

The CLSTM system: reducing settlement risk in foreign exchange transactions

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The launch of the CLS^{TM1} system on 9 September 2002 marked the completion of an ambitious project undertaken by the banking sector following the G10 central banks' recommendations on reducing settlement risk in foreign exchange transactions. The CLS system is owned by 66 of the largest foreign exchange-dealing banks, including 4 French banks. In the first phase, 7 currencies (euro, US dollar, sterling, yen, Swiss franc, Canadian dollar and Australian dollar) will be eligible for CLS. The system is bound to establish itself as the standard "market infrastructure" for settling foreign exchange transactions.

The first section of this article looks at the CLS system in light of the central banks' joint efforts with the banking industry to reduce settlement risk in foreign exchange transactions. The second section describes the CLS operating principles and its contribution to controlling settlement risk. The third section discusses the central banks' role in the oversight of the CLS project. The final section looks at the impact that the implementation of the system may have on payment activities.

¹ CLSTM : Continuous Linked Settlement is a trade mark of CLS UK Intermediate Holdings Ltd.

1| Initiatives by central banks and the banking industry to reduce settlement risk in foreign exchange transactions

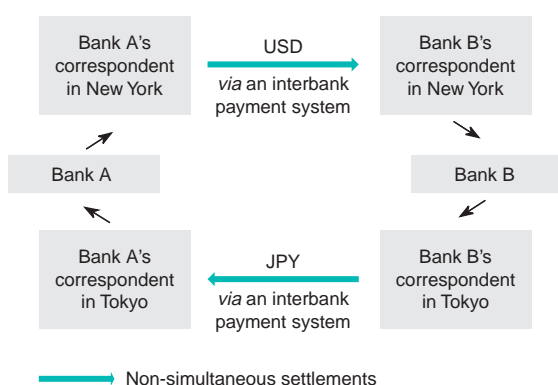
1|1 Settlement risk in foreign exchange transactions

The following example illustrates settlement risk in foreign exchange transactions. Two counterparties, called Bank A and Bank B, have agreed to a foreign exchange transaction in which Bank A sells Bank B 1 million US dollars at a rate of 1 dollar for 120 yen.

To settle the transaction, Bank A has to deliver 1 million dollars to Bank B (dollar leg) and receive 120 million yen from Bank B in exchange (yen leg). In symmetrical terms, Bank B has to deliver 120 million yen and receive 1 million dollars from Bank A in exchange.

As Diagram 1 shows, the two legs of the transaction are settled through separate circuits that are independent of each other. This means that Bank A incurs the risk of delivering the dollars to Bank B without receiving the yen from Bank B and, conversely, Bank B assumes the risk of delivering the yen to Bank A without receiving the dollars from Bank A in exchange.

Diagram 1
Conventional settlement circuit for foreign exchange transactions



The authoritative *Allsopp Report*² defines settlement risk in foreign exchange transactions, which is also termed “Herstatt risk”, as the risk that “one party to a foreign exchange transaction will pay the currency

it sold but not receive the currency it bought”. Any bank involved in a foreign exchange transaction incurs this risk from the time it submits an irrevocable payment instruction for the delivery of the “sold” currency up until the moment it knows for certain whether it has received the “bought” currency from the counterparty.

Thus, Bank A’s exposure to settlement risk arises when it sends its irrevocable instruction for payment of the dollar leg and it does not end until it receives irrevocable payment of the funds corresponding to the yen leg of the transaction. Similarly, Bank B is “at risk” from the time it sends its irrevocable instruction for the yen payment until it receives the irrevocable payment of the dollars bought from Bank A.

The *Allsopp Report* contains analysis based on a survey of 80 banks from G10 countries conducted in 1994 and 1995. The survey showed that the average exposure to settlement risk in foreign exchange transactions extended over several days. This defied the common belief that the risk stemmed solely from time zone differences and only lasted a few hours at most, as well as the belief that the risk is incurred only by the counterparty that has the time zone difference working “against” it.

