



FOCUS NOTE

SETTLEMENT MODELS IN FAST PAYMENT SYSTEMS AND IMPLICATIONS FOR PARTICIPANT ACCESS

PROJECT
FASTT
FRICTIONLESS • AFFORDABLE • SAFE • TIMELY • TRANSACTIONS

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FINANCE, COMPETITIVENESS & INNOVATION GLOBAL PRACTICE

Payment Systems Development Group

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1 SETTING THE CONTEXT

The World Bank has been monitoring closely the developments of fast payment systems (FPSs) by central banks and private players across the globe.¹ This comprehensive study has resulted in a policy toolkit. The toolkit was designed to guide countries and regions on the likely alternatives and models that could assist them in their policy and implementation choices when they embark on their FPS journeys. Work on the FPS Toolkit was supported by the Bill and Melinda Gates Foundation. The toolkit can be found at fast-payments.worldbank.org and consists of the following components:

1. The main report *Considerations and Lessons for the Development and Implementation of Fast Payment Systems*
2. Case studies of countries that have already implemented fast payments
3. A set of short focus notes on specific technical topics related to fast payments

This focus note is part of the third component of the toolkit. It discusses the most relevant aspects related to FPS interparticipant settlements and critical issues regarding access to FPSs by banks and other types of payment service providers (PSPs). These topics are relevant given that the various settlement models have different implications on risk and efficiency of an FPS, as well as on how PSPs may be able to access this system and manage access privileges safely and efficiently. Moreover, access to an FPS in itself is a critical topic for ensuring a level playing field among banks and the various PSP types that provide payment services to end users, and for a quicker adoption of fast payments in any given jurisdiction.





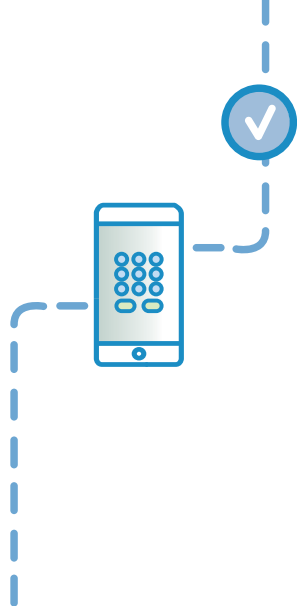
2 BACKGROUND

FPSs enable the immediate and around-the-clock transfer of value from payers to payees. While the user experience of an FPS is intended to be instant or immediate by design (that is, with respect to the crediting of the payee account and debiting of the payer account), what happens behind the scenes in terms of how funds underlying these payment transactions “move” between the PSPs, and how these obligations are legally extinguished, is a different and complex matter.

The aforementioned movement of funds between PSPs is referred to as “settlement” and is preceded by a series of steps generally referred to as “clearing.” (See section 3 for details.) This focus note analyzes the clearing and settlement processes between entities that are participants in an FPS

(that is, banks and other PSPs). It also discusses PSP access to FPSs and the implications that a given settlement model can have for different types of PSPs and various forms of access.

This focus note builds largely on the World Bank report *Considerations and Lessons for the Development and Implementation of Fast Payment Systems*, published in 2021, and the report *Fast Payments—Enhancing the Speed and Availability of Retail Payments*, published by the Committee on Payments and Market Infrastructures (CPMI) in 2016 and on a subsequent CPMI report on this topic in 2021. It also relies on other World Bank staff publications and experiences.²



3 CLEARING AND SETTLEMENT

Clearing and settlement are core functions of a payment system, ensuring a swift, safe, and seamless flow of funds from one participant to another.

The choice of a settlement model has important consequences for the safety and efficiency of an FPS. Indeed, the various clearing and settlement methods between the participating PSPs result in diverging consequences in terms of risk and efficiency for the various actors involved.

Broadly speaking, the two major payment-settlement models for an FPS are (i) real-time settlement and (ii) deferred settlement. Both models have potential benefits as well as potential downsides, and the right choice of a settlement model will depend on the specific context of each FPS, including the legal and regulatory framework, the institutional setting, the market size and number of participants, and the degree of adoption of fast payments in the country and of real-time payments more generally, among other features. Each of these models is discussed in the following subsections.

3.1 FPS PROCESSING MODELS

A fast payment is normally initiated when a payer submits a payment order to their PSP.³ This can be done directly or, in some cases, through intermediaries, such as payment initiators. For a payment transaction to be considered a fast payment, the payment order—once validated and after other checks are performed—must trigger a debit on the payer's

account and a credit to the payee's account in real time or close to real time. In parallel, the clearing and settlement processes between the payer's and the payee's PSPs begin.

More specifically, as per CPMI (2016), the main steps involved in the processing of a fast payment transaction are described in box 1.

The main criterion for classifying FPSs according to their clearing and settlement methods is the speed of settlement between PSPs. Based on this, the following two main categories can be identified:

Model 1: FPS with Real-Time Settlement

In this model, transactions are cleared and settled in real time or close to real time.⁴ Confirmations are also sent to the PSPs involved in close to real time. The credits and debits between the different actors in the payment chain are carried out and settled sequentially at a high speed: the payer's PSP sends the funds to the payee's PSP before the latter credits the funds to the payee. There is continuous settlement as long as the relevant originating PSP participant has adequate balances in its settlement account with the settlement agent (or a valid form of credit; see section 3.5).

Settlement of funds is made on an order-by-order basis (that is, on a gross basis). One exception involves offsetting of payment orders before settlement. The latter process, which is only seldom observed, is based on an algorithm that is applied to a high number of transactions in very short settlement cycles so that settlement actually occurs every handful of seconds.

BOX 1 STEPS FOR FAST PAYMENT PROCESSING

Transmission of the transaction by the payer's PSP initiates the clearing and settlement processes between the PSPs and involves submitting the necessary transaction details to the relevant FPS.

Notification is issued by the FPS to the PSPs of the payer and the payee, confirming that the payment order has been received and verified and is or will be settled. This notification allows the PSP of the payee to credit the funds to the account of the payee.

Very often, transactions are also subject to **netting**, which reduces the number and value of payments needed to settle a set of transactions. This process can be done in close to real time, or it can be deferred.

Source: Adapted from CPMI (2016)

The above steps (transmission, notification, and netting) are often referred to as **clearing**. The activities included in the concept of clearing have to be performed in close to real time in order to provide fast payments to end users (netting being a possible exception).

Once the clearing phase is completed, transactions have to be settled between the participating PSPs. **Settlement** in the account(s) maintained by the PSPs or the operator of the system in the books of a common settlement agent (commercial or central bank) determines the discharge of the obligations derived from the fast payment transaction. This final step can be done in close to real time, or it can be deferred.

Model 2: FPS with Deferred Settlement

In this case, transactions are transmitted, confirmed, and notified to the PSPs involved in close to real time, but the inter-PSP settlement takes place *after* the payee's PSP has credited the funds in the payee's account, usually at the end of a predefined cycle, either once or multiple times during the day. In other words, the discharge of individual payment obligations between the payer and payee are clearly separated from the discharge of the obligations between participating PSPs.

This type of settlement almost always involves netting (typically, multilateral netting, although it can also be bilateral netting) and may take place in a dedicated infrastructure or in another system in which participating PSPs hold accounts, such as the local real-time gross settlement (RTGS) system. The FPS will calculate, in close to real time, the net debit or credit position of each participating PSP after each individual payment is processed. The actual netting process may occur in close to real time or be deferred up to the point right before settlement takes place.

3.2 CURRENT DEGREE OF ADOPTION OF THE DEFERRED NET SETTLEMENT AND REAL-TIME SETTLEMENT MODELS THROUGHOUT THE WORLD

Figure 2 shows the actual settlement models chosen by 16 jurisdictions whose FPSs were studied in detail by the World Bank (2021). This study showed that 11 of the 16 jurisdictions have adopted a deferred settlement model. In

