Committee on Payments and Market Infrastructures

Consultative report

Facilitating increased adoption of payment versus payment (PvP)

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BANK FOR INTERNATIONAL SETTLEMENTS

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Executive summary

In October 2020, the G20 endorsed a roadmap to enhance cross-border payments, developed by the Financial Stability Board (FSB) in coordination with the Bank for International Settlements' Committee on Payments and Market Infrastructures (CPMI) and other relevant international organisations and standard-setting bodies. The G20 cross-border payments programme aims to address long-standing challenges in the cross-border payments market, including high costs, low speed, limited access and insufficient transparency. This programme comprises the necessary elements of a globally coordinated response in the form of a set of 19 building blocks (BBs), based on a CPMI report to the G20 (CPMI (2020a,b)).

As part of BB 9, the CPMI Cross-border Payments Foreign Exchange Workstream (FX WS) has focused on facilitating the increased adoption of payment versus payment (PvP). PvP is a settlement mechanism that ensures that the final transfer of a payment in one currency occurs if and only if the final transfer of a payment in another currency takes place. PvP arrangements are designed primarily to reduce settlement risk in foreign exchange (FX) transactions and, depending on the design, can substantially reduce funding costs by offering functionalities such as netting to reduce participants' liquidity obligations. Other design features in PvP arrangements may also mitigate additional frictions in cross-border payments such as long transaction chains, limited operating hours and weak competition.

Many deliverable FX trades are not settled using PvP and the proportion of non-PvP settlement has increased since the early 2000s. This relative decline in PvP settlement is due to a combination of factors. First, existing arrangements do not support several emerging market economy (EME) currencies, in which trading volumes have increased substantially. Second, existing arrangements do not cater for the specific needs of all market participants or are deemed too expensive. Hence, although existing PvP arrangements have been successful at reducing settlement risk for much of the FX market, certain growing market segments remain exposed to settlement risk.

This consultative report provides a comprehensive overview of existing PvP arrangements as well as proposals for new solutions and suggests potential roles for private and public sector stakeholders to increase adoption of PvP. By publishing this report for consultation, the CPMI FX WS completes BB 9 Action 2b and initiates the public consultation in Action 3a to identify the most feasible options for encouraging greater use of PvP.

In developing this report, the CPMI engaged with the industry through a survey of four existing PvP arrangements and a call for ideas that yielded 16 responses from a range of interested parties including existing infrastructures, global banks, new entrants, and industry groups. Based on an analysis of the industry input, the report finds that:

- While existing PvP arrangements are available for the most traded currency pairs and products, they are not practicable for settling certain trades or they are too costly for some potential users.
- New PvP solutions, which are at varying stages of development, seek to complement the existing arrangements by targeting EME currencies, providing new functionalities such as settlement on demand, offering extended operating hours and expanding their service to retail users.
- Slow uptake of some existing PvP arrangements appears to reflect barriers that would similarly constrain the broad adoption of new solutions. These barriers include:

– weak incentives for users (ie banks and other market participants) to settle FX transactions on a PvP basis consistent with the *BCBS Guidance* (BCBS (2013)) and *FX Global Code* (GFXC (2021));

– technical challenges for PvP providers to access and interoperate with real-time gross settlement (RTGS) systems during operating hours that meet user demands; and

– complications for PvP providers to reconcile differences in national regulatory requirements (eg, around settlement finality and related protections).

- Private and public sector stakeholders, including central banks, can take on various roles to reduce these barriers and facilitate the increased adoption of PvP (Table 1).

Potential roles for private and public sector stakeholders to facilitate PvP adoption

Table 1

Stakeholders	Potential Roles
Private sector entities	1. Exploring potential changes to conventions for an international value date. 2. Aligning nostro operating hours and processes. 3. Promoting integration and interoperability between legacy and emerging systems
Central banks and other public authorities	4. Addressing regulatory barriers and sharpening regulatory incentives. 5. Addressing central bank operational barriers. a. Holistically assess the benefits, risks and barriers for expanding access to central bank accounts for PvP providers (BB 10).[1] b. Consider extending and aligning RTGS operating hours in support of PvP arrangements (BB 12). c. Explore functionalities in RTGS platforms and interoperability where practical. d. Explore easing liquidity constraints on PvP settlement where practical (BB 11). 6. Catalysing private sector engagement and innovation.

[1] Roles 5a, 5b and 5d are covered by other building blocks (BBs) of the G20 cross-border payments programme.

Most of the new solutions outlined in this report seek to provide PvP settlement for wholesale FX transactions and, if implemented, could increase in importance over time. While this report does not seek to determine the systemic importance of the solutions, the CPMI expects any solution determined as systemically important by national authorities to observe the *Principles for financial market infrastructures* (PFMI) (CPSS-IOSCO (2012)).

The CPMI invites interested parties, including operators of existing PvP arrangements, commercial banks, e-money operators and other fintech companies, to share their views on this consultative document (Box 1). During the consultation period planned for August-September 2022, the CPMI intends to hold two workshops, one for providers and one for users of PvP arrangements, before taking industry feedback into consideration, revising the analysis and publishing a final report.

Box 1

Questions for consultation

The CPMI is inviting comments on this consultative document and the questions set out below. Comments should be sent to the CPMI Secretariat (cpmi@bis.org) with "PvP consultation" in the subject line by 30 September 2022. All responses will be published on the website of the CPMI. Commercial or other sensitive information should not be included in the submissions, or may be included, with redactions for publication clearly noted.

In Section 2:

1. Do you agree with the analysis of the causes of non-PvP settlement?
2. Do you find that, for your market segments, some causes are more important than others? Please explain.
3. In which currency pairs or products do you find that non-PvP settlement is increasing?

In Section 3:

4. Do you agree with how the proposals for new solutions could increase the adoption of PvP?
5. Do you find that these new solutions, together, if launched successfully, can mitigate FX settlement risk? Please explain.

In Section 4:

6. Do you agree with the analysis of the barriers to increased adoption of PvP?
7. Which barriers do you find most significant, and do you observe any additional barriers that are not identified in the report? Please explain with specific reference to individual barriers.
8. Do you agree with the possible roles for private and public sector stakeholders in addressing the barriers?
9. Do you find that the private sector could take on other roles in facilitating increased adoption of PvP? Please explain.
10. How could the public and private sectors work together to take this forward? Please explain and suggest any practical actions that could be taken by existing industry bodies.

1. Introduction

In 2019, the G20 finance ministers and central bank governors tasked the FSB, together with the CPMI and other international standard-setting bodies, to develop a roadmap to address challenges with cross-border payments: high costs, low speed, limited access and limited transparency. Through a three-stage process, 19 BBs were identified to tackle these challenges and ultimately enhance cross-border payments. For each of the 19 BBs, specific actions and a timeline were laid out in the G20 roadmap (FSB (2020)). The CPMI is leading 11 BBs, including BB 9 on facilitating increased adoption of PvP settlement mechanisms.

The CPMI FX WS has produced this report, which represents the output of action 2 of BB 9. This action in turn consists of two sub-actions: action 2a tasked the CPMI with taking stock of existing and in-development PvP arrangements designed to support FX settlement and was completed in May 2021; action 2b tasked the CPMI with developing proposals for increased adoption of PvP by encouraging (i) enhancements to existing PvP arrangements and/or (ii) the design of new public sector and/or private-sector PvP arrangements that currently do not exist. By publishing this report for consultation, the CPMI FX WS completes action 2b and initiates the public consultation in action 3a to identify the most feasible options for encouraging greater use of PvP.

PvP is a settlement mechanism that ensures that the final transfer of a payment in one currency occurs if and only if the final transfer of a payment in another currency or currencies takes place.[1] Existing PvP arrangements are designed to first and foremost reduce settlement risk, which is the risk of loss when a party in an FX transaction pays the currency it sold but does not receive the currency it bought. FX settlement failures can arise due to a default event, operational issues, market liquidity constraints or other factors. On top of reducing risk, PvP arrangements can also provide other features, including payment netting which serves to substantially reduce liquidity requirements. New solutions for FX settlement seek to address other aspects of funding costs by providing real-time visibility of bilateral exposures, more flexibility on when to settle and additional netting options. These extended functionalities can help reduce the risk of trapped liquidity and better tailor the arrangement to fit the intricacies of local money markets. More ambitious new solutions may even mitigate other frictions, including long transaction chains, limited operating hours and weak competition, to enhance cross-border payments.

Although existing PvP arrangements such as CLS have made significant progress in reducing settlement risk, the segments of the FX market that remain unsupported by existing arrangements have grown, notably driven in part by increased trading in EME currencies. In parallel, as the cross-border payments market moves towards real-time settlement, users' demand has increased for real-time PvP services that allow for fast and reliable access to liquidity in foreign currency.

Increasing the adoption of PvP has been on policymakers' agenda for decades. In 1996 the G10 central banks endorsed a strategy to reduce settlement risk (CPSS (1996)), which led to the establishment of CLS. In 2013 the Basel Committee on Banking Supervision (BCBS) set out expectations for FX market participants in the *BCBS Guidance* (BCBS (2013)) that are echoed in the *FX Global Code* (GFXC (2021)). Notably, market participants should eliminate settlement risk by using settlement services that provide PvP settlement, and where PvP settlement is not used, market participants should reduce the size and duration of their settlement risk as much as practicable. In December 2020 the BCBS and CPMI Chairs issued a joint letter encouraging bank supervisors, banks and other participants in the FX market to follow these expectations (BCBS-CPMI (2020)).

This report follows up on these recommendations and provides a comprehensive overview of existing PvP arrangements as well as proposals for new arrangements. It identifies the potential barriers to using and expanding PvP services and suggests potential roles for the private and public sectors in catalysing greater availability and use of PvP arrangements. The report does not provide a view on which

[1] See the CPMI Glossary, www.bis.org/cpmi/publ/d00b.htm.

of the solutions are most viable in terms of facilitating increased adoption of PvP, but rather seeks to identify practical actions that would facilitate and encourage increased adoption of PvP settlement over the medium term. The report compiles information from three sources: (i) a survey of existing PvP arrangements in April 2021; (ii) written submissions to a call for ideas on solutions to expand PvP settlement in October 2021; and (iii) bilateral engagement with the submitters and other stakeholders in the spring of 2022.

The remainder of the report is structured as follows. Section 2 investigates the drivers of non-PvP settlement and provides an overview of existing PvP arrangements. Section 3 analyses several proposed solutions that aim to complement existing arrangements by providing additional flexibility and functionalities such as by supporting a broader range of currencies, products, settlement options and users. Section 4 lists the potential roles of the private and public sectors in facilitating increased adoption of PvP. Section 5 concludes and sets out next steps.

2. FX settlement risk and existing PvP arrangements

Existing PvP arrangements have been successful at reducing settlement risk for much of the FX market, but certain market segments remain exposed to settlement risk. This section lays out the developments in FX settlement risk over time, analyses the causes of non-PvP settlement and describes how five existing PvP arrangements cover the market in terms of currencies, products and participation.

2.1 Growth in FX settlement risk and causes of non-PvP settlement

The FX market is the largest financial market in the world and has grown substantially in recent years, from a daily turnover of $1.2 trillion in 2001 to $6.6 trillion in 2019.[2] Accounting for the number of payments for each FX product and bilateral netting, the 2019 turnover translates into daily net payment obligations of $15.2 trillion. The United States dollar (USD) remains the dominant currency, being on one side of 88% of all trades, but EME currencies are gaining market share, reaching 25% of global turnover in 2019, with the renminbi being the most traded EME currency at 4% of global turnover.

