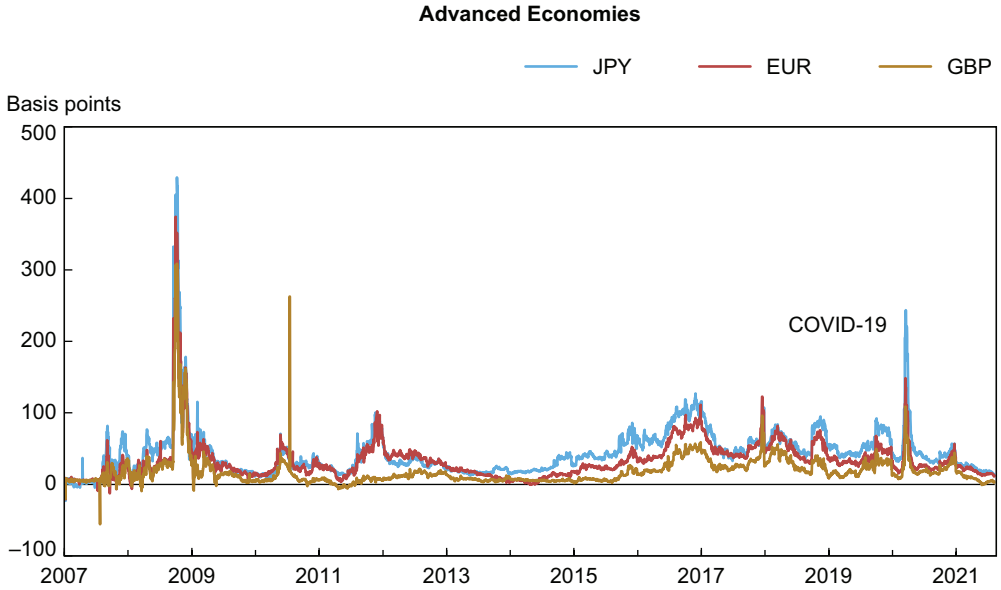
One standard metric that reflects the gap in the cost of funds is the FX swap basis spread (sometimes referred to as the basis), constructed by comparing the implied cost of U.S. dollar funding from an FX swap transaction of a specific tenor to a direct U.S. dollar interest rate. A positive FX swap basis spread reflects a premium to borrow U.S. dollars in the FX swap market, meaning that borrowers pay a higher cost for obtaining funds than the relevant U.S. dollar unsecured rates would suggest.⁶

At the onset of the pandemic in March 2020, the strains initially were most pronounced in shorter-term funding markets, generally with tenors under three months, across both advanced economies and EMEs. Conditions had started to deteriorate at the end of February and became particularly strained around mid-March for short tenor transactions (Chart 1). The premium to obtain U.S. dollar funding in the FX swap market increased to levels last seen in 2008, particularly in the dollar-yen currency pair, reflecting the recent growth in dollar activity among Japanese banks and in holdings of U.S. assets among Japanese nonbank financial entities (BIS CGFS 2020). Across EME currency pairs, the premium to obtain U.S. dollars in the FX swap market also significantly increased in March 2020. However, basis spreads of EME currency pairs remained narrower than peaks reached during the GFC, reflecting a decline in vulnerabilities associated with the dollar funding activities of banks in these countries following post-GFC banking sector reforms (EMEAP 2020).

These strains can also show up in the volume of cross-border funding flows. The flow of funds between branches of FBOs operating in the United States and their home-country parent organizations responded quickly to the pattern of funding needs both within the United States and in foreign markets. The U.S. branches of FBOs received greater net internal capital flows from their parent banks (or reduced outflows went from the

CHART 1

Three-Month FX Swap Basis Spreads for Selected Currencies against the U.S. Dollar

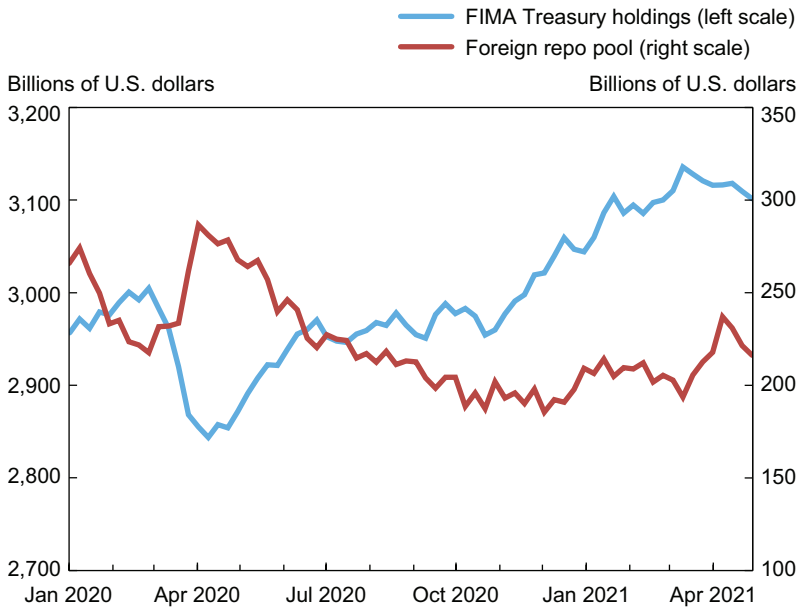


Sources: Bloomberg L.P.; authors' calculations.

Notes: Data are as of 11:00 a.m., London time, and are based on overnight unsecured funding rates (OIS) along with bilateral spot and forward exchange rates. A positive number reflects a premium to borrow or hedge U.S. dollars. JPY is Japanese yen, EUR is euro, GBP is British pound sterling. LATAM series shows the simple average of FX swap basis spreads for the Brazilian real, the Chilean peso, the Colombian peso, and the Mexican peso. ASIA series shows the simple average of FX swap basis spreads for the Hong Kong dollar, the South Korean won, the Singapore dollar, and the Taiwan dollar.

CHART 2

FIMA Treasury Holdings and the Fed's Foreign Repo Pool



Source: Federal Reserve Bank of New York.