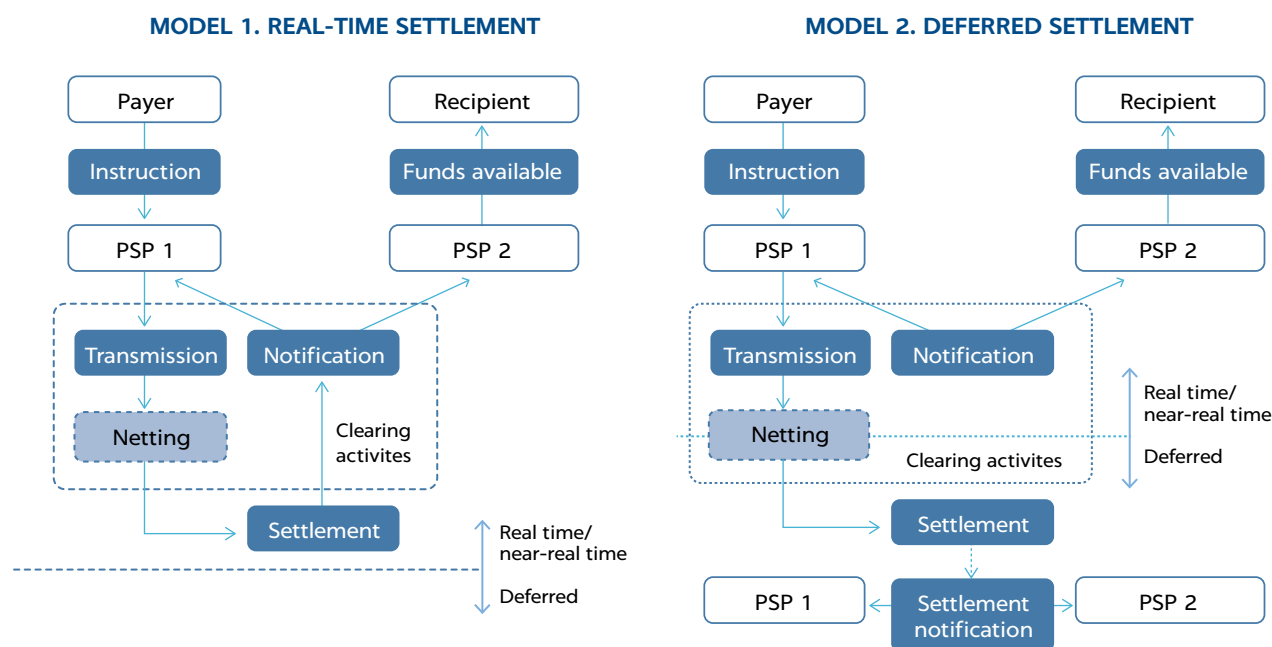
all 11 cases, the deferred settlement model involves multilateral netting.

A broader World Bank analysis of FPSs in more than 50 jurisdictions showed not only that the deferred settlement model is indeed more common but also that the real-time settlement model is witnessing increased uptake. In other words, most new FPS implementations are opting for the latter model.

3.3 VARIATIONS IN THE TWO MAIN MODELS



















FPSs usually exhibit a variety of detailed characteristics related to clearing and settlement. The main such variants are discussed below (following CPMI's 2016 report):

- A system could apply different settlement approaches at different times of the day or week, or for different types of transaction. For example, an FPS may use the local RTGS system to process fast payments with real-time settlement during the operating hours of the latter system, but then use deferred settlement when the RTGS system is closed. Other FPSs could settle payments above a given threshold in real time but apply deferred net settlement to payments below that threshold.
- As previously noted, in FPSs using deferred settlement, the exchange of funds between the PSPs may be conducted on a gross basis (uncommon) or be subject to netting, which in turn can occur on a bilateral or multilateral basis.

FIGURE 1 Stylized Models for Interbank Settlement in FPS

Source: Based on figures 3 and 4 from CPMI (2016).

FIGURE 2 Participant Settlement Models Adopted for Fast Payment Arrangements

Jurisdiction		Deferred Net Settlement	Real Time Settlement
Australia			✓
Bahrain		✓	
Brazil			✓
Chile		✓	
China		✓	
EU			✓
Hong Kong			✓
India		✓	
Kenya		✓	
Malaysia		✓	
Mexico			✓ (Hybrid)*
Nigeria		✓	
Pakistan		✓	
Poland		✓	
Singapore		✓	
Thailand		✓	
UK		✓	
USA			✓

* Mexico's settlement model is referred to as "hybrid" because a multilateral offsetting algorithm runs in quick succession (every three seconds or a configurable number of payments) to clear and settle transactions.

Source: WB 2021.

- The timing of inter-PSP settlement may also vary in the deferred settlement model. For example, it may involve settlement at predetermined times—for example, once every day at the end of the business day, or more frequently. Alternatively, settlement could be based on accumulated positions, so that a transfer is automatically triggered once the value of pending transactions exceeds a threshold. Additional possibilities may exist.
- In FPSs with tiered participation,⁵ some PSPs providing fast payment services to end users would not have direct access to the FPS and would thus rely on a direct participant for submitting payment orders. Tiered participation in FPSs creates additional challenges because of the speed at which payments need to be transmitted between PSPs and the introduction of an additional clearing and settlement layer.⁶
- More than one FPS might be servicing PSPs, and these infrastructures could potentially interoperate. The interoperability of FPSs (domestically and/or at the cross-border level) raises challenges that are similar to those described above for FPSs with tiered participation: ensuring adequate transmission speed with longer payment chains (involving PSPs and several FPSs) and, depending on the specific setup, an additional clearing and settlement layer (between infrastructures).
- The settlement agent may vary. For example, the institution that provides inter-PSP settlement could be a commercial bank that conducts settlement in commercial bank money, or it could be a central bank. Furthermore, hybrid arrangements are also possible and could include a special-purpose institution that conducts settlement in its own ledger, possibly fully backed by funding in central bank money.

These variants related to institutional and organizational arrangements and setups for clearing and settlement in FPSs are analyzed in more detail in the next subsection.

3.4 INSTITUTIONAL AND ORGANIZATIONAL SETUPS FOR CLEARING AND SETTLEMENT

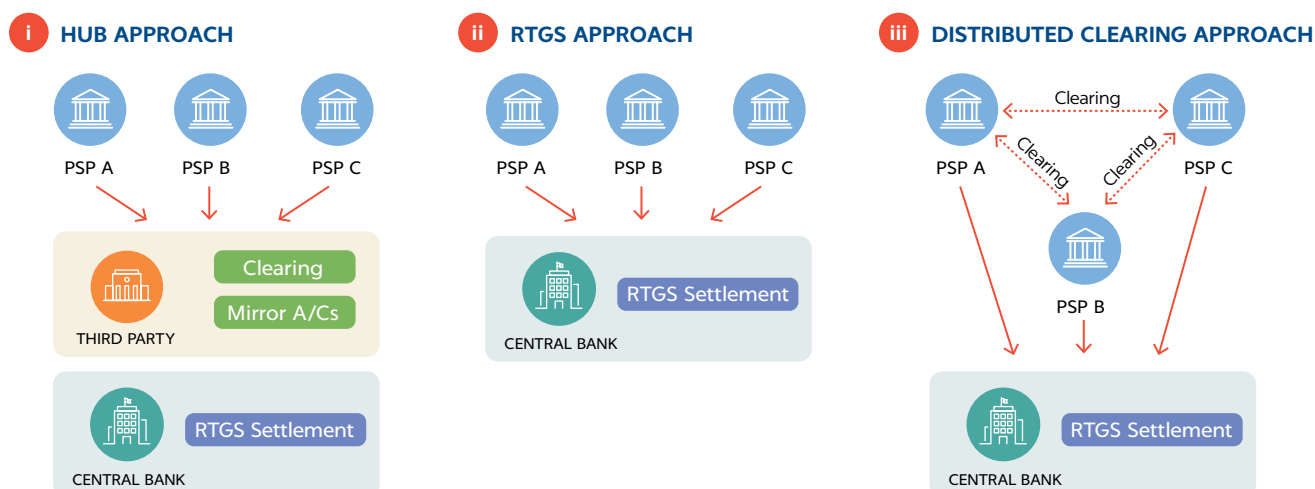
Three main types of institutional setups for clearing and settlement were observed as part of the World Bank's 2021 study. Notably, in all the jurisdictions studied, the central bank is involved in the final settlement of inter-PSP positions: final settlement occurs in the RTGS system or an equivalent settlement account (including the statutory accounts held in the general ledger/core banking system) maintained with the central bank.

The three main observed setups are illustrated in figure 3 and are as follows. The settlement model is independent of the setup, meaning that RTGS or net settlement could be observed in each of the setups.

- i. The hub approach: A third-party organization (for example, the FPS operator itself) acts as a hub, handling the clearing between the participants, and also manages the downstream settlement with the central bank. Participating PSPs maintain adequate funds in the account or pledge collateral at their central bank accounts, and the clearinghouse performs real-time clearing and then notifies the participants. To execute these processes, the hub typically “mirrors” the balance information from the PSP central bank accounts in its own system.⁷ The hub then sends settlement instructions to the central bank, where the actual movement of funds occurs.
- ii. RTGS-based approach: The central bank RTGS system directly supports the clearing and undertakes settlement of fast payment transactions.
- iii. Distributed clearing: Validation and confirmation of payment instructions are carried out bilaterally by PSPs. Clearing is carried out in real time on a 24-hours-a-day, seven-days-a-week (24/7) basis. Subsequently, the payer's PSP initiates the settlement instruction to the central bank, which is processed on a real-time basis.

