BANK FOR INTERNATIONAL SETTLEMENTS

REDUCING FOREIGN EXCHANGE SETTLEMENT RISK: A PROGRESS REPORT

Report prepared by the Committee on Payment and Settlement Systems of the central banks of the Group of Ten countries

Basle

July 1998

FOREWORD

In 1996 the G-10 central banks launched a major campaign to reduce foreign exchange settlement risk. The chosen strategy was founded on the belief that the private sector, with the active support of the public sector, had the power to contain the risk that first came into focus at the time of the 1974 failure of Bankhaus Herstatt. Recognising, however, that success was not guaranteed, the Committee on Payment and Settlement Systems has monitored progress closely for two years to determine the need for further action.

This report, prepared on behalf of the CPSS by its Steering Group on Settlement Risk in Foreign Exchange Transactions, concludes that encouraging progress has been made over the past two years but more needs to be done. Many individual institutions have significantly enhanced the way they manage their foreign exchange settlement exposures, groups of institutions have been working constructively on risk-reducing multicurrency services, and a number of key payment systems have benefited from useful improvements. However, many banks still do not manage their exposures appropriately and industry efforts have not yet realised their full risk-reducing potential.

Thus, despite significant progress, the potential consequences of a disruption in the foreign exchange settlement process remain considerable. As a result, the G-10 central banks have decided to reaffirm and strengthen the strategy launched in 1996, and the report sets out how this is being done. Prompt action to tackle foreign exchange settlement risk remains essential and I strongly believe that continued implementation of the strategy, with the private and public sectors working in concert, is the best way forward.

Bringing the work to this point has been a major accomplishment, and the CPSS is very grateful for the efforts of the Steering Group, which has benefited greatly from the leadership of its chairmen during the past two years - Christopher J. McCurdy (1996-1997) and Lawrence M. Sweet (1997-1998), both of the Federal Reserve Bank of New York.

William J. McDonough, Chairman,
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1. EXECUTIVE SUMMARY

In 1996, the Governors of the central banks of the Group of Ten (G-10) countries endorsed a comprehensive strategy under which the private and public sectors could together reduce the systemic risks in settling foreign exchange transactions. The G-10 central banks have concluded that encouraging progress has been made over the past two years, but much still remains to be done. Accordingly, they have decided that the strategy should be reaffirmed and strengthened. This report, prepared by the Committee on Payment and Settlement Systems (CPSS) of the G-10 central banks, assesses the progress made in reducing foreign exchange settlement risk and sets out the next steps under the strategy.

1.1 Background

The March 1996 CPSS Report on Settlement Risk in Foreign Exchange Transactions (the Allsopp Report) described the G-10 central bank strategy and its underlying analysis. The report noted that the procedures banks used to settle foreign exchange (FX) deals typically caused counterparty exposures that lasted at least overnight and often for several days, and it concluded that, given the vast size of daily FX trading, the resulting risks raised significant concerns about banks' safety and soundness as well as the stability, liquidity and efficiency of financial markets as a whole. The report also noted that, while some major banks were aware of the risks and were actively pursuing ways to manage and reduce them, many other banks remained sceptical about devoting significant resources to such efforts. The report therefore concluded that, building on previous work by central banks, a strategy was needed to reduce the risks, particularly systemic risks.

The agreed strategy emphasised action by the private sector to tackle the problem of foreign exchange settlement risk. Specifically, a three-track approach was adopted. The first track was action by individual banks to manage and reduce their FX settlement risks (for example, by improving their back-office procedures, correspondent banking arrangements and risk management controls and by making greater use of obligation netting arrangements). The second track was action by industry groups to provide risk-reducing multicurrency services (for example, by developing obligation netting arrangements or multicurrency settlement mechanisms). The third track was action by central banks; this track took account of the fact that, while the emphasis of the strategy was on private sector action, the public sector should also play a key role in inducing rapid private sector progress (for example, by actively promoting the strategy and by fostering improvements to national payment systems).

1.2 Recent progress

When launching the strategy, the G-10 central banks recognised that, although they believed that the strategy would be successful and the private sector could play a major role in reducing FX settlement risk, adequate and timely progress was not guaranteed. Accordingly, it was agreed that the CPSS would monitor developments over a two-year period to determine the need for further action. The monitoring, which included two surveys of individual market participants and a review of industry group initiatives, was carried out by the CPSS Steering Group on Settlement Risk in Foreign Exchange Transactions (the Steering Group). That work yielded the following key findings:

Action by individual banks

- Many of the major participants in the market have made significant progress in dealing with FX settlement risk: awareness of the issues is now much higher, including at senior management levels, and a number of banks are devoting significant resources to tackling the problem.

- A substantial number of the banks surveyed during the two-year monitoring period have established clear senior level responsibility for managing the risk and, for control purposes, they now treat FX settlement exposures like other credit exposures of the same size and duration.
- There has been some reduction in exposures as well as some improvement in the methods used to measure them.
- Further near-term improvements seem likely in all these areas.

Action by industry groups

- Bilateral netting has grown with the increased use of services provided by FXNET, Valunet and S.W.I.F.T. Accord as well as bilateral arrangements based on IFEMA and other standard industry contracts.
- A company, CLS Services, has been set up to develop plans for a "continuous linked settlement" bank (the CLS Bank) to settle foreign exchange deals.
- The subsequent merger of CLS Services with the two existing multilateral netting companies, ECHO and Multinet, has created greater certainty about the future shape of multilateral netting.
- Other industry groups are exploring alternative approaches to the problem, such as replacing traditional FX trades with instruments called contracts for difference (CFDs).

Action by central banks

- Significant improvements have been made to wholesale payment systems in recent years, with potential benefits for the settlement of foreign exchange deals.
- Extensions to the operating hours of systems have also taken place, or are being planned, increasing the overlap in system hours in different currencies.
- The relevant central banks have been in discussion with CLS Services about CLS Bank access to central bank accounts and domestic payment systems.
- Representatives of the CPSS have been working with national supervisors on the issue of FX settlement risk.

1.3 Assessment of the need for further action

Looking at developments as a whole over the past two years, encouraging progress has been made in tackling the problem of FX settlement risk and considerable momentum has been achieved that could lead to further, substantial progress. Nevertheless, much remains to be done. For example, although many more surveyed banks have established clear senior level responsibility for managing FX risk and include their exposures under appropriate controls, the G-10 central banks are still concerned that one in ten of the surveyed banks failed to meet these benchmarks. Moreover, the improvement observed in the measurement of exposures is from a generally low level; the result is that at the moment over 60% of the banks in the surveys are still underestimating their exposures. There also remains considerable scope for reducing exposures by improving current practices and increasing the use of bilateral and multilateral obligation netting.

Less systematic information is available about market participants not surveyed during the two-year period. However, the information that is available suggests that, in general, awareness of the risk is much lower in these banks and much less progress has been made in improving risk management.

Many industry initiatives are still under development. Moreover, the G-10 central banks believe that, although industry group solutions could in due course substantially reduce the foreign exchange settlement risk faced by individual banks, such solutions by themselves are unlikely to eliminate the risk entirely: it is therefore important to ensure that momentum is also maintained by individual banks in managing their FX exposures.

1.4 Conclusions

The G-10 central banks believe that the strategy has helped to bring about significant progress to date and that it can be the building-block for future progress. Accordingly, to maintain momentum, they have decided to reaffirm and strengthen the strategy as follows.

The CPSS will continue to promote the overall implementation of the strategy and, as necessary, report to the G-10 central bank Governors on the extent of further progress made. A key element in the work of the CPSS will be to continue to cooperate, where appropriate and feasible, with existing and prospective private sector groups that are planning to provide risk-reducing multicurrency services. In addition, the CPSS will promote the reduction of FX settlement risk worldwide and will identify and assess significant developments in the field of FX settlement.

To strengthen the strategy, the G-10 central bank Governors have invited the Basle Committee on Banking Supervision (the Basle Committee) to develop international supervisory guidance for banks on the prudential management and control of FX settlement risk, consistent with the recommendations of the Allsopp Report (see Annex 1). National supervisors in each G-10 country have already been involved in the implementation of the strategy to varying degrees over the past two years. International guidance will now help to provide a common approach that can be applied, as appropriate, to the management of FX settlement risk by all banks in the G-10 countries, including smaller market participants where relevant. Since the Basle Committee has a strong influence on supervisory policies both inside and outside the G-10 countries, the guidance should also help to encourage attention to the issue where at the moment there is less awareness of the need for action. A common approach could also help to ease the concerns of banks which believe that by devoting resources to tackling the risk they are putting themselves at a competitive disadvantage. The existing action by national supervisors has created a pool of experience that can be drawn on to develop this international guidance.

1.5 Summary of next steps

In the light of the above, the following is a summary of the action to be taken under the three tracks of the reaffirmed and strengthened strategy.

Action by individual banks

Those banks that have not yet done so should take immediate steps to apply an appropriate credit control process to their FX settlement exposures. This recognises the considerable scope for individual banks to address the problem by improving their current practices for managing their FX settlement exposures.

Action by industry groups

Existing and prospective industry groups should continue to develop and offer services and products that contribute to the risk-reducing efforts of individual banks. This reaffirms the G-10 central banks' view that multicurrency services are best provided by the private sector, as was stated in the Allsopp Report of 1996.

Action by central banks

The G-10 central banks, through the CPSS, will continue to promote the strategy worldwide and to monitor progress. Each central bank will continue its efforts to make, or to seek to

achieve, improvements to national payment systems that help to bring about a reduction in FX settlement risk. Each central bank will also continue to stimulate private sector action in its domestic market through the best combination of publicity, moral suasion and measures by the appropriate supervisory authorities. Finally, the Basle Committee on Banking Supervision will reinforce these efforts by developing international supervisory guidance on banks' management of FX settlement risk.

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Sections 2 to 4 of this report describe the action taken to date under each of the three tracks of the strategy – action by individual banks, industry groups and central banks. Section 5 provides an assessment of the current position and the need for further action.

2. ACTION BY INDIVIDUAL BANKS

The Steering Group carried out two in-depth surveys of banks in the foreign exchange market - one in late 1996 and the other in late 1997. The purpose of both surveys was to measure the progress being made by banks individually in meeting the Allsopp Report recommendations on the prudential management and control of FX settlement risk (see Annex 1). Information was gathered in three broad areas:

- *management* - how well banks managed, measured and controlled their FX settlement exposures;
- *duration of the exposures* - how long the exposures in different currencies lasted; and
- *use of netting* - the extent to which FX settlement obligations were netted (obligation netting being one way to reduce the value of the amounts to be settled and thus to reduce the exposures).

Sections 2.1 to 2.3 below cover these three areas.[1]

Summary of main findings from 1997 survey[2]

Management responsibility. 96% of the surveyed banks had clear, senior level responsibility for managing FX settlement risk (up from 62% in 1993).

Use of appropriate controls. 73% of the surveyed banks controlled their FX settlement exposures (for example, by setting limits) in a way that recognised that the exposures presented the same risks as other forms of credit exposure of the same size and duration (up from 47% in 1993).

Proper measurement. 39% of the surveyed banks measured their exposures in a way that avoided underestimation (up from 11% in 1993).

Duration of exposures. On average, there was a one-hour improvement in both cancellation deadlines and receipt-identification times (compared with the 1996 survey) but practices varied widely, leaving many banks with ample scope for further improvement. The longest durations continued to exceed three working days.

Bilateral netting. 77% of the surveyed banks engaged in at least some bilateral netting (up from 67% in 1996). Bilateral netting reduced overall settlement flows in the survey by 15% (up from 13% in 1996).

Multilateral netting. 23% of the surveyed banks engaged in some multilateral netting (up from 18% in 1996). Because the amounts involved were relatively small, multilateral netting reduced overall settlement flows in the survey by only 0.8% (up from 0.7% in 1996).

The sample of banks, which included both domestic and foreign banks operating in each of the G-10 countries, was virtually identical in both the 1996 and 1997 surveys. The 1997 survey included 63 banks (one more than in 1996) but, because some banks provided data for their trading operations in more than one G-10 country, the total number of "reporting entities" was actually 77

[1] Annex 2 contains the questions put to each of the banks included in the 1997 survey and the resulting checklist completed by the central bank concerned.

[2] Comparisons are with either 1993 or 1996, depending on the available data. (The 1996 survey also contained some questions about the situation in 1993.)

(compared with 75 the previous year).[3] Over the period surveyed (27th October to 7th November 1997), the average daily amount both paid and received by these banks to settle FX transactions was equivalent to almost USD 1,200 billion on a gross basis,[4] a roughly 25% increase on the period surveyed in 1996 (28th October to 8th November).[5] Table 1 provides a currency breakdown of these flows.

Table 1

Currency breakdown of gross settlement flows

Currency	**Share of gross settlement flows** (1997 survey)
USD	44%
DEM	15%
JPY	10%
GBP	6%
CHF	5%
FRF	3%
ITL	3%
CAD	3%
NLG	3%
ECU	2%
SEK	1%
BEF	1%
All other	6%
Total*	100%

* Figures do not add to exactly 100% because of rounding.

Each central bank chose which banks in its local FX market to include in the surveys, the objective being to cover at least 50% (by value) of each G-10 market. Typically, large banks that were particularly active in their FX market were chosen. The surveys thus provide an important indication of the practices of the major players in each of these markets. However, the surveys are not necessarily representative of *all* banks and, as a result, it would not be appropriate to draw conclusions from the surveys about the behaviour of other banks in the market, typically banks with smaller FX operations and banks based outside the G-10 countries. Some of these other banks also have substantial FX activity and the settlement risks involved may be significant for the stability of the market. Moreover, it is possible that the rate of progress of these other banks in tackling FX settlement risk is different from that of the surveyed banks. Some information about the progress of banks not included in the surveys is provided in Section 2.4.

2.1 Management of exposures

The first part of the two surveys consisted of qualitative information about banks' management of their FX settlement exposures. On the basis of the information from the surveys, each

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[3] The term "banks" is used as shorthand for "reporting entities" in the remainder of this section of the report. It should also be noted that the surveys included a few non-bank financial institutions (or non-bank credit institutions, in European Union terminology).

[4] That is, before allowing for the effect of netting in reducing the values actually settled.

[5] Among the reasons given by banks for the increase were the continuing growth in the FX market generally, a tendency to concentrate the booking of global FX business in a smaller number of centres (including the G-10 centres covered by the survey) and relatively high market volatility during the period of the 1997 survey.

member of the Steering Group assessed whether or not the banks they had included in the surveys were adequately managing, measuring and controlling their FX settlement exposures. As well as current practices, some information was also gathered in the surveys about changes that had taken place since 1993 and what the banks planned for 1998. Table 2 provides a summary.