A substantial proportion of FX trades are not settled using PvP and the proportion of non-PvP settlement has increased since the early 2000s. The 2019 Triennial Survey suggests that, on any given day, up to $8.9 trillion may be at risk, with a potential loss of up to $2.8 trillion (Bech and Holden (2019)). Combining these results with data from other sources suggests that the proportion of trades settled with PvP protection has fallen from above 50% in 2006 to below 40% in 2019 (Graph 1, left-hand panel). In many jurisdictions, banks' FX settlement risk exposures represent a high proportion of their supervisory capital, and in three jurisdictions they even exceed supervisory capital (Graph 1, centre panel). This suggests that if settlement risk were to materialise, it could be detrimental to banks in these jurisdictions and, as such, the CPMI finds the current level of potential risk to be a threat to global financial stability.

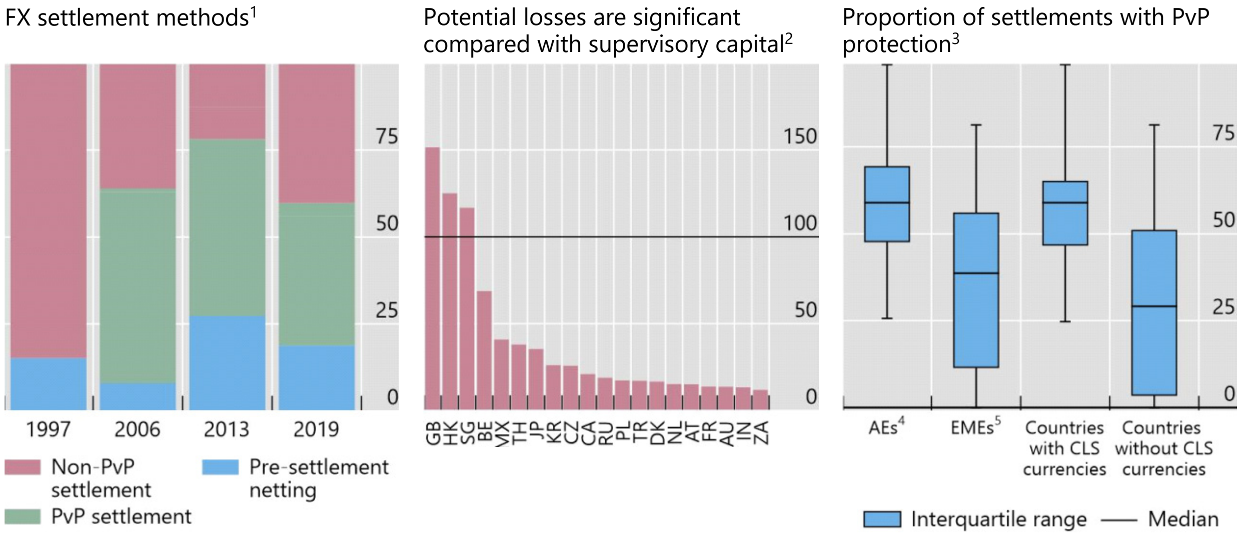
When no PvP arrangement is available, market participants can reduce their exposure to settlement risk in other ways such as by bilateral netting or effecting controlled settlement. The latter involves one counterparty prefunding one currency leg before the other counterparty releases the funds to settle the other currency leg. However, this method only eliminates the latter counterparty's exposure to principal risk and, in addition, it can delay settlement, requires manual intervention and introduces additional operational risk.

[2] See the BIS Triennial Central Bank Survey of Foreign Exchange and Over-the-counter (OTC) Derivatives Markets in 2019 (2019 Triennial Survey), www.bis.org/statistics/rpfx19.htm.

Many trades that are not settled using PvP settle on-us, that is, across the books of a single institution including between branches of one financial group.[3] On-us settlement can reduce settlement risk when the two currency legs are settled simultaneously and conditional upon each other or there is certainty that they will be settled within preauthorised credit lines. If that is not the case, the counterparties remain exposed to settlement risk and would be better off using a PvP arrangement if one were available.

FX settlement risk

In per cent | Graph 1



[1] "PvP settlement" includes CLS and settlement through systems such as Hong Kong's CHATS. [2] Supervisory capital includes both Tier 1 and Tier 2 regulatory capital. The United States did not provide a complete response to the settlement question of the 2019 Triennial Survey and therefore is not included. [3] The median value is represented by a horizontal line, with 50% of the values falling in the range shown by the box. The highest and lowest values are represented by the upper and lower end points of the vertical lines. [4] Advanced economies. [5] Emerging market economies.

AT = Austria; AU = Australia; BE = Belgium; CA = Canada; CZ = Czech Republic; DK = Denmark; FR = France; GB = United Kingdom; HK = Hong Kong SAR; IN = India; JP = Japan; KR = Korea; MX = Mexico; NL = Netherlands; PL = Poland; RU = Russia; SG = Singapore; TH = Thailand; TR = Turkey; ZA = South Africa.

Sources: CPSS (2008); Kos and Levich (2016); IMF Financial Soundness Indicators; 2019 Triennial Survey; BIS calculations.

For any PvP arrangement to be used by counterparties to settle a deliverable FX trade, it first needs to be *available*, that is, the arrangement must support the FX product and both currencies of the trade, and both counterparties must have access to the arrangement either directly or indirectly through third parties. The relative decline in PvP settlement can be attributed partly to a lack of availability, driven by growth in the trading of currencies that are unsupported by existing PvP arrangements (Graph A1). For example, the existing global arrangement, CLSSettlement, supports just a few EME currencies, and although some EME participants have access to other regional or national PvP arrangements, these settle only a limited set of currency pairs. Thus a larger share of FX trades is settled using PvP in advanced economies (AEs) than in EMEs (Graph 1, right-hand panel).

For some deliverable FX trades, while the two currencies are supported by an existing PvP arrangement, one or both counterparties may be unable to access the service. For example, the Hong Kong CHATS PvP Arrangement (CHATS) provides PvP settlement on a gross basis between USD and Chinese renminbi (CNH), the most traded pair involving an EME currency, but direct access is restricted to

[3] Based on a 2021 analysis by CLS of trade data provided by several CLSSettlement members.

banks domiciled in Hong Kong SAR and in jurisdictions linked to CHATS (namely, Indonesia, Malaysia and Thailand). With no indirect access regime, foreign banks effectively cannot settle USD/CNH on a PvP basis.

Second, the PvP arrangement needs to be *fit for purpose*, that is, the arrangement's operating window should allow for the counterparties to transfer funds at times that serve their commercial and operational needs and enable them to adequately monitor their bilateral exposures and optimise liquidity usage in addition to mitigating settlement risk. Market participants often need to move funds outside the operating window of existing PvP arrangements due to commercial sensitivities, often related to liquidity constraints in local funding markets or operational circumstances, requiring settlement to be advanced or postponed. Market participants report that they must choose between mitigating principal risk by settling via the PvP arrangement and observing other commercial or operational needs by settling on a non-PvP basis. For some FX transactions, the counterparties prefer the latter option.

Market participants report that mitigation of settlement risk in and of itself may not be a strong enough selling point to adopt a certain PvP arrangement. The incentives to settle on a PvP basis are weak in part due to miscalculation of risk exposures, for example, when a settlement session[4] lasts for three days across time zones but the risk is only recorded for one day (ie for the value date). So, in addition to reducing settlement risk, PvP arrangements typically incorporate other functionalities that serve to reduce funding costs and ease liquidity management. Most PvP arrangements offer netting, a mechanism that offsets the obligations among participants in order to reduce the number and value of payments needed to settle a set of transactions. Other functionalities include trade capture, that is, a connection to third party systems for compiling and matching trade data, and real-time visibility of bilateral exposures, which allows participants to monitor changes in their net position against each other as trades are captured.

A trade-off exists between ensuring the arrangement is fit for purpose and ensuring that it is not unduly liquidity-intensive. Multilateral netting, where a potentially large set of payment obligations among three or more participants is reduced to one net position per participant, has a higher netting efficiency[5] than bilateral netting, where obligations are offset between just two participants. However, while multilateral netting significantly reduces funding costs, it leads to a rather rigid settlement session: accounts need to be funded and transactions settled during prespecified intervals that allow ample time for intricate rules and procedures to be followed if one or more participants fail to meet their obligations. As bilateral netting involves only two counterparties, it can allow for more flexibility such as triggering the settlement session not only at specific points in time but based on exposure limits or even on an ad-hoc basis, for example, by both counterparties agreeing to settle early if need be. Either form of netting may serve different post-trade processing requirements, and where only one form of netting is available, it may insufficiently meet the needs of counterparties who then prefer to settle on a non-PvP basis.

Third, the PvP arrangement needs to be *efficient*, that is, the above benefits of reducing settlement risk and funding costs should outweigh transaction fees and monthly charges in addition to the investments needed to onboard the PvP arrangement. Onboarding is costly as it requires not only new technical solutions for configuring access to the PvP arrangement but also major changes to internal processes for complying with service rules. For any market segment, it is difficult to ascertain the degree to which each of these costs and benefits influence the decision to use a PvP arrangement, but the counterparties should consider the full range of risk mitigation benefits, including the reduction of systemic risk. To shed further light on the drivers of non-PvP settlement, the 2022 Triennial Survey asks for additional breakdowns by counterparty type and currency pairs. The survey results will be published in late 2022.

[4] The settlement session refers to the time spent and processes associated with funding, settling and defunding a set of FX payment obligations.

[5] Netting efficiency is the ratio of gross value settled to funding required and can be as much 100:1 for certain currency pairs.

2.2 Existing PvP arrangements

In April 2021, the FX Workstream surveyed five existing PvP arrangements supporting wholesale payments (Table 2): the B3 Foreign Exchange Clearinghouse in Brazil (B3), the Clearing Corporation of India Limited's Forex Settlement (CCIL), CHATS in Hong Kong SAR and CLSNow and CLSSettlement in the United States.[6] The survey contained 63 questions covering the currencies and products settled, participation criteria and costs, the timing of settlement as well as drivers and barriers for increased adoption of PvP.

Overview of existing PvP arrangements — Table 2

System name	Jurisdiction	Launch year	Operator	Ownership	Primary regulator	PvP mechanism
B3 Foreign Exchange Clearinghouse (B3)	Brazil	2002	B3 Foreign Exchange Clearinghouse	Private	Central Bank of Brazil	Central clearing with net settlement
Forex Settlement (CCIL)	India	2002	The Clearing Corporation of India Limited	Private	Reserve Bank of India	Central clearing with net settlement
PvP Arrangement (CHATS)	Hong Kong	2000	Hong Kong Interbank Clearing Limited	Other[1]	Hong Kong Monetary Authority	Simultaneous gross settlement
CLSNow	United States	2019	CLS Bank International	Private	Board of Governors of the Federal Reserve System	Simultaneous gross settlement
CLSSettlement	United States	2002	CLS Bank International	Private	Board of Governors of the Federal Reserve System	Simultaneous gross settlement[2]

[1] Jointly owned by the HKMA and the Hong Kong Association of Banks. [2] Funding is on a multilateral net basis.

Source: CPMI survey.

The five existing PvP arrangements belong to two types of financial market infrastructures (FMIs): B3 and CCIL are central counterparties (CCPs) settling on a net basis while CHATS, CLSNow and CLSSettlement are payment systems settling on a gross basis.[7] B3, CCIL and CLSSettlement settle once per day while CHATS and CLSNow settle in real time throughout the day. B3, CCIL and CHATS settle local currencies in central bank money and CNH, USD and euro (EUR) in commercial bank money, whereas CLSNow and CLSSettlement settle all transactions on their own books, which are fully backed by funding in central bank money. Participants fund CLSNow on a gross basis and CLSSettlement on a multilateral net basis in the relevant currencies via their RTGS system accounts, whereas in CHATS participants effect PvP settlement directly on their RTGS system accounts in each currency via an interlinking arrangement.