More specific setups and/or additional arrangements exist, especially for cases in which the real-time settlement model is used, typically because this model requires longer operating hours from the central bank RTGS system (or other settlement system) for inter-PSP settlements and liquidity provisioning.⁸ Three examples are discussed below and are illustrated in figure 4:

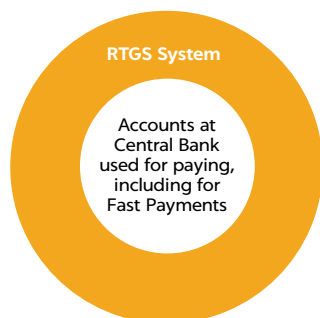
- If inter-PSP settlements take place in the same accounts that FPS participants use for other types of payments in the RTGS system, then, for an FPS that operates on a 24/7 basis, the central bank also needs to make RTGS accounts available 24/7.
- In another setup, FPS participants may each have a dedicated account for FPS settlement at the central bank (that is, distinct from an RTGS account, probably even in a separate settlement system). In this case, the system that manages dedicated FPS accounts would need to be open 24/7 for FPS interparticipant settlements, while the main RTGS system does not necessarily have to be open 24/7. This arrangement would nevertheless require a mechanism that allows for movement of funds between RTGS accounts and dedicated FPS accounts—which nevertheless would be operational only when the RTGS system is open.

FIGURE 3 Observed Institutional Setups for Clearing and Settlement

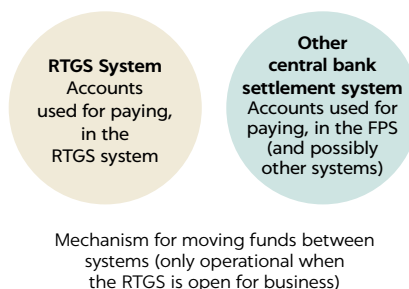
Source: Authors' elaboration.

FIGURE 4 Additional Setups and Arrangements

Setup in which the RTGS System will need to remain open 24/7 for the FPS to operate 24/7

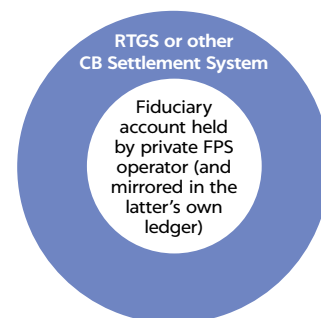


Setup in which the RTGS System does not need to be open 24/7 for the FPS to operate 24/7



Mechanism for moving funds between systems (only operational when the RTGS is open for business)

Other setup in which the RTGS System does not need to be open 24/7 for the FPS to operate 24/7



Funds to/from the fiduciary account are transferred via the RTGS system (only when the latter system is open for business)

Source: Authors' elaboration.

- Other arrangements for real-time settlement that do not involve an RTGS system operating outside its standard business hours include a model that is similar to the hub setup mentioned earlier, but the FPS operator or other special-purpose entity carries out inter-PSP settlements on its own ledger. In this variant, FPS participants would transfer funds (for example, via the RTGS system during its operating hours) into the fiduciary account of the FPS operator, which can also be held at the central bank/RTGS system. The FPS operator would record the corresponding pay-in amounts for each participant, and inter-PSP settlements would then occur in real time on its own ledger. The sum of all the pay-ins (and that of all the participants' balances at a given point in time) recorded on the private ledger is always to be equal to the total funds

in the fiduciary account at the central bank/RTGS system. Further, this type of arrangement may operate during all hours or only during nonstandard business hours (that is, when the central banks/RTGS system is closed).

3.5 IMPLICATIONS OF DIFFERENT MODELS OF SETTLEMENT FOR FAST PAYMENTS

As mentioned earlier, each of the general settlement models has advantages and disadvantages. Deciding which model is better suited for a given jurisdiction will depend on the specific context of each FPS. This section analyzes the main implications of each broad model with regard to risk and potential costs—including opportunity costs—for participants.

Implications of Real-Time Settlement Models

The PSP of the payee credits the account of its customer only after settlement between PSPs has taken place, with finality. As a result, credit risk between participating PSPs is avoided.

However, demands on liquidity of this model are higher, as PSPs continuously require sufficient liquidity to ensure the settlement of fast payments. In the absence of sufficient liquidity, end users may see their payments rejected, which would have a negative impact for the PSPs (for example, on their credibility and overall reputation) and potentially also for the FPS itself. If this were to happen repeatedly, it could even hamper the uptake (or abandonment) of fast payments in the jurisdiction.

The continuous need for adequate liquidity may complicate the liquidity-management processes of PSPs, especially if the RTGS system (or the system/commercial bank where final settlement happens) is closed for some hours during the day. Liquidity requirements may not be too difficult to manage if an FPS processes mainly low-value payments.⁹ However, as uptake of fast payments accelerates and limits on individual fast payment orders are raised or abolished, PSPs—especially smaller non-banks—are likely to need additional tools to manage liquidity risk stemming

from their participation in the FPS. Some of these tools are described below and then also summarized in box 2.

Several arrangements may help PSPs manage and access liquidity to support the settlement of fast payments. These include automated facilities for transferring/replenishing funds from the RTGS system to replenish funds in the FPS account (for example, once the balance in this account hits a certain level); liquidity support directly linked to the intraday liquidity facilities implemented in the local RTGS system; transferring to the FPS account available balances in other eligible accounts at the central bank at the end of the operating day of the RTGS system so that PSPs can process fast payments outside normal operating hours; inter-PSP lending mechanisms within the FPS during non-business hours; and probably even switching to deferred settlement when the RTGS system is closed. Valuable information tools include the monitoring of liquidity levels (for example, alerts if levels fall below a preset limit) and the enabling of consolidated views of a PSP's position in its various central bank accounts (if applicable) or of the mix of accounts with the FPS operator/central bank.

In any case, because FPSs are intended to operate on close to a 24/7 basis, their smooth operation over the long run will most likely require extending the operating hours

BOX 2 COMMON MECHANISMS TO ASSIST PSPs IN MANAGING LIQUIDITY RISK IN THE FPS

The following mechanisms are not mutually exclusive and can be combined:

Central bank intraday liquidity facility: This is typically linked to the RTGS system. Participants in an FPS could be given access to this facility to obtain funds to fund their activity in the FPS, subject to the intraday credit policies of the central bank.

End-of-day transfer of balances available in other eligible central bank accounts: This refers to the ability to transfer available funds from any of the eligible accounts that a bank or other PSP has at the central bank to fund its activity in the FPS, particularly during those hours/days in which the RTGS system is not open for business.

Automated tools for replenishing funds in the FPS: This mechanism is triggered once a certain minimum

balance or threshold is reached in the FPS settlement account of any given bank or other PSP. Automation is a key element to avoid any delays, errors in human monitoring of account balances, and so on.

Inter-PSP transfers: This refers to a facility whereby any participant in the FPS can request funds from other participants, and the ability of any given participant to lend and transfer those funds within the system (that is, from its FPS account to that of the debtor FPS). From an operational perspective, this is simply an interparticipant settlement, although the initiating customer and the final beneficiary are PSPs participating in the system.

Informative tools: These provide the ability to monitor liquidity levels in real time, possibly with certain statistical aids, by system and in consolidated form (all PSP's positions in its various central bank accounts).

of the RTGS system as much as possible (together with the liquidity facilities available in this system).

Implications of Deferred Settlement Models

These models are normally based on multilateral netting. Liquidity needs are reduced, as PSPs do not need to require liquidity continuously but only at designated settlement times (a possible exception being a requirement from the FPS operator to post additional cash collateral) and only for their net debit positions.

On the other hand, the buildup of settlement obligations between PSPs (for example, their net debit positions) gives rise to credit risk: the PSP of the payee credits the funds related to a fast payment in the account of its customer *before* receiving the funds from the PSP of the payer. There is thus an implicit credit extension by the PSP of the payee to the PSP of the payer until final inter-PSP settlement takes

place. It is generally infeasible to reverse fast payments if a PSP does not have enough funds to satisfy its net settlement obligations in the FPS.

Credit and other settlement risks associated with the deferred settlement model may be mitigated with appropriate risk-management tools and mechanisms, including having frequent settlement cycles during the same day to avoid the buildup of net debit positions, setting limits on net debit obligations, collateralization of forecasted net debit positions, prefunding by individual participants so that their net debit position in the FPS cannot exceed the prefunded amount, and/or loss-allocation arrangements. These risk-management mechanisms are not different from those that are applied in other payment systems with deferred net settlement. A brief description of each is provided in box 3.

It is important that measures to limit or mitigate credit risk be balanced well so that the costs they generate on PSPs

BOX 3 COMMON MECHANISMS TO MITIGATE CREDIT RISK ASSOCIATED WITH DEFERRED SETTLEMENT

The following measures and mechanisms are not mutually exclusive. FPS operators often apply a combination of them:

Loss-sharing agreements: These agreements detail, ex ante, how the “surviving” participants would cover the loss created by a defaulting participant. A typical example is settlement guarantee funds, which aim to ensure that resources are available to support settlement of net debit positions in each settlement cycle. Collateralization of net debit positions can be partial or total, depending on whether the posted collateral is intended to cover the forecasted maximum net debit position of the largest participant (that is, “cover one”), the forecasted maximum net debit positions of all participants (“cover all”), or some intermediate case. Fuller collateralization means lower risk but also places a higher burden on PSPs. Issues may still arise related to the ability to access and realize such collateral to support a settlement cycle, particularly outside normal business hours. Moreover, collateral other than cash can be subject to credit, liquidity, and market risks.