The time the exposure lasts is the sum of all the processing times at every level of both settlement circuits, including the internal processing procedures of Bank A and Bank B, those of their respective correspondent banks for the two currencies and the operating rules of the interbank systems used to transmit the payment instructions.

The total amount exposed to settlement risk for a given bank at any time is the cumulative amount of all of the foreign exchange transactions “at risk”, as defined above. As mentioned above, the risk exposure arising from a given transaction can last for several days. The *Allsopp Report* showed that some institutions’ risk exposure could at times be as great as or even exceed their capital, and that it could be concentrated on a single counterparty. This would place the institution in great peril in the event of the failure of this counterparty.

² See “Settlement Risk in Foreign Exchange Transactions” (Bank for International Settlements, March 1996, available for downloading at www.bis.org). This document is called the *Allsopp Report* in honour of the chairman of the Steering Group on Settlement Risk in Foreign Exchange Operations.

The central banks' recommendations on reducing settlement risk in foreign exchange transactions are warranted by this situation, along with the sheer scale of overall trading on the global foreign exchange market (1.2 trillion dollars per day).

1|2 Responses from central banks and the financial sector

After the publication of the *Allsopp Report*, the G10 central banks strove to raise awareness in the banking industry in general and in individual banks. They sparked practical initiatives to reduce or eliminate settlement risk.

Reducing settlement risk primarily requires a reduction in the duration of exposure through better management of procedures at every step in the settlement process.

Banks took notice of the *Allsopp Report* recommendations on this point. A progress report³ released two years after the *Allsopp Report* showed a substantial reduction in the average duration of exposure to settlement risk.

Reducing settlement risk may also require implementation of bilateral or multilateral netting systems that greatly reduce the value at risk (see Box 1).

However, an arrangement that ensures simultaneous and linked payment of both legs of a foreign exchange transaction is required to eliminate settlement risk completely. Building on the delivery versus payment (DVP) concept already applied in securities settlement systems, the payment versus payment (PVP) concept was developed for foreign exchange transactions. It aims to ensure that each counterparty pays what it owes *if, and only if*, it receives what is owed to it.

Such an arrangement was the goal of the CLS project launched by the G20⁴ banks. These banks started by setting up CLS Services Limited, followed by a subsidiary called CLS Bank International (CLS Bank), which was incorporated in New York as an "Edge corporation" for the purpose of settling eligible foreign exchange transactions across its books⁵.

Despite its apparent simplicity, implementation of the payment-versus-payment concept within the specific context of foreign exchange transactions at the global level raises very complex issues. It had to be implemented in such a way that eliminating settlement risk did not create or exacerbate other types of risks, such as liquidity risk. This is why it took so long for the project leading up to the launch of the CLS system to be completed.

³ "Reducing Foreign Exchange Settlement Risk: a Progress Report" (Bank for International Settlements, July 1998, available for downloading at www.bis.org). This document is called the "Sweet Report" in honour of the chairman of the working group.

⁴ A group of commercial banks from 8 countries that was set up to consider payment-versus-payment solutions.

⁵ The group's structure has changed: CLS Bank International and CLS Services are now both subsidiaries of CLS UK Intermediate Holdings Limited, which is a subsidiary of CLS Group Holdings AG, which has its head office in Switzerland.

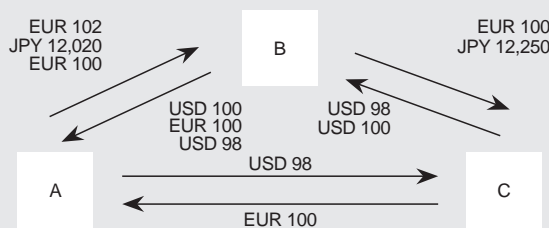
Box 1

Examples of bilateral and multilateral netting

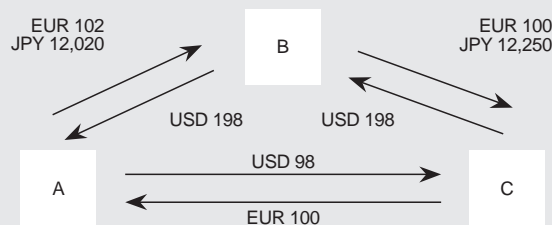
We take a situation where the following transactions between Banks A, B and C all need to be settled for the same value date:

Transaction N°	Bank	Pays	Receives	Counterparty
1	A	EUR 102	USD 100	B
2	B	EUR 100	USD 98	C
3	A	JPY 12,020	EUR 100	B
4	A	USD 98	EUR 100	C
5	A	EUR 100	USD 98	B
6	B	JPY 12,250	USD 100	C

Without netting, the payments to be made are as follows:

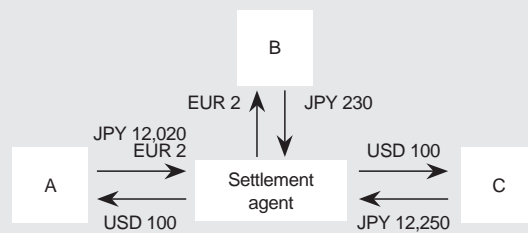


Under a bilateral netting system, there is at most one payment for each pair of counterparties and each currency, which corresponds to the net balance of the transactions in the currency pair between the pair of counterparties:



In this example, a single euro payment between Bank A and Bank B is substituted for the payments that would be required without netting of EUR 102 and EUR 100 from Bank A to Bank B and of EUR 100 from Bank B to Bank A. Furthermore, Bank C can meet its dollar obligations towards Bank B by making a single payment, instead of two. The same is true of the dollar obligations between Bank B and Bank A.

Under a multilateral netting system, each bank has to make or receive at most one payment in each currency. The amount of the payment is equal to the net balance of all of the participant's transactions in that currency with all its counterparties in the system. The payments are made through a settlement agent:



The dollar payment that Bank B is supposed to make to Bank A and the dollar payment that Bank B is supposed to receive from Bank C under the bilateral netting arrangement are netted off: Bank B no longer has to make or receive any dollar payments. A similar situation applies to Bank C's payments in euro.

2| CLS operating principles

As we have seen, the CLS system eliminates settlement risk in foreign exchange transactions by applying the payment-versus-payment concept. In addition, CLS includes arrangements to limit participants' negative positions at all times to provide at least partial protection against liquidity risk. It also has failure management procedures that attenuate the impact of defaults on the non-failing participants.

2|1 Payment mode

Payment principles under CLS

Each participant holds a multi-currency account with CLS Bank, with a subaccount for each currency approved to settle through the system. The CLS Bank provides a "payment versus payment" arrangement, simultaneously settling both sides of a transaction on a trade-by-trade basis across these accounts. Transactions cannot settle unless both counterparties have enough of the required currencies in their accounts with CLS Bank. If this condition is met, settlement of the transaction occurs immediately and is then final.

The example below (Diagram 2) shows the settlement of two transactions that both involve Bank A. The first decreases the bank's position on its euro-sub account and the second increases it. In more general terms, the effect of successive settlements of transactions across accounts on CLS Bank's books on the participants' accounts is the creation of positions in each currency equal to their multilateral net balances.

Each participant's final position in each currency has to be settled in central bank money. Any participant with a negative position in a currency on its account with CLS Bank has to pay in the equivalent amount in central bank money. Likewise, CLS Bank has to pay out an equivalent amount in central bank money to any participant with a positive position in a given currency on its account.

Diagram 2
Debits and credits to accounts with CLS Bank during settlement

Transaction 1



If the transaction is accepted, the following debits and credits are made simultaneously across CLS Bank's books.

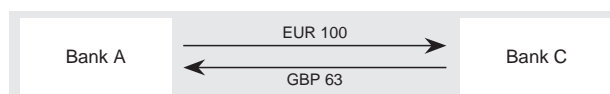
Bank A's multi-currency account:

- debit : USD 100
- credit : EUR 102

Bank B's multi-currency account:

- debit : EUR 102
- credit : USD 100

Transaction 2



If the transaction is accepted, the following debits and credits are made simultaneously across CLS Bank's books.