U.S. branches to the parent organizations). Cetorelli, Goldberg, and Ravazzolo (2020b) show that these adjustments corresponded to a combination of increased loan demand by their clients and decreased dollar funding supply in private capital markets in March. Banks thereafter met their excess funding needs by also using dollars their parent organizations accessed through the CB dollar swaps. This directional flow of dollars through FBOs differed from that which occurred in the early stages of the GFC, when European banking organizations were particularly strained and obtained dollar funding from their U.S. branches through internal capital market transfers (Goldberg and Skeie 2011, and Cetorelli and Goldberg 2011).

Amid tighter conditions in dollar funding markets, a sudden shift in global risk sentiment triggered significant capital outflows from some EMEs, reflecting reduced investor interest in holding EME currencies and facing EME counterparties. Some foreign official sector investors sold U.S. Treasury securities, held as part of their official foreign currency reserves, to build precautionary dollar liquidity buffers, address the dollar funding needs of local institutions, and facilitate FX intervention. The significant volume of these foreign official sales was widely seen as exacerbating strained liquidity conditions in the U.S. Treasury market. Foreign official holdings of Treasury securities declined by nearly \$150 billion in March 2020 and by another \$70 billion in April 2020 (Chart 2). Consistent with the precautionary liquidation motive, cash balances held by foreign official investors at the Federal Reserve and invested overnight in the foreign repo pool spiked by nearly \$70 billion in March to a near-record high of approximately \$300 billion.

2. CENTRAL BANK DOLLAR SWAPS AND FIMA REPO

The Federal Reserve met the March 2020 strains with important facility changes. Before detailing these, we note the long history of central bank operations in markets for dollar liquidity, highlighting changes in institutional features and objectives over time. We then explain and compare the features, operational aspects, and relevant usage of the CB dollar swaps and complementary FIMA Repo Facility from the vantage point of developments since March 2020.

2.1 The Central Bank U.S. Dollar Swap Arrangements

Swap agreements were established in the early 1960s between the Federal Reserve and a number of other central banks. The primary purpose of CB dollar swaps was to fund FX interventions, but they were also used to help some central banks in Europe manage shocks on the Eurodollar market by providing temporary liquidity funding in dollars (McCauley and Schenk 2020). The nominal value of the swap line limits increased in 1973, when the Bretton Woods system ended, and again in 1978, after the dollar exchange rate crisis. However, the facility was seldom used after the early 1980s and eliminated in 1998 in anticipation of the adoption of the euro. The FOMC maintained swap lines with Canada and Mexico. As discussed in Bordo, Humpage, and Schwartz (2014) and Truman (2016), many FOMC participants instead favored a mechanism capable of providing emergency dollar liquidity in the event of a payments system meltdown.

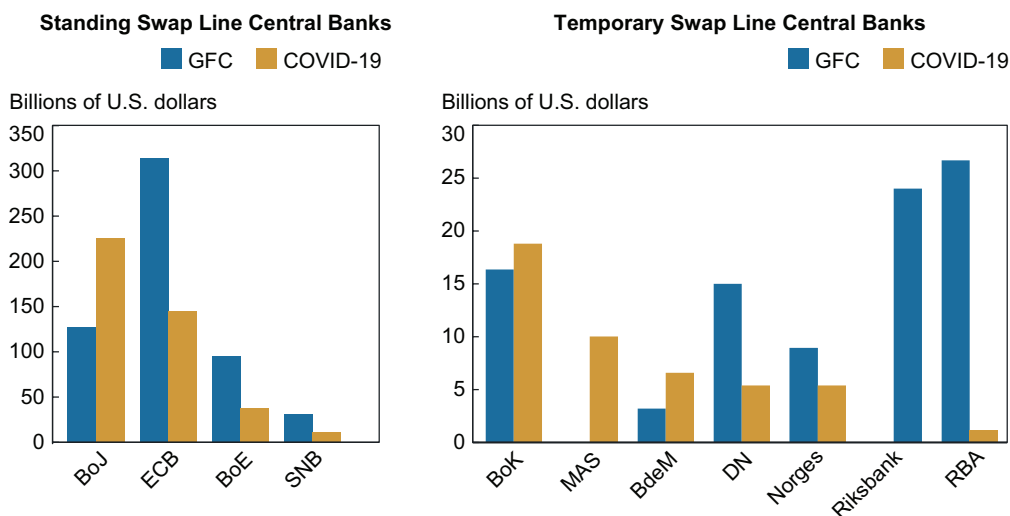
CB dollar swaps were redeployed in late 2007, providing U.S. dollar liquidity to help smooth strains in global U.S. dollar funding markets (Goldberg, Kennedy, and Miu 2011). These swaps were solely intended to provide U.S. dollar liquidity on a temporary basis and not to fund FX intervention, as had been the case in the past. The Federal Reserve initially entered into U.S. dollar liquidity swap arrangements with the European Central Bank (ECB) and Swiss National Bank, further expanding agreements during 2008 to include a total of fourteen central banks.⁷ In early 2010, as the GFC subsided, CB dollar swaps for all counterparties were briefly discontinued. In May 2010, in the wake of the euro-area sovereign and banking crisis, swap arrangements were reintroduced between the Federal Reserve and five other central banks in countries with large dollar financial centers (Bank of Japan, European Central Bank, Bank of England, Swiss National Bank, and Bank of Canada). These arrangements have also been reciprocal between central banks in this network since November 2011, meaning any central bank in the network can draw local currency liquidity from another in the event of funding disruptions in any of the participating currencies. The swap lines among this network were initially implemented on a temporary basis. However, given their effectiveness as a backstop liquidity facility to stabilize offshore dollar funding markets, they were converted into standing facilities in October 2013 and central banks in the network are referred to as standing swap line central banks (SSCBs).

Main developments in CB dollar swaps during the COVID-19 outbreak

In mid-March 2020, as funding conditions deteriorated globally, the network of SSCBs took a series of steps to ease access to the swap lines. On March 15, the network lowered the price

CHART 3

Peak U.S. Dollar Swaps Outstanding during 2020 and the Global Financial Crisis



Source: Federal Reserve Bank of New York.

