FX settlement risk mitigation in (wholesale) cross-border payments

Cross-border Payments Interoperability and Extension Taskforce:
Task Team 1

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This report was written with input from PIE Taskforce task team 1 members* and with comments from other parties.** The views expressed are not necessarily the views of the Bank for International Settlements (BIS), the BIS Committee on Payments and Market Infrastructures (CPMI) or its member central banks.

* CLS, CIPS, GFMA, RTGS.global, SADC
** Baton/OSTTRA, Mastercard, Swift

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1. Background

It has been four years since the G20 endorsed a roadmap to enhance cross-border payments (the Roadmap),[1] 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 organizations and standard-setting bodies. As the program has turned to implementation, the CPMI and FSB have organized the work around priority themes, one of which revolves around interoperability and extension of payment systems.

Under the umbrella of the CPMI-led cross-border payments interoperability and extension taskforce (PIE TF), there have been reflections on how to further reduce outstanding foreign exchange (FX) settlement risk (i.e., the risk that one party to a currency trade fails to deliver the currency owed) in the FX ecosystem in general and for cross-border payments in particular.

In parallel, the revised FX Global Code, published in January 2025,[2] places further emphasis and specificity on FX settlement risk mitigation, reflecting on the evolving FX market landscape and the recognition that settlement risk persists and continues to pose systemic threats to global financial stability.

Against this background, a survey of FX settlement arrangements was conducted to refresh and expand on the CPMI's March 2023 report "Facilitating Increased Adoption of PvP", the results of which are a key input to this report, which serves the purpose of presenting the industry perspective on key principles and suggested next steps to ensure that FX settlement risk mitigation remains high on the agenda of all stakeholders.

2. The heightened importance of FX settlement risk mitigation

2.1 The growth and evolution of the FX market

The FX market, a segment of which involves cross-border payment transfers, is unique. It is the world's largest financial market today, which sovereigns, central banks, government-sponsored entities, corporations and investors regularly rely on for important operational needs, including to reduce risk by hedging currency exposures, pay suppliers and be paid for services outside their home market, convert returns from international investments into domestic currencies, make cross-border investments and raise funding outside home markets.

According to the 2022 BIS Triennial Survey findings, the FX market has grown over the past two decades from around USD1.5 trillion to approximately USD7.5 trillion per day (figure 1).[3] The FX market is now around 25 times greater than global gross domestic product.[4]

The exponential growth of the FX market over the decades is broadly fueled by globalization, financial liberalization at jurisdictional level, technological enhancements (e.g. electronic trading platforms, algorithmic trading) and lower barriers to entry for retail investors. The creation of risk-mitigating and liquidity efficient settlement arrangements (as further explained below) also contributed to this development.

Throughout this growth, the composition of currency participation has also evolved within the global FX market. While the US dollar has remained the dominant currency (involved in 88% of all trades in 2022 – unchanged from 2019), there has been a substantial growth of emerging market and developing economy (EMDE) currencies. For example, the Chinese renminbi saw a notable increase from around

[1] FSB (2020), Enhancing cross-border payments roadmap.
[2] https://www.globalfxc.org/uploads/fx_global.pdf
[3] Bank for International Settlement (2022), Triennial Central Bank Survey of foreign exchange and over-the-counter (OTC) derivatives markets.
[4] Global GDP was USD106.17 trillion per annum = USD0.29 trillion per day; source: World Bank, World Development Indicators database.

1% 20 years ago to approximately 7% in 2022, making it the fifth most actively traded currency (figure 2). Other emerging market currencies like the Mexican peso and Turkish lira have seen increased overall trading activity too. Developments also reflect a growing internationalization of some EMDE currencies.[5]

Figure 1: Global FX market turnover by instrument

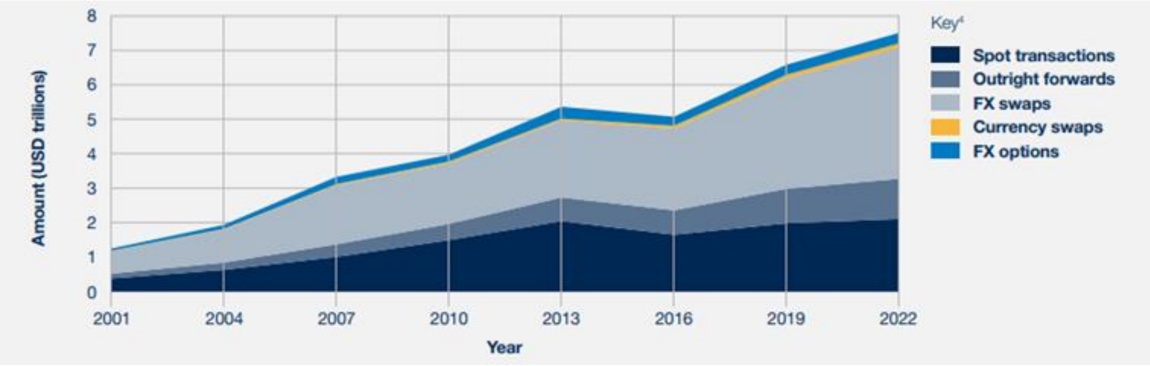
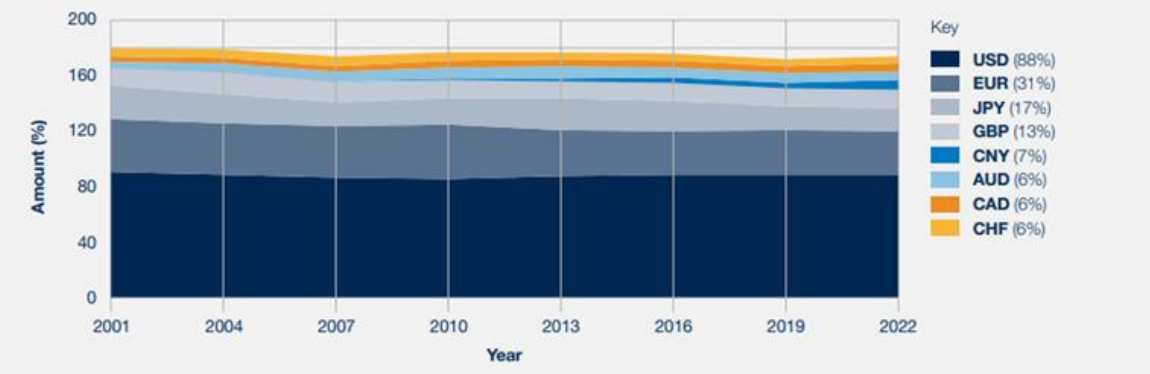


Figure 2: Global FX market turnover by top eight currencies



Source: BIS Triennial Survey (2022). Sum of shares in individual currencies totals 200% as two currencies are involved in each transaction.