Bank A's multi-currency account:

- debit : EUR 100
- credit : GBP 63

Bank C's multi-currency account:

- debit : GBP 63
- credit : EUR 100

Outcome of the settlement of transactions 1 and 2 across the multi-currency account

	Bank A	Bank B	Bank C
EUR	2	-102	100
GBP	63	-	-63
USD	-100	100	-

The transactions to pay off negative and positive positions are referred to as pay-ins and pay-outs. These payments have to be made *via* payment systems that provide real-time finality for central bank money transfers. For this reason, pay-ins and pay-outs are made in each currency *via* a real-time gross settlement (RTGS) payment system.

Pay-ins and pay-outs are recorded on the participants' multi-currency accounts with CLS Bank. A participant making a pay-in in a currency increases its position in that currency on its multi-currency account with CLS Bank by the corresponding amount and, conversely, when CLS Bank makes a pay-out to a participant, the latter's position in the currency concerned is reduced by the corresponding amount.

The distinctive feature of the CLS system is that it combines a payment-versus-payment settlement arrangement on a trade-by-trade basis with the multilateral netting arrangement described in 1|1

above. CLS Bank's role is only that of a settlement agent that credits or debits participants' accounts for the settlement amounts and pay-ins and pay-outs. CLS is never a counterparty to the transactions.

The CLS system has been designed to speed up settlement by enabling it even when the counterparties to a transaction have a negative position on their accounts with CLS Bank in the currencies being sold. However, risk management controls are applied so that negative positions do not exceed the limits set to ensure that transactions can be settled even in the event of the failure of the participant concerned. Furthermore, the ability of CLS Bank to make pay-outs in a given currency depends on the funds available in that currency on its central bank account, which means it depends on the pay-ins received. Once again, risk controls are necessary to ensure that the cumulative amount of pay-outs to be made by CLS Bank never exceeds the amount of the pay-ins it receives.

Box 2

CLS risk control measures

CLS applies three risk control measures at all times:

- *A participant's overall balance across all its currency subaccounts must always be positive or equal to zero,*
- *A participant's negative position in a given currency must not exceed the limit called the "short position limit" (SPL),*
- *The sum of a participant's negative positions must not exceed the limit called the "aggregate short position limit" (ASPL).*

These various balances, aggregates and limits are expressed in dollar equivalents. For this purpose, CLS updates the dollar rates of the currencies in real time using the average bid and offered rates of ten of the most active traders in the market. In view of the potential variations in these rates during the settlement process, a market volatility haircut is applied to the net positions.

Each participant is assigned a specific aggregate short position limit (ASPL) that depends on its capital and its short-term rating. This limit is aimed at managing counterparty risk by making sure that each participant's overall obligations are within limits at all times. It completes the system eligibility rules, which require a minimum rating for participants.

The short position limit (SPL) is calculated for each currency. This limit ensures that the system can provide timely settlement even if the participant with the largest negative position in the currency concerned is unable to make all of its pay-ins. CLS Bank has signed contracts with a number of credit institutions called "liquidity providers" that undertake to provide the liquidity necessary to cover a shortfall up to the short position limit.

Box 3**Example of settlement under the CLS system**

Our example is a simplified one involving three currencies and three banks named A, B and C. Market volatility haircuts are ignored. Unless otherwise indicated, all amounts are expressed in dollar equivalents. The aggregate short position limits (ASPLs) are 200 for Banks A and C and 150 for Bank B. The short position limit (SPL) for each currency is 100.