Notes: The Bank of Canada, Central Bank of Brazil, and Reserve Bank of New Zealand never used the facility. Standing swap line central banks are the Bank of Japan (BoJ), the European Central Bank (ECB), the Bank of England (BoE), and the Swiss National Bank (SNB). Temporary swap line central banks are the Bank of Korea (BoK), the Monetary Authority of Singapore (MAS), Banco de México (BdM), Danmarks Nationalbank (DN), Norges Bank (Norges), Sveriges Riksbank (Riksbank), and the Reserve Bank of Australia (RBA).

from a spread of 50 basis points to a spread of 25 basis points over overnight indexed swaps and added an operation for eighty-four-day term funding to its existing weekly operation for seven-day funds. On March 20, it increased the frequency of the operations for seven-day funds from weekly to daily. In addition, the FOMC granted temporary swap lines to nine other central bank counterparties (temporary swap line central banks, hereafter TSCBs), all of which had received dollar swap lines during the GFC (March 19). Originally authorized until September 30, 2020, swap line access for the TSCBs was extended twice for six months and then for another three months, with planned expiration on December 31, 2021.

Swap line usage peaked at \$449 billion in late May 2020, compared with \$598 billion drawn during the GFC. Aggregate Bank of Japan and ECB usage accounted for about 82 percent of the total peak. The Bank of England and the Swiss National Bank had lower usage than during the GFC (Chart 3), while the Bank of Canada did not draw on its swap line. In 2020, aggregate usage by TSCBs peaked at less than \$50 billion, compared with a peak of \$96 billion during the GFC. This lower usage reflected a decline in vulnerabilities associated with bank dollar funding activity in these countries following banking sector reforms undertaken after the GFC (EMEAP 2020). Among TSCBs, there was no usage by the Central Bank of Brazil, the Riksbank, and Reserve Bank of New Zealand, and relatively small usage by the Reserve Bank of Australia and the other Scandinavian central banks.⁸ The Monetary Authority of Singapore used the facility, a step it had not taken during the GFC, reflecting Singapore's increased role as a dollar financial intermediation center in Asia (EMEAP 2020). Among the TSCBs, the Bank

of Korea had the largest usage and Banco de México's use exceeded GFC levels, reflecting increased hedging of U.S. dollar-denominated investment and trade financing by nonfinancial entities in these countries.

What are the operational mechanics of the CB dollar swaps?

The Federal Reserve's CB dollar swap network is designed to contain deterioration in dollar funding markets by providing foreign central banks with U.S. dollar liquidity, which they can supply to financial institutions in their respective jurisdictions. By providing dollar liquidity directly to the foreign central bank, the CB swaps are structured to help limit credit risk to the Federal Reserve. The Federal Reserve transacts directly only with the foreign central bank, which then distributes dollar liquidity to counterparties that are eligible for access to the facilities. The CB swaps are also priced as backstop facilities to help ensure that they are used largely in times of acute stress and are not replacements for private market activity in normal times.

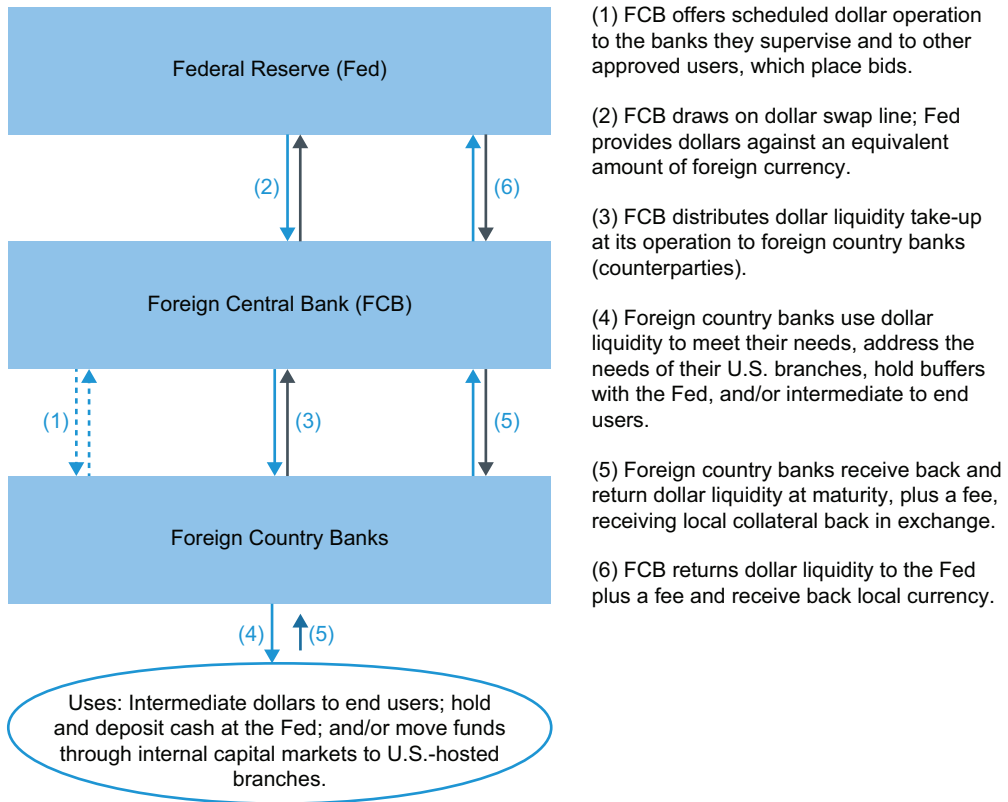
When a foreign central bank draws on its CB dollar swaps, dollar liquidity is typically distributed by the drawing central bank to financial institutions through local dollar operations. Exhibit 1 illustrates the flow of liquidity with an authorized central bank through several steps: (1) The foreign central bank holds a dollar operation on a schedule preapproved with the Federal Reserve, typically in the format of a repurchase agreement (repo) in which dollars are exchanged for local-currency collateral. Eligible counterparties in the foreign central bank's dollar operation are typically the same as those which participate in regular local currency operations. (2) When the operation of the foreign central bank concludes, the central bank makes a request to draw dollars from the Federal Reserve through the swap line arrangement and both formally agree to a draw. (3) The foreign central bank swaps an equivalent amount of local currency for dollars at the tenor of the operation (for example, seven days or eighty-four days) and then provides those dollars to local institutions which bid in the offered operation. The Federal Reserve charges a fee to the foreign central banks based on the relevant U.S. dollar OIS plus a spread, currently 25 basis points.⁹ (4) The foreign central bank passes that fee on to its counterparties, though it is not required to do so. Local institutions that bid at the dollar auction can use the proceeds to meet their own liquidity needs or those of their overseas branches, provide dollar intermediation to end users, and/or build precautionary liquidity buffers (generally deposited at the Federal Reserve).¹⁰ (5) At maturity, local institutions return dollars to the foreign central bank and receive back the securities originally purchased. (6) The foreign central bank then returns the dollars it drew, plus the aforementioned fee, to the Federal Reserve and receives back its local currency. The Federal Reserve does not bear FX risk since the same amount of dollars is exchanged at the settlement and maturity of the swap transaction with the foreign central bank.