Table 2

Measures of foreign exchange settlement risk management
(Percentage of banks in survey meeting criteria; data from 1996 and 1997 surveys)

	At end-1993	**At end-1996**	**At end-1997**	***Expected by end-1998*[#]**
Clear senior level responsibility	62%	84%	96%	*97% (n.a.*)*
Application of appropriate controls	47%	63%	73%	*88% (n.a.*)*
Proper measurement of irrevocable trades[♣]	16%	27%	43%	*66% (71%)*
Proper measurement of uncertain trades[♣♣]	12%	26%	39%	*64% (73%)*
Proper measurement overall	11%	25%	39%	*64% (73%)*
Clear senior level responsibility, appropriate controls *and* proper measurement	9%	20%	35%	*55% (n.a.*)*

[#] Figures without brackets indicate the expectation about 1998 formed from the 1997 survey. (Figures with brackets indicate the expectation about 1998 formed from the 1996 survey.) [*] This question was not asked in the survey. [♣] The measurement of exposure includes all trades in the irrevocable period, as described in footnote 6 in the main text. [♣♣] The measurement of exposure includes all trades in the uncertain period, as described in footnote 6 in the main text.

The surveys showed that, in managing their settlement exposures, the surveyed banks made continuous and encouraging progress between 1993 and 1997. On each of the qualitative measures, there was an improvement of between 26 and 34 percentage points - that is, in each case roughly one-quarter to one-third of the banks in the sample failed the criteria in 1993 but now meet them. Moreover, further progress is expected by the end of this year.

However, the level attained was mixed. The best result concerned *senior level responsibility*, where the 1997 survey showed that 96% of the banks had established clear responsibility and authority for managing settlement exposures with counterparties. The position regarding the use of *appropriate controls* was also relatively good. By end-1997, 73% of the banks were applying a control process to FX settlement exposures that was the same as, or equivalent to, the process they applied to credit exposures of the same size and duration resulting from loans or other formal counterparty credit extensions; this figure was expected to rise to 88% by the end of this year.

The results for *measurement* of exposures, although also improving, continued to be significantly lower than those for responsibility and controls. The Allsopp Report encouraged banks to recognise the periods of irrevocability and uncertainty they face during the settlement process so as not to underestimate their exposures.[6] There are various measurement methods banks can use to

[6] The Allsopp Report defined a bank's actual exposure when settling a foreign exchange trade to be the full amount of the currency purchased; this exposure lasts from the time a payment instruction for the currency sold can no longer be cancelled unilaterally until the time the currency purchased is received with finality. To measure this exposure, a bank needs to recognise both the "irrevocable" and "uncertain" periods during settlement. The irrevocable period lasts from the time when the payment instruction for the currency sold can no longer be cancelled unilaterally until the time when the final receipt of the currency bought is due. This irrevocable period may be followed by an uncertain period, which is the

avoid the problem. The Allsopp Report set out one such method that explicitly recognises that exposures can change during the day and that has the advantage of avoiding overestimation as well as underestimation. The Steering Group found that, although a few of the surveyed banks were planning to implement this or similar methods, most believed it would be too expensive to install the necessary systems to enable them to do so. Instead, most banks used a simple methodology that approximated the duration of their exposures in units of whole calendar days. The Steering Group judged that, on balance, such a method was appropriate if used properly (i.e. provided it did not underestimate exposures). Consistent with this judgement, a number of surveyed banks indicated that they planned to reduce the duration of their exposures to less than a single calendar day and to measure their exposure as an intraday exposure equal to the value of the trades settling on that day. However, at the moment many banks continue to underestimate their exposures by measuring them as equal to one day's trades even though in practice the exposures still last longer than one day.[7]

For this and other reasons, only 39% of the banks in the 1997 survey were judged to be measuring their exposures properly. While low, this figure represents an improvement from 11% in 1993 and 25% in 1996. Based on the information banks supplied about the steps that they are planning to take, the figure could rise further to 64% by end-1998 (although this represents a lower projection than was obtained in the 1996 survey, when it seemed possible that about 73% of the surveyed banks would measure their exposures properly by end-1998).

2.2 Duration of exposures[8]

In the second part of the surveys each bank was asked to identify how long its FX settlement exposures lasted. Specifically, each bank was asked to identify two times for each currency: its unilateral payment cancellation deadline and the time when it identifies final and failed receipts. The *cancellation deadline* was defined as the latest time when in routine situations (i.e. ignoring "best efforts" arrangements or any other possible form of special handling) the bank could, with certainty, unilaterally amend, delay or cancel its payment instructions. For example, if the bank used a correspondent to make payments in the currency concerned, this cancellation deadline would be the latest time that the bank could give a cancellation or other instruction to the correspondent and be sure the instruction would be successfully acted on. The *receipt-identification time* was defined as the time when the bank usually identified final and failed receipts. For example, if the bank used a correspondent bank to receive payments in the currency concerned, this was the time when the bank checked the information provided by the correspondent about the payments received.

Reference times

The cancellation deadlines and receipt-identification times reported by the banks were compared with "reference" times chosen by the Steering Group. These reference times were in most cases the opening and closing/settlement times of the domestic payment systems used to settle FX transactions. The chosen *reference cancellation deadline* for a currency was generally the time when the payment system for the currency opened for business on the day an FX trade was to be settled, since banks selling currencies could in principle have cancelled their payment instructions at any time

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length of time after the bought currency is due that the bank takes to identify whether or not it has received the funds. In practice, banks do not always immediately identify whether or not they have received the currency purchased - for example, in many cases they will not know this for certain until they have received a statement from their correspondent bank and used this to compare actual and expected receipts. When calculating its exposure, a prudent bank will assume that during this uncertain period the funds have *not* been received.

[7] See Section 2.2 below for information on the duration of exposures and Annex 4 for a fuller discussion of approximation methods.

[8] As a supplement to the results presented in this section, Annex 3 provides additional data on the duration of exposures (including more detail on some of the observations made in the text).

up to this point. Similarly, the *reference receipt-identification time* was shortly after the payment system closed (in an RTGS system) or when the payments were finally settled (in a net settlement system), since banks could in principle have identified failed receipts immediately after this time. In effect, these reference times provided one measure of what the market *as a whole* could have achieved in current circumstances.[9] The same reference times were used in both the 1996 and 1997 surveys.[10]

Average cancellation deadlines and receipt-identification times

Table 3 shows the weighted average cancellation deadlines and receipt-identification times reported by the banks in the 1997 survey relative to the reference times. The cancellation deadlines and receipt-identification times varied significantly among both banks and currencies.[11] As the table shows, in the 1997 survey, average cancellation deadlines were between two and six hours before the relevant reference time depending on the currency concerned; taking a weighted average across all currencies, cancellation deadlines were three hours before reference times, a one-hour improvement on the times reported in the 1996 survey.[12] Average receipt-identification times ranged from six to 19 hours after the reference receipt-identification time depending on the currency; taking a weighted average across all currencies, receipt-identification times were 13 hours after reference times, also a one-hour improvement on 1996.[13]

To help identify how certain banks could be about the cancellation deadlines they indicated, one of the survey questions asked them whether these times were documented in a way that gave them a legally enforceable agreement with their correspondent bank. In fact, only 14% of banks in the 1997 survey had such documented times for a majority or all of the currencies, while 68% had no documented times at all.

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[9] From the point of view of an *individual* bank, it might be possible to have cancellation deadlines and receipt-identification times that reduced the period of the exposure to less than that suggested by the reference times. For example, the bank might have an arrangement with its correspondent that instructions to make payments would not be entered into the payment system until the afternoon of the settlement day, in which case the cancellation deadline might be midday (i.e. later than the reference time based on the opening time of the system). However, the Steering Group believed that it was neither feasible nor desirable for the market as a whole to adopt such behaviour, not least because of the danger that it could lead to a concentration of FX-related payments at certain times during the day, which might cause liquidity problems for payment systems. Similarly, individual banks may obtain information on payments received in certain systems throughout the day and thus often be able to achieve a receipt-identification time earlier than the close of such systems. But it is not until a payment system has closed that a bank can be sure that a payment has <u>not</u> been received. Moreover, in most deferred net settlement systems, the beneficiary of the payment and/or the correspondent bank receiving the payment on its behalf in the payment system will have some form of exposure until settlement takes place.

[10] Although there were changes to some payment system opening hours in the period between the two surveys (see Section 4), these did not affect the times that the Steering Group judged to be appropriate to use as reference times.

[11] Table 3 emphasises the differences between currencies. However, currencies are not necessarily the most important variable explaining differences in the times observed in the survey. To some extent the variation may be the effect of time zones and whether banks were direct participants in the payment system concerned or used correspondents, although these factors also provide at best only partial explanations. Perhaps the most significant factor in explaining both cancellation deadlines and receipt-identification times is likely to be the variation in the practices of individual banks, including correspondent banks (with this variation in practices causing a variation between currencies to the extent that different banks are relatively active in different currencies).

[12] Figures for cancellation deadlines are across all currencies except for the special case of the Italian lira (where the reference deadline is relatively early - see footnote 4 to Table 3). The operating hours of this system meant that negative cancellation deadlines relative to the reference deadline were much more common than for other systems.

[13] Figures for receipt-identification times are across all currencies except for the special case of the Canadian dollar (where the reference time is relatively late - see footnote 5 to Table 3). The settlement arrangements in this system meant that negative receipt-identification times relative to the reference time were much more common than for other systems.

Table 3

Average cancellation deadlines and receipt-identification times relative to reference times
(Results from 1997 survey)

Currency[1]	Cancellation deadlines		Receipt-identification times	
	Weighted average cancellation deadline[2] Number of hours earlier than reference time.	**Reference cancellation deadline** In local time of the currency concerned	**Reference receipt-identification time** In local time of the currency concerned	**Weighted average receipt-identification time**[2] Number of hours later than reference time.
JPY	2	09:00	15:00	16
BEF	6	06:30	16:45	15
FRF	6	07:30	18:30	13
DEM	6	08:00	15:00	19
ITL	-10[3]	14:00 V-1[4]	16:00	15
NLG	2	08:00	13:45	6
SEK	5	08:00	12:15	18
CHF	5	09:00	16:15	19
ECU	3	07:30	17:00	9
GBP	5	08:30	15:10	13
CAD	6	07:00	12:00 V+1[5]	-2[6]
USD	2	07:00	18:30	11
Average[7]	3	-	-	13

[1] In this and subsequent tables the currencies are arranged by time zone. [2] Weighted average of times reported by banks. The weights used were the value of each bank's settlement flow in the currency concerned. [3] The negative value indicates a cancellation deadline later than the reference time. See next footnote. [4] The reference lira cancellation deadline is set at 14:00 on the day before settlement because payment instructions can be entered into the system in advance and they become irrevocable after 14:00 on V-1; unless a bank gives its Italian correspondent a cancellation order before that time there is therefore a risk that it may be too late. In June 1997 the new Italian RTGS system (BI-REL) went live, and since January 1998 payments connected to FX settlement have been processed in that system. In BI-REL, the reference cancellation deadline is the opening of the system on Day V and thus the unusually early reference time shown here will in future no longer apply. [5] The reference Canadian dollar receipt-identification time is set at 12:00 on V+1 because the current Canadian large-value payment system is a deferred net settlement system that does not settle until 12:00 on the next day. Later this year the new Canadian LVTS system will be introduced, in which settlement will take place at the end of the same day and so the unusually late reference time shown here will no longer apply. [6] The negative value indicates a receipt-identification time earlier than the reference time. See previous footnote. [7] Average of times for individual currencies, weighted by the currency shares shown in Table 1.

Duration of exposures by currency pair

Based on the weighted average cancellation deadlines and receipt-identification times shown in Table 3, Table 4 shows the duration of exposures for each currency pair.[14] For example, where yen are sold for Belgian francs, the duration shown (33 hours) is the number of hours elapsing between the average cancellation deadline for yen and the average receipt-identification time for Belgian francs. Conversely, where Belgian francs are sold for yen, the duration shown (22 hours) is that elapsing between the average cancellation deadline for Belgian francs and the average receipt-identification time for yen. The table also shows, in brackets, the reference duration (based on the

[14] It was not possible to calculate the weighted average duration by taking the actual exposure durations for each bank and weighting these by the settlement value of the currency pair for the bank concerned because the latter data were not collected in the surveys.

interval between the reference cancellation deadlines and receipt-identification times for the relevant currencies); in the example above, the weighted average duration of 33 hours compares to a reference duration of 16 hours while the weighted average duration of 22 hours compares to a reference duration of one hour.

Table 4

Average duration of exposures by currency pair
(Results from 1997 survey)

Number of hours elapsing between the weighted average cancellation deadline for the currency sold and the weighted average receipt-identification time for the currency bought. (Figures in brackets indicate the number of hours between the corresponding reference times.)

	Buy											
Sell	JPY	BEF	FRF	DEM	ITL	NLG	SEK	CHF	ECU	GBP	CAD	USD
JPY	-	33 (16)	33 (18)	35 (14)	33 (15)	22 (13)	31 (11)	37 (15)	27 (16)	31 (15)	42 (41)	37 (24)
BEF	22 (1)	-	31 (12)	33 (9)	31 (10)	20 (7)	29 (6)	35 (10)	25 (11)	29 (10)	40 (36)	35 (18)
FRF	20 (0)	29 (9)	-	31 (8)	29 (9)	18 (6)	27 (5)	33 (9)	23 (10)	27 (9)	38 (35)	33 (17)
DEM	21 (0)	30 (9)	30 (11)	-	30 (8)	19 (6)	28 (4)	34 (8)	24 (9)	28 (8)	39 (34)	34 (17)
ITL	23 (17)	32 (27)	32 (29)	34 (25)	-	21 (24)	30 (22)	36 (26)	26 (27)	30 (26)	41 (52)	36 (35)
NLG	17 (0)	26 (9)	26 (11)	28 (7)	26 (8)	-	24 (4)	30 (8)	20 (9)	24 (8)	35 (34)	30 (17)
SEK	20 (0)	29 (9)	29 (11)	31 (7)	29 (8)	18 (6)	-	33 (8)	23 (9)	27 (8)	38 (34)	33 (17)
CHF	19 (0)	28 (8)	28 (10)	30 (6)	28 (7)	17 (5)	26 (3)	-	22 (8)	26 (7)	37 (33)	32 (16)
ECU	18 (0)	27 (9)	27 (11)	29 (8)	27 (9)	16 (6)	25 (5)	31 (9)	-	25 (9)	36 (35)	31 (17)
GBP	18 (0)	27 (7)	27 (9)	29 (6)	27 (7)	16 (4)	25 (3)	31 (7)	21 (8)	-	36 (33)	31 (15)
CAD	15 (0)	24 (4)	24 (6)	26 (2)	24 (3)	13 (1)	22 (0)	28 (3)	18 (4)	22 (3)	-	28 (12)
USD	12 (0)	21 (4)	21 (6)	23 (2)	21 (3)	10 (1)	19 (0)	25 (3)	15 (4)	19 (3)	30 (29)	-

The *reference durations* for the different currency pairs in the surveys are a function of differences both in time zones and in payment system operating hours and typically vary between zero and 24 hours.[15] For example, in most cases where yen are bought, time zone differences mean the reference duration is zero: because the yen is in an easterly time zone, it should usually be possible to identify any failed yen receipts before the cancellation deadline for the currency being sold. Conversely, when yen are being sold, the reference durations tend to be longer than for other currencies. However, where there is no time zone difference (for example, between most European currencies), the variations in reference durations simply reflect different payment system hours. As noted earlier, the reference times were the same in both the 1996 and 1997 surveys.