After the first pay-ins are made, the positions on the multi-currency accounts are as follows:

	EUR	GBP	USD	Total	Aggregate negative position	ASPL
A	–	700	100	800	–	200
B	100	–	200	300	–	150
C	500	–	400	900	–	200
SPL	100	100	100	–	–	–

The following transactions have been placed in the queue:

Transaction N°	Bank	Buys		Sells		From/to
		Initial amount	USD equivalent	Initial amount	USD equivalent	
1	A	USD 100	100	EUR 102	100	B
2	B	EUR 205	201	USD 200	200	C
3	B	EUR 318	312	GBP 200	312	C

After settling transaction 1, the positions are changed to:

	EUR	GBP	USD	Total	Aggregate negative position	ASPL
A	-100	700	200	800	-100	200
B	200	–	100	300	–	150
C	500	–	400	900	–	200
SPL	100	100	100	–	–	–

The only negative position is on Bank A's euro account, but it is both within Bank A's aggregate short position limit and within the euro short position limit. Furthermore, Bank A still shows a positive position across all currencies. Transaction 1 does not cause the position on Bank A's multi-currency account to exceed the limits set by the risk controls. Therefore it can be settled.

After settling transaction 2, the positions are changed to:

	EUR	GBP	USD	Total	Aggregate negative position	ASPL
A	-100	700	200	800	-100	200
B	401	–	-100	301	-100	150
C	299	–	600	899	–	200
SPL	100	100	100	–	–	–

A negative position is shown on Bank B's dollar account, but it is both within Bank B's aggregate short position limit and within its dollar short position limit. Furthermore, Bank B still shows a positive position across all currencies. Therefore, transaction 2 can be settled.

After settling transaction 3, the positions are changed to:

	EUR	GBP	USD	Total	Aggregate negative position	ASPL
A	-100	700	200	800	-100	200
B	713	-312	-100	301	-412	150
C	-13	312	600	899	–	200
SPL	100	100	100	–	–	–

Bank B's aggregate negative position now exceeds its aggregate short position limit. In addition, Bank B's negative position in sterling exceeds the short position limit for sterling. This means that transaction 3 does not meet the settlement criteria and it is put back in the queue for another try at settlement later.

Daily operations

Participants can submit settlement instructions to CLS Bank or else rescind them by mutual agreement before 6:30⁶ on the settlement day. Participants can also rescind instructions unilaterally before midnight on the day before settlement day.

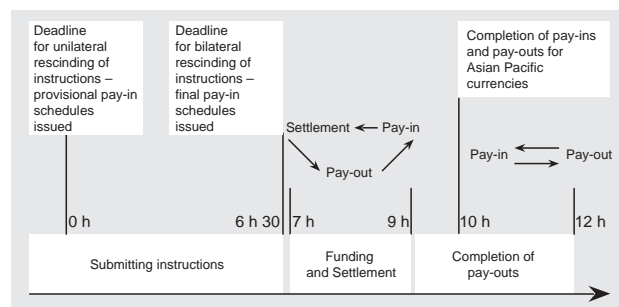
At 6:30, the system calculates the theoretical multilateral net positions in each currency that would result on the participants' account with CLS Bank after execution of all of the foreign exchange transactions submitted for settlement on that day. Participants have to make pay-ins for currencies in which their theoretical multilateral position is negative. For that purpose, CLS Bank sends each participant its pay-in schedule for the day. The pay-in deadlines are 8:00, 9:00 and 10:00 for Asian Pacific currencies (yen and Australian dollar at present) and 8:00, 9:00, 10:00, 11:00 and 12:00 for the other eligible currencies.

The start of the settlement process occurs at 7:00 and, under normal circumstances, transactions are settled and pay-outs are completed by 12:00. All transactions must be settled across the participants' multi-currency accounts by 9:00 and the rest of the time is used to complete pay-ins and pay-outs.

This schedule is a compromise between:

- the need to define a strict deadline for final payment of the sums due to each participant,
- and the concern for spreading out the pay-in requirements throughout the processing cycle so as to ease pressure on banks' liquidity.

Diagram 3
CLS settlement process timeline



Source: CLS Group

The operating hours of the CLS system correspond to the overlapping operating hours of the RTGS systems used to make pay-ins and pay-outs. The earlier cut-off time for Asian Pacific currencies handled by the CLS system corresponds to the close of markets in that area⁷.