The 2022 BIS Triennial Survey has highlighted key shifts in the evolution of FX instruments,[6] indicating a growing reliance on derivative instruments for risk management. FX swaps have continued to dominate, accounting for 51% of total turnover (up from 49% in 2019), driven by liquidity management and hedging needs. FX spot transactions on the other hand, have seen a slight decline in share (28% of total turnover in 2022, down from 30% in 2019). Outright forwards have remained stable at 15% of turnover, while options and cross-currency swaps have experienced minor fluctuations.

There exist other developments which according to some PIE TF task team members are noteworthy from an FX market and cross-border payments perspective (annex 1):

- Reoccurring market turbulence and economic events (e.g., the global financial crisis of 2007-2008 and the more recent banking failures and Credit Suisse rescue) has continued to emphasize the importance of managing credit and liquidity risks in settlement, which continues to be a focus for regulators.[7]

[5] Based on the BIS Triennial Survey data.
[6] For definition of FX instruments, refer to "Bank for International Settlements (2022) Triennial Central Bank Survey of foreign exchange and over-the-counter (OTC) derivatives markets", https://www.bis.org/statistics/rpfx22_fx.pdf
[7] See for example: ECB Sound practices for intraday liquidity risk management https://www.bankingsupervision.europa.eu/press/publications/newsletter/2024/html/ssm.nl241113_2.en.html

- Geopolitical or non-economic shocks (e.g., the Covid-19 pandemic and the war in Ukraine), stress the necessity for robust cross-border settlement arrangements. The pendulum is swinging back towards higher levels of fragmentation in the global financial system, which could in turn reduce the efficiency of international finance and therefore also have a detrimental effect on the interconnectedness of the global FX market and the processing of the underlying cross-border payment flows.
- Discussions and developments have intensified around new technologies including digital assets like stablecoins, central bank digital currencies (CBDC) and digital tokens which leverage Distributed Ledger Technologies (DLT) as underlying infrastructure and payment rails. While the same-day business is still a niche market in the FX ecosystem, some of these innovations (including research and experimentations) are based on the premise of same-day or event instant settlement.

2.2 Payment-versus-payment (PvP) settlement as the de-facto market standard

It should be noted that there exist fundamental differences between the retail and the wholesale FX markets:[8]

- The retail FX market prioritizes transaction costs and speed, where the rapid and affordable processing of high volume but low value payments drive customer satisfaction and convenience.
- In the wholesale FX market, however, settlement risk is a primary concern, as transactions involve large notional amounts that are settled across different payment systems and time zones on predetermined value dates. Therefore, the safe settlement of each currency within a FX transaction is a vital element to the effective functioning and stability of the global wholesale FX market. Settlement risk could materialize if the settlement of FX trades is not fully synchronized.

FX settlement risk materialized in 1974 when Bankhaus Herstatt (the 35th largest bank in Germany at the time) failed.[9] Given the importance of settlements to the overall functioning of the wholesale FX market, in the late 1980s and early 1990s, the G10 central bank community conducted several studies on how to address FX settlement risk.[10] In 1996, industry groups were encouraged to develop and provide risk-reducing multicurrency services.[11] As a consequence, the private sector established CLS in 2002 and more regionally operating solutions over the following years. More recently, new initiatives for mitigating FX settlement risk have emerged.

Many of these solutions (section 3) rely on PvP functionality in which a party's payment instruction in one currency is not settled unless the corresponding payment instruction in the counter currency is settled. FX settlement risk is mitigated by synchronizing the settlement of payment instructions for the two currency legs of a trade.

According to the BIS Triennial Survey results, over the past 25 years, the portion of FX turnover settling without any risk mitigation has decreased from 85% of FX traffic to 31%,[12] with recent estimates suggesting that this could be even lower at 10-15%,[13] with PvP being the preferred method to mitigate FX settlement risk. BIS research highlighted more recent bank losses of EUR300 million (2008) and USD130 million (2020)[14] that may have been prevented by settlement risk mitigation.

[8] According to the FSB KPI reports (e.g. consolidate progress report of October 2023), wholesale payments are defined as payments with a value of at least USD100,000.

[9] In 1974, because of speculations in an environment with high USD volatility, Herstatt Bank had accumulated 470 million DEM/Deutsche Mark (ca. EUR240 million) in losses, compared with capital of only 44 million DEM. When German regulators closed down Herstatt Bank on 26 June 1974 at 16:30 (CET), counterparty banks incurred losses because Herstatt Bank had already received DEM payments and not yet initiated USD payments.

[10] Bank for International Settlement (1989) "Report on Netting schemes"; BIS (1990) "Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten countries"; Committee on Payment and Settlement Systems / CPSS (1993) "Central Bank Payment and Settlement Services with Respect to Cross-Border and Multi-Currency Transactions".

[11] CPSS (1996) "Settlement Risk in Foreign Exchange Transactions", CPSS (1998) "Reducing Foreign Exchange Settlement Risk".

[12] BIS 2022 Triennial Survey.

[13] "Once more unto the breach" – speech by Philippe Lintern, Head of FX Division at Bank of England (2024).

[14] Glowka, M., Nilsson, T. (2022), FX settlement risk: an unsettled issue; BIS Quarterly Review, December.