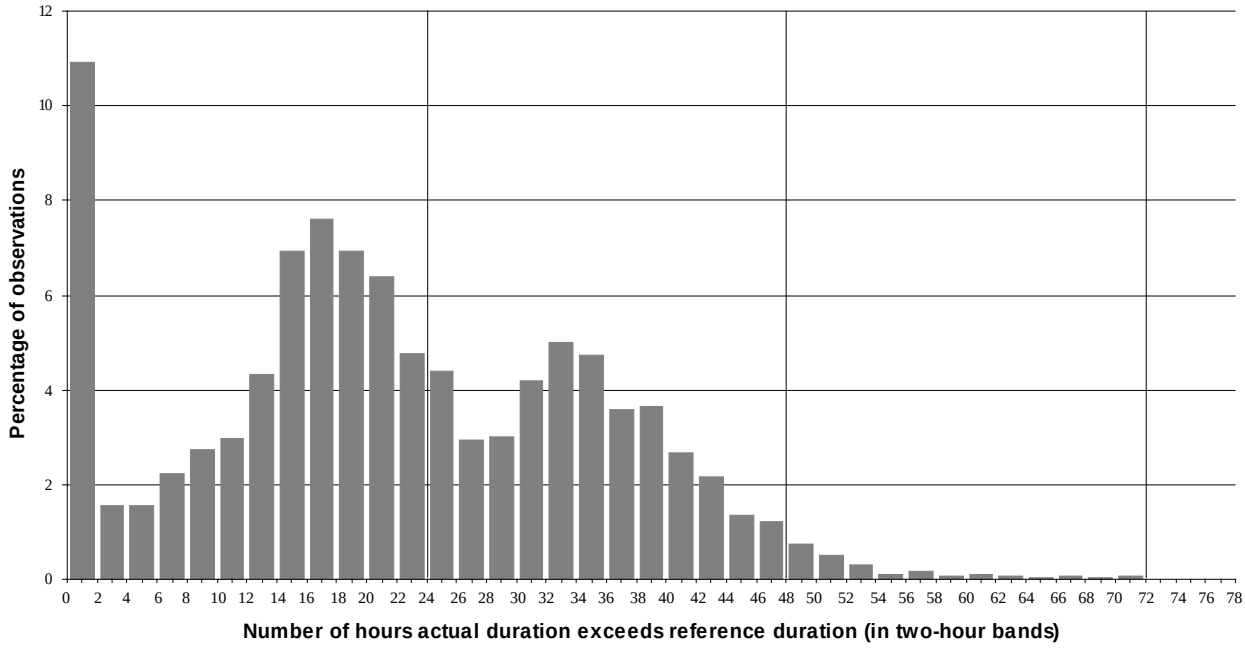
[15] These figures (and the remaining figures in the next two paragraphs) exclude pairs involving selling Italian lire or buying Canadian dollars because of the atypical reference times of these currencies (see footnotes 12 and 13 above).

Table 4 shows there was considerable variation in *actual durations*. The weighted average exposure durations when settling different currency pairs typically ranged from ten to 37 hours, reflecting differences in the practices of individual banks as well as time zone and payment system differences.[16] Indeed, the 1997 survey suggested that, for most currency pairs, only a relatively small proportion of banks (often less than 20%) had exposure durations of less than 24 hours. Even where time zone differences meant that reference durations were at or near zero, there were only a few pairs where the proportion of banks with durations of less than 24 hours was over 50%. This is despite the fact that, as noted in Section 2.1, many banks estimate their exposures on the assumption that they last less than 24 hours, and it explains why the number of banks regarded by the Steering Group as measuring their exposures properly is relatively small. It is also worth noting that the longest durations observed in the 1997 survey continued to be for more than three working days (i.e. over 72 hours). These durations were, of course, even greater when weekends and holidays were taken into account.

The extent to which actual exposure durations exceeded the reference durations (i.e. *excess durations*) for different currency pairs ranged from nine to 26 hours on a weighted average basis. Chart A provides information about the distribution of these excess durations. The chart shows that only about 11% of the durations were within two hours of the reference times. A majority of durations (about 75%) were between 12 and 48 hours longer than the reference durations and a small number of durations were more than three days longer than the reference durations.

Chart A

Distribution of excess exposure durations
(1997 survey) [17]



[16] The effect of time zones is visible in Table 4: reading down the table, the further west the time zone of the currency being sold, the shorter the average durations tend to be, while reading across the table, the opposite pattern is observable (the further west the time zone of the currency being bought, the longer the average durations tend to be).

[17] The observations represent each bank's exposure duration in each currency pair, with all observations weighted equally. Because there were 77 banks in the sample and 132 currency pairs, in principle the number of observations was 10,164 but because not all banks reported times for all currencies the actual number of observations was slightly less than this. The observations were grouped into two-hour time bands. The zero to two hours time band (shown in the chart against its mid-point, i.e. one hour) also includes negative observations (i.e. actual durations that were shorter than reference durations).

Improvements to exposure durations

Banks can reduce the duration of their exposures by extending their cancellation deadlines and by bringing forward their receipt-identification times. Chart B shows that as a result of such changes there was a small overall improvement in durations between the 1996 and 1997 surveys, but also that there was scope for considerable further improvement.

Chart B(i) shows the cumulative distribution of reported cancellation deadlines relative to reference cancellation deadlines, weighted by the value of the settlement flow to which the reported time applied. Chart B(ii) provides similar information for receipt-identification times.[18] On the charts, the small gap between the dotted line for the 1996 survey and the solid line for the 1997 survey indicates the overall improvement between the two years. As noted earlier, there was, on average, a one-hour improvement in both cancellation deadlines and receipt-identification times. However, this improvement was far from uniform, there being considerable variation between individual banks and currencies.[19]

In addition, Chart B shows there was considerable scope for further improvement (as is also evident from the excess durations shown in Chart A). Chart B(i) shows that about 60% of all settlement payments in the 1997 survey were subject to a cancellation deadline that was at or close to the reference deadline, implying that the remaining 40% were subject to cancellation deadlines that were potentially earlier than necessary. Similarly, Chart B(ii) shows that less than 20% of all settlement receipts were subject to a receipt-identification time that was at or close to the reference time, implying that it may have taken longer than necessary to identify the final or failed receipt of the remaining 80% or more of all bought currencies.

As part of the 1997 survey, the banks were asked to quantify the extent to which they expected to improve their current cancellation deadlines and receipt-identification times by the end of 1998. Of the surveyed banks, 39% were expecting to improve their cancellation deadlines and 44% their receipt-identification times.[20] Most banks could not quantify the improvement they expected. However, where banks were able to provide an estimate, the improvements they expected ranged from eight to 15 hours for cancellation deadlines and from ten to 14 hours for receipt-identification times; a majority of banks reporting these quantifiable improvements expected them to apply to all or most currencies.[21]

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[18] With 77 banks and 12 currencies in the 1997 survey, in principle there would have been 924 observations in each chart. However, data concerning the Italian lira were excluded from Chart B(i) and data concerning the Canadian dollar from Chart B(ii) for the reasons set out in footnotes 12 and 13, while not all banks in the sample reported times for all currencies. The actual number of observations for the 1997 survey was therefore 822. (Similar considerations apply to the 1996 survey results shown.)

[19] As discussed in Annex 3, in some cases exposure durations in the 1997 survey were in fact longer than those in the 1996 survey.

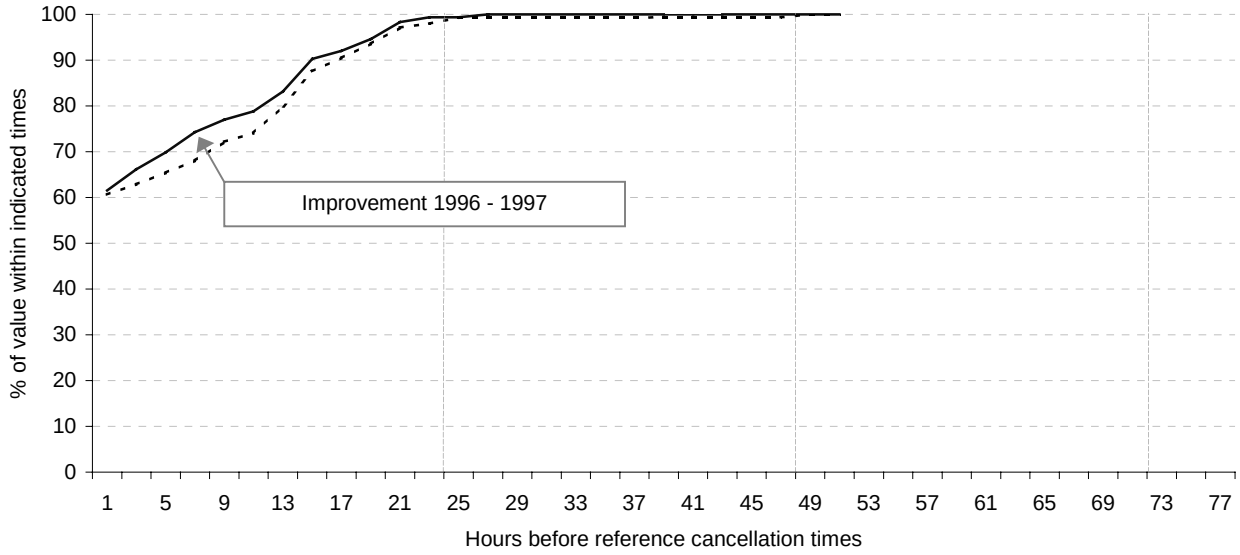
[20] There was significant but not complete overlap between the banks expecting cancellation improvements and those expecting receipt-identification improvements.

[21] Of the 39% of all surveyed banks expecting to be able to improve their cancellation deadlines, just over one-quarter (i.e. 10% of all the surveyed banks) were able to provide an estimate. Of the 44% expecting to be able to improve their receipt-identification times, almost a half (i.e. 19% of all the banks) were able to provide an estimate.

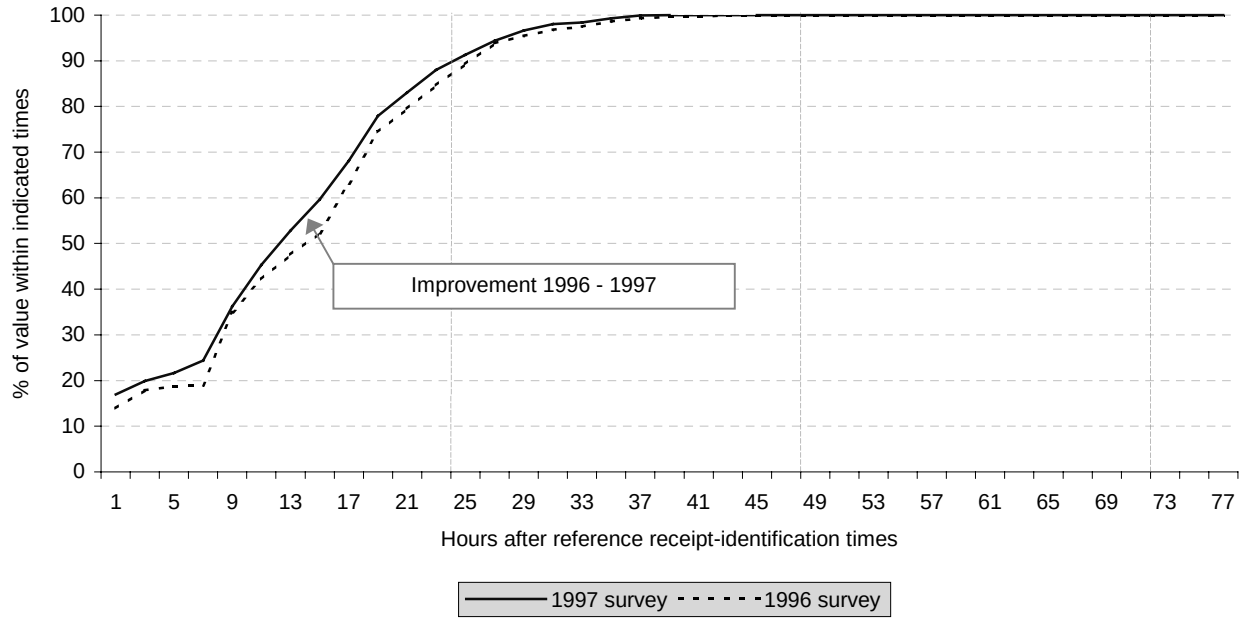
Chart B

Distribution of cancellation deadlines and receipt-identification times relative to reference times
(Cumulative percentage of reported times that were equal to or less than the indicated number of hours from the corresponding reference time)*

(i) Cancellation deadlines (weighted by value of settlement flows)



(ii) Receipt-identification times (weighted by value of settlement flows)



* Excluding the Italian lira (for cancellation deadlines) and the Canadian dollar (for receipt-identification times).

2.3 Use of netting[22]

One way in which FX settlement exposures can be reduced is by netting FX obligations so that only the smaller, net amounts have to be settled. The third part of the surveys therefore asked banks for information about the extent to which they netted their FX settlement obligations. The 1997 survey showed that use of both bilateral and multilateral netting had continued to grow since the 1996 survey. Bilateral netting was common amongst the surveyed banks and reduced the settlement flows in the survey by 15%; multilateral netting was still much less common, reducing survey flows by less than 1%.

Bilateral netting

Seventy-seven per cent of the banks in the 1997 survey engaged in bilateral netting, compared with about 67% in the 1996 survey. At the same time, there was an increase in the number of counterparties with which banks netted bilaterally; Table 5 provides more information on the number of counterparties.