2.2 The Temporary FIMA Repo Facility

Another key facility development was the Federal Reserve's establishment of the FIMA Repo Facility on March 31, 2020. Originally authorized to operate until September 30, 2020, the

EXHIBIT 1

Tracing Liquidity Flows through Central Bank Swap Lines



Source: Federal Reserve Bank of New York.

Note: Solid lines indicate flows of dollars and dotted lines indicate a step without flows.

facility was twice extended for six months and then converted to a standing facility on July 28, 2021. In the event that dollar liquidity becomes scarce, this facility serves to backstop the smooth functioning of the U.S. Treasury market, reassuring FIMA account holders of their ability to secure dollar liquidity through repo transactions with the Federal Reserve in times of unusual market stress, rather than by selling their Treasury securities or financing Treasury securities in the private repo market. The facility complements the CB dollar swaps in helping to ease strains in global dollar funding markets by providing temporary dollar liquidity to a much broader range of foreign official institutions (FIMA account holders) at a backstop interest rate. The extent of central bank access to dollar liquidity had been a point of debate with respect to the structure of the international monetary system, given the extensive international role of the dollar.

Market participants welcomed the announcement of the FIMA Repo Facility as part of a broader set of measures implemented by the Federal Reserve. The facility eased pressure on foreign official institutions to sell Treasury securities for precautionary reasons, but actual usage was minimal in the period soon after introduction and has remained so in 2021.¹¹

Nevertheless, central banks' increased confidence in their ability to raise dollar liquidity through the facility likely contributed to a strong return to Treasury investments by the second week of April 2020 and a drawdown of the large accumulations of precautionary cash balances seen in the Federal Reserve's foreign repo pool (Chart 2).

Tracing liquidity flows through the FIMA Repo Facility

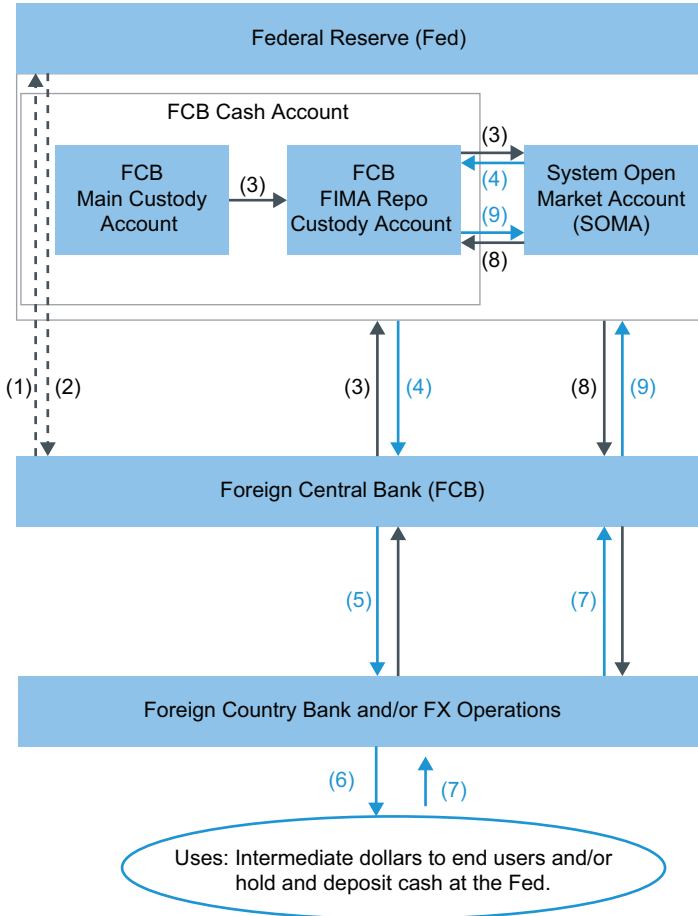
The FIMA Repo Facility allows foreign official institutions to temporarily raise dollars by selling U.S. Treasury securities to the Federal Reserve's System Open Market Account (SOMA) and agreeing to buy them back at the maturity of the repurchase agreement. The term of the agreement at the time of the facility's establishment and subsequent renewals is overnight with an option for account holders to roll over as needed. Transactions are conducted at a rate designed to generally be above market repo rates when the Treasury market is functioning well, therefore positioning the facility as a backstop.¹² Most FIMA account holders, which consist of foreign central banks and other foreign monetary authorities with custodial accounts at the Federal Reserve of New York, are eligible to apply to use the facility, but applications for usage of the facility must be approved by the Federal Reserve.¹³

Once approved to use the facility, a FIMA account holder can draw on it at any time. The operational process and flow of liquidity is illustrated in steps (1) to (9) in Exhibit 2. The process begins with a FIMA account holder sending a trade request to the Federal Reserve (1). If the terms of the requested trade are within facility parameters, the Federal Reserve sends back a trade confirmation (2).¹⁴ The foreign central bank then temporarily sells U.S. Treasury securities to the Federal Reserve (3), which first involves the movement of U.S. Treasury holdings in an amount equivalent to the value of the repo agreement (minus a haircut) from the foreign central bank's main custody account to another specially designated custody account under its control and then to a SOMA custody account at the Federal Reserve. Once the foreign central bank's U.S. Treasury holdings are in the Federal Reserve's custody account, the Federal Reserve sends the cash value of the repo to the foreign central bank's specially designated custody account (4). The foreign central bank decides how to remit the dollar proceeds of the repo, which generally results in a transfer of dollars to local institutions with funding needs and/or funding of FX spot interventions (5, 6).¹⁵ Should the duration of the foreign central bank's dollar liquidity need exceed one day, it has the option to roll over the repo. In this event, the U.S. Treasury securities held in custody in the Federal Reserve's account as part of the repo are revalued (that is, repriced and given a haircut again) and the amount of Treasury securities held as accordingly.¹⁶ Local institutions return the dollars they borrowed to the foreign central bank at maturity (7). Likewise, the foreign central bank repurchases its U.S. Treasury securities at maturity (8) and returns the dollars to the Federal Reserve (9).