The importance of PvP is also recognized by public and private sector initiatives:

- In 2013, the Basel Committee on Banking Supervision (BCBS) issued guidance promoting the use of PvP settlement where practicable, on top of other recommendations around the effective management of FX settlement-related risks, including replacement cost risk, liquidity risk, operational risk and legal risk.[15]
- In 2020, the Chairs of the BCBS and the CPMI encouraged meeting the guidance and expectations agreed in 2013.[16]
- In 2020, the FSB published the G20 Roadmap for Enhancing Cross-Border Payments, which comprised a workstream (building block 9) to facilitate increased adoption of PvP. The CPMI subsequently engaged with public and private sector stakeholders to explore feasible options for increasing PvP adoption.[17]
- The FX Global Code,[18] a set of global principles of good practice that was developed by a partnership between central banks and market participants from 20 jurisdictions, encourages FX market participants to explore ways to further mitigate risk and reduce operational costs by adopting a best practice approach to FX settlement risk management and netting (FX Global Code principles 35 and 50). These principles were further strengthened in 2025 following the recently conducted Code review.

However, despite the portion of the FX market settling without PvP protection having decreased in relative terms, it keeps rising in absolute terms (as the actual size of the FX market has increased fifteen-fold since the late 1980s). **To illustrate, in the late 1980s the FX market size, largely settling without PvP settlement protection, was approximately USD500 billion[19] in nominal values. By contrast, in 2022 (based on BIS Triennial survey data), the 31% share of global FX market turnover settling without any form of PvP risk mitigation represented approximately USD2.2 trillion, equivalent to a four-fold increase since the late 1980s.**

2.3 Reducing FX settlement risk through netting

Certain FX parties or transactions, especially physically settling EMDE currencies, have faced challenges accessing PvP solutions, i.e. settlement risk cannot be fully eliminated. In these cases, the size and duration of the settlement risk and liquidity usage can still be reduced through netting. In this respect, the revised FX Global Code encourages the use of automated netting systems.[20]

Netting services can be bilateral (i.e., between two parties) or multilateral (between three or more parties) in nature. While multilateral netting may reduce flexibility over the timing and speed of FX payments, it could substantially diminish funding needs by up to 99%.[21] Reducing payment obligations through bilateral netting before settlement would also help reduce settlement risk. On average, bilateral netting can help decrease settlement risk exposure by approximately 70%.[22]

2.4 Wider range of settlement practices

FX settlement risk is a spectrum, and it is important to recognize that there exists a range of settlement practices within the FX market with varying levels of FX settlement risk (figure 3).

[15] BCBS (2013) "Supervisory guidance for managing risks associated with the settlement of foreign exchange transactions".
[16] https://www.bis.org/press/201217_letter.pdf
[17] CPMI (2023) "Final report - Facilitating increased adoption of payment versus payment (PvP)".
[18] https://www.globalfxc.org/uploads/fx_global.pdf
[19] According to the 1995 BIS Triennial study (Central Bank Survey of FX and Derivatives Market Activity, BIS, (1995)), the total FX turnover was USD 1.2tn ADV in 1995, representing a 45% increase from the 1992 study and a somewhat faster rate of growth than the 30% between the 1989 and 1992 study. This would put the 1989 total FX turnover at USD 636bn ADV. Assuming a similar rate of growth since the first BIS study in 1986, this would put the total FX turnover at around 500billion ADV.
[20] FX Global Code Principle 35 – Settlement Risk "When determining settlement methods for FX transactions Market Participants should consider the following hierarchy to reduce Settlement Risk: 1. Where practicable, Market Participants should eliminate Settlement Risk, for example by using settlement services that provide PVP settlement. 2. Where Settlement Risk cannot be eliminated, Market Participants should reduce the size and duration of their Settlement Risk as much as practicable. The netting of FX settlement obligations (in particular the use of automated settlement netting systems) is encouraged. 3. Where practicable, gross bilateral settlement should be minimized."
[21] CLSSettlement combines FX settlement risk mitigation with multilateral netting and additional liquidity optimization tools, which yields liquidity savings for CLS settlement members of approximately 99%.
[22] CPSS (2007) "Progress in reducing foreign exchange settlement". The bilateral netting ratio is often far higher for inter-group trades.

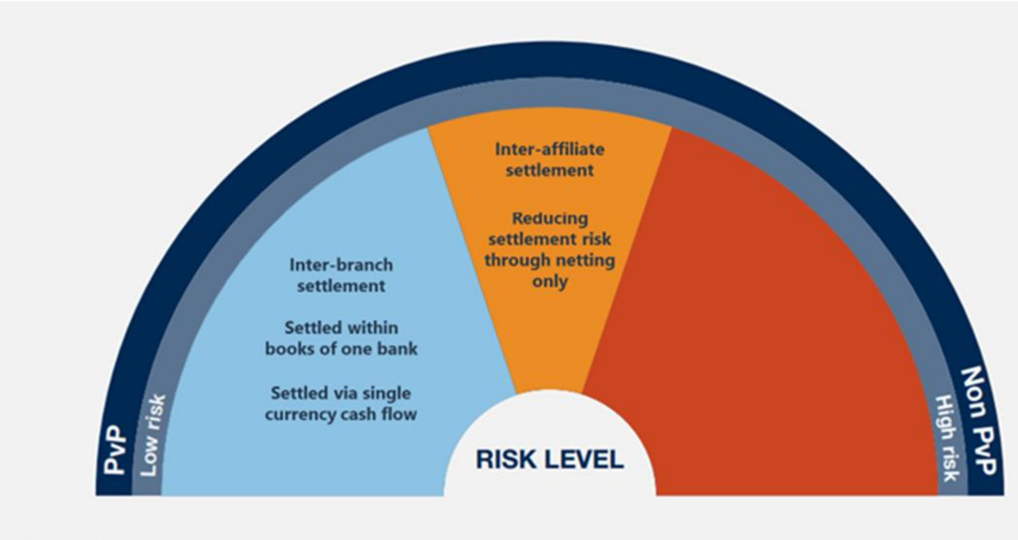
For example, in inter-branch settlement, the two payment obligations underlying an FX trade may be transferred between branches of the same legal entity and settle across the books of a single institution without any time lag, effectively eliminating settlement risk.

For certain trades, including some prime brokerage activities, clients may close out any open market risk with FX banks on a daily basis. The resulting net single currency cash movement represents realized profit and loss from the day's trading activity. As there is no exchange of one currency for another, there is no settlement risk arising from this arrangement.

