
FOREIGN EXCHANGE SETTLEMENT RISK PRACTICES IN SINGAPORE

July 2001

**Market Infrastructure and Risk Advisory Department
Monetary Authority of Singapore**

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EXECUTIVE SUMMARY

Trading in foreign exchange markets involves the management of many risks, including liquidity risk, exchange rate (market) risk and operational risk. However, one of the largest risks facing foreign exchange participants is settlement risk. Settlement risk arises because the two legs of a foreign exchange transaction are delivered in different countries, often in different time zones. However, while time zone differences are an important determinant, studies have shown that foreign exchange settlement risk is more than an intra-day phenomenon. 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.

This report presents the results of a survey conducted by the Monetary Authority of Singapore (MAS) on the settlement practices of major participants in the Singapore foreign exchange market. The survey results indicate that many institutions tend to have significant exposures across their books. Bilateral netting is also not widely practiced by the surveyed banks.

While the value at risk is a natural consequence of trading, the length of time that banks are exposed is of particular concern. The survey found that the industry's exposure for a single day's trades tends to last in excess of 24 hours resulting in the accumulation of exposure over two days. Current reconciliation practices and unfavourable cancellation deadlines have contributed to the excessive exposure.

In terms of risk management practices, the survey found that the majority of the banks tend to under-estimate their value at risk by using the single calendar day method to gauge their exposures. While several institutions surveyed are acutely aware of their exposure to foreign exchange settlement risk and have plans to reduce and improve their risk management

practices, there are still some which are not actively addressing the issue. The need for institutions to improve their focus on foreign exchange settlement risk management is further illustrated by the survey's findings that around one-third of the respondents did not have any senior management involved in the assessment of this risk. The MAS will encourage the industry to move towards international best practices and will consider undertaking a further study to monitor the progress in managing and reducing foreign exchange settlement risk.

1 INTRODUCTION

1.1 Background

1.1.1 International Initiatives in the Reduction of Foreign Exchange Settlement Risk

In 1995, the central banks of G10 countries surveyed approximately 80 major banks in their respective local markets in order to document practices for settling foreign exchange trades. The survey results were collated by the Committee on Payment and Settlement Systems (CPSS)¹ and the findings were published in a report, *Settlement Risk in Foreign Exchange Transactions*, in 1996. This report is frequently referred to as the Allsopp Report. In addition to sharing the results of the survey of market practices, the report also explained how foreign exchange settlement risk arises and it set out a methodology for measuring foreign exchange settlement risk. The report also considered the options for tackling the problem and set out strategies to be adopted by the G10 central banks on the basis of these options.

In late 1997, the central banks of G10 countries carried out another survey of banks in the foreign exchange market. The purpose was to measure the progress made by individual banks in meeting the Allsopp Report recommendations on prudential management and control of foreign exchange settlement risk. The results of their findings were published in the second document, *Reducing Foreign Exchange Settlement Risk: A Progress Report*. This report is often referred to as the Progress Report. In summary, the report concluded that individual banks had made encouraging progress in managing their foreign exchange settlement exposures.

¹ The CPSS was set up by the Group of Ten (G10) central banks in 1990 to act as a forum for monitoring and analysing payment and settlement arrangements. The Secretariat for the CPSS is based at the Bank for International Settlements in Basel, Switzerland (www.bis.org).

1.1.2 East Asia Pacific Initiatives in the Reduction of Foreign Exchange Settlement Risk

The need for initiatives to reduce foreign exchange settlement risk within the East Asia Pacific region, similar to the ones undertaken by G10 central banks, was mooted by the Reserve Bank of Australia (RBA) at the Working Group on Payment and Settlement Systems (WGPSS) meeting in October 1999. This working group meets under the auspices of the Executive Meeting of East Asia and Pacific Central Banks (EMEAP).² Recognising the need for a coordinated EMEAP effort to address cross-currency settlement risk, members agreed to explore this proposal further. At the EMEAP WGPSS meeting in March 2000, the participants finalised plans to study foreign exchange settlement risk in the region. Specifically, the members agreed to conduct a foreign exchange settlement risk survey, in their respective countries, to further understand settlement risk practices. The working group aims to produce a regional report covering the survey findings of all EMEAP members.

1.2 Objectives

According to the most recent Bank for International Settlements (BIS) *Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity* done in 1998, Singapore is the world's fourth largest foreign exchange trading center and the Singapore Dollar (SGD) is among the top ten traded currencies in the world. Therefore, it is important for us to adopt a proactive approach in understanding the extent of our foreign exchange settlement risk exposures. In addition, Singapore is one of the first few major financial markets to open each day and has a time zone difference ranging from 12 to 17 hours with that of the United States, whose currency is the one against

² Established in 1991, EMEAP is a co-operative organisation of central banks and monetary authorities in the East Asia and Pacific region. The primary objective of EMEAP is to strengthen the co-operative relationships among its members.

which most foreign exchange transactions are conducted. Such time zone differences, as well as each bank's foreign exchange settlement practices, affect industry-wide and institution-specific exposure periods and magnitudes.

With these factors in mind, the MAS undertook its study on foreign exchange settlement practices with the following objectives.

1.2.1 Raising Awareness

The study aims to promote greater awareness of foreign exchange settlement risk among market participants. In order for foreign exchange settlement risk to be appropriately assessed and measured, a common understanding of foreign exchange settlement risk concepts is required. To commence this process of increasing awareness, a Foreign Exchange Settlement Risk Seminar³ was held in September 2000. At the seminar, a clear definition of, and guidelines for measuring, foreign exchange settlement exposures were explained to the participants.

1.2.2 Understanding Current Practices

The survey sought to identify factors which contribute to the accumulation of foreign exchange settlement risk exposure in Singapore. The survey results have provided the MAS with a framework for understanding and benchmarking the current foreign exchange settlement practices in the market.

1.2.3 Promoting Improvements

The study aims to function as a platform to help the participants achieve a more comprehensive understanding of the relationship between their risk management practices (such as unilateral cancellation times, reconciliation times, and counterparty credit limits) and foreign exchange exposures

³ The seminar was jointly held by the Monetary Authority of Singapore and The Association of Banks in Singapore.

(including both magnitude and period). In this way, institutions can seek to reduce their foreign exchange exposures by renegotiating correspondent banking relationships and improving back office procedures towards industry best practices.

1.3 Outline of Report

This report consists of the following chapters:

- Chapter 1 outlines previous work undertaken on foreign exchange settlement risk, and the origins and objectives of the MAS' study.
- Chapter 2 provides an in-depth presentation on foreign exchange settlement risk.
- Chapter 3 details the methodology used to measure foreign exchange settlement risk and presents an analysis of settlement practices in Singapore using this methodology.
- Chapter 4 provides an outline and assessment of the risk management practices and techniques currently adopted by the surveyed banks in Singapore.
- Chapter 5 concludes the report with a summary of the findings and recommendations on next steps to be taken.

2 FOREIGN EXCHANGE SETTLEMENT RISK

2.1 Settlement Risk in Foreign Exchange Transactions

Trading in foreign exchange markets involves the management of many risks, including liquidity risk, market risk, and operational risk. Nonetheless, settlement risk remains one of the largest risks faced by foreign exchange participants today.

2.1.1 How Settlement Risk Arises

At its core, settlement of a foreign exchange transaction requires the payment of one currency and the receipt of another. Settlement risk arises because the two legs of a foreign exchange transaction are delivered in different countries, often in different time zones. While time zone differences are an important determinant of foreign exchange settlement risk, a bank's settlement practices can also affect the size and duration of its settlement exposure.

In the absence of any settlement arrangement that ensures the final transfer of one currency will occur if, and only if, the final transfer of the other currency also occurs, one party to a foreign exchange trade could pay out the currency it sold but not receive the currency it bought. This principal risk in the settlement of foreign exchange transactions is referred to as either foreign exchange settlement risk, cross-currency settlement risk or Herstatt risk.

2.1.2 Consequences of a Failed Transaction

On a micro level, settlement risk has both credit risk and liquidity risk dimensions. In the case of credit risk, one party to a foreign exchange trade could pay out the currency it sold but not receive the currency it bought. As a result, it faces the possibility of losing the full principal value involved in the transaction. In this situation, a party's foreign exchange settlement exposure

(the size of its credit exposure to its counterparty when settling an foreign exchange trade) equals the full amount of the purchased currency.

Settlement risk can also have a liquidity dimension if a party did not receive the currency it purchased when due. In this case, it would need to cover and finance this shortfall until its counterparty honoured its obligation. In fact, this liquidity risk is present even if a party could withhold its payment of the currency it sold (i.e. liquidity risk can be present even in the absence of credit risk). Thus, whether viewed from a credit or a liquidity perspective, the amount potentially at risk in settling a foreign exchange trade equals the full value of the purchased currency.

On a macro level, settlement risk can have a systemic impact on payment systems. The settlement of foreign exchange transactions represents a significant share of the daily flows through the payment system. As such, the failure of one market participant to meet its foreign exchange settlement obligations when due may cause significant liquidity or credit problems for other participants, and may thus threaten the stability of the financial system.

2.2 Central Bank Concerns

2.2.1 Duration and Magnitude of Exposures

Central banks are generally concerned about the duration and magnitude of commercial banks' foreign exchange settlement exposures.