2|2 Managing failures

If a participant defaults, additional measures are taken to limit the impact of the default on the other participants. These measures come on top of the three ongoing risk controls applied by CLS Bank, which are described in the section “Payments principles under CLS” 2|1 above. More specifically, the purpose of these measures is to maximise the central bank money liquidity available within the system to ensure that pay-outs arising from the settlement of all transactions across the books of CLS Bank can be completed despite the liquidity shortfall resulting from a participant's failure to execute its pay-ins.

⁶ All times given refer to Paris time, unless otherwise indicated.

⁷ Settlement closes at 18:00 in the Sydney time zone (20:00 between October and March) and at 17:00 in the Tokyo time zone.

Box 4***Failure management procedures***

As a general rule, CLS stops sending pay-outs to any participant that fails to meet its pay-in schedule. Pay-outs can resume as soon as the participant in question remedies its situation. Furthermore, any participant that misses a pay-in deadline is subject to a financial penalty.

When a participant fails to make all its scheduled pay-ins for the 8:00 deadline, CLS sends it a pay-in call urging it to deposit a minimum sum on its account. The relatively small sum can be deposited in the currency of the participant's choice.

At 9:00 the CLS system rejects transactions that are not yet settled and involve a participant that has not complied with its pay-in schedule. This changes the projected positions of the counterparties to the failed transactions. Such counterparties could end up with a potentially larger negative projected position than before in some currencies. They could even swing from a positive projected position to a negative projected position. CLS then sends them a "pay-in call for settlement", urging them to transfer central bank funds to CLS Bank to enable immediate settlement of all of their transactions in the queue.

At the 10:00 deadline for Asian Pacific currencies and the 12:00 deadline for other currencies, CLS sends "pay-in calls for currency close" to the surviving participants, if needed. Even though they have complied with their pay-in schedules and met the pay-in calls for settlement, some of them may still have negative positions in some currencies on their accounts with CLS Bank.

At the same time, transactions involving the failed participant may have already been settled, even though the latter has not made any pay-ins, or has made only some of the pay-ins scheduled. In this case, CLS Bank does not have enough liquidity in the currencies concerned to make the pay-outs due to the counterparties in these transactions. On the other hand, since CLS Bank stopped the pay-outs to the failed participant, it has excess liquidity in the corresponding currencies. Therefore, it can exchange these currencies for the ones it needs to complete the pay-outs to the surviving participants. It swaps these currencies with the designated liquidity providers. The latter are banks, which may or may not be CLS participants, that have contracted to provide liquidity in eligible currencies under such circumstances.

The liquidity providers' commitments are set at a level such that, even if the liquidity provider with the largest commitment for a given currency fails, the other liquidity providers' commitments are adequate to cover the corresponding short position limit. Thus, in theory, CLS Bank will always be able to make the expected pay-outs, even if the participant with the largest debit position fails.

The measures intended to ensure settlement of transactions could turn out to be inadequate to cover the resulting short positions in specific currencies in the event of multiple failures, or if exchange rate variations exceed the market volatility haircuts. In this event, CLS Bank has planned loss-allocation arrangements for the surviving participants.

3| The role of central banks in evaluating and implementing the CLS system

3|1 A coordinated assessment process

Since CLS Bank is located in the United States, the United States Federal Reserve is the “lead overseer” that coordinates oversight of the CLS system. It works in conjunction with the other G10 central banks and other central banks whose currencies are or soon shall be eligible for CLS. This framework was used to assess the compliance of CLS with payment system standards. The central banks issuing the eligible currencies for CLS (euro, US dollar, sterling, yen, Swiss franc, Canadian dollar and Australian dollar) were invited to rule on the inclusion of their currencies in the system. More specifically, the Governing Council of the European Central Bank approved the inclusion of the euro in the CLS system on 10 July 2002.