Moreover, trades may be debited and credited on accounts that are fully controlled by one bank. This means that for payments that are booked simultaneously (without time lag) across the bank's own ledger there is no settlement risk deriving from such an arrangement.

In inter-affiliate settlement, the two corresponding payment obligations may be settled between two subsidiaries or affiliates of a banking group. As such entities typically have their own accounting system, settlement of the two payment legs may not be synchronized, resulting in time lags. Depending on the precise set-up and underlying legal structure, this arrangement could entail some degree of settlement risk.

Figure 3: Settlement risk level by settlement practice



Source: CLS survey conducted with several settlement members.

3. Suggested next steps: Keeping the momentum for FX settlement risk reduction

3.1 Keep emphasizing the need for FX settlement risk reduction

When the G20 cross-border roadmap was established in 2020, 19 building blocks were created, with building block 9 focusing on facilitating the expansion of PvP to a wider range of currencies and market participants to mitigate FX settlement risk.

During its first two years (until 2022), the G20 initiative established foundational elements of the roadmap and conducted stock-takes and analyses. In this context, the CPMI published a final report on building block 9 in March 2023, which analyzes the causes of non-PvP settlement, takes stock of existing and proposed PvP solutions, and suggests roles for both the private and public sector institutions to facilitate increased adoption of PvP.[23] The report finds that existing PvP arrangements have generally been successful at reducing settlement risk, but certain market segments, in particular EMDE currencies, remain exposed. The report also highlights some of the challenges to broad market adoption of PvP arrangements, both for new and existing solutions.[24]

In an effort to deliver tangible enhancements to cross-border payments by the end of 2027, a prioritization plan and a public-private sector engagement model were established in 2023. Work is based on three interconnected themes that focus on selected building blocks. In this framework, building block 9 now sits as a supporting initiative under the payment system interoperability and extension theme, driven forward by the PIE TF.

Beyond the G20 cross-border roadmap, the FX Global Code stresses that market participants should properly measure, monitor and control their settlement risk equivalently to other counterparty credit exposures (principle 50).

Suggested next step #1: Keep emphasizing the need for settlement risk reduction with a focus on physically settling EMDE currencies.

The increasing share of global FX turnover without access to PvP settlement protection arrangements remains a growing challenge. Efforts around FX settlement risk mitigation, with a particular focus on physically settling EMDE currencies must therefore remain a priority for all stakeholders until PvP protection solutions are further developed and matured.

Given that today's settlement risk exposure is four times higher (according to the 2022 BIS Triennial survey data) than where it was in the late 1980s when the public sector requested the private sector to develop and provide risk-reducing multicurrency service, the industry calls on the public sector to consider taking similar actions, engage with the private sector and the broader FX ecosystem to keep emphasis on FX settlement risk reduction and take steps to measure and control risk consistent with FX Global Code guidance.

3.2 Organizing follow-up work identified in the 2023 CPMI report on PvP

The 2023 CPMI report identifies a range of possible roles for the private sector to facilitate PvP adoption on a global scale:

- **Aligning nostro operating hours and processes:** The report identifies that limited operating hours of nostro providers restrict the available time window for PvP settlement, especially with respect to same-day transactions. An extension of nostro operating hours and a refinement of end-of-day activities (to be performed throughout the day in addition to late in the day) could therefore be considered.
- **Exploring potential changes to conventions for an international value date:** In order to support PvP transactions, a market standard could help with respect to trades in which the two legs settle on different local dates at either side of the International Date Line.
- **Promoting integration and interoperability between legacy and emerging systems:** A lack of integration and interoperability between different payment systems for FX settlement can present a technical barrier to broader adoption of PvP for cross-border currency trades. In particular, different technical standards can present a challenge and measures like the migration to ISO 20022 messaging standards can be an important enabler.

[23] CPMI (2023) Facilitating increased adoption of payment versus payment (PvP)- final report. The report was informed by a call for ideas, extensive industry engagement, and a public consultation in 2022.
[24] These include: (i) weak incentives for market participants to settlement FX trades using PvP; (ii) technical challenges for PvP providers to access and interoperate with RTGS systems; and (iii) legal challenges for PvP providers to reconcile differences in national legal and regulatory frameworks.

In relation to the first and second aspect, it is noted that (as presented in this note) same-day settlement still remains a niche market in the wholesale FX space but may gain ground in the coming years. Moreover, any change to operating hours, processes and conventions may impact other asset classes and other business areas, and therefore requires careful consideration.

With respect to questions around the existence of a business case for interoperability, it should be noted that existing and emerging PvP solutions are often complementary in nature in the sense that they are tailored to specific markets, serving different use cases and having different geographical reach.

Suggested next step #2: Consider follow-up work identified in 2023 CPMI report "Facilitating increased adoption of PvP".

The PIE TF task team felt that, given the complexity of the FX ecosystem and the diversity of perspectives of the various industry players, follow-up work, if moved forward, would benefit from the facilitation of the public sector (e.g., through the CPMI Community of Practice on Payment Systems (CoPS)).

Given the impact on the wider financial system, including central banks' monetary policy, work around an international value date would require the close involvement and possibly the steer of the public sector.

Beyond the follow-up work identified in the 2023 CPMI report, developments in the innovation space, such as digital assets (e.g., stablecoins), and their implications on FX settlement risk mitigation efforts could be explored.

3.3 Capacity building around existing PvP solutions

Magnitude of FX settlement risk

According to the 2022 BIS Triennial Survey results,[25] the share of the FX market without risk mitigation stands at 31% of FX trades. Following a detailed review in conjunction with market participants, the upcoming BIS Triennial survey (2025) relies on a different reporting methodology than previous years to provide a more granular picture of settlement risk in the market. A more recent estimate puts the share of the FX market without risk mitigation at around 10 to 15%.[26]

The availability of quantitative data on the FX settlement risk in the ecosystem is of key relevance for understanding and tracking risk and mitigation in different segments of the FX market. In this respect, the refined methodology for the 2025 BIS Triennial Survey is expected to allow for providing a more accurate picture of the magnitude of FX settlement risk.