B3 and CCIL guarantee settlement and use the measures typical to CCPs for managing counterparty risk, which includes exposure limits, margins, default funds and loss sharing arrangements. CHATS, CLSNow and CLSSettlement do not guarantee settlement, so while any participant in these systems is protected from principal risk (ie the risk of losing the full principal amount), if the counterparty to a trade fails to deliver a currency on time, the participant is still exposed to liquidity risk (ie the risk of not receiving a currency when expected) and replacement-cost risk (ie the risk of incurring extra costs when replacing

6 CLSNow was included after the initial survey was completed. Buna also responded to the survey but has yet to launch its PvP mechanism and hence is included in Section 3, which covers proposals for new arrangements. Baton Systems was not surveyed initially but began to settle transactions between banking groups in December 2021. Baton Systems is included in Section 3.

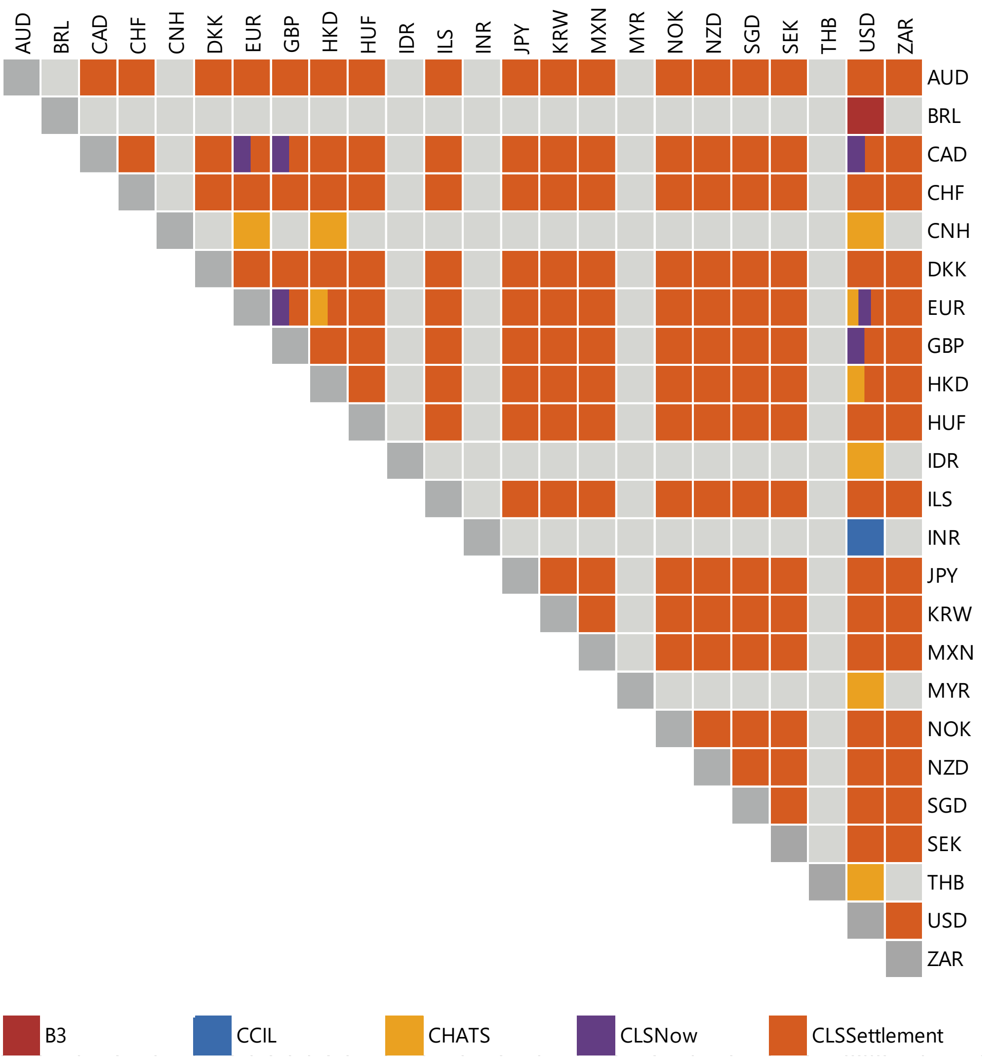
7 This report does not intend to give a complete overview of all existing FX settlement arrangements. For example, some other CCPs also settle deliverable FX trades, and CLS in turn offers an FX clearing service for CCPs, CLSClearedFX.

the original transaction at current market prices). The length of a settlement session, as measured from the time of funding a trade to the time of receiving the counter currency on the value date, varies from less than a minute to several hours across the five arrangements. Additional delays can be caused by direct participants lacking access to liquidity or relying on funding from third parties.

The five arrangements vary greatly in their scope of supported currencies. CLSSettlement supports any pairwise combination of 18 currencies (Graph 2), including the currencies of all major and most other AEs, in addition to a few EMEs. CLSSettlement is thus the only PvP arrangement with global reach as its currencies span all five regional groups, including Africa, the Americas, Asia, Europe and Oceania. CLSNow supports six pairs of four currencies, while CHATS supports nine currency pairs of seven different currencies, of which five are Asian currencies and two are global reserve currencies (ie USD and EUR). B3 and CCIL settle just one currency pair each as they cater specifically to the needs of the FX markets in Brazil and India, respectively.

Eligible currency pairs in existing PvP arrangements

Graph 2



AUD = Australian dollar; BRL = Brazilian real; CAD = Canadian dollar; CHF = Swiss franc; CNH = Chinese renminbi; DKK = Danish krone; EUR = euro; GBP = British pound sterling; HKD = Hong Kong dollar; HUF = Hungarian forint; IDR = Indonesian rupiah; ILS = Israeli new shekel; INR = Indian rupee; JPY = Japanese yen; KRW = Korean won; MXN = Mexican peso; MYR = Malaysian ringgit; NOK = Norwegian krone; NZD = New Zealand dollar; SGD = Singapore dollar; SEK = Swedish krona; THB = Thai baht; USD = United States dollar; ZAR = South African rand.

Source: CPMI survey.

The five arrangements also support different FX products (Table A1). All except CLSNow process spot transactions although the two CCPs, B3 and CCIL, have a limited product scope: B3 only clears spots whereas CCIL also clears outright forwards and FX swaps. CHATS and CLSSettlement additionally settle currency swaps, options and other transactions (eg CLSSettlement also settles bilaterally netted payment instructions related to over-the-counter (OTC) credit derivatives). CLSNow is designed specifically to settle the out-legs of in/out swaps and other same-day FX transactions.

The five arrangements manage, and in some cases reduce, participants' liquidity obligations in various ways. CLSSettlement reduces funding requirements through multilateral netting by up to 96% of gross notional value with further reductions being possible via an optimisation tool. Similarly, CCIL's multilateral netting process reduces participants' funding requirements by 90%, which in turn reduces funding costs for clients at the nostro level.[8] CHATS offers settlement institutions of the respective RTGS systems operating within the PvP service the availability of interest-free intraday liquidity in the form of intraday repo transactions.

All five arrangements provide direct access to banks subject to eligibility criteria including financial, legal and operational requirements (Table A2). For example, direct participants must adhere to a rulebook, use specified messaging standards, participate in operational tests, maintain minimum credit ratings and contribute to a default fund (for CCPs).[9] B3, CCIL and CLSSettlement also extend access to certain other financial institutions, however, none of the five arrangements extend access to non-bank payment service providers (PSPs). B3 and CCIL only extend access to domestically domiciled participants while CHATS is also open to participants domiciled in jurisdictions which are connected to the system (ie Indonesia, Malaysia and Thailand).

Finally, the five arrangements have different operating hours. They all settle transactions only on weekdays and in a window between five hours (for CLSSettlement) and ten hours (for CHATS). None of the five services report plans to extend operating hours as they (i) consider the demand for extensions to be limited, which in turn could be driven by the types of FX products settled, and (ii) need offline hours to maintain and update the systems to preserve operational resilience.

3. Proposals for new arrangements

Section 3 provides an analysis of the proposals that were submitted in response to the call for ideas, including (i) a summary of the call for ideas; (ii) design characteristics that aim to expand PvP; (iii) design characteristics that may address cross-border payment frictions; and (iv) a summary of PvP for retail cross-border payments.

3.1 Summary of the call for ideas

In October 2021, the CPMI FX WS publicly invited interested parties, including commercial banks and fintech companies, to share their solutions or views on potential approaches to increase adoption of PvP.[10] Interested parties were asked to provide their thoughts on existing PvP arrangements, submit proposals

[8] Additional intraday funding costs in terms of nostro credit can emerge where a participant needs to bridge the time between paying into the PvP service and receiving incoming flows from other transactions later in the day.

[9] Indirect participation is typically extended by direct participants with limited involvement of the PvP service operator. Direct participants may choose to extend the PvP service to clients (also referred to as third parties) that meet certain criteria, and direct participants typically charge for these services, although the survey respondents (ie, the PvP service operators) were unable to provide detailed information on this.

[10] See www.bis.org/press/p211007.htm.

on potential new public and/or private sector solutions, or possible future solutions to expand PvP settlement to a wider range of transactions.

Submitters were prompted to address how their solution proposes to achieve PvP, what FX products and currency pairs the solution would be well suited or designed to settle, as well as how the solution would incentivise and broaden user participation.[11] Submitters were also asked how the solution would address the challenges faced by the market related to settling cross-border wholesale deliverable FX payments and to identify what roles the public and private sectors could play in the solution.

The call for ideas yielded 16 responses from a range of interested parties, including existing infrastructures, global banks, new entrants and industry groups. Most proposals were from the EU, the United Kingdom and the United States, with one response from the Asia-Pacific region (Australian Payments Network) and one from the Middle East region (Buna). The latter was the only submission from an EME. The CPMI FX WS engaged in follow-up conversations with 11 submitters to learn more about their system design and views on potential barriers to broad adoption of their services.

3.1.1 Maturity and time-to-market

Overall, the call for ideas resulted in 11 submissions that provided concrete solutions (Table 3). Of these proposals, one is live (Baton), eight are in development or under consideration (9th Gear, Buna,[12] CLSAlt, Fnality, FX Shield, IZZI, RTGS.global and Settlement Circle) with different target times to market, and two are prototypes (Jura and Meridian). Of the remaining submissions, two provided industry views on ways to expand PvP to a wider range of transactions (AusPayNet and GFMA),[13] two provided conceptual proposals (Citi and Vanini), and one suggested how its service could assist in enabling PvP (SWIFT).

For the nine solutions in development, the time to market depends on several factors including improving design characteristics and capabilities; time for technology to be developed, tested and rolled out for production; further outreach and engagement with potential participants on use cases; and ongoing discussions with central banks and supervisors regarding account structure, planned services and supervisory expectations.

3.1.2 Proposed settlement models

The concrete solutions aim to achieve PvP settlement through two types of settlement models: (i) a centralised model in which settlement of both currency legs occurs on the ledger of a single settlement institution (Graph 3, left-hand panel), and (ii) a decentralised model in which settlement of each currency leg occurs on the ledgers of two separate settlement institutions and is synchronised either by a settlement agent or by the counterparties themselves (Graph 3, right-hand panel).

PvP settlement is achieved through a clear legal basis governing settlement finality and through settlement rules and procedures that clearly define the point at which settlement is final. This ensures that final settlement of one currency leg occurs if and only if final settlement of the other currency leg (or legs) also takes place. In decentralised models, settlement rules and procedures across the two settlement institutions should ensure that final settlement of one currency leg is conditional on final settlement of the other currency leg. Reasonable steps should be taken to confirm the effectiveness of cross-border recognition and the protection of cross-system settlement finality in order to clearly establish the point at which finality takes place and ensure that this is not subject to different interpretations.[14]

[11] Proposed solutions were not evaluated by the CPMI FX WS against the PFMI, and inclusion in this report does not imply that the solutions achieve PvP settlement or that they observe the PFMI.

