

CHAPTER 9

Systems operating on a payment versus payment basis: focus on the CLS settlement system for foreign exchange transactions

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This chapter deals with settlement on a “payment versus payment” (PvP) basis, focusing particularly on the CLS (Continuous Linked Settlement) system, which is used to settle foreign exchange transactions on a PvP basis, currently in 18 eligible currencies. After addressing the need to manage settlement risk in foreign exchange transactions (section 1), we go on to present the CLS system (sections 2 to 4). What makes a PvP system like CLS different is that it offsets positions in different currencies against each other and completes the final stage of foreign exchange transactions.

1. The need to manage settlement risk in foreign exchange transactions

1.1. Settlement risk in foreign exchange transactions

Settlement risk in foreign exchange transactions is defined as the risk of delivering the currency sold without receiving the currency purchased (or vice versa). Let’s consider an example where Bank X and Bank Y are counterparties in a dollar (USD)/euro (EUR) foreign exchange transaction. Bank X is selling euros to Bank Y in exchange for dollars. It must therefore deliver euros to Bank Y (the “euro leg” of the

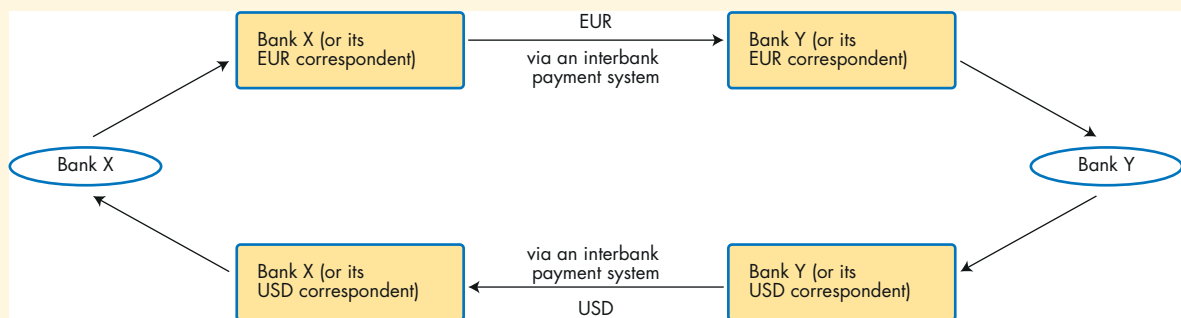
trade) in exchange for receiving dollars (the “dollar leg”). At the same time, Bank Y must deliver dollars to Bank X and will receive euros in exchange.

Traditionally, each leg of a foreign exchange transaction was settled separately and independently, using a network of correspondent banks (with each counterparty to the transaction using its correspondents in the currencies involved) and interbank payment systems in the currencies concerned. Under this system, settlement is generally not simultaneous, given in particular the different time zones involved and differing local banking practices for cross-border payments.

Each of the counterparties to the transaction, Bank X and Bank Y, is exposed to settlement risk vis-à-vis the other. Settlement risk arises as soon as the payment instruction for the currency sold becomes irrevocable, i.e. when it can no longer be cancelled unilaterally. It ends with the final and irrevocable receipt of payment for the currency purchased. Several hours can lapse between the irrevocable payment in EUR by Bank X and the irrevocable corresponding payment in USD by Bank Y.

A foreign exchange transaction thus carries not only risk arising from exchange rate fluctuations (market risk), but also settlement

Box 1: Settlement of a foreign exchange transaction using the traditional network of correspondent banks and interbank payment systems in the currencies concerned



risk, which has two components: principal risk and replacement cost risk. Principal risk materialises in the event of a definitive default by one of the two counterparties: the non-defaulting counterparty has delivered the currency that it sold, but has not received the currency that it bought. In this situation, the amount at risk is not a portion of the transaction's underlying value but its principal, i.e. the trade's nominal amount, or the total amount of the currency purchased. Replacement cost risk materialises in the event of a temporary default by one of the two counterparties: the non-defaulting counterparty must replace the initial trade with a new trade at the prevailing market price, which could prove costlier. In the rest of this chapter, the term "settlement risk" refers to principal risk.

A historical episode that highlighted settlement risk on foreign exchange transactions took place on 26 June 1974, with the failure of German bank Herstatt.¹ Although small in size, the bank was very active in the foreign exchange market. On the day in question, it was forced into liquidation by the German regulator at 15:30 CET (central European time). Earlier that day, several of its counterparties had issued irrevocable instructions for payment in Deutsche Marks (DEM), but had not yet received the countervalue in dollars (USD) because the US financial markets had just opened. When the bank's liquidation was announced, its New York correspondent (Chase Manhattan Bank) immediately suspended all payments in USD owed by Herstatt, thus causing the bank's counterparties, who were owed USD because they had already paid the corresponding amounts in DEM, to incur losses. Other banks refused to issue payment instructions before receiving confirmation of receipt of the countervalue. Despite the German bank's small size, its closure triggered major disruption in payment systems and the foreign exchange market. For fear of further bankruptcies, the US payment system (CHIPS²) was suspended. The value of transactions

T1: Losses sustained by some London banks as a result of Herstatt's failure

(USD millions)	
Williams and Glyn's	9 (deposits)
Chase Manhattan	5 (swaps)
Moscow Norodny	365 (swaps)
Union Bank of Switzerland	25 (swaps)
Hill Samuel	21 (swaps)
United Bank of Kuwait	190 (swaps)
First Wisconsin National Bank of Milwaukee	10 (swaps)
Antony Gibbs	1.25 (swaps)

Source: Catherine R. Schenk (2014).

through the system plunged almost 60%³ over the following days and the settlement of interbank transactions was affected for several months. Confidence in the foreign exchange market rapidly began to crumble,⁴ interest rates in the eurodollar market surged and international banking activity contracted as banks around the world repatriated their assets.

1.2. Measures taken by central banks and the banking industry to mitigate settlement risk

Given the increasing amounts traded daily in the foreign exchange market, settlement risk on foreign exchange transactions was a particular concern for central banks, due to its potentially systemic effect. In the 1980s and 1990s, the G10 countries' central banks carried out a number of studies on the systems in use for cross-border and multi-currency payments. The first report published was the Lamfalussy report⁵ in 1990, which contained a recommendation to "continue to review possible measures that central banks might take to improve efficiency and reduce risks in the settlement of cross-border and multi-currency transactions". The second report was the Noël report,⁶ published in 1993. As a follow-up to the Lamfalussy report, the Noël report examined the services that central banks could consider providing to mitigate the risks and increase the efficiency of cross-border and multi-currency transactions.