Previous surveys undertaken by the CPSS and the RBA revealed that foreign exchange settlement risk is more than an intra-day phenomenon, not simply because of time zone differences but also due to individual banks' settlement practices.

In terms of the magnitude of exposures, the scale of potential settlement problems is demonstrated by the latest survey of foreign exchange market turnover. The BIS estimated that the average total daily turnover of global foreign exchange markets for spot, outright forward and foreign exchange swap contracts was US\$ 1,500 billion in 1998. Since each trade could involve two or more payments, daily settlement flows are likely to amount, in aggregate, to a multiple of this figure, although no comprehensive data is available. In fact, in the surveys conducted by the G10 central banks and the RBA, it was found that the banks' exposures were in excess of their capital, as was the case in this survey's findings.

Outlined in Appendix 1 are brief summaries of five case studies that demonstrate the way in which foreign exchange settlement risk has actually affected financial institutions and payment systems.

2.3 Defining and Measuring Foreign Exchange Settlement Risk

To ensure consistency of our study with the G10 countries' surveys, we have adopted the same definition of foreign exchange settlement exposure as the CPSS. The following explains the definition and measurements used, drawing heavily from sections of the CPSS report, *Settlement Risk in Foreign Exchange Transactions*.

2.3.1 Defining Foreign Exchange Settlement Risk

To tackle the systemic risk inherent in the current settlement arrangements, a realistic understanding of the nature and scope of foreign exchange settlement exposure first needs to be developed.

Following discussions with market participants, CPSS defined foreign exchange settlement exposure to be a bank's actual exposure – the amount at

risk – when settling a foreign exchange trade. In essence, it equals the full amount of currency purchased and 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.

It is important to note that this definition is designed to address both the *size* and *duration* of the credit exposure that arise during the foreign exchange settlement process. It says nothing about the *probability* of the occurrence of an actual loss. The definition also does not specifically address the *ability* of a bank to measure and control its foreign exchange settlement exposure.

2.3.2 Measuring Foreign Exchange Settlement Exposure

Although settling a trade involves numerous steps, a trade's status – from the time it is executed until the time it is settled - can be classified according to five broad categories:

Table 1: Status of Foreign Exchange Trades

<u>Status</u>	<u>Description</u>
<i>Revocable</i> (Status R)	The payment instruction for the sold currency either has not been issued or may be unilaterally cancelled without the consent of the institution's counterparty or any other intermediary. The institution faces no current settlement exposure for this trade.
<i>Irrevocable</i> (Status I)	The payment instruction for the sold currency can no longer be cancelled unilaterally either because it has been processed by the relevant payment system or because some other factor (e.g. internal procedures, correspondent banking arrangements, local payment systems rules, laws, etc.) makes cancellation dependent upon the consent of the counterparty or another intermediary; the final receipt of the bought currency is not yet due. In this case the bought amount is clearly at risk.
<i>Uncertain</i> (Status U)	The payment instruction for the sold currency can no longer be cancelled unilaterally; receipt of the bought currency is due, but the institution does not yet know whether it has received these funds with finality. In normal circumstances, the institution expects to have

	received the funds on time. However, since it is possible that the bought currency is not received when due (e.g. owing to an error or to a technical or financial failure of the counterparty or some other intermediary), the bought amount might, in fact, still be at risk.
Fail (Status F)	The bank confirmed that it did not receive the bought currency from its counterparty. In this case, the bought amount is overdue and remains clearly at risk.
Settled (Status S)	The institution knows that it has received the bought currency with finality. From a settlement risk perspective, the trade is considered settled and the bought amount is no longer at risk.

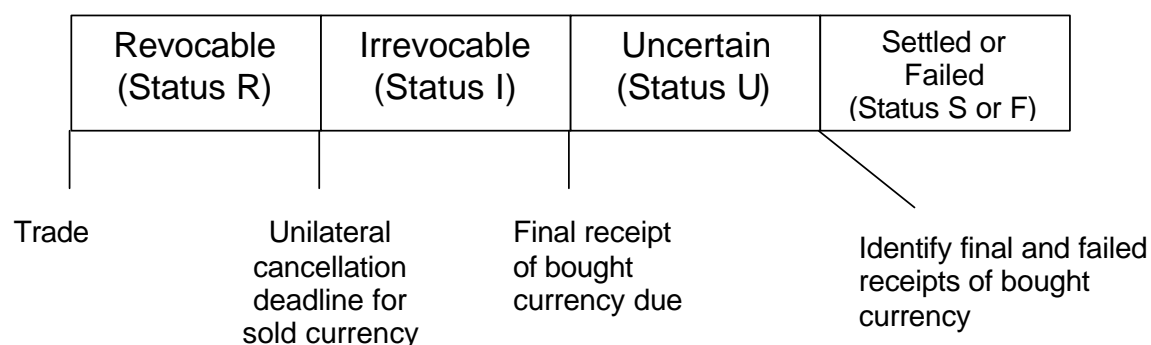
To classify its trades according to the above five categories and measure the duration of its foreign exchange settlement exposure, a bank would need to know the following three timings for each currency that it trades:

- a) Unilateral payment cancellation deadline – the time beyond which an institution can no longer stop a payment without the permission of a third party;
- b) When the currency purchased is due to be received with finality; and
- c) When final and failed receipts are identified.

2.3.3 Changing Status of a Trade

As described below, the above three timings are dependent on the characteristics of the relevant payment systems, as well as the internal settlement practices and the correspondent banking arrangements.

Figure 1: Foreign Exchange Settlement Process : Changing Status of a Trade



For instance, banks which identify their final and failed receipts of bought currencies as soon as they are due can determine their exposures exactly. For these institutions, the current exposure equals the sum of their Status I and Status F trades. In contrast, those that do not immediately identify their final and failed receipts cannot pinpoint the exact size of their foreign exchange settlement exposures. The uncertainty they face reflects their inability to know which of their Status U trades will or will not be actually settled.

2.3.4 Minimum and Maximum Exposures

Faced with the uncertainty described above, banks should be aware of both their minimum and maximum foreign exchange settlement exposures. In general, banks can use the following guidelines to measure their minimum and maximum exposures on the basis of the current status of its current trades:

Minimum exposure: Sum of Status I and Status F trades.

Maximum exposure: Sum of Status I, Status F and Status U trades.

This equals the minimum exposure plus the amount of bought currencies that should – but might not – have been received.

For this study, the MAS assessed the industry's risk profile by computing the maximum exposure.⁴ While the industry's actual exposure will usually fall below this maximum amount, it is the magnitude of a potential 'worst-case scenario' which is important.

⁴ The amount at risk presented in this report explicitly assumes that there were no failures to settle in any currency on an average day. No information was sought from survey respondents on failed transactions and, thus the exposures presented in Chapter 3 only measures the Status I and Status U trades.

3 SETTLEMENT PRACTICES IN THE SINGAPORE FOREIGN EXCHANGE MARKET

3.1 Survey Methodology

3.1.1 Scope

The survey was undertaken based on the work of the CPSS and the recommendations of EMEAP WGPSS. Minor amendments were made to the survey form used by CPSS in order to adapt it for Singapore's context.⁵ The questionnaire covers both qualitative and quantitative aspects of the market's foreign exchange risk management practices. The qualitative aspects included current practices in the management of exposures and expected improvements. The quantitative aspect captured numerical data on the size and duration of foreign exchange settlement exposures. The survey focused solely on foreign exchange transactions where the settlement risk was borne in Singapore, i.e. all foreign exchange-related transactions on the books of the Domestic Banking Unit (DBU) and Asian Currency Unit (ACU). Foreign exchange-related payments and receipts generated through vostro accounts were not captured.

3.1.2 Sample Selection

The banks invited to participate in the survey consisted of the top 39 banks in the Singapore foreign exchange market. These banks accounted for, in aggregation, more than 90 per cent of the total foreign exchange transactions in Singapore in 1999.

3.1.3 Data Collation

The survey was conducted over a two week period from 15 to 28 September 2000. All invited banks participated in the survey. In the analysis of quantitative data, weighted average measurements were used. The

⁵ A copy of the survey questionnaire is included in Appendix 2.

individual responses were aggregated to construct an industry risk profile of the Singapore foreign exchange market. For qualitative data, the MAS reviewed the different approaches taken by individual banks and from this some common risk management practices were identified.

3.2 Settlement Practices

3.2.1 Settlement Methods

The majority of the surveyed institutions were directly responsible for settlement of SGD as a result of the direct access they have in the Singapore real-time gross settlement (RTGS) system, the MAS Electronic Payment System (MEPS). For those not participating directly in MEPS, settlement is done through a settlement agent in Singapore.

For foreign currencies, payments and receipts were mainly made through the use of nostro accounts held with other (correspondent) banks. However, the choice of a correspondent bank is often related to ownership. When the affiliated banks (e.g. branches, parent or subsidiaries) of the respondent directly participate in the relevant payment systems, the relative use of non-related nostro banks declined. Most traded currencies experienced a near-equal split in the proportion of foreign exchange business being settled 'internally' (i.e. either directly or by related corporate entities) and those handled 'externally' (i.e. by an unrelated correspondent bank).

The settlement methods used by the surveyed banks for all reported currencies are presented in Table 2.