Limits on the maximum net debit or credit positions that can be established between participants or to the maximum gross aggregate positions: These limits could be bilateral (between pairs of PSPs) or multilat-

eral, and they may be established and controlled by the FPS operator or managed on a bilateral basis between PSPs. In the absence of additional measures, these limits do not provide coverage against credit risk but ensure that the maximum risk that can arise in the system is capped.

Limits to the maximum value of individual fast payments that can be processed: This type of measure does not strictly limit the maximum net debit or credit position that can be established between PSPs, but a low limit would typically reduce the likelihood that large net positions arise between them. A very low limit may nevertheless reduce the value proposition of the FPS for consumers and, especially, corporate customers.

Prefunding of positions by individual participants: Prefunding by means of cash coupled with operational controls that keep positions from exceeding prefunded amounts is designed to allow full mitigation of the credit risk associated with deferred settlement. The assumption is that settlement positions will be covered by the prefunded cash in the event of an insolvency. Fast payments are then settled against a payment capacity collateralized with funds deposited with a trusted party (typically the local central bank).

are not too onerous¹⁰ and/or they do not complicate unnecessarily the operation of the FPS. For example, if limits are too low for a specific FPS environment, fast payment orders sent by a PSP that has reached its maximum net debit position or exhausted its collateral will be rejected. These rejections will be immediately apparent for end users.

Finally, it should always be kept in mind that when inter-PSP settlements occur outside normal business hours, the provision of additional liquidity to support settlement can be challenging for an FPS even if it uses a deferred settlement arrangement. Among other possible contingencies, a participant may be required to enhance its prefunding lev-

els or its pledged collateral if there is an unforeseen increase in transactions. This is an important reason to try to coordinate settlement cycles with the operating hours of the local RTGS system to be able to access its intraday liquidity facilities and/or to extend the opening times of the RTGS system (or other relevant central bank settlement system). It should also be noted that a reliable and efficient technical interface between the FPS and RTGS system—assuming the two are different platforms—is crucial to ensure an effective exchange of data between them, which in turn would ensure that the FPS operates effectively.

3.6 SELECT COUNTRY FINDINGS ON SETTLEMENT MODELS USED FOR FAST PAYMENTS

TABLE 1 Indicative settlement models and processes

Jurisdiction and FPS	Settlement Model	Settlement Setup	Brief Description of the Settlement Process
AUSTRALIA (NPP)	Real time	Distributed clearing	<p>Once a payment order has been cleared by the payee's PSP, the payer's PSP payment gateway automatically initiates settlement by sending a settlement request to the Fast Settlement Service (FSS). FSS tests whether the payer institution has sufficient funds and then transfers value between the two parties' settlement accounts at the central bank in real time. The FSS then sends settlement confirmation to both parties.</p> <p>NPP payments are settled by the FSS independent of other types of payments submitted to the RTGS system: Participants can split liquidity in their settlement account for NPP payments or RTGS payments. However, the entire funds in a participant's settlement account are available to settle NPP payments outside of business hours/on weekends.</p> <p>The central bank assists participants with their liquidity management through the automated system liquidity-management tools in the RTGS system. Eligible institutions can also access the central bank's standing facilities.</p>
BAHRAIN (Fawri+ which is supported by the EFTS)	Deferred settlement (with multilateral netting)	Hub	<p>Banks' net clearing obligations on Fawri+ are settled in the central bank RTGS system in two cycles: at 9 am and 1:30 pm on business days, using net settlement. Transactions during the weekend are settled in the first cycle of the next business day. The FPS operator is discussing with the central bank adding one more settlement cycle on business days.</p> <p>Banks can monitor in real time incoming and outgoing transactions, so that they can ensure adequacy of funds.</p> <p>Daily Fawri+ transactions for customers have been capped at BD 1,000 (\$2,650) per account per day by the central bank to minimize liquidity risk.</p>
BRAZIL (Pix)	Real time	Hub	<p>Pix payments are settled in special-purpose accounts held at the Central Bank of Brazil's <i>Sistema de Pagamentos Instantâneos</i> (SPI). SPI is the settlement engine for Pix. Pix direct participants must prefund these accounts, and no overdraft is allowed.</p> <p>The central bank provides liquidity during the working hours of the STR (<i>Sistema de Transferência de Reservas</i>, or Reserves Transfer System) RTGS system (6:30 am to 6:30 pm Monday–Friday). Costless standing facilities are available to banks, while payment institutions (that is, non-bank PSPs offering e-money services) can fund their settlement account with the balances that their customers have in prepaid payment accounts. The central bank also opened a new window (6:30–7 pm) during which banks can use their reserve requirement balances to fund their SPI/Pix account. They can also use a new credit facility (repurchase agreement) that costs 90 percent of Brazil's monetary policy rate.</p>

TABLE 1 *continued*

Jurisdiction and FPS	Settlement Model	Settlement Setup	Brief Description of the Settlement Process
CHILE (TEF)	Deferred settlement (with multilateral netting)	Hub and distributed clearing	<p>TEF has multiple settlement mechanisms in place. Participants can choose either to clear transactions through the FPS operator Combanc (settling in the RTGS system at the end of the day) or to settle their obligations directly through the RTGS system in a different cycle. Non-banks can send indirect payment instructions through both mechanisms.</p> <p>TEF participants are required to prefund their settlement accounts at the central bank to mitigate credit/liquidity risks.</p> <p>The central bank provides liquidity to commercial banks through open market operations and short-term credit through standing facilities.</p>
CHINA (IBPS)	Deferred settlement (with bilateral netting)	Hub	<p>Transactions cleared in IBPS are settled using the central bank's RTGS system. In 2021, six cycles per day were used.</p> <p>The central bank has incorporated liquidity risks of IBPS into the RTGS overall liquidity management by sharing settlement account funds with the High-Value Payment System and the Bulk Electronic Payment System.</p> <p>Credit risk is controlled through a net debit limit mechanism, which means participants can conduct transactions only within their net debit limit.</p>
EUROPEAN UNION (TIPS ¹¹)	Real-time settlement	RTGS based	<p>Settlement takes place in central bank money, for which reason participation in TIPS depends on being eligible to access central bank money. Hence, to open an account in TIPS in euros, a PSP needs to fulfill the same eligibility criteria that are required for participation in TARGET2.</p> <p>Nevertheless, in some European Union countries, for domestic payments, PSPs that are unable to participate directly in TARGET2 may still be able to use a purely domestic FPS solution.¹²</p> <p>In TIPS, participating PSPs can set aside part of their liquidity in a dedicated account opened with their central bank, from which fast payments can be settled. It is possible to add funds to TIPS accounts only during TARGET2 operating hours.</p>
HONG KONG (FPS)	Real time	Hub	<p>Each settlement participant has a settlement account (including an FPS ledger account and also a ledger account at the local RTGS system, called the Clearing House Automated Transfer System, or CHATS) with the Hong Kong Monetary Authority (HKMA).</p> <p>FPS uses real-time settlement across the books of the HKMA (for payments in Hong Kong dollars) and the Bank of China-Hong Kong (for payments in renminbi) as long as sufficient funds are in the FPS ledger accounts of the originating participant.</p> <p>An auto-sweeping mechanism for both Hong Kong dollars and renminbi is in place to support fund transfers between the RTGS and FPS accounts. Auto-sweeping is based on the parameters of minimum balance, maximum balance, and desired balance.</p> <p>Each indirect participant keeps an account with a settlement participant and agrees bilaterally with the latter on the terms and conditions for processing payment orders.</p>
INDIA (IMPS and UPI)	Deferred settlement (with multilateral netting)	Hub	<p>Settlement services in IMPS and UPI are performed by the FPS operator NPCI in the central bank RTGS system. Participant settlement positions are passed as "multilateral net settlement batches" using the Net Settlement Interface. NPCI must publish the arrival time of the net settlement positions for members to ensure adequate funds availability.</p> <p>While the approach and process are similar, NPCI separated IMPS and UPI settlements because the net obligations had to arrive separately for the two systems in line with legal and regulatory requirements.</p> <p>Settlement for IMPS and UPI takes place six times a day on RTGS working days. (RTGS is now available on a 24/7 basis.)</p>