- 1 Following this incident, settlement risk commonly became known as "Herstatt risk" in the banking industry.
- 2 Clearing House Interbank Payment Systems (CHIPS) was launched in April 1970, when nine large US banks joined forces to form a major system for the settlement of international transactions in USD (for more details on the CHIPS system, see Chapter 8).
- 3 See Berger A. Molyneux P. and Wilson J.O.S (2015).
- 4 Several small banks were squeezed out of the foreign exchange market and, following Herstatt's failure, clearing banks in New York introduced a "recall of funds" clause, reserving the right to recall funds transferred to correspondent banks until 10:00 (EST) the following day.
- 5 Report of the Committee on Interbank Netting Schemes of the G10 central banks (1990). For more details on the Lamfalussy report, see Chapter 18.
- 6 Central bank payment and settlement services with respect to cross-border and multi-currency transactions (September 1993) <https://www.bis.org/cpmi/publ/d07.pdf>

The risks in question related to the fact that the two legs of a foreign exchange transaction required the use of different payment systems for each currency involved. The report examined and assessed the following four options: (i) modifying or making available certain home-currency payment and settlement services, (ii) extending the opening hours of home-currency large-value funds transfer systems, (iii) establishing cross-border operational links between these payment systems, (iv) developing multi-currency payment and settlement services. Without stating a preferred option, the report recommended that each central bank assess the implications of each option in the light of monetary policy, the adequacy of private sector sources of liquidity to cover settlements in each currency, and the impact on systemic risk. Other factors to be assessed when looking at the various options included the legal basis, the effect on competition in financial markets, cost-effectiveness, and acceptability from the central bank's perspective.

The key study on settlement risk in foreign exchange transactions is the Allsopp report⁷ published in March 1996. This report established that settlement risk was not widely recognised and, hence, the two components of settlement risk, i.e. the duration and size of the exposure, were significantly underestimated. Exposure

to settlement risk can effectively last for up to several days,⁸ which means that the total exposure - sometimes to a single counterparty - could equal, or even exceed, an institution's equity capital. In view of this, the Allsopp report recommended a three-pronged strategy:

- action by individual banks to improve the measurement and management of settlement risk associated with foreign exchange transactions;
- action by industry groups (i.e. the private sector), which are encouraged to devise and implement "risk-reducing multi-currency services»;
- action by central banks to foster rapid private sector progress and, where appropriate, support the efforts of the private sector by improving the services provided by their RTGS⁹ payment systems. Netting mechanisms that reduced the amounts at risk already existed, but in practice there remained a residual exposure equal to the net amount resulting from the netting process. The payment versus payment (PvP) concept was based on the delivery versus payment¹⁰ model already in use for securities transactions. With PvP, the two legs of a foreign exchange transaction are settled simultaneously subject to the following condition: one

7 Settlement risk in foreign exchange transactions : <https://www.bis.org/cpmi/publ/d17.pdf>

8 Contrary to the generally accepted idea that settlement risk on foreign exchange transactions is simply linked to time zone differences and thus lasts no more than a few hours and only applies to the counterparty adversely affected by the time lag, the Allsopp report showed that settlement risk on foreign exchange transactions generally lasted for several days. This finding, based on a study carried out in 1994-1995 across 80 banks in G10 countries, was derived by adding up all the time lags present across all levels of the settlement channels used for the two currencies concerned, in particular the in-house processing procedures of the two counterparties, their respective correspondents in the two currencies and the operating rules of the interbank systems through which payment instructions are routed.

9 The Allsopp report considered that the private sector was best placed to design and set up multi-currency settlement services, but that the success of such services required close cooperation between market participants and the central banks. The central banks were thus prompted to extend the operating hours of their RTGS (Real-Time Gross Settlement) payment systems to increase the overlap between the three main monetary time zones (North America, Europe and Asia).

10 For more details on delivery versus Payment, or DvP, see Chapter 3.

Box 2: First initiatives to reduce settlement risk in the foreign exchange market: FXNET, ECHO and Multinet

The first private sector initiatives aimed at reducing settlement risk involved clearing mechanisms for foreign exchange transactions on a bilateral (FXNET) or multilateral (ECHO and Multinet) basis.

FXNET was a bilateral netting service for foreign exchange transactions (spot and forward), created in 1987 by a consortium of international banks operating in the London foreign exchange market. The system enabled users to carry out cross-border trades with counterparties in 13 countries. FXNET matched trade confirmations and novated trades by replacing the original transactions with a netted payment obligation.

.../...

ECHO (Exchange Clearing House Organisation) was a clearing house providing users with multilateral netting services for spot and forward (up to 2 years) foreign exchange transactions. It began operating in 1995 in 11 major currencies traded between the main international banks. Transactions between users were matched by SWIFT Accord¹ then transmitted to ECHO for clearing and settlement. ECHO netted new transactions with previous ones in rolling accounts then, after the final cut-off time, calculated and sent to each member its multilateral net position with the clearing house. To settle the positions, ECHO debited the accounts of members showing short positions on its books as soon as funds became available and issued instructions to pay members showing long positions. However, settlement was not immediate and the settlement risk that this created could last up to a day (24 hours). In order to manage credit and liquidity risk, ECHO continuously monitored incoming funds throughout its operating hours and set credit exposure limits for members. It also had available a “pool” of securities deposited by users to provide the necessary liquidity in foreign currency (via a foreign exchange swap for USD) should the member with the largest debit position on a given day default. A mechanism for the allocation of losses was also included in the system’s rules.

Multinet was formed by eight North American banks in 1992 and operated in a similar way to ECHO.

These multi-currency clearing systems did not prove to have viable business models, due to high investment and risk management costs. Their assets were transferred to CLS when it was set up in 1997.

¹ SWIFT Accord was a confirmation matching service for foreign exchange transactions developed by SWIFT and offered to its users (including ECHO members).

leg can be settled if and only if the other leg is also settled. The recommendations set out in the Allsopp report were taken up in two follow-up reports in 1998 and 2008.¹¹

The practical implementation of a PvP settlement system, with the creation of CLS (Continuous Linked Settlement), took several years (1997-2002) due to its complexity.¹² During the same period, the Basel Committee on Banking Supervision, working closely with the Committee on Payments and Settlements Systems and drawing on the Allsopp report, issued guidelines¹³ to help banking supervisors to improve their assessment of the management and oversight of settlement risk associated with foreign exchange transactions. These guidelines were updated in 2013.¹⁴

2. Legal structure of the CLS Group and the CLS system

2.1. Legal structure of the CLS Group

The CLS Group’s structure comprises CLS Group Holding AG, a holding company governed by Swiss law,¹⁵ representing the system’s shareholders. This company in turn owns CLS UK Intermediate Holding, a limited liability company under UK law, which provides various services (financial, legal, human resources, audit and communication, etc.) to its subsidiaries, CLS Bank International and CLS Services Ltd. CLS Bank International, based in New York, holds the accounts of the Settlement Members. CLS Services Limited, a limited liability company based in London, provides CLS Bank International and its subsidiaries¹⁶ with operational and back-office services.