Table 2: Currencies Traded and Settlement Methods Used

Currency	Settlement Method* (%)		
	A	B	C
AUD	76	3	21
BND	57	0	43
CAD	70	10	20
CHF	83	0	17
CZK	50	0	50
DEM	15	8	77
DKK	75	0	25
ESP	0	0	100
EUR	41	10	49
GBP	37	8	55
HKD	40	8	52
IDR	59	16	25
INR	67	0	33
JPY	58	3	39
MXN	67	0	33
NLG	0	0	100
NOK	78	0	22
NZD	91	3	6
PLN	50	0	50
SEK	86	7	7
SGD	21	0	79
THB	69	0	31
TWD	0	0	100
USD	43	14	43
ZAR	85	0	15

*Where:

- **A** indicates that correspondent banking services in the currency were provided by a local clearing bank not affiliated with respondent institution other than on a commercial basis;
- **B** indicates that correspondent banking services in the currency were provided by a related entity of respondent institution (e.g. separately incorporated parent or subsidiary);
- **C** indicates that respondent institution (include branches/head office, but not a separately incorporated parent or subsidiary) settled itself.

3.2.2 Key Times in the Settlement Process

Based on data collected in Question 1 of the survey, Table 4 lists the earliest, median, latest, and weighted average timings for unilateral cancellation deadlines and reconciliation times for all the currencies traded.

Depending on the time zone that the currencies are settled in, the unilateral cancellation deadlines varied widely, from as early as 08:00 on the day before value date (V-1) to as late as 07:00 on V+1. Given the implications of the unilateral cancellation deadline on a bank's foreign exchange settlement risk exposure, it is essential that the correspondent's service agreement specifies the cancellation deadline.

The survey revealed that 33 per cent of the surveyed banks have documented cancellation deadlines with their nostro agents for most of their currencies traded. However, 51 per cent of the banks do not have any documentation at all and the remaining 16 per cent did not make any indication with respect to this question (Table 3 shows comparative figures for G10 countries). For the banks without any documentation, their nostro agents would attempt to cancel payment instructions only on a "best efforts" basis. Such a commitment is, however, not legally binding and thus inadequate as a cancellation deadline. In these cases, the paying bank's risk exposure would commence immediately when the payment instruction is sent.

Table 3: Documentation of Cancellation Deadlines

	Singapore	G10*
Percentage share of banks with documented cancellation for a majority or all of the currencies settled	33	14
Percentage share of banks with no documented cancellation times.	51	68

*Data from 1998 CPSS report

Table 4: Cancellation Deadlines and Reconciliation Times

Currency	Cancellation Deadline				Reconciliation Time			
	Earliest	Median	Latest	Wtd avg (gross)	Earliest	Median	Latest	Wtd avg (gross)
AUD	10:00 V-1	6:00 V	14:00 V	3:52 V	17:00 V	11:00 V+1	18:00 V+1	10:57 V+1
BND	18:00 V-1	9:00 V	15:00 V	9:42 V	12:00 V+1	14:00 V+1	18:00 V+30	7:16 V+12
CAD	10:00 V-1	16:00 V	5:00 V+1	20:08 V-1	9:30 V+1	14:00 V+1	16:00 V+2	13:57 V+1
CHF	10:00 V-1	14:00 V	18:00 V	12:55 V	8:00 V+1	12:00 V+1	16:00 V+2	22:29 V+1
CZK	14:00 V	15:00 V	17:30 V	14:58 V	13:30 V+1	16:00 V+1	17:00 V+1	14:54 V+1
DEM	10:00 V-1	13:00 V	21:30 V	1:51 V	9:30 V+1	14:00 V+1	17:00 V+1	13:38 V+1
DKK	9:00 V	14:00 V	17:00 V	13:26 V	10:00 V+1	14:00 V+1	17:00 V+1	11:54 V+1
ESP	10:00 V-1	0:30 V	15:00 V	10:04 V-1	16:00 V+1	1:30 V+2	11:00 V+2	na
EUR	10:00 V-1	13:00 V	22:30 V	10:19 V	5:00 V+1	12:00 V+1	18:00 V+1	14:39 V+1
GBP	9:30 V-1	13:45 V	23:00 V	12:38 V	8:00 V+1	12:00 V+1	12:00 V+2	14:38 V+1
HKD	10:00 V-1	9:00 V	16:30 V	1:11 V	4:00 V+1	12:00 V+1	18:00 V+1	11:05 V+1
IDR	10:00 V-1	17:00 V-1	13:00 V	19:51 V-1	0:00 V	11:30 V+1	18:00 V+1	12:42 V+1
INR	14:00 V-1	18:00 V-1	13:00 V	18:55 V-1	0:00 V	15:00 V+1	18:00 V+1	12:11 V
JPY	10:00 V-1	8:15 V	12:30 V	6:42 V	17:00 V	11:00 V+1	18:00 V+1	12:09 V+1
MXN	8:00 V-1	15:00 V	7:00 V+1	11:24 V	16:00 V+1	16:00 V+1	18:00 V+1	16:21 V+1
NLG	9:00 V	13:00 V	15:00 V	9:24 V	11:00 V+1	15:00 V+1	16:00 V+1	15:55 V+1
NOK	18:00 V-1	15:00 V	18:00 V	13:57 V	10:00 V+1	14:00 V+1	14:00 V+2	12:06 V+1
NZD	10:00 V-1	5:00 V	12:30 V	5:39 V	17:00 V	11:00 V+1	18:00 V+1	10:58 V+1
PLN	9:30 V-1	16:00 V	18:00 V	9:15 V	8:00 V+1	16:00 V+1	17:00 V+1	16:08 V+1
SEK	10:00 V-1	15:00 V	16:30 V	13:38 V	10:00 V+1	14:00 V+1	17:00 V+1	11:26 V+1
SGD	12:00 V-1	17:00 V	18:30 V	13:42 V	17:00 V	18:30 V	17:30 V+1	22:46 V
THB	10:00 V-1	9:30 V	15:00 V	6:46 V	16:00 V	11:00 V+1	18:00 V+1	11:55 V+1
TWD	15:00 V-1	15:00 V-1	15:00 V-1	15:00 V-1	15:00 V+1	15:00 V+1	15:00 V+1	15:00 V+1
USD	17:00 V-1	18:00 V	5:30 V+1	16:32 V	10:00 V+1	13:00 V+1	18:00 V+1	14:32 V+1
ZAR	16:00 V-1	12:00 V	21:30 V	13:53 V	9:30 V+1	15:00 V+1	14:00 V+12	15:37 V+1

It was also noted that the reconciliation times for some exotic currencies could be as late as one month after the settlement date. This was mainly due to the practice of the respondents' nostro agents providing only fortnightly or monthly statements. Although these currencies are not heavily traded, such practices could be improved.

3.3 Settlement Risk

3.3.1 Duration of Exposures for Currency Pairs

Given the importance of USD in the Singapore foreign exchange market, this section analyses the exposures for certain currency pairs involving a USD leg. Table 5 shows the duration⁶ of foreign exchange settlement risk for major currencies and the SGD against the USD.

Table 5: Industry Weighted Average Duration of Exposures (Hours)

<u>Currency Pair</u>	<u>USD bought</u>	<u>USD sold</u>
<u>Major Currencies:</u>		
USD/JPY	31	19
USD/EUR	28	22
USD/GBP	25	22
USD/CAD	42	21
USD/AUD	34	18
USD/CHF	25	29
USD/SGD	24	6

As shown above, the duration of foreign exchange settlement risk is generally shorter for transactions where the USD was sold, rather than where the USD was bought. This is largely due to the two legs of the foreign exchange transaction being settled at different times across the time zones. Payment instructions for selling USD can be cancelled later

⁶ Duration represents the difference, in hours, between the weighted average time when a payment instruction in the sold currency can no longer be cancelled unilaterally and the weighted average time when a receipt in the bought currency is confirmed with finality (or has been identified as failed).

in the Singapore day, while receipts of other currencies can be confirmed earlier. In contrast, when USD is purchased, the payment of the corresponding currency is made first, and the USD is not received until later in the Singapore day when the USD payment system opens, therefore resulting in a longer exposure duration. In terms of exposure duration of currency pairs, Singapore's survey results were broadly comparable with that of Australia's.

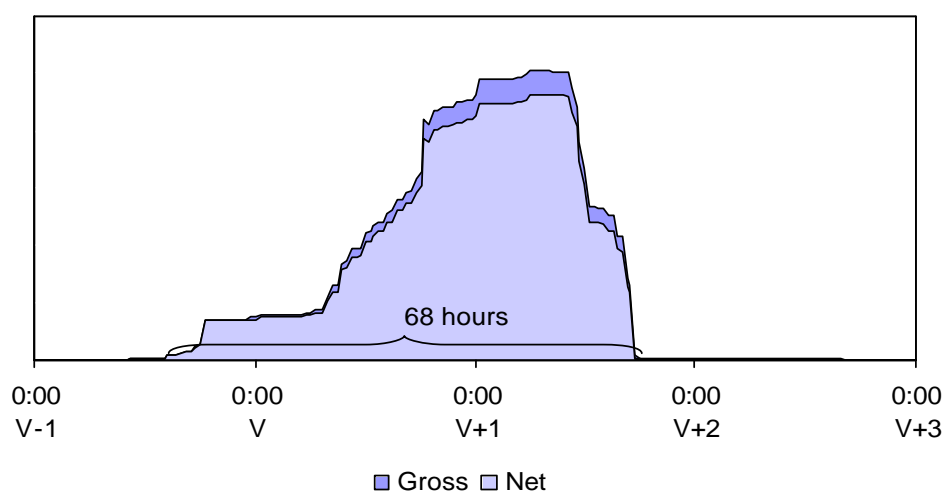
3.3.2 Industry Risk Profiles

This section presents an analysis of the risk profile for the Singapore foreign exchange market, based on the trading patterns of respondents, the values settled and the reconciliation practices employed. The computation of the risk profile is based on the foreign exchange transactions that were settled between the survey period of 15 to 28 September 2000.