Table 5

Number of counterparties for bilateral netting

Distribution of number of counterparties				
Number of counterparties for bilateral netting	Percentage of banks having this number of counterparties for bilateral netting			
	1997 survey		*1996 survey*	
0 counterparties (i.e. no bilateral netting)	23%		*33%*	
1-20 counterparties	34%	77%	*24%#*	*67%*
21-100 counterparties	23%		*24%#*	
Over 100 counterparties	19%		*13%#*	
Number not identified (but > 0)	-		*5%*	
Use of bilateral netting with major counterparties				
Of their top X counterparties overall ...	... on average,* banks netted bilaterally with this number of counterparties			
	1997 survey		*1996 survey*	
Top 10	4		*3*	
Top 25	7		*6*	
Top 50	12		*10*	

As the last row shows, in the 1996 survey 5% of the banks engaged in bilateral netting but did not provide data on the number of counterparties they had. The results for the three marked bands therefore understate the true position in aggregate by 5 percentage points. * Including all banks in the survey (i.e. including banks with no counterparties for bilateral netting).

[22] Consistent with the recommendations in the Allsopp Report, this section refers only to obligation netting (the netting of amounts due in the same currency for settlement on the same day under two or more trades). Many banks also use close-out netting (the immediate settlement on a net basis of all future obligations upon occurrence of a defined event such as the default of one of the counterparties); close-out netting does not, by itself, reduce routine FX settlement exposures.

Table 6 provides information on the effect of netting in reducing settlement flows. Across all currencies, 29% of the gross settlement flows in the 1997 survey were subject to bilateral netting, up from 24% in the 1996 survey. Overall, bilateral netting reduced total settlement flows by 15% in the 1997 survey, up from 13% in 1996.[23] In absolute amounts, this was an average daily reduction of USD 173 billion equivalent in 1997 (compared with USD 123 billion equivalent in 1996).

Table 6
Effect of netting*

	Bilateral netting		**Multilateral netting**	
	1997 survey	*1996 survey*	1997 survey	*1996 survey*
A: value of settlement flows subject to netting (% of gross flows)	USD 344bn (29%)	*USD 227bn (24%)*	USD 14bn (1.2%)	*USD 9bn (1.0%)*
B: reduction in settlement flows due to netting (% of gross flows)	USD 173bn (15%)	*USD 123bn (13%)*	USD 10bn (0.8%)	*USD 6bn (0.7%)*
Memo: strength of netting# (B÷A)	50%	*54%*	71%	*67%*

* This table is based on the average of the settlement amounts paid by banks and those received (the difference between the two across all currencies being insignificant). # Effect of netting on the portion of the gross flows to which it was applied.

Multilateral netting

Multilateral netting (using ECHO, the only FX clearing house operational when the survey was carried out) was still relatively uncommon: of the banks in the 1997 survey, 23% engaged in some multilateral netting (up from 18% in the 1996 survey). Since the 1996 survey, ECHO has started to accept yen trades and at the time of the 1997 survey handled each of the currencies in the survey except the Canadian dollar and the ECU currency unit.[24]

Taking all currencies together, multilateral netting reduced the settlement flows to which it was applied by 71% (compared with 50% for bilateral netting). This 71% "strength of netting" effect for multilateral netting was slightly higher than in the 1996 survey, when it was 67%.[25] However, multilateral netting accounted for only 1.2% of the gross settlement flows (a slight increase

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[23] On average in the 1997 survey, the effect of bilateral netting on the settlement flows to which it was applied ("the strength of netting") was to reduce the flows by 50% - that is, if a notional gross settlement flow of value 100 was subject to bilateral netting, on average the value actually settled would be reduced to 50. This average strength of netting effect was slightly weaker than in the 1996 survey, when it was 54%; this may be because, as the number of counterparties continues to grow, the business is typically with counterparties with smaller volumes and thus with whom there are less likely to be offsetting flows. For comparison, one of the available bilateral netting services (Valunet) was able to provide data for its entire operations during the survey period (i.e. not just the transactions and currencies included in the Steering Group's survey) and this showed a strength of netting effect of 40%. Another service (FXNET) provided data for a period earlier in 1997 which showed a 49% strength of netting effect. More information on bilateral netting services is included in Section 3.1.

[24] Since April this year, ECHO has also accepted ECU trades. Multinet, another FX clearing house, began trial operations after the survey period ended. Multinet and ECHO have subsequently merged. See Section 3.2 for more information about multilateral netting services.

[25] The effect measured in the survey sample (i.e. 71%) is similar to the 75% recorded by ECHO itself during the period covered by the survey (the difference arising from the fact that ECHO's measure included all participants and all currencies, rather than just those included in the Steering Group's survey).

compared with the previous survey) and so the overall effect on these flows remained tiny - just 0.8% (that is, 71% of 1.2%), compared with 0.7% in 1996. In absolute amounts, this was an average daily reduction of USD 10 billion equivalent in 1997 (compared with USD 6 billion equivalent in 1996).

2.4 Banks not in the surveys

The Steering Group has less information about banks not included in the surveys - typically banks with smaller FX operations and non-G-10 banks. However, the information that has been gathered indicates that it is likely that these banks are less aware of FX settlement risk as an issue and have less familiarity with the strategy of the G-10 central banks for tackling the problem. Understanding of the factors that determine the duration of exposures, and that can cause the durations to significantly exceed 24 hours, appears to be relatively weak. As a result it is likely that fewer efforts have been made to improve management procedures and to reduce durations. The use of obligation netting to reduce the exposures also seems to be very low. Overall, it is probable that these banks have made less progress than the surveyed banks in dealing with FX settlement risk.

3. ACTION BY INDUSTRY GROUPS

In addition to continued growth in bilateral and multilateral obligation netting, significant new developments in the available industry services have been set in motion since the Allsopp Report was published. In July 1997, CLS Services Limited (CLSS) was set up by the G20 banks[26] to implement their plans for the CLS Bank, a limited-purpose bank providing a form of payment versus payment by means of a so-called "continuous linked settlement" process. In December 1997 CLSS merged with the two multilateral netting services, ECHO (which had operated since 1995) and Multinet (which had not yet been brought into full operation).[27] As well as setting up the CLS Bank, the enlarged CLSS plans to provide a single multilateral netting service through an enhanced ECHO system and to phase out Multinet's operations. Over the past year there has also been market consideration of a different approach to reducing settlement risk, namely replacing traditional FX trades with contracts for difference. This section looks at these various developments.

3.1 Bilateral netting[28]

FXNET, Valunet and S.W.I.F.T. Accord each continue to provide standardised bilateral netting services to banks.[29] In addition, many pairs of banks have set up their own bilateral netting arrangements, often using a standardised contract such as the International Foreign Exchange Master Agreement (IFEMA). Section 2 of this report noted that, among the surveyed banks, there had been significant growth in the proportion of settlement flows subject to bilateral netting and this is consistent with the growth in participation in the bilateral netting services shown in Table 7.

Table 7

Number of offices (institutions) using bilateral netting services*

	FXNET	Valunet	S.W.I.F.T. Accord
December 1995	57 (29)	17 (10)	27 (n.a.)
December 1996	60 (30)	16 (9)	32 (n.a.)
March 1998	78 (33)	16 (9)	40 (n.a.)
Memo: number of trades per day (March 1998)	7,758	437	627

* Number of offices (number of institutions in brackets). Some institutions have more than one office participating in the arrangements as separate entities.

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[26] The G20 banks were a group of major commercial banks from eight countries formed to consider payment-versus-payment (PVP) solutions.

[27] ECHO (Exchange Clearing House Limited) is a London-based clearing house for the multilateral netting and settlement of spot and forward foreign exchange obligations between its users. Multinet was authorised in December 1996 as a limited-purpose bank based in New York and there was limited live testing of multilateral netting operations in December 1997, but full operation was deferred while the merger talks were taking place.

[28] This section refers to obligation netting (see footnote 22).

[29] FXNET is a limited partnership owned by 15 major banks; the service is operated by Electronic Broking Systems (EBS), which is also a partnership of banks. S.W.I.F.T. Accord is provided by the Society for Worldwide Interbank Financial Telecommunication. Valunet is operated by International Clearing Systems under contract to Multinet.

3.2 Multilateral netting

Table 8 shows that ECHO has continued to expand (in terms of participants, currencies and volume of business) but that the level of activity remains modest. This is consistent with the finding in the survey of individual banks that the use of multilateral netting remains low compared with transactions that are settled gross or even by bilateral netting. Following its decision to use ECHO to provide a single multilateral netting service, CLSS has said that it will enhance the system's risk management measures.

Table 8

ECHO

	Number of participants*	Number of currencies	Number of trades/day
December 1995	11 (11)	11	114
December 1996	21 (14)	14	225
March 1998	42 (21)	19	819

* Number of offices (number of institutions in brackets). See footnote to Table 7.

3.3 The proposed CLS Bank

Although the details of the CLS Bank design continue to evolve, the underlying principle is clear. CLSS has stated that the CLS Bank will act as a settlement intermediary between the two counterparties to an FX trade or between their correspondents. Participants will hold multicurrency accounts at the CLS Bank, which will settle trades by debiting the account of the seller of the currency and crediting that of the buyer. Both sides of each trade will settle simultaneously on the CLS Bank's books to achieve a form of payment-versus-payment in which FX settlement exposures will be eliminated, although liquidity risk will remain. While settlement of the trades will be on a gross basis across the accounts at the CLS Bank, the funding and defunding of the accounts by the participants will be on the basis of the net amounts in each currency of the trades they are settling that day. As well as accepting individual trades, the CLS Bank is also being designed to accept netted positions from CLSS's multilateral and bilateral netting services.

3.4 Merger of ECHO, Multinet and CLS Services

A number of factors led to the merger between ECHO, Multinet and CLSS. ECHO and Multinet believed that a fragmentation of flows between their two netting systems would lower the overall risk reduction potential of multilateral netting and the commercial viability of their individual services. CLSS had also indicated that it would prefer to work together with the two clearing houses to develop the CLS Bank. More generally, a number of market participants thought it was unlikely that all three services (ECHO, Multinet and the CLS Bank) would be commercially viable and so were reluctant to commit themselves to any particular arrangement until it was clearer which ones would succeed. The merger between the three has thus been welcomed by many market participants as providing greater certainty about the future shape of multicurrency services. At the same time the merger may give CLSS a potentially sizeable position in the market, from which it could develop into a significant market utility for FX settlement services.

3.5 Other initiatives: contracts for difference

The G-10 central bank strategy encourages efforts by industry groups to find new ways to reduce or eliminate settlement risk. One possibility being investigated by the private sector is an FX instrument known as a contract for difference (CFD). This initiative is based on the premise that a large portion of foreign exchange transactions do not require delivery of the underlying currencies: they are related to hedging or speculative activities and only require settlement of the mark-to-market profit or loss. As proposed, a CFD would be an agreement between two counterparties to replace a traditional foreign exchange transaction with the obligation to make (or the right to receive) a single payment, in a predetermined currency, representing the market gain or loss that would have resulted from the forgone foreign exchange transaction.[30]

The development of CFDs is being explored by two industry groups. One is a working group meeting in London under the auspices of EBS and comprising representatives from several large banks active in the foreign exchange market. CFDs are also being explored by the New York Foreign Exchange Committee, a private sector group sponsored by the Federal Reserve Bank of New York. These two industry groups have overlapping membership and their efforts are complementary. As part of their work, the groups are identifying changes in market trading and settlement conventions that would be required before a CFD market could be launched.

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[30] Other instruments with similarities to CFDs (e.g. non-deliverable forwards and foreign currency derivatives) already exist but are not widely used for G-10 currencies.

4. ACTION BY CENTRAL BANKS

This section surveys the third element of the strategy, the action taken by central banks to support the strategy. Each central bank, in cooperation, where appropriate, with the relevant supervisory authorities, chose the most appropriate steps to induce private sector action in its domestic market. In addition, central banks have made or encouraged key enhancements to national payment systems.

4.1 Publicity, education and moral suasion

For the strategy to succeed it was important that the market was fully aware of the need for action. G-10 central banks and the BIS have been publicising the strategy through a variety of means. The public version of the Allsopp Report was widely distributed and accompanied by press conferences and briefings. As well as being sent to individual banks, the report was made available to other parties, such as banking associations and non-G-10 central banks, and it continues to be made available (both in hard copy and, more recently, on the BIS Web site) to anyone with an interest in the matter or who might be able to influence market behaviour. Central bankers have also written articles for commercial journals or their own publications and have given numerous presentations at conferences. There have also been meetings with individual banks and seminars with groups of banks. The result was that the Allsopp Report and the strategy it contained received widespread and positive coverage.

Central banks have continued to work to ensure the strategy keeps a high profile. Commercial conferences and publications continue to provide an opportunity for central banks to publicise the issue. A number of central banks have also set up ad hoc or more regular arrangements to keep banks in their country informed of developments or to provide a forum in which FX settlement risk issues can be discussed by the central bank and market participants. Central banks outside the Group of Ten have also made vigorous efforts to promote the reduction of FX settlement risk.

4.2 Supervisory measures

The involvement of domestic supervisors is an important aspect of the national strategies many central banks are following to ensure progress by individual banks. Members of the Steering Group have been working with national supervisors on this issue and in some cases supervisors have been involved in the interviews with banks conducted as part of the survey process. In most G-10 countries, supervisors are incorporating consideration of FX settlement risk into their domestic supervisory process, as indicated below:

- In *Belgium*, supervisory guidelines for money market and foreign exchange operations, which include a requirement to contain FX settlement risk, were published in 1990. The guidelines cover such matters as responsibilities of top management, segregation of duties, reporting lines and internal limits and controls. Since the publication of the Allsopp Report the supervisory authority has been paying increased attention to settlement risk during on-site inspections and for this purpose has produced an internal checklist to be used by its inspectors; the checklist covers the issues the inspectors need to consider but does not set specific standards that banks have to meet.
- In *Canada*, supervisors include the management of FX settlement risk as part of their regular examinations of banks' risk management procedures. However, as yet no specific standards or guidelines have been issued.
- In *France*, a regulation on internal controls, which stipulates that banks must measure and manage their settlement risk appropriately, was adopted in May 1997. Banks are being encouraged to adopt the methodology in the Allsopp Report, although they are given flexibility about how to manage the risk appropriately. Each year, banks must report on their internal control arrangements

and how they monitor exposures; implementation of the regulation is checked during on-site inspections.