[12] The Buna platform is live but its cross-currency capability and PvP mechanism are still in development as of July 2022.

[13] The industry views also discussed PvP arrangements that support retail payments and remittances.

[14] See CPSS-IOSCO (2012), paragraph 3.8.4.

Overview of responses Table 3

Abbreviation	Full name[1]	Geographical scope	Substance	Maturity
9th Gear	9th Gear	Global	Concrete Solution	In development
AusPayNet	Australian Payments Network	N/a[2]	Industry view	N/a
Baton	Baton Systems Core FX	Global	Concrete solution	Live
Buna	Buna Payment System	Regional	Concrete solution	Live[3]
Citi	Citi Regulated Liability Network	Global	Conceptual proposal	N/a
CLSAlt	CLS Alternative PvP Service	Global	Concrete solution	In development
Fnality	Fnality International Limited	Global	Concrete solution	In development
FX Shield	FX Shield	Global	Concrete solution	In development
GFMA	Global Financial Markets Association	N/a	Industry view	N/a
IZZI	Project IZZI	Global	Concrete solution	In development
Jura	Project Jura[4]	Regional	Concrete solution	Prototype
Meridian	Project Meridian[5]	N\A	Concrete solution	Prototype
RTGS.global	RTGS Global Limited	Global	Concrete solution	In development
SC	Settlement Circle	Global	Concrete solution	In development
SWIFT	SWIFT	Global	Enabling service	N/a
Vanini	Luca Vanini	Global	Conceptual proposal	N/a

[1] The full name links to further details about each respondent if such information is publicly available. [2] Not applicable to all conceptual proposals, industry views and enabling services. [3] The Buna platform is live but its FX service and PvP mechanism are still in development as of July 2022. [4] Jura's contributors include Banque de France, the Swiss National Bank, the BIS Innovation Hub Swiss Centre and a private sector consortium. [5] Meridian's contributors include the Bank of England and the BIS Innovation Hub London Centre.

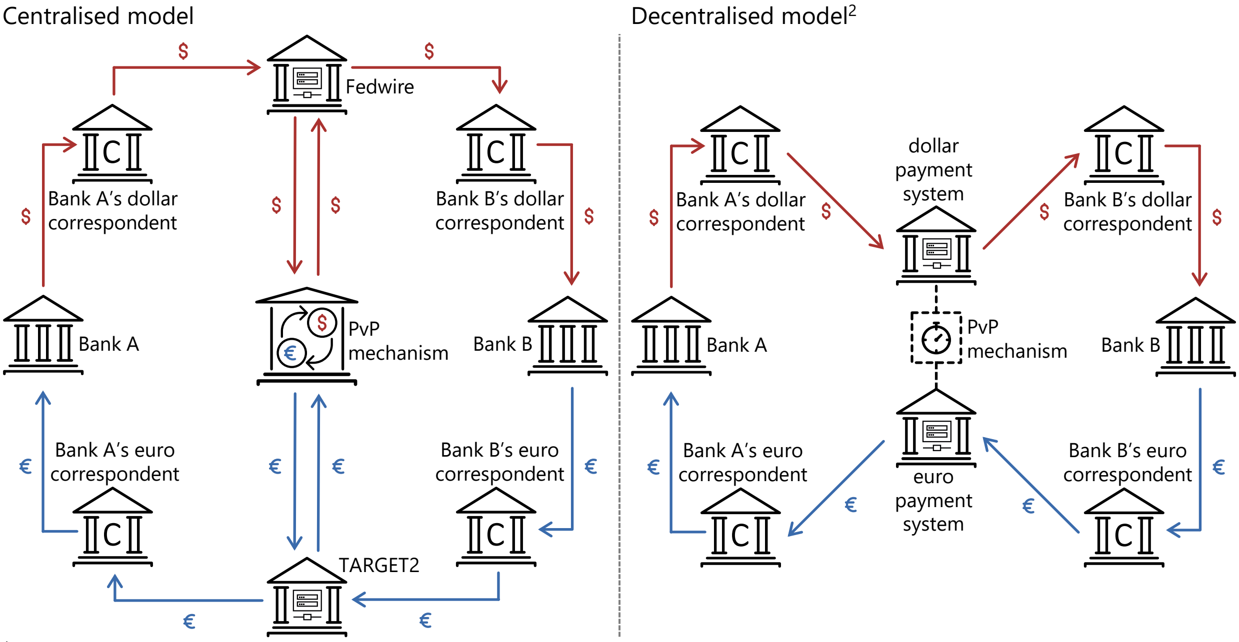
Source: CPMI survey.

Several proposals aim to provide settlement 24 hours a day, seven days a week (24/7), with most relying on prefunding deposited in central bank or commercial bank accounts, depending on the currency and access eligibility requirements in the respective jurisdictions. Some proposals envisage conducting money settlements either by using central bank accounts or commercial bank accounts exclusively. Others suggest that either would be suited to the design of the proposal and that a combination of both could be used where possible to facilitate settlement in a range of currencies.

By design, Jura and Meridian explore settlement in central bank money, the former through a prototype for tokenised wholesale central bank digital currency (wCBDC), which is issued and redeemed by central banks and only available to financial intermediaries, and the latter through the introduction of earmarked liquidity and synchronised settlement in RTGS systems as new functionalities to facilitate services by operators in the payments ecosystem.[15] RTGS.global's model also relies on central bank money as participating banks in each jurisdiction segregate some amount of liquidity (ie funds) in their central bank accounts for use in the RTGS.global system. A subsequent exchange of funds is reflected on RTGS.global's ledger as bilateral transfers between participating banks, while RTGS.global itself is never a financial intermediary in the "flow of funds".

[15] In the experimental setting of Jura, to comply with existing legal and regulatory frameworks, each wCBDC did not represent a direct claim against the central bank, and the final settlement of the cash leg was only achieved in the corresponding RTGS system. In a production setting, legal changes related to the issuance of wCBDC may be required to achieve settlement finality.

PvP settlement models[1] Graph 3



[1] Both stylised models illustrate the full settlement session, including funding, for settling an FX trade where Bank A buys euros for dollars from Bank B. [2] In the decentralised model, the dollar and euro payment systems represent various setups including commercial bank nostro accounts (Baton), separate systems prefunded via RTGS accounts (eg Fnality and IZZI), RTGS systems (Meridian) or wCBDC (Jura). In Jura, participants settled PvP directly with each other by exchanging wCBDC tokens that were issued and redeemed on the value date.

Source: CPMI.

Fnality and 9th Gear have proposed the usage of an omnibus or technical account in RTGS systems, commonly owned by participants or an approved third party, while the ownership shares of each currency are recorded on a blockchain. The responses from 9th Gear, Settlement Circle and FX Shield suggested the proposed designs could leverage escrow/omnibus accounts with correspondent banks to settle the final legs of the payment chain for netted obligations but noted that the solutions could be supported by central bank accounts rather than commercial bank accounts. CLSAlt suggested using either central bank accounts or commercial bank accounts giving priority to currencies its clients have identified as “Primary Target Currencies”.

Baton, designed to leverage traditional correspondent banking relationships, finds that settlement in commercial bank money allows for direct access to a PvP arrangement across a broader range of currencies. Baton therefore uses designated settlement accounts at counterparties’ existing nostro providers where possible.

Two proposals entail a design that leverages both central bank and commercial bank accounts. IZZI would use commercial bank money in the form of a balance in a demand deposit account issued by an authorised deposit taking bank or non-bank PSP and matched by central bank balances. Settlement within Buna is backed by central bank money for the Middle Eastern currencies and commercial bank money for the international currencies (ie EUR and USD).

3.2 Increased scope of PvP in terms of currencies, products and markets served

The proposals suggest expanding PvP through a variety of outcomes, including by extending the range of currencies that can be settled using PvP and by providing additional features to meet participant needs and increase adoption. These features include: (i) extended settlement windows to accommodate transactions across different time zones, particularly through services that operate 24/7; (ii) increased access to smaller participants who may find the costs and operational requirements of existing PvP arrangements too prohibitive; (iii) functionalities to manage intraday liquidity such as instant settlement, multiple netting options; and (iv) integration of the execution of a cross-currency payment with the associated FX transaction. The analysis is based on views expressed by respondents to the call for ideas, relating to design features that may still be in exploration, and does not reflect an endorsement by the CPMI of any arrangement or feature.

3.2.1 Currencies and products

Of the specific EME currencies mentioned by submitters, CLSAlt initially targets CNH, the Russian rouble (RUB), the Turkish lira (TRY) and the Polish zloty (PLN) settling against USD and EUR, with a plan to support a wider range of EME currencies over time. Buna settles the Egyptian pound (EGP), the Jordanian dinar (JOD), the Saudi riyal (SAR), the United Arab Emirates dirham (AED), EUR and USD and is planning to introduce additional Middle Eastern and international currencies in the future. Solutions targeting EME currencies stated that they are likely to focus on transactions with an AE currency on one leg and an EME currency on the other leg (AE/EME pairs), since the volumes and settlement risk in AE/EME pairs are much higher than in EME/EME pairs. IZZI, FX Shield, CLS and Baton consider their designs to be currency agnostic and thus adaptable to any AE or EME currency. 9th Gear similarly suggests that digitising currencies would allow them to effect settlement for any currency subject to counterparty agreements. Fnality is targeting AE currencies, specifically the Canadian dollar (CAD), EUR, the British pound sterling (GBP), the Japanese yen (JPY) and USD, before expanding to EME currencies. Jura has explored a prototype for settlement in EUR and the Swiss franc (CHF), and states that their design can be replicated for additional currencies.

According to feedback from market participants, any new PvP arrangements should include AE as well as EME currencies. While the proposed arrangements see no theoretical limit to the currency pairs that can be settled, there are practical considerations tied to settlement finality protections in legislative frameworks that may limit expansion to some currencies. Market participants have noted, however, that while the focus of new solutions may be on certain types of currencies, such as EME currencies, there are opportunities to settle more commonly traded pairs on a PvP basis as well. Due to benefits of scale, it may be most beneficial for emerging arrangements to consider a wide range of currencies to complement the existing CLSSettlement service. Feedback from market participants also suggested that mismatches in the details of transactions submitted to settle on a PvP basis (eg booking differences in transaction details or timing issues when transactions are inputted) may often result in non-PvP settlement of PvP-eligible transactions.

Overall, respondents suggested that most solutions are designed to support all deliverable FX products including spots, forwards and swaps, and some would support real-time or same-day transactions (Table 4). While the responses mainly focused on FX settlement, a few submitters noted that their solutions could also be used for delivery versus payment (DvP) settlement of other asset types. Fnality suggested that each Fnality Payment System within the Fnality Global Payments network is designed to interoperate with third party business platforms (eg securities settlement systems (SSSs) and central securities depositories (CSDs)) to enable DvP settlement. Jura also experimented with settling euro wCBDC against commercial paper, and IZZI suggested that its design could be used by CSDs and SSSs for real-time settlement of securities and by CCPs for multi-currency margin collection and disbursement.

3.2.2 Settlement timing and operating hours (availability)

Respondents suggested that some PvP-eligible transactions settle on a non-PvP basis due to a lack of available options that allow participants to make payments on the same day and at any point during the day. All proposed arrangements are designed to provide settlement 24/7 or in a predetermined settlement window based on funding aspects. A few proposals would allow users to customise their settlement sessions based on their liquidity needs and these sessions need not be aligned with the operating windows of RTGS systems. Another proposal involves a service design that ensures settlement sessions occur at optimal times in terms of when liquidity is best available for each currency.