A. The One-Day Industry Profile

Figure 2 illustrates the pattern of risk accumulation, and subsequent reduction, for a single day's foreign exchange transactions based on data collected from the survey, excluding some exotic currencies which were considered to be outliers skewing the sample results.

Figure 2: Single Day Profile



As shown in the diagram, the weighted average exposure duration for a single day's worth of foreign exchange transactions was 68 hours during the survey period. Settlement risk of some foreign exchange transactions (for example sales of Mexican Nuevo Pesos) commenced and became irrevocable some 15.5 hours before the value date (V). The accumulated exposure increased during the evening before the value date as the bulk of payment instructions for some currencies became irrevocable but still uncertain with respect to settlement finality. Throughout mid-morning of the value day, the accumulated exposure rose steadily as payment instructions for more currencies became irrevocable.

There was a substantial increase in exposure at 16.30 on the value day as bulk of the USD payment instructions became irrevocable. By the close of the Singapore banking day, instructions to pay in the majority of traded currencies became irrevocable. After the close of the banking day, most banks reconciled the receipt of SGD, resulting in a small dip in the exposure amount.

By 9.30 on V+1, the exposure amount reached its peak. This peak exposure was approximately equivalent to the gross total for the payment leg of all foreign exchange deals less the SGD receipts which were already reconciled.

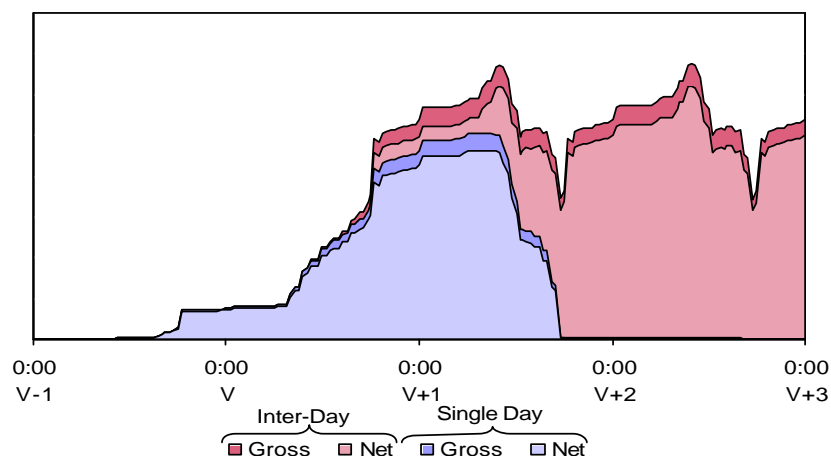
Exposures began to fall between 10.00 and 12.30 on V+1 as many currencies' receipts were confirmed as having been received with finality. This reduction in exposure continued throughout the day and by the end of V+1, the remaining amount at risk was attributable to several exotic currencies still unconfirmed. The amount at risk fell to zero by 16:30 on the second day after value date.

At the close of business day on the value date, it should be possible to make some reductions in the amount at risk by reconciling the receipt of those currencies in the Asia-Pacific time zone that have been settled with finality. For example, as the Foreign Exchange Yen Clearing System (FEYCS) closes at 18.00 Singapore time, reconciliation of JPY receipts on V day could potentially reduce the exposures. Total settlement risk could be reduced further if more Asian currencies' receipts, which are settled on a real-time basis, such as the HKD, are reconciled by the local close of the business day. However, the current practice of most banks in Singapore is to reconcile the receipt of all currencies, other than the SGD, on the day after the value date.

B. The Inter-day Industry Profile

The inter-day profile in Figure 3 illustrates the accumulation of the industry's settlement exposure for the Singapore foreign exchange market on an ongoing basis. Each new trading day gives rise to new exposures requiring reconciliation. Throughout the survey period, when these new exposures were coupled with the uncertainty of pending receipts in the morning of V+1, the duration of exposure for the peak value was one hour.

Figure 3: Single and Inter-day Profiles



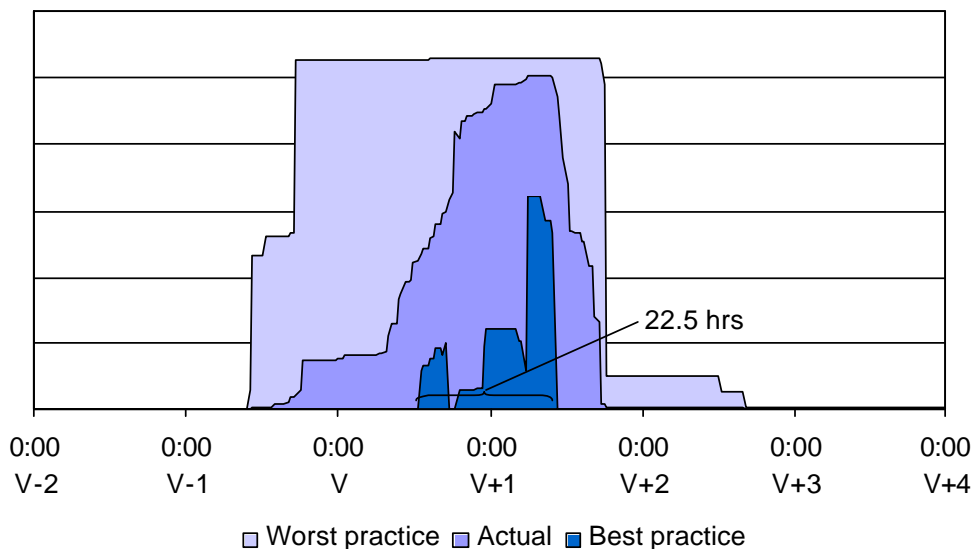
3.3.3 Variation Among Reporting Banks

The information presented above represents the collective exposure of survey respondents. However, individual practices did vary, often substantially, from this general industry profile. The following sections show a composite of the 'best' and 'worst' industry settlement practices using the same values for an average day, but different cancellation and reconciliation times.

A. Current best practice

'Best practice' refers to the combination of responses, which produced the latest unilateral cancellation deadline, and the earliest reconciliation deadline, for each currency. If all survey respondents employed the current best practices in each currency, then the industry's collective exposure to foreign exchange settlement risk would be similar to the risk profile shown for best practice in Figure 4.

Figure 4: Single Day Profile - Best, Current and Worst Practices

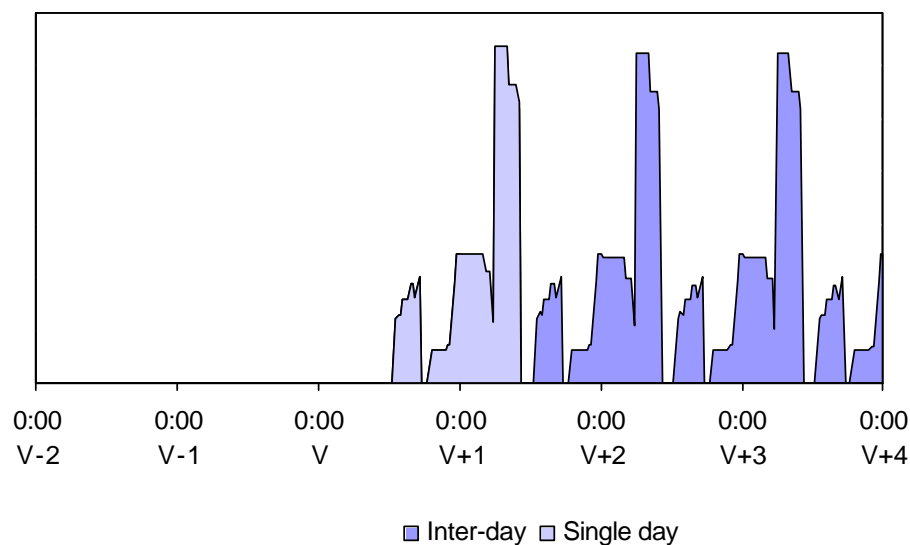


As shown in the profile above, the maximum foreign exchange settlement exposure can be reduced significantly from the current levels. The industry's settlement risk exposure could last for 22½ hours (less than one business day) as settlement risk would not start accumulating

until the value date itself. This is a significant reduction from 68 hours under the actual general industry practice.

Under the best practice model, foreign exchange exposure could be reduced to zero at the end of the business day on value date with the reconciliation of some Asia-Pacific currencies' receipts (JPY, SGD, AUD, THB, IDR) on the same day. All receipts would be reconciled by 14.00 on V+1. Figure 5 illustrates the inter-day profile of the current best practice, which does not result in significant settlement exposures accumulating across the days.

