

## FX settlement risk: an unsettled issue<sup>1</sup>

*FX settlement risk, the risk that one party to a currency trade fails to deliver the currency owed, can result in significant losses and undermine financial stability. Netting and payment versus payment (PvP) mechanisms help to mitigate this risk. However, almost a third of deliverable FX turnover, or \$2.2 trillion, was still at risk on any given day in April 2022, up from \$1.9 trillion in April 2019. Settlement risk remains because existing PvP arrangements are unavailable, or unsuitable for certain trades, or market participants find them too expensive. Ongoing policy initiatives and private sector innovation aim to encourage PvP adoption for more currencies and market participants.*

*JEL classification: E42, F31, G15.*

FX settlement risk, the risk that one party to a trade of currencies fails to deliver the currency owed, can result in significant losses for market participants, sometimes with systemic consequences. The failure of Bankhaus Herstatt in 1974, the best known example, eroded confidence in interbank relations and caused a freeze in money market lending (Galati (2002)). Recent examples include KfW Bankengruppe's €300 million loss when Lehman Brothers collapsed in 2008 (Hughes (2009)), and Barclays' \$130 million loss to a small currency exchange in March 2020 (Parsons (2021)).

Almost 50 years after the Herstatt bankruptcy, nearly a third of deliverable FX turnover remains subject to settlement risk, according to new data from the 2022 BIS Triennial Survey. While this share is unchanged from the 2019 Survey, settlement risk has increased in absolute terms in line with the growth in FX turnover. That is, \$2.2 trillion was at risk on any given day in April 2022, up from an estimated \$1.9 trillion in April 2019 (see the Technical Annex).

This feature assesses the scale of FX settlement risk and the mechanisms in place to mitigate it.<sup>2</sup> We first document the current risk level and its components, drawing on expanded FX settlement risk data in the 2022 BIS Triennial Survey. Second, we highlight the reasons why risk remains. Third, we present ongoing policy initiatives and private sector innovations to mitigate this risk.

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<sup>2</sup> See also Galati (2002), Lindley (2008), Kos and Levich (2016) and Bech and Holden (2019).

### **Key takeaways**

- In April 2022, \$2.2 trillion of daily FX turnover was subject to settlement risk, up from an estimated \$1.9 trillion in April 2019.
- FX settlement risk, the risk that one party in a currency trade fails to deliver the currency owed, remains because existing settlement arrangements to mitigate risk are unavailable, or unsuitable for settling certain trades, or market participants find them too expensive.
- Public and private sector stakeholders are working to reduce FX settlement risk for a broader range of currencies and market participants.

## **Mechanisms to reduce settlement risk**

Market participants have two main options for mitigating FX settlement risk.<sup>3</sup> First, they can bilaterally offset their payment obligations to reduce the amounts that need to be settled (ie “pre-settlement netting”). Second, they can settle any remaining turnover via payment-versus-payment (PvP) arrangements or via the same clearer, termed “on-us”. In a PvP mechanism, the final payment of one currency occurs if, and only if, the final payment of the other currency takes place. In on-us settlement, both payment legs settle across the books of a single institution. However, parties are protected against loss only if both legs settle *simultaneously* or if settlement is certain to occur within preauthorised credit lines (ie “on-us with loss protection”).<sup>4</sup>

Pre-settlement netting reduced settlement risk in almost a fifth of deliverable turnover in 2022, unchanged from 2019 (Graph 1.A, blue bars). As turnover has grown, this amounts to pre-settlement netting of \$1.3 trillion per day (Table 1), up from an estimated \$1.1 trillion in 2019. The increase can be attributed to wider availability of automated netting services, driven also by market pressure to reduce funding costs.

In the remaining turnover to be settled, much settlement risk remains despite the broader adoption of PvP arrangements since 1997. In April 2022, \$3.5 trillion of deliverable turnover was settled with risk mitigation (Table 1 and Graph 1.A, green bars). Of this, \$2.5 trillion was settled via CLS, a global financial market infrastructure that provides for PvP in 18 currencies (see CPSS (2008), Annex 4, for details on CLS). Nearly \$1 trillion was settled either via other PvP arrangements or via the same clearer or on-us with loss protection. The remaining \$2.2 trillion was settled via on-us without loss protection or via other non-PvP arrangements and is therefore subject to risk.<sup>5</sup>

<sup>3</sup> Settlement risk is a general term used to designate the risk that settlement will not take place as expected. It comprises both credit and liquidity risk. In this feature, we focus on principal risk, a form of credit risk that arises for deliverable FX turnover, ie trades that settle with multiple payments between counterparties (eg spot trades, outright forwards, FX swaps and currency swaps). Principal risk is the risk that a counterparty loses the full value involved in a transaction. Loss of principal can occur if one party to an FX trade delivers its currency, but the counterparty does not.