The Federal Reserve is responsible for all aspects of post-trade clearing, settlement, and collateral management in contrast with commercial tri-party repo arrangements in which the clearing agent performs these functions. This reliance on the Federal Reserve's back-office infrastructure for FIMA repos has had important implications for operational readiness, which will be discussed later.

EXHIBIT 2

The Stylized Flow of Liquidity through the FIMA Repo Facility



- (1) FCB requests a trade.
- (2) Fed confirms trade.
- (3) FCB temporarily sells U.S. Treasury securities to the Fed, with the FCB moving the securities from its main custody account to a SOMA account.
- (4) Fed sends cash value of the repo to the FCB.
- (5) FCB provides obtained funds to local institutions and/or funds FX operations against local collateral or currency.
- (6) Foreign country banks use dollar liquidity to meet their needs, intermediate to end users, and/or hold and deposit cash at the Fed.
- (7) At maturity, foreign country banks receive back dollars from their counterparties, return funds to the FCB.
- (8) FCB repurchases U.S. Treasury securities at maturity.
- (9) FCB returns dollars to the Fed.

Source: Federal Reserve Bank of New York.

Notes: Solid blue lines indicate flows of U.S. dollars. Solid gray lines indicate exchange of U.S. Treasury securities in steps (3), (4), and (8) or local securities in steps (5) and (7). Dotted lines indicate a step without flows.

Similarities and differences with the Fed's CB swaps

There are similarities and differences across the dollar facilities with respect to objectives, counterparties, and operational constraints (Table 1).

The FIMA Repo Facility is offered to a broader range of foreign official institutions compared with the narrower set of central bank swap counterparties and offers a lower level of credit risk to the Federal Reserve. For example, if a counterparty fails to return the dollars to the Federal Reserve, the Federal Reserve is left with U.S. Treasury securities. By contrast, in the event that dollars are not repaid in a swap transaction, the Federal Reserve would be left holding the local currency of the foreign jurisdiction, which may entail a higher risk of value loss.¹⁷

TABLE 1
Key Features of the FIMA Repo Facility and Central Bank Dollar Swaps

Feature	FIMA Repo Facility	CB Dollar Swaps
Backstop tool	Yes	Yes
Objective(s)	Dollar liquidity provision and U.S. Treasury market function support	Dollar liquidity provision
Federal Reserve Counterparty	Foreign and international monetary authority account holders at the Federal Reserve/New York Fed (e.g., foreign central banks)	Selected foreign central banks
Asset exchanged for U.S. dollars	U.S. Treasury securities	Foreign currency
Custodian of exchanged asset	Federal Reserve	Foreign central banks
Format	Standing facility	Five standing swap lines and nine temporary swap lines
Transaction request	Ad hoc at the request of approved FIMA account holders	Pre-approved schedules of operations
Transaction maturity	Overnight	Up to 88 days
Maximum position size	U.S. Treasury holdings at the New York Fed, subject to internal counterparty limits communicated bilaterally to applicants	Unlimited for standing swap lines; capped at \$30 or \$60 billion for temporary swap lines
Pricing	For the temporary facility, the offering rate was the Fed's IOER plus a spread. For the standing facility the rate was set at 25 basis points (the top range of the Fed's effective federal funds target rate).	Term U.S. dollar OIS plus a spread (currently 25 bps)

Source: Federal Reserve Bank of New York.

Notes: *Format* means the time duration of the facility, *Term* is a transaction with a maturity longer than one day, *U.S. dollar OIS* is a U.S. dollar overnight indexed swap, *IOER* is the interest rate paid on excess reserves, and *intermediation* refers to the entity providing U.S. dollars to a private market counterparty. All central bank transaction instructions sent to the Federal Reserve (and the Federal Reserve Bank of New York) for use of both facilities are screened for sanctions compliance.

The new FIMA Repo Facility fills a gap in many foreign central banks' dollar liquidity management toolkits by providing a way to obtain dollar liquidity temporarily during periods of acute market stress without having to liquidate U.S. dollar asset holdings. By being able to temporarily exchange their security holdings instead of selling assets, central banks with access to the FIMA Repo Facility can avoid fire sales of U.S. dollar assets that may otherwise be required to generate dollar liquidity.

The amount of dollar liquidity available via the FIMA Repo Facility for any FIMA account holder is limited to the smaller of two quantities: the U.S. Treasury securities held at the Federal Reserve by the FIMA account holder or the counterparty limit, set bilaterally. In comparison, the standing swap lines have no specific limits, while the temporary swap lines are capped at \$30 or \$60 billion, depending on the central bank.¹⁸ Another difference is that in a CB swap transaction, unlike the FIMA repo, the reserve assets of the foreign central bank are unencumbered.

The CB swap and FIMA Repo facilities also differ in the tenor of dollar liquidity provided. Dollar funding through FIMA Repo facilities can only be obtained on an overnight basis. By contrast, the swap lines currently offer up to eighty-eight days of funding or such other periods the parties may agree on, though the current scheduled period for the standing swap lines is seven days. Although the FIMA Repo Facility does not offer additional longer-term funding, its existence provides reassurance of access to overnight liquidity, which can be rolled over. In this way, the facility can dampen precautionary asset sales and the associated cross-market amplification effects.

3. EFFECTS OF THE CENTRAL BANK DOLLAR SWAP AND FIMA REPO FACILITY

CB dollar swaps work through a number of channels to mitigate market strains. The dollars provided through swap central bank counterparties enable foreign commercial banks to access U.S. dollar liquidity at a lower cost than in the stressed private market, obviating the need to bid up rates excessively in the market. Moreover, these more favorable dollar liquidity terms allow foreign commercial banks to continue providing private credit when markets are strained. This credit provision spans direct lending by their branches in the United States as well as those in their home economies, including to nonbank financial intermediaries and other private borrowers. Having adequate access to dollar liquidity also enables FBOs to meet precautionary funding needs. The FIMA Repo Facility allows central banks without swap lines to gain access to backstop dollar liquidity, thus reducing the need of other foreign official institutions to sell their U.S. dollar reserve assets, which can help limit the amplification of stress in U.S. credit and other financial markets.