- In *Germany*, a new provision, providing the framework for detailed supervisory measures concerning settlement risk, has been added to the Banking Act which came into effect in January this year. Since October 1995, settlement risk has also been included in the relevant regulations concerning banks' internal credit controls: a supervisory statement on minimum requirements for the trading activities of credit institutions now forms part of the regular supervisory process.
- In *Italy*, arrangements set up by banks to measure FX settlement risk are checked during on-site inspections. At the moment, FX settlement risk is not covered explicitly by any supervisory regulation, but a regulation on internal auditing, to be issued shortly, will require banks to have adequate systems to identify, measure and control their exposure to different types of risk, including FX settlement risk.
- A checklist for on-site examinations that covers settlement risk was published in *Japan* in 1996. The checklist, which covers such items as whether the bank's management understands the risk and has appropriate policies to measure and control it, is also being used by central bank supervisors to encourage banks to improve their risk management.
- In the *Netherlands*, FX settlement risk is on the supervisory agenda as an item to be covered during on-site examinations. The supervisors have discretion about the extent to which they investigate the risk in individual banks, this depending mainly on the size of banks' FX business. Whether or not guidelines will be issued is under consideration.
- In *Sweden*, supervisors have focused on the supervision of major banks. On-site examinations have emphasised the importance of continued efforts from the banks in order to continue their development of systems and routines to manage and control settlement risk. No specific standards or guidelines have been issued.
- In *Switzerland*, no specific documentation concerning settlement risk exists but there are more general guidelines which require banks to register, measure and limit settlement risk. In cases where the supervisors believe there is a problem, they will discuss this with the bank and its auditors and a package of corrective measures will be developed.
- In 1996 the supervisors in the *United Kingdom* developed a checklist to guide supervisors on lines of questioning relevant to the measurement and control of FX settlement risk. The supervisors have discretion about the extent to which they investigate the risk in individual cases, depending on such factors as the size of the bank's FX business and, in the case of foreign bank branches, the activity of its home supervisors. Through this exercise general supervisory awareness of the issue has improved.
- In the *United States*, central bank supervisors have developed guidelines for bank examiners on settlement risk which are currently being field-tested at a few banks. The guidelines, based on the analysis of settlement risk in the Allsopp Report, are intended to be comprehensive and detailed. Once testing and development is complete, the guidelines will be shared with other regulators.

4.3 Contacts with industry groups

During the development of the strategy and since its launch, the Steering Group has been in dialogue with industry groups working on the development of risk-reducing services, using the Lamfalussy framework of minimum standards and cooperative oversight as a starting-point.[31] The Steering Group continues to meet from time to time with those developing the CLS Bank (first the

[31] Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten Countries - the Lamfalussy Report (Basle, November 1990).

G20 and now the management and members of CLSS) in order to learn of the arrangement's progress and to help identify issues that the operation of the CLS Bank could raise. Since the completion of the merger, the discussions have been broadened to include CLSS's plans for netting services. The meetings are held on the understanding that, in providing their reactions, Steering Group members are not suggesting approval of a particular plan, which could only come once a formal application has been made by CLSS to the appropriate authorities. In parallel with the discussions of the Steering Group, the central banks whose currencies are likely to be included in the CLS Bank arrangements at an early stage have been in bilateral discussions with CLSS about a number of issues. In particular, these discussions have considered CLSS's request that the CLS Bank be allowed access to settlement accounts at the central banks concerned and to the respective large-value payment systems.

Steering Group members have also met either individually or collectively with other industry groups such as the G40,[32] the Association Cambiste Internationale, S.W.I.F.T. and groups working on CFDs.

4.4 Improvements to payment services

Since the introduction of the strategy, there have been further changes to payment systems that facilitate private sector risk reduction efforts. There has also been a significant improvement in the extent to which payment system operating hours in different time zones overlap. Chart C overleaf provides information about the operating hours of selected G-10 payment systems.

RTGS systems

In G-10 countries, five more RTGS systems have now become operational:

- In the *United Kingdom*, CHAPS began to operate in RTGS mode in April 1996, replacing the previous net settlement mode.
- In *Belgium*, ELLIPS, the new RTGS system, began operations in September 1996.
- In *Italy*, BI-REL went live in June 1997 and from January this year it became fully operational, processing all wholesale payments (including those made to settle FX transactions).
- In *France*, TBF went live in October 1997. FX-related payments, which were made through the previous payment system, Sagittaire, until the beginning of this year, migrated in June to TBF or SNP (see below).
- In the *Netherlands*, TOP became operational in November 1997, replacing the previous system, which had both RTGS and net settlement modes.

In addition, improvements to existing systems have been made, or are planned;

- In *Sweden*, banks can now connect to RIX using S.W.I.F.T. (rather than a specialised communications system). This should make it easier for banks to integrate their own systems with RIX and thus encourage them to settle more payments in RTGS mode rather than batch gross mode.
- By the end of 2000, *Japan* expects to make RTGS the only method of settlement in BOJ-Net (at the moment the net settlement mode is normally used). In addition, by the end of 1998 an RTGS mode will be added to the existing FEYCS net settlement system (see below).

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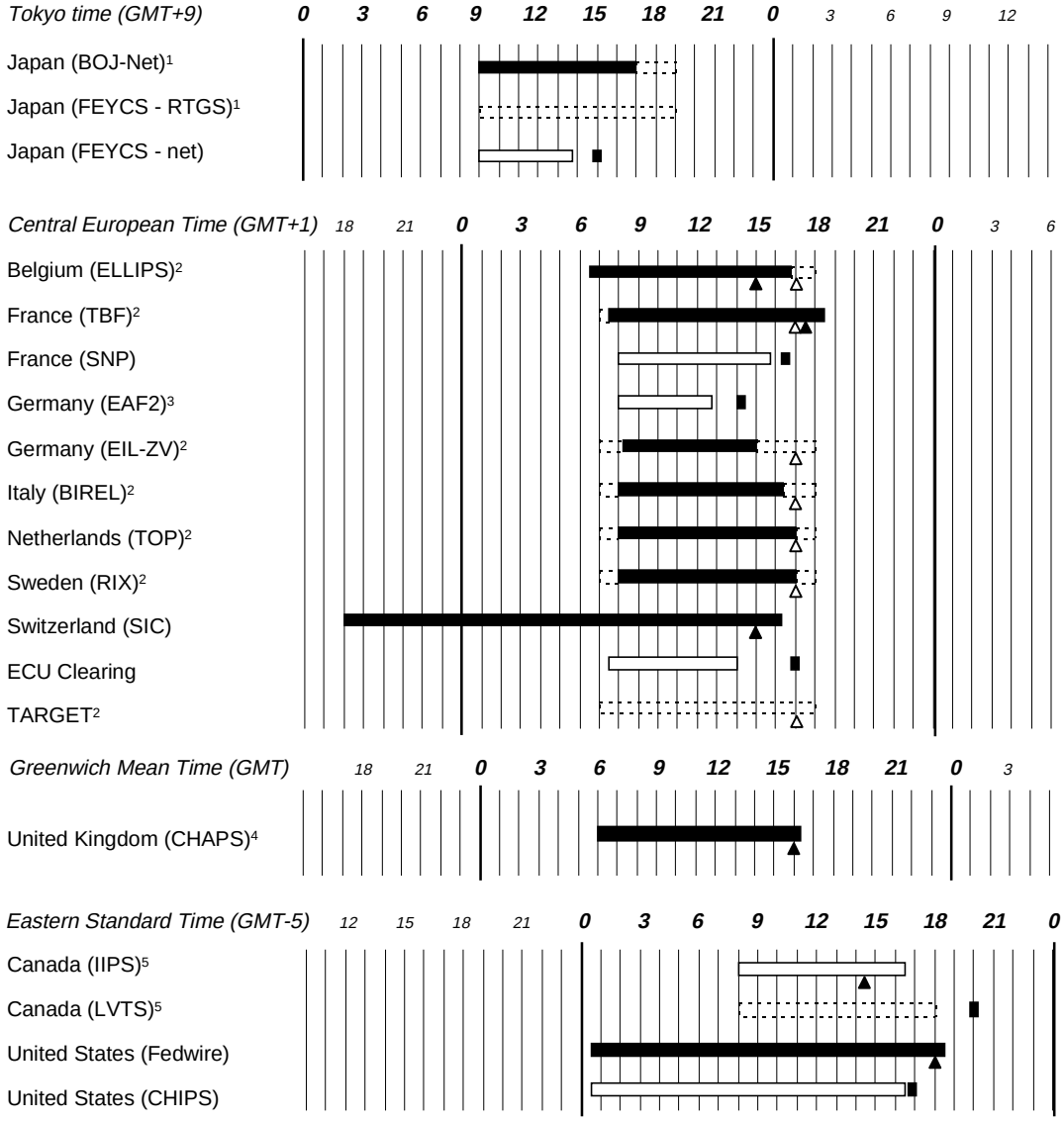
[32] The G40 is a group of approximately 50 FX trading banks that were not members of the original G20 and that have been working together in an informal group on issues concerning the reduction of FX settlement risk.

Chart C

Current or planned opening hours of selected G-10 payment systems

The differences in time zones shown are those applying during winter time



Key

RTGS system (current hours) ……..

Net system (current hours plus settlement time)……

Planned hours (for new or existing systems) ……..

Cut-off time for third-party payment orders (where applicable)… ▲ Current △ Planned

[1] Dates of planned times: FEYCS-RTGS introduction (in December 1998 with closing time of 17:00, to be extended to 19:00 in 2000), BOJ-Net extension (2000). [2] The operating hours (i.e. opening, closing and third party cut-off times) for ELLIPS, TBF, EIL-ZV, BIREL, TOP and RIX will be standardised on those shown for the TARGET RTGS system when the latter is introduced (January 1999). [3] EAF2 is a net settlement system that combines features of liquidity saving and early finality. [4] CHAPS hours shown are for the existing GBP service. As part of the introduction of TARGET, an additional CHAPS service (handling Euro and with the standard TARGET hours shown) will be introduced (January 1999). [5] IIPS settles next day at 12:00; this system will be withdrawn when LVTS is introduced (Autumn 1998).

Improvements in RTGS system opening hours have also taken place or are in prospect. Since December 1997, the US RTGS system, Fedwire, has been open from 00:30 US Eastern Time (equivalent to 06:30 Central European Time (CET)), eight hours earlier than previously. Fedwire now overlaps with the entire European business day (rather than just the afternoon hours as was previously the case) and provides for the first time an overlap, of about two and a half hours, with Japan. From January 1999, RTGS systems in the European Union that are to be connected to the TARGET system for handling the euro will be open between 07:00 and 18:00[33] CET. By the end of 2000, the opening hours of BOJ-Net will be 09:00 to 19:00 (equivalent to 01:00 to 11:00 CET), a two-hour extension in the evening that will create further overlap with Fedwire (four and a half hours) and TARGET (four hours).[34]

Non-RTGS systems

There have also been important developments concerning several major non-RTGS systems in G-10 countries:

- In *France*, SNP, a new end-of-day net settlement system based on the same technical platform as TBF, went live in February 1997. This year it will become Lamfalussy compliant.[35]
- In the *United States*, the CHIPS system has made further changes to its risk management arrangements so that it can now guarantee completion of the settlement process even in the event that any two participants fail simultaneously. CHIPS has also expanded its opening hours so that, like Fedwire, it now opens at 00:30 US Eastern Time.
- In *Germany*, EAF2 has since January this year been open to participants from both inside and outside the European Union by remote access (previously participants had to have an office in Frankfurt); EAF2 is a system that combines features of liquidity saving and early finality.
- In *Japan*, the facility in the FEYCS end-of-day net settlement system whereby payment instructions could be entered in advance of the settlement date was abolished in October 1997; the facility had been a potential source of risk as, once entered, instructions were irrevocable. As noted above, by the end of this year an RTGS mode will be added to FEYCS; in addition, the existing net settlement mode will have improved risk management features, thereby ensuring completion of settlement in the event that a participant with the largest net debit position fails.
- In *Canada*, the new LVTS system is expected to go live this autumn; LVTS is an end-of-day net settlement system that will carry a central bank guarantee of completion of the settlement process even in the event of multiple failures.
- The Euro Banking Association is upgrading its end-of-day net settlement system in order to become at least Lamfalussy compliant from January 1999, from which date the system will handle transactions in euro rather than ECU.

Other developments

The directive on settlement finality will improve the finality of payments and the validity of netting in the European Union. The directive was adopted in June this year, with implementation by EU member states due to follow within 18 months.

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[33] For third-party payments the cut-off time will be 17:00.

[34] The opening hours of the RTGS mode of FEYCS (which will be 09:00 to 17:00 when the RTGS mode is introduced later this year) will also be extended to 19:00 by the end of 2000. For both BOJ-Net and FEYCS, the system design will allow the opening hours to be extended until 20:00.

[35] The term "Lamfalussy compliant" is used to indicate a system which meets the minimum standards for multilateral net settlement systems set out in the Lamfalussy Report.

5. ASSESSMENT

When launching the strategy, the G-10 central banks recognised that, although they believed that the strategy would be successful and that the private sector could play a major role in reducing FX settlement risk, adequate and timely progress was not guaranteed. Accordingly, it was agreed that developments would be monitored over a two-year period to determine the need for further action. This section of the report assesses the progress made and sets out the next steps under the strategy.

5.1 Assessment of the need for further action

Looking at developments as a whole over the past two years, encouraging progress has been made in tackling the problem of FX settlement risk and considerable momentum has been achieved that could lead to further, substantial progress. Nevertheless, much remains to be done. Many industry initiatives are still under development. Moreover, the G-10 central banks believe that, although industry group solutions could in due course substantially reduce the foreign exchange settlement risk faced by individual banks, such solutions by themselves are unlikely to eliminate the risk entirely; it is therefore important to ensure that momentum is also maintained by individual banks in managing their FX settlement exposures.

The G-10 central banks have therefore concluded that, although there have been significant improvements in the practices of many of the surveyed banks, the improvements are not yet sufficiently thorough or widespread. Banks give a number of reasons why more progress has not been made. A common argument has been that the risks they face will be substantially reduced when a widely used multicurrency settlement service is functioning and when there is more certainty about the future shape of multilateral netting; some banks claim, therefore, that in the meantime there is little reason to incur the costs of improving their internal systems, particularly when there are other projects with tight deadlines (such as preparing for the introduction of the Euro and fixing the Year 2000 problem) which are competing for resources. Some banks have also argued that there is no commonly agreed standard that they need to meet in controlling their exposures and that they are therefore reluctant to put themselves at what they see as a competitive disadvantage by incurring costs to improve their own systems unless other banks are doing the same. Indeed, more generally there seems to be a view that the benefits of reducing the risk are not high enough to justify the costs of doing so. This suggests that some banks are underestimating the risks they face in the market, in part no doubt because they underestimate their own settlement exposures.

Many banks therefore need to take further action. Achieving this will not be straightforward. In the face of continued uncertainty about the future shape of industry services and competing priorities for resources to change their systems, many banks still need to be persuaded to take the necessary action promptly.

The G-10 central banks believe that the strategy adopted in 1996 has helped to bring about significant progress to date and that it can be the building block for future progress. Accordingly, to maintain momentum, they have decided to reaffirm and strengthen the strategy as follows.

5.2 Involvement of the Basle Committee on Banking Supervision

The G-10 central bank Governors have invited the Basle Committee on Banking Supervision (the Basle Committee) to develop, in a way that would be consistent with the recommendations of the Allsopp Report (see Annex 1), international supervisory guidance for banks on the prudential management and control of their foreign exchange settlement risk.