<sup>4</sup> Simultaneous on-us settlement differs from PvP in that the two payments are timed to coincide but may settle unconditionally, ie one payment may settle even if the other payment does not.

<sup>5</sup> As data are not fully comparable over time, changes in settlement risk cannot be measured precisely. If the proportion of on-us settlement with loss protection was the same in 2019 as in 2022, the share of deliverable turnover without risk mitigation is unchanged at 31%.

## Settlement of foreign exchange (FX) turnover in April 2022<sup>1</sup>

In billions of US dollars

Table 1

	All counterparties		Reporting Dealers		Other financial institutions		Non-financial customers	
Deliverable turnover <sup>2</sup>	6,988	100%	3,248	100%	3,348	100%	392	100%
Pre-settlement netting <sup>3</sup>	1,337	19%	591	18%	665	20%	82	21%
Turnover settled	5,651	81%	2,658	82%	2,683	80%	310	79%
with risk mitigation	3,495	50%	1,783	55%	1,563	47%	149	38%
via CLS (PvP)	2,518	36%	1,333	41%	1,125	34%	59	15%
via other PvP arrangements	257	4%	101	3%	127	4%	30	8%
via on-us with loss protection	720	10%	349	11%	310	9%	60	15%
without risk mitigation	2,155	31%	875	27%	1,120	33%	161	41%
via on-us without loss protection	550	8%	259	8%	231	7%	60	15%
via other non-PvP arrangements	1,606	23%	616	19%	889	27%	101	26%

<sup>1</sup> See technical annex for details. <sup>2</sup> Turnover settled with multiple payments between counterparties (eg spot trades, outright forwards, FX swaps and currency swaps). <sup>3</sup> Pre-settlement netting is calculated as the difference between deliverable turnover and turnover settled.

Source: BIS Triennial Central Bank Survey; authors' calculations.

The scale of FX settlement risk varies markedly across jurisdictions (Graph 1.B). In some locations with less trading, more than three quarters of deliverable turnover was subject to settlement risk. By contrast, in the locations with the largest trading volumes only 20–40% was, resulting in a global average of 31%. In general, a smaller share of trades is settled without risk mitigation in advanced economies (AEs) than in emerging market economies (EMEs).

Trades between reporting dealers tend to settle with risk mitigation; those with customers less so (Table 1). Relative to large global banks, smaller market participants often lack access to certain PvP arrangements or netting services.

### Why settlement risk remains

Recent industry engagement by the BIS Committee on Payments and Market Infrastructures (CPMI) has highlighted factors that limit the adoption of PvP settlement (CPMI (2022)). These industry outreach efforts formed part of the broader G20 programme to enhance cross-border payments.<sup>6</sup>

First is a simple cost-benefit calculus. Adoption of PvP or similar arrangements requires that market participants find the individual and systemic benefits of using the arrangement to outweigh the costs, which include transaction fees, monthly charges and investments associated with joining the service. Some smaller market participants have indicated that joining existing PvP arrangements, or indirectly accessing their services through a direct participant, is too expensive or not practicable for some trading activities.

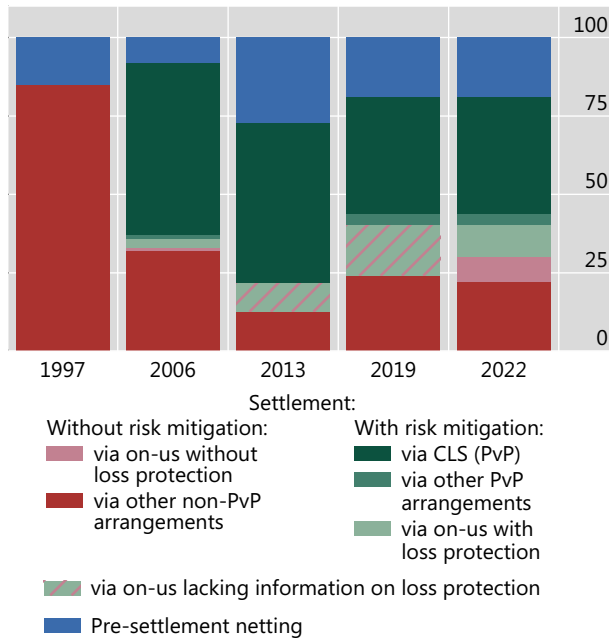
<sup>6</sup> See [www.bis.org/cpmi/cross\\_border.htm](http://www.bis.org/cpmi/cross_border.htm).