11 “Reducing foreign exchange settlement risk, a progress report”, July 1998 <https://www.bis.org/cpmi/publ/d26.pdf> and “Progress in reducing foreign exchange settlement risk”, May 2008 <https://www.bis.org/cpmi/publ/d83.pdf>

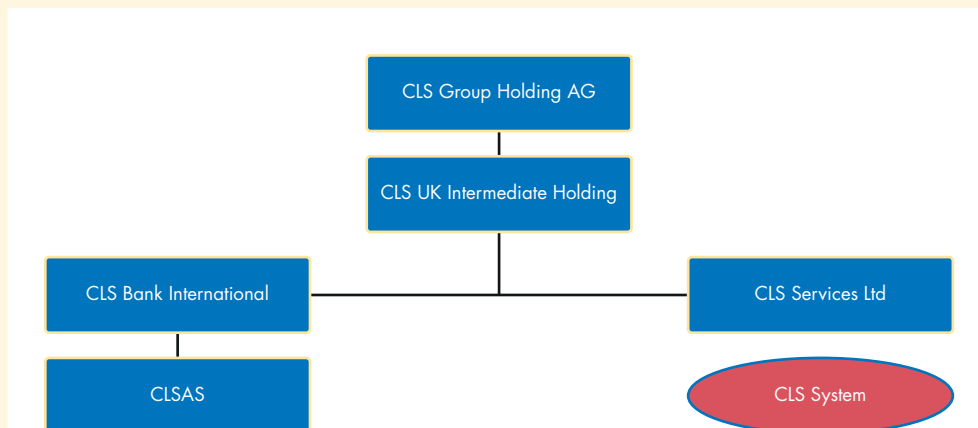
12 Beyond its apparent simplicity, the “payment versus payment” method involves highly complex issues when it comes to implementing it for foreign exchange transactions worldwide. It had to be ensured that the elimination of settlement risk did not create or exacerbate other types of risk, such as liquidity risk. This partly explains why the CLS project took significantly longer than initially anticipated.

13 “Supervisory guidance for managing settlement risk in foreign exchange transactions”; BIS (BCBS), September 2000.

14 “Supervisory guidance for managing risk associated with the settlement of foreign exchange transactions”; BIS (BCBS), February 2013.

15 Companies with this status hold and administer stakes in other companies. Under Swiss law, companies with this status benefit from specific tax provisions under certain conditions.

16 CLS Bank International holds a 51% stake (in a joint venture with Traiana, a subsidiary of the ICAP group) in CLS Aggregation Service (CLSAS) LLC, a company based in the state of Delaware, which provides an aggregation service for foreign exchange transactions. It makes the settlement of large-volume orders more efficient, meeting the needs of high-frequency traders in the foreign exchange market.

Box 3: Legal structure of CLS

Source: CLS.

The CLS system is owned by CLS UK Intermediate Holding and its operating rules are governed by UK law, while the account management agreement between the system's members and CLS Bank International is subject to US law (State of New York).

The CLS system began its settlement operations in September 2002, with seven eligible currencies: the US dollar (USD), euro (EUR), yen (JPY), pound sterling (GBP), Swiss franc (CHF), Australian dollar (AUD) and Canadian dollar (CAD). At the end of 2018, it had 18 eligible currencies¹⁷ and 72 direct members.¹⁸

2.2. How CLS works

Operating on a PvP basis, CLS settles payment instructions for transactions in the spot foreign exchange market, some listed derivatives (exchange-traded futures) and currency swaps (swaps, forward swaps, overnight swaps, tomorrow-next day swaps, etc.). Each of the system's members holds a multi-currency account with CLS Bank containing its positions in the currencies processed in the system. Under the payment versus payment approach, both sides of the transaction are settled simultaneously, but CLS acts only as a

settlement agent: it does not substitute the counterparties as a central counterparty (CCP) would (see Chapter 11). CLS Bank holds accounts with the central banks that issue the currencies processed and the direct participants of the CLS system (the settlement members) have opened foreign currency accounts with CLS Bank. The settlement members replenish their CLS account denominated in a given currency by crediting the CLS Bank account in the books of the central bank that issues that currency ("funding"). They can reduce their position with the CLS Bank by performing the opposite transaction ("defunding"). The system ensures that members' accounts show sufficient balances in the currencies to be delivered.

Taking all the instructions entered on a gross basis in the system, CLS calculates a single net position for each member in each currency (a "pay-in" balance if the net position is negative or a "pay-out" balance if it is positive). The net position is then settled in a single payment in central bank money, irrevocably and in real time, via the RTGS systems of the currencies involved. Members' payment instructions generally result from multi-currency transactions involving various maturities and counterparties. The net positions obtained

¹⁷ The latest currency to become eligible for the system was the Hungarian forint (HUF) in November 2015.

¹⁸ Direct members of CLS are called settlement members (see Section 2.1). They are nearly all shareholders in the company that operates the system.

by routing all the instructions through a single exchange and settlement system are thus substantially lower than the amounts they would have to settle on a gross basis using several settlement mechanisms. In other words, members benefit from a very strong netting effect for the financing of their positions.¹⁹

There are various stakeholders in the CLS system:

- (i) The central banks whose currencies are processed by the system provide CLS with account management and settlement services. Each central bank has an account in the name of CLS on its books and positions in the relevant currency are settled in central bank money using the RTGS system.
- (ii) Settlement Members are direct members of the CLS system, to which they submit payment instructions for their transactions directly. They pay the currency amounts that they must deliver into their accounts with CLS, and the currency amounts due to them are paid out by CLS. Payment instructions are only executed when the risk management tests have been successfully completed.²⁰ Settlement Members are shareholders of CLS,²¹ must be subject to appropriate banking supervision and must comply with operational and financial robustness requirements. Settlement Members can provide services to other banking or non-banking entities (not eligible for direct membership)²² who do not use the system directly (acting as third-party service providers). At the end of 2017, CLS had more than 60 Settlement Members, almost half of which also qualified as third-party service providers, offering the service to more than 11,000 entities, representing 22% of the value and 16% of the volume of trades settled by the system.
- (iii) Most of CLS's Settlement Members do not have direct access to the RTGS

systems of the central banks whose currencies are eligible for the system. Those members usually rely on "nostro agents" to deliver and receive their CLS payments in the relevant currencies. The nostro agents assume the traditional role of a correspondent bank, but play an important part in the CLS system by providing access to the local RTGS through which the net positions of many members are settled. They must demonstrate unfailing operational reliability, as well as the ability to provide liquidity at very short notice.

- (iv) Lastly, for each currency processed in the system, CLS has Liquidity Providers ready to step in should a Settlement Member be unable to settle its pay-in balance. In such cases, CLS calls upon the Liquidity Providers, who have agreed to deliver the needed currency in exchange for currencies in which the defaulting Settlement Member has a credit balance. Liquidity Providers are likely to be called in by CLS at a fairly late stage in the operating hours of the settlement system, as the operator first seeks to obtain the missing funds from the defaulting Settlement Member. Liquidity Providers must thus be ready to respond to requests from CLS at very short notice.