Characteristics of foreign exchange settlement arrangements

Table 4

	9th Gear	Baton	Buna	CLSAlt	Fnality	FX Shield	IZZI	Jura	RTGS. global	SC
Settlement model										
Centralised			✓	✓		✓			✓	✓
Decentralised	✓[1]	✓			✓		✓[2]	✓		
Proposed account structure										
Central bank accounts					✓			✓	✓	
Commercial bank accounts	✓	✓								✓
Central bank or commercial bank accounts or a combination of both			✓	✓		✓	✓			
Eligible FX products										
Spots	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Forwards	✓	✓		✓	✓	✓	✓	✓[3]	✓	✓
Swaps	✓	✓		✓	✓	✓	✓	✓[3]	✓	✓
Same-day / real-time trades	✓	✓		✓[4]	✓	✓	✓[5]	✓	✓	✓
Settlement timing and availability										
24/7	✓	✓	✓		✓	✓[6]	✓	✓[3]	✓	✓[7]
Settlement session per currency pair				✓[8]						
Control over transaction timing	✓	✓			✓	✓	✓	✓	✓	
Netting options										
Multilateral	✓			✓[9]						
Bilateral	✓	✓[10]				✓[11]				✓[12]
Pre-netted FX payments									✓	
None (gross settlement)			✓		✓		✓	✓	✓	
Proposed users										
Commercial banks	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Non-banks (eg PSPs and corporates)	✓	✓	✓			✓	✓			✓
Retail users			✓				✓			
Types of requirements										
Central bank account for direct participation								✓[13]	✓[14]	
Involvement of nostros	✓[15]	✓[16]		✓[17]		✓[18]	✓[19]	✓[20]		✓[21]

[1] Centralised as a third party platform used by mutual agreement of the counterparties to the trade but decentralised such that the users effect settlement of FX trades themselves. [2] For cross-currency payments. [3] Not part of the Jura experiment but feasible on the DLT platform. [4] To the extent that these are material in terms of notional value and directionality and where settlement windows are not early in the business day. [5] Designed to settle real-time cross-currency payments and real-time FX trades. The infrastructure can be used by PSPs to settle other FX products. [6] For confirmation/matching with payments restricted to RTGS operating hours. [7] For confirmation/ matching. [8] Windows aligned to local market liquidity conditions for currency pairs. Matching and status updates happen in real time; settlement occurs when funding is in place. [9] By currency pair. CLS has suggested bilateral netting may also be an option. [10] Participant defined and based on risk exposure or timing. [11] Netting timing is participant defined. [12] Participant defined. [13] Resident and non-resident regulated financial institutions approved by the central banks to hold and settle local wCBDC. [14] Central bank account access in home jurisdiction. [15] Funds transfer through correspondents. [16] Nostros provide funding and settlement accounts. [17] Local market commercial banks as nostros in each currency. [18] Omnibus accounts with correspondents but could also be supported by central bank accounts. [19] Any resident or non-resident bank or PSP can be a direct participant. If a direct participant does not have, or chooses not to use, its own central bank account, it can fund its payments via a nostro. [20] Non-resident regulated financial institutions without access to the local RTGS system use correspondents to transfer balances to a central bank technical account. [21] Accounts in prime correspondents in each currency.

Source: CPMI Survey.

Several trade-offs exist for those arrangements that offer settlement within a predefined window, and for those that offer settlement 24/7, typically depending on the underlying design and settlement asset. For example, those that offer settlement 24/7 need to consider the limitations of nostro operating hours. Participant feedback also suggested that real-time reconciliation of the movement of central bank monies needs to be supported by real-time reconciliation of nostro account statements, as settlement finality is typically deemed to have occurred once the statements from nostro providers showing daily activity are reconciled. For solutions offering settlement sessions by currency pair, extending RTGS hours in key currency pairs may be necessary to allow for overlapping settlement windows. For systems that aim to continue to operate when RTGS systems are closed to settle 24/7, it would not be possible to fund and defund from the system during RTGS non-operating hours, which may have implications for liquidity management.

3.2.3 Access and participation

Most of the proposed solutions aim for a global scope. Buna is an RTGS and instant payments system in the Middle East region but aims for global reach. Jura explored FX settlement between regulated financial institutions in France and Switzerland but has a functional design that could be replicated in additional jurisdictions.

Broadly, direct participation in the proposed new arrangements is limited to commercial banks, with some responses suggesting nonbanks, such as PSPs, corporates and commercial firms may also be able to be direct participants. Some solutions necessitate access to local RTGS systems or are otherwise tied to central bank approval by virtue of their design, consequently limiting the types of entity that could have direct access. Indirect access may be possible. Other solutions such as Baton and IZZI, however, noted that central bank account access was unnecessary for direct participation as existing funding arrangements based on correspondent banking perform adequately. A few arrangements suggested that they would support cross-currency payments made by retail users.

Users of PvP arrangements have emphasised the necessity of ensuring broad access to as many FX market participants as possible, while recognising that there may be varied levels of technical sophistication and ability to manage costs. Participant stratification may be a factor impacting PvP adoption, as more sophisticated participants drive liquidity needs and technology uptake, while creating complexity for smaller participants who have less access to costly infrastructure. FX Shield and Buna are aiming to support smaller participants, for whom cost is a barrier to entry, who may not be executing a high volume or value of trades, or who may need support in securing liquidity for instant payment transactions and may not otherwise have adequate arrangements in all markets to obtain liquidity. IZZI similarly suggests linking the settlement of a cross-currency payment directly to the associated FX trade to enable banks or non-bank PSPs to send and receive multi-currency payments without needing to manage the risks of handling multiple currencies.

Respondents outlining proposed solutions have mentioned that broad adoption and market support would be essential to achieving network effects, and users of PvP arrangements have also heavily emphasised the need for any solution to have critical mass in terms of market participation, to avoid partial adoption and unrealised benefits. A wide user network would result in greater cost benefits and liquidity management efficiencies. Interoperability across systems may be one way of avoiding fragmentation.

3.2.4 Netting options

Respondents proposed a range of netting features: two propose multilateral netting; four propose bilateral netting; and the remaining five rely on gross, instantaneous settlement to deliver operational flexibility in addition to reducing settlement risk. Some market participants have suggested that, to meet the needs of clients and best manage liquidity, PvP arrangements should provide several netting options, while CLS suggests that, also based on market feedback, multilateral net funding with gross PvP settlement is optimal from both an operational and liquidity management perspective.

3.3 Addressing frictions associated with cross-currency payments

This section describes how new arrangements for FX settlement could address frictions in cross-border payments through design characteristics that may impact costs, long transaction chains, limited operating hours and weak competition. The analysis is based on views expressed by respondents to the call for ideas, relating to design features that may still be in exploration, and does not reflect an endorsement by the CPMI of any arrangement or feature.

3.3.1 Reducing costs of cross-border FX settlement

Funding costs

To facilitate settlement of cross-currency payments in PvP arrangements, participants are required to have time-bound access to foreign currency markets, often relying on correspondent banks to pre-position funding across multiple currencies to meet PvP deadlines. Along with the cost of pre-positioning this funding, there are often additional costs tied to executing the currency conversion before onward payments are made and to managing exchange rate risk until the end-to-end process is complete. The use of PvP can reduce funding costs as one element of pricing a cross-currency payment is the cost of managing the associated settlement risk. New arrangements for FX settlement also include proposed design characteristics for liquidity management that may reduce the costs of funding. These are further detailed below:

- *Real-time visibility of liquidity and FX pricing transparency may simplify liquidity management and reduce cost pressures.* IZZI suggested that a real-time FX conversion component integrated into the settlement service could reduce costs by eliminating the need to preposition funding in multiple currencies and the need to manage the risks of handling multiple currencies. Similarly, Buna aims to provide integrated FX rate management and exchange services to give participants the option of redistributing their balances within the system in multiple currencies and to reduce costs of overall operations. The response suggested that this may be particularly advantageous to small and medium-sized banks which may not have adequate bilateral arrangements in all markets to obtain liquidity, or which may be able to secure these only on costly terms. 9th Gear, Baton and RTGS.global suggested that providing increased visibility into liquidity positions may also improve liquidity management and therefore reduce funding pressures, especially in the context of efficiently securing liquidity for processing cross-border payments 24/7.
- *Instant settlement providing immediate liquidity availability.* 9th Gear, Fnality, IZZI, Jura and RTGS.global suggested that settlement of FX transactions instantly and on a transaction-by-transaction basis eliminates lag and allows currency conversion to immediately be available, which can reduce liquidity pressures. Baton suggested that shorter and more flexible intraday settlement sessions, as well as support for settlement on demand, would reduce funding costs. At least one respondent noted, however, that instant settlement may require an increase in the need to hold precautionary liquidity, and participants may find it difficult to ensure sufficient liquidity is available in currencies to allow same-day or instant settlement. The absence of netting could also increase liquidity needs for settlement purposes.
- *Extending participant control as well as reducing intermediation may introduce flexibility in managing funding needs.* Fnality suggested that if participants are able to maintain control of settlement balances within the arrangement, the balances can be used to make non-FX payments, which may simplify liquidity management and reduce funding costs. Fnality and RTGS.global noted that services enabling point-to-point bilateral transfers or FX settlement directly between participants may reduce reliance on commercial bank accounts and services from nostros and thus reduce funding costs by avoiding trapped liquidity. Meridian suggested that removing the requirement to prefund transactions could reduce liquidity inefficiencies, and

RTGS.global similarly suggested to do so by earmarking funds held in central bank accounts instead of prefunding transactions in commercial bank nostro accounts.

Participation costs

Decisions to use PvP arrangements can be led by costs of implementation and ongoing participation, particularly where there may be varying levels of technical sophistication amongst potential users. New proposals have highlighted a range of design solutions that may impact operating and participation costs including:

- *Increased standardisation and automation to reduce the risk and costs of payment failures.* Baton suggested that enabling greater automation may provide efficiencies and cost savings by transforming settlement from a high-touch to a low-touch environment. CLS commented that the reduction of payments through netting, the use of real-time status notifications to enable end-to-end automation and the adoption of real-time reconciliation may also reduce operational overheads and costly compensation claims. Several respondents (eg Baton, IZZI, Meridian and RTGS.global) suggested that leveraging common standards such as ISO 20022 messaging may improve end-to-end processing efficiency and thus reduce participation costs.
- *Interoperability with existing processes and systems.* 9th Gear, CLS and SWIFT noted that leveraging existing technologies and protocols may minimise implementation costs for participants. FX Shield and Settlement Circle seek to leverage existing technologies that are already a part of the confirmation and settlement processes used by market participants, thereby allowing them to deliver a service that would reduce integration costs and participation overheads. This may address the lack of appetite for large-scale or disruptive technology changes expressed particularly by smaller participants, especially in EME jurisdictions, and participants for which FX does not comprise a significant part of their business. 9th Gear, FX Shield and IZZI suggested using application programming interfaces (APIs) for access and integration, and Settlement Circle expects to migrate from the SWIFT network to APIs over time. Three proposals intend to streamline additional elements of the payment process, such as integrating know-your-customer (KYC) due diligence services to reduce the cost of managing partner bank relationships (IZZI and RTGS.global), simplifying AML/CFT compliance through a centralised screening process (IZZI) and offering KYC services, especially to smaller potential market participants for whom the expense of implementing proper KYC processes would represent a barrier to entry (FX Shield).

3.3.2 Reducing delays in clearing and settling cross-border payments

Delays in clearing and settling cross-border payments increase liquidity and credit risk and can have a negative effect on business and investments, particularly where payments are time critical. One source of delays is the lack of overlapping operating hours across jurisdictions to effect settlement. Another is a lack of automation and straight through processing of payments.