When it received the approval of all of the central banks concerned and after conducting its own investigation, the United States Federal Reserve approved CLS offering live services to its members on 5 September 2002.

The central banks’ assessments before the launch were conducted as part of the cooperative oversight arrangement for the CLS system. The process had started more than three years previously with the examination of the operating rules, simulations of the impact of CLS on banks’ liquidity, monitoring of test results and discussions with CLS representatives. Now that the system has gone live, the oversight process is continuing to ensure that CLS maintains compliance with standards. Central banks will have to look into any future changes in the operating rules and conditions of the CLS system.

3|2 Preparing RTGS systems for the implementation of CLS

Since the central banks run the RTGS systems used for making pay-ins and pay-outs under CLS, in some cases, they have had to adapt their operating hours in order to provide a sufficient period of overlap in the operation of the RTGS systems in the three main financial zones (Europe, America, Asia/Pacific). Thus, in December 1997, the United States Federal Reserve moved the opening time of its Fedwire RTGS system up to 0:30 (New York time). The Fedwire system now operates 18 hours a day.

Central banks also made efforts to improve availability of their RTGS systems and defined contingency procedures to ensure rapid execution of pay-ins and pay-outs in the event of disruptions. Failure to complete pay-ins on time, regardless of the cause, could lead to the rejection of transactions and pay-in calls in the currency concerned and others. The failure of a single RTGS system could disrupt the worldwide operations of the CLS system.

Thoroughgoing analysis was conducted within the Eurosystem in conjunction with the banking industry to facilitate the execution of euro pay-ins and pay-outs *via* the TARGET system. Recommendations⁸ were issued urging credit institutions to prepare for their pay-ins so that they have enough time to initiate contingency measures in the event of problems with the system.

More specifically, a special high-priority transfer for executing pay-ins was created in the *TBF* system, which is the French component of TARGET. This prevents participants’ pay-ins from being delayed by other transfers already in the queue. In addition, special contingency measures have been instituted for CLS pay-ins and pay-outs. All of these arrangements have been set out in a formal agreement between the Banque de France and the French CLS participants.

⁸ "Recommendations for CLS Payments in Euro," which can be viewed at the European Central Bank website (www.ecb.int).

4| The impact of CLS on payment and settlement activities

4|1 Impact on banks' liquidity

CLS is likely to have a major impact on the participants' liquidity in view of the sweeping changes it has brought about in foreign exchange settlement circuits.

The multilateral netting arrangement for payment flows under CLS is one of the most important factors reducing liquidity requirements. It greatly reduces the amounts of the pay-ins due from each participant in comparison to the gross amounts of transactions submitted⁹.

The concentration of foreign exchange settlements under CLS could be another factor affecting banks' liquidity. The scale of the investment required to join CLS means that the number of Settlement Members, which are the direct participants in the CLS system, is bound to be lower than the number of banks that are currently dealing directly on the foreign exchange market. As a consequence, the CLS Bank Settlement Members offering settlement services may end up handling transactions for a large number of third parties, thus concentrating substantial payment flows.

Furthermore, most Settlement Members do not have direct access to all of the RTGS systems used for the eligible currencies. This means they have to use "nostro agents" for pay-ins and pay-outs in some currencies. Some nostro agents could end up concentrating the pay-ins for a large number of Settlement Members in a given currency, which could entail very substantial liquidity requirements.

However, when a nostro agent handles the transactions in a given currency for several Settlement Members, it is likely that some of them will have an overall positive balance in the currency. Thus, the nostro agent will receive pay-outs that will ease the strain of pay-ins on its liquidity.

CLS Settlement Members also need to consider the liquidity management constraints of meeting strict pay-in schedules. These leave banks with less room for manoeuvre in carrying out their transactions and concentrates their liquidity requirements between the hours of 7:00 and 12:00.

Overall, on the basis of simulations conducted as part of the CLS project, Settlement Members are of the opinion that the impact of CLS on their liquidity requirements will be manageable. This is in line with the liquidity profile analysis conducted on the French Settlement Members during the first few weeks of live operations¹⁰. Naturally, this view will have to be confirmed as CLS reaches full-scale operations.