2.3. Risk management mechanisms used by CLS

To maximise the system's efficiency, instructions can be settled even if the counterparties involved show debit balances with CLS in the currencies sold. However, risk management systems have been set up to limit the size of debit balances and guarantee that instructions can be settled even if a Settlement Member defaults. Moreover, CLS's ability to pay out net credit balances depends on the liquidity available, i.e. the pay-ins it has received.

A payment instruction can settle only if each of the two members involved holds a **sufficient** position in its account with

19 Including in/out swaps (see Box 5), the netting effect can be as high as 99%. In such cases, the net position to be settled in the system represents just 1% of the initial gross amounts of the transactions.

20 See Section 2.3.

21 With a few exceptions (central banks), CLS recently changed its membership rules and now allows several entities within the same banking group to participate directly in the system. These entities do not become shareholders but must pay for admission rights. In this way, CLS is seeking to extend its member base and improve members' resolvability by clearly separating the payment instructions of the various entities in the system.

22 Investment funds, insurance companies and some big non-financial companies that enter into foreign exchange transactions.

CLS Bank in the currency to be delivered. This can even be a debit position, as long as the following three conditions are satisfied:

- (i) **all currencies combined**, the balance of the member’s multi-currency account is positive or zero,
- (ii) the member’s debit position in a given currency must not exceed a specified limit known as the “**Short Position Limit**” (SPL),
- (iii) the member’s aggregate debit positions, taking all currencies together, must not exceed a specified limit known as the “**Aggregate Short Position Limit**” (ASPL).

If these three conditions are met, the payment instruction is settled immediately and irrevocably. If not, the payment instruction is rejected.

Lastly, CLS applies haircuts to debit and credit balances to hedge against market risk (i.e. foreign exchange risk). This is because a credit position with CLS in a given currency, used to guarantee a Settlement Member’s debit position in

another currency, can depreciate due to exchange rate fluctuations.

2.4. A typical settlement day in the CLS system

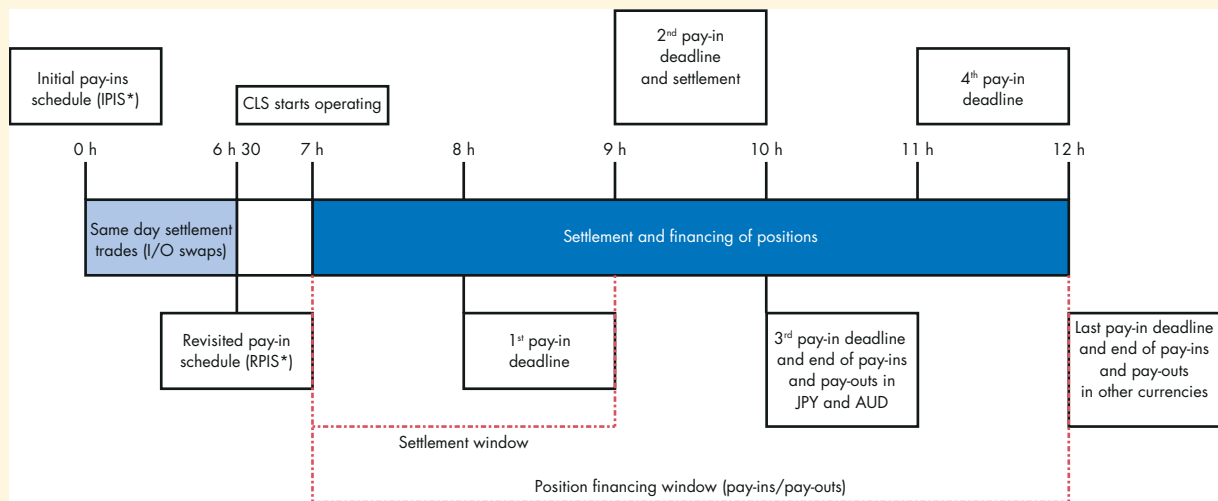
Every day, payment instructions in CLS must meet stringent requirements in terms of payment deadlines to ensure that Settlement Members receive the funds due to them on the effective settlement date, while at the same time minimising pressure on Settlement Members’ liquidity.

Settlement Members can submit (and unilaterally cancel) their instructions²³ to CLS until the day prior to the transaction date (D-1) at midnight (CET).²⁴ CLS calculates each Settlement Member’s multilateral net position based on all the foreign exchange payment instructions submitted on the value date. For currencies showing a negative multilateral net position, the Settlement Member is required to make payments or “pay-ins”. CLS produces an initial pay-in schedule that can be modified by members bilaterally until 6:30 CET on the settlement date. Between midnight and 6:30 CET, Settlement Members can bilaterally submit additional instructions or cancel instructions

23 Payment instructions are in the form of SWIFT messages including the information required for settlement. They should not be confused with the foreign exchange transactions that they are intended to settle.

24 Central European Time (GMT+1).

Box 4: A day of settlement in CLS (all times are CET)



* Initial and revisited Pay-In Schedule (IPIS, RPIS).

Source: CLS.

submitted previously. These transactions essentially serve to reduce the amounts of pays-ins featuring in the initial payment schedule via in/out swaps (see Box 5).

CLS disseminates the final pay-in schedule to Settlement Members at 6:30 CET, stating the minimum amount that Settlement Members must pay in

Box 5: CLS's pay-in schedule and the use of in/out swaps

CLS calculates the pay-in schedule for each Settlement Member based on the provisional positions once all the members' payment instructions have been processed. In the example below, the Settlement Member has credit positions (pay-outs) in Canadian dollars (CAD), yen (JPY), pounds sterling (GBP) and Swiss francs (CHF), and debit positions (pay-ins) in Australian dollars (AUD), euros (EUR) and US dollars (USD). CLS breaks down the debit positions into several payments to be made by the set deadlines. Payments in the Asia Pacific region's currencies are given priority and are made by 10:00 CET, to take into account the closing time of the local RTGS systems. Pay-ins in Australian dollars (AUD) thus end at that time. Payments are not broken down evenly, because CLS's risk management procedures must be complied with and all instructions must be processed at 9:00 CET. In this example, the USD pay-in at 9:00 shows a fairly high amount (USD -3,600 million) and payments coming in at 10:00 CET must be sufficient to enable CLS to cover its pay-outs in JPY.

Pay-in schedule for a settlement member

(aggregate amounts in millions for each currency)

Currency	Provisional net position	8 h CET	9 h CET	10 h CET	11 h CET	12 h CET
CAD	500	0	0	0	0	0
AUD	-250	-100	-200	-250	-250	-250
EUR	-550	-100	-250	-350	-450	-550
JPY	200,000	0	0	0	0	0
USD	-4,800	-900	-3,600	-4,000	-4,500	-4,800
GBP	900	0	0	0	0	0
CHF	3,500	0	0	0	0	0

Sources: CLS, ECB.