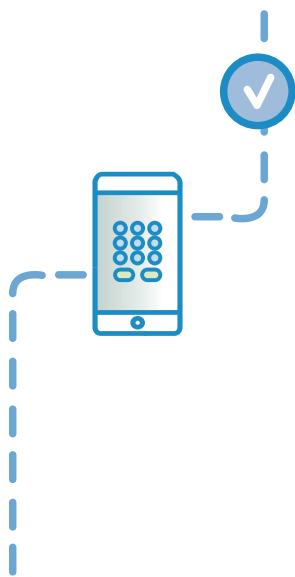
TABLE 1 *continued*

Jurisdiction and FPS	Settlement Model	Settlement Setup	Brief Description of the Settlement Process
KENYA (PesaLink)	Deferred settlement (with multilateral netting)	Hub	<p>PesaLink transactions are settled in the central bank RTGS system in two cycles daily on working days. It is expected that the number of daily settlement cycles will be increased to five as transactions pick up. Transactions on weekends and during the off hours of the RTGS system are settled in the first working cycle of the next working day.</p> <p>To reduce credit and liquidity risks, there is a customer transaction limit of K Sh 1 million (\$8,300). Direct participants (that is, banks) are required to maintain collateral at the RTGS system.</p>
MALAYSIA (RPP)	Deferred settlement (with multilateral netting)	Hub	<p>Settlement is executed via the domestic RTGS system in two cycles per day. The first cycle occurs at 11 am. The second occurs at 3:50 pm.</p> <p>For liquidity management, the central bank provides a collateralized intraday credit facility via the RTGS system.</p>
MEXICO (SPEI)	Real time (with adaptations)	RTGS based	<p>SPEI uses a real-time hybrid settlement model. A multilateral offsetting algorithm runs in quick succession (every three seconds or a configurable number of payments) to clear and settle transactions. The algorithm selects those transactions that can be settled based on available balances in the participants' settlement accounts and clears and settles in batch mode. Participants can classify their transfer orders as high priority, and SPEI will also try to settle these orders first. Orders that cannot be settled because of lack of funds remain in the queue, except for CoDi transfers (the overlay service).</p> <p>At the start of daily operations and during the day, participants transfer funds from their accounts at the central bank's Account Holders Service System (SIAC) to their SPEI account. These liquidity transfers can be conducted from 7 pm to 6 am of the following banking day. At the end of the day, positive balances in SPEI are credited back to participants' current accounts in SIAC or to a concentration account within the system for participants without a SIAC account.</p> <p>The central bank provides an intraday liquidity facility to commercial banks only. Payment orders are capped at Mex\$8,000 (\$400) after 5 pm and until early in the morning.</p>
PAKISTAN (RAAST)	Deferred settlement (with multilateral netting)	Hub	<p>Settlement is performed in multiple sessions/cycles per day (two cycles as of May 2021, although more are expected soon).</p> <p>Direct participants in RAAST are also participants in the central bank RTGS system. They reserve funds for RAAST settlements by transferring funds from their RTGS settlement account into their reserve account. Operating limits per participant set in RAAST can never exceed the amount they have reserved in the RTGS system.</p> <p>At the end of a clearing session, RAAST prepares the net settlement batch. Settlement instructions are sent to the RTGS system before 5 pm. (RAAST operates from 8 am to 5 pm Monday–Friday.) Once RAAST is notified that the settlement was successful, the position in RAAST is reset to zero.</p> <p>Participants can monitor their interbank payments via their settlement account in the RTGS system, including instructions settled, payments queued, or rejected. They can also manage priorities for queued payments.</p> <p>The central bank provides an intraday liquidity facility.</p>
POLAND (Express Elixir)	Real time	Hub	<p>Express Elixir has adopted a prefunding model in which all participating banks deposit funds in advance in a fiduciary account maintained at the central bank RTGS system. Balances in this account determine whether a participant may submit payment orders.</p> <p>Participants have a “basic limit” and a “lower limit.” The moment their balance in the fiduciary account reaches the lower limit, the system will immediately inform the participant. Participants manage their liquidity in this fiduciary account by making transfers from (or sending surplus of funds to) their RTGS account.</p> <p>To manage risks, each participant also defines the single transaction value limit. If the limit for sent orders is exceeded, the payment order is rejected immediately.</p>

TABLE 1 *continued*

Jurisdiction and FPS	Settlement Model	Settlement Setup	Brief Description of the Settlement Process
SINGAPORE (FAST)	Deferred settlement (with multilateral netting)	Hub	<p>Settlement takes place in two cycles per business day via the domestic RTGS system, which was enhanced to cater to the settlement of the FAST interparticipant clearing obligations. The FPS operator prepares the net settlement files and sends them to the RTGS system for settlement.</p> <p>In terms of risk management, the “risk position” is defined as the net of outflows versus inflows. Participants must post collateral to cover the net outflow position; otherwise, the participant will not be allowed to transact further until the net outflow position is reduced.</p>
THAILAND (PromptPay)	Deferred settlement (with multilateral netting)	Hub	<p>PromptPay transactions are settled in two cycles per day through the local RTGS system. The FPS operator creates the settlement file and sends it to this system.</p> <p>A throughput guideline requires the main participants to submit at least 30 percent of their transactions by noon and at least 70 percent by 3 pm.</p>
UNITED KINGDOM (FPS)	Deferred settlement (with multilateral netting)	Hub	<p>FPS transactions are settled in three cycles per day on working days via the local RTGS system. For transactions that take place during the weekend, settlement occurs in the first cycle of the next working day.</p> <p>The net sender cap (NSC) is a measure to control settlement risk. It is the maximum amount that participants are allowed to send having netted off the value received from the value sent at that time. NSC also reflects the collateral that participants will need to hold at the central bank.</p> <p>Whenever a participant encounters difficulty in meeting its settlement obligations, the FPS operator instructs the central bank to use cash held in the participant’s collateral account (RCA) to meet the settlement obligations. In that circumstance, the FPS would reduce the bank’s NSC before the central bank debits the RCA.</p> <p>Direct participants are responsible for providing infrastructure and settlement facilities to indirect agencies.</p>
UNITED STATES (RTP)	Real time	RTGS based	<p>Settlement in RTP is done using a real-time settlement model through a fully prefunded account jointly owned by all the participating entities in the Federal Reserve. All payments are prefunded by the sending participant into the joint account.</p> <p>The FPS operator has established a prefunded requirement for each sending participant. Financial institutions that do not fund for themselves must have an arrangement in place with another financial institution for fulfilling funding obligations.</p> <p>RTP verifies and reserves settlement capacity by the sending participant before forwarding the payment to the receiving participant. In case the sending participant has an insufficient prefunded position to cover a payment, the core infrastructure will reject the payment. Overdrafts or negative prefunded positions are also not permitted.</p> <p>RTP continuously records net position and current prefunded position. In case of successful transfer, RTP records entries by decreasing the net position and current prefunded position of sending participants (or its funding provider) and increases the net position and current prefunded position of receiving participants (or its funding provider). Settlement with respect to a payment message is deemed complete when RTP has recorded both the decrease in the sending participant’s net position and the increase in the receiving participant’s net position in the joint Federal Reserve account.</p>

Source: Authors’ elaboration based on World Bank (2021).



4 IMPLICATIONS OF EACH SETTLEMENT MODEL FOR A PARTICIPANT'S ABILITY TO ACCESS AN FPS

The participation of a wide range of banks and non-bank PSPs is crucial to the success of a fast payments arrangement, including for promoting and maintaining a more competitive and dynamic market for payment services.

In practice, jurisdictions have only direct participants, a combination of direct and indirect participants, and/or a hybrid mode. (See below.)

Direct Access/Direct Participation

Direct access means that a participant submits its payment instructions directly to the FPS (in a hub or RTGS-based setup) *and* is responsible vis-à-vis the system and other direct participants for the settlement of its positions. If the FPS settles in central bank money, a participant may have direct access to a settlement account as well as to some central bank credit facilities (for example, intraday credit) or have direct access to a settlement account only.

Direct access to the FPS—and to any payment system—features significant advantages, including speeding up payments and reducing transaction costs by eliminating the need to rely on a third party for executing payment orders. Furthermore, direct access gives participants better control over the quality of payment services they offer to their customers.

Earlier FPSs that were introduced around 2010 typically started by allowing only commercial banks to be direct participants. The reasoning was that banks are comprehensively regulated, are subject to stringent capital requirements, and in general were considered safer for limiting settlement risks. For example, banks have more tools at their disposal to manage liquidity risk, such as full access to the interbank

money market and to intraday lending and other short-term credit facilities from the central bank.

From a regulatory and oversight perspective, direct access provides central banks with a channel to observe the operational and financial performance of the direct participants.

Various requirements typically need to be fulfilled to qualify for direct participation in an FPS. The criteria include, by design, the ability to debit/credit customer accounts in real time, together with various other operational, financial, and legal requirements.¹³ In addition, an FPS operator/manager will usually require participants to have a robust risk-management framework, including adherence to recognized standards for anti-money laundering and combating the financing of terrorism. Many FPS operators also establish holding a settlement account at the central bank as a prerequisite for direct participation. (Section 4.4 elaborates on this last aspect.)

Some entities that in principle would be eligible for becoming a direct participant may nevertheless choose not to be one. This could be due to high costs (including high compliance and other administrative costs) that harm their cost-benefit equation. In practice, the World Bank has observed that some central banks mandate direct participation from at least commercial banks. Other central banks do not make such direct participation mandatory but have introduced incentive measures to boost adoption by participants.