Nevertheless, Settlement Members felt it would be a good idea to introduce arrangements to reduce liquidity constraints. They call for "inside/outside swaps" where two Settlement Members enter into a swap to reduce their negative positions in certain currencies on their multi-currency accounts with CLS Bank, thereby reducing the pay-ins requirements. This swap involves an inside leg settled via CLS and an outside leg settled through other payment mechanisms¹¹.

This type of arrangement may very well reduce the banks' liquidity requirements, but it has the major drawback of re-introducing a form of settlement risk, since the outside leg is settled outside of CLS and does not benefit from the safeguards inherent in a payment versus payment mechanism. Furthermore, CLS Bank's liquidity simulations show that if the Settlement Member with the largest negative balance fails, the amounts of the rejected transactions and of the pay-in calls would be greater if inside/outside swaps are used.

Thus, for central banks, inside/outside swaps can only be a temporary solution to facilitate adaptation to the new system and they should not become permanent liquidity management tools under CLS.

⁹ CLS ran simulations in 2001 on the forecasts provided by 51 future participants. These showed that the average amount of pay-ins in each currency was between 8% and 18% of the gross amount of transactions in the same currency.

¹⁰ If CLS increased liquidity requirements for Settlement Members, it could lead to higher than normal demand for intraday credit from the Banque de France and an increase in the number of transactions pending settlement in the TBF queue. Neither phenomenon was observed in the first weeks after CLS went live.

¹¹ For example, a Settlement Member that is short in euro and long in yen could find another Settlement Member in the opposite situation and make a deal to purchase euros for yen, with settlement inside CLS, and a deal to sell euros for yen, with settlement outside CLS.

4|2 Likely changes in payment system flows

Before CLS, banks settled their foreign exchange operations preferably through net settlement systems such as Euro1 or Chips, and, to a lesser extent, *via* RTGS systems. A substantial proportion of payments were also made through correspondent banking circuits (see Diagram 1).

Since the Settlement Members' positions will be settled across their CLS Bank accounts via the RTGS systems, flows through net settlement systems are bound to decrease as CLS reaches full scale operation. But there could also be a decrease in the flows through RTGS systems since the amounts settled *via* RTGS systems up until now have been gross transaction amounts, which are not the same as the net amounts paid through CLS pay-ins and pay-outs.

A substantial reduction is expected in transaction numbers handled by net settlement systems and RTGS systems alike, since CLS replaces hundreds or even thousands of daily transaction-by-transaction payments in the case of the most active banks, with the sole pay-ins or pay-outs, which means fewer than 10 daily payments per currency and per Settlement Member.

A simulation conducted within the Eurosystem on the basis of 2001 data, which compared foreign exchange statistics from euro payment systems with CLS data on the aggregate pay-in amounts forecasted

by the 51 future Settlement Members, also shows a decrease in the number and value of payments. The decrease will have a larger impact on the Euro 1 system than on the TARGET system. Furthermore, the implementation of CLS is likely to have a very moderate impact on the number and value of payments handled by the French systems TBF and PNS.

Caution must be applied when considering these forecasts, since they ignore the potential payment flows between Settlement Members and Third Parties. A Settlement Member settling foreign exchange transactions through CLS on behalf of a Third Party will naturally have to transfer the currencies involved in the transactions to and from the Third Party in question.

In addition to changes in the size of liquidity requirements, there could be other effects on liquidity conditions in the various payment systems. As CLS Bank's pay-outs never exceed the pay-ins received and, furthermore, since pay-outs are only executed when a Settlement Member's multi-currency account balance reaches a certain threshold, the overall central bank liquidity available is reduced during the CLS settlement process.

The satisfactory conditions under which CLS started live operations point to its future success as a standard market infrastructure. However, it will take several months to make a proper assessment of the impact of CLS on payment system flows and liquidity and its more general impact on market operations.