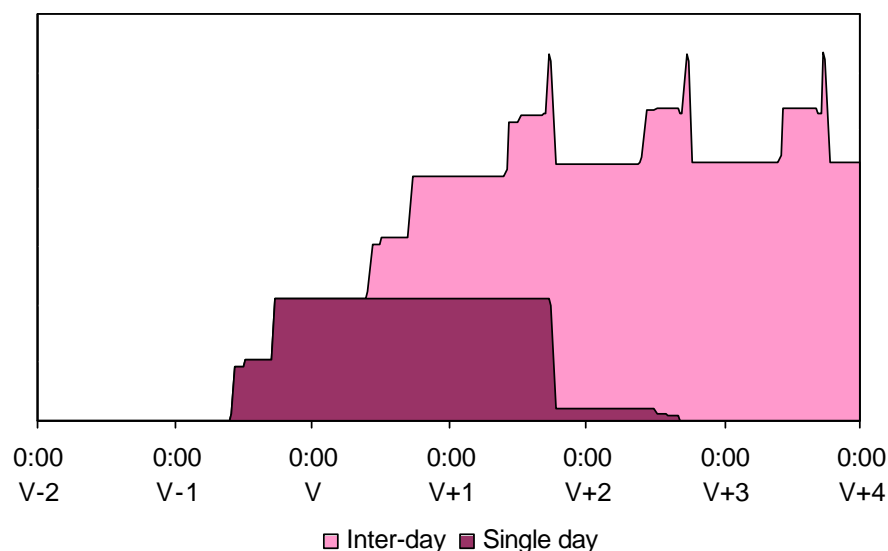
Figure 5: Best Practice – Single and Inter-day Profiles



B. Current worst practice

'Worst practice' refers to the combination of responses, which produced the earliest unilateral cancellation deadline, and the latest reconciliation time, for each currency. Figure 6 illustrates the exposure of the industry to foreign exchange settlement risk if the worst settlement practices were employed for payments and receipts in each currency.

Figure 6: Worst Practice – Single and Inter-day Profiles



For the single-day profile, a substantial settlement exposure would accumulate on the day before value date. The first noticeable decline in the value at risk would not occur until 18:30 on V+1 day. Even after this initial reduction, the remaining settlement exposure would remain for another 22 hours before most of the other major currencies are reconciled. By the close of business day V+2, the settlement exposures related to some exotic currencies would still be present. As noted previously, it may take anywhere from 7 to 31 business days to confirm final receipts of these exotic currencies.

The exposure for a single day's transactions for worst practice would last about 80 hours (exclusive of exotic currencies). The continuation of settlement exposure over more than three business days, would mean that the accumulated inter-day total value at risk could be as high as three times the amount receivable of a single day's foreign exchange transactions.

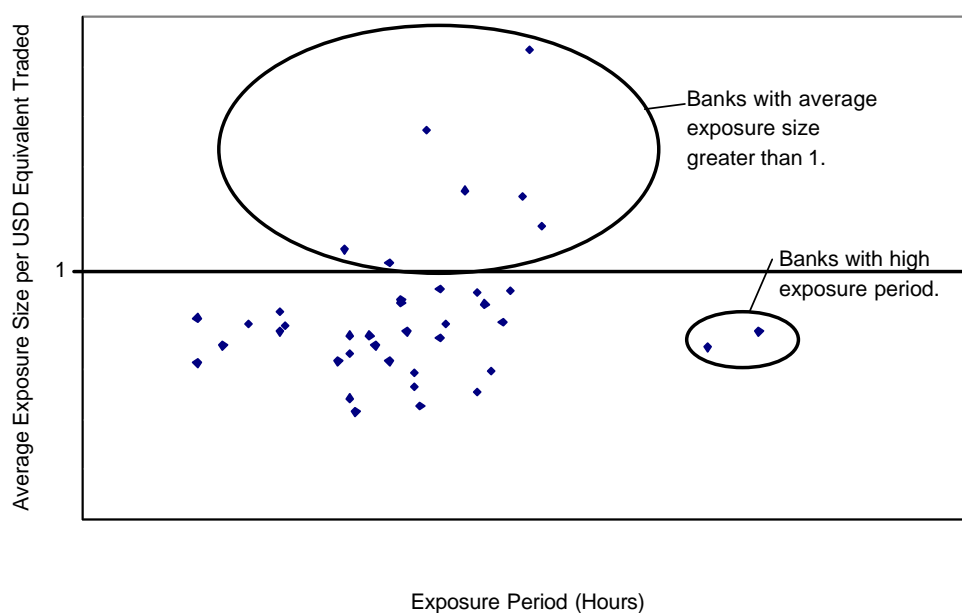
While this scenario represents an extreme situation, i.e. the amalgamation of the worst settlement practices currently exhibited, it

must be remembered that such practices do exist in some form, as they are based on responses from the banks that were surveyed.

C. Industry Distribution Analysis

The average inter-day exposure size represents the average exposure faced by a bank throughout the day. Figure 7 shows the distribution of the surveyed banks with respect to their exposure period and adjusted average exposure size.⁷ The average exposure magnitude faced by seven respondents exceeded the total value of a single day's trades, i.e. on average, for every dollar traded in a given day, more than a dollar is at risk of failure during settlement. This is a reflection of relatively weak reconciliation practices and unnecessarily early cancellation times. While the rest of the banks managed to keep their average inter-day exposure size below the amount receivable for a single day's trades, there were two banks with exceptionally high exposure periods due to late reconciliation timings for a few currencies.

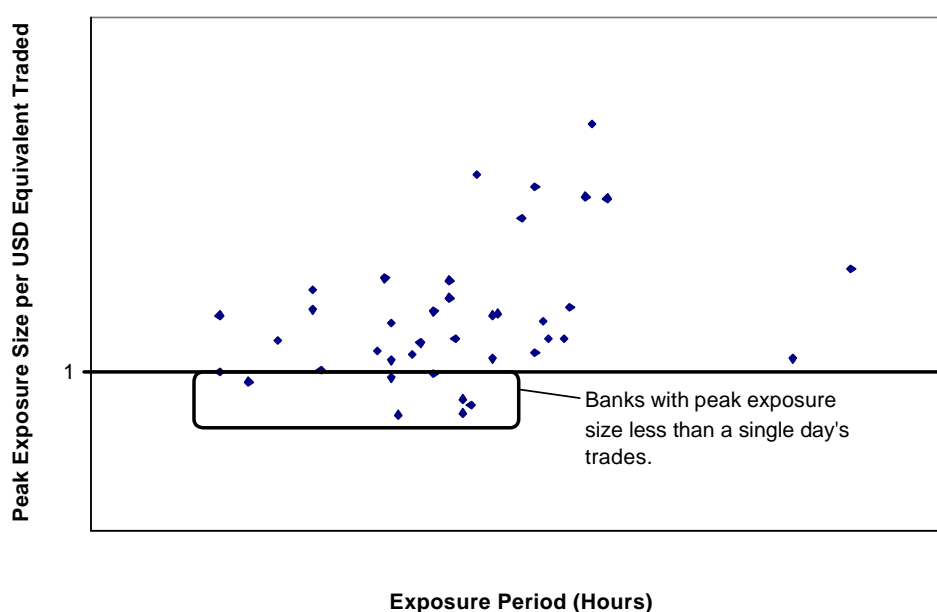
Figure 7: Distribution Analysis – Exposure Period and Adjusted Average Exposure



⁷ For the computation of the adjusted average exposure size per USD equivalent traded, the average exposure size for inter-day profile is divided by the amount receivable for a single day's trades by the institution.

Figure 8 illustrates the distribution of the surveyed banks with respect to their adjusted peak exposure size⁸ and exposure period. Banks with good settlement practices should have adjusted peak exposure sizes of less than one. As demonstrated by several institutions, it is possible to keep the peak exposure size well below the amount receivable for a single day's trades.

Figure 8: Distribution Analysis – Exposure Period and Adjusted Peak Exposure



3.3.4 Caveat

While MAS and the survey participants made every effort to ensure the accuracy of the data, some survey responses may have been inaccurate due to a misunderstanding of some aspects of the questionnaire, as this was the first time such a survey was done. Much care was given to minimize this, with an industry seminar to explain the finer details, and subsequent liaisons with some participants on obvious mistakes. Taking these into consideration, MAS believes that the information included in this report is a fair and accurate representation of

⁸ The adjusted peak exposure size is computed using the maximum inter-day exposure divided by the amount receivable for a single-day's transactions.

general settlement practices used in the Singapore foreign exchange market.

4 Risk Management

Adequate risk management measures are useful in helping institutions mitigate foreign exchange settlement risk. In this regard, Questions 4 and 5 of the survey sought to gain a better understanding of the risk management practices and risk reduction measures used by the participants. In general, common risk management practices among the participants were observed from the responses.

4.1 Best Practice in Institutions

4.1.1 Senior Management Responsibility

The Progress Report highlighted the need for an adequate overall management structure to deal with foreign exchange settlement risk. Indeed, it is evident that management of foreign exchange settlement risk begins with appropriate responsibilities and supervision by senior management. Specifically, senior management should be aware of both the general nature of foreign exchange settlement risk and the specific levels of risk that their institution is exposed to.