- *Providing settlement 24/7.* The limited operating hours of key stakeholders, including RTGS systems and intermediaries involved in clearing cross-border payments, create delays in settlement, particularly in corridors with large time zone differences. Most proposals (eg 9th Gear, Baton, Citi, Fnality, FX Shield, IZZI, Jura and RTGS.global) aim to mitigate this friction by providing mechanisms for settlement or for confirmation and matching on a 24/7 basis, even while the timing of funding and defunding may be dependent on the operating hours of RTGS systems.
- *Improving the rate of automation and straight through processing of payments.* Relying on manual intervention without real-time monitoring and automated reconciliation processes may extend settlement delays and introduce inefficiencies in liquidity management. Most proposals aim to improve the rate of straight through processing by ensuring automated reconciliation, or real-time payment and settlement notifications. Baton, CLS, FX Shield, IZZI and Settlement Circle suggested designs that automate every step in the process from trade capture to final settlement.

3.3.3 Eliminating long transaction chains

Participants in PvP arrangements typically rely on chains of linked correspondent banks to transmit cross-border payments in multiple currencies, as direct connections are often costly or unavailable. Longer transaction chains increase costs associated with pre-positioning liquidity and managing risk, and they introduce settlement lags by increasing processing and reconciliation times.

Fnality suggested enabling settlement to occur directly between participants on a peer-to-peer basis to remove the need for a central agent or intermediary bank. Reducing these layers of intermediation may help avoid settlement lags by reducing the length of the transaction chain. However, participants will still need to fund and defund their positions via either the correspondent banking network or the relevant RTGS system, although a few global banks will be able to do the latter in every currency. Jura suggested that, subject to central banks' access policies, granting non-resident banks access to wCBDC intraday could improve multi-currency settlement by reducing the number of intermediaries (ie platforms and correspondents).

A cross-currency payment may require an intermediary bank along the payment chain to execute an FX trade, either before or after the cross-currency payment is made. Buna and IZZI suggested integrating currency conversion into their systems to enhance transparency regarding fees and exchange rates and to shorten the number of steps required in ensuring the transfer of each leg of a cross-currency payment. Depending on the design, this may enable the use of a single payment instruction to replace sequential processing by each party involved in the chain connecting the payer to the payee.

3.3.4 Increasing competition

Weak competition in the provision of cross-border payment services has typically been due to the barriers to entry posed by the other frictions mentioned, particularly cost. A few solutions seek to increase competition in the operator space, particularly around currency conversion for retail and wholesale use-cases. IZZI suggests its design will promote price and service competition among banks and non-bank PSPs providing accounts and payment services to end users in addition to opportunities for competing FX traders. Buna plans to introduce FX rate management and exchange services in its system and envisions that many FX providers can be registered for the same currency pairs, with the intention of enhancing the end customer experience (retail and corporate) by offering diverse currency choices. Meridian envisions a possibility for multiple "synchronisation operators" to offer settlement services, building on the RTGS synchronisation functionality being explored under the project, which could open up the potential for competition in the payments ecosystem.

3.4 Summary of PvP for retail cross-border payments

The cross-border retail payments market is complex, involving many different parties and underlying arrangements. Cross-border retail payments including remittances often rely on correspondent banks or other back end arrangements for the provision of foreign exchange services. For less common currency pairs (largely those involving EME currencies), this may consist of a series of correspondent banking relationships for a single payment transaction, which increases costs, operational complexities and processing times. For example, transaction chains often lengthen, and FX settlement risk increases, as payments involving EME currencies may require an AE currency as a bridge. Frictions impacting these sectors include high costs, low speed and a lack of transparency in pricing and conversion. Individuals and small and medium-sized enterprises (SMEs) are especially impacted by slow payment execution and high costs for maintaining accounts and transaction fees (relative to the sum being transferred particularly for low value payments).

Existing PvP arrangements and several new proposals target mainly wholesale use cases focusing on the deliverable FX market. Some respondents have, however, suggested that functionality designed for the wholesale market may also improve retail transactions (eg by allowing for currency conversion), so they consider both use cases. Five submissions consider retail use cases, particularly how lowering costs could enhance cross-border and cross-currency retail payments, including remittances, and expand PvP in EME currencies.[16]

Buna suggested its proposal could enhance the end customer experience by offering multiple currency choices, currency convertibility and FX rate management services, potentially reducing transaction costs for end customers, whether retail or wholesale. Both cases are important as Buna aims to support regional economic integration across the Middle East and with other partner regions. Citi's proposal, which also includes the creation of a new FMI, suggests that tokenised, regulated liabilities could be made available to retail and corporate customers of financial institutions. Citi's solution is designed to create a network of regulated banks and non-banks through shared infrastructure in order to encourage financial inclusion by lowering their cost to serve expanded customer segments. IZZI's solution aims to give banks and non-banks the ability to compete and offer single-currency and cross-currency payment services with PvP protection to depositors and end users (retail and wholesale). IZZI suggests that its payment services and accounts may be functionally simple and can be offered at low to no cost to promote financial inclusion, while incorporating currency convertibility to increase pricing transparency. RTGS.global noted that once liquidity positions are established in its system, participants can use them to initiate payments to beneficiary banks and their retail and corporate customers.

AusPayNet did not outline a particular technical solution but suggested that interlinking existing PvP platforms with newer, cheaper arrangements could broaden reach to additional currencies and address cost factors that inhibit the adoption of PvP arrangements for lower value payments in both the remittance and retail payments segments.

4. Options to facilitate increased adoption of PvP

As set out in Section 3, there are several credible technology and business solutions that could expand the range of PvP arrangements available to FX market participants. While not all of these solutions have commenced live operations, uptake of those that have launched remains relatively low. Increased adoption of existing, as well as new, PvP arrangements could help reduce the proportion of global FX trades that remain exposed to settlement risk, to strengthen the global financial system and reduce some of the frictions that contribute to making cross-border payments expensive, slow and opaque.

This section identifies potential ways for the private and public sectors to reduce some of the barriers to the development and growth of new PvP arrangements and ways to create stronger incentives for market participants to make use of existing, as well as new, PvP arrangements. Close collaboration between the public and private sectors in reducing these barriers could help increase adoption of PvP and unlock the full potential of current innovation in FX settlement arrangements while also mitigating systemic risk.

The CPMI has not assessed the suitability of the potential new PvP arrangements described in Section 3 and does not intend to endorse any one solution. Each new PvP arrangement should comply with local regulatory (and oversight) requirements in the jurisdictions in which it operates. A systemically important PvP infrastructure should fully observe the PFMI, as that is vital to preserve the resilience of the FX settlement ecosystem and contain the systemic risk that could arise from weaknesses in the design or operation of systemically important PvP infrastructure.

[16] Some of these proposals are also explored under BB 13 and BB 17 on interlinking of payment systems and multilateral platforms, respectively.

4.1 Roles for the private sector

The FX settlement ecosystem comprises many private sector actors, including PvP providers, nostro agents, liquidity providers and messaging services. It is also shaped by a range of market standards and conventions, for example, around nostro cut-off times, many of which have developed organically over an extended period. Some of these standards and conventions may act as barriers to expanding the functionality and range of transactions covered by existing, as well as new, PvP arrangements. A collaborative, cross-industry approach is likely to be needed to identify and lower these barriers.

This section sets out a range of possible roles for the private sector – acting collectively – in overcoming barriers to expanding PvP settlement. The roles are not mutually exclusive, and it is likely that the benefits from them – in terms of PvP adoption – will be multiplicative rather than additive.

4.1.1 Exploring potential changes to conventions for an international value date

Expanding the time window during which PvP settlement can be achieved in support of greater same-day PvP transactions may have little practical benefit unless supported by a market standard on value dates for trades in which the two legs settle simultaneously but on different local dates at either side of the International Date Line. Industry feedback indicates that central bank engagement could be important to secure a broad consensus on changes needed to market conventions given the impact on the wider financial ecosystem, including central banks' own policy operations.

4.1.2 Aligning nostro operating hours and processes

To expand the functionality and use of new same-day PvP services, market participants may need to extend nostro settlement hours and associated end-of-day processes. These end-of-day activities can include checks to ensure that all payments requiring processing have been made (and subsequent resolutions), end-of-day batch processing (eg, to roll trading positions to the next business day and unwind intraday liquidity), interest payments and regulatory reporting. Such processes may need to be performed throughout the day, as well as later in the day to expand the range of transactions eligible for same-day PvP. The changes that may be required necessitate further review both to assess what changes might need to be made and potential impacts of those changes on other areas. For example, nostro account balances are currently typically reconciled at the end of the value date via statements of activity provided to the account holder to confirm settlement finality.

4.1.3 Promoting integration and interoperability between legacy and emerging systems

PvP settlement is a network industry, characterised by substantial economies of scale. This is especially the case for mechanisms that use a netting procedure to limit liquidity demands, since netting benefits increase quickly with the number of transactions and participants. Fragmentation across multiple PvP providers, operating in the same market segment, may erode some of the benefits of PvP settlement, especially if the mechanisms are not interoperable.

To operate effectively, PvP arrangements need to connect to, and exchange data with, other parts of the payments infrastructure (including other PvP arrangements), as well as participants located in multiple jurisdictions. Different standards present a technical challenge, particularly in achieving straight through processing for FX transactions settling PvP. Industry feedback highlights technology interoperability and data standardisation, including as part of the migration to ISO 20022 messaging standards, as important enablers for new and expanded PvP arrangements.[17]

[17] BB 14 explores adoption of a harmonised ISO 20022 version for message formats (including rules for conversion / mapping) and BB15 considers harmonisation of API protocols for data exchange.

4.2 Roles for central banks and other public authorities

Central banks have a unique role in the FX settlement ecosystem, for example as RTGS system operators, central bank liquidity providers, prudential regulators, overseers, catalysts for innovation and convenors for industry. In all these capacities, central banks (and other public authorities) have an interest in facilitating increased adoption of PvP as far as practicable, while maintaining a resilient ecosystem and ensuring that systemically important PvP infrastructure is soundly designed and operated, in line with the standards set out in the PFMI. This is especially relevant for EME jurisdictions, where greater access to global infrastructures could increase currency trading and cross-border economic activity.

This section sets out the range of potential roles for the public sector, noting that some will be for consideration as part of other building blocks (noted alongside each option where appropriate). They divide into three broad categories mirroring central banks' functions as regulators and overseers, RTGS system operators and conveners of or catalysts for industry discussion.

4.2.1 Addressing regulatory barriers and sharpening regulatory incentives

Regulation affects the users as well as providers of PvP settlement services. Users are typically subject to banking regulations anchored in BCBS standards, while providers are usually (but not always) treated as financial market infrastructure and subject to standards based on the PFMI.

On the user side, the *BCBS Guidance* and *FX Global Code* both encourage use of PvP arrangements and rigorous management of FX settlement risk. There is, however, evidence that a substantial volume of transactions for which an existing PvP arrangement is available are not routinely settled using PvP. This may partly reflect limited functionality, especially for time-sensitive transactions that users are unwilling to submit for batch settlement. Nonetheless, some industry feedback suggests that stronger regulatory measures could help to encourage greater use of PvP services. For example, central banks (and/or prudential regulators) could examine possible ways to strengthen regulatory incentives for FX market participants to use PvP arrangements, including through global adoption of the *BCBS Guidance* across jurisdictions and more rigorous application of the guidance to market participants. Among other things, central banks could encourage better reporting and measurement of settlement risk exposures. For example, the full duration of the exposure should be captured, especially in cases where the settlement session lasts multiple days due to time-zone differences, correspondent banking arrangements or other factors.

On the provider side, regulation and oversight aim to ensure that PvP arrangements are safe, secure and reliable, such that they support market confidence and do not act as a conduit for systemic disruption. Multiple central banks and other regulatory agencies may have an interest in the ongoing supervision and oversight of large-scale PvP arrangements operating in their jurisdiction and/or settling transactions in their currency. PvP arrangements should fulfil all applicable regulatory requirements in every jurisdiction in which they operate.