Indirect Access/Indirect Participation

Indirect access occurs when a PSP uses another PSP that is a direct participant in the FPS (for example, a sponsor bank) to act on its behalf as a settlement agent.

Indirect participation in an FPS (or another payment system, such as the RTGS system) brings certain benefits to market players, end users, and the payments market as a whole, but it also raises a number of concerns.

On one hand, this arrangement makes it possible to extend the range of entities that can use the fast payments arrangement in one way or another, so that they can bring the underlying services to their customers. In fact, in most countries, the high investment, maintenance, and compliance costs associated with direct participation in an FPS might discourage small banks as well as various types of non-bank PSPs from accessing the system in a direct manner.

Indirect participants, on the other hand, necessarily rely on the services of competitors to access the FPS and may be required to provide them with sensitive business information. More broadly, Bossone, Srinivas, and Banka (2020) identified the following potential disadvantages of a PSP accessing an FPS indirectly:¹⁴

- i. Indirect participants may not have a wide enough choice of sponsor banks and/or may find it difficult to make meaningful comparisons between various service offerings.
- ii. Sponsor banks may require commercially sensitive information from an indirect participant to start or continue providing settlement services to it.
- iii. Fees for securing indirect access may be too high and become a barrier for indirect participants to provide payment services to their customers in competitive terms.
- iv. A sponsor bank may not be providing the technical support required by the indirect participant, and/or the technical access capabilities provided to the latter may be far inferior to those available to direct participants. (For example, indirect participants may not be able to achieve near-real-time service provision due to these limitations.)
- v. A sponsor bank may discontinue the supply of indirect access even if the indirect participants continue to comply with all relevant regulatory requirements.¹⁵
- vi. Indirect access can raise credit and liquidity risks when receipt of funds belonging to indirect participants are held by the direct participant and not credited immediately.

In general, non-bank PSPs have had to access FPSs indirectly (the same applies for several other key payment infrastructures), having to sign a contract with a bank that is a direct participant in order to use the FPS.

However, this is changing: some jurisdictions have expanded direct access to at least some types of non-bank PSPs to promote innovation, improve customer experience, increase competitiveness of offerings, and drive financial inclusion. (See section 4.1 for more details.)

Hybrid Forms of Access

In some FPSs, some non-bank PSPs can connect directly to the infrastructure but still have to rely on a commercial bank to fulfill their settlement obligations. This would not qualify as direct access, as this modality entails submitting payment instructions directly to the system *as well as* being responsible for the settlement of their positions. With this hybrid form of access, the relevant participants improve their control over their payment orders.

Yet in other FPSs, such as UPI in India, other parties (different from banks or non-bank financial institutions) are granted a form of “access” to the system. These parties are typically third-party service providers engaged in the business of payment initiation and therefore access the FPS through a third-party account-initiation mode.

4.1 CURRENT OVERALL STATUS OF BANKS’ AND NON-BANKS’ ACCESS TO FPS

The World Bank (2021) observed that a slight majority of the jurisdictions it studied still allow only banks as direct participants. It nevertheless noticed that some jurisdictions that did not allow direct participation of non-bank PSPs in their FPSs in the recent past are now allowing it. Select findings on participants’ access to FPSs from this study are shown in table 2.

The CPMI, in its report *Developments in Retail Fast Payments and Implications for RTGS Systems*, published in December 2021, surveyed FPS access conditions across 26 CPMI jurisdictions (and a total of 31 FPSs). It found that banks can be direct participants in all such systems, while non-bank PSPs can be direct participants in 16 systems.¹⁶ Moreover, CPMI also compared access criteria for the FPSs with those of the domestic RTGS system. In this last regard, it found out—surprisingly—that in 11 FPSs access criteria are more restrictive than those of the RTGS system (meaning, among other things, that these FPSs allow direct access only by banking entities, whereas the domestic RTGS system allows access by more types of participants). In 12 FPSs, it is about the same, and in eight it is less restrictive. Appendix A of this focus note presents the summary table from CPMI’s report.

TABLE 2 Select Findings on Participant Access to FPS

AUSTRALIA (NPP)	<p>Financial institutions can either become full participants through direct membership or opt for indirect membership. NPP allows authorized deposit-taking institutions (ADIs) or restricted ADIs that have a settlement account with the central bank as full participants. These ADIs include banks, building societies, and credit unions.</p> <p>Other categories include “settlement participants” and “identified participants.” NPP full participants can perform clearing functions on behalf of the settlement participants and can also perform clearing and settlement functions on behalf of identified institutions. NPP also allows “connected institutions” to connect directly with the system, although the latter are able to initiate payments only from a customer’s account and do not provide clearing and settlement services.</p>
BAHRAIN (Fawri+)	<p>A central bank directive provides the eligibility criteria for licensed retail banks and non-bank PSPs to participate in Fawri+. Essentially, a direct participant is a bank having direct technical access to the near-real-time electronic funds transfer system (EFTS) and is a member of the domestic RTGS system.</p> <p>All banks are required by the central bank to accept inward Fawri+ payments and must provide at least one bank access channel to make outward Fawri+ transactions. Currently, all retail banks are direct participants.</p> <p>Non-bank PSPs participate only indirectly under the “online biller” category. Through a technical link to one of the modules in the EFTS infrastructure, a PSP can provide fast payment services to their customers using a subposition account under a direct participating bank that holds its clients’ money accounts.</p>
BRAZIL (Pix)	<p>Pix is open to a broad range of authorized participants. Participation is mandatory for any bank or other PSP operating more than 500,000 customer accounts. Non-bank PSPs that issue prepaid payment accounts can be direct participants. The only difference between them and banks in Pix is that they cannot access central bank liquidity.</p> <p>Other non-banks that do not have a license from the central bank to issue e-money can access Pix only indirectly, by establishing a sponsorship contract with a direct Pix participant.</p> <p>The central bank has also enabled open application programming interfaces (APIs) to third-party access. Access to APIs is now open to authorized payment-initiation service providers.</p>
HONG KONG (FPS)	<p>A direct participant is a licensed bank in Hong Kong that also participates in the CHATS of the relevant currency.</p> <p>An indirect participant is a stored-value facility licensed by the HKMA. It has access to all FPS services and engages a direct participant for settling funds in FPS.</p>
INDIA (IMPS and UPI)	<p>Banks and prepaid payment instrument (PPI) licensees can be direct participants in the FPSs. For IMPS, they must be members of the local RTGS system, while for UPI, banks must be live members of IMPS.</p> <p>PPI licensees can also choose to connect to IMPS and UPI to send payment orders but have settlement done via a sponsor bank. Other banks also have the option of connecting to IMPS indirectly through a sponsor bank.</p> <p>UPI allows third-party application payment-initiation service providers, such as Google Pay or Amazon Pay, to connect to banks to provide UPI services.</p> <p>As of late 2020, 26 PPIs had joined IMPS, while 21 third-party application payment-initiation service providers participated in UPI.</p>
KENYA (PesaLink)	<p>Member banks of the Kenya Bankers Association, including microfinance banks, can become direct participants in PesaLink. One of the requisites is to have a settlement account at the central bank.</p> <p>Non-bank PSPs, such as payment service aggregators, can participate as indirect participants only, through sponsorship arrangement with participating banks.</p> <p>There are plans to allow the latter entities to connect directly to PesaLink.</p>
MALAYSIA (RPP)	<p>Participation in the prior FPS was limited only to banks. Pursuant to the Interoperable Credit Transfer Framework issued by the central bank, which came into effect on July 1, 2018, the RPP operator PayNet has implemented an open-access regime by which all banks and eligible non-bank PSPs (an “approved” e-money issuer or a “registered” merchant acquirer) can also become direct participants. Eligibility criteria for e-money issuers is related mainly to their relevance in the market (that is, their size), while for merchant acquirers it is related mainly to their financial strength.</p> <p>As RPP settles all transactions in the RTGS system, holding a settlement account in this system, which is operated by the central bank, is an indispensable requirement. Non-bank PSPs that do not fulfill this requirement may appoint a settlement bank to settle the RPP transactions on their behalf.</p> <p>As of 2021, 30 banks and six non-bank PSPs were direct participants in RPP.</p>
MEXICO (SPEI)	<p>All banks and non-bank financial entities that are regulated and supervised by the central bank or other Mexican financial authorities are eligible as direct participants. In fact, licensed non-bank e-money issuers are required to become direct participants in SPEI once they have reached a certain number of customer accounts or transaction volume. Access requirements are essentially the same for all participants, thus ensuring equal treatment.</p> <p>SPEI participants are also able to participate in the overlay service CoDi if they fulfill a functionality certification as well as technological requirements specific to CoDi. Banks participating in SPEI that have more than 3,000 accounts and offer fund transfers through an app are mandated to offer CoDi to their customers.</p>