## Settlement of foreign exchange turnover<sup>1</sup>

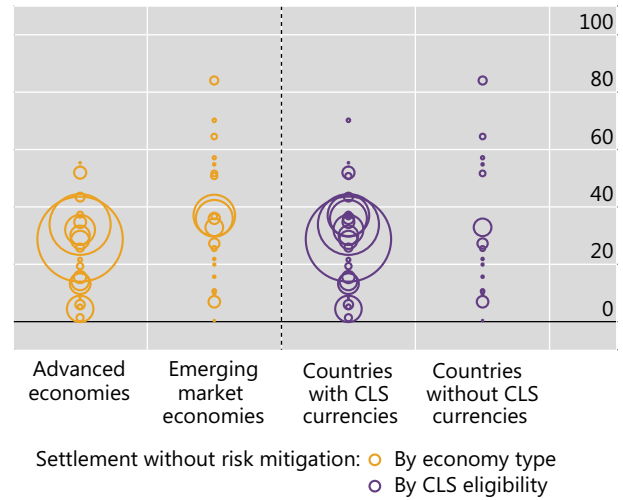
As a percentage of deliverable turnover<sup>2</sup>

Graph 1

A. By settlement method over time



B. By country classification in 2022<sup>3</sup>



<sup>1</sup> See technical annex for details. <sup>2</sup> Turnover settled with multiple payments between counterparties (eg spot trades, outright forwards, FX swaps and currency swaps). <sup>3</sup> Each circle represents a country, and circle area is proportional to the deliverable turnover reported by that country.

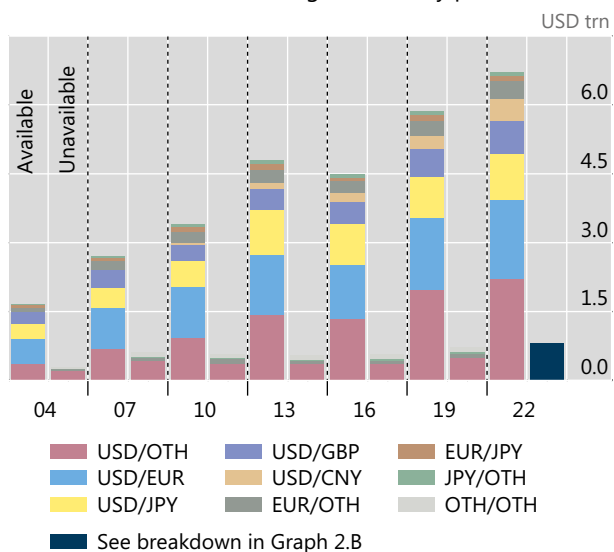
Sources: CPSS (2008); Kos and Levich (2016); BIS Triennial Central Bank Survey; authors' calculations.

Second, non-PvP settlement may be the only option for some counterparties, currencies or time zones. Even though existing PvP arrangements support the most actively traded currency pairs (Graph 2.A), market participants are not always able to use them. For example, CHATS in Hong Kong SAR can settle offshore Chinese renminbi against the US dollar, but only institutions located in Hong Kong SAR, Malaysia, Indonesia or Thailand have access. In addition, existing PvP arrangements do not always allow market participants to adequately manage intraday liquidity. For example, a PvP arrangement may not operate within a time window that matches periods of peak liquidity. Turnover in unsupported currencies has also increased slightly since 2016. These are mainly EME currencies against the US dollar (Graph 2.B) that are not eligible for settlement in CLS. As a result, countries without CLS currencies report high rates of settlement risk (Graph 1.B).

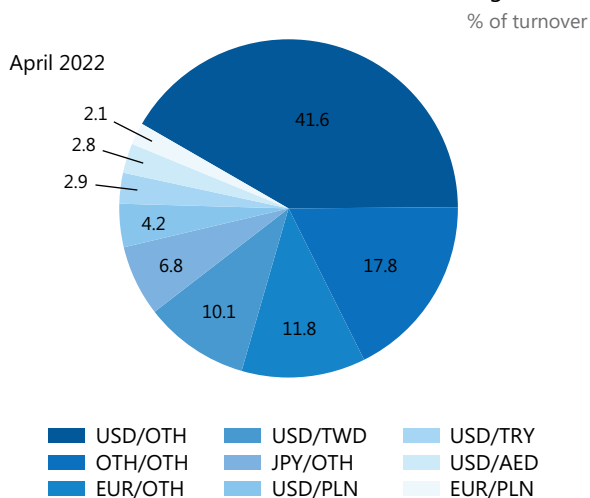
## Policy measures and innovation to boost risk mitigation

Private and public sector stakeholders, including central banks, are collaborating to foster greater adoption of PvP. The Global Foreign Exchange Committee (GFXC), which comprises central banks and market participants, has strengthened its guidance on settlement risk in the FX Global Code, a set of principles of good practice in the FX market (GFXC (2021)). The code calls for market participants to use PvP if possible or reduce their risk exposures through other means such as netting and has the support of the Basel Committee on Banking Supervision (BCBS-CPMI (2020)).