Some respondents to the call for ideas identified robust settlement finality protection as a prerequisite for expanding the range of PvP arrangements available to market participants. For some EME currencies, the domestic legal regime may not adequately provide for these protections and may also define the points of irrevocability and finality in different ways, such that conflicts of law could emerge. This is a particular concern for PvP providers that, by design, operate in multiple jurisdictions or currencies. Setting clear standards and, if needed, providing technical assistance at the international level to develop the relevant legal regimes to support the provisions of the PvP provider's legal agreements with its participants and settlement banks relating to finality could help to remove a significant barrier to the ability of PvP operators to on-board additional currencies and corridors.[18]

[18] This could be included under BB 4 on aligning regulatory, supervisory and oversight frameworks for cross-border payments.

Similarly, some respondents identified the need to secure regulatory approvals in multiple jurisdictions as a potential obstacle to launching new PvP services. Central banks could explore whether and how regulatory and supervisory assessments of new or expanded PvP services could be coordinated to reduce administrative costs and encourage innovation. Any such coordination would need to respect central banks' individual regulatory and oversight mandates towards PvP providers operating in their jurisdiction or offering settlement in their currency.

4.2.2 Addressing central bank operational barriers

The terms on which PvP providers and their users can access and use central bank accounts – money and, if admitted, credit – have important implications for the broader utility of PvP arrangements. Industry feedback has identified several ways in which adjustments to central bank operations could ease the work of their systems as well as its utilisation by users, thereby encouraging greater adoption of PvP settlement.

Holistically assess the benefits, risks and barriers for expanding access to central bank accounts for PvP providers[19]

The CPMI identified, through a global survey of central banks (CPMI (2022b)), that only a minority of payment systems currently provide direct access to entities other than resident banks. Stakeholders in the cross-border payments ecosystem, such as non-bank PSPs, FMIs and foreign banks, can face challenges in obtaining direct payment system access. Direct access to central bank payment systems can foster greater competition and innovation as well as reduce the length of cross-border payment chains. However, it can also introduce risks to payment system users and central banks. Some national legal and regulatory frameworks limit the types of entity eligible for direct access to payment systems or central bank accounts.

Some PvP providers require their users to have direct access to RTGS systems in order to participate directly in the PvP arrangement, which can present a barrier to non-banks such as investment firms and non-bank payments providers. It follows that incumbent banks may possess the advantage of choosing which new infrastructures to participate in. According to the CPMI report on improving access, almost all wholesale payment systems, both in CPMI and non-CPMI jurisdictions, allow the direct participation of domestic financial institutions with a banking licence. Meanwhile, other types of entity that could have an important role in providing cross-border payment services, such as non-bank PSPs or foreign branches/subsidiaries located in the payment system jurisdiction, are significantly less likely to be eligible for direct access.

Some proposals described in Section 3 rely on settlement in central bank money, or settlement supported by funds at a central bank. Central banks may consider holistically evaluating the barriers, benefits and risks of improving access to central bank accounts and services to PvP providers, recognising that – in some jurisdictions – access to central bank accounts is determined by legislative and regulatory requirements. Examples of potential account structures across jurisdictions include limited purpose accounts (for the purposes of making settlements or payments, without access to credit); allowing an FMI to act as a settlement agent with operational control of a joint account; or recognising the use of accounts to maintain central bank money of third parties.

Consider extending and aligning RTGS operating hours in support of PvP arrangements[20]

Central banks extending RTGS operating hours can support certain PvP arrangements that rely on settlement in central bank money. The CPMI has set out three possible "end states" for central banks to consider and introduced the concept of a "global settlement window" – the period when the largest

[19] BB 10 further examines how to expand access for FMIs, non-banks and foreign banks to key payment systems. The operators of PvP arrangements are typically FMIs that would require access to central bank accounts to hold pooled funds or discharge payments made between counterparties.

[20] BB 12 further examines extending and aligning operating hours of key payment systems to allow overlapping.

number of RTGS systems simultaneously operate (CPMI (2022a)). Existing arrangements offering PvP may favour the opening hours of AEs and may therefore pose a barrier to undertaking PvP with EMEs, a growing market segment. Extending RTGS operating hours in a coordinated manner, especially across currency pairs where the overlap of operating hours is limited, could extend the global settlement window. Expanding the overlap of operating hours provides a foundational component in support of PvP arrangements that rely on central bank accounts. This could widen the set of FX transactions that could be settled using PvP.

Operating hours could also be extended on a bilateral basis to prioritise certain high-value or high-volume currency corridors, or where there is an additional driver such as trade or demographics. However it should be noted that extending operating hours in isolation is unlikely to yield appreciable benefits without cooperation from market participants, such as nostro providers, who may need to upgrade their own internal systems and reconciliation processes to utilise the extended settlement window.

Explore functionalities in RTGS platforms and interoperability where practical

Many central banks around the world are undertaking infrastructure renewal programmes to replace legacy systems with more modern technology, including developing plans to put in place functionality that allows liquidity to be ring-fenced and settlement to be synchronised across different ledgers (RTGS systems). This can link the transfer of two assets in such a way that one asset moves if and only if another movement happens, which is a necessary but not always sufficient element of any PvP arrangement.

Today the use of central bank money is complex because each RTGS system has its own rules, legal and operational, relating to account access and settlement. Some central banks are exploring ways to interface and connect multiple RTGS systems to significantly expand opportunities for external providers to settle FX transactions PvP, for example by allowing easier connection to synchronised settlement for a broader range of assets and systems using risk-free central bank money. This in turn could lower funding costs and reduce settlement risk in more markets.

Closer cooperation by central bank operators to facilitate standard operational ways of working could help to facilitate innovation and interoperability. This could include standardising APIs, messaging and other technical on-boarding requirements to prevent further fragmentation in the ecosystem, which could enable PvP entrants to avoid bespoke technical builds and connection process in each jurisdiction. That in turn would make it easier and cheaper for PvP entrants to scale up and enter new markets.

Explore easing liquidity constraints on PvP settlement where practical

Settling FX transactions PvP in real time is liquidity-intensive. Existing and some proposed new PvP arrangements mitigate liquidity risks by multilateral netting such that participants do not need to fund the full gross value of their transactions. The drawback of multilateral netting is that it reduces flexibility over the timing and speed of FX payments. Industry feedback suggests that some B2B payments (eg those connected to corporate actions) require payment to be made at a particular time of day. This may preclude the use of multilateral netting.

The emergence of new PvP arrangements, whether they offer settlement on a gross, bilateral net or multilateral net basis, could increase industry appetite for facilities that allow surplus central bank liquidity to be rotated between currencies more easily. Users could thus better manage intraday liquidity, particularly unexpected liquidity shortfalls, and reduce funding costs.

Central banks could explore how to ease liquidity pressures in a number of ways, for example by building a network of central bank guarantees based on collateral at the home central bank to provide foreign central banks with guarantees.[21] This was the rationale for developing the Scandinavian Cash Pool

[21] BB 11 explores reciprocal liquidity arrangements across central banks (liquidity bridges) in more depth.

when CLSSettlement was launched in 2002.[22] In a liquidity bridge, RTGS participants pledge collateral to a given central bank ("facilitating central bank") in exchange for short-term (typically intraday) liquidity from another central bank ("lending central bank") in the latter's currency. This liquidity, provided by the lending central bank, can be used to meet the participants' own routine payment obligations, or those of the participants' subsidiaries or affiliates, in the lending central bank's currency.

The implementation of such arrangements may reduce FX and credit risks for participants that raise intraday liquidity through FX transactions with commercial counterparties. It may also provide broader financial stability benefits, including by reducing intraday settlement risk across borders and providing a source of central bank liquidity in times of market stress. Liquidity bridges must, however, be designed in a way that minimises financial risk to the central banks involved, and they must not disrupt other central banking functions such as monetary policy implementation and the regulation of liquidity risks among RTGS participants.

4.2.3 Catalysing private sector engagement and innovation

In addition to their operational and regulatory roles, central banks can use their convening power to facilitate coordinated industry solutions to structural problems in a particular market. For example, several central banks have established standing committees to serve as forums for central banks and market participants to discuss risks and vulnerabilities in FX markets. At a global level, the Global Foreign Exchange Committee (GFXC) serves to collate and identify responses to challenges common to multiple jurisdictions, for example through development of the *FX Global Code*. [23]

These groups – and others like them – could help to develop and build support for the changes to market conventions described in Section 4.1.1. Some respondents to the call for ideas emphasised that clear direction from central banks, for example through the GFXC, would be necessary to catalyse industry discussion on revised value date conventions and similar practices, especially where these are currently well established and difficult to change.

5. Conclusion

The call for ideas yielded numerous promising proposals for new solutions that may be capable of processing FX transactions that currently settle on a non-PvP basis. Existing PvP arrangements have proven resilient in their ability to reduce FX settlement risk and optimise liquidity usage, particularly for AE currencies. New solutions may complement existing PvP arrangements by supporting a wider range of EME currencies, reaching less sophisticated market participants and providing features such as real-time and same-day PvP settlement to further control bilateral exposures and improve liquidity management. Any new solution would need to achieve a critical mass of users to effectively reduce FX settlement risk, although several new solutions could coexist as they may target different FX market segments.

Industry engagement indicates that both enhancements to existing PvP arrangements and the development of new solutions can benefit from private and public stakeholders working together to address common barriers to the broad adoption of PvP. The private sector could agree on conventions for value dating, align nostro operating hours, and promote interoperability between legacy and emerging systems. Central banks could assess operational barriers to the use of central bank accounts, money and credit facilities by new PvP providers as well as catalyse continued private sector engagement on reducing

[22] The Scandinavian Cash Pool enables the pledging of cash as cross-border collateral between Denmark, Norway and Sweden. The system was developed in order to facilitate CLSSettlement participants' access to intraday liquidity in the Scandinavian currencies, although the use of the SCP is not limited to liquidity provision for CLSSettlement (Danmarks Nationalbank (2003)).

[23] The GFXC continually works on strengthening adherence to the *FX Global Code*, see www.globalfxc.org/press/p220628.htm.

FX settlement risk and consider sharpening regulatory incentives for market participants to use PvP services where they are available.

Going forward, the CPMI seeks to gather additional feedback from market participants, including providers and users of existing and prospective FX settlement services. Based on industry engagement, the CPMI will refine its view on the practical actions required to expand PvP settlement, focusing on the needs of users, to clarify the potential benefits and pain points associated with the various solution design choices. The CPMI will seek to prioritise potential next steps to be taken by private and public stakeholders alike, noting that central banks will continue to play important roles as operators of RTGS systems, liquidity providers, supervisors and prudential regulators, and convenors of industry stakeholders. The next steps will be integrated into the overall cross-border payments programme to realise synergies between private and public sector actions. Finally, the CPMI, together with other public stakeholders such as the BCBS, will continue to monitor the evolution of FX settlement risk and PvP adoption with the aim of enhancing global cross-border payments.[24]

References

Basel Committee on Banking Supervision (BCBS) (2013): *Supervisory guidance for managing risks associated with the settlement of foreign exchange transactions,* February.

BCBS and Committee on Payments and Market Infrastructures (CPMI) (2020): *Supervisory Guidance on managing FX settlement risk and the Global FX Code*, December.

Bech, M and H Holden (2019): "FX settlement risk remains significant", *BIS Quarterly Review,* December.

Committee on Payments and Market Infrastructures (CPMI) (2020a): *Enhancing cross-border payments: building blocks of a global roadmap*, July.

——— (2020b): *Enhancing cross-border payments: building blocks of a global roadmap - Technical background note,* July.

——— (2022a): *Extending and aligning payment system operating hours for cross-border payments,* May.

——— (2022b): *Improving access to payment systems for cross-border payments: best practices for self-assessments,* May.

Committee on Payments and Settlement Systems (CPSS) (1996): *Settlement risk in foreign exchange transactions*, March.

——— (2008): *Progress reducing foreign exchange settlement risk*, May.