As shown in the example above, CLS Settlement Members are required to make payments, sometimes for very large amounts, in accordance with a strict pay-in schedule. To reduce this demand for liquidity, banks use an automated tool which enables them to transfer the positions they hold in CLS outside the system. They buy currencies in which they hold large debit positions in CLS outside the system, and sell currencies in which they have credit positions.

A Settlement Member will thus enter into a foreign exchange transaction with same day settlement in CLS with another Settlement Member who has the opposite needs. To offset changes in positions, the Settlement Members may also enter into opposite trades with same day settlement outside CLS. These transactions, known as in/out swaps, give Settlement Members a day to raise sufficient liquidity to cover their payments, which can be very substantial. However, these transactions have a major drawback in that the leg of the swap settled outside CLS is exposed to a form of settlement risk, where the level of risk is high and the amounts at risk significant. The introduction of new settlement sessions for trades with same day settlement would, however, solve this problem.¹ Such sessions are already operational for North America for same day settlement in US dollars (USD) and Canadian dollars (CAD).

¹ See section 4.3.

each currency at a stated time,²⁵ so that all payment instructions can be settled before 9:00 CET. The system starts to call for funds at 7:00 CET. This process ends at 12:00 CET. Settlement Members begin to settle their debit positions (via pay-ins) and, as soon as there is sufficient liquidity and the risk tests have been successfully completed (i.e. overall net positions are strictly positive), CLS settles the credit positions (via pay-outs). There is no set schedule for pay-outs, but in general, the Asia Pacific region's currencies are given priority (as the RTGS systems for these currencies close first), as are the largest balances. The settlement system's daily operating hours cover the operating hours of the RTGS systems of central banks whose currencies are processed so that CLS can settle pay-ins and pay-outs on its accounts with central banks.

2.5. Management of defaults and allocation of losses in CLS

CLS has several procedures in place to ensure that it is able to settle the instructions accepted for settlement and that each Settlement Member receives the currencies due to it as a result of settlement of instructions, even if one of the Settlement Members defaults.

As a rule, as soon as a Settlement Member misses a pay-in deadline, CLS suspends all pay-outs to that member until it meets its obligations. In all cases, Settlement Members that fail to make payments on time are subject to financial penalties.

If a Settlement Member fails to make all payments due by the 8:00 CET deadline, CLS issues a pay-in call requesting it to top up its account. At 9:00 CET,²⁶ CLS rejects all instructions not yet processed involving the late-paying Settlement Member. The provisional currency positions of the counterparties to the said transactions therefore change (i.e. some positions could show higher provisional debit balances than before in certain currencies, or positions that initially showed credit balances may

now be in debit). CLS sends them "pay-in calls for settlement," so that the system can immediately process queued transactions. Lastly, CLS sends a "pay-in call for currency close" to Settlement Members still showing debit positions in currencies whose markets will soon be closing.²⁷

If the Settlement Member fails to respond to the call and there is insufficient liquidity to cover the remaining pay-outs, CLS contacts its liquidity providers to obtain the needed currency via a swap.²⁸ If the liquidity committed is still insufficient, notably in the event of defaults by several Settlement Members (and nostro agents) and/or liquidity providers, CLS settles the pay-outs in other currencies in which it still has liquidity. As a last resort, it can carry the amounts remaining to be settled forward to the next business day.

CLS can sustain losses if a Settlement Member defaults and its credit positions depreciate below the haircuts set, so that they are no longer sufficient to offset its debit positions. In such cases, the resulting losses are allocated among the Settlement Members involved in transactions with the defaulting member on the day of default.²⁹ CLS activates a second loss allocation mechanism³⁰ if at least two Settlement Members are unable to contribute to the first mechanism. The amount of losses that can be allocated to each Settlement Member is capped at USD 30 million.

3. Oversight arrangement for CLS

3.1. Role of the US Federal Reserve in the supervision of CLS

CLS Bank International, based in New York, is a US banking entity to which the status of "Edge Act Corporation" was granted in 1999, limiting its business scope (it is qualified as a "single purpose bank»). The bank's sole purpose is to settle foreign exchange transactions. Its operations are regulated by the Federal Reserve Board (FRB), with

25 Pay-in deadlines are set at 8:00, 9:00 and 10:00 (CET) for the Asia Pacific region's currencies and at 8:00, 9:00, 10:00, 11:00 and 12:00 (CET) for other currencies.

26 The theoretical cut-off time for processing transactions.

27 10:00 (CET) for the Asia Pacific region, 12:00 (CET) for Europe and North America.

28 CLS and the liquidity provider(s) enter into a swap in the desired currency in exchange for another currency in which they have a surplus in their accounts. On the next business day, CLS and the liquidity provider carry out the opposite transaction.

29 Combined Loss Allocation.

30 General Loss Allocation.

support from the Federal Reserve Bank of New York (FRBNY), which is responsible for the prudential oversight of CLS Bank, as well as providing secretariat services and coordinating the work of the Oversight Committee (OC) in charge of the cooperative supervision of the CLS system.

As regards cooperative oversight, CLS as a system must meet the international standards applicable to systemically important payment systems set out in the Federal Reserve's Board's policy on risk in payment systems.³¹ The Principles for Financial Market Infrastructures (PFMI, see Chapter 7) were adopted in the United States with "Regulation HH" under the Dodd-Frank Act (DFA).³² The regulation gives the Federal Reserve enhanced oversight powers, enabling it to prescribe more stringent risk management standards for market infrastructures and payment systems such as CLS, which are qualified as systemically important Financial Market Utilities (FMU) by the Financial Stability Oversight Council (FSOC).³³

Lastly, CLS is exempted from the location policy adopted by the Eurosystem in its oversight framework³⁴ (see Chapter 17). The Eurosystem agreed not to apply the location policy to CLS, which, given its foreign exchange transaction settlement activity, settles a large portion of all transactions in euros outside the euro zone. The exemption was granted on the grounds that the CLS system contributes to financial stability, as settlement on a PvP basis in central bank money helps to significantly minimise settlement risk on foreign exchange transactions. The exemption, however, is subject to the Eurosystem's close involvement in the cooperative oversight arrangement for CLS implemented by the Federal Reserve Bank of New York. Only transactions settled in CLS on a PvP basis are exempt from the thresholds applicable under the location policy. Transactions not settled on a PvP basis, such as those involved in CLS's latest initiatives (see section 4), are subject to these thresholds.

3.2. Cooperative oversight of the CLS system

Given its international scale and role in handling many currencies, the CLS system is subject to cooperative oversight governed by an agreement ("the Protocol").³⁵ between a number of central banks, including those of the G10 countries, together with other central banks whose currencies are processed by CLS.³⁶ The Federal Reserve, as the lead overseer, coordinates this oversight. The purpose of the cooperation arrangement is to enable the central banks involved to participate in the system's oversight so as to ensure its safety and efficiency. Under this arrangement, the central banks ensure that CLS complies with standards applicable to payment systems and market infrastructures, as well as examining changes proposed by the operator to assess their potential impact on the system's rules, operating conditions, and, in particular, its risk profile. The Oversight Committee, under the aegis of the Federal Reserve Bank of New York (FRBNY), which includes the signatory central banks, oversees this cooperation.