Supervisors' general concern about the risks faced by individual banks means they have a natural interest in how banks manage FX settlement risk. As shown in Section 4, national supervisors have already been involved in the implementation of the strategy to varying degrees over the past two years. At this stage, involvement of the Basle Committee would help to provide a consistent

framework for further attention by banks to their management of FX settlement exposures. In particular, it would help to ensure that a common approach was applied, as appropriate, across all banks in G-10 countries, including smaller market participants where relevant. Moreover, given that the policies formed by the Basle Committee have a strong influence on supervisory policies both inside and outside the G-10 countries, it would also help encourage attention to the issue of FX settlement risk where at the moment there is less awareness of the need for action. Greater consistency of approach to the issue should, among other things, help to ease the concerns of banks that believe that by devoting resources to tackling foreign exchange settlement risk they are putting themselves at a competitive disadvantage.

5.3 Future role of the CPSS

The G-10 central banks will, through the CPSS, continue to promote the overall implementation of the strategy and to actively assure the market that central banks attach great importance to its timely success. In particular the CPSS will:

- maintain or establish contacts with industry groups as appropriate; continue to monitor significant developments in the field of FX settlement (for example, CFDs); and, if warranted, alert the G-10 central bank Governors to the need for further action;
- continue to work with and support the lead central banks in analysing industry group proposals for risk-reducing multicurrency services in the context of the Lamfalussy framework;
- promote the reduction of foreign exchange settlement risk worldwide; and
- support the Basle Committee on Banking Supervision in developing guidance for banks on the management of foreign exchange settlement risk.

5.4 Summary of next steps

In the light of the above, the following is a summary of the action to be taken under the three tracks of the reaffirmed and strengthened strategy.

Action by individual banks. Those banks that have not yet done so should take immediate steps to apply an appropriate credit control process to their FX settlement exposures. This recognises the considerable scope for individual banks to address the problem by improving their current practices for managing their FX settlement exposures.

Action by industry groups. Existing and prospective industry groups should continue to develop and offer services and products that contribute to the risk-reducing efforts of individual banks. This reaffirms the G-10 central banks' view that multicurrency services are best provided by the private sector, as was stated in the Allsopp Report of 1996.

Action by central banks. The G-10 central banks, through the CPSS, will continue to promote the strategy worldwide and to monitor progress. Each central bank will continue its efforts to make, or to seek to achieve, improvements to national payment systems that help to bring about a reduction in FX settlement risk. Each central bank will also continue to stimulate private sector action in its domestic market through the best combination of publicity, moral suasion and measures by the appropriate supervisory authorities. Finally, the Basle Committee on Banking Supervision will reinforce these efforts by developing international supervisory guidance on banks' management of FX settlement risk.

ANNEX 1

ALLSOPP REPORT RECOMMENDATIONS ON MANAGING FOREIGN EXCHANGE SETTLEMENT RISK[1]

Individual banks should take immediate steps to apply an appropriate credit control process to their FX settlement exposures. This recognises the considerable scope for individual banks to address the problem by improving their current practices for measuring and managing their FX settlement exposures. In particular, banks could improve their back office payments processing, correspondent banking arrangements, obligation netting capabilities and risk management controls sufficiently to permit them to:

- measure FX settlement exposures properly;
- apply an appropriate credit control process to FX settlement exposures; and
- reduce excessive FX settlement exposures for a given level of trading.

Measure exposures

First, banks could adopt internal procedures that would permit them to measure their FX settlement exposures properly. For instance, a bank could develop a system that frequently updates its current and future global exposures as it executes new trades and as unsettled trades move through the settlement process. This would give it much more accurate and timely information regarding its FX settlement exposure. This capability, however, might not be immediately feasible, particularly for an international bank actively trading a wide range of currencies with a substantial number of counterparties out of many locations without the benefit of a consolidated risk management system. Nevertheless, such a bank (or, at least, each of its trading centres) could adopt procedures to update its exposure calculations periodically (e.g. once or twice a day) and to measure its minimum and maximum exposure at any moment on the basis of all available information. In either case, Appendix 1 of the Allsopp Report provides guidelines that a bank (or each of its trading centres) could use to measure its current and future exposures.

Manage exposures

Second, a bank could adopt internal procedures for explicitly assessing the risks and rewards of its FX settlement activities, thereby permitting it to manage its properly measured exposures on the basis of fully informed business judgements. As part of an effective management approach, a bank could choose to control its properly measured FX settlement exposures in a manner consistent with the way in which it controls its other credit exposures. For instance, many banks currently set a limit on their total credit exposure with a single counterparty based on an internal credit analysis. Such a limit would generally apply to all operations that generate credit exposure, whether a loan, a deposit, a letter of credit or any other formal extension of credit. Some banks also set separate sub-limits on different possible durations of credit exposure (e.g. remaining exposures of up to seven days, up to thirty days, up to ninety days, etc.). Furthermore, some banks that have many offices around the world but do not have a global real-time limit monitoring system, divide each limit or sub-limit among the various entities and monitor them on a decentralised basis. This control process enables a bank (or a particular office) to undertake any combination of credit-generating activities with a single counterparty and still assure senior management that the bank's overall credit exposure will remain within the level it considers appropriate.

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[1] Adapted from Section 4.1 of the Allsopp Report.

This assurance, or any similar assurance that could be provided by other effective credit control processes, could be extended to credit exposures that arise in settling FX trades simply by including properly measured FX settlement exposures under the same set of controls. For this to work effectively, however, a bank would need to accept the proposition that when dealing with a particular counterparty FX settlement exposure represents the same credit risk, and the same probability of loss, for the bank as, for example, a loan of identical size and duration. Once a bank applies its standard credit controls to FX settlements, it could assure itself that these exposures would not exceed a level the bank considers appropriate.

Reduce excessive exposures

Third, even without lowering the scale of its FX trading, a bank could reduce any FX settlement exposure it deems excessive and decrease the uncertainty surrounding the size of its exposures by improving its settlement practices. For instance, by eliminating overly restrictive payment cancellation deadlines and shortening the time it takes to identify the final and failed receipt of bought currencies, a bank could lower its actual and potential FX settlement exposure for the same level of FX trading. Depending on a bank's trading pattern, the use of available bilateral or multilateral obligation netting arrangements could reduce exposures even further. If necessary, in certain cases a bank may further protect itself against excessive FX settlement exposures by, for instance, requiring collateral from its counterparties.

ANNEX 2

SURVEY DOCUMENTS

Documents used in the 1997 survey

A: REQUEST FOR INFORMATION

1. Please complete ***Attachment 1*** by specifying the requested times based on your bank's current practices and correspondent banking arrangements for settling foreign exchange trades on a routine basis. Please report the times using the 24-hour clock and in the local time of the reporting entity (*not* the local time of the currency concerned). *Please complete a separate form for each of the reporting entities (i.e., bank-wide or individual trading centres) being covered.*

2. Please complete ***Attachments 2A and 2B*** regarding your bank's current average daily foreign exchange (spot, forward and swap) settlement flows. *Please complete a separate form for each of the reporting entities (i.e. bank-wide or individual trading centres) being covered.*

3. Please complete ***Attachment 3*** regarding the number of FX trading counterparties your bank has and the extent to which the bank has arrangements with these counterparties to settle on a bilateral or multilateral net basis. For the purpose of this question, "counterparty" is defined on a "settling entity" rather than "institutional" basis; a counterparty may include any bank, non-bank financial, or corporate entity. *Please complete a separate form for each of the reporting entities (i.e. bank-wide or individual trading centres) being covered.*

4. Please describe the current duties, responsibilities and reporting structure of the person(s) charged with managing on a day-to-day basis the bank's foreign exchange settlement exposures with individual counterparties. Please discuss any significant changes that have taken place over the past 12 months.

5. Please describe your bank's (or, where relevant, your individual trading centre's) current methodology for measuring and projecting its bilateral FX settlement exposures for credit risk management purposes. Please discuss any significant changes that have taken place over the past 12 months. Please focus on the extent to which the methodology now takes into account (i) the period of "irrevocability" when settling a trade (i.e., the time between your bank's unilateral cancellation deadline of the sold currency and the time by which the final receipt of the bought currency is due); and (ii) the period of "uncertainty" when settling a trade (i.e., the time it takes your bank to identify the final or failed receipt of the bought currency after it is due).

6. Please discuss any plans your bank (or, where relevant, your individual trading centre) may have to revise its exposure measurement methodology to take into account the periods of "irrevocability" and "uncertainty" when settling a trade. Please provide likely dates for implementing any such revisions.

7. Please describe any plans your bank may have to shorten the periods of "irrevocability" and "uncertainty" it currently faces during the routine settlement of FX trades. Please include specific targets and likely dates for meeting these targets. In particular, please indicate the extent to which the bank plans over the next year to implement improvements to the times listed in Attachment 1 regarding unilateral cancellation deadlines and the identification of final and failed receipts. Please provide separate answers corresponding to each of the reporting entities (i.e., bank-wide or individual trading centres) being covered.

8. Please describe your bank's current process for controlling counterparty credit exposures associated with FX settlements. Please discuss any significant changes that have taken place over the past 12 months. Please indicate the extent to which your bank now includes bilateral FX settlement exposures under the same set of counterparty credit controls it applies to deposits, placements and other formal short-term credit extensions. For instance, if your bank employs limits to these formal short-term credit extensions, describe the extent to which limits apply to FX settlement exposures. (For example, in measuring its counterparty credit exposures, does the bank aggregate bilateral FX settlement exposures with other credit extensions? Are bilateral FX settlement exposures subject to the same or different limits than those applied to other credit extensions? Are limits applied globally or on a decentralised basis among the bank's trading centres? Are limits mandatory or indicative? How are exposures in excess of the limits handled?)

9. Please describe any plans your bank may have to include FX settlement exposures under the same set of counterparty credit controls it applies to deposits, placements, and other formal short-term credit extensions. If applicable, please provide specific targets and likely dates for meeting these targets.

ATTACHMENT 1: Please provide answers in the local time of the indicated reporting entity (*not* the local time of the currency concerned)

Please fill in all blanks. If necessary, use "NR" for "Not relevant or de minimis activity" and "NA" for "Not available" Please use format specified in footnote 5 *eg 20:30 V+1.*

Please provide a separate form for each of the reporting entities (ie bank-wide or individual trading centres) being covered.

	Column 1: send payment instructions[1]	*Column 2:* unilateral payment cancellation deadline[2]		*Column 3:* final receipts due[3]		*Column 4:* identify final and failed receipts[4]
Currency	Time / day[5]	Time / day[5]	Document-ed?[6]	Time / day[5]	Document-ed?[6]	Time / day[5]
JPY						
BEF						
FRF						
DEM						
ITL						
NLG						
SEK						
CHF						
GBP						
ECU						
CAD						
USD						

REPORTING ENTITY

_____

Bank name

_____

City/country of trading centre

1 At what time do you routinely issue your payment instructions for value on day V?

2 In routine cases (ie ignoring best effort arrangements or any other possible form of special handling), what is your routine deadline for *unilaterally* cancelling (or delaying or amending) *with certainty* your payment instructions for value on day V (ie what is the earliest time after which such cancellation could depend on the consent or "best efforts" of your correspondent bank, the beneficiary, the beneficiary's correspondent bank, or some other intermediary)? If your back office or correspondent has more than one way to execute your payment instructions in a particular currency (eg via a large-value transfer system or via book-entry transfer) and the cancellation deadlines differ according to the method used, please list the *earliest* time.

3 Assuming your counterparty (via its correspondent bank etc) has successfully made the payment "on time" given the terms of the trade, by what time will the funds be credited to your account - ie what is the latest time your correspondent in the currency concerned will credit your account *with finality?* (Note that where a payment could be received by your correspondent at any time during the payment system day, this time would normally be later than the close of the payment system.) If funds can be paid to you in more than one way (eg via a large-value funds transfer system or via book-entry transfer), please list the latest time a final payment can reach you via any of the relevant options and still be considered "on time".

4 At what time do you usually *identify* final and failed payments to you for value on day "V"?

5 For each time, please indicate the hour and minute **using the 24-hour clock**. (Please use 00:00 for midnight and 12:00 for midday.) For each day, please use V to indicate value day, V-1 (or V-2 etc) to indicate one (or two etc) business day(s) before value day, and V+1 (or V+2 etc) to indicate one (or two etc) business day(s) after value day. *Example: 8.30 pm on the day after settlement day should be shown as "20:30 V+1".*

6 Please reply "yes" if the indicated time and day is based on a legally enforceable agreement or arrangement. Otherwise reply "no".

ATTACHMENT 2A - NOTIONAL VALUE, BEFORE NETTING, OF FX-RELATED SETTLEMENT OBLIGATIONS

	NOTIONAL VALUE, BEFORE NETTING, OF AVERAGE DAILY FX-RELATED OBLIGATIONS (SPOT, FORWARD, AND SWAP) SETTLED DURING THE PERIOD BEGINNING 27 OCTOBER 1997 AND ENDING 7 NOVEMBER 1997 **Please provide amounts in millions of US dollars using average exchange rates prevailing on settlement day (if this is not feasible, end-of-period exchange rates may be used). Please fill in all the blanks; if needed, use "NR" for "not relevant or de minimis activity" and "NA" for "not available".** **(If possible, data should exclude inter-branch activity.)**							
	Total		***of which, notional value settled under multilateral netting agreements***		***of which, notional value settled under bilateral netting agreements***		***of which, gross value settled on a trade-by-trade basis***	
Currency	***Payable [Sum of columns (3), (5), and (7)]*** ***(1)***	***Receivable [Sum of columns (4), (6), and (8)]*** ***(2)***	***Payable*** ***(3)***	***Receivable*** ***(4)***	***Payable*** ***(5)***	***Receivable*** ***(6)***	***Payable [Should equal Attachment 2B, col. (7) amount]*** ***(7)***	***Receivable [Should equal Attachment 2B, col. (8) amount]*** ***(8)***
JPY								
BEF								
FRF								
DEM								
ITL								
NLG								
SEK								
CHF								
GBP								
ECU								
CAD								
USD								
All other								
Total								

REPORTING ENTITY _____ Bank name _____ City/country of trading centre

Please provide a separate form for each of the reporting entities (ie bank-wide or individual trading centres) being covered