Suggested next step #3: Enhancing transparency on the magnitude of FX settlement risk.

The BIS Triennial survey is the main source for quantifying the magnitude of FX settlement risk in the market. Going forward, given the fast-paced developments in the FX market, the PIE TF task team sees benefit in more frequent market data collections beyond the Triennial survey (e.g., on a semi-annual basis) and in line with the FX Global Code principle on measuring settlement risk. It is acknowledged that work is already ongoing at the local FX committee level.[27]

Overview of PvP solutions

The CPMI conducted a survey of existing and emerging PvP arrangements in April 2021, the results of which informed its 2023 PvP Report. That report provides a comprehensive overview of the different PvP solutions and their designs (as of the date of publication).

[25] BIS Triennial Central Bank Survey.
[26] "Once more unto the breach" – speech by Philippe Lintern, Head of FX Division at Bank of England (2024).
[27] Semi-annual surveys are already conducted by several FX committees (e.g. Australia, Canada, Hong Kong, UK, US, Singapore and Japan).

The overview inter alia provides information about the different provider's jurisdiction and the legal and regulatory framework, the supported currency pairs and products, the type of entities that can participate either directly or indirectly, operating days and settlement windows, and the supported settlement assets.

Suggested next step #4: Enhancing transparency on available PvP solutions.

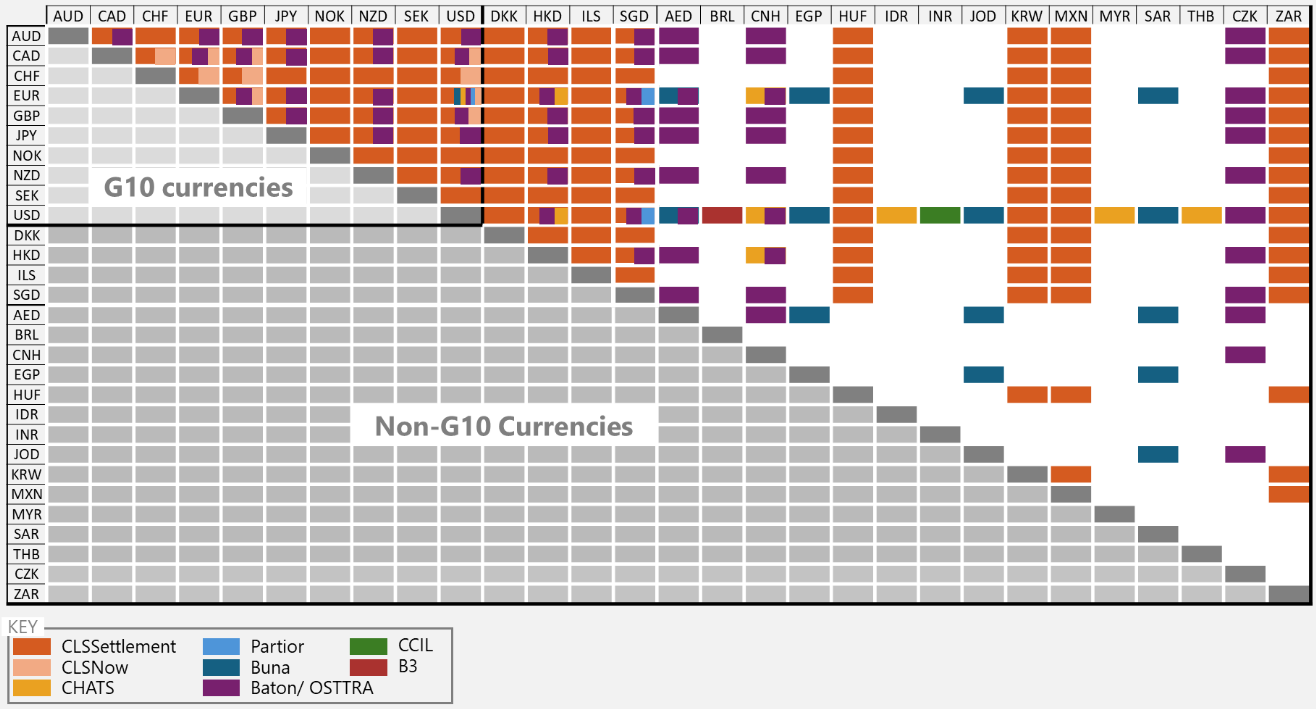
In striving to increase PvP adoption, it is important to have a transparent picture of the global and regional PvP solutions that exist today. Given the rapid pace of technological change and evolving market dynamics, benefit is seen in updating the collected information (figure 4 and annex 2) at regular intervals (e.g., annually) to ensure continued transparency of available PvP and risk mitigation solutions in the FX market.

Figure 4: Coverage of PvP arrangements across G10 and non-G10 currencies

Eligible currency pairs in active PvP arrangements

A survey was launched in January 2025 at PIE TF level, with the aim of collecting, analyzing and publicly sharing PvP arrangements' existing eligibility criteria for currency access. Below is a point-in-time view of PvP settlement arrangements and their coverage across G10 and non-G10 currencies.

Please note this includes only PvP settlement solutions that are currently in live operations. RTGS.global (planning to launch services in GBP, EUR, PHP and MYR) and Fnality (planning to launch a network of independent payment systems that interoperate to allow instant PvP settlement in GBP, USD and EUR) are not included. More detailed information of the PvP settlement solution providers can be found in annex 2.



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

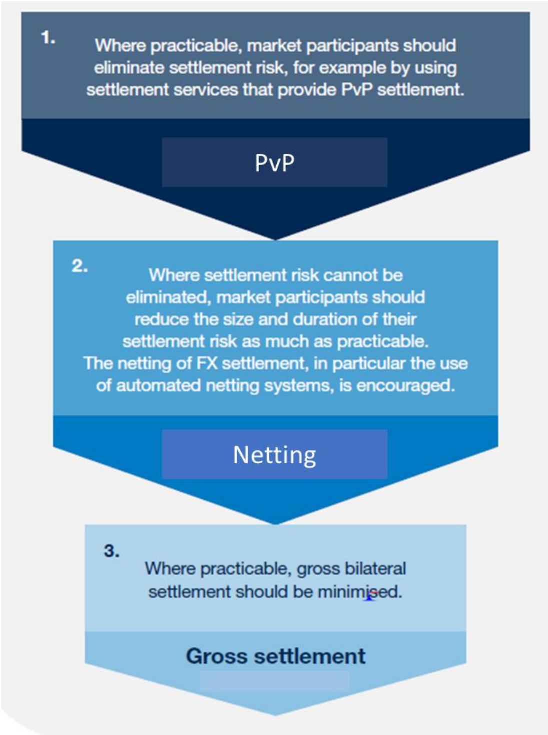
Source: PIE TF 2025 survey (except B3, which is based on the 2023 CPMI report - Facilitating increased adoption of payment versus payment (PvP).