4. Settlement in today's foreign exchange market: CLS's position and areas of development

4.1. Overview of settlement methods for foreign exchange transactions

Following its launch in 2002, CLS swiftly became crucial to the foreign exchange market as a tool for mitigating settlement risk. However, it experienced teething problems: its financial viability was a source of concern. Later, CLS benefited to a certain extent from the positive effects of the 2007-2008 financial crisis, as market players became more risk-averse and hence more in favour of settlement on a PvP basis. In March 2008, the value of foreign exchange transactions settled daily in CLS passed the USD 10,000 billion mark. In September and October 2008, despite

31 Federal Reserve Board's Policy Statement on Payment Systems.

32 Dodd-Frank Wall Street Reform and Consumer Protection Act.

33 The FSOC was set up under the DFA and its role is to identify risks to financial stability in the United States, to respond to situations of imminent risk and to promote market discipline. It can put a national or foreign financial company under the direct supervision of the Federal Reserve. It can also order an institution into "orderly" bankruptcy. It is chaired by the Secretary of the Treasury and includes representatives of the various regulatory authorities (Federal Reserve, SEC, CTFC, OCC, FDIC, etc.).

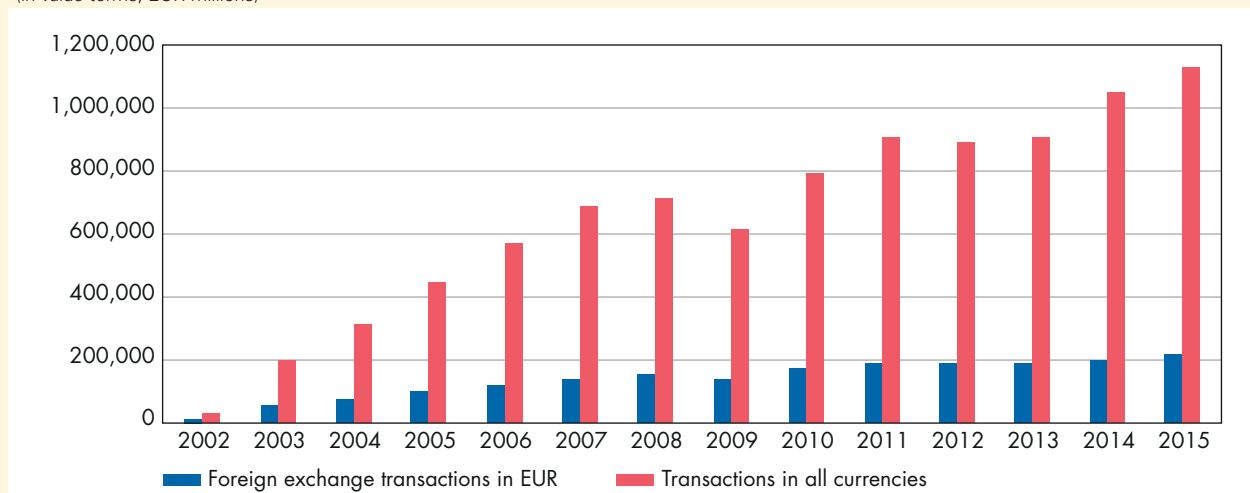
34 <https://www.ecb.europa.eu/pub/pdf>

35 <http://www.federalreserve.gov/paymentsystems/cls>

36 The central banks of the G10 countries (Germany, Belgium, Canada, the United States, France, Italy, Japan, the Netherlands, the United Kingdom, Sweden and Switzerland) and other central banks whose currencies are processed in the system (European Central Bank, the central bank of Norway, Reserve Bank of Australia, Reserve Bank of South Africa, the Bank of Israel, the Bank of Korea, the Hong Kong Monetary Authority (HKMA), the Monetary Authority of Singapore (MAS), and the central bank of Mexico).

Box 6: Foreign exchange transactions settled by CLS

(in value terms, EUR millions)



Sources: CLS, ECB.

the market coming under severe strain due to the failure of US bank Lehman Brothers, CLS remained continuously operational. The latest record in volume terms dates back to January 2015, with more than 2.2 million trades settled.

Even though CLS has become more widely used in recent years, settlement risk has not been completely eradicated in the foreign exchange market. Kos and Levich (2016) provide figures on the various settlement methods in use in the foreign exchange market, based among others on a study carried out by CLS in April 2013. In 2013, CLS processed (in value terms) almost 51% of all foreign exchange

transactions in the market and almost 55% of all transactions in currencies eligible for the CLS system. Other PvP payment systems exist,³⁷ but their weight in the foreign exchange market as a whole remained very small. The share of foreign exchange transactions using other payment methods remained fairly significant, even in currencies eligible for the CLS system. The table below shows that non-PvP gross settlement methods, i.e. payments exposed to settlement risk using the traditional channel of correspondent banks, still represented almost 11% of settlements in currencies eligible for CLS and nearly 40% of those in non-eligible currencies.

³⁷ Such as that of Hong Kong, see Box 8.

Box 7: Market share (in terms of transaction value) by settlement method (2013)

(%)

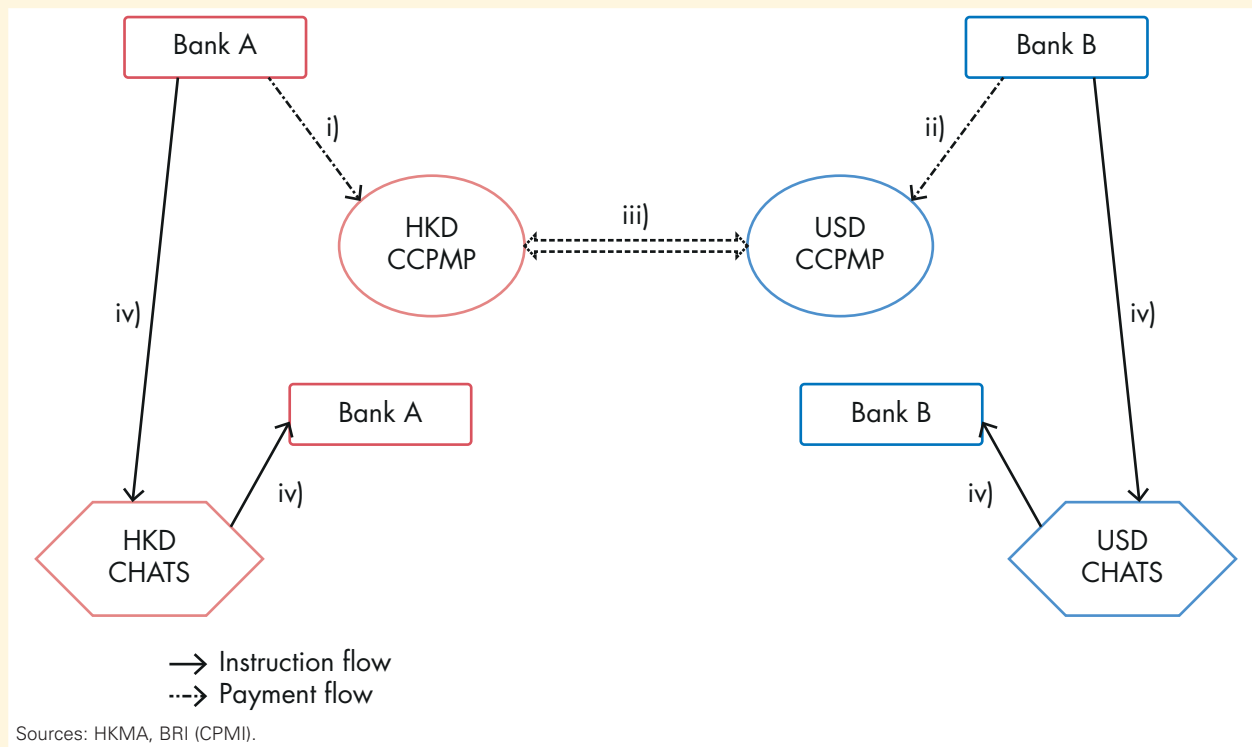
	Total foreign exchange market	Currencies eligible for CLS	Currencies not eligible for CLS
CLS system	50.8	54.6	–
Other PvP systems ¹	0.1	0.0	1.2
On-Us settlement*	9.2	9.0	12.2
Bilateral clearing	27.3	25.8	48.3
Gross settlement/Non-PvP	12.5	10.6	38.3