A. PvP is available for the largest currency pairs



B. Where PvP is unavailable, USD is often one leg



<sup>1</sup> See technical annex for details. <sup>2</sup> A PvP arrangement is available if a currency pair can be settled by either the B3 Foreign Exchange Clearinghouse (B3) in Brazil, the Clearing Corporation of India Limited's Forex Settlement (CCIL), the Clearing House Automated Transfer System (CHATS) in Hong Kong or CLS.

Sources: CPMI (2022); BIS Triennial Central Bank Survey; authors' calculations.

The CPMI has outlined potential roles for private and public sector stakeholders to increase PvP adoption (CPMI (2022)). For example, central banks could extend the opening hours of payment systems to expand the available window for PvP settlement across time zones. However, local money markets and nostro agents would similarly need to adjust their operating hours and procedures to take advantage of longer settlement windows. The CPMI will continue its work to engage with the private sector and address any regulatory and operational barriers to PvP adoption. It expects to publish a final report in 2023.

Private companies are also developing new services that complement existing PvP arrangements by targeting additional currencies and by providing more options for users to manage intraday liquidity. Incumbent PvP operators plan to expand their services to EME currencies, and small fintechs are looking at new ways to enable PvP settlement. For example, one new solution allows users to synchronise settlement on the accounts of multiple nostro providers using distributed ledger technology rather than settling over the accounts of a single institution (ie the CLS model). As the future of payments may involve the use of multiple central bank digital currencies (CBDCs), the BIS Innovation Hub and the New York Innovation Center have experimented with settling wholesale CBDC using PvP in Project Jura and Project Cedar, respectively (BIS (2021), FRBNY (2022)).

## References

Bank for International Settlements (BIS) (2021): *Project Jura: cross-border settlement using wholesale CBDC*, December.

Basel Committee on Banking Supervision and Committee on Payments and Market Infrastructures (BCBS-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, pp 48–9.

Committee on Payments and Market Infrastructures (CPMI) (2022): *Facilitating the increased adoption of PvP – consultative report*, July.

Committee on Payments and Settlement Systems (CPSS) (2008): *Progress in reducing foreign exchange settlement risk*, May.

Federal Reserve Bank of New York (FRBNY) (2022): *Project Cedar – Phase One Report*, November.

Galati, G (2002): "Settlement risk in foreign exchange markets and CLS Bank", *BIS Quarterly Review*, December, pp 55–65.

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

Hughes, J (2009): "Lessons on running a smooth settlement system", *Financial Times*, 20 August.

Kos, D and R Levich (2016): "Settlement risk in the global FX market: how much remains?", *CLS Insights*, 26 October.

Lindley, R (2008): "Reducing foreign exchange settlement risk", *BIS Quarterly Review*, September, pp 53–65.

Parsons, J (2021): "Regulators moot public utility to tackle FX settlement risk", *Risk.net*, 30 November.

## Technical annex

The 2022 Triennial Survey has been expanded to include, *inter alia*, data on settlement by counterparty type. This enables us to adjust the data for local and cross-border inter-dealer double-counting, ie “net-net” basis. For comparison, we estimate net-net settlement data for 2019 by applying the unadjusted shares of each settlement method to net-net deliverable turnover. For example, we find that the unadjusted share of deliverable turnover without risk mitigation was 31% in 2019 (coincidentally the same as in 2022). As net-net deliverable turnover was \$6 trillion in 2019, we calculate that \$1.9 trillion was subject to settlement risk.

Table 1: Adjusted for local and cross-border inter-dealer double-counting, ie “net-net” basis; daily averages in April; settled turnover may include trades that were executed before April but settled in April.

Graph 1.A: Adjusted for local but not cross-border inter-dealer double-counting, ie “net-gross” basis; daily averages in April; on-us settlement is where both legs of a trade are settled across the books of a single institution; respondents in 2013 and 2019 did not report whether on-us settlement was with or without loss protection.

Graph 1.B: Adjusted for local but not cross-border inter-dealer double-counting, ie “net-gross”; daily averages in April; a few countries reported greater settled turnover than deliverable turnover in which case we use settled turnover as the denominator.

Graph 2: Adjusted for local and cross-border inter-dealer double-counting, ie “net-net” basis; daily averages in April.