Research conducted around the introduction and expansion of CB dollar swaps during the GFC has shown that these facilities significantly reduced strains in U.S. dollar funding markets, as demonstrated by comparing FX swap basis spreads for directly covered currencies with those of other currencies after CB dollar swaps were employed in late 2007 and expanded during 2008 (see, for example, Baba and Packer [2009], Goldberg, Kennedy, and Miu [2011], and Bahaj and Reis [forthcoming]). The reduced funding strains occurred for the currencies and terms associated with dollar provision, but then extended to broader dollar funding markets.

Newer research shows that the suite of policy actions taken by the FOMC in 2020, including those related to the swap lines and the FIMA Repo Facility, helped stabilize U.S. dollar funding markets, supporting the continued flow of credit to the U.S. economy and beyond. These types of conclusions, by Cetorelli, Goldberg, and Ravazzolo (2020a, 2020b) and Goldberg and Ravazzolo (2021), are obtained by applying various methods that evaluate the effects of facility-related announcements on the settlement of dollar flows, and explore the effects of settlement and operationalization of dollars through these facilities on a range of funding and international credit indicators. The analytics also explore the effects of shifts in risk sentiment on FX swap basis spreads and international flows.

One method focuses on feedback from market observers. According to market participants, in mid-March 2020, banks became less interested in intermediating dollar flows to nonbanks, especially for term funding, given lingering uncertainty over the path and duration of the

coronavirus. It was only when banks had accumulated sizable excess dollar balances through take-up of central bank dollar operations funded through the swap lines network that they began to intermediate dollars to other regional banks and nonbanks. Overall, market participants were positive on the effects of access to dollars through central bank swap facilities and later offered positive feedback on the FIMA facility introduction.

Quantitative evidence comes from examining indicators of strains in dollar funding markets, international Treasury holdings, cross-border global liquidity flows, and exchange market pressure. The actual settlement of dollars through the facilities was key, obviating the need for banks to secure dollar funds in already stressed private markets. In March 2020, these funds were being used in part to support continued credit provision in the United States and abroad, helping to contain pandemic-induced contractions in credit supply. International capital flows largely reverted to pre-pandemic levels, as did exchange market pressures, after markets stabilized.

No matter the quality and quantity of the data we process, it is challenging to isolate the effects of particular facilities, especially given rapid shifts in market conditions and sentiment amid multiple official interventions. Subject to this caveat, below we provide key lessons based on our analysis of the available data.

Settlement of dollars through CB swap operations calmed funding strains, even more than announcements of facility-related developments.

Cetorelli, Goldberg, and Ravazzolo (2020a) analyze changes in selected FX basis spreads around key facility announcements and auction settlements: (1) the March 15 SSCB announcement, (2) the March 19 TSCB announcement, (3) the March 20 announcement of daily seven-day SSCB auctions, and (4) the March 31 FIMA Repo Facility announcement. The announcement window includes the day of and, in some cases, the day following the announcement. The FX swap basis spread changes over this window are compared with the average spread during the two days prior to the announcement.

On average across currencies, the TSCB activation, the daily SSCB auction analyses, and the FIMA Repo announcements corresponded with average reductions in FX swap basis spreads. Relative to other currencies, currencies with announcements related to SSCBs and TSCBs did not have significantly narrower FX swap basis spreads on and after announcement dates. By contrast, the announcement of the increased frequency of seven-day U.S. dollar operations lowered the rate of increase in the FX swap basis spreads for currency pairs of countries with SSCBs, as compared with the changes observed in FX swap basis spreads of other currency pairs. One causal interpretation of this pattern is that the latter announcement improved market conditions on the announcement day, relative to conditions over the prior two days. However, we caution that these results have no controls to benchmark what the respective changes in FX swap basis spreads would have been without the announcements.

The actual settlement of funds from U.S. dollar operations has had materially different effects on the FX swap basis spreads of currency pairs of the standing swap central banks versus those of all other currencies. After controlling for the effects of concurrent equity market volatility, the settlements of daily seven-day auctions on one-week FX swap basis spreads improved market conditions. In contrast, settlements of seven-day and eighty-four-day operations were not associated with immediate improvements in three-month swap basis spreads. Our interpretation is that initially the term liquidity obtained by banks was only partially channeled beyond the banking system and the relief provided to broader markets was delayed.

Over longer horizons, strains in dollar funding markets were reduced by access to CB swaps and later to the FIMA Repo Facility, while risk sensitivity also declined.

Goldberg and Ravazzolo (2021) conduct further analysis of how CB swaps and the FIMA Repo Facility influenced FX swap basis spreads over longer time horizons, using daily data on FX swap basis spreads for twenty-one currencies from January 2, 2020, through June 30, 2020. Three periods are compared: Period 1 covers February 1, 2020, through March 10, 2020; Period 2 covers March 19, 2020, through April 4, 2020; and Period 3 covers May 21, 2020, through June 30, 2020. All currencies on average exhibited an increase in FX swap basis spreads in the initial stress Period 2 compared with the pre-pandemic Period 1, but those currencies with access to CB swaps showed significantly lower strains. In the latter period, after the activation of the FIMA Repo Facility, those currencies recorded significantly greater declines in FX swap basis spreads compared with the pandemic stress period. On net and on average, all of these FX swap basis spreads returned to pre-pandemic levels by the third period.

Related regression analytics of the daily data show that, while both groups of currencies exhibited increased risk sensitivity from Period 1 to Period 2, the increase in sensitivity was significantly lower for currencies with access to swap lines. Comparing Period 3 with Period 2, the currencies that were instead associated with FIMA repo accounts experienced significantly larger reductions in the sensitivity of FX swap basis spreads to daily changes in risk sentiment as proxied by the VIX index (Chicago Board of Exchange Volatility Index).

Credit provision in the United States and abroad is supported by dollars settled through CB swap lines and potentially FIMA Repo Facility.

The COVID-19 shock had a significant impact on U.S. FBO branch balance sheets beginning in late February 2020. Cetorelli, Goldberg, and Ravazzolo (2020b) show that, as funding strains became evident, deposits began to decline and the net funding U.S. FBOs received from parent organizations rose. Other borrowings rose as well, including those secured through the fed funds market, the repo market, and the Federal Reserve's discount window.