ATTACHMENT 2B - ACTUAL VALUE, AFTER ANY NETTING, OF FX-RELATED SETTLEMENT FLOWS

	ACTUAL VALUE, AFTER ANY NETTING, OF AVERAGE DAILY FX-RELATED (SPOT, FORWARD, AND SWAP) PAYMENTS AND RECEIPTS DURING THE PERIOD BEGINNING 27 OCTOBER 1997 AND ENDING 7 NOVEMBER 1997 **Please provide amounts in millions of US dollars using average exchange rates prevailing on settlement day (if this is not feasible, end-of-period exchange rates may be used). Please fill in all the blanks; if needed, use "NR" for "not relevant or de minimis activity" and "NA" for "not available".** **(If possible, data should exclude inter-branch activity.)**							
	Total		***of which, actual flows to settle multilaterally netted trades***		***of which, actual flows to settle bilaterally netted trades***		***of which, actual flows to settle individual, non-netted trades***	
Currency	***Payments [Sum of columns (3), (5), and (7)]*** ***(1)***	***Receipts [Sum of columns (4), (6), and (8)]*** ***(2)***	***Payments*** ***(3)***	***Receipts*** ***(4)***	***Payments*** ***(5)***	***Receipts*** ***(6)***	***Payments [Should equal Attachment 2A, col. (7) amount]*** ***(7)***	***Receipts [Should equal Attachment 2A, col. (8) amount]*** ***(8)***
JPY								
BEF								
FRF								
DEM								
ITL								
NLG								
SEK								
CHF								
GBP								
ECU								
CAD								
USD								
All other								
Total								

REPORTING ENTITY _____ Bank name _____ City/country of trading centre

Please provide a separate form for each of the reporting entities (ie bank-wide or individual trading centres) being covered

ATTACHMENT 3 - NUMBER OF FX TRADING COUNTERPARTIES

For the purpose of this form, "counterparty" is defined on a "settling entity" rather than "institutional" basis
A counterparty may include any bank, non-bank financial or corporate entity
References to "top 10, top 25, top 50 counterparties" refer to counterparty rankings by *value* of trades

Please provide a separate form for each of the reporting entities (ie bank-wide or individual trading centres) being covered

REPORTING ENTITY: _____ Bank name _____ City/country of trading centre	Number of counter-parties
How many FX trading counterparties does this reporting entity *currently* have in total?	
Bilateral netting	
With how many of its *total* FX counterparties does this reporting entity have arrangements to settle trades on a bilaterally netted basis?	
With how many of its *top 10* FX counterparties does this reporting entity have arrangements to settle trades on a bilaterally netted basis?	
With how many of its *top 25* FX counterparties does this reporting entity have arrangements to settle trades on a bilaterally netted basis?	
With how many of its *top 50* FX counterparties does this reporting entity have arrangements to settle trades on a bilaterally netted basis?	
Multilateral netting	
With how many of its *total* FX counterparties does this reporting entity have arrangements to settle trades on a multilaterally netted basis?	
With how many of its *top 10* FX counterparties does this reporting entity have arrangements to settle trades on a multilaterally netted basis?	
With how many of its *top 25* FX counterparties does this reporting entity have arrangements to settle trades on a multilaterally netted basis?	
With how many of its *top 50* FX counterparties does this reporting entity have arrangements to settle trades on a multilaterally netted basis?	

B: CHECKLIST FOR COMPILING ANSWERS FROM INDIVIDUAL BANKS

[Completed by the national central bank for each bank head office / trading centre it surveyed]

		Yes or no	Relevant question*
	Senior level responsibility		
a	Has the bank established clear, senior level responsibility and authority for managing its FX settlement exposures with individual counterparties?	_____	4
	Measurement		
b	Does the bank *currently* include its "irrevocable" trades in its measurement methodology?	_____	5
c	Do you expect the bank to include its "irrevocable" trades in its measurement methodology *by end-1998*?	_____	6
d	Does the bank *currently* include its "uncertain" trades in its measurement methodology?	_____	5
e	Do you expect the bank to include its "uncertain" trades in its measurement methodology *by end-1998*?	_____	6
	Control		
f	Does the bank *currently* include bilateral FX settlement exposures under the same set of counterparty credit controls it applies to deposits, placements and other formal short-term credit extensions?	_____	8
g	Do you expect the bank to include, *by end-1998*, its bilateral FX settlement exposures under the same set of controls it applies to loans, placements, or other formal credit extensions?	_____	9

* Refers to "Request for information"

Duration of exposures
(*improvements expected by end-1998)*

		Yes or no	Relevant question*
h	Is the bank actively taking steps which seem likely to result in improved *cancellation* deadlines by end-1998?	_____	7

		Number of hours	
i	If the answer to "h" is "yes" and the improvements are quantifiable, by how many hours do you expect the bank to improve (i.e. to postpone), by end-1998, its current unilateral *cancellation* deadlines?		7
	JPY.....…..……	_____	
	BEF.....	_____	
	FRF.....	_____	
	DEM.....	_____	
	ITL.....	_____	
	NGL.....	_____	
	SEK.....	_____	
	CHF.....	_____	
	GBP.....	_____	
	ECU.....	_____	
	CAD.....	_____	
	USD.....	_____	

		Yes or no	
j	Is the bank actively taking steps which seem likely to result in improved *receipt-identification* times by end-1998?	_____	7

		Number of hours	
k	If the answer to "j" is "yes" and the improvements are quantifiable, by how many hours do you expect the bank to improve (i.e. to advance), by end-1998, the identification of final and failed *receipts*?		7
	JPY.....	_____	
	BEF.....	_____	
	FRF.....	_____	
	DEM.....	_____	
	ITL.....	_____	
	NGL.....	_____	
	SEK.....	_____	
	CHF.....	_____	
	GBP.....	_____	
	ECU.....	_____	
	CAD.....	_____	
	USD.....	_____	

* Refers to "Request for information"

ANNEX 3

ADDITIONAL DATA ON EXPOSURE DURATIONS

Improvements in cancellation deadlines and receipt-identification times

Table 3 in Section 2 showed, for the 1997 survey, the average cancellation deadlines and receipt-identification times of the surveyed banks relative to the reference times. Table A.1 below shows the extent to which those 1997 results represented an improvement compared with the results for 1996. Overall there was a modest improvement: the weighted average of all currencies showed an improvement of one hour in both cancellation deadlines and receipt-identification times.

However, the results for individual banks and currencies were mixed. Indeed, in a number of cases the times appear to have deteriorated (for currencies, this is shown by the negative numbers in Table A.1). In some cases this reflects a real deterioration in individual banks' times which typically seems to have occurred when surveyed banks changed their correspondent banks. In at least one significant case, the cause of the deterioration was an increase in the volume of payments, which led the bank concerned to start issuing payment instructions at an earlier time (with these payment instructions being irrevocable under the payment system's rules).

Table A.1

Improvement in average cancellation deadlines and receipt-identification times[1]
(1997 survey compared with 1996 survey)

Currency	Cancellation deadlines	Receipt-identification times
	Number of hours improvement in weighted average cancellation deadlines[2]	Number of hours improvement in weighted average receipt-identification times[2]
JPY	4	1
BEF	-3	2
FRF	2	6
DEM	0	2
ITL	-1	0
NLG	0	1
SEK	2	0
CHF	0	3
ECU	1	2
GBP	0	2
CAD	-3	0
USD	1	0
Average[3]	1	1

[1] Weighted average of times reported by banks (as in Table 3 in Section 2). The weights used were the value of each bank's settlement flow in the currency concerned. [2] Negative numbers indicate that there was a deterioration compared with 1996. [3] Average of times for individual currencies, weighted by the currency shares shown in Table 1 in Section 2.

For currencies, the changes (both improvements and deteriorations) to some extent also reflect changes to the weights applied to banks to calculate the average for a currency. Although overall settlement values in the survey grew by about 25%, the rate of growth varied considerably between banks. So even where there was no change to individual banks' actual times, if banks with inferior times grew relatively fast, the result would be a deterioration in the average time for the currency.

However, in certain cases the deterioration reflects mistakes made by banks in the 1996 survey, particularly about their ability to cancel payment instructions unilaterally; in such cases greater accuracy in the 1997 figures can appear as a deterioration in the survey results.

Excess durations by currency pair

Table A.2 shows, for each currency pair, the average excess duration (i.e. the difference between the weighted average and the reference exposure durations), based on the same information as Table 4 in Section 2. Table A.3 shows the extent to which there was an improvement (i.e. a decrease) in these excess durations in the 1997 survey compared with the 1996 survey. (The table can also be read as showing the improvement in average durations, since the same reference durations were used in both surveys.)

Tables A.2

Excess exposure durations
(1997 survey)

Number of hours by which average durations exceeded reference durations (Negative numbers indicate average durations that are less than reference durations)												
	Buy											
Sell	JPY	BEF	FRF	DEM	ITL	NLG	SEK	CHF	ECU	GBP	CAD	USD
JPY	-	17	15	21	18	9	20	22	11	16	1	13
BEF	21	-	19	24	21	13	23	25	14	19	4	17
FRF	20	20	-	23	20	12	22	24	13	18	3	16
DEM	21	21	19	-	22	13	24	26	15	20	5	17
ITL	6	5	3	9	-	-3	8	10	-1	4	-11	1
NLG	17	17	15	21	18	-	20	22	11	16	1	13
SEK	20	20	18	24	21	12	-	25	14	19	4	16
CHF	19	20	18	24	21	12	23	-	14	19	4	16
ECU	18	18	16	21	18	10	20	22	-	16	1	14
GBP	18	20	18	23	20	12	22	24	13	-	3	16
CAD	15	20	18	24	21	12	22	25	14	19	-	16
USD	12	17	15	21	18	9	19	22	11	16	1	-

Table A.3

Improvement in excess exposure durations
(Comparison between 1997 and 1996 surveys)

Number of hours' improvement in times reported in the 1997 survey compared with times in the 1996 survey (Negative numbers indicate a deterioration)												
	Buy											
Sell	JPY	BEF	FRF	DEM	ITL	NLG	SEK	CHF	ECU	GBP	CAD	USD
JPY	-	6	10	6	4	6	5	7	7	7	4	5
BEF	-2	-	3	-1	-3	-1	-2	0	0	0	-3	-2
FRF	3	4	-	4	2	6	2	5	4	4	2	3
DEM	1	2	6	-	0	2	1	3	3	3	0	1
ITL	0	0	5	0	-	0	-1	2	1	1	-1	-1
NLG	1	2	6	2	0	-	0	3	2	2	0	1
SEK	3	4	8	4	2	3	-	5	4	4	2	3
CHF	0	1	5	1	0	1	0	-	2	2	-1	0
ECU	1	2	6	2	1	2	1	3	-	3	0	1
GBP	1	1	6	1	0	1	0	3	2	-	0	0
CAD	-3	-2	2	-2	-3	-2	-3	-1	-1	-1	-	-3
USD	2	2	7	3	1	2	1	4	3	3	1	-

Distribution of actual durations

To supplement the averages shown for each currency pair in Table 4 in Section 2 (and in Tables A.2 and A.3 above), Table A.4 overleaf provides some information on the distribution of the actual exposure durations for each currency pair. As noted in the text in Section 2, for most currency pairs only a relatively small proportion of banks (often less than 20%) had durations of less than 24 hours, and even where time zone effects meant that reference durations were at or near zero, there were only a few currency pairs for which the proportion of banks with durations less than 24 hours was over 50%.

Comparing the exposure durations for 1997 with those for 1996 in Table A.4, the small overall improvement is visible in many currency pairs (the percentage of banks with durations less than 24 hours has increased, while the percentage with durations over 48 hours has fallen). However, the uneven nature of the change between 1996 and 1997 is also evident and it is worth noting that, despite an improvement to the worst cancellation deadlines and receipt-identification times reported by surveyed banks, the longest durations continued to be more than three working days (i.e. over 72 hours). These durations were, of course, even greater when weekends and holidays were included.

Table A.4

Distribution of exposure durations

For each currency pair, percentage of banks having exposure durations within time band shown
Results from 1997 survey *(results from 1996 survey in brackets)*

Less than 24 hours

Sell	Buy											
	JPY	BEF	FRF	DEM	ITL	NLG	SEK	CHF	ECU	GBP	CAD	USD
JPY	-	4 *(5)*	7 *(3)*	7 *(7)*	8 *(4)*	8 *(7)*	4 *(5)*	4 *(3)*	22 *(18)*	9 *(11)*	0 *(1)*	4 *(7)*
BEF	30 *(27)*	-	11 *(8)*	18 *(14)*	15 *(11)*	16 *(14)*	14 *(14)*	14 *(11)*	30 *(22)*	18 *(16)*	8 *(5)*	12 *(11)*
FRF	26 *(22)*	10 *(9)*	-	15 *(11)*	12 *(8)*	14 *(11)*	11 *(11)*	11 *(8)*	28 *(20)*	15 *(14)*	5 *(4)*	12 *(11)*
DEM	34 *(28)*	15 *(9)*	12 *(5)*	-	16 *(8)*	18 *(11)*	14 *(11)*	13 *(8)*	29 *(20)*	20 *(15)*	9 *(4)*	18 *(16)*
ITL	31 *(30)*	15 *(16)*	12 *(12)*	16 *(18)*	-	15 *(16)*	14 *(16)*	14 *(15)*	26 *(24)*	15 *(20)*	7 *(7)*	16 *(16)*
NLG	27 *(26)*	12 *(12)*	11 *(8)*	14 *(14)*	14 *(9)*	-	11 *(12)*	11 *(11)*	31 *(24)*	14 *(16)*	5 *(5)*	12 *(15)*
SEK	26 *(26)*	10 *(16)*	9 *(12)*	14 *(16)*	12 *(14)*	11 *(16)*	-	10 *(15)*	28 *(22)*	14 *(21)*	4 *(11)*	12 *(19)*
CHF	35 *(28)*	16 *(18)*	15 *(14)*	20 *(20)*	16 *(16)*	18 *(19)*	15 *(19)*	-	32 *(23)*	19 *(21)*	9 *(12)*	19 *(21)*
ECU	33 *(27)*	18 *(19)*	14 *(15)*	24 *(22)*	19 *(18)*	21 *(22)*	20 *(21)*	18 *(19)*	-	21 *(22)*	11 *(14)*	17 *(22)*
GBP	41 *(34)*	25 *(23)*	24 *(19)*	31 *(24)*	27 *(22)*	26 *(22)*	25 *(21)*	23 *(21)*	40 *(31)*	-	22 *(15)*	27 *(24)*
CAD	51 *(49)*	40 *(36)*	38 *(33)*	44 *(40)*	39 *(33)*	38 *(36)*	38 *(34)*	38 *(36)*	54 *(42)*	42 *(37)*	-	45 *(38)*
USD	59 *(56)*	51 *(42)*	49 *(39)*	53 *(47)*	44 *(39)*	52 *(42)*	51 *(41)*	49 *(41)*	54 *(47)*	48 *(41)*	47 *(38)*	-