All survey respondents indicated that the responsibility of foreign exchange settlement has been formally assigned to an individual or department. Around 70 per cent confirmed that their senior management are involved in assessing foreign exchange settlement risk. This would suggest that some foreign exchange trading institutions might not be devoting sufficient attention to foreign exchange settlement risk.

4.1.2 Measurement of Exposures

While the CPSS has proposed a methodology for measuring foreign exchange settlement risk exposure, it is no surprise that many foreign exchange trading institutions continue to use their own foreign exchange settlement risk measurement methodology. Based on the

survey results, about 85 per cent of the respondents have an established methodology for measuring and projecting their foreign exchange settlement exposures. However, it is of some concern that the remaining 15 per cent of respondents did not indicate whether they had any such established methodology. However, of those that do have an existing methodology, 77 per cent used the single calendar day method and 8 per cent used the multiple day method in measuring foreign exchange settlement risk.

The single calendar day methodology seeks to measure exposures as being equal to receipts due on a single day. Given that the exposure period and magnitude of most respondents are generally greater than 24 hours and higher than a single day's trade respectively, it can be concluded that many institutions, by using the single day method, are underestimating their foreign exchange settlement exposures.

The multiple day method measures exposure as being equal to two or more days' trades. While this method usually provides a better estimate of an institution's settlement risk than the single day method, it fails to capture the intra-day fluctuations of foreign exchange settlement risk.

The recommended methodology set out in the Allsopp Report, and as described in Section 2.3, recognises that exposures can change during the day and therefore, it has the advantage of avoiding over-estimation and under-estimation. While 18 per cent of the respondents indicated their intention to improve their measurement method by various means, such as implementing global risk management systems, only two banks noted an intention to implement the recommended method to improve the accuracy of their measurement method.

4.1.3 Control of Exposures

The proper measurement of an institution's foreign exchange settlement risk helps them to make informed business decisions. As part of an effective management approach, a bank can also choose to control its foreign exchange settlement exposures in a manner consistent with the way it controls its other credit exposures. Indeed, in our survey, about 67 per cent of the respondents indicated that they apply similar credit limit controls across all formal short-term credit extensions.

4.2 **Reducing Foreign Exchange Settlement Risk**

4.2.1 Netting

One way in which foreign exchange settlement exposures can be reduced is by netting foreign exchange obligations so that only the smaller net amounts are settled. Only 47 per cent of the surveyed banks indicated that they engage in bilateral netting agreements with their counterparts. This is quite low compared to the G10⁹ and surveyed Australian banks of 77 per cent and 62 per cent, respectively. Bilateral netting reduced the settlement flows by 8 per cent, relatively lower than that found for G10 countries in the CPSS survey in 1997, which indicated a reduction of settlement flows by 15 per cent through bilateral netting. Table 6 provides more information on the extent of bilateral netting between participants in the Singapore foreign exchange market.

⁹ G10 countries conducted a second FX settlement risk survey in 1997.

Table 6: Number of Counterparties for Bilateral Netting

Distribution of Number of Counterparties		
No. of counterparties for which have bilateral netting arrangements	Percentage of banks with bilateral netting arrangements	
	Singapore	CPSS 1997 Survey
0 counterparty	56	23
1-20 counterparties	26	34
21-100 counterparties	18	23
Over 100 counterparties	3	19

4.2.2 Improved Cancellation and Reconciliation Times

Besides reducing the size of settlement exposures through netting, a foreign exchange trading institution can also change its internal procedures and processes so as to reduce the duration of its settlement exposure. Specifically, it may do so by eliminating overly restrictive unilateral payment cancellation deadlines and reducing the time it takes to identify its final and failed receipts of purchased currencies.

In the survey, 38 per cent of the respondents indicated their intention to shorten the duration of their exposures. Recognising the importance of appropriate unilateral cancellation deadlines and reconciliation timings, some respondents indicated their intention to review and negotiate with nostro agents on a regular basis, while others choose to enhance reconciliation procedures to shorten the period of uncertainty.

4.2.3 Real-Time Gross Settlement

Internationally, there is a noticeable trend towards the establishment of RTGS systems for settlement of high-value payments, such as foreign exchange transactions. Our survey shows that over 96 per cent of foreign exchange flows on the books of banks can now be settled on a real-time gross settlement basis. This provides banks with the opportunity to reconcile final receipts earlier during the operating

hours of the RTGS system instead of having to wait until the end of the netting cycle. However, this is only possible if the correspondent banks identify receipts and despatch statements promptly. The surveyed banks tend to delay the reconciliation of Asia-Pacific currencies to the following day after value date, thereby prolonging their exposures unnecessarily.

4.2.4 Continuous Linked Settlement (CLS)

The concept of CLS arose in 1995 as a result of the G-20's study on foreign exchange settlement risk.¹⁰ Essentially, CLS is a private sector initiative to simultaneously settle both sides of a foreign exchange transaction across the books of CLS Bank. CLS will contribute towards eliminating settlement risk which can occur when each leg of a foreign exchange transaction is settled separately. CLS Bank is expected to commence operations in October 2001. CLS Bank will initially provide simultaneous settlement capabilities for seven major currencies, i.e. AUD, CAD, EUR, JPY, GBP, CHF, USD and more currencies will be included at a later stage.

The CLS Bank will be supervised by the Federal Reserve Bank of New York. However, its settlement processing will be done in UK. Currently, there are over 60 shareholders banks in the holding company for CLS Bank, CLS Services (CLSS). These shareholders will be eligible to participate in CLS Bank directly. All other entities, which are not shareholders of CLSS, may access CLS services as third party customers.

Of the 38 per cent of respondents who indicated intentions of shortening their exposures, approximately 17 per cent highlighted

¹⁰ The G20 is an ad-hoc committee of major foreign exchange trading banks.

participation in CLS as a measure to reduce their foreign exchange settlement risk.

4.2.5 Payment versus Payment¹¹ (PvP)

Besides CLS, another possible option to reduce foreign exchange settlement risk might be the establishment of bilateral or multilateral cross-border links between national RTGS payment systems. In particular, direct operational and informational links could be created that would give participating central banks the joint capability to monitor, control and simultaneously execute final transfers over their respective home-currency payments systems. With such cross-border connections, central banks could directly provide the private sector with PvP settlement services for currencies with overlapping payments system operating hours. However, in the CPSS report, *Central Bank Payment and Settlement Services with respect to Cross-Border and Multi-Currency Transactions*, private sector effort was the preferred approach to reduce risk and increase efficiency in the settlement process.

4.2.6 Longer Payment System Operating Hours

The extension of the operating hours of an individual payment system would help to reduce the current gap (or increase the current overlap) with the operating hours of other countries' payment systems. Combined with the availability of final transfers over those systems, such an overlap could allow all relevant currencies to settle on a PvP basis, thereby assuring counterparties that payments in one currency would be made if and only if payments in all relevant currencies are made.

¹¹ Payment versus payment is a mechanism in a foreign exchange settlement system which ensures that a final transfer of one currency occurs if and only if a final transfer of the other currency or currencies takes place.

4.2.7 Contracts for Difference (CFD)

A CFD is an agreement between two counterparties to replace a traditional foreign exchange transaction with an 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. This instrument could deliver benefits analogous to those of bilateral netting. This initiative is based on the premise that a large portion of foreign exchange transactions are for hedging or speculative activities which only require settlement of the mark-to-market profit or loss.

5 Conclusions

5.1 Summary of Findings

From the survey results, it is evident that many respondents have significant foreign exchange settlement risk exposures across their books. However, an assessment of current best practices shows that there is much room for improvement. By focusing on factors such as eliminating overly restrictive cancellation deadlines and improving reconciliation practices, the duration and magnitude of banks' exposures could be significantly reduced. In addition, the magnitude of exposures could also be reduced further if banks practice bilateral netting with their counterparties.

The survey results indicated that banks tend to unnecessarily prolong their exposure to foreign exchange settlement risk due to existing reconciliation practices. Receipts in most of the major currencies traded are not confirmed until the middle of the business day following the value date. If reconciliation could be done promptly after purchased currencies are received, the period of uncertainty could be substantially reduced thereby reducing the accumulated value at risk.

With RTGS systems implemented in many countries, it is possible for correspondent banks to promptly identify any receipts or failures throughout the operating hours of the respective payment system and promptly dispatch statements for prompt reconciliation by the banks. Hence, for the Asian-pacific currencies such as HKD, THB, AUD and JPY, it is unnecessary to wait until the next day to reconcile the final receipts.

The survey results did indicate that a growing number of foreign exchange participants are increasingly aware of the issues surrounding

foreign exchange settlement risk, and are now actively measuring, monitoring and enforcing limits against settlement risk. In doing so, these banks are taking significant steps towards achieving best practice standards. However, there remains much to be done in order for current industry practice to reach best practice standards. At a minimum, all banks should ensure that senior management is responsible for controlling foreign exchange risk, to ensure the appropriate level of attention is devoted to this issue.

5.2 Recommendations

With this report, the MAS hopes to promote a greater awareness of, and need for, foreign exchange settlement risk management among foreign exchange participants. The topics presented and issues discussed within this report are aimed at assisting foreign exchange participants achieve a more comprehensive understanding of the relationship between their risk management practices (such as unilateral cancellation times, reconciliation times, and counterparty credit limits) and foreign exchange exposures (including both magnitude and duration). In this way, institutions can seek to reduce their foreign exchange exposures by renegotiating correspondent banking relationships and improving back office procedures towards industry best practices. However, unless all participants in the Singapore foreign exchange market make a serious commitment towards tackling these issues, it will be difficult to achieve any significant improvements.