Greater changes occurred in the third week of March, when FBO branch balance sheets registered a combined sharp decline in deposits, a marked increase in lending, further increases in other borrowing, and a substantial jump in funding received on net from their parent organizations. The sharp increase in lending was likely due to large customer draws on the sizable credit commitments in place with the branches rather than a reflection of new loan extensions. The freezing up of the corporate credit market led customers to draw on those lines, resulting—all else equal—in U.S. FBOs facing an increase in funding needs to match the increase in loans on their balance sheets. U.S. branches of FBOs with access to dollar liquidity through the dollar operations of SSCBs borrowed more internally from their parent organizations.

Following the increase in dollar availability through the standing swap lines, the share of net internal borrowing among U.S. branches of FBOs grew significantly more for U.S. branches that had access to these dollars and had larger needs for such funding. The swap dollars supported the flow of funds back to the United States, where hosted branches of foreign banks met needs generated by draws on committed credit lines when corporate funding markets were strained. U.S. branches of FBOs also held precautionary liquidity demanded by their banking organizations. The activation of internal funding channels within these banking organizations in response to the shock was more than sufficient to

support the balance sheet needs of FBO branches and continue the flow of credit to borrowers in the United States. The fact that the increase in internal borrowing was larger than what was immediately needed suggests that dollars obtained from parent companies were also used to boost overall precautionary liquidity or to support some of the liquidity needs of related intermediate holding companies.¹⁹

Goldberg and Ravazzolo (2021) provide additional insights through analysis of Treasury TIC data and BIS Locational Banking Statistics. In the initial stage of the pandemic, U.S. Treasury holdings of foreign entities declined broadly. These declines, sometimes described as part of a dash for cash, on average initially were not proportionately larger for countries without swap lines. Some of the dollars were placed in the Federal Reserve's foreign repo pool. On average, the individual countries that set up FIMA repo accounts further reduced U.S. Treasury holdings through May 2020, then rebuilt those holdings, eventually surpassing pre-pandemic values.

International capital flows, captured through the asset and liability data reported in BIS Locational Banking Statistics, show that banking systems with access to swap lines continued to provide credit in the early part of the pandemic, including to banking sector borrowers abroad, at a higher rate than other groups of countries. Cross-border lending through banks to both bank and nonbank borrowers was strongest for banking systems where central banks had swap line access. Differential patterns across countries declined after country access to the FIMA Repo Facility was established.

The facilities helped lower funding costs, support capital flows, and reduce the sensitivity of funding costs and capital flows to changes in risk sentiment. The speed and degree of normalization of conditions in offshore funding markets and in cross-border bank and international capital flows were dependent on access to different types of facilities, with strains normalizing at a slower pace and to a lesser extent in countries without access to standing swap arrangements.

4. POLICY CONSIDERATIONS

During the GFC and the COVID-19 pandemic, the Federal Reserve showed a commitment to well-functioning U.S. dollar funding and credit markets. The dollar liquidity that it made available in the early stages of the pandemic helped calm global dollar funding markets, support the provision of credit, and limit the disruptive financial amplification effects of the worldwide shock. The Federal Reserve, working in conjunction with other monetary authorities, demonstrated operational readiness, agility, and common purpose as the frequency of dollar operations was adjusted, auctions of longer funding tenors were added, and temporary swap lines were extended to additional central banks. Expertise previously developed during the GFC, both within the Federal Reserve and within some of its foreign counterparts, supported the swift introduction of the FIMA Repo Facility.

However, despite operational readiness around the CB dollar swaps, the announcement of facilities did not immediately eliminate all funding strains. The costs of dollar funding, such as three-month FX swap basis spreads, remained relatively elevated for some time despite sizable usage of CB dollar swaps. In some cases, market segmentation and intermediation frictions may have prevented U.S. dollar liquidity from reaching entities in need of liquidity, particularly nonbank financial intermediaries and corporations without access to the dollar operations of

swap central banks. For example, foreign banks appear to have met their own institutional needs, including for liquidity buffers, before passing funds through to other end-users. This raises a policy question about how to reduce the potential for funding market strains *ex ante* and then how to best respond to the range of institutional needs.

Indeed, some new vulnerabilities of the post-GFC dollar funding landscape stem from the increased role played by nonbank financial institutions, a point discussed in BIS CGFS (2021). Nonbanks have access to a narrower range of U.S. dollar funding sources, including central bank backstop facilities. In periods of stress, the large footprint of nonbank financial institutions in some markets also increases the risk of possible fire sales of dollar assets, potentially amplifying market volatility. Some of these dynamics were evident in March 2020, raising questions about how to reduce such vulnerabilities and the extent of dollar liquidity availability from backstop tools at local central banks.

Additionally, history informs us that not all crises unfold in similar ways. Compared with the GFC, an interesting novelty around the March 2020 take-up of swap central bank dollar operations is that foreign banks' parent companies helped cover the new dollar funding needs of their U.S. branches. Some of the dollar liquidity provided through the swap lines made its way back to the United States instead of remaining in offshore funding markets. This type of dynamic arises in part through the structure of regulation and also through the design of the swap agreements. U.S. branches of foreign banks are ultimately supervised by their respective home country central banks and supervisory authorities, which ensure their compliance with local capital and liquidity requirements.²⁰ The CB swaps are structured in a way that exposes foreign central banks to the credit risk of their local institutions and leverages foreign central bank expertise in distributing dollar liquidity. This design, built into the structure of regulation and into the central bank swaps themselves, allowed liquidity flows from swap lines to reach the most stressed parts of institutions, limiting the consequences for the rest of these organizations in the spring of 2020.

Finally, the COVID-19 experience highlights that, even though central banks held more FX reserves after the GFC, providing insulation to some of them, there were still potential amplification effects in a coordinated shock that gave rise to concentrated asset liquidation. The new FIMA Repo Facility, deployed in late March of 2020, should help address such strains in a future crisis by at least partially attenuating the need of reserve managers to sell U.S. Treasury holdings. Though the FIMA Repo Facility has seen minimal usage through 2021, its introduction provided a backstop that offers entities with accounts at the New York Fed the capacity to convert U.S. Treasury holdings into cash overnight, if needed. This may reduce precautionary (contingency) selling of U.S. Treasury securities and make U.S. Treasury assets more attractive to reserve managers by reducing holding costs (reflected in a reduction of liquidity premiums or convenience yields).