24 hours to 48 hours

Sell	Buy											
	JPY	BEF	FRF	DEM	ITL	NLG	SEK	CHF	ECU	GBP	CAD	USD
JPY	-	84 *(81)*	81 *(84)*	82 *(80)*	76 *(81)*	79*(77)*	85 *(81)*	83 *(82)*	67 *(70)*	79 *(76)*	84 *(84)*	86 *(81)*
BEF	62 *(63)*	-	78 *(81)*	73 *(77)*	71 *(76)*	73 *(73)*	75 *(74)*	74 *(77)*	61 *(68)*	73 *(74)*	79 *(82)*	81 *(80)*
FRF	66 *(68)*	78 *(77)*	-	75 *(78)*	73 *(76)*	74 *(73)*	77 *(74)*	76 *(77)*	63 *(76)*	76 *(68)*	81 *(81)*	80 *(81)*
DEM	59 *(67)*	77 *(85)*	80 *(88)*	-	73 *(84)*	74 *(81)*	78 *(81)*	77 *(84)*	65 *(74)*	73 *(80)*	81 *(88)*	75 *(79)*
ITL	62 *(62)*	75 *(76)*	79 *(78)*	75 *(73)*	-	75 *(73)*	77 *(73)*	76 *(74)*	67 *(68)*	77 *(72)*	81 *(82)*	76 *(77)*
NLG	66 *(64)*	77 *(77)*	78 *(80)*	77 *(76)*	73 *(77)*	-	78 *(74)*	78 *(76)*	59 *(65)*	77 *(73)*	82 *(81)*	79 *(76)*
SEK	67 *(66)*	81 *(75)*	81 *(78)*	78 *(75)*	77 *(77)*	79 *(73)*	-	79 *(74)*	63 *(70)*	78 *(71)*	85 *(78)*	81 *(73)*
CHF	59 *(65)*	75 *(76)*	77 *(78)*	72 *(73)*	74 *(76)*	74 *(72)*	77 *(71)*	-	63 *(70)*	75 *(72)*	81 *(78)*	75 *(73)*
ECU	58 *(64)*	72 *(73)*	76 *(76)*	68 *(70)*	68 *(72)*	69 *(68)*	70 *(68)*	72 *(70)*	-	71 *(70)*	77 *(75)*	76 *(72)*
GBP	55 *(61)*	70 *(73)*	70 *(76)*	64 *(71)*	65 *(70)*	68 *(72)*	70 *(73)*	72 *(72)*	56 *(62)*	-	70 *(78)*	69 *(72)*
CAD	47 *(48)*	58 *(60)*	59 *(62)*	53 *(56)*	57 *(62)*	59 *(58)*	59 *(59)*	59 *(58)*	44 *(53)*	55 *(58)*	-	52 *(59)*
USD	41 *(43)*	47 *(57)*	48 *(58)*	45 *(50)*	52 *(57)*	45 *(54)*	46 *(55)*	48 *(55)*	43 *(51)*	51 *(56)*	49 *(58)*	-

More than 48 hours

Sell	Buy											
	JPY	BEF	FRF	DEM	ITL	NLG	SEK	CHF	ECU	GBP	CAD	USD
JPY	-	12 *(14)*	12 *(14)*	12 *(13)*	16 *(15)*	12 *(16)*	11 *(14)*	13 *(15)*	11 *(12)*	12 *(14)*	16 *(15)*	11 *(12)*
BEF	8 *(10)*	-	11 *(11)*	10 *(9)*	14 *(14)*	11 *(14)*	11 *(12)*	12 *(12)*	10 *(11)*	10 *(9)*	12 *(12)*	7 *(9)*
FRF	8 *(10)*	12 *(14)*	-	11 *(11)*	15 *(16)*	12 *(16)*	12 *(15)*	14*(15)*	10 *(12)*	9 *(11)*	14 *(15)*	8 *(8)*
DEM	7 *(5)*	8 *(5)*	8 *(7)*	-	11 *(8)*	8 *(8)*	8 *(8)*	9 *(8)*	6 *(5)*	7 *(5)*	9 *(8)*	6 *(5)*
ITL	7 *(8)*	10 *(8)*	9 *(9)*	9 *(9)*	-	10 *(11)*	9 *(11)*	11 *(11)*	7 *(8)*	8 *(8)*	12 *(11)*	8 *(7)*
NLG	7 *(10)*	11 *(11)*	11 *(12)*	10 *(11)*	14 *(14)*	-	11 *(14)*	11 *(14)*	10 *(11)*	10 *(11)*	12 *(14)*	8 *(9)*
SEK	7 *(8)*	10 *(8)*	9 *(10)*	8 *(8)*	11 *(10)*	10 *(11)*	-	11 *(11)*	8 *(8)*	8 *(8)*	11 *(11)*	7 *(8)*
CHF	7 *(7)*	8 *(7)*	8 *(8)*	8 *(7)*	9 *(8)*	8 *(9)*	8 *(10)*	-	6 *(7)*	7 *(7)*	9 *(10)*	7 *(5)*
ECU	8 *(8)*	10 *(8)*	10 *(9)*	8 *(8)*	13 *(11)*	10 *(11)*	10 *(11)*	10 *(11)*	-	8 *(8)*	11 *(11)*	7 *(7)*
GBP	4 *(5)*	5 *(4)*	5 *(5)*	5 *(5)*	8 *(8)*	5 *(7)*	5 *(7)*	5 *(7)*	4 *(7)*	-	8 *(7)*	4 *(4)*
CAD	1 *(3)*	3 *(4)*	3 *(5)*	3 *(4)*	4 *(5)*	3 *(7)*	3 *(7)*	3 *(7)*	3 *(4)*	3 *(5)*	-	3 *(3)*
USD	0 *(1)*	3 *(1)*	3 *(3)*	1 *(3)*	4 *(4)*	3 *(4)*	3 *(4)*	3 *(4)*	3 *(1)*	1 *(3)*	4 *(4)*	-

ANNEX 4

APPROXIMATE METHODS OF MEASURING FX SETTLEMENT EXPOSURES

This annex provides some examples of the approximation methods that banks use to measure their exposures and analyses whether these can result in underestimation of the exposures.

Example 1

Consider a bank due to settle the following amounts in a given currency pair:

Settlement values	
Monday	0
Tuesday	160
Wednesday	120
Thursday	200
Friday	0

Assume that, for this currency pair, the relevant cancellation deadline is 09:00 on settlement day (V) and the relevant receipt-identification time is 17:00 on that day. The table below shows two different methods of measuring the exposure.

Example 1				
Period	**(1) Hourly method**		**(2) Calendar day method**	
	Measure	*Error*	Measure	*Error*
Monday	0	*0*	0	*0*
Tuesday 00:00 – 09:00	0	*0*	160	*+160*
Tuesday 09:00 – 17:00	160	*0*	160	*0*
Tuesday 17:00 – 23:59	0	*0*	160	*+160*
Wednesday 00:00 – 09:00	0	*0*	120	*+120*
Wednesday 09:00 – 17:00	120	*0*	120	*0*
Wednesday 17:00 – 23:59	0	*0*	120	*+120*
Thursday 00:00 – 09:00	0	*0*	200	*+200*
Thursday 09:00 – 17:00	200	*0*	200	*0*
Thursday 17:00 – 23:59	0	*0*	200	*+200*
Friday	0	*0*	0	*0*

Column 1 of the table shows an accurate method of measuring the exposure (called here the hourly method).[2] This method has the advantage that it avoids both underestimation and

[2] The Allsopp Report defined a bank's actual exposure when settling a foreign exchange trade to be the full amount of the currency purchased; this exposure lasts from the time a payment instruction for the currency sold can no longer be cancelled unilaterally until the time the currency purchased is received with finality. To measure this exposure, a bank needs to recognise both the "irrevocable" and "uncertain" periods during settlement. The irrevocable period lasts from the time when the payment instruction for the currency sold can no longer be cancelled unilaterally until the time when the final receipt of the currency bought is due. This irrevocable period may be followed by an uncertain period, which is the length of time after the bought currency is due that the bank takes to identify whether or not it has received the funds. In practice, banks do not always immediately identify whether or not they have received the currency purchased - for example, in many cases they will not know this for certain until they have received a statement from their correspondent

overestimation of exposures. However, for simplicity, the bank might choose to estimate its exposure using the calendar day method (Column 2), in which it assumes its exposure on the value day lasts throughout the day rather than just between 09:00 and 17:00. In this example, the method avoids underestimation but does lead to overestimation (before 09:00 and after 17:00 each day the bank estimates that it has a positive exposure when its actual exposure is zero). Although underestimation is clearly a more serious problem, overestimation also has disadvantages: it may lead to inefficient use of counterparty credit limits or to excessive expansion of credit limits to offset the overestimate.

Example 2

In this example the amounts to be the settled are the same as in the previous example but the relevant cancellation deadlines and receipt-identification times are assumed to be 18:00 on the day before settlement (i.e 18:00 V-1) and 17:00 on settlement day (17:00 V) respectively – i.e. the exposure still lasts less than 24 hours but now starts on the day before settlement is due.

In the table below, Columns 1 and 2 again show the exposure measured by the hourly and calendar day methods. The calendar day method again causes overestimation of exposures at certain times but, in this example, the method also leads the bank to *underestimate* its exposure. The bank assumes its exposure relating to trades settling on day V starts at midnight V-1/V whereas it actually starts six hours earlier at 18:00 V-1. So to the extent that the trades settling the next day are bigger than those settling today, the bank will underestimate its exposure during this time (this happens on Monday when the value of the trades on the next day increases from 0 to 160, and again on Wednesday when the increase on the next day is from 120 to 200).

However, the third column shows a variation of the calendar day method, called here the "24-hour period" method, which avoids the underestimation. Unlike the normal calendar day method (where the bank is assumed to change its exposure estimate at the beginning of each day), in this variation the bank changes the estimate at 18:00 each day – i.e. at the time the new exposure starts. Equally appropriate would be any time between 17:00 and 18:00 - i.e. during the period after one day's exposure has ended but before the next day's has begun.

Example 2						
Period	**(1) Hourly method**		**(2) Calendar day method**		**(3) 24-hour period method**	
	Measure	*Error*	Measure	*Error*	Measure	*Error*
Monday until 18:00	**0**	*0*	0	*0*	0	*0*
Monday 18:00 – 23:59	**160**	*0*	0	***-160***	160	*0*
Tuesday 00:00 – 17:00	**160**	*0*	160	*0*	160	*0*
Tuesday 17:00 – 18:00	**0**	*0*	160	*+160*	160	*+160*
Tuesday 18:00 – 23:59	**120**	*0*	160	*+40*	120	*0*
Wednesday 00:00 – 17:00	**120**	*0*	120	*0*	120	*0*
Wednesday 17:00 – 18:00	**0**	*0*	120	*+120*	120	*+120*
Wednesday 18:00 – 23:59	**200**	*0*	120	***-80***	200	*0*
Thursday 00:00 – 17:00	**200**	*0*	200	*0*	200	*0*
Thursday 17:00 – 18:00	**0**	*0*	200	*+200*	200	*+200*
Thursday 18:00 – 23:59	**0**	*0*	200	*+200*	0	*0*
Friday	**0**	*0*	0	*0*	0	0

bank and used this to compare actual and expected receipts. When calculating its exposure, a prudent bank will assume that during this uncertain period the funds have *not* been received.

Example 3

In this example the amounts to be settled are once again assumed to be the same, and the relevant cancellation deadline is 18:00 V-1 as in the previous example, but the receipt-identification time is now assumed to be 21:00 V rather than 17:00 V. The key difference here is that the duration of the exposure is now greater than 24 hours and so there is a period each day (18:00 to 21:00) when the bank may be exposed to more than one day's trades.

In this example, underestimation would not result if the bank used a variation of the calendar day method in which it estimated its exposures as being equal to the sum of the current day's settlement value and the following day's settlement value (Column 2).

However, the simple calendar day method (Column 3) would lead to underestimation, both because the exposure starts before the calendar day starts (as in the previous example) and because it fails to take account of the fact that more than one day's exposures can be outstanding at any time. (The 24-hour method would also underestimate exposures for the latter reason.)

Some other possible variations of the calendar day method that were used by the surveyed banks can also cause underestimation. One such method is to say that, as the exposures last 27 hours (i.e. 1.125 days), the estimate is 1.125 the current day's settlement value (Column 4); this is correct as an average but can clearly lead to an underestimate during the period when more than one day's exposure is outstanding or when tomorrow's value is higher than today's. Perhaps less clearly a cause of underestimation is an estimate equal to twice today's settlement value (Column 5). This can cause underestimation because the maximum exposure is (in this example) the sum of today's and tomorrow's values; underestimation therefore again results when tomorrow's value is higher than today's.

Example 3										
Period	**(1) Hourly method**		**(2) Two calendar days method** $X_V + X_{V+1}$*		**(3) Calendar day method** X_V*		**(4) 1.125 x current day method** $1.125X_V$*		**(5) 2 x current day method** $2X_V$*	
	Measure	*Error*	Measure	*Error*	Measure	*Error*	Measure	*Error*	Measure	*Error*
Monday until 18:00	**0**	*0*	160	*+160*	0	*0*	0	*0*	0	*0*
Monday 18:00 – 21:00	**160**	*0*	160	*0*	0	***-160***	0	***-160***	0	***-160***
Monday 21:00 – 23:59	**160**	*0*	160	*0*	0	***-160***	0	***-160***	0	***-160***
Tuesday 00:00 – 18:00	**160**	*0*	280	*+120*	160	*0*	180	*+20*	320	*+160*
Tuesday 18:00 – 21:00	**280**	*0*	280	*0*	160	***-120***	180	***-100***	320	*+40*
Tuesday 21:00 – 23:59	**120**	*0*	280	*+160*	160	*+40*	180	*+60*	320	*+200*
Wednesday 00:00 – 18:00	**120**	*0*	320	*+200*	120	*0*	135	*+15*	240	*+120*
Wednesday 18:00 – 21:00	**320**	*0*	320	*0*	120	***-200***	135	***-185***	240	***-80***
Wednesday 21:00 – 23:59	**200**	*0*	320	*+120*	120	***-80***	135	***-65***	340	*+140*
Thursday 00:00 – 18:00	**200**	*0*	200	*0*	200	*0*	225	*+25*	400	*+200*
Thursday 18:00 – 21:00	**200**	*0*	200	*0*	200	*0*	225	*+25*	400	*+200*
Thursday 21:00 – 23:59	**0**	*0*	200	*+200*	200	*+200*	225	*+225*	400	*+400*
Friday#	**0**	*0*	0	*0*	0	*0*	0	*0*	0	*0*

* X_V is the value to be settled on day V and X_{V+1} the value to be settled on day V+1. # In this example it is assumed that the value to be settled on the following Monday is also zero.

Conclusion

The above examples indicate only some of the possible approximation methods and the circumstances in which they might be applied. In particular, they ignore further complications arising from the fact that exposures may extend over part or all of three days or more and that different currency pairs are likely to have different durations. However, they do indicate that selecting an appropriate approximation method is not always straightforward and that, if approximation is not to lead to underestimation, a bank still needs to have a thorough understanding of the duration of its exposures.