3.4 Developing guidance on degree of FX settlement risk for non-PvP arrangements

The revised FX Global Code, published in January 2025, places further emphasis and specificity on FX settlement risk mitigation.[28] Specifically, the FX Global Code amendments introduce a hierarchical "risk waterfall" approach to managing settlement risk. PvP settlement occupies the top tier and should be prioritized in the first instance. But where settlement risk cannot be eliminated, the FX Global Code encourages market participants to reduce the size and duration of their settlement risk as much as practicable. To that end, the netting of FX obligations is encouraged (figure 5).

In addition to PvP and netting, there exist other arrangements with a certain degree of settlement risk, such as trades settled via a net single currency cashflow, trades settled within the books of one bank, inter-branch settlement and inter-affiliate settlement.

Figure 5: FX Global code "risk waterfall"



Suggested next step #5: Participants should consider the guidance on the degree of settlement risk for non-PvP arrangements.

Where PvP settlement risk mitigation arrangements are not yet in place, risk reduction through bilateral and multilateral netting should be considered in line with the "risk waterfall" of the revised FX Global Code. To that end, market participants should consider the full spectrum of available risk mitigation measures if PvP is not practicable or possible.

3.5 Exploring liquidity optimization in view of shorter settlement cycles

In the FX space, the time lag between submission and the actual settlement of payment instructions typically follows the market convention of two days (T+2) while next-day settlement (T+1) may increasingly occur following the shifts to T+1 settlement in the securities space. Today, only a small number of payment instructions match and settle on the same-day or instantaneously (T+0). The existing FX same-day market helps banks avoid overnight exposure to FX risk, optimize balance sheets and meet regulatory requirements.

[28] https://www.globalfxc.org/press-releases/press-p241210/

Given the large amounts at stake in the FX markets, and beyond FX settlement risk mitigation, liquidity optimization through (multilateral and bilateral) netting plays an important role in FX settlement. Moreover, due consideration needs to be given to operational risk aspects and settlement risk in non-FX products.

Suggested next step #6: Explore liquidity optimization in view of shorter settlement cycles.

As industry experiments and academic discussions around same-day settlement and the introduction of shorter settlement cycles are intensifying, the potential impact or benefits on netting efficiencies in the wholesale FX space needs to be fully understood. Research and experimentation around PvP, conducted by the private and public sector, is often based on the premise of instant settlement and does not explore netting and liquidity optimization.

Going forward, it is suggested that research and experimentation (by private and public sector) around future PvP models and settlement risk solutions, including new settlement assets like wholesale central bank digital currencies, considers the opportunities and challenges of liquidity optimization tools, given their relevance for FX market participants.

Case study conducted by CLS and Financial Network Analytics (FNA) on the introduction of additional settlement cycles in a given day

CLS conducted a joint research study with FNA, which focused on the implications and potential benefits of introducing additional settlement cycles to the existing CLSSettlement cycle. The CLSSettlement system operates a single settlement cycle each day with funding and settlement between 07:00–12:00 CET.

The study found that the opportunities and challenges of introducing additional settlement cycles depend not only on the number of cycles per day, but also on the time of day.

The study concluded that the introduction of up to two additional cycles after 07:00 CET could theoretically lead to a potential reduction in PvP settlement risk for up to USD500 billion, by making the same-day FX market that currently settles outside of CLSSettlement eligible, noting that a large portion of this same-day market matches after the current 07:00 CET cycle and therefore currently settles outside of CLSSettlement.

The study also hypothesized that liquidity requirements could be significantly reduced by up to USD240 billion through netting efficiency gains when moving to multilateral batch netting within CLSSettlement and it extends CLSSettlement's operational efficiency benefits (e.g., straight-through processing, minimizing failed trades) to the same-day FX market.

The study does not indicate a strategic direction for CLS or suggest plans for implementation and solely serves as a foundation for further reflection and discussion with the broader FX ecosystem on the implications of same-day FX settlement solutions.

4. Conclusions and next steps

The FX market has grown exponentially over the past decades. Fifty years ago, the FX market's daily trading volume was below USD100 billion globally.[29] Between 1983 and 2022, FX market turnover surged from USD110 billion to around USD7.5 trillion per day.[30]

In the late 1980s the FX market size, largely settling without PvP settlement protection, was approximately USD500 billion in nominal values. By contrast, in 2022 (based on BIS Triennial survey data), a 31% share of global FX market turnover settled without any form of settlement risk mitigation, representing approximately USD2.2 trillion and being equivalent to a four-fold increase compared to the late 1980s.

FX settlement risk mitigation, with a particular focus on physically settling EMDE currencies, must remain high on the agenda of all stakeholders. Concretely, the following recommendations and possible actions are put forward for further consideration.

Table 1: Summary of suggested next steps

	Suggested next steps	**Owner**	**Complementary work**
1	Keep emphasizing the need for FX settlement risk reduction with a focus on physically settling EMDE currencies	Public sector (steer) / private sector	Revised FX Global Code (published in January 2025)
2	Consider follow-up work identified in 2023 CPMI report "Facilitating increased adoption of PvP"	Public sector (steer) / private sector	
3-4	Enhance transparency on magnitude of FX settlement risk and available PvP solutions • More frequent market data collections • Regular update of available PvP solutions (work conducted at PIE TF level)	Public sector / private sector	BIS Triennial Survey (to be published in Q4 2025)
5	Consider guidance for market participants on degree of settlement risk for non-PvP arrangements	Public sector / private sector	Revised FX Global Code (published January 2025)
6	Explore liquidity optimization in view of shorter settlement cycles	Public sector / private sector	Ongoing research and experimentation (e.g. on central bank digital currencies)

[29] DraKoln, N. (2004) Forex for small speculators.