Overall, the CB swaps and the new FIMA Repo Facility are important tools for managing global dollar funding markets and are consistent with U.S. financial stability and economic objectives.

NOTES

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¹ To support market function and address dislocations in the U.S. Treasury market, the FOMC took other and more relevant direct actions. For details, see the following articles elsewhere in this special issue: “The Primary Dealer Credit Facility” and “The Federal Reserve’s Market Functioning Purchases.”

² Intermediaries that might provide U.S. dollars through one instrument, for example a loan, also need to fund that asset by borrowing U.S. dollars, for example, a U.S. dollar deposit. Intertwined in this process is the need to hedge risks, including those related to exchange rate, interest rate, and maturity, for which certain instruments, such as FX forwards and swaps, tend to be used. For a list of instruments and their characteristics, see Table 1, “U.S. Dollar Funding: An International Perspective,” <https://www.bis.org/publ/cgfs65.htm>.

³ For an interactive mapping of U.S. dollar funding flows, see Afonso, Ravazzolo, and Zori (2019), https://www.newyorkfed.org/research/blog/2019_LSE_Markets_Interactive_afonso.

⁴ For example, banks headquartered in Japan, the United Kingdom, France, Switzerland, and Canada engage in significant dollar lending, especially to other advanced foreign economies. Chinese and some other banks of East Asia’s emerging economies are significant suppliers of dollar-denominated credit, especially to other EMEs, as noted in EMEAP (2020).

⁵ Liao and Zhang (2020) show that there was a larger rise in the cost of dollar funding through FX swaps for currencies whose home jurisdictions had more positive net international investment positions (that is, their investment in foreign assets was larger than their foreign debts), corresponding with more demand for hedging of dollar investments. See <https://www.federalreserve.gov/econres/ifdp/files/ifdp1283.pdf>.

⁶ The relevant U.S. dollar unsecured rates in this paper are Overnight Indexed Swap (OIS) rates. The formula below provides an example based on the cost of borrowing euros in unsecured markets and converting them to U.S. dollars via the FX swap market and then comparing that with the rate paid to borrow U.S. dollars directly in the unsecured market:

$$EURUSD \text{ Swap Basis Spread} = \left[\frac{360}{tenor} \left(\left(\frac{forward(tenor)}{spot} \right) \left(1 + EurOIS(tenor) \frac{tenor}{360} \right) \right) - 1 \right] - USD \text{ OIS}(tenor)$$

where *spot* is the FX spot rate at time *t*, *forward(tenor)* is the FX forward rate contracted at time *t* for delivery at time *t+tenor*, and *EUROIS(t, tenor)* or *USD OIS(t, tenor)* is the uncollateralized euro or dollar interest rate from time *t* to time *t+tenor*, which in this case is the overnight interest swap rate.

⁷ See Goldberg, Kennedy, and Miu (2011) for details about central bank counterparties of standing and temporary swap arrangements in the global financial crisis period. Baba and Packer (2009) provide initial insights into smoothed strains in U.S. dollar funding markets. In addition to the Bank of Japan, European Central Bank, Bank of England, Swiss National Bank, and Bank of Canada, the counterparties to the nine temporary swap lines are the central banks of Australia, Brazil, Denmark, Mexico, New Zealand, Norway, Singapore, South Korea, and Sweden.

⁸ Gislén, Hansson, and Melander (2021) argue that lower usage of the dollar operations of the ECB and Scandinavian central banks most likely reflects the fact that European and Scandinavian banks had higher initial liquidity, higher capital, and lower dollar exposure than they did during the GFC.

⁹ Before being reduced on March 15, 2020, the price of CB dollar swaps had been set at U.S. dollar OIS plus 50 basis points as of November 30, 2011, during the euro-area financing turmoil, when the price was reduced from U.S. dollar OIS plus 100 basis points. For details on the 2011 price announcement, see <https://www.federalreserve.gov/newsevents/pressreleases/monetary20111130a.htm>.

¹⁰ See step (2) in the stylized balance sheet mechanics of central bank swap lines, Graph 2 in Aldasoro et al. (2020).

NOTES (CONTINUED)

¹¹ Aggregate volumes are reported in the weekly H.4.1 data release on the Federal Reserve's balance sheet under the repo line item "foreign official." See <https://www.federalreserve.gov/releases/h41/>.

¹² For the temporary facility, the rate was set at interest on excess reserves plus 25 basis points. When converted into a standing facility on July 28, 2021, the rate was set at 25 basis points.

¹³ See Choi, Nemeth, and Potter (2020) on central bank services. The Federal Reserve Bank of New York maintains cash and custody accounts for nearly every central bank in the world and the FIMA Repo Facility adds to a suite of Federal Reserve dollar-based correspondent banking and custody services.

¹⁴ For example, within transaction size limits and priced at the correct facility pricing.

¹⁵ FX intervention funded in this way would only be in the direction of currency sales to strengthen the domestic currency vis-à-vis the U.S. dollar.

¹⁶ That is, should the value of the purchased Treasury securities fall below the outstanding FIMA repo, additional Treasury securities are moved from the FIMA repo custody account to the SOMA and vice versa if the mark-to-market valuation (minus haircut) exceeds the amount of the outstanding FIMA repo.

¹⁷ Absent default, neither party in the swap transaction faces market risk because the spot and forward legs of the transaction are at the same exchange rate and the same dollar amount as for the FIMA repo transaction.

¹⁸ The temporary CB dollar swap facilities support the provision of U.S. dollar liquidity in amounts up to \$60 billion each for the Reserve Bank of Australia, the Banco Central do Brasil, the Bank of Korea, the Banco de México, the Monetary Authority of Singapore, and the Sveriges Riksbank, and \$30 billion each for the Danmarks Nationalbank, the Norges Bank, and the Reserve Bank of New Zealand. See <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200319b.htm>.

¹⁹ See <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20140218a.htm>.

²⁰ U.S. branches are subject to certain liquidity requirements (see, for example, 12 C.F.R. 252.157[c] at <https://www.ecfr.gov/current/title-12/chapter-II/subchapter-A/part-252>). Depending on their organizational form, they may also be subject to certain capital requirements.

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