Source: Kos and Levich (2016)

¹ See Box below on settlement infrastructures for foreign exchange transactions in Hong Kong.

Box 8: Settlement infrastructure for foreign exchange transactions in Hong Kong

Hong Kong has four RTGS payment systems (CHATS¹): the HKD CHATS system for the settlement of transactions in Hong Kong dollars and the USD CHATS, EUR CHATS and RMB CHATS for the settlement of foreign exchange transactions in the US dollar, euro and Chinese renminbi, respectively. These four systems are linked by a PvP system called the “Cross-Currency Payment Matching Processor” (CCPMP), which enables payment instructions to be settled simultaneously, thus eliminating settlement risk. The common operator of these four systems is a private company, Hong Kong Interbank Clearing Ltd (HKICL), owned jointly by the local central bank (Hong Kong Monetary Authority, HKMA) and an association representing the Hong Kong banking industry, Hong Kong Association of Banks (HKAB). The USD CHATS system also set up a PvP link with Malaysia’s RTGS system (RENTAS)² in November 2006 and with Indonesia’s RTGS system (BI-RTGS) in January 2010.



The chart above presents the PvP mechanism, taking as an example the settlement of a USD/HKD trade. Bank A sells HKD to Bank B in exchange for USD. On the settlement day, (i) Bank A sends a payment instruction to Bank B via the HKD CHATS system, (ii) Bank B initiates a “mirror” instruction via the USD CHATS system; (iii) the HKD and USD CCPMP systems link the two instructions. The HKD and USD CHATS systems hold in their respective settlement accounts funds in HKD for Bank A and funds in USD for Bank B. If the two banks have sufficient liquidity in the currencies involved, (iv) the two payment systems transfer the funds to the respective counterparties simultaneously.

1 Clearing House Automated Transfer System.
 2 Real Time Electronic Transfer of Funds and Securities.

The HKMA has put risk management mechanisms in place to ensure the proper operation of the systems. Liquidity management is facilitated by mechanisms for liquidity optimisation,³ management of queued payments, and the monitoring and management of flows. The features of the HKD CHATS system are similar to those of the other CHATS systems, with a few exceptions:

- the HKD CHATS settlement agent is the HKMA whereas, for the other systems, commercial banks handle payments in the various currencies;
- the USD CHATS and EUR CHATS systems have a two-tier membership structure: banks can use the system as either direct members or indirect members after obtaining the approval of the HKMA and the settlement agents;
- unlike the USD CHATS and EUR CHATS systems, HKD CHATS does not offer intra-day credit facilities to its direct members.

Hong Kong’s multi-currency RTGS systems

RTGS system	Launch date	Settlement bank	Number of members* (directs/indirect)	Average daily transactions (in value)*	Average daily number of transactions*
USD CHATS	Aug. 2000	HSBC Ltd	94/219	USD 18.1 billion	18,220
EUR CHATS	April 2003	Standard Chartered Bank (HK) Ltd	37/18	EUR 563.7 million	485
RMB CHATS	June 2007	Bank of China (HK) Ltd	184	RMB 395.4 billion	6,788

* data as of 2013.

Source: HKMA.

3 RTGS Liquidity Optimiser (http://www.hkma.gov.hk/gdbook/eng/r/rtps_liquidity_optimiser.shtml)

4.2. Integrating new currencies in the system

When it was first established, CLS processed seven currencies. At the end of 2017, it was settling foreign exchange transactions in 18 currencies. The table below shows the dates on which the various currencies were integrated in CLS since the system’s launch.

While admitting new currencies is a source of external growth for CLS, it also meets the demands of clients, central banks and banking regulators, who want PvP mechanisms to be used more widely in the foreign exchange market to reduce risk.³⁸ As stated above, half of transactions

in the foreign exchange market are still settled outside CLS. Certain currencies are developing rapidly in the foreign exchange market, in particular those of the BRIC countries,³⁹ whose weight in the global economy and international trade is increasing.

Against this backdrop, CLS continues to work on plans to integrate new currencies. Integration, however, is a long and complex process, subject to strict specifications and official approval by the central bank of the currency concerned, as well as CLS’s regulators and supervisory bodies (FRNY, Oversight Committee).⁴⁰ The integration of emerging countries’ currencies will inevitably change CLS’s risk profile. In view

38 “Supervisory guidance for managing risk associated with the settlement of foreign exchange transactions”; BIS (BCBS), February 2013.

39 Brazil, Russia, India and China.

40 See the CLS website, which provides a commercial brochure for its currency programme: <https://www.cls-group.com/news-insights/publications>

Box 9: Launch dates for the integration of currencies

Currency	Effective launch date
US dollar (USD), euro (EUR), Japanese yen (JPY), Pound sterling (GBP), Swiss franc (CHF), Canadian dollar (CAD) and Australian dollar (AUD)	September 2002
Danish krone (DKK), Norwegian krone (NOK), Singapore dollar (SGD) and Swedish krone (SEK)	September 2003
Hong Kong dollar (HKD), South Korean won (KRW), New Zealand dollar (NZD), and South African rand (ZAR)	December 2004
Israeli shekel (ILS) and Mexican peso (MXN)	May 2008
Hungarian forint (HUF)	November 2015

Source: CLS.