TABLE 2 *continued*

NIGERIA (NIP)	NIP allows banks as well as non-bank PSPs as direct participants. NIP commenced with only two commercial banks as participants. Today, the number of participants has grown to include all commercial banks, microfinance banks, and mobile money operators.
PAKISTAN (RAAST)	RAAST admits direct participants, indirect participants (all entities that do not have access to local RTGS system), and subparticipants. (The latter have an account in the local RTGS system as a subaccount of the direct participant.) In practice, only banks and microfinance banks can access RAAST as direct participants. Some government entities can also access RAAST directly as “special members.”
POLAND (Express Elixir)	In Express Elixir, only direct participation is provided for, and only banks participate. Non-bank PSPs do not have access to the RTGS settlement accounts and therefore cannot participate in Express Elixir. Apart from direct participants, Express Elixir developed the concept of the “participant unit.” Each participant may register one or more participant units (for example, a bank’s branch), which are explicitly identified in the system. These participant units may independently submit and accept payment orders based on their specific needs.
SINGAPORE (FAST)	The Monetary Authority of Singapore allows banks and eligible non-bank financial institutions to have direct access to FAST and the overlay service PayNow. The first wave of non-bank financial institutions went live as FAST participants in February 2021. As of 2021, FAST had 28 institutions participating directly (23 banks and five non-banks) and did not have any indirect participants.
THAILAND (PromptPay)	Both commercial banks licensed under the Commercial Banking Act and special financial institutions established by a specific law can become direct participants of PromptPay. Non-bank PSPs can also connect directly to PromptPay. However, settlement is via a sponsor bank; therefore, they are regarded as indirect participants. As of 2021, 24 commercial banks were connected as direct participants, while seven non-bank PSPs were connected as indirect participants.
UNITED KINGDOM (FPS)	FPS allows participation through three categories: (i) directly connected settling participants, (ii) directly connected nonsettling participants, and (iii) indirect agencies. There are detailed guidelines for participation under each category. Participants in the first category are regarded as direct participants. Currently, both banks and non-bank PSPs can become direct participants. They must have a settlement account with the central bank. Non-bank PSPs that do not have a settlement account with the central bank can become a directly connected non-settling participant. In this case, they are required to have an agreement with a sponsor bank. PSPs in this category must still comply with FPS rules, assurance, and attestation requirements. Lastly, indirect agencies get their agency arrangements from any of the entities that are directly connected to the central infrastructure of FPS.
UNITED STATES (RTP)	RTP allows every federally insured depository institution to connect. Institutions can connect to the system either directly or through third-party service providers. Non-bank PSPs, such as PayPal or Venmo, use RTP, submitting transactions via their banks. RTP participation rules define the following four participant categories: Funding participant: A participant that has become a party to the RTP “Prefunded Balance Account Agreement”—which is used for the purpose of supporting the operations of RTP—and requests and receives disbursements from the Prefunded Balance Account to its Federal Reserve account. In case it is a sending participant, it is required to fulfill prefunding obligations. Nonfunding participant: A participant that is not a funding participant and has designated a funding agent to act on its behalf to prefund obligations. Receiving participant: A participant that holds the receiver’s account and receives a payment message. Sending participant: A participant that holds the sender’s account and initiates a payment message. A participant must be either a funding participant or a nonfunding participant, <u>and</u> must be a receiving participant. A participant also may be a sending participant. As of November 2020, 63 participant banks and credit unions were in RTP, together with 19 third-party service providers and four funding agents.

Source: WB 2021.

4.2 IMPLICATIONS OF THE REAL-TIME SETTLEMENT MODEL FOR ACCESS

Liquidity management is perhaps the biggest challenge of an FPS with real-time settlement. Therefore, some banks or other PSPs with fewer tools to manage their liquidity position in the FPS may find it difficult to join the system as a direct participant or remain in it under that status.

Banks are normally required to maintain a reserve requirement with the central bank. In the vast majority of jurisdictions, those funds (or a share thereof) can be used during the day for making payments in the FPS operated by the central bank or for settling in the RTGS system positions from an FPS operated by the private sector.¹⁷

On the other hand, non-bank PSPs that do not engage in financial intermediation are not required to hold a reserve requirement with the central bank. Instead, many of them (for example, e-money institutions, issuers of other prepaid instruments, and so forth) are required to hold all customer funds in a commercial bank in a fiduciary account, trust account, or similar. Box 4 discusses specific considerations for these non-bank PSPs—in particular, e-money institutions—in connection with their participation in an FPS as direct participants.

Another relevant tool for liquidity management is intraday credit and other short-term credit facilities provided by the central bank. Central banks have historically preferred restricting the provision of these forms of liquidity to commercial banks, supported by a number of arguments, including that only commercial banks are exposed to massive liquidity risk due to their intermediation role/term transformation function.¹⁹ In contrast, PSPs that operate on a fully funded basis, such as entities issuing prepaid cards, mobile money, and e-money in general—which, by regulation, may not run short of funds—should, in theory, never find themselves in need of financing short positions.²⁰ This would apply to non-bank PSPs of any size, including bigtechs. However, non-bank PSPs can still face periodic operational problems (for example, a delay in funding their FPS settlement account) that would make them unable to continue processing payments unless they had access to a credit facility.

Finally, on the operational side, a direct participant will need a fail-safe connectivity with the FPS for both clearing and settlement. In the hub or RTGS-based setups, clearing and settlement are concomitant, but this may not be the case for the distributed-clearing approach, where clearing between PSPs and settlement with the central bank (or other settlement agent) are separated (although they run in parallel).

BOX 4 E-MONEY INSTITUTIONS JOINING AN FPS AS DIRECT PARTICIPANTS—CONSIDERATIONS ON LIQUIDITY SOURCES

Worldwide, a common regulatory practice is for e-money institutions (including issuers of prepaid products redeemable in cash) to hold the customer funds they have received in exchange for the e-money issued in a trust/fiduciary account (or equivalent) at one or more commercial banks or, in some cases, with the central bank.¹⁸

In practice, these funds represent the liquidity that e-money institutions possess to face their day-to-day operational obligations vis-à-vis their customers, be it to cash out their resource funds or to make a fund transfer to other account holders.

In this specific sense, these resources are similar to the reserve requirements that banks hold with their central bank. And, in this context, there is no *a priori* reason for forbidding these funds from being used as a main liquidity source for customer-initiated payments in an FPS, just as banks do daily with their reserve

requirements (or a part thereof). If such a prohibition for non-banks were to exist, e-money institutions would need to find additional resources (for example, own resources or loans from other institutions) to fund their settlement account with the FPS. This would very likely make direct participation in an FPS unviable for such non-bank PSPs.

On the other hand, it is worth noting that using the funds deposited in a trust/fiduciary account at a commercial bank would require the bank to transfer the needed funds to the e-money institution's settlement account at the central bank (or other settlement agent). This would need to occur in a very speedy, efficient, and low-cost manner, so that e-money institutions would be in a position to offer fast payment services to their customers in conditions largely equivalent to those that banks offer to their own customers.

4.3 IMPLICATIONS OF THE DEFERRED SETTLEMENT MODEL FOR ACCESS

As explained in section 3.5 above, FPSs with deferred settlement give rise to credit risk. Therefore, a major challenge for an entity to become a direct participant in an FPS using this settlement model would be having the necessary financial resources and other tools and expertise to be able to participate in the risk-management mechanisms established by the FPS operator/manager, such as prefunded collateral and loss-sharing arrangements. (See box 2.) Indeed, privately operated FPSs that use deferred net settlement very often restrict direct participation to entities with “acceptable” risk profiles to minimize credit risk in the system (and other risks, such as operational and liquidity).

Some FPSs may also require prefunding of the expected end-of-cycle net debit position (possibly in addition to posting collateral or other prefunded mechanisms). In cases like these, for non-bank PSPs that hold customer funds in fiduciary accounts with banks, challenges for direct participation in an FPS with deferred settlement would be similar to those described in section 4.2 for FPSs with real-time settlement.

Likewise, even if FPSs with deferred settlement reduce liquidity requirements, participants may still find it difficult in some situations to access the necessary liquidity to fund their net debit position. (See section 3.5.) The challenges for non-bank PSPs in accessing central bank liquidity facilities explained in section 4.2 are also applicable here.

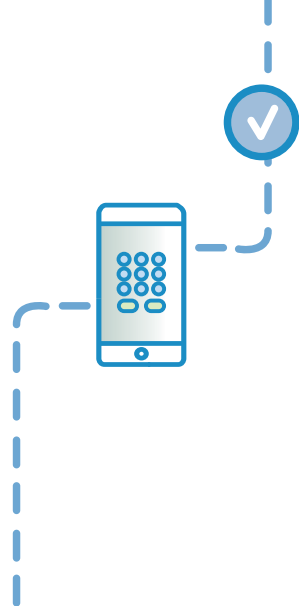
4.4 IMPLICATIONS OF SETTLING IN CENTRAL BANK MONEY

The central bank is by far the most common settlement agent for FPS interparticipant obligations, including for FPSs that are owned and operated privately. In fact, as mentioned in section 3.4, in all of the 16 countries that were studied by detail by the World Bank (2021), participants in the FPSs settle their final obligations in central bank money, either in the RTGS system or another central bank system.