[30] Frankel, J. et al (1996) The microstructure of foreign exchange markets / chapter: Risk and Turnover in the Foreign Exchange market; BIS Triennial Central Bank Survey

Annex 1: Developments in the FX space

Over the past years, several factors emerged which have the potential to significantly impact the FX ecosystem and consequently have a bearing on the underlying multicurrency cross-border payment flows.

Growth of emerging market and developing economy currencies

Throughout the evolution of the FX market, several key currencies have comprised the bulk of FX trading, dominated by the US dollar, which facilitates offshore funding markets and serves as a base currency via which other currencies are exchanged indirectly.

In recent years, the share of emerging market and developing economy (EMDE) currencies has substantially grown. For example, the Chinese renminbi's share of the FX market has increased from 1% twenty years ago to 7% in 2022 (based on BIS Triennial Survey data), making it the fifth most actively traded currency.

Times of "polycrises"[31]

Today's world is characterized by reoccurring market turbulence, either caused by economic events (e.g., the global financial crisis of 2007-2008 and the Credit Suisse rescue) or non-economic shocks (e.g., the Covid-19 pandemic and the war in Ukraine). Due to the global connectedness of the financial systems, these triggers can create a ripple effect across the global FX market that quickly impact upon currency prices. In fact, the FX market is quite sensitive to external events and subject to considerable volatility.[32] At the same time, the FX market is normally very liquid, at least with respect to major currency pairs, which minimizes the risk of erratic fluctuations.

Historically, FX market turnover increases in tandem with volatility. The reason being that in times of elevated uncertainty and risk, market participants generate additional (cross-border) payment traffic by adjusting positions to hedge risk. Specifically, inter-dealer trading tends to increase, and derivatives business appears to shift towards shorter maturities.[33]

Global financial system fragmentation

As the geopolitical situation evolves, the fragmentation of the global financial system could potentially increase. Higher levels of fragmentation could reduce the efficiency of international finance and therefore also have a detrimental effect on the interconnectedness of the global FX market and the processing of the underlying cross-border payment flows.

The emergence of an increasingly multipolar world could impact the global FX market due to more pronounced complexities of the financial infrastructure and barriers in global capital flows. Those developments could inter alia translate into rising levels of uncertainty for investors and more market volatility, which in turn could bring challenges for liquidity allocation between globally acting market participants.

Research suggests that that the negative effects of fragmentation will not be distributed equally around the globe. It is expected that regions with less developed and less integrated capital markets will be affected more significantly.[34]

[31] Polycrisis is "a cluster of related global risks with compounding effects, such that the overall impact exceeds the sum of each part"; see World Economic Forum (2023). The Global risks report. The term 'polycrisis' was coined by the French social scientist Edgar Morin in 1999.

[32] Melvin, M., Taylor, M. (2009). The crisis in the foreign exchange market, CESifo working paper No. 2707; Bech, M. (2012). FX volume during the financial crisis and now.

[33] Drehmann, M., Sushko, V. (2022). The global foreign exchange market in a higher-volatility environment, BIS Quarterly Review December.

[34] World Economic Forum (2025) Navigating Global Financial System Fragmentation, Insight Report

Emergence of new settlement assets

In recent years, discussions around digital assets like stablecoins, central bank digital currencies (CBDC) and tokens have intensified. These discussions share a common reliance on Distributed Ledger Technologies (DLT) as underlying infrastructure and payment rails. While no large-scale implementation of DLT-based infrastructure exists to date,[35] there has been creative and thought-provoking experimentation and research around DLT, tokenization and (wholesale) CBDC by the industry and the public sector.

Conceptually, there could be different designs for cross-border solutions which involve FX transactions: (i) a shared (or unified)[36] ledger which brings together multiple financial asset markets as executable objects on a common programmable platform, (ii) bilateral links between ledgers through which assets can be exchanged, or (iii) a central hub connecting different ledgers which host different assets. Depending on the concrete design, these approaches could impact FX settlement risk mitigation, especially when implemented in addition to and with interoperability with existing market solutions.

[35] OECD (2025) Tokenization of assets and distributed ledger technologies in financial markets – potential impediments to market development and policy implications, OECD Business and Finance Policy Papers, No. 75

[36] This concept was first introduced by the BIS in 2023, and now underpins the design in the Project Agora launched by the BIS.

Annex 2: Overview of existing PvP arrangements (February 2025)

(Source: PIE TF 2025 survey. See supporting footnotes on page 19).

Table 2: Overview of PvP arrangements (1/3)

	CLSSettlement	**CLSNow**	**CHATS**	**Partior**
Operator	CLS Bank International	CLS Bank International	Hong Kong Interbank Clearing Ltd	Partior
System name	CLSSettlement	CLSNow	Clearing House Automated Transfer System	Partior Decentralised FX PvP
Jurisdiction	United States	United States	Hong Kong SAR	Singapore
Year of launch/expected	2002	2019	2000	2024
Primary regulator/overseer	Board of Governors of the Federal Reserve System	Board of Governors of the Federal Reserve System	Hong Kong Monetary Authority	Monetary Authority of Singapore
PvP mechanism	Simultaneous gross settlement[37]	Simultaneous gross settlement	Simultaneous gross settlement	Simultaneous gross settlement
Settlement timing	Once per business day	Throughout the business day	Throughout the business day	Instant and once per hour
Operating days	5.5	5.5	5	7
Money settlements[38]	Central bank money (AUD, CAD, CHF, DKK. EUR, GBP, HKD, HUF, ILS, JPY, KRW, MXN, NOK, NZD, SEK, SGD, USD, ZAR)	Central bank money (CAD, CHF, EUR, GBP, USD)	Central bank money (HKD, IDR, MYR, THB), Commercial bank money (CNH, EUR, USD)	Commercial bank money (USD, EUR, SGD, AED, QAR), central bank money to be supported through RTGS interoperability (e.g. GBP BoE CHAPS synchronisation)
Settlement model	Centralized	Centralized	Centralized	Decentralized
Netting options	Multilateral	Multilateral	Multilateral	Multilateral
Eligible FX instruments				
Spots	×		×	×
Outright forwards	×		×	×
FX swaps	×	×	×	×
Currency swaps	×		×	
Options	×		×	
Other	×[39]	×[40]	×[41]	
Number of active/live direct members	73	3	226	6
Proportion of direct members that are banks	97%	100%	99%	100%
Type of active/live direct members				
Commercial banks	×	×	×	×
Non-banks, e.g., PSPs and corporates				×
Retail users				
Types of requirements				
Locational requirement	× (jurisdictions for which CLS has received a satisfactory finality and netting opinion)	× (jurisdictions for which CLS has received a satisfactory finality opinion)	× (domestic only, except for CLS Bank)	None
Financial requirement	× (existing regulatory capital and minimum rating)	× (existing regulatory capital and minimum rating)	× (existing regulatory capital)	None
Operational requirement	× (including meeting technical requirements, testing requirements, and funding obligations)	× (including meeting technical requirements, testing requirements, and funding obligations)	× (including SWIFT connectivity, testing requirements, and system set up)	× (participants need to have nostro relationship with settlement bank on Partior network and / or central bank for RTGS interoperability)