Box 10: Amount* of foreign exchange transactions settled by currency and growth rate

Currency	Daily average (USD billion)					Growth rate			
	2004	2007	2010	2013	2016	04/07	07/10	10+/13	13/16
USD	1,114	2,845	3,371	4,662	4,438	155.4	18.5	38.3	-4.8
EUR	470	1,231	1,551	1,790	1,591	161.9	26.0	15.4	-11.1
JPY	292	573	754	1,235	1,096	96.2	31.6	63.8	-11.3
GBP	162	494	512	633	649	204.9	3.6	23.6	2.5
AUD	54	220	301	463	348	307.4	36.8	53.8	-24.8
CAD	56	143	210	244	260	155.4	46.9	16.2	6.6
CHF	74	227	250	276	243	206.8	10.1	10.4	-12.0
CNY	0	15	34	120	202	–	126.7	252.9	68.3
SEK	31	90	87	94	112	190.3	-3.3	8.0	19.1
MXN	10	44	50	135	97	340.0	13.6	170.0	-28.1
NZD	7	63	63	105	104	800.0	0.0	66.7	-1.0
SGD	13	39	56	75	91	200.0	43.6	33.9	21.3
HKD	28	90	94	77	88	221.4	4.4	-18.1	14.3
NOK	18	70	52	77	85	288.9	-25.7	48.1	10.4
KRW	10	38	60	64	84	280.0	57.9	6.7	31.3
TRY	0	6	29	71	73	–	383.3	144.8	2.8
INR	3	24	38	53	58	700.0	58.3	39.5	9.4
RUB	4	25	36	86	58	525.0	44.0	138.9	-32.6
BRL	6	13	27	59	51	116.7	107.7	118.5	-13.6
ZAR	12	30	29	60	49	150.0	-3.3	106.9	-18.3
DKK	15	28	23	42	42	86.7	-17.9	82.6	0.0
PLN	6	25	32	38	35	316.7	28.0	18.8	-7.9
TWD	3	12	19	24	32	300.0	58.3	26.3	33.3
THB	2	6	8	17	18	200.0	33.3	112.5	5.9
MYR	1	4	11	21	18	300.0	175.0	90.9	-14.3
HUF	0	9	17	23	15	–	88.9	35.3	-34.8
CZK	2	7	8	19	14	250.0	14.3	137.5	-26.3
ILS	1	5	6	10	14	400.0	20.0	66.7	40.0
SAR	1	2	3	5	15	100.0	50.0	66.7	200.0

* On a net basis.

Source: BRI.

of this, without neglecting its integration programme for new currencies, in 2017 CLS decided to offer a new service, CLSNet, to calculate bilateral net balances, in particular for currencies not eligible for the CLS system.⁴¹ This service, set for launch in 2018, is not a payment system: CLS does not make payments or transfer payment instructions. It is a vehicle that standardises players' processing operations and by so doing mitigates operational risk, improves intra-day liquidity management and cuts transaction costs.

4.3. Same day settlement sessions

In September 2013, CLS introduced a second settlement session in its system for same day settlement (SDS) of USD/CAD foreign exchange transactions. This second session is geared towards covering settlement risk on transactions with same day settlement⁴² which are not settled during the main session of the CLS system.⁴³ The SDS session for USD/CAD trades serves as a testing ground to assess the project's feasibility for other currencies. However, it faces severe liquidity constraints, notably for European members, which have to block part of the liquidity needed for the second session when it could be used to settle payments in other systems. Finally, the USD/CAD session has not been as successful as anticipated. In view of this, CLS is considering alternative solutions to reduce settlement risk, such as a gross PvP mechanism, which would make currency-for-currency payments simultaneously, to reduce settlement risk. Settlement would not be based on multilateral net positions but on the gross amount owed in each currency.

4.4. Other services in use or planned by CLS in the foreign exchange market

Since November 2015, CLS has expanded its range of foreign exchange instruments settled using the PvP system to include

cross-currency swaps (CCS), which have become much more prevalent in the market since 2010. A CCS combines a foreign exchange swap and an interest rate swap. CLS only settles the contract's principal value,⁴⁴ with payment instructions being supplied and confirmed previously by Markit.⁴⁵

At the same time, CLS now provides a compression service⁴⁶ for forex forward instructions⁴⁷ (see Chapter 5) in collaboration with TriOptima.⁴⁸ Provided in response to strong market demand, this service enables Settlement Members to significantly reduce the number of transactions they submit to the system and to limit their gross exposures, thus reducing their capital requirements for counterparty risk and leverage ratio requirements under the new regulations (EMIR, Basel III, DFA).

At present, central counterparty clearing houses (CCP) are indirect members ("third parties") of CLS. In connection with the introduction of mandatory clearing for standardised OTC derivatives, CLS is currently setting up a dedicated PvP settlement service⁴⁹ for CCPs for the clearing of certain foreign exchange products⁵⁰ that are not exempt⁵¹ (i.e. OTC foreign exchange options). This would enable CCPs to benefit from the CLS system's netting effect, thus reducing their exposures to liquidity risk in the event of a default by one of their clearing members. Their transactions would also be settled in central bank money, as CLS has access to the local RTGS for each currency concerned. The service would operate on an "all or nothing" settlement basis so as to limit the risks associated with partial or unfinished settlement.

The project is being developed in collaboration with the British CCP, LCH Ltd and the German CCP, Eurex Clearing AG. The effective launch of the new service is scheduled for 2018, once it has been approved by the relevant authorities.

41 Non-eligible currencies are those which cannot be settled on a PvP basis during CLS's main session.

42 "Outright Same-Day trades"; "Near-leg of Same-Day/Next-day Swaps"; "Near-leg of Same-Day/Forward Swaps"; "Far-leg of CLS In/Out Swaps" or "Far-leg of Informal Liquidity Swaps".

43 CLS's main session does not cover an ordinary payment day due to time differences and the different operating hours of the RTGS systems of the central banks involved.

44 Interest payments would be excluded from CLS's service.

45 Markit (acquired in 2016 by IHS) is a financial information company based in the UK.

46 Compression is a risk mitigation technique whereby two or more counterparties terminate transactions contained in a portfolio and replace them with one or more other transactions with a combined nominal value below that of the original transactions.

47 13% of the value of transactions settled in the foreign exchange market, with an increase of 43% between 2010 and 2013 (BIS).

48 TriOptima AB is a Swedish company specialising in risk management and post-market infrastructure. It is a subsidiary of the ICAP group.

49 The service will be completely separate from the "mainstream" service used by banks.

50 Exchange-traded or OTC foreign exchange options, FX futures, cross-currency swaps, etc.

51 Several jurisdictions (e.g. United States, Australia, Singapore and Japan) have decided to exempt derivatives such as FX swaps and FX forwards from mandatory clearing by a central counterparty, considering that the settlement risk on these products is greater than the corresponding credit risk and replacement risk. These instruments generally have fairly short maturities (under one year) and represent nearly 50% of the value of transactions settled on the foreign exchange market.