Appendix 1: Case Studies

A. The failure of Bankhaus Herstatt (1974)

On 26th June 1974 the Bundesaufsichtsamt für das Kreditwesen withdrew the banking licence of Bankhaus Herstatt, a small bank in Cologne active in the foreign exchange market, and ordered it into liquidation during the banking day but after the close of the interbank payments system in Germany. Prior to the announcement of Herstatt's closure, several of its counterparties had irrevocably paid Deutsche Mark to Herstatt on that day through the German payments system against anticipated receipts of US dollars later that same day in New York in respect of maturing foreign exchange transactions.

Upon the termination of Herstatt's business at 10:30 New York time on 26th June (15:30 in Frankfurt), Herstatt's New York correspondent bank suspended outgoing US dollar payments from Herstatt's account. This action left Herstatt's counterparty banks exposed for the full value of the Deutsche Mark deliveries made. Moreover, banks which had entered into forward trades with Herstatt not yet due for settlement lost money in replacing the contracts in the market, and others had deposits with Herstatt.

B. Drexel Burnham Lambert (1990)

In February 1990, the Drexel Burnham Lambert (DBL) group collapsed, the initial cause being severe liquidity problems. The Bank of England had to intervene, as a facilitator, to minimise the impact of DBL's problems on the counterparties of one of its London subsidiaries, Drexel Burnham Lambert Trading (DBLT), which traded as a principal in the foreign exchange and gold markets.

As market awareness grew of the extent of the problems in the DBL group, DBLT's counterparties became progressively less willing to incur intraday exposures to it in the settlement of their foreign exchange deals. At the same time DBLT was unwilling to pay the amounts it owed on maturing deals, because of concerns that the counterparties might decline to pay the other currency involved and instead set off the receipts from DBLT against amounts due to them from other companies in the DBL group.

After intensive discussions with DBLT, which was required to produce evidence of its solvency, the Bank of England put in place a settlement facility, which remained open for a full week, to resolve this developing gridlock. Under this facility, DBLT's counterparties were invited to pay amounts due into accounts held in the Bank of England's name with the Bank's correspondent bank (in almost all cases the central bank) in each country concerned. Once the Bank had received confirmation that funds had been credited to these accounts it informed DBLT. DBLT then made irrevocable payments of countervalue to each counterparty directly, using funds made available for the purpose by its immediate parent company. Upon receipt of these payments the respective counterparty was asked to confirm to the Bank of England that it was prepared for the Bank to release the relevant deposit to DBLT.

C. BCCI (1991)

The appointment of a liquidator to Bank of Credit and Commerce International S.A. (BCCI S.A.) on 5th July 1991 caused a principal loss to UK and Japanese foreign exchange counterparties of the failed institution.

An institution in London was due to settle on 5th July 1991 a dollar/sterling foreign exchange transaction into which it had entered two

days previously with BCCI S.A., London. The sterling payment was duly made in London on 5th July. BCCI had sent a message to its New York correspondent on 4th July (a public holiday in the United States) to make the corresponding US dollar payment for value on 5th July. The payment message was delayed beyond the time of the correspondent bank's initial release of payments (at 7 a.m.) by the operation of a bilateral credit limit placed on BCCI's correspondent by the recipient CHIPS¹² member. The payment remained in the queue until shortly before 4 p.m. (New York time), when it was cancelled by BCCI's correspondent, shortly after the correspondent had received a message from BCCI's provisional liquidators in London on the subject of the action it should take with regard to payment instructions from BCCI London. In this way, BCCI's counterparty lost the principal amount of the contract.

A major Japanese bank also suffered a principal loss in respect of a dollar/yen deal due for settlement on 5th July, since yen had been paid to BCCI S.A. Tokyo that day, through the FEYCS, and the assets of BCCI S.A. in New York State were frozen before settlement of the US dollar leg of the transaction took place.

D. The attempted Soviet coup d'état (1991)

The short-lived coup d'état in Moscow in August 1991 led to uncertainty about the status and possible actions of certain financial institutions based in, or owned by institutions in, the then Soviet Union. For a few days the uncertainty had a disruptive effect on settlement in the foreign exchange market, in which these institutions were active traders. Some of their market counterparties were unwilling, given the political climate, to expose themselves to what they saw as potentially very acute principal risk in settling their maturing foreign exchange

¹² Clearing House Interbank Payments System.

contracts. They instead pressed for the receipt of countervalue (or a guarantee from an acceptable third party) in advance of releasing funds. As a result, some deals were not settled when due.

There were also some instances of unwillingness on the part of the Soviet-based institutions' correspondent banks to release funds even when countervalue had been received, including at least one attempt by a correspondent to withhold funds it was due to pay out to its customer on one day to cover an amount it was due to receive from the same customer the next day.

E. The Barings crisis (1995)

The unforeseen collapse of Baring Brothers at the end of February 1995 caused a problem in the ECU clearing. On Friday, 24th February one clearing bank had sent an ECU payment instruction addressed to Barings' correspondent for a relatively small amount for value on Monday, 27th February. After the appointment of an administrator to Barings on 26th February the sending bank sought to cancel the instruction but it found that the rules of the ECU clearing did not permit this; moreover, the receiving bank was legally unable to reverse the transaction. As it turned out, the sending bank happened to find itself in an overall net debit position in the clearing at the end of the day. Under pressure of time the bank agreed to cover that position by borrowing from a long bank, so enabling the settlement of more than ECU 50 billion in payments between the 45 banks participating in the clearing eventually to be completed on the due date.

Appendix 2: Sample Questionnaire**Question 1 – DURATION OF FX-RELATED SETTLEMENT EXPOSURES**

This question seeks information on the duration of foreign exchange (FX) settlement exposures for the various currencies in which your institution, on its DBU and ACU books, settled FX transactions (Spot, Forward, and Swap) during the survey period.

Exclude inter-desk or inter-branch transactions. Use "NA" for "not available".

Please provide the answers in terms of Singapore time (*not* the local time of the currency concerned), and use the format specified in footnote 6 *e.g.* 20:30 V+1.

Currency	Principal method(s) of settlement ¹	Send payment instructions ²		Unilateral payment cancellation deadline ³			Final receipts due ⁴			Identify final and failed receipts ⁵	
		Time ⁶	Day ⁶	Time ⁶	Day ⁶	Docu-mented? ⁷	Time ⁶	Day ⁶	Docu-mented? ⁷	Time ⁶	Day ⁶
	Column (1)	Column (2)		Column (3)			Column (4)			Column (5)	
AUD											
CAD											
CHF											
EUR											
FRF											
GBP											
HKD											
JPY											
NZD											
SGD											
USD											

* All footnotes can be found in Annex A.

Example:

USD	A, B	10:00	V-1	11:00	V	N	18:00	V	Y	10:00	V+1
		16:00	V-1				19:00	V	Y		

Note:

1) The above example is used to illustrate how this question can be completed and may not necessarily reflect a typical scenario.

2) With reference to the above example, the bank uses 2 principal methods to settle USD, i.e. method A & B (Refer to Annex A for more information). Depending on the method of settlement, payment instructions for USD can be sent at either 10:00 hrs, V-1 or 16:00 hrs, V-1. Both methods have the same unilateral cancellation deadline at 11:00 hrs, V, which is not documented. Final receipts due for USD for both methods are documented at 18:00 hrs, V and 19:00 hrs, V. Identification of final and failed receipts is done at 10:00 hrs, V+1.

Question 1 (Continued) – DURATION OF FX-RELATED SETTLEMENT EXPOSURES

This question seeks information on the duration of foreign exchange (FX) settlement exposures for the various currencies in which your institution, on its DBU and ACU books, settled FX transactions (Spot, Forward, and Swap) during the survey period.

Exclude inter-desk or inter-branch transactions. Use "NA" for "not available".

Please provide the answers in terms of Singapore time (*not* the local time of the currency concerned), and use the format specified in footnote 6 e.g. 20:30 V+1.

Currency	Principal method(s) of settlement ¹	Send payment instructions ²		Unilateral payment cancellation deadline ³			Final receipts due ⁴			Identify final and failed receipts ⁵	
		Time ⁶	Day ⁶	Time ⁶	Day ⁶	Docu-mented? ⁷	Time ⁶	Day ⁶	Docu-mented? ⁷	Time ⁶	Day ⁶
	Column (1)	Column (2)		Column (3)			Column (4)			Column (5)	

* All footnotes can be found in Annex A.
 * Please make additional copies of this form when there is insufficient space.

Example:

USD	A, B	10:00	V-1	11:00	V	N	18:00	V	Y	10:00	V+1
		16:00	V-1				19:00	V	Y		

Note:
 1) The above example is used to illustrate how this question can be completed and may not necessarily reflect a typical scenario.
 2) With reference to the above example, the bank uses 2 principal methods to settle USD, i.e. method A & B (Refer to Annex A for more information). Depending on the method of settlement, payment instructions for USD can be sent at either 10:00 hrs, V-1 or 16:00 hrs, V-1. Both methods have the same unilateral cancellation deadline at 11:00 hrs, V, which is not documented. Final receipts due for USD for both methods are documented at 18:00 hrs, V and 19:00 hrs, V. Identification of final and failed receipts is done at 10:00 hrs, V+1.