CPSS and International Organization of Securities Commissions (IOSCO) (2012): *Principles for financial market infrastructures*, April.

Danmarks Nationalbank (2003): "SCP – Scandinavian Cash Pool", *Monetary Review 4th Quarter,* December.

Financial Stability Board (FSB) (2020): *Enhancing cross-border payments: Stage 3 roadmap,* October.

Global Foreign Exchange Committee (GFXC) (2021): *FX Global Code,* July.

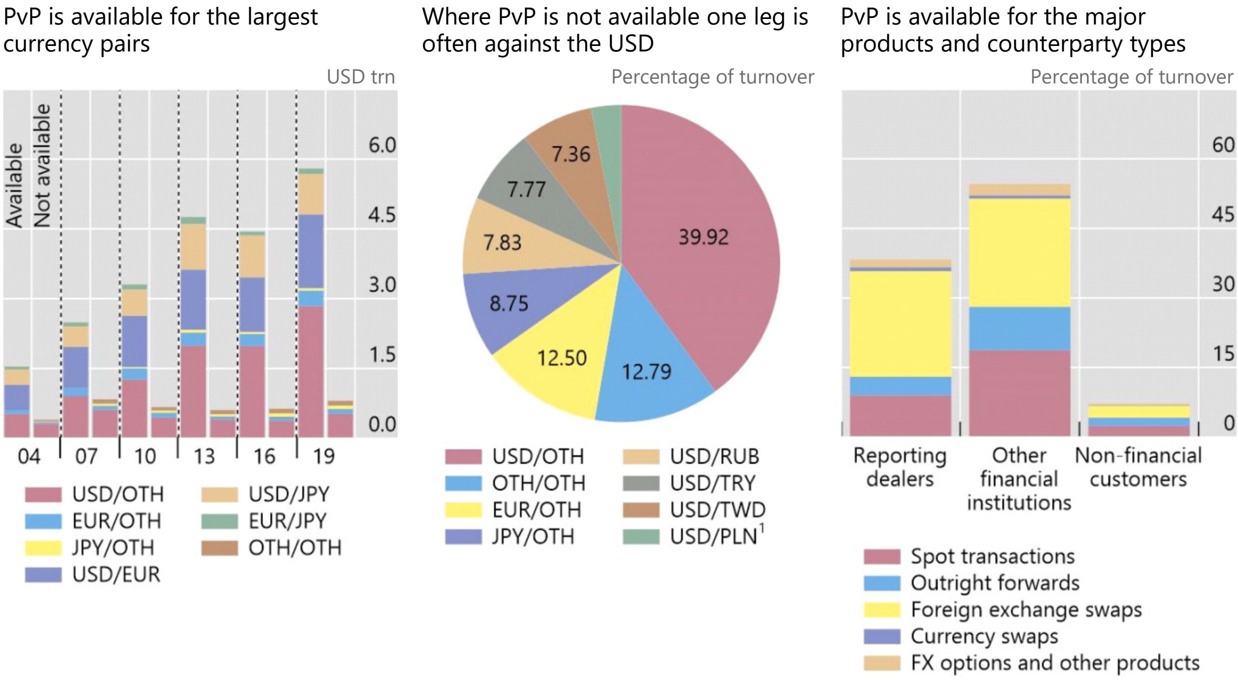
Kos, D and R Levich (2016): "Settlement risk in the global FX market: how much remains?", *SSRN*, October.

[24] This includes incorporating the results of the 2022 Triennial Survey into the final version of this report.

Appendix 1: Supplementary graphs and tables

Availability of PvP settlement with respect to currencies and FX products

Graph A1



[1] The percentage of turnover for USD/PLN is 3.1%.

EUR = euro; JPY = Japanese yen; OTH = other currencies; PLN = Polish zloty; RUB = Russian rouble; TRY = Turkish lira; TWD = New Taiwan dollar; USD = United States dollar.

Sources: 2019 Triennial Survey; BIS calculations

Eligible FX products in existing PvP arrangements

Table A1

	B3	HK CHATS	CCIL	CLSNow	CLSSettlement
Spot transactions	✓	✓	✓		✓
Outright forwards		✓	✓		✓
Foreign exchange swaps		✓	✓	✓	✓
Currency swaps		✓			✓
Options		✓			✓
Other		✓[1]		✓[2]	✓[3]

[1] The scope of FX products supported is subject to the direct participating banks' arrangements on how to use HK CHATS PvP settlement platform at the back end for the simultaneous settlement of two currency legs for relevant financial instruments, and is not stipulated in the Rules and Operating Procedures. [2] Same-day trades. [3] CLSSettlement settles bilaterally netted payment instructions related to OTC credit derivatives submitted on behalf of clients by the DTCC Deriv/SERV service.

Source: CPMI survey.

Direct participation in existing PvP arrangements

Table A2

	B3	HK CHATS	CCIL	CLSNow	CLSSettlement
Number of members	83	163	78	3	76
Proportion of members that are banks (per cent)	93	97	99	100	95
Types of requirement					
Locational requirement	✓ domestic only	✓ jurisdictions which participate in the PvP arrangement only	✓ domestic only	✓ jurisdictions for which CLS has received a satisfactory finality opinion	✓ jurisdictions for which CLS has received a satisfactory finality and netting opinion
Financial requirement	✓ minimum capital	✓ existing regulatory capital	✗ must be an authorised FX dealer	✓ existing regulatory capital and minimum rating	✓ existing regulatory capital and minimum rating
Operational requirement	✓ including meeting technical requirements, conditions and funding obligations	✓ including SWIFT connectivity, testing requirements and system setup	✓ including having a current account with the Reserve Bank of India and meeting minimum technical requirements	✓ including meeting technical requirements, testing requirements, and funding obligations	✓ including meeting technical requirements, testing requirements, and funding obligations
Fixed costs	Communications link, technology, data centre	None	One-time membership fee (INR 100,000)	Annual service fee	Account opening fee and annual account maintenance fee
Variable costs	Volume based	Volume based	Value based	Value based	Volume and value based
Involvement of nostro agents	✓ settlement banks located in NY for USD settlement	✗	✓ commercial banks for USD	✗ CLS utilises its own central bank accounts. Members may utilise nostro agents for settlement in currencies in which they do not have central bank accounts	✗ CLS utilises its own central bank accounts. Members may utilise nostro agents for settlement in currencies in which they do not have central bank accounts

Source: CPMI survey.

Appendix 2: Actions and milestones for Building Block 9 – Facilitating increased adoption of PvP

Below, the full actions and milestones for Building Block 9 based on the G20 roadmap are listed (FSB (2020)). The dates for each milestone in the following table indicate the start and completion dates for the steps described in the milestone. For all actions in 2021 and 2022, actions and dates are committed deliverables. The content of actions and dates of milestones beyond late 2022 are indicative.

Actions and milestones

Action 1: Encourage observance of existing international guidance on use of PvP and ways to identify, measure, monitor, and control remaining FX settlement risk.

a. BCBS and CPMI Chairs to issue joint letter encouraging the observance of the expectations agreed to in the 2013 BCBS Supervisory Guidance on managing FX settlement risk.[25] Relevant authorities to continue guiding supervised entities to observe expectations and to encourage FX committees to support the Global FX Code[26] principles

December 2020

Action 2: Stocktaking and analysis to develop options that could increase adoption of PvP

a. CPMI to take stock of existing and in-development PvP arrangements designed to support FX settlement. In addition, drivers for non-PvP settlement should be analysed, leveraging existing analytical work in this field.

November 2020 – May 2021

b. CPMI, to develop proposals for increased adoption of PvP by encouraging (i) enhancements to existing PvP arrangements and/or (ii) the design of new public sector and/or private-sector solutions for PvP arrangement that currently do not exist.

June 2021 – April 2022

Action 3: Identification of the most feasible option(s) and development of an implementation plan

a. CPMI to conduct public consultation (domestically and/or internationally, as appropriate) on the most feasible option(s) for encouraging greater use of PvP and determine next steps for implementing the BB, based on the results of the consultation.

May 2022 – November 2022

b. Relevant bodies to work with CPMI to develop an implementation plan.

December 2022 – December 2023

[25] Guideline 2 on Principal Risk notes that "A bank should use FMIs that provide PvP settlement to eliminate principal risk when settling FX transaction. Where PvP settlement is not practicable, a bank should properly identify, measure, control and reduce the size and duration of its remaining principal risk."

[26] Principle 35 and Principle 50, which note that "Market Participants should take prudent measures to manage and reduce their Settlement Risks, including prompt resolution measures to minimise disruption to trading activities" and "Market Participants should measure and monitor their Settlement Risk and seek to mitigate that risk when possible".

Appendix 3: Cross-border Payments Foreign Exchange Workstream

Chair

Federal Reserve Bank of New York	Hampton Finer

Members

Reserve Bank of Australia	Matthew Boge
The People's Bank of China	Changchun Mu Lyu Yuan (Alternate) Xiaochen Zhang (Alternate)
European Central Bank	Robert Hofmeister*
Hong Kong Monetary Authority	Kwok-Hung Lee [until August 2021] Stephen Pang [since August 2021]
Reserve Bank of India	Sudhanshu Prasad
Bank Indonesia	Ahmad Arifin [until April 2022] Rozidyanti [since April 2022] Ratih Indrastuti (Alternate) [until April 2022] Sigit Setiawan (Alternate) [since April 2022]
Bank of Italy	Paolemilio Feleppa*
Bank of Korea	Jaesung Park Gibaek Kwon (Alternate)
Saudi Central Bank	Feras Bakhsh
South African Reserve Bank	Shaun Rayfield Jeannie Weilbach (Alternate)
Bank of England	John Jackson [until November 2021] Paul Bedford* [since November 2021] Michaela Costello* (Alternate)
Board of Governors of the Federal Reserve System	Mark Magro* Kelly Roberts* (Alternate) Aleksandra Petkovic* (Alternate)
Federal Reserve Bank of New York	Zareera Bukhari* Emily Dougherty* (Alternate)

Observers

Basel Committee on Banking Supervision	Stefan Hohl
Financial Stability Board	Kieran Murphy Alexandre Stervinou (Alternate) [until September 2021]
International Monetary Fund	Tommaso Mancini Griffoli
World Bank Group	Gynedi Srinivas Nilima Ramteke (Alternate)

Secretariat

CPMI Secretariat	Thomas Nilsson* Jenny Hancock [until July 2021] Mark Choi [since July 2021]

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* Member of the drafting team.

Appendix 4: Acronyms and abbreviations

24/7	24 hours a day, seven days a week
AE	advanced economy
AED	United Arab Emirates dirham
API	application programming interface
B3	B3 Foreign Exchange Clearinghouse
BB	Building Block of the G20 roadmap
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
CAD	Canadian dollar
CCIL	Clearing Corporation of India Ltd
CCP	central counterparty
CHATS	Hong Kong CHATS PvP Arrangement
CHF	Swiss franc
CLS	CLS Bank International
CNH	Chinese renminbi
CPMI	Committee on Payments and Market Infrastructures
CSD	central securities depository
DvP	delivery versus payment
EGP	Egyptian pound
EME	emerging market economy
EUR	euro
FMI	financial market infrastructure
FSB	Financial Stability Board
FX	foreign exchange
FX WS	Foreign Exchange Workstream
G20	Group of Twenty
GBP	British pound sterling
GFXC	Global Foreign Exchange Committee
JOD	Jordanian dinar
KYC	know your customer
OTC	over-the-counter
PFMI	Principles for financial market infrastructures
PLN	Polish zloty
PSP	payment service provider
PvP	payment versus payment
RTGS	real-time gross settlement
RUB	Russian rouble
SAR	Saudi riyal
SME	small and medium-sized enterprise
SSS	securities settlement system
TRY	Turkish lira
USD	United States dollar
wCBDC	wholesale central bank digital currency