Table 3: Overview of PvP arrangements (2/3)

	Buna	Baton/OSTTRA	CCIL	B3
Operator	Arab Regional Payments, Clearing and Settlement Organization (ARPCSO)	Osttra Group Ltd	The Clearing Corporation of India Ltd	B3 SA
System name	Buna	Osttra PvP Settlement Orchestration - Powered by Baton Systems	Forex Settlement	Foreign Exchange Clearinghouse
Jurisdiction	Supranational Organization (IO entity, based in UAE)	United Kingdom	India	Brazil
Year of launch/expected	2023	2018	2002	2002
Primary regulator/overseer	Central Bank of the UAE	Financial Conduct Authority	Reserve Bank of India	Central Bank of Brazil
PvP mechanism	Simultaneous gross settlement	Simultaneous net settlement	Central clearing, net settlement	Central clearing, net settlement
Settlement timing	Throughout the business day	Throughout the business day	Once per business day	Once per business day
Operating days	6	6	5	[no information available]
Money settlements [FN1]	Central bank money (AED, EGP, JOD), Commercial bank money (SAR, USD, EUR)	Commercial bank money (AED, AUD, GBP, CAD, CNH, CZK, EUR, HKD, JPY, NZD, SGD, USD)[42]	Central bank money (INR), Commercial bank money (USD)	Central bank money (BRL), Commercial bank money (USD)
Settlement model	Centralized	Decentralized	Centralized	Centralized
Netting options	None (gross settlement)	Bilateral[43]	Multilateral	[no information available]
Eligible FX instruments				
Spots	×	×	×	×
Outright forwards		×	×	
FX swaps		×	×	
Currency swaps		×		
Options		×		
Other		×[44]		
Number of active/live direct members	100	15	81	83
Proportion of direct members that are banks	100%	100%	96%	93%
Type of active/live direct members				
Commercial banks	×	×	×	×
Non-banks, e.g., PSPs and corporates			×	[no information available]
Retail users				
Types of requirements				
Locational requirement	None	None	× (domestic only for HKD CHATS, except for CLS Bank)	× (domestic only)
Financial requirement	None	None	× (must be an authorized FX dealer and existing regulatory capital)	× (minimum capital)
Operational requirement	× (Membership in the in-country payment system or account with the central bank, correspondent bank per currency (except local one), compliance program, and Swift connectivity)	× (must agree to standard system operating procedures and rulebook)	× (having current account with Reserve Bank of India and meeting minimum technical requirements, including SWIFT connectivity, testing requirements and system set up)	× (including meeting technical requirements, conditions, and funding obligations)

Table 4: Overview of PvP arrangements (3/3)

	Fnality	RTGS.global
Operator	Fnality US and Fnality UK	RTGS.global
System name	Dollar Fnality Payment System ($FnPS) and Sterling Fnality Payment System (£FnPS)	RTGS.global
Jurisdiction	United States and United Kingdom	United Kingdom
Year of launch/expected	2026	2025
Primary regulator/overseer	Still under consideration/discussion with respective central banks for each local system	Bank of England
PvP mechanism	Simultaneous gross settlement	Simultaneous gross settlement
Settlement timing	24 hours	Throughout the business day
Operating days	7	7
Money settlements [FN1]	Central bank money (GBP, USD)	Central bank money (GBP, EUR, PHP, MYR)
Settlement model	Decentralized	Centralized
Netting Options	gross settlement – potential offsetting options under consideration	Not in the initial release
Eligible FX instruments		
Spots	×	×
Outright forwards	×	×
FX swaps	×	×
Currency swaps	×	×
Options	×	×
Other	×[45]	×[46]
Number of active/live direct members	0	0
Proportion of direct members that are banks	N/A	N/A
Type of active/live direct members		
Commercial banks	×	×
Non-banks, e.g., PSPs and corporates		
Retail users		
Types of requirements		
Locational requirement	Members to meet specific UK and/or US eligibility criteria	× (jurisdictions with regulatory framework that support omnibus account or equivalent)
Financial requirement	× (regulated going concern banks only)	None
Operational requirement	× (integration via MX/ISO20022 and/or API)	× (integration via API, support 24/7/265)

Tables 2-4: Overview of PvP arrangements supporting footnotes

39 Funding is on a multilateral net basis.

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

41 CLSSettlement settles bilaterally netted payment instructions related to OTC credit derivatives submitted on behalf of clients by the DTCC Deriv/SERV service.

42 Same-day trades.

43 The scope of FX instruments 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.

44 Active currencies listed above, but all currencies are eligible for the service.

45 Current active participants settle on a bilateral net basis, but other methods are available subject to demand.

46 There are no product specific or tenor restrictions.

47 Supports programmability of payments through earmarking (smart contracts), which can be used to facilitate PvP settlement across two local Fnality payment systems.

48 Settlement rails for cross-border payment flows.