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

This question seeks information on the notional value (expressed in millions), before netting, of the relevant currency for all FX-related payments and receipts (Spot, Forward, and Swap) made by your institution, on its DBU and ACU books, during the survey period.

Exclude inter-desk or inter-branch transactions.

Omit any currencies for which total obligations for the survey period are less than one million USD equivalent. Round all answers to the nearest million. Use "NA" for "not available".

Currency	Total		Of which, notional value settled under bilateral netting agreements (Netted Trades)		of which, gross value settled on a trade-by-trade basis (Non-Netted Trades)	
	Payable [Sum of columns (3) and (5)]	Receivable [Sum of columns (4) and (6)]	Payable	Receivable	Payable *[Should equal Question 3, col. (5) amount]	Receivable *[Should equal Question 3, col. (6) amount]
	Column (1)	Column (2)	Column (3)	Column (4)	Column (5)	Column (6)
AUD						
CAD						
CHF						
DEM						
EUR						
FRF						
GBP						
HKD						
JPY						
NZD						
SGD						
USD						

Example:

USD	500	200	200	50	300	150
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Note:

- The above example is used to illustrate how this question can be completed and may not necessarily reflect a typical scenario.
- With reference to the above example, the total notional USD obligations payable and receivable during the survey period were USD500m and USD200m respectively. Out of the USD500m payable, USD200m was settled on a bilateral netted basis and USD300m was settled on a gross basis. Similarly, USD50m receivable was settled on a bilateral netted basis, while USD150m was settled on a gross basis.

Question 3 - ACTUAL VALUE, AFTER ANY NETTING, OF FX-RELATED SETTLEMENT FLOWS

This question seeks information on the **actual value** (expressed in millions), after **netting**, of the relevant currency for all FX-related payments and receipts (Spot, Forward, and Swap) made by your institution, on its DBU and ACU books, during the survey period.

Exclude inter-desk or inter-branch transactions.

Omit any currencies for which total obligations are less than one million USD equivalent. Round all answers to the nearest million. Use "NA" for "not available".

Currency	Total		Of which, actual flows to settle bilaterally netted trades		of which, actual flows to settle individual, non-netted trades	
	Payments [Sum of columns (3) and (5)] (1)	Receipts [Sum of columns (4) and (6)] (2)	Payments (3)	Receipts (4)	Payments *[Should equal Question 2, col. (5) amount] (5)	Receipts *[Should equal Question 2, col. (6) amount] (6)
	Column (1)	Column (2)	Column (3)	Column (4)	Column (5)	Column (6)
AUD						
CAD						
CHF						
DEM						
EUR						
FRF						
GBP						
HKD						
JPY						
NZD						
SGD						
USD						

Example:

USD	450	150	150	0	300	150
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Note:

1) The above example is used to illustrate how this question can be completed and may not necessarily reflect a typical scenario.

2) With reference to the above example, the total actual value of USD paid and received during the survey period were USD450m and USD150m respectively. Out of the USD450m paid, USD150m was related to bilateral netting and USD300m was related to gross settlement. All of the USD150m received was in relation to gross settlement.

Question 4 - NUMBER OF FX TRADING COUNTERPARTIES

This question seeks information on the number of foreign exchange trading counterparties your institution, on its DBU and ACU, has and the extent to which there are arrangements with these counterparties to settle on a bilateral basis.

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.

If needed, use "NA" for "not available".

	Number of counterparties
How many FX trading counterparties does your institution <i>currently</i> have in total?	
<i>Bilateral netting</i>	
With how many of its <i>total</i> FX counterparties does your institution have arrangements to settle trades on a bilaterally netted basis?	
With how many of its <i>top 10</i> FX counterparties does your institution have arrangements to settle trades on a bilaterally netted basis?	
With how many of its <i>top 25</i> FX counterparties does your institution have arrangements to settle trades on a bilaterally netted basis?	
With how many of its <i>top 50</i> FX counterparties does your institution have arrangements to settle trades on a bilaterally netted basis?	

Question 5 – FX SETTLEMENT PRACTICES

Please provide written responses to the following questions

- i) Has senior management conducted an assessment of your institution's FX settlement risk?
If yes, please describe the scope of such assessment.
[Such assessment may include an analysis of currency pair exposure durations, adequacy of FX settlement exposure measurement methodology, and appropriateness of FX settlement limits.]
- ii) Is someone in your institution responsible for managing FX settlement exposures with respect to (a) **individual counterparties**, and (b) **aggregate settlement exposures** on a day-to-day basis?
If yes, please describe the current duties, responsibilities and reporting structure.
[Management of FX settlement exposures may include enforcement of FX settlement exposures limits, monitoring of counterparty exposures, and management of failed settlements.]
- iii) Currently, does your institution have a methodology for measuring and projecting its bilateral FX settlement exposures for credit risk management purposes?
If yes, please describe the method used.
[To illustrate, an institution may use any of the following 3 methods to measure and project its FX settlement exposures:
- **Single calendar day**: Measures exposures as being equal to receipts due on a single day.
 - **24-hour period**: Measures exposures within a 24-hour period, and not within a single calendar day.
 - **Multiple day**: Measures exposures as being equal to 2 or more days' trades (depending on how many days' trades may be outstanding at any time)].
- iv) Are there any plans to revise your institution's exposure measurement methodology? If yes, please provide details of revision and likely dates for implementing any such revisions.
- v) Are there any plans to shorten the periods of "irrevocability" and "uncertainty" during the routine settlement of FX trades? If yes, please describe.
[To shorten the periods of "irrevocability" and "uncertainty", it usually means improving the timings of unilateral cancellation deadlines and identification of final and failed receipts.]
- vi) When controlling counterparty credit exposures associated with FX settlements, does your institution apply the same set of counterparty credit controls it applies to deposits, placements and other formal short-term credit extensions?
If not, please provide reasons.
[Specifically, in measuring its counterparty credit exposures, does your institution 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 your institution's trading centres? Are limits mandatory or indicative? How are exposures in excess of the limits handled?]
- vii) With respect to your institution's current procedures, how are you notified by each of your correspondents that your account has been credited? What follow-up action do you take upon identifying a failed receipt?
[For example, do you inform credit area immediately, or after a predetermined escalation process?].

Annex A

- ¹ For each of the currencies, please indicate, using 'A', 'B' or 'C', the *principal* method(s) of settlement, where:
- **A** indicates that correspondent banking services in the currency were provided by a local clearing bank not affiliated with your institution other than on a commercial basis;
 - **B** indicates that correspondent banking services in the currency were provided by a related entity of your institution (e.g. separately incorporated parent or subsidiary);
 - **C** indicates that your institution (include branches/head office, but not a separately incorporated parent or subsidiary) settled itself.
- [For example, a Singapore branch of a US bank, "ABC Bank", settling its GBP transactions using the London branch of "ABC Bank" would insert "C" under GBP, where as if it used the UK subsidiary of "ABC Bank" it would insert "B".]
- ² At what time do you routinely issue your payment instructions for value on day V?
- ³ 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 (i.e. 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 (e.g. 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.
- ⁴ 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 - i.e. what is the latest agreed 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 (e.g. 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".
- ⁵ At what time do you usually *identify* final and failed payments to you for value on day "V"? For example, this may be the time when you routinely complete the reconciliation of an electronically transmitted nostro statement.
- ⁶ 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"*. Note that midnight in the evening of any given value day should be recorded as 00:00 on the following day.
- ⁷ Please reply "yes" if the indicated time and day is based on a legally enforceable agreement or arrangement. Otherwise reply "no".

Appendix 3: Currency Codes

Currency	Code	Currency	Code
Australian Dollar	AUD	Japanese Yen	JPY
Brunei Dollar	BND	Mexican Nuevo Peso	MXN
Canadian Dollar	CAD	Netherlands Guilder	NLG
Swiss Franc	CHF	Norwegian Krone	NOK
Czech Koruna	CZK	New Zealand Dollar	NZD
Deutsche Mark	DEM	Zloty (Poland)	PLN
Danish Krone	DKK	Swedish Krona	SEK
Spanish Peseta	ESP	Singapore Dollar	SGD
Euros	EUR	Thai Baht	THB
Pound Sterling	GBP	Taiwan Dollar	TWD
Hong Kong Dollar	HKD	US Dollar	USD
Indonesian Rupiah	IDR	Rand (South Africa)	ZAR
Indian Rupee	INR		

Appendix 4: References

1. Bank for International Settlements, *Reducing Foreign Exchange Settlement Risk: A Progress Report*, Committee on Payment and Settlement Systems, July 1998.
2. Bank for International Settlements, *Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten Countries*, Committee on Payment and Settlement Systems, November 1990.
3. Bank for International Settlements, *Settlement Risk in Foreign Exchange Transactions*, Committee on Payment and Settlement Systems, March 1996.
4. Reserve Bank of Australia, *Foreign Exchange Settlement Practices in Australia*, December 1997.
5. Reserve Bank of Australia, *Reducing Foreign Exchange Settlement Practices in Australia: A Progress Report*, December 1999.