One of the implications of an FPS settling in central bank money is that direct participants will need to have a settlement account with the central bank. In this sense, it is important to notice that the rules and terms governing who can hold an account with the central bank would also determine who can become a direct participant in the FPS. In other words, it is possible for operators/managers of an FPS to intend to have an open-access policy, aiming at allowing various types of non-banks to act as direct participants together with commercial banks. However, if this FPS settles in central bank money, and the rules for accessing central bank settlement accounts are much more restrictive (for example, they are open only to banks or a few types of large non-bank financial institutions), then direct access to the FPS will be automatically restricted.

Moreover, as mentioned earlier, the terms governing who is permitted to hold a central bank settlement account are very often complemented by terms governing which account holders can obtain central bank credit, such as intraday credit for reducing settlement risk.

Although not very common, an FPS can settle in commercial bank money. In this case, the intended direct-access policy of the FPS operators/managers could be applied in practice with lesser restrictions—as long as the banks (and other entities) that are direct participants in this arrangement do not oppose a certain type of PSP settling its own obligations. On the other hand, having a commercial bank as the settlement agent for an FPS (or any other major payment system) brings in some additional risks that need to be managed effectively. In particular, settlement risks could arise as—different from central banks—commercial banks are not issuers of the settlement asset and have a much more limited financial capacity (liquidity, in particular) and tools to provide safe intraday or very short-term credit to FPS participants. Furthermore, these commercial banks are not free from potentially going into bankruptcy, which could have significant implications—for example, for the funds and settlement accounts that other FPS participants hold with them.



5 CONCLUSION

The choice of a settlement model for the FPS has important consequences for the safety and efficiency of this system and therefore will also have implications for system participants. Both the real-time settlement model and the deferred settlement model have potential benefits as well as potential downsides. The right choice of a settlement model will depend on the specific context of each FPS, including such aspects as the legal and regulatory framework of the relevant jurisdiction, the institutional setting, the market size and number of participants, and the degree of adoption of fast payments and of real-time payments more generally, among other features.

One relevant aspect that has emerged from the analysis is that, given that FPSs operate on a (nearly) 24/7 basis and the domestic RTGS systems usually do not, managing liquidity outside RTGS operating hours can be an issue of concern for participants, especially if the FPS is already processing significant volumes of transactions and transactions of significant value. Importantly, the difficulty of managing liquidity outside “normal” RTGS operating hours is not exclusive to FPSs in which real-time settlement has been adopted.

Another issue of particular interest for this focus note has been the potential implications of adopting a given settlement model for the ability of banks and other PSPs to obtain

and maintain direct access to the FPS. Once again, both settlement models can erect hurdles for banks and other PSPs participants for gaining direct access to the FPS, either because of the difficulty of accessing immediate liquidity in a real-time settlement model or because of the difficulty of fulfilling the credit risk-management measures in a deferred net settlement model. Nevertheless, it needs to be noted that non-bank PSP have been able to obtain direct access to FPSs that use either settlement model.

Finally, the potential role of central bank digital currencies and distributed ledger technologies (DLT) in facilitating and improving settlement in an FPS (and other central bank settlement systems) merits attention. Most central bankers will consider that wholesale central bank digital currencies already exist, as central bank money has been available in digital form for wholesale transactions between banks (and, in some cases, also other PSPs) for decades. The use of DLT may help improve and modernize existing interparticipant wholesale settlement mechanisms. For example, proponents of DLT highlight a range of benefits, such as the possibility of settling transactions instantly, around the clock, in a wider range of assets, and with a broader spectrum of participants. Users of DLT platforms could also program transactions to be settled automatically based on predefined conditions.



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APPENDIX A

FPS IN CPMI JURISDICTIONS

Fast Payments versus RTGS Participation: Criteria and Arrangements

Country	FPS name	Participation Criteria comparison			Access arrangements			
		<	=	>	Direct	Indirect	Bank	Non-bank
Argentina	Immediate Transfer	✓			✓		✓	
Australia	NPP			✓	✓	✓	✓	✓
Belgium	CEC.IP		✓		✓	✓	✓	
Brazil	SPI		✓		✓	✓	✓	✓
Canada	RTR			✓	✓	✓	✓	✓
China	IBPS		✓		✓	✓	✓	
Euro area	RT1	✓			✓	✓	✓	
Euro area	TIPS		✓		✓	✓	✓	
France	SEPA EU	✓			✓	✓	✓	
HK SAR	FPS			✓	✓	✓	✓	✓
India	IMPS UPI			✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓
Indonesia	BI-FAST		✓		✓	✓	✓	✓
Japan	Zengin System	✓			✓	✓	✓	
Korea	EBS CD/ATM	✓ ✓			✓ ✓	✓ ✓	✓ ✓	✓ ✓
Mexico	SPEI		✓		✓		✓	✓
Netherlands	equensWorldline IP CSM	✓			✓	✓	✓	
Russia	FPS	✓			✓		✓	✓
Saudi Arabia	sarie			✓	✓	✓	✓	✓
Singapore	FAST			✓	✓		✓	
South Africa	RTC	✓			✓		✓	
Spain	SNCE		✓		✓	✓	✓	
Sweden	BiR RIX-INST		✓ ✓		✓ ✓	✓ ✓	✓ ✓	
Switzerland	Twint SIC IP	✓	✓		✓ ✓		✓ ✓	— ✓
Turkey	FAST			✓	✓		✓	✓
United Kingdom	FPS		✓		✓	✓	✓	✓
United States	RTP FedNow Service	✓	✓		✓ ✓	✓	✓ ✓	— —

Source: CPMI (2021).

NOTES

1. According to CPMI, a fast payment can be defined as a payment in which the “transmission of the payment message and the availability of ‘final’ funds to the payee occur in real time or near real time on as near to a 24-hour and seven-day (24/7) basis as possible.”
2. In particular, see Banka H., Bossone B., and G. Srinivas (2020), “Granting access to Real Time Gross Settlement Systems in the fintech era”, *Journal of Payments Strategy & Systems* Vol. 14, No. 4 2020, pp. 1–17.
3. Unless the fast payment is a “pull transaction” (initiated with a request from the payee for a credit transfer). Pull-type payment transactions in fast payments are uncommon, though a nascent trend for enabling them is being observed.
4. Actual fast payment implementations may have some latency in certain activities, so payment speed is not always technically real time. For this reason, in this focus note, “close to real time” is used as an equivalent to “real time.”
5. Tiered participation arrangements in payment systems occur when some PSPs (indirect participants) rely on the services provided by other PSPs (direct participants) to gain indirect access to the services of a clearing and/or settlement infrastructure.
6. This, between the PSP that is an indirect participant in the FPS and its sponsoring PSP, which participates directly in the FPS.
7. Whether on a real-time or on a periodic, though frequent, basis.
8. As will be discussed in section 3.5, the real-time settlement model is more demanding on liquidity than a deferred settlement model that uses netting.
9. Many FPSs used, or still use, an upper limit on individual fast payments or daily limits.
10. Posting collateral carries opportunity costs. Posting collateral in cash also entails the loss of interest on the funds, since payment system operators typically do not pay interest on those funds.
11. In the European Union, there are various national FPSs, and TIPS was built to reduce potential fragmentation across the region.
12. These other infrastructures, generally known as “clearance and settlement mechanisms,” or CSMs, typically settle by adjusting balances of their participants in their own books, backed by a pool of funds held in a (national) central bank account.
13. Operational requirements include criteria relating to the participants’ ability and readiness to connect safely to the infrastructure and operate with minimal disruptions, if any. Financial requirements generally refer to a PSP having sufficient capital and liquid resources, while legal requirements may include licenses, authorizations, and approvals to conduct specific activities, as well as positive expert legal opinions on specific matters that the FPS operator/manager deems relevant.
14. Adapted from Bossone, Srinivas, and Banka (2020).
15. This was observed in the last few years in the cross-border context with the so-called “derisking” process, whereby several commercial banks started closing the accounts that remittance service providers had with them to operate their business.
16. It also found that eight FPSs handle only direct participants, while the rest permit both direct and indirect participants.
17. Normally, a bank would have to meet the requirement by the end of the day, or in many cases, the requirement is based on a weekly, biweekly, or monthly average.
18. In a few cases—for example, in Brazil and China—those funds must be maintained with the central bank. In Brazil, they can also be invested in treasury bills. In both cases, these funds can be used for making customer-initiated payments in the FPS.
19. For additional arguments, see Bossone, Srinivas, and Banka (2020).
20. An exception could be when funds belonging to these PSPs are held “in transit” by a sponsor bank in an FPS or other payment system.

